CORRESPONDENCE COVER SHEET
WASTE PERMITS DIVISION
TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Date: May 3, 2023
Facility Name: Ruffino Road Type IX Registration Application
Permit or Registration No.:

Nature of Correspondence:
☐ Initial/New
☒ Response/Revision*

*If Response/Revision, please provide previous TCEQ Tracking No.: 28501428
(Previous TCEQ Tracking No. can be found in the Subject line of the TCEQ's response letter to your original submittal.)

This cover sheet should accompany all correspondences submitted to the Waste Permits Division and should be affixed to the front of your submittal as a cover page. Please check the appropriate box for the type of correspondence being submitted. For questions regarding this form, please contact the Waste Permits Division at (512) 239-2335.

Table 1 - Municipal Solid Waste

APPLICATIONS	REPORTS and RESPONSES
☐ New Notification	☐ Closure Report
☐ New Permit (including Subchapter T)	☐ Groundwater Alternate SRC Demonstration
☒ New Registration (including Subchapter T)	☐ Groundwater Corrective Action
☐ Major Amendment	☐ Groundwater Monitoring Report
☐ Minor Amendment	☐ Groundwater Statistical Evaluation
☐ Limited Scope Major Amendment	☐ Landfill Gas Corrective Action
☐ Notice Modification	☐ Landfill Gas Monitoring
☐ Non-Notice Modification	☐ Liner Evaluation Report
☐ Transfer/Name Change Modification	☐ Soil Boring Plan
☐ Temporary Authorization	☐ Special Waste Request
☐ Voluntary Revocation	☐ Other:
☐ Subchapter T Workplan	
☐ Other:	

Table 2 - Industrial & Hazardous Waste

APPLICATIONS	REPORTS and RESPONSES
☐ New	☐ Annual/Biennial Site Activity Report
☐ Renewal	☐ CfPT Plan/Result
☐ Post-Closure Order	☐ Closure Certification/Report
☐ Major Amendment	☐ Construction Certification/Report
☐ Minor Amendment	☐ CPT Plan/Result
☐ Class 3 Modification	☐ Extension Request
☐ Class 2 Modification	☐ Groundwater Monitoring Report
☐ Class 1 ED Modification	☐ Interim Status Change
☐ Class 1 Modification	☐ Interim Status Closure Plan
☐ Endorsement	☐ Soil Core Monitoring Report
☐ Temporary Authorization	☐ Treatability Study
☐ Voluntary Revocation	☐ Trial Burn Plan/Result
☐ 335.6 Notification	☐ Unsaturated Zone Monitoring Report
☐ Other:	☐ Waste Minimization Report
	☐ Other:

TETRA TECH

Mr. Steve Odil
Municipal Solid Waste Permits Section, MC124
Waste Permits Division
Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, TX 78753

May 3, 2023

Subject: NOD1 Response
Ruffino Road Type IX Landfill Mining Registration Application
Closed City of Bellaire and City of West University Landfills
Houston, Harris County, Texas

Dear TCEQ:
On behalf of the City of Houston (COH), Tetra Tech is pleased to submit our response to TCEQ's Notice of Deficiency No. 1 (original and three copies to TCEQ Austin and one copy to Region 12).

NOD1 Issues and our responses (bold) are below:

1. Complete and submit all appropriate TCEQ Core Data Forms (TCEQ-10400). Harris County Appraisal District online records indicate that the owner of the west tract is the City of Bellaire, and the owner of the east tract is the City of West University Place. Core Data Forms are provided for the City of Houston and the City of Bellaire. Ensure that the Regulated Entity Name is the same for all Core Data Forms and matches the Facility Name for the Mining Facility provided in Section 1.1.A of Form TCEQ-20876. The Customer Legal Name should be different for each Core Data Form. Ensure that all signatures meet the requirements of 305.44.

   The City of Houston purchased the City of West University property in December 2022. The Special Warranty Deed in Attachment I-5 is a record of the transaction. Because of the purchase, the Landowner Affidavits are signed by the City of Houston and City of Bellaire. Three Core Data Forms are provided as follows:
   - **CN City of Houston and RN West University Landfill (update to customer information and change in RN ownership)**
   - **CN City of Houston and RN Bellaire Landfill (update to customer information)**
   - **CN City of Bellaire and RN Bellaire Landfill (update to customer information)**

2. Complete and submit all required Property Owner Affidavits in Section 1.13 of the form, TCEQ-20876 or explain why none is needed for the City of West University Place. Property owner affidavits are provided for the City of Houston and City of Bellaire, but not City of West University Place.

   Because of the City of Houston's purchase of the City of West University property, the Landowner Affidavits are signed by the City of Houston (West U Landfill property) and City of Bellaire (Bellaire Landfill property).

3. Section 1.4 of the Form TCEQ-20876 provides a URL address, but information for this project could not be located on the page provided. Provide a URL address of a publicly accessible Internet Website where the application and all revisions to that application will be posted in the Application URL provided in Section 1.4 of the Form. This information must be provided in accordance with 30 TAC §330.57(i)(1). If it is listed on the website provided in Section 1.4 under some other project name, please make it clear on the initial website that it relates to this project.

   The registration application was posted on the City of Houston website, www.engagehouston.org/drainage-projects on May 3, 2023.

4. Provide a revised adjacent and potentially affected landowners property map to show all property ownership within ¼ mile of the facility, and all mineral interest ownership under the facility. Provide a list keyed to the land and mineral interest ownership map and give each owner's name

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1500 CityWest Boulevard, Suite 1000, Houston, TX 77042
Cell 936-202-0746 Tel 832-251-5165 [redacted]

and mailing address derived from the real property appraisal records, as required by 30 TAC §§281.5(6) and 330.59(c)(3). Provide the list in electronic form or on pre-printed mailing labels. Please use a label format that has 30 labels to a page (AVERY 5160). Each letter in the name and address must be capitalized, contain no punctuation, and the appropriate two-character abbreviation must be used for the state. Each entity listed must be blocked and spaced consecutively. If you wish to provide the list on printed labels, please provide four complete sets of labels of the landowner list. The figure and list in Attachment I-3 are too small to read the landowner numbers.

The list of landowners within one-quarter mile of the project boundary with numbers keyed to the property locations on the Landowners Map is in Attachment 2, Unmarked Pages. A flash drive containing the list in AVERY 5160 format (30 addresses per page) was attached to the cover of one binder shipped to TCEQ in Austin. The sealed and signed landowner map along with letters describing the mineral rights searches are included in Attachment I-3 of our original application submittal.

Additional Corrections:

- **In Application Form TCEQ-20876, the address of the local library where the application is provided for public viewing has been corrected**
- **In the Bellaire Core Data form, Michael Leech's email address and phone number has been replaced with Sharon Citino's email address and phone number.**

Revisions to our original submittal are indicated by "striking out" the text that was replaced and "underlining" the new text. Attachment 1 to this letter contains the revised redline/strikeout version and Attachment 2 contains the revised unmarked version. Sections that have been revised for this response are indicated in the table of contents below:

Locations of Revised Pages

Form TCEQ-20714	Correspondence Cover Sheet (precedes this letter)	**revised**
Cover Letter (this document)		**revised**
Application Cover Page and Table of Contents		
Form TCEQ-20876	Application for MSW Landfill Mining Registration	**revised Pages 7 and 9**
Part I Supplement and Attachments	General Information	**revised**
	(Attachment I-3 Land Ownership List and I-9 Core Data Form)	
Part II Supplement and Attachments	Existing Conditions	
Part III Supplement and Attachments	Site Development Plan	
Part IV Supplement and Attachments	Site Operating Plan	
MSW Application Checklist		

Please call me at 936-202-0746 with any questions.

Sincerely,

Jim Norstrom, P.E.
Senior Project Manager

TETRA TECH

Attachments

1. Relined Pages
2. Unmarked Pages

cc:

- TCEQ Region 12 Office - 5425 Polk St., Ste. H, Houston, TX 77023-1452
- Mr. Paresh Lad – City of Houston Public Works, 611 Walker Street, Houston, TX 77002
- Mr. Martin Murdock – Quiddity Engineering, 6330 West Loop South, Suite 150, Bellaire, TX 77401

Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, Texas

Cover Page & Table of Contents

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

936-202-0746

April 2023

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER
TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

Type IX Landfill Mining Registration Application

Ruffino Road Landfills

Houston, TX

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Form TCEQ-20714 Correspondence Cover Sheet

Cover Letter

Application Cover Page and Table of Contents (this document)

Form TCEQ-20876 Application for MSW Landfill Mining Registration

Part I Supplement and Attachments General Information

Part II Supplement and Attachments Existing Conditions

Part III Supplement and Attachments Site Development Plan

Part IV Supplement and Attachments Site Operating Plan

MSW Application Checklist

Form TCEQ-20876	Application for MSW Landfill Mining Registration

TETRA TECH

Texas Commission on Environmental Quality

Municipal Solid Waste Landfill Mining Registration Application No. _____

Ruffino Road Landfills

[Houston], Harris County, Texas

April 10, 2023

[Application Revision Date, if applicable]

Prepared for

City of Houston Public Works - Transportation and Drainage Operations

Applicant Mailing Address

611 Walker Street, Houston, Texas 77002

Prepared by

Tetra Tech

[TBPE Firm Registration Number F-3924

Firm Mailing Address

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

How to Use this Form

Use this form to apply for a Type IX registration to operate a landfill mining facility to recover materials for beneficial use from a closed or inactive landfill unit or an active disposal facility. **A test-pit plan** containing the information required by Title 30 Texas Administrative Code (TAC) Chapter 330, 330.63(d)(7)(A) must be submitted to the executive director for review and approval prior to submitting the application for a Type IX landfill mining registration. Select or mark checkboxes for the statements that apply to the application, and attach additional pages as necessary to address any issues or questions. Enter "NA" for any field not applicable to the proposed facility.

For a new registration application, submit an original application and three (3) complete copies prepared in accordance with the registration application requirements prescribed in Chapter 330, Subchapter B, pursuant to 30 TAC 330.5(a)(7).

Who Applies

A facility owner or operator may submit the application in accordance with 30 TAC Chapter 305, 305.43 and 305.44.

Applicable Rules

This form follows requirements for a landfill mining operation specified in Subchapters B, E, and N of 30 TAC Chapter 330; and requirements in 30 TAC 330.149, 330.151, 330.165, and 330.167 relating to operational standards; 330.459 and 330.461 relating to closure; 330.505 relating to cost estimates for closure; and 30 TAC Chapter 37, Subchapter R.

The rules are available online at <www.tceq.texas.gov/goto/rules/>.

Test Pit Plan

Submit a Test Pit Plan for review. Prior approval of a test pit plan must be obtained from the executive director before excavation of test pits.

Application Content

A permit modification is allowed if permittee of an active and operating landfill owns the landfill mining activity. For the permit modification application, complete Permit/Registration Modification and Temporary Authorization Application Form (TCEQ-20650) for an MSW Facility, Parts III and IV (including attachments) of this form, and skip Parts I and II of this form. Include the following items in a Type IX landfill mining registration application.

1. This completed application form (form TCEQ-20876) prepared in accordance with 30 TAC Subchapter B, consisting of:

    - Title Page and Table of Contents, sealed and signed in accordance with 30 TAC 330.57(g)(2) and (3);
    - Parts I through IV, including the attachments;
    - Applicant certification and property owner affidavit (Sections 1.12 and 1.13 located at end of Part I of this form), signed in accordance with 30 TAC 305.43 and 305.44, and notarized.

2. A TCEQ Core Data Form (form TCEQ-10400) for registrant, and operator if different from registrant, available online at <www.tceq.texas.gov/goto/coredata>.

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Part I General Information

1.1 Facility Information

Facility Information must match regulated entity information on Core Data Form.

A. Mining Facility

Facility Name: Ruffino Road Landfills (City of West University Landfill and City of Bellaire Landfill)

Physical or Street Address (if available): 9610 Ruffino Road, Houston, TX 77031

MSW Authorization Number (if issued): West University MSW Landfill Permit 1250 and Bellaire MSW Landfill Permit 1238 (both voluntarily revoked)

Regulated Entity Reference Number (if issued): RN103021457 (West University Landfill) and RN106916414 (Bellaire Landfill)

If RN number has not been issued for the mining facility, complete a Core Data Form (form TCEQ-10400, available online at <www.tceq.texas.gov/goto/coredata>*) and submit with this application.*

Describe the location of the facility with respect to known or easily identifiable landmarks:
East of the intersection of Beltway 8 West and US-59/I-69

Detail access routes from the nearest United States or state highway to the facility:
Ruffino Road to the west, north on the Beltway 8 feeder road, and straight onto the Beltway 8 entrance ramp northbound.

B. Host Landfill

Landfill Name: City of West University Landfill and City of Bellaire Landfill

Physical or Street Address (if available): 9610 & 9800 Ruffino Road, Houston, TX 77031

MSW Permit Number or Other Identification Number (if issued): West University MSW Landfill Permit 1250 and Bellaire MSW Landfill Permit 1238 (both voluntarily revoked)

Regulated Entity Reference Number (if issued): RN103021457 (West University Landfill) and RN106916414 (Bellaire Landfill)

City: Houston County: Harris State: TX Zip Code: 77031

(Area Code) Telephone Number: 832-395-2690 Email Address: [redacted]

Latitude (Degrees, Minutes, Seconds, or Decimal Degrees): 29° 39' 23.1588'' N

Longitude (Degree, Minutes, Seconds, or Decimal Degrees): 95° 32' 52.062'' W

C. Activities to be Conducted at the Mining Facility

Check all that apply:

☐ Waste Processing ☒ Material Recovery ☐ Material Treatment

☐ Temporary Storage ☒ Other: Excavation and relocation of all buried waste and soil from the closed landfills for future developent of a stormwater detention pond to mitigate flooding of Keegans and Brays Bayous. Excavated materials will be disposed of in Type I or Type IV landfills or recovered for recycling and beneficial use.

1.2 Facility Contact Information

A. Applicant

The applicant is the person or other legal entity to whom the Registration would be issued.

Applicant Name: City of Houston

Customer Reference Number (if issued): CN600128995

If the applicant does not have a CN number, complete a Core Data Form (form TCEQ-10400, available online at <www.tceq.texas.gov/goto/coredata>) and submit it with this application. The applicant name must match the customer name on the applicant Core Data Form.

Contact Person's Name: Mr. Paresh Lad Title: ENV SP, Houston Public Works, Transportation and Drainage Operations

Mailing Address: 611 Walker Street,

City: Houston County: Harris State: TX Zip Code: 77002

(Area Code) Telephone Number: 832-395-2690 Email Address: [redacted]

B. Site Operator

If the operator is the same as the applicant, indicate "Same as Applicant" in this section.

Site Operator Name: Same as Applicant

Customer Reference Number (if issued): CN

If the operator does not have a CN number, complete a Core Data Form (form TCEQ-10400, available online at <www.tceq.texas.gov/goto/coredata>) and submit it with this application. The operator name must match the customer name on the applicant Core Data Form.

Contact Person's Name: Title:

Mailing Address:

City: County: State: Zip Code:

(Area Code) Telephone Number: Email Address:

C. Consultant

Firm Name: Tetra Tech

Texas Board of Professional Engineers Firm Registration Number: F-3924

Contact Person's Name: Jim Norstrom Title: Senior Project Manager

Texas Board of Professional Engineers License Number (if applicable): 57016

Mailing Address: 1500 CityWest Boulevard, Suite 1000

City: Houston County: Harris State: TX Zip Code: 77042

(Area Code) Telephone Number: 936-202-0746 Email [redacted]

1.3 Governmental Entities Information

A. Texas Department of Transportation

District: Houston

District Engineer's Name: Ms. Eliza Paul

Mailing Address: 7600 Washington Avenue

City: Houston County: Harris State: TX Zip Code: 77007

(Area Code) Telephone Number: 713-802-5000 Email Address:

B. Local Government Authority Responsible for Road Maintenance *(if applicable)*

Agency Name: Harris County Precinct 1

Contact Person's Name: Commissioner Rodney Ellis

Mailing Address: 1001 Preston Street, 9th Floor

City: Houston County: Harris State: TX Zip Code: 77002

(Area Code) Telephone Number: 713-274-1000 Email Address: [redacted]

C. City Mayor

Mayor's Name: The Honorable Sylvester Turner

City Name: Houston

Mailing Address: P.O. Box 1562

City: Houston County: Harris State: TX Zip Code: 77251

(Area Code) Telephone Number: 713-837-0311 Email Address:

D. Council of Governments (COG)

Name of the COG: Houston-Galveston Area Council (HGAC)

COG Representative's Name, Title: Ms. Cheryl Mergo

Mailing Address: 3555 Timmons Lane, Suite 100

City: Houston County: Harris State: TX Zip Code: 77277

(Area Code) Telephone Number: 713-993-4520 Email Address: [redacted]

E. River Basin Authority

Name of the River Basin Authority: San Jacinto River Authority

Watershed Sub-Basin Name: Brays Bayou

Contact Person's Name: Jace A. Houston, General Manager

Mailing Address: 1577 Dam Site Road

City: Conroe County: Montgomery State: TX Zip Code: 77304

(Area Code) Telephone Number: 936-588-3111 Email Address:

F. Coastal Management Program

Is the facility within the Coastal Management Program boundary?

☐ Yes ☒ No

G. U.S. Army Corps of Engineers

The facility is located in the following District of the U.S. Army Corps of Engineers:

☐ Albuquerque, NM ☒ Galveston, TX

☐ Ft. Worth, TX ☐ Tulsa, OK

H. Local Government Jurisdiction

Within City Limits of: Houston

Within Extraterritorial Jurisdiction of:

Is the facility located in an area in which the governing body of the municipality or county has prohibited the storage, processing or disposal of municipal or industrial solid waste?

☐ Yes ☒ No

If "Yes", provide a copy of the ordinance or order as an attachment.

I. City Health Authority *(if applicable)*

Agency Name: City of Houston Health and Human Services Department

Contact Person's Name: Stephen L. Williams

Mailing Address: 8000 N. Stadium Drive

City: Houston County: Harris State: TX Zip Code: 77054

(Area Code) Telephone Number: 713.837.0311 Email Address:

J. County Health Authority *(if applicable)*

Agency Name: Harris County Health and Environmental Services

Contact Person's Name: Interim Executive Director: Gwen Sims, Med, RD, LD

Mailing Address: 2223 West Loop South

City: Houston County: Harris State: TX Zip Code: 77027

(Area Code) Telephone Number: 832-927-7500 Email Address:

K. County Judge Information

Judge's Name: Judge Lena Hidalgo

Mailing Address: 1001 Preston Street, Suite 911

City: Houston County: Harris State: TX Zip Code: 77002

(Area Code) Telephone Number: Email Address: [redacted]

L. State Representative

State Representative's Name, House District Number: Rep. Allen, Alma A. District 131

District Office Address: 10101 Fondren Road, Suite 500

City: Houston County: Harris State: TX Zip Code: 77096

(Area Code) Telephone Number: (713) 776-0505 Email Address:

M. State Senator

State Senator's Name, Senate District Number: Borris L. Miles

District Office Address: 5302 Almeda, Suite A

City: Houston County: Harris State: TX Zip Code: 77004

(Area Code) Telephone Number: (713) 665-8322 Email Address:

1.4 Posting of Application on Website—30 TAC 330.57(i)

Provide the web address (URL) of the publicly accessible internet website where the application and all revisions will be posted: https://www.engagehouston.org/drainage-projects

1.5 Location of Copy of Application for Public Viewing—30 TAC 39.405(g)

Name of the Public Place: Henington-Alief Regional Library

Physical Address: 11903 Bellaire Boulevard

City: Houston County: Harris State: TX Zip Code: 77072

(Area Code) Telephone Number: 832-393-1820

1.6 Notice of Application and Opportunity to Request Public Meeting—30 TAC 330.69(b)

Party responsible for publishing notice: ☐ Applicant (Registrant/Site Operator) ☒ Consultant

Contact Person's Name: Jim Norstrom Title: Senior Project Manager

Mailing Address: 1500 CityWest Boulevard, Suite 1000

City: Houston County: Harris State: TX Zip Code: 77042

(Area Code) Telephone Number: 936-202-0746 Email [redacted]

1.7 Alternative Language Notice—30 TAC 39.405(h)(2)

Is an alternative language notice required for this application? ☒ Yes ☐ No

Use the Public Notice Verification Form (TCEQ-20244-Waste) to determine if it is required, available at <www.tceq.texas.gov/assets/public/permitting/forms/20244-Waste-NAORPM.pdf>

1.8 Application Fee—30 TAC 330.59(h)(1)

Indicate how the application fee was paid: ☐ Check ☒ Online

Attach a photocopy of the check or a copy of the electronic payment receipt. If paid online, provide ePay confirmation number: Trace Number: [redacted] Authorization [redacted] TCEQ Amount: $150.00 Texas.gov Price: $153.64*

1.9 Evidence of Competency—30 TAC 330.59(f)

1. List all Texas solid waste sites that the owner and operator have owned or operated within the last ten years: See Supplement to Part I, Section 1.9

2. List all solid waste sites in all other states, territories, or countries in which the owner and operator have a direct financial interest: None

3. List the names of the principals and supervisors of the owner's and operator's organization, together with previous affiliations with other organizations engaged in solid waste activities: See Parts I&II text.

1.10 Facility Supervisor's License—30 TAC 330.59(f) and 30 TAC 30.213(a)

☒ The Solid Waste Facility Supervisor will obtain Class A license prior to commencing facility operations.

1.11 Other Permits and Construction Approvals

Complete the following table regarding other permits and construction approvals.

Table I 1. Other permits and construction approvals.

Other Permit or Approval	Received	Pending	Not Applicable
Hazardous Waste Management Program under the Texas Solid Waste Disposal Act	☐	☐	☒
Underground Injection Control Program under the Texas Injection Well Act	☐	☐	☒
National Pollutant Discharge Elimination System Program under the Clean Water Act and Waste Discharge Program under Texas Water Code, Chapter 26	☐	☐	☒
Prevention of Significant Deterioration Program under the Federal Clean Air Act (FCAA) Nonattainment Program under the FCAA	☐	☐	☒
National Emission Standards for Hazardous Air Pollutants Preconstruction Approval under the FCAA	☐	☐	☒
Ocean Dumping Permits under the Marine Protection Research and Sanctuaries Act	☐	☐	☒
Dredge or Fill Permits under the CWA	☐	☐	☒
Licenses under the Texas Radiation Control Act	☐	☐	☒

List additional permits or approvals not indicated in the preceding table:

Note: NPDES permit is shown as NA. Coverage under the General Permit for Stormwater Discharges associated with Construction Activity will be obtained before starting excavation and landfill mining.

1.12 Applicant Certification and Signature—30 TAC 305.44

The applicant is the person or entity in whose name the registration would be issued. If the application is signed by an authorized representative for the applicant, the applicant must complete the delegation of signature authority.

A. Certification by Applicant or Authorized Signatory

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name of applicant, or person authorized to sign: Ms. Johana Clark

Title of person signing: Senior Assistant Director of Houston Public Works

Signature: _____ Date: 5/2/23

Notarization

SUBSCRIBED AND SWORN to before me by the said Johana Clark

On this 2 day of May, 2023.

My commission expires on the 5 day of August, 2023.

_____

Notary Public in and for

Harris County, Texas

JESSIKA GUZMAN
NOTARY ID #13188824-2
My Commission Expires
FEBRUARY 10, 2027

B. Applicant's Delegation of Signature Authority [30 TAC 305.43]

~~I hereby delegate the person named below as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and appear for me at any hearing or before the Commission in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.~~

~~Name of applicant's representative:~~ NA

~~Name of person who is the applicant, or officer or official representing corporation or public agency that is the applicant:~~ NA

~~Signature:~~ _____ ~~Date:~~ _____

~~Notarization~~

~~SUBSCRIBED AND SWORN to before me by the said~~ NA

~~On this~~ _____ ~~day of~~ _____, _____.

~~My commission expires on the~~ _____ ~~day of~~ _____, _____.

_____

~~Notary Public in and for~~

_____ ~~County, Texas~~

1.13 Property Owner Affidavit—30 TAC 330.59(d)(2) West University Landfill Property

This section must be completed by the owner of the property on which facility would be located.

I am the owner of the land on which the proposed facility would be located. I acknowledge that the State of Texas may hold me either jointly or severally responsible for the operation, maintenance, and closure of the facility. I further acknowledge that the facility owner or operator and the State of Texas shall have access to the property during the active life and after closure for the purpose of inspection and maintenance.

Property owner name: City of Houston

Signature: _____ Date: 02/27/23

Notarization

SUBSCRIBED AND SWORN to before me by the said Johana Clark

On this 27th day of February, 2023

My commission expires on the 5th day of August, 2023

_____

Notary Public in and for

Harris County, Texas

CHAYLA BRIANA FRANKLIN
Notary Public, State of Texas
Comm. Expires 08-05-2023
Notary ID 132116057

B. Applicant's Delegation of Signature Authority [30 TAC 305.43]

~~I hereby delegate the person named below as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and appear for me at any hearing or before the Commission in conjunction with this request for a Texas Water Code or Texas Solid Waste Disposal Act permit. I further understand that I am responsible for the contents of this application, for oral statements given by my authorized representative in support of the application, and for compliance with the terms and conditions of any permit which might be issued based upon this application.~~

~~Name of applicant's representative:~~ ~~NA~~

~~Name of person who is the applicant, or officer or official representing corporation or public agency that is the applicant:~~ ~~NA~~

~~Signature:~~ _____ ~~Date:~~ _____

~~Notarization~~

~~SUBSCRIBED AND SWORN to before me by the said~~ ~~NA~~

~~On this~~ _____ ~~day of~~ _____, _____.

~~My commission expires on the~~ _____ ~~day of~~ _____, _____.

_____

~~Notary Public in and for~~

_____ ~~County, Texas~~

1.13 Property Owner Affidavit—30 TAC 330.59(d)(2)

City of Bellaire Landfill Property

This section must be completed by the owner of the property on which facility would be located.

I am the owner of the land on which the proposed facility would be located. I acknowledge that the State of Texas may hold me either jointly or severally responsible for the operation, maintenance, and closure of the facility. I further acknowledge that the facility owner or operator and the State of Texas shall have access to the property during the active life and after closure for the purpose of inspection and maintenance.

Property owner name: City of Bellaire, Texas

Signature: _____ Date: 4.5.23

Notarization

SUBSCRIBED AND SWORN to before me by the said Sharon Citino

On this 5th day of April, 2023

My commission expires on the 24th day of April, 2026.

_____

Notary Public in and for

Harris County, Texas

RAQUEL PORRAS NOTARY PUBLIC STATE OF TEXAS ID 12823046-7 EXP. 04/24/2026

1.14 Attachments to Part I of the Application—30 TAC 330.59

Table I-2. Required Attachments.

Attachment	Location
General Location Maps per 30 TAC 330.59(c)(1)	A**ttachment I-1**
Texas Department of Transportation (TxDOT) County Map per 30 TAC 330.59(c)(2)	Attachment I-2
Land Ownership Map per 30 TAC 330.59(c)(3)(A)	A**ttachment I-3**
Land Ownership List, including Electronic List or Mailing Labels per 30 TAC 330.59(c)(3)(B)	Attachment I-3
Facility Legal Description per 30 TAC 330.59(d)(1)	A**ttachment I-4**
Property Legal Description per 30 TAC 330.59(d)(1)(A)	Attachment I-5
Final Plat Record of Property per 30 TAC 330.59(d)(1)(B)	Attachment I-6 **- BLANK, the property is not platted**
Facility Metes and Bounds Description per 30 TAC 330.59(d)(1)(C)	Attachment I-7
Metes and Bounds Drawings per 30 TAC 330.59(d)(1)(D)	Attachment I-8
Legal Authority (Certificate of Incorporation) per 30 TAC 330.59(e)	N**A (City of Houston)**

Table I-3. Additional Attachments (if applicable).

Attachment	Location
TCEQ Core Data Form	A**ttachment I-9**
Confidential Documents	N**A**
Assumed Name Certificate	N**A**

Part II Summary of Existing Conditions, Surrounding Land Use and Impacts, Traffic, and Location Restrictions

2.1 Facility Background Information

A landfill mining facility may be located within or adjacent to a closed disposal facility, an inactive portion of a disposal facility, or an active disposal facility. Complete the items below to provide information that describes the MSW landfill you propose to mine.

A. Status of Host Landfill

☐ Landfill is unpermitted and unpermitted Landfill Identification No. is _____.

☐ Landfill is permitted and MSW Permit No. is _____.

☒ Permit is revoked; former MSW Permit No. was 1238 and 1250.

☐ Permit is active.

☐ Landfill unit to be mined is inactive.

☐ Landfill unit to be mined is active.

☐ Landfill unit is in post-closure care.

B. MSW Landfill Type and Types of Waste Disposed at the Facility (check all that apply)

☒ Permitted Type I ☐ Household and other MSW wastes

☐ Permitted Type IV ☐ Construction and demolition wastes

☐ Other (describe; landfill mining applies to excavation of buried MSW only) _____

C. Type of Liner System Underlying the Landfill (check all that apply)

☐ Compacted clay and geomembrane

☒ Compacted clay only

☒ In-situ clay

☐ Unlined

☐ Other (describe): _____

If the landfill is lined, describe the liner systems: Compacted clay and in-situ clay

D. Leachate Collection System

The landfill includes a leachate collection system

☐ Yes ☒ No ☐ Unknown

If yes, describe the leachate collection systems: _____

E. Additional Information

Landfill Age: Bellaire Landfill 34 years, West University Landfill 33 years Years

Duration of Landfill Operation: Bellaire Landfill 1954-1988, West University Landfill 1959-1992 Years

Approximate date of closure for the landfill unit(s) to be mined: Bellaire Landfill 1988, West University Landfill 1992

2.2 Impact on Surrounding Area—30 TAC 330.61(h)

This section addresses the facility's impacts on cities, communities, groups of property owners, or individuals.

1. Provide information regarding the likely impacts of the facility on cities, communities, groups of property owners, or individuals: See Part II Supplement, Section 2.2
2. Describe the character of the surrounding area land uses within one mile of the facility: See Part II Supplement, Section 2.2
3. Identify growth trends within five miles of the facility with directions of major development: See Part II Supplement, Section 2.2
4. Describe proximity of the facility to land uses within one mile of the facility:

   Number of residences: See Part II Supplement, Section 2.2

   Indicate the distance to the nearest residence(s): See Part II Supplement, Section 2.2 ☐ feet ☐ miles

   Provide directions of the nearest residence(s): See Part II Supplement, Section 2.2

   Number of Commercial establishments: See Part II Supplement, Section 2.2

   Indicate the distance to the nearest commercial establishment(s): See Part II Supplement, Section 2.2 ☐ feet ☐ miles

   Provide directions of the nearest commercial establishment(s): See Part II Supplement, Section 2.2

   Number of schools: See Part II Supplement, Section 2.2

   Number of churches: See Part II Supplement, Section 2.2

   Number of cemeteries: See Part II Supplement, Section 2.2

   Number of historic structures and sites: See Part II Supplement, Section 2.2

   Number of archaeologically significant sites: See Part II Supplement, Section 2.2

   Number of sites having exceptional aesthetic quality: See Part II Supplement, Section 2.2

2.3 Transportation—30 TAC 330.61(i)	Transportation Study Report presented in Attachment II-9

A. Access Roads

Complete the following table regarding the roads that will be used to access the site.

Table II-1. Roads That Will be Used to Access the Site.

Name of Road	Surface Type and Number of Lanes
Ruffino Road	Asphalt, 2 Lanes

B. Daily Traffic Volume

Complete the following table regarding existing and expected volume of vehicular traffic on access roads within one mile of the facility, and the projected volume of traffic expected to be generated by the facility on access roads within one mile of the facility.

Table II-2. Traffic Volume.

Vehicle Traffic	Volume (vehicles per day)
Existing Vehicle Traffic	640
Expected Vehicle Traffic	1,280
Projected Vehicle Traffic Generated by the Facility	640

1. Describe the source or method used to obtain the volumes: Collected traffic counts (8/12/2021) and historical traffic data obtained from TxDOT's Traffic Count Database System

2. If traffic volume was determined by counts in the field, indicate the locations where the counts were conducted: Ruffino Road at West Bellfort Avenue, Beltway 8 Northbound Frontage Road at Ruffino Road, Beltway 8 Northbound Frontage Road at West Bellfort Avenue & Beltway 8 Southbound Frontage Road at West Bellfort Avenue

3. Has a response from the Texas Department of Transportation (TxDOT) for the coordination regarding traffic and location restrictions been received?

   ☐ Yes ☒ No

   If "Yes", include a copy of the response in the attachment. If "No", obtain a response.

C. Airport Safety:

1. Provide analysis for the impact of the facility upon airports per 30 TAC 330.61(i)(5): This section requires that the impact of the landfill mining operation on airports be evaluated according to 30 TAC 330.545, Airport Safety. According to our measurements, the nearest airport is the Sugarland Regional Airport which is 6.4 miles to the west-southwest. as shown on Attachment II-1.1. Because the Ruffino Road Site is more than six miles from any small general service airport runway and more than five miles from any large general public commercial airport, notification of the airport and Federal Aviation Administration is not required.

2. Has a response from the Federal Aviation Administration (FAA) for the coordination regarding traffic and location restrictions been received?

   ☒ Yes ☐ No

   If "Yes", include a copy of the response in the attachment. If "No", obtain a response.

2.4 General Geology and Soils Statement—30 TAC 330.61(j)

Discuss in general terms the geology and soils of the site: See Part II Supplement, Section 2.4.

2.5 Groundwater and Surface Water—30 TAC 330.61(k)

1. Provide data about the site-specific groundwater conditions at and near the site: See Part II, Supplement Section 2.5.

2. Provide data on surface water at and near the site: See Part II, Supplement Section 2.5.

3. Describe how the facility will comply with applicable rule requirements of Texas Pollutant Discharge Elimination System (TPDES) and the Clean Water Act, 402, as amended: See Part II, Supplement Section 2.5.

2.6 Abandoned Oil and Water Wells—30 TAC 330.61(l)

1. Discuss the location of any and all existing or abandoned water wells: See Part II Supplement, Section 2.6.

2. ☐ Within 30 days prior to construction of the facility, all abandoned water wells will be capped, plugged, and closed per all applicable rules and regulations of the commission or other state agency.

3. Discuss the location of any and all existing or abandoned crude oil or natural gas wells, or other wells associated with mineral recovery situated within the facility: See Part II Supplement, Section 2.6.

4. ☒ On-site crude oil or natural gas wells:

   On-site crude oil or natural gas wells or other wells associated with mineral recovery that are under the jurisdiction of the Railroad Commission of Texas have been properly capped, plugged, and closed in accordance with all applicable rules and regulations of the Railroad Commission of Texas at the time of application.

2.7 Floodplain and Wetlands—30 TAC 330.61(m)

A. Floodplain

Will the facility be located within a 100-year floodplain?

☒ Yes ☐ No

Identify the floodplain zone: FEMA Flood Insurance Rate Map, Harris County, Texas Panel 845 of 1150 (see Attachment II-6)

Attach a copy of the Federal Emergency Management Agency (FEMA) flood map for the area. If the facility will be within a 100-year floodplain, attach documentation demonstrating that the facility is designed and will be operated in a manner to prevent washout of waste during a 100-year storm event, or that the facility has obtained a conditional letter of map revision from FEMA.

B. Wetlands

Will the facility be located in wetlands?

☐ Yes ☒ No

If "Yes", attach documentation to the extent required under Clean Water Act, 404 or applicable state wetlands laws.

2.8 Texas Historical Commission (THC) Review—30 TAC 330.61(o)

Has the Texas Historical Commission provided a review letter documenting compliance with the Natural Resources Code, Chapter 191, Texas Antiquities Code?

☒ Yes ☐ No

If "Yes", include a copy of the response in the attachment. If "No", obtain a response.

2.9 Council of Governments and Local Government Review—30 TAC 330.61(p)

Were Parts I and II of the application submitted for review to the applicable council of governments (COG) for compliance with regional solid waste plans?

☒ Yes ☐ No

If "No", submit Parts I and II of the application including all associated attachments to the applicable COG.

2.10 Endangered or Threatened Species—30 TAC 330.61(n)

Will the facility and the operation of the facility result in the destruction or adverse modification of the critical habitat of endangered or threatened species, or cause or contribute to the taking of any endangered or threatened species?

☐ Yes ☒ No

If yes, provide mitigation measures: _____

2.11 Attachments to Part II of the Application—30 TAC 330.61

Table II-3. Required Attachments.

Attachment	Location
General Location Maps per 30 TAC 330.61(c)	**Attachment II-1.1**
Facility Layout Maps per 30 TAC 330.61(d)	Attachment II-2
General Topographic Map per 30 TAC 330.61(e)	**Attachment II-3**
Aerial Photograph per 30 TAC 330.61(f)	Attachment II-4
Land Use Map per 30 TAC 330.61(g)	**Attachement II-5**
Published Zoning Map per 30 TAC 330.61(h)(1)	NA. The City of Houston does not have zoning
Floodplains and Wetland Documentation per 30 TAC 330.61(m)	**Attachment II-6**
Copies of Coordination Letters and responses from Texas Department of Transportation (TxDOT), Federal Air Administration (FAA), Texas Historical Commission (THC) and Council of Government and Local Governments, etc.	Attachment II-7

Table III-4. Additional Attachments, if applicable.

Attachment	Location
Buildings within 500 Feet of Site Boundary	**Attachment II-1.2**
Water Wells, Oil and Gas Wells	Attachment II-1.3
Transportation Study Report	Attachment II-9

Part III Site Development Plan

3.1 General Facility Design—30 TAC 330.63(b)

A. Facility Access Control Measures

Describe how access will be controlled for the facility to discourage unauthorized entry or uncontrolled disposal of solid waste or hazardous materials: See Supplement to Part IV, Section 4.4

B. Waste Movement

- Provide flow diagrams indicating the storage, processing, and disposal sequences for the various types of wastes and recovered materials. Indicate Attachment no. See Attachments III-2 through III-4.
- Provide schematic view drawings showing the various phases of collection, separation, processing, and disposal of excavated waste. Indicate Attachment no. See Attachments III-2 through III-4.
- Provide generalized construction details of all storage and processing units and ancillary equipment. Indicate Attachment no. See Attachments III-3 and III-4.

  Ensure to indicate approximate dimensions and capacities, construction materials, vents, covers, enclosures, and protective coatings of surfaces, as applicable.
- Provide engineering design details of all containment dikes or walls proposed to enclose all storage and processing components and loading and unloading areas. Indicate Attachment no. See Attachments III-3 and III-4.
- Describe ventilation and odor control measures for each storage, separation, and processing unit See Supplement to Part IV, Section 4.10
- Describe plans for on-site storage of materials, including maximum duration of on-site storage of separated materials See Supplement to Part IV, Sections 4.0 and 4.3
- Provide the maximum period of time that the unprocessed waste, processed waste, and separated recyclable materials are to remain on site: See Supplement to Part IV, Sections 4.0 and 4.3
- Provide for ultimate disposition of stored materials and process effluents: See Supplement to Part IV, Sections 4.0 and 4.3
- Describe plans for disposition of all stored materials and effluent resulting from all processing operations: See Supplement to Part IV, Sections 4.0 and 4.3

List of each waste management unit in table below. Include attachments documenting specifications and performance data, as necessary.

Table III-1. Manufacturer Specifications for Waste Management Units.

Unit Type	Maximum Number of Units	Approximate Dimensions	Approximate Capacity per Unit
Process Tank(s)	NA	NA	NA
Tipping Floor	NA	NA	NA
Container(s)			
Roll-off Boxes	8	23' x 8' x 4' and 23' x 8' x 6'	20 to 30 cubic yards
Leachate Tank(s)	4 Frac Tanks	45' x 8.5' x 11'	21,000 gallons
Processing Units	4	Powerscreen Warrior Model 2400 60' x 50' x 16'	800 tons/hour
Storage Tank(s)			
Storage Area	4	5**0'x 50' = 2,500 sq ft per area**	9**25 cubic yards per area**
Other (Specify)	4 **Diesel Fuel Tanks**	1**1' long, 4' diameter**	1**,000 gallons per tank**

C. Sanitation/ Water Pollution Control

Describe how storage and processing areas will be designed to control and contain spills and prevent contaminated water from leaving the facility. For unenclosed containment areas, account for precipitation from a 25-year, 24-hour storm event:See Part III Supplement, Section 3.2

D. Endangered Species Protection

Describe how the facility will be designed to protect endangered species: See Part II Supplement, Section 2.10.

3.2 Facility Surface Water Drainage Report Statement—30 TAC 330.63(c)

☒ Surface water drainage statement:

The facility will be constructed, maintained, and operated to manage run-on and runoff during the peak discharge of a 25-year rainfall event and must prevent the off-site discharge of waste and feedstock material, including, but not limited to, in-process and/or processed materials. Surface water drainage in and around the facility will be controlled to minimize surface water running onto,

into, and off the treatment area as required under 30 TAC 330.303 (relating to Surface Water Drainage for Municipal Solid Waste Facilities).

3.3 Waste Management Unit Design

A. Test Pit Evaluation Report [30 TAC 330.63(d)(7)(A)]

Was a test pit evaluation report submitted and approved?

☐ Yes ☒ No

If "No", include a test pit evaluation report as an attachment to this application.

If "Yes", ensure that the following are addressed in the report.

1. ☒ The location and depth of test pit excavations.
2. ☒ Description of the characteristics of waste:

   A description of the characteristics of waste observed in test pits excavated on the site, including the percentage by weight of paper, plastic, ferrous metal, other metal, glass, soil fractions, and other constituents.
3. ☒ A Toxicity Characteristic Leaching Procedure (TCLP) analysis of each representative type of waste excavated.
4. ☒ Analysis for asbestos, polychlorinated biphenyls (PCBs), and hazardous waste constituents for waste excavated from each test pit.
5. ☒ Number and size of test pits as approved in the test pit plan.
6. ☒ A description of how the test pits were backfilled, the type of clay soil used in the backfilling, and the height of the backfill relative to the existing surrounding grade.
7. ☒ A cross-section drawing using the information from the test pits to depict the top and bottom elevations of the landfill.
8. ☒ A plan view map depicting the location and extent (vertical and lateral) of the waste unit and proposed extent of mining/recovery operations.
9. ☒ The type of liner underlying the waste.
10. ☒ Historical records of landfill:

    Correlation of historical records of landfill and results from the test pit excavation regarding presence of hazardous waste, special waste, construction and demolition waste, liners, leachate collection systems, gas collection systems, disposal location of each waste type, disposal methods, etc.
11. ☒ Description of how all waste removed from the test pit excavation was disposed in a permitted landfill.

B. Process Descriptions [30 TAC 330.63(d)(7)(B)]

1. Provide a narrative for the process diagram that depicts the general process: Please see Part IV Supplement, Site Operating Plan, Section 4.0, Mining Operation Plan.

2. List the materials intended for processing and recovery: Soil will be separated from waste if practical and tested to determine whether it is Grade 1, Grade 2, or waste grade soil.

3. Anticipated volume of waste to be processed: The volume of buried waste in both landfills is estimated to be 2,374,662 cubic yards. Excavated material that is primarily waste will be loaded into trucks for disposal at a Type I landfill. Therefore, the volume of excavated material that is processed to separate usable soil from waste will be less than this amount.

4. An estimate of the daily quantity of material to be processed: We estimate the daily excavated volume to be 4,320 bank cubic yards. Some excavated material will probably be loaded directly into trucks for disposal at a Type I landfill, so the daily volume of material processed to separate usable soil from waste may be less than this volume.

5. Describe the process of screening hazardous materials: See Part IV Supplement, Sections 4.0 (Segragation of Suspicious Material) and 4.1.2, Prohibited Materials.

6. Describe the process to recover reusable or recyclable material: See Part IV Supplement, Sections 4.0, Mining Operation Plan

7. Describe any water addition and how the process water will be handled and disposed of, if a wet mining process is to be used: This will not be a wet mining process.

8. Describe processing rates: See 3.3(B)(4)

9. Provide mass balance calculations: Estimated material volumes are presented in Part III Supplement, Section 3.3.C.2 .

10. Provide a complete narrative on product distribution, including disposition of materials, proposed use of soils onsite and off-site: See Part IV Supplement, Section 4.0, Mining Operation Plan

11. Describe management of leachate to ensure proper disposal in an authorized facility: See Part IV Supplement, Section 4.5

C. Design Criteria [30 TAC 330.609]

1. Groundwater Protection

Liners shall be installed and maintained where receiving, processing, post-processing, screening, and storage areas would be in contact with the ground or in areas where leachate, contaminated materials, contaminated products, or contaminated water is stored or retained.

- Describe the liner systems to be installed and maintained for excavated waste storage, processing, and screening areas as required by 30 TAC 330.609(1)(A) or (B): See Part III Supplement, Section 3.3.C.1.

- Describe the proposed liner cover material designed to withstand normal traffic from the processing operations: See Part IV Supplement IV, Section 4.3.

The attached Liner Quality Control Plan addresses the following:

- ☐ A demonstration per 30 TAC 330.337(b)(1) through (4):

  A demonstration that the constructed liner system will not undergo uplift from hydrostatic forces during its construction or operational life and that any existing liner system will not undergo uplift from hydrostatic forces during mining operations.

- ☐ Provision for submission of liner construction certifications as required by 30 TAC 330.341.

- ☐ Protection of existing systems on landfills:

  If leachate collection systems, liners, or gas collection systems exist, care will be taken to not destroy or disrupt these systems if it is planned to retain these features on-site, and these systems must remain operational until they are removed.

2. Excavation of Buried Waste

Describe the methods of excavating the buried waste materials: See Part IV Supplement, Section 4.0, Mining Operation Plan.

The methods of excavation must include how the material will be handled, how long it will remain in the area, what equipment will be used, how the material will be moved from the excavation area, how the excavation area will be held to a minimum, the maximum side slopes in buried waste, the maximum excavation area at any one time, and the sequence of excavation. Also, as required by 30 TAC 330.609(3), ensure that the side slopes of excavations shall be no steeper than 34 degrees.

3. Detention of Waste at the Facility

Describe how the facility design ensures rapid processing and minimum detention of waste at the facility: See Part IV Supplement, Section 4.0, Mining Operation Plan.

4. Prevention of Nuisances

Provide design features for the waste storage units that will prevent the creation of nuisances or public health hazards due to odors, fly breeding, or harborage of other vectors: See Part IV Supplement, Section 4.11

5. Control of Air Pollution

Address the following requirements to determine whether the facility is entitled to an air quality standard permit:

- Will all permanent on-site roads be watered, treated with dust-suppressant chemicals, or paved and cleaned as necessary to achieve maximum control of dust emissions?
  ☒ Yes ☐ No

- Will vehicular speeds on non-paved roads be no more than ten miles per hour?
  ☒ Yes ☐ No

- Will leachate and gas condensate be managed so that they will not be used as dust-suppressant?
  ☒ Yes ☐ No

- Does the facility have adequate means of preventing nuisance odors from leaving the facility boundaries, prior to processing any material with a high odor potential?
  ☒ Yes ☐ No

- Does the facility design and operation require that all materials be conveyed mechanically, or if conveyed pneumatically, the conveying air shall be vented to the atmosphere through a fabric filter(s) having a maximum filtering velocity of 4.0 feet/minute with mechanical cleaning or 7.0 feet/minute with air cleaning?
  ☒ Yes ☐ No

- Except for initial start-up and shut-down, will all processing equipment not enclosed inside a building be equipped with low-velocity fog nozzles spaced to create a continuous fog curtain or the operator have portable watering equipment available during the processing operation?
  ☒ Yes ☐ No

- Will all conveyors that off-load materials from processing equipment at a point that is not enclosed inside a building have available a water or mechanical dust suppression system; and will these controls be utilized as necessary for maximum control of dust when stockpiling material?
  ☒ Yes ☐ No

- Will all activities that could result in increased odor emissions be conducted in a manner that does not create nuisance conditions or only be conducted inside a building maintained under negative pressure and controlled with a chemical oxidation scrubbing system or bio filter system?
  ☒ Yes ☐ No

- Will excavated waste material transported from the landfill facility be transported in covered trucks to minimize the loss of material?
  ☒ Yes ☐ No

If you answered **"Yes"** to all the requirements above, the facility qualifies for a standard air quality permit. Please contact the air permits division accordingly.

If you answered **"No"** to any of the above requirements, please contact the air permits division to apply and obtain appropriate air quality authorization under 30 TAC Chapter 116.

Air Quality Authorization: Provide a copy of the appropriate **air quality authorization** in the application. State Attachment no. See Part III Supplement, Section 3.3.C.5.

3.4 Sampling, Analysis and Reporting Requirements for Final Soil Product—30 TAC 330.611 and 330.613

A. Sampling and Analysis Plan

1. Analytical Methods

Check for the test methods proposed for the final soil products at the facility:

☒ Chemical and physical analysis will utilize "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (SW-846); or

☒ "Methods for Chemical Analysis of Water and Wastes" (EPA-600).

☒ Analysis of pathogens will utilize "Standard Methods for the Examination of Water and Wastewater" (Water Pollution Control Federation, 1995).

☒ Analysis for salinity and pH:

Analysis for salinity and pH will utilize North Central Regional (NCR) Method 14 for Saturated Media Extract Method contained in "Recommended Test Procedure for Greenhouse Growth Media" NCR Publication Number 221 (Revised), Recommended Chemical Soil Test Procedures, Bulletin Number 49 (Revised), October 1988, pages 34-37.

☒ Analysis for total, fixed, and volatile solids:

Analysis for total, fixed, and volatile solids will utilize Method 2540 G (Total, Fixed, and Volatile Solids in Solid and Semi-solid Samples) as described in "Standard Methods for the Examination of Water and Wastewater" (Water Pollution Control Federation, 1995).

2. Sample Collection

☒ Sampling Plan:

Sampling plan that describes the plan and procedures proposed for collection, preservation, and analysis of samples to assure valid and representative results consistent with current standards of the NELAC Institute is enclosed. The sampling plan is included in the Attachment Supplement to Part III, Section 3.4.

3. Documentation

The following record will be maintained regarding the facility's activities or operation for three years after the final product is shipped off-site or upon facility closure:

☒ batch numbers identifying the final product sampling batch;

☒ the quantities, types, and sources of materials processed, and the dates processed;

☒ the quantity and final product grade designation, as described in 30 TAC 330.615 (relating to Final Soil Product Grades and Allowable Uses);

☒ the date of sampling; and

☒ all analytical data used to characterize the final product, including laboratory quality assurance/quality control data.

The following records will be maintained on-site permanently or until facility closure:

☒ sampling plan and procedures;

☒ training and certification records of staff; and

☒ final soil product test results.

The records will be available for inspection by executive director representatives during normal business hours. The executive director may at any time request by registered or certified mail that a soil generator submit copies of all documentation listed in paragraph (1) of 30 TAC 330.613 for auditing the final soil product grade. Documentation requested under this section will be submitted within ten working days of receipt of the request.

4. Sampling Frequencies

☒ Final soil product:

All final soil product will be sampled and assigned a final product grade set forth in 30 TAC 330.615 at a minimum rate of one sample for every 5,000 cubic yard batch of final soil product or annually, whichever is more frequent. Each sample will be a composite of nine grab samples as discussed in 30 TAC 330.613(f) for sampling from stockpiles or from conveyor belts utilizing the protocol specified in the current standards of the NELAC institute.

5. Sampling Requirements

☒ Sampling from stockpiles:

One-third of the grab samples shall be taken from the base of the stockpile (at least 12 inches into the pile at ground level), one-third from the exposed surface, and one-third from a depth of two feet from the exposed surface of the stockpile.

☒ Sampling from conveyors:

Sampling times will be selected randomly at frequencies that provide the same number of subsamples per volume of mined soil product as specified in Subsection 3 above. Sampling may be done with the belt stopped at the time of sample collection or samples may be taken as the material falls from the end of a (moving) conveyor.

In cases where the belt is stopped, sampling shall be done along the entire width and depth of the belt. For cases where samples are taken as the material falls from the end of a moving conveyor, free-falling samples need to be taken to minimize the bias created as larger particles segregate or heavier particles sink to the bottom as the belt moves. In order to minimize sampling bias, the sample container shall be moved in the shape of a "D" under the falling product to be sampled. The flat portion of the "D" shall be perpendicular to the beltline. The circular portion of the "D" shall be accomplished to return the sampling container to the starting point in a manner so that no product to be sampled is included.

6. Analytical Requirements

☒ Final product sampling and analysis:

The final product will be sampled and analyzed for the following parameters. The executive director may at any time request that additional parameters be tested. These parameters are:

a. a. total metals, to include: arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc;

b. b. weight percent of foreign matter, dry weight basis;

c. c. pH by the saturated media extract method;

d. d. salinity by the saturated media extract electrical conductivity method;

e. e. pathogens: salmonella, and fecal coliform;

f. f. polychlorinated-biphenyls; and

g. g. asbestos.

7. Data Precision and Accuracy

☒ Analytical data quality will be established per the current standards of the NELAC Institute.

B. Reporting

1. ☒ Annual reports:

   Annual written reports will be submitted. These reports will include minimum of input and output quantities, a description of the soil end-product distribution, and all results of any required laboratory testing. A copy of the annual report will be kept on-site for a period of five years.

2. ☒ Quarterly reports:

   Quarterly reports of final soil product testing for each sampling batch of final soil product will be submitted to the executive director within two months after each quarterly event in compliance with 30 TAC 330.613(i). Reports will include, but may not be limited to, all the following information:

   a. batch numbers identifying the final soil product sampling batch;

   b. the quantities and types of waste materials processed, and the dates processed;

   c. the quantity of final soil product;

   d. the final soil product grade or permit number of the disposal facility receiving the final product if it is not Grade 1 or Grade 2 as established in 30 TAC 330.615 of this title;

   e. all analytical results used to characterize the final soil product, including laboratory quality assurance/quality control data and chain-of-custody documentation; and

   f. the date of sampling.

   Sampling and analysis of the final product will be performed as described below to determine the product's grades. Testing of final product and interpretation of results shall be conducted in accordance with the current standards of the NELAC Institute.

3.5 Final Soil Product Grades and Allowable Uses—30 TAC 330.615

From the results of the testing, the final soil product will be classified as described below.

A. Grade 1 Soil

☒ The final product shall meet all the following criteria:

a. Contains no foreign matter of a size or shape that can cause human or animal injury;

b. Does not exceed any Maximum Allowable Concentrations of the metal and PCBs for Grade 1 Soil, listed in Table 1 (Maximum Allowable Concentrations) of 30 TAC 330.615;

c. Does not contain foreign matter in quantities that cumulatively are greater than 1.5% dry weight on a four-millimeter screen;

d. Meets the requirements for pathogen reduction for Grade 1 Soil as described in Table 2 (Additional Final Product Standards) of 30 TAC 330.615; and

e. Meets the requirements for salinity and pH for Grade 1 Soil as described in Table 2 (Additional Final Product Standards) of 30 TAC 330.615.

Grade 1 Soil Use Limitation: There will not be restrictions on the use of Grade 1 Soil.

B. Grade 2 Soil

☒ The final product shall meet all the following criteria:

a. shall contain no foreign matter of a size or shape that can cause human or animal injury;

b. shall not exceed all Maximum Allowable Concentrations for Grade 2 Soil in Table 1 (Maximum Allowable Concentrations) of 30 TAC 330.615;

c. shall not contain foreign matter in quantities that cumulatively are greater than 1.5% dry weight on a four-millimeter screen;

d. shall meet the requirements for pathogen reduction for Grade 2 Soil as described in Table 2 (Additional Final Product Standards) of 30 TAC 330.615; and

e. shall meet the requirements for salinity and pH for Grade 2 Soil as described in Table 2 (Additional Final Product Standards) of 30 TAC 330.615.

Limitations on the Uses for Grade 2 Soils: Grade 2 soils shall not be used at a residence, recreational area, or licensed child-care facility, or for food chain crops.

C. Waste Grade Soil

☒ The final soil product shall be considered Waste Grade Soil, if the soil:

a. exceeds any one of the Maximum Allowable Concentrations for Grade 2 final products in Table 1 (Maximum Allowable Concentrations) of 30 TAC 330.615; and

b. does not meet the other requirements of Grade 1 or Grade 2 Soils.

Limitations on the Use of Waste Grade Soil: Waste grade soil shall be appropriately disposed at a permitted municipal solid waste facility.

3.6 Closure Plan

A. Closure Requirements [30 TAC 330.459]

☒ Waste, waste residues, and recovered materials:

All waste, waste residues, and any recovered materials will be removed from the site prior to the closure of the facility. All material on-site (feedstock, in process, and processed) will be evacuated to an authorized facility and all leachate handling units, tipping areas, processing areas, and post-processing areas will be decontaminated.

B. Certification of Final Facility Closure [30 TAC 330.461]

☒ Notice to the public and executive director:

Notice will be provided for final facility closure to the public and executive director no later than 90 days prior to initiating final closure in accordance with 30 TAC 330.461(a). Signs and barriers will be installed upon notification of final closure to the executive director. Certification of closure (signed by an independent licensed professional engineer), and a request for voluntary revocation of facility registration will be provided within 10 days after completion of final closure of the facility.

C. Closure Cost Estimate [30 TAC 330.505]

Provide itemized closure cost estimates in the following Closure Cost Estimates Worksheet. The cost estimates must meet the requirements indicated in 30 TAC 330.459, 330.461, and 330.505. Attach documents detailing any additional unit closure costs not itemized. Enter the total of those additional unit closure costs on line 13 of the closure cost worksheet in the following Closure Cost Estimates Worksheet.

Table III-2. Closure Cost Estimates Worksheet.

Item No.	Item Description	Unit of Measure-ment	Quantity	Unit Cost	Total Cost
1	Site Evaluation and Engineering Review	NA	1	$10,000	10000
2	Bid Document and Procurement	NA	1	$15,000	15000
3	Contract Award and Administration	NA	1	$10,000	10000
4	Clean-Up, Removal and Transport of Waste Stored On-Site	NA	15,552	$5.00	46656
5	Disposal of Waste at an Authorized Facility	cubic yards	15,552	$15.00	233280
6	Waste Treatment	NA	0	0	0
7	Process Units Dismantling	NA	0	0	0
8	Wash Down and Disinfection of Facility and Processing Units	NA	4	$1,000	4000
9	Vector Control	NA	10	$200	2000
10	Site Security	NA	10	$1,000	10000
11	Signs, Newspaper Notice and TCEQ Notice	NA	1	$5,000	5000
12	Facility Inspection and Closure Certification by Licensed Engineer	NA	1	$10,000	10000

Item No.	Item Description	Unit of Measure-ment	Quantity	Unit Cost	Total Cost
13	Additional Storage and Processing Unit Closure Cost Items (describe in attachments)	Identify Attachments	NA	NA	0
14	Storage and Processing Unit Closure Costs Subtotal	NA	NA	NA	345936
15	Contingency Cost 10%	NA	NA	NA	34594
16	Total Closure Cost Estimate	NA	NA	NA	$380,530

D. Financial Assurance

☒ Financial assurance as required by 30 TAC Chapter 37 Subchapter R:

The registrant will provide financial assurance as required by 30 TAC Chapter 37 Subchapter R prior to execution of the activities at the facility. An increase in the closure cost estimate and the amount of financial assurance will be provided if changes to the facility conditions increase the maximum cost of closure at any time during the active life of the facility.

3.7 Buffer Zones and Easement Protection—30 TAC 330.543

Is the buffer zone in any location at the facility less than 50 feet wide?

☐ Yes ☒ No

If yes, describe your alternative buffer zone and how it will allow access for emergency response and maintenance:

3.8 Attachments to Part III of the Application

Table III-3. Required Attachments.

Attachment	Location
Test Pit Evaluation Report per 30 TAC 330.63(d)(7)(A)	A**ttachment III-1**
Flow Diagram indicating storage, processing, and disposal sequences for waste and other materials per 30 TAC 330.63(b)(2)(A)	A**ttachment III-2**
Schematic view drawings showing phases of collection, separation, processing, and disposal for the wastes managed per 30 TAC 330.63(b)(2)(B)	A**ttachment III-3**

Attachment	Location
Proposed ventilation and odor control measures for each storage, separation, processing, and disposal unit per 30 TAC 330.63(b)(2)(C)	S**ee Part III Supplement, 3.3.C.4 & 3.3.C.5**
Generalized construction details of slab and subsurface supports of all storage and processing components per 30 TAC 330.63(b)(2)(D)	NA. There will be no pernament structures requiring slabs or foundations.
Generalized construction details of all storage and processing units and ancillary equipment per 30 TAC 330.63(b)(2)(E)	NA. There will be no pernament structures requiring slabs or foundations.
Locations and engineering design details of all containment dikes or walls proposed to enclose all storage and processing components and all loading and unloading areas per 30 TAC 330.63(b)(2)(a)(F)	S**ee Attachment III-4, Process Diagram**
Process Diagram per 30 TAC 330.63(d)(7)(B)(vi)	A**ttachment III-4**
Liner Systems Design per 30 TAC 330.609(1)	A**ttachment III-5**
Liner Quality Control Plan per 30 TAC 330.339	NA. No new liners will be constructed.
Demonstration for hydrostatic forces per 30 TAC 330.337(b)	S**ee Part III Supplement, 3.3.C.1**
Air Quality Requirements per 30 TAC 330.607 [Note: It is recommended to contact Air Permits Division of the TCEQ to address this.]	Attachment III-6
Sampling and Analysis Plan for Final Soil Product per 30 TAC 330.613	S**ee Part III Supplement, 3.4**
Manufacturer Specifications for Waste Processing/ Management Units per 30 TAC 330.63(b)(2)(D)	S**ee Table III-1 above**
Additional Storage and Processing Unit Closure Cost Items per 30 TAC 330.505	S**ee Section 3.6.C above**

Table III-4. Additional attachments, if applicable.

Attachment	Location
Drainage Calculations	Attachment III-7
Pre-Development Drainage Sub-Areas	A**ttachment III-8**
Plan of Borings and Groundwater Contours	Attachment III-9
Geologic Cross Sections	Attachment III-1**0**
C**losure Plan**	Attachment III-11

Part IV Site Operating Plan

4.1 Operational Requirements—30 TAC 330.609

1. Describe how the recovery process will be operated to preclude the entry of hazardous constituents: See Supplement to Part IV, Section 4.0

2. Specify arrangements for disposal of resulting wastes to prevent waste disposal at an unauthorized facility: See Supplement to Part IV, Section 4.0

3. Describe how the existing leachate collection systems, liners, and monitoring systems will be protected to avoid them being destroyed or disrupted by the landfill mining activities and operations: See Supplement to Part IV, Section 4.1.5.

4. ☒ Certified operator:

   The facility will employ at least one agency-certified landfill operator who will routinely be available on-site during the hours of operation.

5. ☒ Health and safety coordinator:

   The facility will employ at least one health and safety coordinator on a full-time basis to be on-site at least 70% of the time during excavation and waste processing. The health and safety coordinator shall be trained in hazardous waste and emergency response operations.

6. ☒ Covered trucks will be used for transporting excavated material offsite.

7. ☒ A Health and Safety Plan for conducting the facility operations is provided. The plan is in the Attachment no. Supplement to Part IV, Section 4.14.

8. ☒ Facility personnel will be trained for the facility's health and safety plan.

9. Specify personal protection equipment to be located and used at the site and their operational characteristics: Supplement to Part IV, Section 4.14

10. ☒ Changes to the approved processing method or other significant changes to the approved registration application will require prior written authorization from the TCEQ.

4.2 Facility-Generated Waste—30 TAC 330.205 and 330.207

1. Describe the final disposition or uses for the waste and other materials generated at the facility: Supplement to Part IV, Sections 4.0 and 4.2.

2. Describe how contaminated water and leachate generated at the facility will be collected, contained, managed and disposed in a manner that will not cause surface water or groundwater pollution: Supplement to Part IV, Section 4.5.

3. ☒ Liner systems:

   Collection units other than storage tanks shall have a clay or synthetic liner and the liner shall be constructed in accordance with 30 TAC 330.331(b) (relating to Design Criteria). One foot of freeboard for the 25-year, 24-hour rainfall event shall be provided.

4. ☒ Contaminated water will not be discharged without specific written authorization from the TCEQ.

5. ☒ The use of leachate and gas condensate in any mining process is prohibited.

4.3 Storage Requirements—30 TAC 330.209

1. Describe how excavated, processed, and unprocessed waste, and other materials will be stored, contained or bundled at the facility: Supplement to Part IV, Section 4.3 and 4.14.

2. Describe how control of odors, vectors, and windblown waste will be maintained in the storage areas: Supplement to Part IV, Section 4.8, 4.10, and 4.11.

4.4 Access Control—30 TAC 330.223

1. Describes the means for controlling public access to the facility to prevent uncontrolled access and ensure protection of human health and safety and the environment: Supplement to Part IV, Section 4.4.

2. If access control is provided by means of a perimeter fence, with lockable gates, identify the type of fence that will be installed at the facility:

   ☒ A four-foot-high barbed wire fence;

   ☒ A six-foot-high chain-link fence; or

   ☐ Other (describe): _____

3. ☒ The facility access road:

   The facility access road from a publicly owned roadway will be at least a two-lane gravel or paved road, designed for the expected traffic flow with adequate turning radii according to the vehicles that will utilize the facility, and avoid disruption of normal traffic patterns.

4. ☒ Vehicle parking will be provided at the facility for equipment, employees, and visitors.

5. ☐ Safety bumpers at hoppers will be provided for vehicles.

6. Describe how access roads and parking areas will be maintained to control dust and prevent mud from being tracked off-site: Supplement to Part IV, Section 4.9.

4.5 Spill Prevention and Control—30 TAC 330.227

1. Describe how the storage and processing areas will be designed to control and contain spills and contaminated water from leaving the facility: Supplement to Part IV, Section 4.5.

2. Provide calculations to show that the containment design will control and contain a worst-case spill or release. For unenclosed containment areas, account for precipitation from a 25-year, 24-hour storm: See Attachment III-7.

4.6 Operating Hours—30 TAC 330.229]

Provide the operating hours for operating heavy equipment and transporting materials on- or off-site of the facility; include justification for hours outside of 5:00 a.m. to 9:00 p.m., Monday through Friday: Monday through Saturday, 5am to 9pm.

List the alternative operating hours, if any, of up to five days in a calendar-year period: Saturday's are added because of the high volume of waste that will be excavated and transported offsite.

4.7 Facility Sign—30 TAC 330.231

☒ A sign will be conspicuously displayed at all entrances to the facility.

The sign will measure at least four feet by four feet with letters at least three inches in height and will include the following information:

Facility name: Ruffino Road Landfill Mining Project

Type of facility: IX

Hours and days of operation: Monday through Saturday, 5am to 9pm.

Registration number: Yes, the Type IX Registration number will be shown on the sign.

Facility rules: Yes. Rules will be listed on the facility sign plus emergency phone number.

4.8 Control of Windblown Material and Litter—30 TAC 330.233

1. ☒ Windblown material and litter will be collected as necessary, at least once per day, on days that the facility is in operation, to minimize unhealthy, unsafe, or unsightly conditions.

2. ☒ Litter scattered throughout the facility, along fences and access roads, and at the gate will be picked up once a day on the days the facility is in operation and properly managed.

3. ☒ Wire or other type fencing or screening will be provided when necessary to minimize windblown materials.

4.9 Facility Access Roads—30 TAC 330.237

1. Describe how the tracking of mud and debris onto public roadways from the facility will be minimized: Supplement to Part IV, Section 4.9.

2. Describe how dust from on-site and other access roadways will be controlled to prevent it from becoming a nuisance to surrounding areas: Supplement to Part IV, Section 4.9.

3. Identify the means of dust control (water source or other specific other) to be provided at the facility: Supplement to Part IV, Section 4.9. and 4.10.3.

4. ☒ On-site and other access roadways:

   All-weather roads will be provided within the facility to the loading/ unloading area(s) designated for wet-weather operation. All on-site and other access roadways will be maintained on a regular basis. Access roadways will be re-graded as necessary to minimize depressions, ruts, and potholes.

4.10 Odor Management Plan—30 TAC 330.149

1. Identify potential sources of odors at the facility: Supplement to Part IV, Section 4.10.
2. Identify wastes that require special attention regarding odors: Supplement to Part IV, 4.10.
3. Provide general instructions for control of odors at the facility: Supplement to Part IV, 4.10.

4.11 Disease Vector Control—30 TAC 330.151

1. Specify the general methods for control of on-site populations of disease vectors at the facility: Supplement to Part IV, Section 4.11.
2. State specific minimum frequencies for conducting disease vector control operations: Supplement to Part IV, Section 4.11.

4.12 Ponded Water—30 TAC 330.167

1. Describe techniques to be used at the facility to prevent ponding of water over waste: Supplement to Part IV, Section 4.12.
2. Describe corrective actions to remove or methods to be used to eliminate ponded water that occurs in any portion of the facility: Supplement to Part IV, Section 4.12.
3. Specify an inspection schedule for facility personnel to follow in inspecting the site to identify potential ponding sites or locations at the facility: Supplement to Part IV, Section 4.12.
4. ☒ Water that has come into contact with waste shall be managed as described in Attachment no. Supplement to Part IV, Section 4.5..

4.13 Employee Sanitation Facilities—30 TAC 330.249

☒ Potable water in the form of bottled water will be provided at the site for all visitors and employees.

☒ Sanitary facilities will be provided at the site for all employees and visitors.

4.14 Attachments to Part IV of the Application

Table IV-1. Required Attachments.

Attachment	Location
Contaminated Water Management per 30 TAC 330.207	**Supplement to Part IV, Section 4.5**
Recordkeeping and Reporting per 30 TAC 330.219	**Supplement to Part III, Section 3.4**
Fire Protection per 30 TAC 330.221	**Supplement to Part IV, Section 4.15**
Ventilation and Air Pollution Control per 30 TAC 330.245 [Note: Contact Air Permits Division of the TCEQ to address this.]	**Supplement to Part IV, Section 4.10.1**
Health and Safety Plan per 30 TAC 330.609(10) and 330.247	**Supplement to Part IV, Section 4.14**
Landfill Cover per 30 TAC 330.165	**Supplement to Part IV, Sections 4.8 & 4.10**

Table IV-2. Additional Attachments (if applicable).

Attachment	Location

Instructions

Where to Submit the Application and Get Help

Submit the original and three copies of the application to the Municipal Solid Waste Permits Section MC-124, TCEQ, PO Box 13087, Austin, TX 78711-3087.

If you have any questions about this form or about operating a landfill mining facility to recover material for beneficial use, please contact us at (512) 239-2335.

Engineer Seal and Firm Number

Include the seal, with signature and date of the engineer preparing the application; and the firm number of the engineer's company on the title page, table of contents, and other parts of the application as required by 30 TAC 330.57(f)(1).

Certification and Signatures

The application must be signed and notarized, as required by 30 TAC 281.5. Signature blocks for the applicant, authorized signatory, and property owner must bear the signature and seal of a Notary Public.

Confidential Documents

The Commission has a responsibility to provide a copy of each application to other agencies and to interested persons upon request, and to safeguard confidential material from becoming public knowledge. Thus, the Commission requests that the applicant: (1) be prudent in the designation of material as confidential and (2) submit such material only when essential to the review.

The Commission suggests that the applicant ***not*** submit confidential information as part of the application. However, if this cannot be avoided, the confidential information should be described in non-confidential terms throughout the application, cross-referenced, and submitted as a separate document or binder, and clearly marked "CONFIDENTIAL."

Reasons for confidentiality include the concept of trade secrecy and other related legal concepts which give a business the right to preserve confidentiality of business information to obtain or retain advantages from its right in the information. This includes authorizations under Title 18 United States Code 1905 and special rules cited in Title 40 Code of Federal Regulations Part 2, Subpart B.

The applicant may elect to withdraw any confidential material submitted with the application. However, the registration cannot be issued, amended, or modified if the application is incomplete.

Attachments

Prepare the attachments according to the referenced rule sections for the attachments for Parts I through IV of this application. *Additional attachments may be included in the application, as applicable.*

Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, Texas

Part I Supplement
General Information

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

936-202-0746

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER
TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

April 2023

Part I Supplement
Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, TX

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PURPOSE OF APPLICATION

See Application Form 20876

1.0 PART I - GENERAL INFORMATION

1.1 Facility Information

See Application Form 20876

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See Application Form 20876

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See Application Form 20876

1.6 Notice of Application and Opportunity to Request Public Meeting 30TAC330.69(b)

See Application Form 20876

1.7 Alternative Language Notice 30TAC39.405(h)(2)

See Application Form 20876

1.8 Application Fee 30TAC330.59(h)(1)

See Application Form 20876

1.9 Evidence of Competency 30TAC330.59(f)

The evidence of competency for this registration application meets the requirements of 30 TAC §330.59(f). The following sections address each subsection of the regulation.

30 TAC §330.59(£)(1)

The Texas solid waste sites that have been owned or operated by City of Houston within the last 10 years are:

Site Name	Site Type	Permit or Registration Number	County	Dates of Operation
Southeast Transfer Station	MSW Type V	40131	Harris	10/13/97 to present

Southwest Transfer Station	MSW Type V	40132	Harris	10/13/97 to present
Northwest Transfer Station	MSW Type V	40133	Harris	10/13/97 to present
Northeast Transfer Station	MSW Type V	40330	Harris	Registration Issued 10/6/22. Not operating yet.

30 TAC §330.59(f)(2)

The City of Houston has no financial interest in any solid waste sites in other states, territories, or countries.

30 TAC §330.59(£)(3)

The City of Houston will employ a licensed solid waste facility supervisor, as defined in Chapter 30 of this title (relating to Occupational Licenses and Registrations), before commencing site operation.

30 TAC §330.59(±)(4)

The following officers and supervisors have substantial experience in the waste services industry and are well-qualified principals and supervisors.

DeMarcus Glass
1245 Judiway, Houston Tx, 77018
C. 281-782-8171 O. 832-393-7821 [redacted]
21 Years Solid Waste Experience

Derek Mebane
1506 Central St., Houston, Texas 77012
C. 713-492-8683 O. 832-393-0441 [redacted]
30 yrs. Solid Waste Experience
TCEQ MSW Operator A (SW0002828-Expired)

Maurice Renfro
11500 South Post Oak, Houston, Texas 77035
C. 832-454-9109 O-832-393-7964 [redacted]
22 Years Solid Waste Experience
TCEQ MSW Operator A (Expired)

1.10 Facility Supervisor's License 30TAC330.59(f) and 30TAC30.213(a)

See Application Form 20876

1.11 Other Permits and Construction Approvals

See Application Form 20876

1.12 Applicant Certification and Signature 30TAC305.44

See Application Form 20876

1.13 Property Owner Affidavit 30TAC330.59(d)(2)

See Application Form 20876

1.14 Attachments to Part I of the Application

I-1 General Location Map

I-2 TXDOT County Map

I-3 Land Ownership Map & List

I-4 Facility Legal Description

I-5 Property Legal Description

I-6 Final Plat Record of Property Page intentionally blank The property is not platted.

I-7 Facility Metes & Bounds Description

I-8 Metes & Bounds Drawing

I-9 TCEQ Core Data Forms

REFERENCE: TEXAS DEPARTMENT OF TRANSPORTATION, OFFICIAL TRAVEL MAP (HOUSTON, TX)

NO.	REVISION DESCRIPTION	DATE

Site Address:
9610 Ruffino Road
Houston TX 77031
LAT 29°39'23.04"N
LON -95°32'56.04"W

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 FAX 713.784.2962

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION

GENERAL LOCATION MAP

Attachment I-1

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-801 Figure 1 General Location Map.dwg

REFERENCE: TEXAS DEPARTMENT OF TRANSPORTATION, OFFICIAL TRAVEL MAP (HOUSTON, TX)

NO.	REVISION DESCRIPTION	DATE

Site Address:
9610 Ruffino Road
Houston TX 77031
LAT 29°39'23.04"N
LON -95°32'56.04"W

STATE OF TEXAS
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TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 FAX 713.784.2962

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION

TEXAS DEPARTMENT OF TRANSPORTATION COUNTY MAP

Attachment I-2

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-802 TXDOT County Map.dwg

Attachment I–3 Land Ownership Map and List

LEGEND:

PERMIT BOUNDARY

1/4 MILE BUFFER LINE

ADJACENT AND POTENTIALLY AFFECTED LANDOWNER PROPERTY BOUNDARIES

(703) ADJACENT LANDOWNER NUMBER

NOTE:

LANDOWNER LIST AND PROPERTY LINES TAKEN FROM HARRIS COUNTY APPRAISAL DISTRICT WEBSITE AS OF FEBRUARY 28, 2023.

LANDOWNER LIST WITH ADDRESSES ACCOMPANIES THIS MAP

MINERAL INTERESTS AS RESEARCHED BY COURTHOUSE SPECIALISTS:

HCAD 0430630000170 TRACT:
SAM & LAURA RUFFINO UNDIVIDED 1/2 OF THE MINERALS IN DEED VOL. 1382, PG. 270, HARRIS COUNTY DEED RECORDS

HCAD 0430630000175 TRACT:
NO MINERAL RESERVATIONS FOUND

0 300 600 900

N

HCAD 0430630000170

HCAD 0430630000175

RUFFINO ROAD TYPE IX LANDFILL

59/69 SOUTHWEST FREEWAY

SW PLAZA DRIVE

SW PLAZA CT

TOOLEY DRIVE

TWIN HILLS DRIVE

WILLOW MEADOW DRIVE

KRISTIN DRIVE

McAFEE DRIVE

RENTUR DRIVE

MEAUX DRIVE

BANKSIDE DRIVE

VICKJOHN DRIVE

CLARIDGE DRIVE

PORTAL DRIVE

SANFORD DRIVE

BENNING DRIVE

SPELLMAN DRIVE

PLAINFIELD ROAD

CONSUELA DRIVE

WEST BELFORT STREET

MARTIN HEIGHTS DRIVE

WILSON PINES CT

WILLOW CT

STANWOOD DRIVE

PETERSHAM DRIVE

CHANWELL DRIVE

LONGSTAFF DRIVE

HAVERSTOCK DRIVE

MANORGATE DRIVE

THURLEIGH STREET

BEDFORD STREET

DOVER STREET

RUFFINO ROAD

SAM HOUSTON TOLLWAY

CHESSINGTON DRIVE

FOR PERMITTING PURPOSES ONLY

STATE OF TEXAS
REGISTERED
KEVIN A OLSON
5248
PROFESSIONAL
LAND SURVEYOR
03/09/2023

TETRA TECH

ADJACENT & POTENTIALLY AFFECTED LANDOWNERS MAP

RUFFINO ROAD TYPE IX LANDFILL
MINING REGISTRATION APPLICATION
HARRIS COUNTY, TEXAS

FIRM REGISTRATION NO. 10194114
MARTIN OLSON SURVEY INC.
PROFESSIONAL SURVEYORS, BOUNDARY
CONSTRUCTION & TOPOGRAPHIC SURVEYS
227 DERRICK DR.
HUMBLE, TX 77338
PH: 281-446-8899

MARTIN FILE: RUFFINO ADJ OWNER 2023.DWG

COURTHOUSE
SPECIALISTS

PROFESSIONAL RESEARCH SERVICES

March 6, 2023

Martin Olson Survey Inc.
227 Derrick Drive
Humble, TX 77338
Attn: Mr. Kevin Olson

Ref: Harris Co. CAD 0430630000170

Dear Mr. Olson:

Thank you for your request regarding the mineral interest for the following tract situated in Harris County, Texas. My findings are as follows:

Harris CAD 0430630000170:

- **Nicholas S. Schmitz reserved the E/2 of the minerals for a term of twenty-five (25) years from December 15, 1917. Texas RRC does not show production; it is believed the mineral interest reverted at end of said 25-year term.**
- **Sam Ruffino and Laura Ruffino, et ux, reserved an undivided ½ of the minerals in Deed Vol. 1382, Page 270 of the Deed Records of Harris County, Texas.**
- **The City of West University Place, Texas, was conveyed the tract WD/VL Vol. 3120, Page 1 of the Deed Records of Harris County, Texas, subject to the reservation of ½ minerals in Vol. 1382, Page 270.**

It appears tract HCAD 0430630000170 is burdened by the undivided ½ mineral interest reserved in Deed Vol. 1382, Page 270 of the Deed Records of Harris County, Texas.

Thank you for allowing us the opportunity to help with your project. Please call if you have any questions.

Sincerely,

Nick Moore, RPL
Abstracting Manager
512-569-6435
Courthouse Specialists
CourthouseDirect.com

2341203A

COURTHOUSE
SPECIALISTS

PROFESSIONAL RESEARCH SERVICES

March 6, 2023

Martin Olson Survey Inc.
227 Derrick Drive
Humble, TX 77338
Attn: Mr. Kevin Olson

Ref: Harris Co. CAD 0430630000175

Dear Mr. Olson:

Thank you for your request regarding the mineral interest for the following tract situated in Harris County, Texas. My findings are as follows:

Harris CAD 0430630000175:

I was unable to locate a mineral reservation of record in Harris County, Texas, regarding this tract.

Thank you for allowing us the opportunity to help with your project. Please call if you have any questions.

Sincerely,

Nick Moore, RPL
Abstracting Manager
512-569-6435
Courthouse Specialists
CourthouseDirect.com

2341203A

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION
ADJACENT & POTENTIALLY AFFECTED LANDOWNER LIST

1.)GROUP 1 REALTY	800 GESSNER RD STE 500	HOUSTON,TX	77024-4498
2.) GROUP 1 REALTY	4401 COLWICK RD	HOUSTON,TX	28211-2311
3.)GROUP 1 REALITY INC	800 GESSNER RD STE 500	HOUSTON,TX	77024-4498
4.)5X5 HOLDINGS I LLC	PO BOX 192229	DALLAS, TX	75219-8515
5.)LITHIA REAL ESTATE	150 N BARTLEFT ST	MEDFORD,TX	97501-6032
6.)10400 SW PLAZA LLC	2324 McCLENDON ST	HOUSTON,TX	77030-2022
7.)PARAMOUNT SOUTHWEST LTD	PO BOX 570908	HOUSTON,TX	77257-0908
8.)FASTCO FOODS SERVICE LLC	10425 SW PLAZA DR	HOUSTON,TX	77074-1117
9.)RED SEA PROPERTIESLLC	425 SUMMER PARK DR	STAFFORD,TX	77477-5577
10.)QRV ALLSTAR LLC	720 S COLORADO BLVD UNIT 150N	DENVER,CO	80246-1904
11.)CITY OF HOUSTON	PO BOX 1562	HOUSTON,TX	77251-1562
12.)CITY OF HOUSTON	10785 SOUTHWEST FWY	HOUSTON,TX	77074
13.)PM PARTNERS LP	207 E CLAREDON	PHOENIX,AZ	85012-2072
14.)HARRIS COUNTY FLOOD CONTROL DISTRICT	9900 NORTHWEST FWY	HOUSTON,TX	77092-8601
15.)CITY OF HOUSTON	PO BOX 1562	HOUSTON,TX	77251-1562
16.)CITY OF HOUSTON	PO BOX 1562	HOUSTON,TX	77251-1562
17.)TRISTAR PROPERTIES LLC	8300 BISSONNET ST STE 221	HOUSTON,TX	77074-3900
18.)ARCHER ROBERTS P	20 SAINT PETERS WALK	SUGARLAND,TX	77479-2525
19.)ARCHER TODD D	PO BOX 710530	HOUSTON,TX	77271-0530
20.)PPL REAL ESTATE LLC	10777 SOUTHWEST FWY	HOUSTON,TX	77074-1003

21.)CITY OF HOUSTON	PO BOX 1562	HOUSTON,TX	77251-1562
22.)LEWIS CARROLL A	ADDRESS UNKNOWN		
23.) ARCHER ROBERT P	11614 SOUTHWEST FRWY	HOUSTON,TX	77031-3612
24.)VAUDAGNA GLENYS	10118 THURLEIGH ST	HOUSTON,TX	77031-2009
25.)YUN PANG PL	PO BOX 771533	HOUSTON,TX	77215-1533
26.)PRO TECH SERVICES GROUP LLC	2326 PRINCESS DEANNA LN	KATY,TX	77493-3488
27.)MERHI BROTHERS	11203 BEDFORD ST	HOUSTON,TX	77031-1911
28.)TOTAL CONTRACTING LIMITED	11203 BEDFORD ST	HOUSTON,TX	77031-1911
29.)TAHTOUH JOSEPH	14002 BARNHART BLVD	HOUSTON,TX	77077-1920
30.)KJS ENTERPRISESLLC	12440 S SAM HOUSTON PKWY W	HOUSTON,TX	77031-2000
31.)MBN INC	12420 S SAM HOUSTON PKWY W	HOUSTON,TX	77031-1902
32.)OMEGA HOME HEALTH SERVICES INC	12425 S SAM HOUSTON PKWY W	HOUSTON,TX	77031-2001
33.)DARBAR REAL ESTATE HOLDINGS INC	12423 W SAM HOUSTON PKWY S	HOUSTON,TX	77031-2001
34.)BROWN ADELINE B	12615 BROOKGLADE CIR UNIT 408	HOUSTON,TX	77099-1389
35.)VACHI INVESTMENTS LLC	550 S. HILL ST STE 1559	LOS ANGELES	90013-2446
36.)DOVER STREET CENTER LLC	8416 S BREEZE DR STE 1E	HOUSTON,TX	77071-1922
37.) VACHI INVESTMENTS LLC	550 S. HILL ST STE 1559	LOS ANGELES	90013-2446
38.)TEXAS CONFERENCE ASSN 7TH	PO BOX 800	ALVARADO,TX	76009-0800
39.)FLORES JOSE & MORALES	11014 BRAES FOREST DR.	HOUSTON, TX	77071-1534
40.)GHEBREMICHEAL JOSEPH	10055 RUFFINO RD	HOUSTON,TX	77031-2128
41.)TEHERANCHI C & CYRUS	11315 BEDFORD ST	HOUSTON,TX	77031-2103

43.)MORALES OBED 1702 COUNTRY CLUB BLVD SUGARLAND,TX 77478-3906

44.)MORALES OBED 11353 DOVER ST HOUSTON,TX 77031-2554

45.)MARQUEZ J & ELSIE D 12129 STONE WEST DR HOUSTON,TX 77035-4605

46.)YOUNES ALLA N 3623 MEADOW SPRINGS DR SUGARLAND,TX 77479-3253

47.)BEDFORD DRIVE PARK LLC 11419 DOVER ST HOUSTON,TX 77031-2505

48.)UNITED TOWING &TRANSPORT INC 18331 THICKET GROVE RD.HOUSTON,TX 77084-7597

49.)ASH FREDERICK L 11520 BEDFORD ST HOUSTON,TX 77031-2108

50.)SANTOS JOSE J 11411 BEDFORD ST HOUSTON,TX 77031-2105

51.)HTG HOLDINGS LLC 11415 BEDFORD ST HOUSTON,TX 77031-2105

52.)NGUYEN STEVE & TRANG P 11515 BEDFORD ST HOUSTON,TX 77031-2107

53.)MAZURKIEWICZ JAMES J 4321 SKINNER LN RICHMOND,TX 77046-8645

54.)YIELD HOSPITALITY LLC 11969 W SAM HOUSTON PKWY S HOUSTON,TX 77031-2365

55.)HARI SUNRISE LLC 11959 S SAM HOUSTON PKWY W #34 HOUSTON,TX 77031-2365

56.)RCO INTERNATIONAL INC 5522 POUNDSTONE CT SUGARLAND,TX 77479-5379

57.)HMH PROPERTIES LIMITED 5522 POUNDSTONE CT SUGARLAND,TX 77479-5379

58.)LUCKY TOUCH INC 614 ELMHURST CT SUGARLAND,TX 77479-3443

59.)STAR GAS & GROCERY INC 614 ELMHURST CT SUGARLAND,TX 77479-3443

60.)CIRCLE S GAS & GROCERY INC 614 ELMHURST CT SUGARLAND,TX 77479-3443

61.)AMR PREMIUM W BELFORD LLC 200 CRESENT CT #1820 DALLAS,TX 75201-7818

62.)LI'S & A INVESTMENTS 13238 BROOKSIDE DR SUGARLAND,TX 77478-2879

63.)LI'S & A INVESTMENTS LP 13211 BROOKSIDE DR SUGARLAND,TX 77478-2790

64.)ASI INVESTMENTS LLC 11841 S SAM HOUSTON PKWY W HOUSTON,TX 77031-2360

65.)11920 SAM HOUSTON PROPERTY LLC 1080 ELDRIDGE PKWY STE 1175 HOUSTON,TX 77077-2582

66.)GUJARATI SAMAJ OF HOUSTON INC 9550 W BELFORD AVE HOUSTON,TX 77031-2368

67.)CIRCLE K STORES INC PO BOX 5280 DC-17 PHOENIX,AZ 85072

68.)GUJARATI SAMAJ OF HOUSTON INC PO BOX 7200733 HOUSTON,TX 77272-0733

69.)BELFORT BELTWAY LLC 5909 FONDREN RD OFC HOUSTON,TX 77036-2916

70.)FRY BUSINESS INC 9461 W BELFORT ST STE B HOUSTON,TX 77031-2308

71.)CMV INVESTMENTS INC 9457 W BELFORT ST HOUSTON,TX 77031-2308

72.)G D K ENTERPRISES INC 9415 W BELFORT ST HOUSTON,TX 77031-2308

73.)SAIDHAM LODGING LLC 11840 S SAM HOUSTON PKWY W HOUSTON,TX 77031-2336

74.)ZMT GROUP LLC % ALI MEHDI 7476 HARWIN DR HOUSTON,TX 77036-2008

75.)RAIN DROP FOUNDATION INC 9301 W BELFORT ST STE 106 HOUSTON,TX 77031-2101

76.) TRAN SAN D 385 CUMBERLAND ST SAN FRANCISCO ,CA 94114-2515

77.)EMOVON PAUL 9430 TOOLEY DR HOUSTON,TX 77031-1010

78.)WILLIAMSON SAMUEL 9428 TOOLEY DR HOUSTON,TX 77031-1010

79.)ELLIS BYRON K 5680 HIGHWAY 6 # 208 MISSOURI CITY,TX 77459-4188

80.)WILLIAMS ROBERT 9418 TOOLEY DR HOUSTON,TX 77031-1010

81.)NELSON LEONA 9414 TOOLEY DR HOUSTON,TX 77031-1010

82.)ALLEN MODUPE ADETUTU 14007 SEA MYRTLE LN SUGAR LAND ,TX 77498-2095

83.)GOSSE CLINTON G FAMILY LIVING TRUST 307 BLALOCK RD HOUSTON ,TX 77024-6514

84.)LOVE DERRICK J & CAWANA G 3502 W CREEK CLUB DR MISSOURI CITY ,TX 77459-4012

85.)GOSSE CLINTON G FAMILY LIVING TRUST 307 BLALOCK RD HOUSTON,TX 77024-6514

86.)TRAN PROPERTIES LLC 385 CUMBERLAND ST SAN FRANCISCO,CA 94114-2515

87.)VEGA JOSE 9324 TOOLEY DR HOUSTON,TX 77031-1008

88.)EBHODAGHE FELICIA 12446 CHADWELL DR HOUSTON,TX 77031-3402

90.)GOMEZ ERICA MARISELA 9306 TOOLEY DR HOUSTON,TX 77031-1008

91.)POPOPS PROPERTIES LLC 2210 GENTRYSIDE DR HOUSTON,TX 77077-5525

92.)BRAEBURN VALLEY W. CIVIC ASSOC. 6842 N SAM HOUSTON PKWY HOUSTON,TX 77064-3258

93.)VELASQUEZ BETTY M 9427 TOOLEY DR HOUSTON,TX 77031-1009

94.)VU YEN N 828 ALLSTON ST HOUSTON,TX 77007-1526

95.)RODRIGUEZ ROSAMARIA 9419 TOOLEY DR HOUSTON,TX 77031-1009

96.)ROSA ANDRES 9415 TOOLEY DR HOUSTON,TX 77031-1009

97.)BROWN LILLIE M 9407 TOOLEY DR HOUSTON,TX 77031-1009

98.)SWISHER BENJAMIN I 9403 TOOLEY DR HOUSTON,TX 77031-1009

99.)CHAVEZ CARMEN 9335 TOOLEY DR HOUSTON,TX 77031-1007

100.)GARCIA HIGINIO ADDRESS UNKNOWN

101.)CHO CHING 9030 WILLOW MEADOW DR HOUSTON,TX 77031-1809

102.)MENDEZ SALVADOR 12106 GRANTLEY DR HOUSTON,TX 77099-3914

103.)DREFF MICHAEL 9315 TOOLEY DR HOUSTON,TX 77031-1007

104.)MOHAMED SHAABAN 9311 TOOLEY DR HOUSTON,TX 77031-1007

105.)KONVICKA EUNICE M 9307 TOOLEY DR HOUSTON,TX 77031-1007

106.)HERNANDEZ PEDRO & GENEVA 9303 TOOLEY DR HOUSTON,TX 77031-1007

107.)DIAZ EDGAR 9302 TWIN HILLS DR HOUSTON,TX 77031-1012

108.)WARD JAMES 9306 TWIN HILLS DR HOUSTON,TX 77031-1012

109.)MENDEZ ROBERT 9107 TWIN HILLS DR HOUSTON,TX 77031-1117

110.)CERVANTES OLGA 9314 TWIN HILLS DR HOUSTON,TX 77031-1012

111.)GILMORE RODNEY F & JUDY 9318 TWIN HILLS DR HOUSTON,TX 77031-1012

112.)ORANTES ALVARO A 9322 TWIN HILLS DR HOUSTON,TX 77031-1012

113.)CANEJO NINFA S 9326 TWIN HILLS DR HOUSTON,TX 77031-1012

114.)WILLIAMS MICHAEL 9330 TWIN HILLS DR HOUSTON,TX 77031-1012

115.)GUTIERREZ ROSA J 9338 TWIN HILLS DR HOUSTON,TX 77031-1012

116.)NAIR S RAMACHANDRAN 9323 TWIN HILLS DR HOUSTON,TX 77031-1011

117.)CANALES MANUEL D 9319 TWIN HILLS DR HOUSTON,TX 77031-1011

118.)SESSIONS BRENDA K 9315 TWIN HILLS DR HOUSTON,TX 77031-1011

119.)STANLEY PAUL & JEANNETTE T 9311 TWIN HILLS DR HOUSTON,TX 77031-1011

120.)MAYRAZ NOAM & MARIA C 3916 FELISA PL FORT WORTH,TX 76133-5535

121.)TX TWIN HILLS LLC 15715 TUCKERTON RD HOUSTON,TX 77095-5117

122.)PERAZA OSCAR J 9426 WILLOW MEADOW DR HOUSTON,TX 77031-1016

123.)FLORES MARIA E 9422 WILLOW MEADOW DR HOUSTON,TX 77031-1016

124.)DELEON JESUS R & RICARDA B 9418 WILLOW MEADOW DR HOUSTON,TX 77031-1016

125.)WOLF PORTFOLIO PROPERTIES LLC SERIES J 9234 CYPRESS CREEK PKWY HOUSTON,TX 77070-6208

126.)PIZANO PALEMON Z & CECILA 10407 SILKWOOD DR HOUSTON,TX 77031-1107

127.)ABREGO LUCIO A 10903 SILKWOOD DR HOUSTON,TX 77031-1706

128.)MORENO D & MARIA G 9402 WILLOW MEADOW DR HOUSTON,TX 77031-1016

129.)ALTAMIRANO RENE 20527 COCOPLUM DR KATY, TX 77449-5632

130.)QUINTERO MARIO X 6717 HENDON LN HOUSTON,TX 77074-6101

131.)GOMEZ ALBERTO 9322 WILLOW MEADOW DR HOUSTON,TX 77031-1014

132.)MNSF T2 SPE LLC 836 MORRISON BLVD STE 320 CHARLOTTE, NC 28211-4399

133.)RODRIGUEZ SANDRA 9314 WILLOW MEADOW DR HOUSTON,TX 77031-1014

134.)ANDERSON J O & BRENDA 9310 WILLOW MEADOW DR HOUSTON,TX 77031-1014

135.)JERNIGAN K & CHARLETTE G 12123 ASHLEY CIRCLE DR W HOUSTON ,TX 77071-3671

136.)LOPEZ DIGMA R 9302 WILLOW MEADOW DR HOUSTON,TX 77031-1014

137.)FENIX WILLIENE & YASSA 9431 WILLOW MEADOW DR HOUSTON,TX 77031-1015

138.)CURRENT OWNER PO BOX 25005 HOUSTON,TX 77265-5005

139.)FRAZIER FRANKLIN D 9423 WILLOW MEADOW DR HOUSTON,TX 77031-1015

140.)MACIAS LETISIA 9419 WILLOW MEADOW DR HOUSTON,TX 77031-1015

141.)ESTEBAN MARIA E 9415 WILLOW MEADOW DR HOUSTON,TX 77031-1015

142.)PUENTE RAUL 9411 WILLOW MEADOW DR HOUSTON,TX 77031-1015

143.)KAFI INC PO BOX 79581 HOUSTON,TX 77279-9581

144.)9403 WILLOW MEADOW DR LLC 6140 HWY 6 STE 108 MISSOURI CITY,TX 77459-3802

145.)NATEL ESTATES LLC	26934 DUSTIN LN.	MAGNOLIA, TX	77354-2809
146.)URBANO JESUS	9327 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
147.)MACIAS JUAN PABLO	9323 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
148.)KING JACQUELINE M	9319 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
149.)MEJIA BENEDICTO L	9315 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
150.)BARRERA ADRIAN S	9311 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
151.)ANDRADE-GONZALES I	9307 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
152.)BROWN STEPHEN RAY	9303 WILLOW MEADOW DR	HOUSTON,TX	77031-1013
153.)FLUSCHE JUDITH A	9302 KRISTIN DR	HOUSTON,TX	77031-1002
154.)BRZOVSKIS KEVIN B	9306 KRISTIN DR	HOUSTON,TX	77031-1002
155.)LIDIAK DANIEL J	9310 KRISTIN DR	HOUSTON,TX	77031-1002
156.)GONZALEZ O A FLORES	9314 KRISTIN DR	HOUSTON,TX	77031-1002
157.)CLEMENTS RODNEY G	9318 KRISTIN DR	HOUSTON,TX	77031-1002
158.)GUTIERREZ CAROLINA	9322 KRISTIN DR	HOUSTON,TX	77031-1002
159.)LEDESMA JUAN M	9326 KRISTIN DR	HOUSTON,TX	77031-1002
160.)CURRENT OWNER	9328 KRISTIN DR	HOUSTON,TX	77031-1002
161.)SCARBROUGH LARRY	4103 CREEKSIDE DR	RICHMOND, TX	77406-8643
162.)REYES JOSE R	9406 KRISTIN DR	HOUSTON, TX	77031-1004
163.)AVELLANEDA HERIBERTO	9410 KRISTIN DR	HOUSTON, TX	77031-1004
164.)BERNAL MIGUEL A	9414 KRISTIN DR	HOUSTON , TX	77031-1004
165.)MURRELL DIANNE VALERIE	9418 KRISTIN DR	HOUSTON, TX	77031-1004

166.)VARGAS TERESA P & ARTURO 7923 MYRTLE LN MISSOURI CITY, TX 77459-5748

167.)ORELLANA E O & GLORIA A 9426 KRISTIN DR HOUSTON , TX 77031-1004

168.)TRAN ON & CUC T 10515 PLAINFIELD ST HOUSTON, TX 77031-1026

169.)ZARATE RIGOBERTO B 10511 PLAINFIELD ST HOUSTON , TX 77031-1026

170.)BRAEBURN VALLEY W. CIVIC ASSOC 6842 N SAM HOUSTON PKWY HOUSTON,TX 77064-3528

171.) MATHEW LEELAMMA 10602 PLAINFIELD ST HOUSTON,TX 77031-1006

172.) NGUYEN ALAIN T 10606 PLAINFIELD ST HOUSTON,TX 77031-1006

173.) CHERUKARA S T & JOMA S 4535 LAKESIDE MEADOW DR MISSOURI CITY,TX 77459-1638

174.) ETUK PHILIP DAVID 10614 PLAINFIELD ST HOUSTON,TX 77031-1006

175.) CASTILLO E EFREN 10702 PLAINFIELD ST HOUSTON,TX 77031-1021

176.)SONG THOMAS TING 3510 BUCHANAN HILL LN KATY,TX 77494

177.)SEWELL ERIN 10710 PLAINFIELD ST HOUSTON,TX 77031-1021

178.)BERCU MICHAEL P 10714 PLAINFIELD ST HOUSTON,TX 77031-1021

179.)FLANAGAN CALEB 10518 SHIPMANS LANDING DR MISSOURI,TX 77459-6787

180.)DAVIES JOYCE 10722 PLAINFIELD ST HOUSTON,TX 77031-1021

181.)MATHEWS SYLVIA J SAVOY 9431 KRISTIN DR HOUSTON,TX 77031-1003

182.)FLORES CESAR R 9427 KRISTIN DR HOUSTON,TX 77031-1003

183.)FAIR PORT VENTURES LLC 1321 UPLAND DR UNIT 3118 HOUSTON,TX 77043-4718

184.)TO MINH QUAN 9419 KRISTIN DR HOUSTON,TX 77031-1003

185.)BAXTER KENNETH & MICHELLE 9415 KRISTIN DR HOUSTON,TX 77031-1003

186.)HERNANDEZ ODELAISEY DUARTE 9411 KRISTIN RD HOUSTON,TX 77031-1003

187.)MARSHALL PATRICK 9407 KRISTIN DR HOUSTON,TX 77031-1003

188.)JACKSON CARLETON P 9403 KRISTIN DR HOUSTON,TX 77031-1003

189.)TRUONG PHAC D 9331 KRISTIN DR HOUSTON,TX 77031-1001

190.)VANEGAS JACKLINE & WILFREDO 9327 KRISTIN DR HOUSTON,TX 77031-1001

191.)SALAZAR ENRIQUE & BLANCA 9323 KRISTIN DR HOUSTON,TX 77031-1001

192.)SAM MICHAEL ALLEN & YOLANDA 9319 KRISTIN DR HOUSTON,TX 77031-1001

193.)NGUYEN THANH H 9315 KRISTIN DR HOUSTON,TX 77031-1001

194.)EVERSOLE JAMES A 7417 COBBS OAK LN ROSHARON,TX 77583-6305

195.)GUERRERO RAUL S & LETICIA 9307 KRISTIN DR HOUSTON,TX 77031-1001

196.)VILLARREAL MARIBEL 9303 KRISTIN DR HOUSTON,TX 77031-1001

197.)PARADA GILBERTO 9403 MCAFEE DR HOUSTON,TX 77031-1019

198.)CLOYD ELIZABETH 3828 GERTIN ST HOUSTON,TX 77004-6504

199.)MENDOZA ABDON & BESSY 9310 MCAFEE DR HOUSTON,TX 77031

200.)PETERSON JOSEPHINE V 9314 MCAFEE DR HOUSTON,TX 77031-1018

201.)STRICKLAND JUSTIN S 12203 SHOREBRIDGE RD CYPRESS,TX 77433-2399

202.)DUONG JENNY Y 1420 15TH ST SW NAPLES,FL 34117-4414

203.)PARADA GILBERTO & YOLANDA 9403 MCAFEE DR HOUSTON,TX 77031-1018

204.)TRUONG THI BICH THANH 9330 MCAFEE DR HOUSTON,TX 77031-1018

205.)MOSHOU STEVE 9402 MCAFEE DR HOUSTON,TX 77031-1020

206.)PARADA ELISEO DEJESUS 9302 MCAFEE DR HOUSTON,TX 77031-1018

207.)LARA OSCAR G & SANDY 9410 MCAFEE DR HOUSTON,TX 77031-1020

208.)PINEDA FRANCISCO 9414 MCAFEE DR HOUSTON,TX 77031-1020

209.)LAZO MARIA & WILFREDO 9418 MCAFEE DR HOUSTON,TX 77031-1020

210.)MAGARIN LUIS 9422 MCAFEE DR HOUSTON,TX 77031-1020

211.)JOHNSON EDWARD J & CYNTHIA 9426 MCAFEE DR HOUSTON,TX 77031-1020

212.)CHERUKARA J T & SHAIBY 6919 OAK BAY CIR MISSOURI CITY,TX 77459-5066

213.)SMITH MICHAEL K 10878 WESTHEIMER RD STE 123 HOUSTON,TX 77042-3202

214.)HARRIS J A 9427 MCAFEE DR HOUSTON,TX 77031-1019

215.)FLORES CARLOS R & 9423 MCAFEE DR HOUSTON,TX 77031-1019

216.)MARROQUIN CARLOS GODINEZ 9419 MCAFEE DR HOUSTON,TX 77031-1019

217.)NOLASCO MARINA 9122 MCAFEE DR HOUSTON,TX 77031-1104

218.)CURRENT OWNER 9411 MCAFEE DR. HOSTON,TX 77031-1019

219.)DEVINEY HOWARD L JR 2929 W HOLCOMBE BLVD APT 371 HOUSTON,TX 77025-1541

220.)PARADA G JESUS & YOLANDA G 9403 MCAFEE DR HOUSTON,TX 77031-1019

221.)SCHELTEMA PHILIP ROGER 9331 MCAFEE DR HOUSTON,TX 77031-1017

222.)WALLACE WES 9327 MCAFEE DR HOUSTON,TX 77031-1017

223.)RAX HARRY B 9323 MCAFEE DR HOUSTON,TX 77031-1017

224.)BAUGH CARI L 9319 MCAFEE DR HOUSTON,TX 77031-1017

225.)JULIAN PRESTON 8211 FAWN TERRACE DR HOUSTON,TX 77071-3643

226.)FIELDS ERIC T & MARCELLE 9311 MCAFEE DR HOUSTON,TX 77031-1017

227.)JOHN M KUTTY & THAVALATHIL 9307 MCAFEE DR HOUSTON,TX 77031-1017

228.)PARADA GILBERTO D 9403 MCAFEE DR HOUSTON,TX 77031-1019

229.)CURRENT OWNER 9302 RENTUR DR HOUSTON,TX 77031

230.)QUEVEDO J ALBERTO & SARAH 9306 RENTUR DR HOUSTON,TX 77031-1023

231.)SPRINGOB WALTRAUD K 707 SANTA MARIA ST SUGAR LAND,TX 77478-3335

232.)SCHULTZ PATRICIA L 9314 RENTUR DR HOUSTON,TX 77031-1023

233.)RODRIGUEZ SYLVIA F 9318 RENTUR DR HOUSTON,TX 77031-1023

234.)PLATIS VAUGHN 9322 RENTUR DR HOUSTON,TX 77031-1023

235.)MARRERO AMARIS N 9326 RENTUR DR HOUSTON,TX 77031-1023

236.)CURRENT OWNER 9551 RAVENSWORTH RD HOUSTON,TX 77031-3510

237.)BOWDEN BEVERLY A 9402 RENTUR DR HOUSTON,TX 77031-1025

238.)HERNANDEZ ANA J C 9406 RENTUR DR HOUSTON,TX 77031-1025

239.)DUARTE JOSEPH JR 9410 RENTUR DR HOUSTON,TX 77031-1025

240.)HILL SYLVIA J & CHARLES E 9414 RENTUR DR HOUSTON,TX 77031-1025

241.)RAMIREZ BULMARO 9418 RENTUR DR HOUSTON,TX 77031-1025

242.)MILLER TOM A & IVY M 9422 RENTUR DR HOUSTON,TX 77031-1025

243.)GONZALEZ JORGE 9426 RENTUR DR HOUSTON,TX 77031-1025

244.)CARTWRIGHT RAYOLA B 5330 SIENNA PKWY APT#107 MISSOURI CITY,TX 77459-5226

245.)LOYA BLAS & NUBIA 9431 RENTUR DR HOUSTON,TX 77031-1024

246.)GILLESPIE MICHAEL H 9427 RENTUR DR HOUSTON,TX 77031-1024

247.)DOLLAHON D L & KAREN D 9423 RENTUR DR HOUSTON,TX 77031-1024

248.)BARRIENTOS RAUL & ESTELA 9419 RENTUR DR HOUSTON,TX 77031-1024

249.)CAMARENA J & MARIA C 9415 RENTUR DR HOUSTON,TX 77031-1024

250.)CAMARENA JUVENAL 9411 RENTUR DR HOUSTON,TX 77031-1024

251.)GONZALEZ JAVIER A 9407 RENTUR DR HOUSTON,TX 77031-1024

252.)HARRELL DAVID L 635 SHADOW WOOD DR SMITHS STATION,AL 36877-4841

253.)PAGAYA SMARTRESI FI FUND PROP OWN II 6440 SHADY OAK RD EDAN PRAIRIE,MN 55344-7700

254.)PAIGE REGINALD J & CASSANDRA 9327 RENTUR DR HOUSTON,TX 77031-1022

255.)GRAHAM BERNICE E ESTATE OF 9323 RENTUR DR HOUSTON,TX 77031-1022

256.)MARSHALL MARCUS D 9319 RENTUR DR HOUSTON,TX 77031-1022

257.)CABRERA EDUARDO & BASILIA9315 RENTUR DR HOUSTON,TX 77031-1022

258.)JOYA GLORIA M 9311 RENTUR DR HOUSTON,TX 77031-1022

259.)W W HOMES INVEST INC 6638 SHARPSTOWN GREEN CIR HOUSTON,TX 77036-4087

260.)CURRENT OWNER 8510 BURNING HILLS DR HOUSTON,TX 77071-1126

261.)GONZALEZ GUADALUPE 9203 TWIN HILLS DR HOUSTON,TX 77031-1119

262.) CORNISH MARK & SOFIA E 9306 MEAUX DR HOUSTON,TX 77031-1724

263.)NGUYEN CHUONG 9310 MEAUX DR HOUSTON,TX 77031-1724

264.)KING SEAN MICHAEL DAVID 9314 MEAUX DR HOUSTON,TX 77031-1724

265.)GONZALEZ ENELDA 9318 MEAUX DR HOUSTON,TX 77031-1724

266.)AYALA JUAN M SOP ELSA D VELASQUEZ 9322 MEAUX DR HOUSTON,TX 77031-1724

267.)MATAMOROS DARWIN O 9426 MEAUX DR HOUSTON,TX 77031-1726

268.)MORROW WM A JR 9330 MEAUX DR HOUSTON,TX 77031-1724

269.)HUYNH ARTHUR & SUSAN 8502 DASHWOOD DR HOUSTON,TX 77036-4716

270.)REDDY VIVEK D NELSON REDDY METTA A 9406 MEAUX DR HOUSTON,TX 77031-1726

271.)MORFINREYES JAVIER M 9410 MEAUX DR HOUSTON,TX 77031-1726

272.)VASQUEZ JOSE & MARIA E 9414 MEAUX DR HOUSTON,TX 77031-1726

273.)GASERY REGINALD J 9418 MEAUX DR HOUSTON,TX 77031-1726

274.)CARROLL BRENDELL L 9422 MEAUX DR HOUSTON,TX 77031-1726

275.)ESCALANTE KARINA 9426 MEAUX DR HOUSTON,TX 77031-1726

276.)RODRIGUEZ ARTEMIO J 9430 MEAUX DR HOUSTON,TX 77031-1726

277.)SALAS MARIA DELROCIO 10726 PLAINFIELD ST HOUSTON,TX 77031-1021

278.)ROWLAND CYNTHIA K 10730 PLAINFIELD ST HOUSTON,TX 77031-1021

279.)ERC INVESTMENTS LTD 818 MERRICK DR SUGARLAND,TX 77478-3742

280.)PARKER JUDY T 10806 PLAINFIELD ST HOUSTON,TX 77031-1727

281.)ABELLA MARIA V & RODOLF 10810 PLAINFIELD ST HOUSTON,TX 77031-1727

282.)CORVERA JOSE 10814 PLAINFIELD ST HOUSTON,TX 77031-1727

283.)ODOM MARTHA S 10818 PLAINFIELD ST HOUSTON,TX 77031-1727

284.)PACHECO MARIA 10822 PLAINFIELD ST HOUSTON,TX 77031-1727

285.)PETRI LIVING TRUST % VERLE A & MARJORIE PETRI 81 CRESTWOOD CIR SUGAR LAND,TX 77478-3993

286.)MENENDEZ EDWIN L 10830 PLAINFIELD ST HOUSTON,TX 77031-1727

287.)SORIA IGNACIA 8211 KINGSBROOK RD. APT#204 HOUSTON,TX 77024-3314

288.)HERNANDEZ MAXIMO 10906 PLAINFIELD ST HOUSTON,TX 77031-1728

289.)AGUILAR JOSE A & MARIA 7920 SAN FELIPE BLVD APT#701 AUSTIN,TX 78729-7698

290.)WEINTRAUB M S 1835 MAN O WAR COURT RICHMOND,TX 77406-1850

291.)PORTILLO ZULMA Y 10918 PLAINFIELD ST HOUSTON,TX 77031-1728

292.)FISHER Y J & JOHNNY 10922 PLAINFIELD ST HOUSTON,TX 77031-1728

293.)CUMMINGS COLTON 9435 CLARIDGE DR HOUSTON,TX 77031-1718

294.)GOINS JOE W 9435 CLARIDGE DR HOUSTON,TX 77031-1718

295.)DING YAN 9427 CLARIDGE DR HOUSTON,TX 77031-1718

296.)GREEN AUGUSTA IV 9423 CLARIDGE DR HOUSTON,TX 77031-1718

297.)CURRENT OWNER PO BOX 310611 HOUSTON,TX 77231-0611

298.)BONILLA JOSE L 9415 CLARIDGE DR HOUSTON,TX 77031-1718

299.)NORTH STAR CAPITAL VENTURE INC 9411 CLARIDGE DR HOUSTON,TX 77031-1718

300.)MAHONEY DONALD RAY SR 9407 CLARIDGE DR HOUSTON,TX 77031-1718

301.)MACON GEORGE T & JOYCE 9403 CLARIDGE DR HOUSTON,TX 77031-1718

302.)KARNY GABRIEL & HANA 9402 PORTAL DR HOUSTON,TX 77031-2213

303.)BAKER KEVIN D 9800 PAGEWOOD UNIT 3105 HOUSTON,TX 77042-5532

304.)KRUKEWITT D M 9410 PORTAL DR HOUSTON,TX 77031-2213

305.)VIATOR MARY D 9414 PORTAL DR HOUSTON,TX 77031-2213

306.)THOMPSON LINDA H 9418 PORTAL DR HOUSTON,TX 77031-2213

307.)SALMERON MARIO ORANTES 9422 PORTAL DR HOUSTON,TX 77031-2213

308.)HUMPPI LAUREN 9426 PORTAL DR HOUSTON,TX 77031-2213

309.)MICHEAU TYREE M 9430 PORTAL DR HOUSTON,TX 77031-2213

310.)LAMPE BENJAMIN L 9434 PORTAL DR HOUSTON,TX 77031-2213

311.)LYMAN GEORGE E & KIMBERLY 9438 PORTAL DR HOUSTON,TX 77031-2213

312.)MCCLENNY JUSTIN & JANINE C 9442 PORTAL DR HOUSTON,TX 77031-2213

313.)DELAO LOUIS 9431 MEAUX DR HOUSTON,TX 77031-1725
D % DELAO SONJA ESTATE OF

314.)WEBER SUE ANN 9427 MEAUX DR HOUSTON,TX 77031-1725

315.)CORVERA R & PENA M E 9423 MEAUX DR HOUSTON,TX 77031-1725

316.)FOLEY ALYSSA ERIN 9419 MEAUX DR HOUSTON,TX 77031-1725

317.)MENDEZ SALVADOR & 9415 MEAUX DR HOUSTON,TX 77031-1725

318.)QUIET MIND GROUP LLC 915 BROADWAY ST HOUSTON,TX 77012-2126

319.)MIRELES JOSE O & XIOMARA 9407 MEAUX DR HOUSTON,TX 77031-1725

320.)LEMUS KATHERIN LILIANA 9403 MEAUX DR HOUSTON,TX 77031-1725

321.)WOLBERS GERRIT & ROSARIO V 12807 MAXFIELD DR HOUSTON,TX 77082-3611

322.)GONZALEZ ROSALBA ANDRADE 9327 MEAUX DR HOUSTON,TX 77031-1723

323.)NANCE MARY S & DAVIS WM H 9323 MEAUX DR HOUSTON,TX 77031-1723

324.)OS 1 CONSTRUCTION LLC 9322 MEAUX DR HOUSTON,TX 77031-1724

325.)PEREZ OSCAR L 9315 MEAUX DR HOUSTON,TX 77031-1723

326.)LAZO JOSE A 9311 MEAUX DR HOUSTON,TX 77031-1723

327.)AHMED FAARID U 9307 MEAUX DR HOUSTON,TX 77031-1723

328.)PATTERSON REAL ESTATE LLC 9123 MCAFEE DR HOUSTON,TX 77031-1103

329.)DOTY NELLIE 9302 BANKSIDE DR HOUSTON,TX 77031-1713

330.)LAZO ESTATES INC 4003 GLENWOOD DR. RICHMOND,TX 77046-9646

331.)MAY PHILLIP L 9310 BANKSIDE DR HOUSTON,TX 77031-1713

332.)HELMER R G JR & JUNE 9314 BANKSIDE DR HOUSTON,TX 77031-1713

333.)BENAVIDEZ R & RAFAEL A 9318 BANKSIDE DR HOUSTON,TX 77031-1713

334.)NOWICKI GREGORY 9322 BANKSIDE DR HOUSTON,TX 77031-1713

335.)MARKIN RON J 9326 BANKSIDE DR HOUSTON,TX 77031-1713

336.)HILLAR MARIAN & JANETT 9330 BANKSIDE DR HOUSTON,TX 77031-1713

337.)TANNOUS NASRI 9402 BANKSIDE DR HOUSTON,TX 77031-1715

338.)MENDOZA D S & M LUCERO 9406 BANKSIDE DR HOUSTON,TX 77031-1715

339.)BUTARBUTAR SRI LYANTI 9410 BANKSIDE DR HOUSTON,TX 77031-1715

340.)DIAZ ANTONIO & ROSA 9414 BANKSIDE DR HOUSTON,TX 77031-1715

341.)BLENMAN C A & DAWN Y 9418 BANKSIDE DR HOUSTON,TX 77031-1715

342.)WONG JUDY 9422 BANKSIDE DR HOUSTON,TX 77031-1715

343.)RUSHING JUDITH M 9426 BANKSIDE DR HOUSTON,TX 77031-1715
% RUSHING BENDEL S ESTATE OF

344.)DANIEL DOROTHY T 9430 BANKSIDE DR HOUSTON,TX 77031-1715

345.)ESPINAL MARIA 9431 BANKSIDE DR HOUSTON,TX 77031-1714

346.)ALEXANDER CHARLIE A 9427 BANKSIDE DR HOUSTON,TX 77031-1714

347.)SHVARTZAPEL Y & CARMELA 9423 BANKSIDE DR HOUSTON,TX 77031-1714

348.)BAILEY HOSEA L JR & LOIS 9419 BANKSIDE DR HOUSTON,TX 77031-1714

349.)MELVILLE BRENT 9415 BANKSIDE DR HOUSTON,TX 77031-1714

350.)PIZANO ELIAS & MARIA I 9411 BANKSIDE DR HOUSTON,TX 77031-1714

351.)YAUGER LYNNE RAINEY 9407 BANKSIDE DR HOUSTON,TX 77031-1714

352.)ANGWIN MARTHA M 9403 BANKSIDE DR HOUSTON,TX 77031-1714

353.)PINTO JOHN & DEBRA 9331 BANKSIDE DR HOUSTON,TX 77031-1712

354.)US BANK TRUST TRUSTEE 3701 REGENT BLVD STE 200 IRVING,TX 75063-2296
% HUDSON HOMES MANAGEMENT LLC

355.)ZAMBRANO WILMER	9323 BANKSIDE DR	HOUSTON,TX	77031-1712
356.)GOODEN LONNIE J JR	9319 BANKSIDE DR	HOUSTON,TX	77031-1712
357.)KOR JACK & SARAH	9315 BANKSIDE DR	HOUSTON,TX	77031-1712
358.)REYES SANTOS M	9311 BANKSIDE DR	HOUSTON,TX	77031-1712
359.)HUTCHINS R B IV & ANNELIESE M	9307 BANKSIDE DR	HOUSTON,TX	77031-1712
360.)CRAWFORD DENEICE H	9303 BANKSIDE DR	HOUSTON,TX	77031-1712
361.)MITCHELL KAREN E	9302 VICKIJOHN DR	HOUSTON,TX	77031-1733
362.)KOTISSO G & BEKELU	9306 VICKIJOHN DR	HOUSTON,TX	77031-1733
363.)ZEIBAK CHRISTINA J	9307 VICKIJOHN DR	HOUSTON,TX	77031-1732
364.)WOODHOUSE R & RACHEL	9314 VICKIJOHN DR	HOUSTON,TX	77031-1733
365.)GUILLEN ANSELMO R	9318 VICKIJOHN DR	HOUSTON,TX	77031-1733
366.)CABUSAS BENJAMIN C	9322 VICKIJOHN DR	HOUSTON,TX	77031-1733
367.)ORELLANA JOSE N & ROSA F	9326 VICKIJOHN DR	HOUSTON,TX	77031-1733
368.)ALLEN MURPHY	9330 VICKIJOHN DR	HOUSTON,TX	77031-1733
369.)GYAMFI RUTHANN R	9402 VICKIJOHN DR	HOUSTON,TX	77031-1735
370.)BRADLEY SOFRONIA J	9406 VICKIJOHN DR	HOUSTON,TX	77031-1735
371.)BERRY-CRUZ SANDRA	9410 VICKIJOHN DR	HOUSTON,TX	77031-1735
372.)NACARIO CESAR N MR&MRS	9414 VICKIJOHN DR	HOUSTON,TX	77031-1735
373.)MARQUEZ ROMEO E	9418 VICKIJOHN DR	HOUSTON,TX	77031-1735
374.)PONTIFES SILVESTRE	9422 VICKIJOHN DR	HOUSTON,TX	77031-1735
375.)ROSALES RAUL	9426 VICKIJOHN DR	HOUSTON,TX	77031-1735
376.)MICKLE VICTORIA	9430 VICKIJOHN DR	HOUSTON,TX	77031-1735

377.)SOTO SARA 9431 VICKIJOHN DR HOUSTON,TX 77031-1734

378.)UGWU EDITH NKEM 9427 VICKIJOHN DR HOUSTON,TX 77031-1734

379.)ALVARADO J M & MARIA A 9423 VICKIJOHN DR HOUSTON,TX 77031-1734

380.)FRANCO CIRILO ET AL 9419 VICKIJOHN DR HOUSTON,TX 77031-1734

381.)CABRERA DARIO R & NINFA 9415 VICKIJOHN DR HOUSTON,TX 77031-1734

382.)GREENBAUM JOSEPH W 9411 VICKIJOHN DR HOUSTON,TX 77031-1734

383.)BRIDGE SFR IV SPEED BORROWER 6836 MORRISON BLVD STE 320 CHARLOTTE ,NC 28211-4399

384.)DIKE IFEOMA 8919 ASPEN MEADOW DR HOUSTON.TX 77071-3256

385.)CASTILLO FRANCISCO JOSUE AKIAS 9331 VICKIJOHN HOUSTON,TX 77031-1732

386.)ESTRELLA GUADALUPE 9327 VICKIJOHN DR HOUSTON,TX 77031-1732

387.)JONES G & PRISCILLA 9323 VICKIJOHN DR HOUSTON,TX 77031-1732

388.)FRANCO E J & LETICIA D 11444 FM 361 RD RICHMOND,TX 77469-8814

389.)GUANDIQUE ANA 9315 VICKIJOHN DR HOUSTON,TX 77031-1732

390.)SHELTON ELIZABETH A 9311 VICKIJOHN DR HOUSTON,TX 77031-1732

391.)ZEIBAK HALA 9307 VICKIJOHN DR HOUSTON,TX 77031-1732

392.)ZEIBAK JIHAD & SANA 9303 VICKIJOHN DR HOUSTON,TX 77031-1732

393.)TRAPOLINO L S 1601 S SHEPHERD DR APT 108 HOUSTON,TX 77019-3534

394.)REESE MARTA R 9306 CLARIDGE DR HOUSTON,TX 77031-1717

395.)LIN YUNFEI 9310 CLARIDGE DR HOUSTON,TX 77031-1717

396.)REYES MOISES 9314 CLARIDGE DR HOUSTON,TX 77031-1717

397.)THIBODEAUX ONEIL J JR 9318 CLARIDGE DR HOUSTON,TX 77031-1717

398.)BROMFIELD GLORIA ANN 9322 CLARIDGE DR HOUSTON,TX 77031-1717

399.)W W HOMES INVESTMENT INC 6338 SHARPSTOWN GREEN CIR HOUSTON,TX 77036

400.)MIRON JESUS R 9330 CLARIDGE DR HOUSTON,TX 77031-1717

401.)PHAN NGOC T 10702 CORONA LN HOUSTON,TX 77072-3706

402.)PIRNIE BONNIE % PIRNIE FAMILY LIVING TRUST 9406 CLARIDGE DR HOUSTON,TX 77031-1719

403.)MENDOZA JUANA 9410 CLARIDGE DR HOUSTON,TX 77031-1719

404.)HARRIS TRACY D 9414 CLARIDGE DR HOUSTON,TX 77031-1719

405.)MORALES TERESA 9418 CLARIDGE DR HOUSTON,TX 77031-1719

406.)STIGGINS MONICA 9405 MARGARET JEWEL LN AUSTIN,TX 78748-4203

407.)EMERSON CHARLSIE 9426 CLARIDGE DR HOUSTON,TX 77031-1719

408.)HE GEOFFREY JUN 18370 ALTIMIRA CIR MORGAN HILL,CA 95037-9085

409.)REESE ANTHONY D 9327 CLARIDGE DR HOUSTON,TX 77031-1716

410.)THOMAS ROSE ENTERPRISES LLC 1951 LAKEWINDS DR MISSOURI CITY,TX 77459-1711

411.)HERNANDEZ FRANCISCO 9319 CLARIDGE DR HOUSTON,TX 77031-1716

412.)PETTUS EVELYN D 9315 CLARIDGE DR HOUSTON,TX 77031-1716

413.)GOMEZ VLADIMIR 9311 CLARIDGE DR HOUSTON,TX 77031-1716

414.)ORELLANA C & MATILDE 9307 CLARIDGE DR HOUSTON,TX 77031-1716

415.)DELUMPA P J & BRIGITTE E 9303 CLARIDGE DR HOUSTON,TX 77031-1716

416.)MCPARLANE KEVIN & ELAINE 9239 CLARIDGE DR HOUSTON,TX 77031-1701

417.)VILLARREAL M D & LISA A 9235 CLARIDGE DR HOUSTON,TX 77031-1701

418.)CRUZ J GUADALUPE 9306 PORTAL DR HOUSTON,TX 77031-2211

419.)LOPEZ GEORGE J 9310 PORTAL DR HOUSTON,TX 77031-2211

420.)STRIEGOLD MICHAEL ALLEN 9314 PORTAL DR HOUSTON,TX 77031-2211

421.)BARAHONA FRANCISCO R 9318 PORTAL DR HOUSTON,TX 77031-2211

422.)GARLAND ROBERT WELDON 9322 PORTAL DR HOUSTON,TX 77031-2211

423.)GOLDBERG JEFIM 9326 PORTAL DR HOUSTON,TX 77031-2211

424.)ZELT GLENN W 9330 PORTAL DR HOUSTON,TX 77031-2211

425.)ENGLANDER JOAN R 9334 PORTAL DR HOUSTON,TX 77031-2211

426.)MANUEL DEANDEA S 9338 PORTAL DR HOUSTON,TX 77031-2211

427.)YOULD JENNIFER B 9339 PORTAL DR HOUSTON,TX 77031-2210

428.)PILLAI B CHANDRASEKAR 9335 PORTAL DR HOUSTON,TX 77031-2210
% THE PORTAL PROPERTY TRUST

429.)LIANG YU 2209 S BRAESWOOD BLVD UNIT 33D HOUSTON,TX 77030-4380

430.)WILLIAMS ANTHONY B 3822 PECAN VALLEY DR MISSOURI CITY,TX 77459-4441

431.)CASTRO ENCARNACION 9323 PORTAL DR HOUSTON,TX 77031-2210

432.)HILL DAVIS R & NANCY L 9319 PORTAL DR HOUSTON,TX 77031-2210

433.)FINKELSHTEYN LEONTINA 6615 SUTTERS CREEK TRL MISSOURI CITY,TX 77459-3158

434.)ACN REALTY LLC PO BOX 711388 HOUSTON,TX 77271-2193

435.)WITT GEORGE 9307 PORTAL DR HOUSTON,TX 77031-2210

436.)CURRENT OWNER	2211 SHERIDAN ST	HOUSTON,TX	77030-2015
437.)BESSER DAVID L	9310 SANFORD RD	HOUSTON,TX	77031-2217
438.)SORTO CARLOS	9314 SANFORD RD	HOUSTON,TX	77031-2217
439.)ALARCON J SAMBRANO	9318 SANFORD RD	HOUSTON,TX	77031-2217
440.)SALAZAR SUZANNE C	9322 SANFORD RD	HOUSTON,TX	77031-2217
441.)VILLESCAS PAOLA	9326 SANFORD RD	HOUSTON,TX	77031-2217
442.)RIVERA CARMEN M	9330 SANFORD RD	HOUSTON,TX	77031-2217
443.)KENNEMUR JAMES E	9334 SANFORD RD	HOUSTON,TX	77031-2217
444.)FERNANDEZ JOHAN	16731 BEECHNUT ST APT 605	HOUSTON,TX	77083-6644
445.)MARTIN KEVIN B	9443 PORTAL DR	HOUSTON,TX	77031-2212
446.)CARLISLE MORRIS LEE	9439 PORTAL DR	HOUSTON,TX	77031-2212
447.)HART MILBY JR	9435 PORTAL DR	HOUSTON,TX	77031-2212
448.)MUHAMMAD GWYN	9431 PORTAL DR	HOUSTON,TX	77031-2212
449.)GOMEZ DAMIAN H	9427 PORTAL DR	HOUSTON,TX	77031-2212
450.)SMITH J B & ELLEN S	9423 PORTAL DR	HOUSTON,TX	77031-2212
451.)AGUILAR CHRISTINA	9419 PORTAL DR	HOUSTON,TX	77031-2212
452.)FELIX PATSY J	9415 PORTAL DR	HOUSTON,TX	77031-2212
453.)YEPEZ CARLOS JR	9411 PORTAL DR	HOUSTON,TX	77031-2212
454.)GONZALEZ Y L & A	9407 PORTAL DR	HOUSTON,TX	77031-2212
455.)JOHN-LOUIS VIOLA H	9403 PORTAL DR	HOUSTON,TX	77031-2212
456.)LIANG YU	2209 S BRAESWOOD BLVD APT 33D	HOUSTON,TX	77030-4380

457.)JUAREZ PABLO Z	9406 SANFORD RD	HOUSTON,TX	77031-2218
458.)CURRENT OWNER	PO BOX 2505	STAFFORD,TX	77497-2505
459.)SHIN JI SOO	9414 SANFORD RD	HOUSTON,TX	77031-2218
460.)SMITH GERTRUDE	9418 SANFORD RD	HOUSTON,TX	77031-2218
461.)LOPEZ JOSE REYNALDO	9422 SANFORD RD	HOUSTON,TX	77031-2218
462.)BEDOY JOSEPH	9426 SANFORD RD	HOUSTON,TX	77031-2218
463.)REYES MIGUEL	9430 SANFORD RD	HOUSTON,TX	77031-2218
464.)OREGON J N & G	9434 SANFORD RD	HOUSTON,TX	77031-2218
465.)MONTGOMERY H H	9438 SANFORD RD	HOUSTON,TX	77031-2218.
466.)ALEXANDER BRIAN K	9442 SANFORD RD	HOUSTON,TX	77031-2218
467.)CARRANZA JONATHAN	9439 SANFORD RD	HOUSTON,TX	77031-2218
468.)BROUSSARD THARSILLA	9435 SANFORD RD	HOUSTON,TX	77031-2218
469.)RAMIREZ EMILIO J	9431 SANFORD RD	HOUSTON,TX	77031-2218
470.)NORTHSTAR CAPITAL VENTURE	6702 FAWNCLIFF DR	HOUSTON,TX	77069-3234
471.)WADE JEFFRY T & H C	9423 SANFORD RD	HOUSTON,TX	77031-2218
472.)GILBREATH GARY & JEANETTE	9419 SANFORD RD	HOUSTON,TX	77031-2218
473.)RAINEY KENNETH J	9415 SANFORD RD	HOUSTON,TX	77031-2218
474.)GERSH DAVID A	9411 SANFORD RD	HOUSTON,TX	77031-2218
475.)TURCIOS HUMBERTO A	9407 SANFORD RD	HOUSTON,TX	77031-2218
476.)OMAR ABDELLA	9403 SANFORD RD	HOUSTON,TX	77031-2218
477.)CAMPOS BERNARDA	9402 BENNING DR	HOUSTON,TX	77031-2206
478.)COLLIER RONNIE L & PILAR	9406 BENNING DR	HOUSTON,TX	77031-2206

479.)UMANZOR ONEYDA V	9410 BENNING DR	HOUSTON,TX	77031-2206
480.)WONG KING C	9414 BENNING DR	HOUSTON,TX	77031-2206
481.)WALESZONIA DONNA J	9418 BENNING DR	HOUSTON,TX	77031-2206
482.)PINSONNAULT BERNARD A	9422 BENNING DR	HOUSTON,TX	77031-2206
483.)MARTINEZ MARIBEL	9426 BENNING DR	HOUSTON,TX	77031-2206
484.)GONZALEZ DIANA M	9430 BENNING DR	HOUSTON,TX	77031-2206
485.)ROBB MARY E	9434 BENNING DR	HOUSTON,TX	77031-2206
486.)HOGAN S R	9438 BENNING DR	HOUSTON,TX	77031-2206
487.)GARY WARREN J & MARY L	9442 BENNING DR	HOUSTON,TX	77031-2206
488.)LEONES JOSEPH & BELCINIA	3902 PLUM HILL LN	MISSOURI CITY,TX	77459-6697
489.)THOMAS FRANK & BRENDA	9435 BENNING DR	HOUSTON,TX	77031-2206
490.)CASTREJON ANDRES	9431 BENNING DR	HOUSTON,TX	77031-2206
491.)CHENG T S & CRISANTA L	9427 BENNING DR	HOUSTON,TX	77031-2206
492.)HEATHCOTE KENNETH F	9423 BENNING DR	HOUSTON,TX	77031-2206
493.)MC CUTCHAN CLAUDETTE C	9419 BENNING DR	HOUSTON,TX	77031-2206
494.)DANG NIGHIEM Q	9810 KIMBERLY LOCH LN	HOUSTON,TX	77089-2600
495.)AZIZEH COURTNEY	9411 BENNING DR	HOUSTON,TX	77031-2206
496.)ROSSETTE ANGELICA P	9407 BENNING DR	HOUSTONTX	77031-2206
497.)REYES ANSELMO ANIBAL	9403 BENNING DR	HOUSTON,TX	77031-2206
498.)PATEL G C & NALINI G	9402 SPELLMAN RD	HOUSTON,TX	77031-2228
499.)HUEZO EMILIO	9406 SPELLMAN RD	HOUSTON,TX	77031-2228
500.)SOMOZA FERNANDO B	9410 SPELLMAN RD	HOUSTON,TX	77031-2228

501.)IGLESIA DEL DIOS VIVO	10811 RIDERWOOD DR	HOUSTON,TX	77099-1830
502.)JONES YOLANDA S	9418 SPELLMAN RD	HOUSTON,TX	77031-2228
503.)JENKINS DAVID & FAYE	9422 SPELLMAN RD	HOUSTON,TX	77031-2228
504.)FLORES RONALD	9426 SPELLMAN RD	HOUSTON,TX	77031-2228
505.)BYRD BARRY	9430 SPELLMAN RD	HOUSTON,TX	77031-2228
506.)SNOW JESSE B JR	9434 SPELLMAN RD	HOUSTON,TX	77031-2228
507.)LINN K W & ELIZABETH A	9438 SPELLMAN RD	HOUSTON,TX	77031-2228
508.)TAYLOR CHARLES LYNN	9442 SPELLMAN RD	HOUSTON,TX	77031-2228
509.)GROOM CHARLSIE G	9439 SPELLMAN RD	HOUSTON,TX	77031-2228
510.)BODNER EMANUEL	9435 SPELLMAN RD	HOUSTON,TX	77031-2228
511.)KHAM KAM LIAN	9431 SPELLMAN RD	HOUSTON,TX	77031-2228
512.)GALDAMEE JOSE H	9427 SPELLMAN RD	HOUSTON,TX	77031-2228
513.)LYKINS JESSICA M	9423 SPELLMAN RD	HOUSTON,TX	77031-2228
514.)MCINTOSH L H & BRENDA M	9419 SPELLMAN RD	HOUSTON,TX	77031-2228
515.)RIZWAN MUHAMMAD	6701 SANDS POINT DR UNIT#112	HOUSTON,TX	77074-3749
516.)DAS SUBHAS	4320 VALLEY OAKS DR	LEANDER,TX	78641-3187
517.)RIVAS ESPERANZA	10903 SILKWOOD DR	HOUSTON,TX	77031-1706
518.)SARABIA FELIX & TERESA G	9403 SPELLMAN RD	HOUSTON,TX	77031-2228
519.) 11230 PLAINFIELD LLC	3106 STONEY BROOK LN	MISSOURI CITY,TX	77459-4115
520.) COHEN NATALIE A	11318 WINDY CREEK DR	PEARLAND,TX	77584-8212
521.) GALVAN LETICIA	12210 HOGGARD MEADOWS PL	STAFFORD,TX	77477
522.) COHEN GIDON	11318 WINDY CREEK DR	PEARLAND,TX	77584-8212
523.) CELESTIAL CHURCH OF CHRIST ILERI OLUWA PARISH INC	9430 W BELLFORT ST	HOUSTON,TX	77031-2309

524.) IGLESIA DEL DIOS VIV O COLUMNA	8312 EASTEX FWY	HOUSTON,TX	77093-8325
525.)TORRES PHILLIP M	9339 SANFORD RD	HOUSTON,TX	77031-2216
526.)EDMONDS MOULTON T	9335 SANFORD RD	HOUSTON,TX	77031-2216
527.)SURBER MILLIE	9331 SANDFORD RD	HOUSTON,TX	77031-2216
528.)HODGE JERELINE	9327 SANFORD RD	HOUSTON,TX	77031-2216
529.)JACOBS IRIS CORNELIA	9323 SANFORD RD	HOUSTON,TX	77031-2216
530.)TAPSCOTT MEI SHAO	PO BOX 10678	HOUSTON,TX	77206-0678
531.)MERLOS REINA V	9315 SANFORD RD	HOUSTON,TX	77031-2216
532.)VON UNWERTH HAROLD	9311 SANFORD RD	HOUSTON,TX	77031-2216
533.)BROSCH SUSANNE I	9307 SANFORD RD	HOUSTON,TX	77031-2216
534.)RICHARD G CHOLAKIAN TRUST	7218 MOBUD	HOUSTON,TX	77074-3414
535.)SERRATO ORFELIO	9310 BENNING DR	HOUSTON,TX	77031-2205
536.)MACIAS JOSE S & ALICIA	9314 BENNING DR	HOUSTON,TX	77031-2205
537.)TRAN OANH THI KIM	9318 BENNING DR	HOUSTON,TX	77031-2205
538.)IGLESIAS JONATAN	9322 BENNING DR	HOUSTON,TX	77031-2205
539.)MORENO G MARIA DEL SOCORRO % GARZA BENITO ESTATE OF	9326 BENNING DR	HOUSTON,TX	77031-2205
540.)REID HEATHER D MORAND	9330 BENNING DR	HOUSTON,TX	77031-2205
541.)CHAVEZ SALVADOR	9334 BENNING DR	HOUSTON,TX	77031-2205
542.)BAKER DANA L	9338 BENNING DR	HOUSTON,TX	77031-2205
543.)JACKSON TANO JELANI	9339 BENNING DR	HOUSTON,TX	77031-2204
544.)CHAVARRIA SONIA M	9335 BENNING DR	HOUSTON,TX	77031-2204
545.)PEREZ C & YELANIE SHADIRA	9331 BENNING DR	HOUSTON,TX	77031-2204
546.)BENITEZ EFRAIN	9327 BENNING DR	HOUSTON,TX	77031-2204

547.)MACKEY ROBERT C & NORMA J	9323 BENNING DR	HOUSTON,TX	77031-2204
548.)GARAGASH VICTORIA	9319 BENNING DR	HOUSTON,TX	77031-2204
549.)DENKINS RON D	9315 BENNING DR	HOUSTON,TX	77031-2204
550.)CHENAULT GLORIA H	9311 BENNING DR	HOUSTON,TX	77031-2204
551.)PORTER BONNIE F	9310 SPELLMAN RD	HOUSTON,TX	77031-2227
552.)JOHNSON TIDDIE F	9314 SPELLMAN RD	HOUSTON,TX	77031-2227
553.)ABAZIE VINCENT I & PAULINE	9318 SPELLMAN RD	HOUSTON,TX	77031-2227
554.)MARTINEZ GABINO & ROSIBEL	9322 SPELLMAN RD	HOUSTON,TX	77031-2227
555.)RE FUND I LLC	320 W OHIO ST STE 650N	CHICAGO,IL	60654-6566
556.)TURNER SANDRA L	9330 SPELLMAN RD	HOUSTON,TX	77031-2227
557.)WAUGH TIMOTHY	9334 SPELLMAN RD	HOUSTON,TX	77031-2227
558.)RASOS K D & RONALDO B	9338 SPELLMAN RD	HOUSTON,TX	77031-2227
559.)PIZANO PALEMON	10407 SILKWOOD DR	HOUSTON,TX	77031-1107
560.)ANDRADE C& ANGELINA	9335 SPELLMAN RD	HOUSTON,TX	77031-2226
561.)SALAMANCA E & ANGELA	9331 SPELLMAN RD	HOUSTON,TX	77031-2226
562.)CONTRERAS A HERMINIA	9327 SPELLMAN RD	HOUSTON,TX	77031-2226
563.)SANTIBANEZ JESUS A & DINA	9323 SPELLMAN RD	HOUSTON,TX	77031-2226
564.)VARGA JAMES J & HELEN	9319 SPELLMAN RD	HOUSTON,TX	77031-2226
565.)BRADLEY CHERRY & LEROY	9315 SPELLMAN RD	HOUSTON,TX	77031-2226
566.)JASSO RUPERTO	9311 SPELLMAN RD	HOUSTON,TX	77031-2226
567.)BAILEY CLIFTON W & SHEILA	9307 SPELLMAN RD	HOUSTON,TX	77031-2226
568.)BAUTISTA JESUS PIZANO	2603 COUNT ERIC DR	HOUSTON,TX	77084-4243
569.)ROBERTS THEODORE K	1914 S VERMONT AVE STE 200	LOS ANGELES,CA	90007-1252
570.)ROBERTS T K	1914 S VERMONT AVE STE 200	LOS ANGELES,CA	90007-1252

571.)OLLAWA VALENTINE	1495 SILVERADO DR	HOUSTON,TX	77077-2313
572.)URIAS ALBA	9200 W BELLFORT ST APT 101	HOUSTON,TX	77031
573.)PAMPER ME INC	2204 SWEET CLOVER DR	AUSTIN,TX	78745-7604
574.)FLORES TONY & MARY	PO BOX 1592	STAFFORD,TX	77497-1592
575.)JENG ROSE LIKUN	9200 W BELLFORT ST UNIT 80	HOUSTON,TX	77031-2323
576.)MACHA REBECCA S	9200 W BELLFORT ST APT 9	HOUSTON,TX	77031-2312
577.)THOMPSON JERRY L	9200 W BELLFORT ST APT 10	HOUSTON,TX	77031-2312
578.)HATCH PAUL B	9200 W BELLFORT ST APT 11	HOUSTON,TX	77031-2312
579.)QUICK JULUIS H	9200 W BELLFORT ST APT 12	HOUSTON,TX	77031-2312
580.)MEDRANO VICTOR M	9200 W BELLFORT ST APT 13	HOUSTON,TX	77031-2312
581.)CHAN HON HEI V	9200 W BELLFORT ST APT 14	HOUSTON,TX	77031
582.)CHU CHING Y	9200 W BELLFORT ST APT 15	HOUSTON,TX	77031
583.)UWAKWE PETER A	1129 BIRCH RISE RD	RICHMOND,TX	77406-7234
584.)AKINBAYO OLUMUNMI	9200 W BELLFORT ST APT 17	HOUSTON,TX	77031-231
585.)CHENG CHAOCHUN	1721 DOSH WAY	UPLAND,CA	91784-9284
586.)JENG ROSE LIKUN	9200 W BELLFORT ST UNIT 80	HOUSTON,TX	77031-2323
587.)CARRENO MARIA I	9200 W BELLFORT ST APT 21	HOUSTON,TX	77031-2313
588.)ROBERTS T K	1914 S VERMONT AVE STE 200	LOS ANGELES,CA	90007-1252
589.)QUICK TRUST DATED	9200 W BELLFORT ST APT 12	HOUSTON,TX	77031-2312
590).SALMON JUDY A	9200 W BELLFORT ST APT 26	HOUSTON,TX	77031-2314
591.)CHENG CHAOCHUN	1721 DOSH WAY	UPLAND,CA	91784-9284
592.)JENG ROSE LIKUN	9200 W BELLFORT ST UNIT 80	HOUSTON,TX	77031-2323
593.)TIANFU GARDEN LLC	4521 GRAND CYPRESS DR	AUSTIN,TX	78747-1329
594.)CANARY CORPORATION	15020 CUTTEN RD	HOUSTON,TX	77070-3273

595.)CARRENO MARIA I 9200 W BELLFORT ST APT 31 HOUSTON,TX 77031-2315

596.)CHEN WEN TU 512 EL MONTE ST SAN GABRIEL,CA 91776-2629

597.)CHOW PAK H 9200 W BELFORT STE 70 HOUSTON,TX 77031

598.)CURTIS NANCY D 5518 GREYLOG DR HOUSTON,TX 77048-1850

599.)SIMPSON BERNADINE ESTATE OF PO BOX 582 MISSOURI CITY,TX 77459-0582

600.)GARCIA JESUS F 11815 CHESSINGTON DR HOUSTON,TX 77031-2603

601.)O KOON FAI 9200 W BELLFORT ST APT 14 HOUSTON,TX 77031

602.)MAHARDDHIKA NINING 12995 CLAREWOOD DR HOUSTON,TX 77072-1763

603.)ROBERTS T K 1914 S VERMONT AVE STE 200 LOS ANGELES,CA 90007-1252

604.)CRUZ MARIA S 9200 W BELLFORT ST APT 43 HOUSTON,TX 77031-2317

605.)DUYN LAURA VAN 9200 W BELLFORT ST APT 44 HOUSTON,TX 77031-2317

606.)DO HENRY 7619 WOODLAND WEST DR HOUSTON,TX 77040-2609

607.)CHENG CHAOCHUN 1721 DOSH WAY UPLAND,CA 91784-9284

608)SANCHEZ JJ 9200 W BELLFORT ST UNIT 47 HOUSTON,TX 77031-2317

609.)HUANG THOMAS 3422 SUMMER BAY DR SUGAR LAND,TX 77478-4454

610.)ROBERTS T K 1914 S VERMONT AVE STE 200 LOS ANGELES,CA 90007-1252

611.)GODOY A B 10855 MEADOWGLEN LN UNIT 1032 HOUSTON,TX 77042-4076

612.)ANI LOUTFI 9200 W BELLFORT ST UNIT 51 HOUSTON,TX 77031-2318

613.)RAMIREZ D & CLAUDIA 3730 SIEBINTHALER LN HOUSTON,TX 77084-6133

614.)CHENG CHAOCHUN 1721 DOSH WAY UPLAND,CA 91784-9284

615.)DAVIS BRENDA C 9200 W BELLFORT ST APT 55 HOUSTON,TX 77031-2319

616.)CHEN WEN TU 512 EL MONTE ST SAN GABRIEL,CA 91776-2629

617.)LE YEN PO BOX 639 ALIEF,TX 77411

618.)WALTON K & P 9200 W BELLFORT ST APT 60 HOUSTON,TX 77031-2320

619.)LAM K & YALAJU 6701 SANDS POINT DR APT 72 HOUSTON,TX 77074-3747

620.)ROBERTS T K 9200 W BELLFORT ST APT 62 HOUSTON,TX 77031-2320

621.)ZHOU JING 9200 W BELLFORT ST APT 63 HOUSTON,TX 77031

622.)DAVRISHEV MUKHLIS 9018 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

623.)MARTINEZ J & REINA 9014 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

624.)NGO NGHI H 9010 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

625.)TRINH THANH K 9006 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

626.)JAIMES M & RAUNEL 9002 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

627.)LY DUNG T 8938 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

628.)MENDEZ JOSE L 8934 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

629.)TRAN HANH TUYET 8930 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

630.)CHAVARRIA MARIO A 8926 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

631.)MALONE C A & DERRICK 8922 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

632.)TRAN CUONG V 8918 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

633.)MAI K T 8914 MARTIN HEIGHTS DR HOUSTON,TX 77031-2764

634.)TRUONG HN 9030 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

635.)ABDORROH MACH HA 9034 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

636.)AGUILAR C JAMES 9038 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

637.)RIVERA LIRIAN Y 9042 MARTIN HEIGHTS DR HOUSTON,TX 77031-2766

638.)VILLANUEVA CARMEN J 9102 MARTIN HEIGHTS DR HOUSTON,TX 77031-2745

639.)GASHAW GETACHEW 9106 MARTIN HEIGHTS DR HOUSTON,TX 77031-2745

640.)HUANG XING YUN 9110 MARTIN HEIGHTS DR HOUSTON,TX 77031-2745

641.)EMERSON JAMES W	9114 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
642.)BERRIOS MARIA L	9118 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
643.)DINH CUC THI	9122 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
644.)IGLESIAS MARIA ISABEL	9126 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
645.)ARGUELLO ELISEO &	9130 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
646.)SPARKS M W & CUC	9134 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
647.)ODEBUNMI SAMSON A	9138 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
648.)OSIDELE SEGUN S	9142 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
649.)ANYAIBE NNAMDI	9146 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
650.)OLIVA SABINO	9150 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2745
651.)ROBERSON MATAMA	11702 WILSON PINES CT	HOUSTON,TX	77031-2762
652.)OTUONYE N & UCHECHI	11706 WILSON PINES CT	HOUSTON,TX	77031-2762
653.)PHAN QUAN THI	11710 WILSON PINES CT	HOUSTON,TX	77031-2762
654.)CHAU PHUNG K	11714 WILSON PINES CT	HOUSTON,TX	77031-2762
655.)XU HONGTAO	11718 WILSON PINES CT	HOUSTON,TX	77031-2762
656.)HENDERSON LYDA	11722 WILSON PINES CT	HOUSTON,TX	77031-2762
657.)HUA LINDA	11726 WILSON PINES CT	HOUSTON,TX	77031-2762
658.)MENGIS YOHANNES G	11727 WILSON PINES CT	HOUSTON,TX	77031-2763
659.)HAILE GIRMAY G	11723 WILSON PINES CT	HOUSTON,TX	77031-2763
660.)HARRIS S & SANDRA S	11719 WILSON PINES CT	HOUSTON,TX	77031-2763
661.)BERRIOS S & PEDRO	9143 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2746
662.)CAO TRI VAN	9139 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2746
663.)KPADOBI ANTHINY O	9135 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2746
664.)NGUYEN LAI V	11702 SWEET WILLOW CT	HOUSTON,TX	77031-2754

665.)ADESOKAN ANIFAT	11706 SWEET WILLOW CT	HOUSTON,TX	77031-2754
666.)GARCIA ANA L & FELIPE	11710 SWEET WILLOW CT	HOUSTON,TX	77031-2754
667.)NGO HIEN D	714 SANDPIPER DR	SUGAR LAND,TX	77478-3442
668.)SUTTON M MARIE	11711 SWEET WILLOW CT	HOUSTON,TX	77031-2755
669.)NGUYEN V T & XUAN T	11707 SWEET WILLOW CT	HOUSTON,TX	77031-2755
670.)JUNAID MICHAEL	11703 SWEET WILLOW CT	HOUSTON,TX	77031-2755
671.)VO HAN Q	9043 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
672.)OSINBANJO C R & IBRAHIM A	9039 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
673.)SCHAPIRO T J & DELLA A	9035 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
674.)ARREGUIN J M & OLGA	9031 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
675.)PEREIRA JACOBO L	9027 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
676.)KHAKIQI AMAN & LIDA	4006 PECAN SHADOWS DR	RICHMOND,TX	77407-3223
677.)HA TRANG	9019 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
678.)LE LOAN	9015 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
679.)KOLLMORGEN B P	9011 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
680.)WOLDEMICHAEL G	9007 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2767
681.)DE MONTERROSA M P	8502 HAZEN ST	HOUSTON,TX	77036-6864
682.)PHAM MINH H	8939 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2765
683.)CAI HUA FANG	8935 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2765
684.)BIAGAS MARVIN J	8931 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2765
685.)VUONG HIEN P	8927 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2765
686.)MARIN JOSE N	8923 MARTIN HEIGHTS DR	HOUSTON,TX	77031-2765

687.)VU DAI BANG 8919 MARTIN HEIGHTS DR HOUSTON,TX 77031-2765

688.)THI DANG XUAN DU 8915 MARTIN HEIGHTS DR HOUSTON,TX 77031-2765

689.)FREMION A & ELLEN J 9126 PETERSHAM DR HOUSTON,TX 77031-2722

690.)MOR OSA INVESTMENTS LLC 404 OXFORD ST UNIT 1425 HOUSTON,TX 77007-2677

691.)BALAGAMWALA M BILAL 9118 PETERSHAW DR HOUSTON,TX 77031-2722

692.)WILKINSON THOMAS H 9114 PETERSHAM DR HOUSTON,TX 77031-2722

693.)BELL LARRY G 9110 PETERSHAM DR HOUSTON,TX 77031-2722

694.)SIMPSON JOHN & JEANETTE 9106 PETERSHAM DR HOUSTON,TX 77031-2722

695.)UDEOBONG ITA A 10806 ROLLER MILL LN SUGAR LAND,TX 77498-5048

696.)KEEBLE M JOYCE 8815 PETERSHAM DR HOUSTON,TX 77031-2716

697.)KLOSINSKI T L & FRANCES 9022 PETERSHAM DR HOUSTON,TX 77031-2720

698)CROWDER RALPH & SELENA 9018 PETERSHAM DR HOUSTON,TX 77031-2720

699.)BUI MIKE K 9014 PETERSHAM DR HOUSTON,TX 77031-2720

700.)ARRAZOLO F & LAURA B 9010 PETERSHAM DR HOUSTON,TX 77031-2720

701.)TANDY WILLIAM L 9006 PETERSHAM DR HOUSTON,TX 77031-2720

702.)COLLINS BRIDGETTE C 9002 PETERSHAM DR HOUSTON,TX 77031-2720

703.)SIMPSONWHITE ELCENIA 8922 PETERSHAM DR HOUSTON,TX 77031-2718

704.)SHARBER WILLIAM W 8918 PETERSHAM DR HOUSTON,TX 77031-2718

705.)LEHMAN S R & PAMELA D 8914 PETERSHAM DR HOUSTON,TX 77031-2718

706.)DE LA CRUZ DALILA 11903 CHADWELL DR HOUSTON,TX 77031-2701

707.)MANCIA OSCAR & EVA 11907 CHADWELL DR HOUSTON,TX 77031-2701

708.)CAI YANGANG 9406 PETERSHAM DR HOUSTON,TX 77031-2735

709.)CERDA JOSE F SR 9402 PETERSHAM DR HOUSTON,TX 77031-2735

710.)GALLAIS SEBASTIEN 9322 PETERSHAM DR HOUSTON,TX 77031-2733

711.)SANCHEZ MONICA THALIA	9318 PETERSHAM DR	HOUSTON,TX	77031-2733
712.)RODRIGUEZ S P	9314 PETERSHAM DR	HOUSTON,TX	77031-2733
713.)TSOU PEINAN & GORETTI	9310 PETERSHAM DR	HOUSTON,TX	77031-2733
714.)LAVENTON LESTER R	9306 PETERSHAM DR	HOUSTON,TX	77031-2733
715.)TANIS MEHMET C	PO BOX 940214	HOUSTON,TX	77094-7214
716.)MOSS EDMOND & CARLETTA	9222 PETERSHAM DR	HOUSTON,TX	77031-2731
717.)BAETZEL CHAPMAN	9218 PETERSHAM DR	HOUSTON,TX	77031-2731
718.)SHILLINGLAW J P JR & STELLA	9214 PETERSHAM DR	HOUSTON,TX	77031-2731
719.)BOUYER ELAINE	9210 PETERSHAM DR	HOUSTON,TX	77031-2731
720.)STEWARD MARVITA	9206 PETERSHAM DR	HOUSTON,TX	77031-2731
721.)HILL-MARGONI GEORJA	9202 PETERSHAM DR	HOUSTON,TX	77031-2731
722.)RUIZ ELIDA & JOHN	11802 MANORGATE DR	HOUSTON,TX	77031-2713
723.)GASKAMP ERWIN A	9315 PETERSHAM DR	HOUSTON,TX	77031-2732
724.)CHANG ANNE S	9311 PETERSHAM DR	HOUSTON,TX	77031-2732
725.)WILSON C E & BRENDA	9307 PETERSHAM DR	HOUSTON,TX	77031-2732
726.)KAMAL MARYAM	9303 PETERSHAM DR	HOUSTON,TX	77031-2732
727.)SALAZAR JAIME	9223 PETERSHAM DR	HOUSTON,TX	77031-2730
728.)CRINER WALTER H	9219 PETERSHAM DR	HOUSTON,TX	77031-2730
729.)SUWANNAKINTHORN C	9215 PETERSHAM DR	HOUSTON,TX	77031-2730
730.)CHEN H MEI-YU & MING CHIA	9211 PETERSHAM DR	HOUSTON,TX	77031-2730
731.)CURRENT OWNER	9207 PETERSHAM DR	HOUSTON,TX	77031-2730
732.)PORTILLO CARLOS J & ADYS G	11802 STANWOOD DR	HOUSTON,TX	77031-2724
733.)TOSH CAROL	11806 STANWOOD DR	HOUSTON,TX	77031-2724

734.)YEPEZ JOSE LUIS	11810 STANWOOD DR	HOUSTON,TX	77031-2724
735.)KAZEM MOHAMAD A	11814 STANWOOD DR	HOUSTON,TX	77031-2724
736.)CORDERO VICENTA & PEDRO	11818 STANWOOD DR	HOUSTON,TX	77031-2724
737.)TALLEY DONNA C	11822 STANWOOD DR	HOUSTON,TX	77031-2724
738.)AVILA GEYSER M	11826 STANWOOD DR	HOUSTON,TX	77031-2724
739.)CHEN Y SHIH & MEI CHU WU	9315 LONGSTAFF DR	HOUSTON,TX	77031-2741
740.)CHALAS FABIO A	9311 LONGSTAFF DR	HOUSTON,TX	77031-2741
741.)CURRENT OWNER	9307 LONGSTAFF DR	HOUSTON,TX	77031-2741
742.)WESTBROOK CLARA	9303 LONGSTAFF DR	HOUSTON,TX	77031-2741
743.)KERELEGON R F	9302 LONGSTAFF DR	HOUSTON,TX	77031-2712
744.)BABU KURUR S & ANCY	7919 PAWNEE PASS	MISSOURI CITY,TX	77459-3395
745.)ARMAS A S & VERONICA	9310 LONGSTAFF DR	HOUSTON,TX	77031-2712
746.)KENNARD JAMES & RACHEL	9314 LONGSTAFF DR	HOUSTON,TX	77031-2712
747.)DIXSON-HALL EARLEANE	9318 LONGSTAFF DR	HOUSTON,TX	77031-2712
748.)LEMUS EDGAR E & NUBIA E	10707 SAGEGREEN DR	HOUSTON,TX	77089-5204
749.)TATUM MARY	9326 LONGSTAFF DR	HOUSTON,TX	77031-2712
750.)CURRENT OWNER	9127 PETERSHAM DR	HOUSTON,TX	77031-2721
751.)BAYNES LIONEL A	9122 HAVERSTOCK DR	HOUSTON,TX	77031-2710
752.)VILLANUEVA ARMANDO	9119 PETERSHAM DR	HOUSTON,TX	77031-2721
753.)TEEL ANNIE	9115 PETERSHAM DR	HOUSTON,TX	77031-2721
754.)CURRY JULIUS	9111 PETERSHAM DR	HOUSTON,TX	77031-2721
755.)COOK MARK J & DORIS	9107 PETERSHAM DR	HOUSTON,TX	77031-2721
756.)MONTONCHAIKUL DHAVI	9103 PETERSHAM DR	HOUSTON,TX	77031-2721

757.)NEEL JAMES H	9023 PETERSHAM DR	HOUSTON,TX	77031-2719
758.)ONEIL W R & SUSAN K	9019 PETERSHAM DR	HOUSTON,TX	77031-2719
759.)COWEN K & PEACE A	9015 PETERSHAM	HOUSTON,TX	77031-2719
760.)CURRENT OWNER	9011 PETERSHAM DR	HOUSTON,TX	77031-2719
761.)HAMNER RONALD	9007 PETERSHAM DR	HOUSTON,TX	77031-2719
762.)VAGLIENTI BARBARA J	9003 PETERSHAM DR	HOUSTON,TX	77031-2719
763.)JOHNSON LUTHER L	11906 CHADWELL DR	HOUSTON,TX	77031-2702
764.)SUHOR DANIEL A	11910 CHADWELL DR	HOUSTON,TX	77031-2702
765.)KEESE G M & KAREN E	11914 CHADWELL DR	HOUSTON,TX	77031-2702
766.)GARCIA OSCAR JAIME	11915 PLAINFIELD ST	HOUSTON,TX	77031-2723
767.)PAREDES JUAN	11911 PLAINFIELD ST	HOUSTON,TX	77031-2723
768.)LAU KATRINA WAI	11907 PLAINFIELD ST	HOUSTON,TX	77031-2723
769.)GREIWE STEPHANIE	11903 PLAINFIELD ST	HOUSTON,TX	77031-2723
770.)SALIAGAS ZIZI	11902 PLAINFIELD ST	HOUSTON,TX	77031-2723
771.)SHADWELL G L & I K	11906 PLAINFIELD ST	HOUSTON,TX	77031-2723
772.)PARCALI Z & MUSTAFA	11910 PLAINFIELD ST	HOUSTON,TX	77031-2723
773.)HAWES R & RACHEL A R	9018 HAVERSTOCK DR	HOUSTON,TX	77031-2708
774.)MCINTYRE ROBIN G	9022 HAVERSTOCK DR	HOUSTON,TX	77031-2708
775.)WRIGHT ELCENIA L	9102 HAVERSTOCK DR	HOUSTON,TX	77031-2710
776.)EBERSON SARAH N	9106 HAVERSTOCK DR	HOUSTON,TX	77031-2710
777.)BENKATO HASSAN	9110 HAVERSTOCK DR	HOUSTON,TX	77031-2710
778.)MEJIA ESMERALDA	9114 HAVERSTOCK DR	HOUSTON,TX	77031-2710
779.)THOMPSON VIRGIL	9118 HAVERSTOCK DR	HOUSTON,TX	77031-2710

780.)HEROD CARMEN E	9122 HAVERSTOCK DR	HOUSTON,TX	77031-2710
781.)HAMILTON MELISA	9123 LONGSTAFF DR	HOUSTON,TX	77031-2711
782.)INYANG EMMA	9119 LONGSTAFF DR	HOUSTON,TX	77031-2711
783.)LEE MARIANNE	9115 LONGSTAFF DR	HOUSTON,TX	77031-2711
784.)MCLELLEAN ROBERT C	9111 LONGSTAFF DR	HOUSTON,TX	77031-2711
785.)TERRY A E & BRENDA G	9107 LONGSTAFF DR	HOUSTON,TX	77031-2711
786.)CARBALLO RAFAEL A	9103 LONGSTAFF DR	HOUSTON,TX	77031-2711
787.)PIPPIN MARY KATHRYN	9106 LONGSTAFF DR	HOUSTON,TX	77031-2740
788.)FISBECK MAX M	9110 LONGSTAFF DR	HOUSTON,TX	77031-2740
789.)BAKER RICKEY & JANICE	9114 LONGSTAFF DR	HOUSTON,TX	77031-2740
790.)ESQUIVEL MARIA	9118 LONGSTAFF DR	HOUSTON,TX	77031-2740
791.)FAGALA LARRY M	72 LARRYILYNN LN	EDWARDS,MO	65326-2510
792.) MEDRANO JUAN A	1902 GARDENIA DR	HOUSTON,TX	77018-4604
793.)ZEIBAK SAMANTHA	9235 VICKIJOHN DR	HOUSTON,TX	77031-1730
794.)OU WAN KAY	9234 VICKIJOHN DR	HOUSTON,TX	77031-1731
795.)JACKSON REGINA L	9243 BANKSIDE DR	HOUSTON,TX	77031-1710
796.)ZERMENO JUAN C	9242 BANKSIDE DR	HOUSTON,TX	77031-1711
797.)ZAVALA PASTRO	9239 MEAUX DR	HOUSTON,TX	77031-1721
798.)ARGUETA JOSE L	9238 MEAUX DR	HOUSTON,TX	77031-1722
799.)JOYA C HUMBERTO	9239 RENTUR DR	HOUSTON,TX	77031-1127
800.)MONICO A V GONZALEZ	9238 RENTUR DR	HOUSTON,TX	77031-1129
801.)UGWU CHICHI EMMANUEL	14735 STANBRIDGE DR	HOUSTON,TX	77083-5606
802.)CHENG ALBERT YUNG	9238 MCAFEE DR	HOUSTON,TX	77031-1106

803.)LEE JACQUELYN M	9219 KRISTIN DR	HOUSTON,TX	77031-1101
804.)DEBOSE F DAVID JR	9218 KRISTIN DR	HOUSTON,TX	77031-1101
805.)CERVANTES MARIO	9235 WILLOW MEADOW DR	HOUSTON,TX	77031-1123
806.)DUREE DONNA G	9234 WILLOW MEADOW DR	HOUSTON,TX	77031-1124
807.)BRABEC G A & JOANNE	9235 TWIN HILLS DR	HOUSTON,TX	77031-1119
808.)ARTEAGA MA GUADALUPE	11331 HILLSIDE GLEN TL	HOUSTON,TX	77065
809.)GUTIERREZ SALVADOR	15914 CERCA BLANCA DR	HOUSTON,TX	77083-4925
810.) SERIES ZZ OF K&T TRINITY ENT.	5860 HWY 6	MISSOURI CITY,TX	77459
811.)SANCHEZ BERNARDO	9322 TOOLEY DR	HOUSTON,TX	77031-1008
812.)VASQUEZ MANUEL	703 LA ROCHE LN	HOUSTON,TX	77036-6705
813.)WEI CHUNG	3649 GIBSON RD APT A	EL MONTE,CA	91731-2365

INFORMATION TAKEN FROM HARRIS COUNTY APPRAISAL DISTRICT WEBSITE ON 2/28/23

Attachment I–4 Facility Legal Description

183-77-0058

CITY OF BELLAIRE
66.6099 ACRE TRACT OUT OF
H.T.& B.R.R. CO. SURVEY

D

A Tract of land containing 66.6099 acres more or less, being a portion of a 75 acre tract deeded from Joe H. Reeder and H. P. Everts, to the City Of Bellaire as per deed dated March 24, 1954, and recorded in Volume 2742, Page 662, of the deed records of Harris County, Texas, also being out of the H.T.& B.R.R. Co. Survey Number 5, Abstract Number 397, Harris County, Texas and being more particularly described by metes and bounds as follows;

Beginning at a set 5/8 inch iron rod marking the intersection of the north line of Ruffino Road based on a 70 foot right-of-way, and the west line of the said H.T.& B.R.R. Co Survey Number 5, also being in the east line of Lot 5 Block 13 of Braeburn Gardens Subdivision as per map or plat recorded in Volume 23, Page 55 of the Map Records of Harris County, also being North 02 deg. 46 min. 30 sec. West a distance of 10.00 feet along the east line of Braeburn Gardens Subdivision from the southeast corner of said Lot 5 also being in the east line of Harris County Flood Control Ditch Number D-118-05-00 based on a width of 65 feet.

Thence North 02 deg. 46 min. 30 sec. West along the common west line of the H.T.& B.R.R. Co. Survey Number 5, the east line of Braeburn Gardens Subdivision, and Harris County Flood Control Ditch Number D-118-05-00, for a distance of 1468.22 feet to a found 5/8 inch iron rod being the northeast corner of Lot 2 Block 14 of Braeburn Gardens Subdivision, and in the south line of Kegans Bayou, also known as Harris County Flood Control Ditch Number D-118-00-00, based on a 120 foot right-of-way, as per deed dated December 7, 1960, and recorded in Volume 4218, Page 218 of the Deed Records of Harris County, Texas.

Thence in a northeasterly direction following the southerly right-of-way line of Kegans Bayou with the courses and distances as follows:

Thence North 53 deg. 34 min. 00 sec. East for a distance of 64.84 feet to a found 5/8 inch iron rod for corner.

Thence North 45 deg. 25 min. 40 sec. East for a distance of 302.56 feet to a found 5/8 inch iron rod for corner.

Thence North 68 deg. 35 min. 00 sec. East for a distance of 530.58 feet to a found 5/8 inch iron rod for corner.

Thence North 52 deg. 58 min. 30 sec. East for a distance of 242.61 feet to found 5/8 inch iron rod for corner.

Thence North 19 deg. 11 min. 41 sec. East for a distance of 390.16 feet to a found 5/8 inch iron rod for corner.

Thence North 58 deg. 48 min. 00 sec. East for a distance of 519.39 feet to a found 5/8 inch iron rod for corner in the west line of the City of West University Place 70.966 acre tract (called 75 acres) as per deed recorded in Volume 3120 Page 1, of the Deed records of Harris County.

LEGAL DESCRIPTION OF TRACT
OF LAND FOR USE BY
THE CITY OF WEST UNIVERSITY PLACE
AS A SOLID WASTE DISPOSAL SITE

STATE OF TEXAS)(

COUNTY OF HARRIS)(

Description found as part of deed to City of West University Place of 75 acres from W.G. Kingelin et ux dated March 13, 1956, recorded in volume 3120, page 1 of Deed Record of Harris County, Texas:

A certain tract of land located in Harris County, Texas and being lot number four (4) of Ruby's Subdivision of Section No. 5, Block No. 10 located by Certificate No. 5/253 HT & BRR Co. Survey Patent No. 29, Volume 12 patented by A.T. Morse assignee containing 75 acres of land, more or less.

cc: Harris County Health Department
Houston City Health Department

500-77-3568

Beginning at a 4 inch iron pipe in the North line of Ruffino road, said pipe marking the Southeast corner of the City of West University Place 75 acre tract of land and also marking the Southwest corner of the Larry W. Morris and Andrew Buckner 54.5012 acre tract of land and being 2403.65 feet Westerly from a 3/4 inch sucker rod marking a point in the east line of Section 5 in block 10 of the H.T. & B. R.R. Survey, Abstract No. 397, in Harris County Texas, said rod being recognized by many surveyors as being the east line of said survey, and said rod being 16.6 feet West of a fence corner, and said beginning corner also being South 89 43' 56" West a distance of 1011.26 feet from a 5/8 inch iron rod in the North line of Ruffino Rd. marking the Southeast corner of the Morris - Buckner tract as agreed upon by instrument dated October 15, 1962, as recorded in volume 4962 page 271, Deed records of Harris County, Texas.

D

Thence North 0+ 59' 52" West along a fence line a distance of 2362.67 feet to a 4" inch pipe marking the Northwest corner of the Morris - Buckner tract.

FILED
94 AUG 29 AM 11:43
Beverly B. Kaufman
COUNTY CLERK
HARRIS COUNTY, TEXAS

THE STATE OF TEXAS }
COUNTY OF HARRIS }

I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED, in the Official Public Records of Real Property of Harris County, Texas on

AUG 2 9 1994

COUNTY COURT OF HARRIS COUNTY, TEXAS

Beverly B. Kaufman
COUNTY CLERK
HARRIS COUNTY, TEXAS

RECORDER'S MEMORANDUM
AT THE TIME OF RECORDATION, THIS INSTRUMENT WAS FOUND TO BE INADEQUATE FOR THE BEST PHOTOGRAPHIC REPRODUCTION BECAUSE OF ILLEGIBILITY, CARBON OR PHOTO COPY, DISCOLORED PAPER, ETC.

Attachment I–5 Property Legal Description

Texas American Title Company
Title Reserch Services
2000 Bering Drive, Suite 1000
Houston, Texas 77057
Ph: 713-244-2867, Fax: 713-244-2872

ABSTRACTOR'S CERTIFICATE

Ownership Restrictions, Easements and Liens Only

GF Number: 2791022-00001
Date: January 1, 2022

The State of Texas
The County of Harris

Texas American Title Company has examined the real property records, the state district court, and the county court records for the county in which the real property is located. The time period examined extended from **September 15, 1967 to December 26, 2021**. If you desire different or additional examination, please contact us immediately.

This certificate is not an abstract of title. The statement above identifies what real property interests were examined. Please note that an ownership search does not identify leasehold interests (including ground leases) and does not identify any mineral rights. (We have not examined and do not examine for oil, gas, or other mineral rights.) Unless expressly stated otherwise below, only voluntary liens have been identified; federal tax, judgment, child support, and other involuntary liens have not been identified. The examination has identified the following items, during the stated time period, as affecting the real property identified below:

Record Title Appears To Be Vested In:

CITY OF BELLAIRE (by Warranty Deed filed for record under Volume 2742, Page 662, of the Deed Records of Harris County, Texas)

Legal Description: (HCAD Tax ID# 043-063-000-0175)

Seventy-five acres of land out of the southwest corner of SECTION FIVE, H. T. & B. R.R. COMPANY SURVEY, granted to. A. T. MORSE, assignee, by virtue of certificate No. 2/253, Patent No. 29, Volume 12, dated April 16, 1862, and described by metes and bounds as follows:

BEGINNING in the middle of the south prong of Brays Bayou also known as Keagan's Bayou where the west line of said Survey 5 crosses same;

THENCE South along fence and the west line of said Survey No. 5 a distance of 1529.5 feet to a stake 40 feet north of the southwest corner of said Survey No. 5 in the north line of Ruffino Road;

THENCE East along the north line of Ruffino Road and fence a distance of 1587 feet to a fence post for corner;

THENCE North along fence a distance of 2711 feet to the middle of said Bayou;

Texas American Title Company
Title Reserch Services
2000 Bering Drive, Suite 1000
Houston, Texas 77057
Ph: 713-244-2867, Fax: 713-244-2872

THENCE up said Bayou with its meanders a general course of South 53° 28' West, a distance of 1976 feet to the PLACE OF BEGINNING, and being the same land conveyed to Joe H. Reeder and H. P. Everts by Deed from Don F. Beck, recorded in Volume 2621, at Page 368 of the Deed Records of Harris County, Texas,

SAVE AND EXCEPT that certain 0.1004 of an acre tract of land conveyed to the State of Texas by Deed filed for record under Harris County Clerk's File No. M246674.

Note: The Company does not represent that the above acreage or square footage calculations are correct.

SUBJECT TO: Claims of present occupants; discrepancies in area and boundaries; unpaid bills for Labor or Material in connection with recent repairs or new improvements; Unpaid Taxes; changes in Marital or Corporate Status of owner(s) since date of purchase; Homestead Rights or Claims.

Restrictions:

None found of record.

Easements and other encumbrances:

a) Right-of-way for public road affecting the subject property granted to Harris County, as set forth and defined by instrument(s) filed for record under Volume 1332, Page 505, of the Deed Records of Harris County, Texas.

b) Building set-back line(s) as set forth and defined by City Ordinance(s) filed for record under Volume 3799, Page 559, of the Deed Records and under County Clerk's File No(s). B212231, all in Harris County, Texas.

c) Drainage easement(s) affecting the subject property granted to Harris County Flood Control District, as set forth and defined by instrument(s) filed for record under Harris County Clerk's File No(s). B266806.

d) Utility and aerial easements affecting the subject property granted to Houston Lighting & Power Company, as set forth and defined by instrument(s) filed for record under Harris County Clerk's File No(s). H607955, being partially release by Y120532.

e) Utility and aerial easements affecting the subject property granted to Houston Lighting & Power Company, as set forth and defined by instrument(s) filed for record under Harris County Clerk's File No(s). L841435, being partially released by Y120533.

f) Subject to the terms, conditions and stipulations contained in those certain Affidavits to the Public, filed for record under Harris County Clerk's File Nos. M750207 and X864860.

g) Sanitary sewer easement affecting the subject property granted to the City of Houston, as set forth and defined by instrument(s) filed for record under Harris County Clerk's File No(s). N348367.

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Houston, Texas 77057
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h) Subject to the terms, conditions and stipulations contained in that certain License & Permission, by and between Harris County Flood Control District and the City of Houston, a memorandum of which is filed for record under Harris County Clerk's File No. P463000.

i) Subject to the terms, conditions and stipulations contained in that certain Notice of Storm Water Quality Requirements, filed for record under Harris County Clerk's File No. X801883.

j) Subject to the terms, conditions and stipulations contained in that certain Ground Lease, by and between the City of Bellaire, Texas and Ruffino Hills LP, a memorandum of which is filed for record under Harris County Clerk's File No. 20090402151.

k) Subject to the zoning ordinances now in force in the City of Houston, Texas.

l) All leases, grants, exceptions or reservations of coal, lignite, oil, gas and other minerals, together with all rights, privileges, and immunities relating thereto, appearing in the Public Records whether listed in herein or not. There may be leases, grants, exceptions or reservations of mineral interest that are not listed.

m) Subject to the terms, conditions, and stipulations asserted under any and all leases, which may not necessarily be filed of record, with rights of tenants in possession.

n) Subject to any portion of the subject property lying within the boundaries of a public or private roadway, where dedicated or not.

Property Liens:

We find no outstanding mortgage liens of record affecting the subject property. An inquiry should be made concerning the existence of any unrecorded lien or other indebtedness, which could give rise to any security interest in the subject property.

NOTICE: Texas American Title Company (the "Company") has provided this report or certificate to you the person identified above under the terms set forth below. Only the person identified above may rely on this report; it has been prepared solely for the benefit of that person. The use or reliance on this report or certificate by any other person is not authorized or permitted. **By accepting this report or certificate, you agree to these terms and you agree that the Company has no liability to you, except as expressly limited herein.** To the maximum extent allowed by law, the Company disclaims any and all warranties, express or implied, concerning this report or certificate and the information contained therein. Your only remedy for any mistake, misstatement, inaccuracy, error, or omission made or occurring in this report or certificate, or made or occurring in its delivery or non-delivery, is expressly limited to an action to recover damages, which damages you expressly agree are limited to an amount equal to the sum actually paid for this report or certificate plus the sum of $100.00. You further agree that: the Company is not liable for consequential or special damages; the limitation of damages set forth herein is reasonable considering the amount paid, the limited services requested, and the intended use of this report or certificate; the Company would not provide the requested report or certificate without this limitation of damages; the limitation of damages applies to all claims, whether the claim arises under contract, tort or other law; and the Company has no liability to any third person arising from or related to this report or certificate. **This**

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report or certificate is not a title insurance policy or title opinion and is not a guaranty or warranty of title. In its role as a title insurance agent, the Company sells policies of title insurance. If you desire protection against title defects, you should purchase a title insurance policy. Liability will then exist only under the terms of the policy, will be measured and limited by the policy, and the liability will be that of the title insurance company named in the policy. No representative of the Company has the authority to make any oral statements correcting, contradicting, revising, amending or supplementing this report or certificate, including the terms of this notice.

When preparing this report or certificate the Company used only the information contained in the public records specifically identified above. (If none is identified, the Company used only the Real Property Records of the county in which the property is located.) Documents not recorded and events and other matters not reflected in the public records may affect ownership and title but will not be reflected on this report or certificate. No inspection has been made of the property. Matters that may be shown by an inspection or on a survey may also affect ownership and title but will not be reflected on this report or certificate.

The Company may identify a document listed above by a term commonly used to describe similar documents. By way of illustration, a document titled "Restrictive Covenants" may be referred to as "Deed Restrictions" or as "Covenants, Conditions and Restrictions." The Company may also identify a document using its actual title. The Company, however, makes no warranty or representation that the term, title or other name used to describe the document accurately reflects the legal effect of the document. For example, a document titled "Restrictive Covenants" may also establish a lien, an easement, or some other interest.

In order to determine the effect of a document, the document must be carefully reviewed. The Company does not provide legal advice concerning the effect or significance of documents shown on this report or certificate. If you have a question as to the effect or significance of a document, you should obtain the assistance of a qualified professional.

Texas American Title Company

Darrell Stone
Title Examiner

RP-2022-604626
12/29/2022 ER $46.00

SPECIAL WARRANTY DEED

NOTICE OF CONFIDENTIALLY RIGHTS: IF YOU ARE A NATURAL PERSON, YOU MAY REMOVE OR STRIKE ANY OR ALL OF THE FOLLOWING INFORMATION FROM ANY INSTRUMENT THAT TRANSFERS AN INTEREST IN REAL PROPERTY BEFORE IT IS FILED FOR RECORD IN THE PUBLIC RECORDS: YOUR SOCIAL SECURITY NUMBER OR YOUR DRIVER'S LICENSE NUMBER.

THE STATE OF TEXAS §

KNOWN ALL BY THESE PRESENTS:

COUNTY OF HARRIS §

CITY OF WEST UNIVERSITY PLACE, a municipal corporation situated in Harris County, Texas ("**Grantor**"), whose address is 3800 University Boulevard, West University Place, Texas 77005, for and in consideration of the sum of **Ten and No/100 Dollars ($10.00)** and other good and valuable consideration, the BARGAINED, SOLD and CONVEYED, and by these presents does GRANT, BARGAIN, SELL AND CONVEY unto **THE CITY OF HOUSTON TEXAS**, a municipal corporation situated in Harris, Fort Bend and Montgomery Counties, Texas ("**Grantee**"), whose address is P.O. Box 1562, Houston, Texas 77251, the following tracts of land:

> A certain 73.081 acre (3,183,410 square feet) tract of land situated in the H.T.&B. R.R. Company Survey, Abstract No. 397, Harris County, Texas and being a remainder called 75 acres as conveyed to City of West University Place, Texas as recorded under Volume 3120, Page 1 of the Harris County Deed Records (H.C.D.R.), and said 73.081 acre tract being more particularly described by metes and bounds description as follows, all bearings and grid coordinates recited herein are referenced to the Texas Coordinate System, South Central Zone 4204, North American Datum of 1983, (NAD 83), 2011 adjustment; said 73.081 acre tract being more particularly described in **Exhibit "A"** attached hereto and made hereof (the "**Property**")

RP-2022-604626

together with all of Grantor's right, title and interest in and to, if any, (i) all tenements, hereditaments and appurtenances pertaining thereto, (ii) all buildings, structures, fixtures and improvements thereon, and (iii) that portion of all public ways abutting or adjoining said land up to the centerline thereof.

Grantee, having full and ample opportunity to inspect all aspects of the Property, acknowledges and agrees that to the maximum extent provided by law, the sale of the Property as provided for herein is to be made on an "AS IS", "WHERE IS", and "WITH ALL FAULTS" basis, and Grantee expressly acknowledges that, in consideration of the agreement of Grantor, and except for the express representations, warranties and covenants of Grantor under that certain Purchase and Sale Agreement dated Dec. 12, **2022, by and between Grantor and Grantee, Grantor makes no warranty or representations, express or implied, or any warranty of any condition, title (other than special warranty with respect to**

this deed), habitability, merchantability, or fitness or a particular purpose with the respect to the Property or any portion thereof.

To the extent such ownership does not interfere with Grantee's use of the Property or any TCEQ permit, oil and mineral rights are specifically reserved unto Grantor; provided, however, Grantor, as a covenant binding upon Grantor and all future owners of the minerals being reserved by Grantor, irrevocably and unconditionally waive all rights to the surface of the Property and to the right to conduct operations of whatsoever nature with respect to the exploration for, exploitation of, mining, production, processing, transporting and marketing of oil, gas or other minerals from the Property.

Any development of the Property shall comply with 30 Texas Administrative Code Chapter 330, Subchapter T (USE OF LAND OVER CLOSED MUNICIPAL SOLID WASTE LANDFILLS) and other applicable federal, state and local laws. See also 30 Texas Administrative Code Rule § 330.963.

This Special Warranty Deed and the conveyance hereinabove set forth are also executed by Grantor and accepted by Grantee subject to the terms, conditions and provisions hereof and further subject to all easements, conditions, restrictions, covenants, mineral or royalty interests, mineral reservations, surface waivers, utility conveyances, liens, encumbrances, regulations or orders of municipal and/or other governmental authorities, if any, or other matters of record in Harris County, Texas, to the extent the same are validly existing and applicable to the Property (collectively, the "**Permitted Encumbrances**"), and as otherwise shown on **Exhibit "B"**.

TO HAVE AND TO HOLD the Property, together with all and singular the rights and appurtenances thereunto in anywise belonging, unto Grantee, its successors and assigns, forever, and Grantor does hereby bind itself, its successors and assigns, forever, and Grantor does hereby bind itself, its successors and assigns, to WARRANT AND FOREVER DEFEND, all and singular title to the Property unto Grantee, tis successors and assigns, against every person whomsoever lawfully claiming or to claim the same or any part thereof by, through, or under Grantor, but not otherwise, subject only to the Permitted Encumbrances.

This instrument may be executed and delivered in any number of counterparts, each of which so executed and delivered shall be deemed to be an original and all of which shall constitute one and the same instrument.

[*Signature pages follow this page.*]

IN WITNESS WHEREOF, Grantor has executed this Special Warranty Deed this 27th day of December 2022.

GRANTOR:

City of West University Place, a municipal corporation situated in Harris County, Texas

By: _____

Name: DAVID BEACH

Title: CITY MANAGER

APPROVED AS TO FORM:

_____

Ondrea U Taylor
Senior Assistant City Attorney
LD No. RE0000000598

AFTER RECORDING, RETURN TO:

Frontier Title
1177 West Loop South, Suite 1350
Houston, Texas 77027

THE STATE OF TEXAS §
§
COUNTY OF HARRIS §

This instrument was acknowledged before me on this 27 th day **of December, 2022**, by David Beach, City Manager of City of West **University Place, Texas.**

Anna N Evelyn
My Commission Expires
7/16/2026
Notary ID
129686701

Evelyn
NOTARY PUBLIC STATE OF TEXAS

RP-2022-604626

EXHIBIT "A"

THE PROPERTY

PARCEL NO.	LY23-016
PROJECT NO.	
DWG NO	74373

Project Name: City of Houston
73.081 Acres
Parcel LY23-016
January, 2022

METES AND BOUNDS OF
73.081 ACRES OF LAND
SITUATED IN THE
H.T.&B. R.R. COMPANY, SURVEY, ABSTRACT NO. 397
HARRIS COUNTY, TEXAS

Being 73.081 acre (3,183,410 square feet) tract of land situated in the H.T.&B. R.R. Company Survey, Abstract No. 397, Harris County, Texas and being a remainder called 75 acres as conveyed to City of West University Place, Texas as recorded under Volume 3120, Page 1 of the Harris County Deed Records (H.C.D.R.), and said 73.081 acre tract being more particularly described by metes and bounds description as follows, all bearings and grid coordinates recited herein are referenced to the Texas Coordinate System, South Central Zone 4204, North American Datum of 1983, (NAD 83), 2011 adjustment, all surface distances recited herein may be converted to grid by multiplying surface values by a combined scale factor of 0.999880479;

BEGINNING at a found 5/8-inch iron rod, having grid coordinates of N 13,802,365.17; E 3,064,722.96 and being in the north right-of-way line of Ruffino Road (70-foot wide, the adjoining north 35 feet recorded under Volume 1332, Page 505 and Volume 1332, Page 508 H.C.D.R.) and being in the east line of a called 75 acre tract as conveyed to City of Bellaire, a municipal corporation as recorded under Volume 2742, Page 662 of the Harris County Deed Records (H.C.D.R.) and the southwest corner of said called remainder 75 acres (City of West University Place, Texas) and the herein described tract;

THENCE, North 02°49'27" West, along the east line of said called 75 acre (City of Bellaire) and the west line of said called 75 acre (City of West University Place, Texas), pass at a distance of 2,633.39 feet a set 5/8-inch iron rod with cap stamped "Ally", and continuing a total distance of 2708.39 feet to a point to the centerline of Keagan Bayou (Harris County Flood Control District (H.C.F.C.D.) Unit D118-00-00) and said centerline described in a called 2.097 acre tract of land, a H.C.F.C.D. Easement recorded under H.C.C.F. No. B243043 H.C.D.R., and being the northwest corner of said 2.097 acre tract and of the herein described tract;

THENCE, along the centerline of Keagan Bayou the following fifteen (15) courses and distances as follows:

1. North 71°27'21" East, a distance of 93.17 feet to a point;
2. North 52°08'21" East, a distance of 141.82 feet to a point;
3. North 19°27'51" East, a distance to 68.96 feet to a point;
4. North 07°43'21" East, a distance of 103.95 feet to a point;
5. North 01°39'51" East, a distance of 102.04 feet to a point;
6. North 49°40'21" East, a distance of 86.56 feet to a point;
7. North 61°13'21" East, a distance of 93.54 feet to a point;
8. North 80°59'21" East, a distance of 179.20 feet to a point;
9. North 37°55'51" East, a distance of 138.22 feet to a point;
10. North 22°25'21" East, a distance of 99.54 feet to a point;
11. North 32°02'21" East, a distance of 97.94 feet to a point;
12. North 39°20'51" East, a distance of 100.91 feet to a point;
13. North 21°22'21" East, a distance of 104.18 feet to a point;
14. North 28°25'21" East, a distance of 81.89 feet to a point;

15. North 80°14'21" East, a distance of 71.80 feet to a point and being the northeast corner of said called remainder 75 acre tract and the herein described tract;

THENCE, South 02°18'13" East, with the east line of called remainder 75 acre tract, pass at a distance of 58.47 feet a set 5/8-inch iron rod with cap stamped "Ally" and being the north corner of Block 19 of Braeburn Valley West Section One Subdivision as recorded under Volume 157, Page 1 of the Harris County Map Records (H.C.M.R.) and being the northwest corner of Willow Meadow Drive (60 foot wide as recorded under Volume 157, Page 1 H.C.M.R.), and pass at a distance of 1225.28 feet the southwest corner of Braeburn Valley West Section One and the northwest corner of Braeburn Valley West Section Two Subdivision as recorded under Volume 175, Page 27 H.C.M.R., and continuing for a total distance of 1364.36 feet to a set 5/8-inch iron rod with cap stamped "Ally" for an angle point;

THENCE, South 03°02'13" East, continuing with the west line of Braeburn Valley West Section Two Subdivision and the east line of called remainder 75 acre tract, a distance of 2364.45 feet to a found 5/8-inch iron rod in the north right-of-way line of Ruffino Road and being the southeast corner of the herein described tract;

THENCE, South 87°42'57" West, with the north right-of-way line of Ruffino Road, a distance of 999.20 feet to the **POINT OF BEGINNING** and containing 73.081 acres (3,183,410 square feet) of land.

The above description was prepared in conjunction with a Parcel Map of the same date and submitted to Houston Public Works - Houston, Texas.

Grace Y. Cervin, RPLS No. 5564
Ally General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd Street, Ste. 203
Houston, Texas 77092
281-888-7682 (Office)
TBPELS Firm No. 10194392
January 6, 2022/November 21,2022
Job No. 0014-009-41 (City of West University Place)

PARCEL NO. LY23-016
PROJECT NO. 74373
DWG NO

CHECKED
DATE 11/21/2022
APPROVED

RP-2022-604626

EXHIBIT "B"

PERMITTED ENCUMBRANCES

a) Right of Way reserved in instrument filed for record in Volume 392, Page 553, and Volume 413, Page 165, Deed Records of Harris County, Texas, and being described and located therein.

b) Right of Way granted to Harris County as set forth in instrument filed for record in Volume 1332, Page 508, Deed Records of Harris County, Texas, and being described and located therein.

c) Terms, conditions, stipulations, and provisions and any rights or claims concerning clean-up and/or environmental impact relating to Solid Waste Disposal Site as evidenced by Affidavit to the Public filed for record under Harris County Clerk's File No. R030298.

d) All the oil, gas and other minerals, and all other elements not considered a part of the surface estate, the royalties, bonuses, rentals and all other rights in connection with same all of which are expressly excepted therefrom and not insured hereunder, as the same are set forth in instrument(s) filed for record in Volume 392, Page 553, Deed Records of Harris County, Texas. (Said interest not investigated subsequent to date of reservation or conveyance.)

e) A one-half (1/2) interest in and to all the oil, gas and other minerals, and all other elements not considered a part of the surface estate, the royalties, bonuses, rentals and all other rights in connection with same all of which are expressly excepted therefrom and not insured hereunder, as the same are set forth in instrument(s) filed for record in Volume 1382, Page 270, Deed Records of Harris County, Texas. (Said interest not investigated subsequent to date of reservation or conveyance.)

RP-2022-604626

Pages 9

12/29/2022 11:21 AM

e-Filed & e-Recorded in the

Official Public Records of

HARRIS COUNTY

TENESHIA HUDSPETH

COUNTY CLERK

Fees $46.00

RP-2022-604626

RECORDERS MEMORANDUM
This instrument was received and recorded electronically and any blackouts, additions or changes were present at the time the instrument was filed and recorded.

Any provision herein which restricts the sale, rental, or use of the described real property because of color or race is invalid and unenforceable under federal law.
THE STATE OF TEXAS
COUNTY OF HARRIS
I hereby certify that this instrument was FILED in File Number Sequence on the date and at the time stamped hereon by me; and was duly RECORDED in the Official Public Records of Real Property of Harris County, Texas.

COUNTY CLERK
HARRIS COUNTY, TEXAS

Attachment I–6 Final Plat Record of Property

Page intentionally blank. The property is not platted.

Attachment I–7 Facility Metes and Bounds Description

DBE/MBE/HUB/SBE/8(A)

Ally General Solutions, LLC
dba AGS Engineering & Construction LLC
7070 W. 43rd St. Ste. 203
Houston, Texas 77092
281-888-7682

METES AND BOUNDS OF
76.084 ACRES OF LAND
SITUATED IN THE
H.T.&B. R.R. COMPANY, SURVEY, ABSTRACT NO. 397
HARRIS COUNTY, TEXAS

Being 76.084 acre (3,314,208 square feet) tract of land situated in the H.T.&B. R.R. Company Survey, Abstract No. 397, Harris County, Texas and being a called 75 acres as conveyed to City of Bellaire, a municipal corporation as recorded under Volume 2742, Page 662 of the Harris County Deed Records (H.C.D.R.), and said 76.084 acre tract being more particularly described by metes and bounds description as follows, all bearings and grid coordinates recited herein are referenced to the Texas Coordinate System, South Central Zone 4204, North American Datum of 1983, (NAD 83), 2011 adjustment, all surface distances recited herein may be converted to grid by multiplying surface values by a scale factor of 0.999880479;

BEGINNING at a found TxDOT Brass Cap monument being the north corner of a 0.1004 acre tract of land described in a deed to State of Texas as recorded under Harris County Clerk's File (H.C.C.F.) No. M246674 of the Official Public Records of Real Property, Harris County, Texas (O.P.R.R.P.H.C.T.) and being the north corner of a cut-back line of the northeasterly right-0f-way line of South Sam Houston Parkway West (a.k.a. Beltway 8-variable width) and the north right-of-way line of Ruffino Road (70-foot wide, the adjoining north 35 feet recorded under Volume 1332, Page 505 and Volume 1332, Page 508 H.C.D.R.);

THENCE, North 02°47'39" West**,** with the west line of said called 75 acres and the east line of Block 13, Thurleigh Lane (60 foot wide) and Block 14 of Braeburn Gardens Subdivision as recorded under Volume 23, Page 55 of the Harris County Maps Records (H.C.M.R.), pass at a distance of 1375 feet a set 5/8-inch iron rod with cap stamped "Ally" , and continuing for a total distance of 1436.35 feet to the centerline of Keagan Bayou (Harris County Flood Control District (H.C.F.C.D.) Unit D118-00-00) and said centerline described in a called 2.608 acre tract of land, a H.C.F.C.D. Easement recorded under H.C.C.F. No. B266806 H.C.D.R., and being the northwest corner of said 2.608 acre tract and of the herein described tract;

THENCE, along the centerline of Keagan Bayou the following fifteen (15) courses and distances as follows:

1. North 50°45'21" East, a distance of 104.19 feet to a point;
2. North 41°19'51" East, a distance of 199.81 feet to a point;
3. North 61°22'21" East, a distance of 187.95 feet to a point;
4. North 70°19'21" East, a distance of 104.06 feet to a point;
5. North 74°58'51" East, a distance of 100.43 feet to a point;
6. North 79°15'21" East, a distance of 96.69 feet to a point;
7. North 52°57'21" East, a distance of 300.60 feet to a point;
8. North 19°31'51" East, a distance of 113.55 feet to a point;
9. North 12°18'51" East, a distance of 98.27 feet to a point;
10. North 23°00'51" East, a distance of 181.47 feet to a point;
11. North 70°54'51" East, a distance of 202.08 feet to a point;
12. North 57°51'21" East, a distance of 101.55 feet to a point;
13. North 24°40'51" East, a distance of 110.07 feet to a point;

DBE/MBE/HUB/SBE/8(A)

Ally General Solutions, LLC
dba AGS Engineering & Construction LLC
7070 W. 43rd St. Ste. 203
Houston, Texas 77092
281-888-7682

14. North 52°50'21" East, a distance of 87.79 feet to a point;
15. North 71°27'21" East, a distance of 101.94 feet to a point and being the northwest corner of a remainder called 75 acre tract as conveyed to the City of West University Place, Texas as recorded under Volume 3120, Page 1 H.C.D.R. and the northwest corner of a called 2.097 acre tract of land, a H.C.F.C.D. Easement recorded under H.C.C.F. No. B243043 H.C.D.R. and being the northeast corner of said called 2.608 acre tract, and the northeast corner of said called 75 acre tract and the herein described tract;

THENCE, South 02°49'27" East, along the east line of said called 75 acre (City of Bellaire) and the west line of said called 75 acre (City of West University Place, Texas), pass at a distance of 75.0 feet a set 5/8-inch iron rod with cap stamped :Ally", and continuing for a distance of 2708.39 feet to a found 5/8-inch iron rod in the north right-of-way line of Ruffino Road and being the southeast corner of the herein described tract;

THENCE, South 87°40'57" West, with the north right-of-way line of Ruffino Road, a distance of 1493.58 feet to a point for the southeast corner of said cut-back line and being the southwest corner of the herein described tract; from which a found Txdot Brass Cap monument bears South 47°44'14" East, 0.71 feet;

THENCE, North 47°44'14" West, along said cut-back line, a distance of 132.40 feet to the **POINT OF BEGINNING** and containing 76.084 acres (3,314,208 square feet) of land.

Grace Y. Cervin, RPLS No. 5564
TBPLS Firm No. 10194392
January 6, 2022
Job No. 0014-009-41 (City of Bellaire)

PARCEL NO.	LY23-016
PROJECT NO.	
DWG NO	74373

Project Name: City of Houston
73.081 Acres
Parcel LY23-016
January, 2022

METES AND BOUNDS OF
73.081 ACRES OF LAND
SITUATED IN THE
H.T.&B. R.R. COMPANY, SURVEY, ABSTRACT NO. 397
HARRIS COUNTY, TEXAS

Being 73.081 acre (3,183,410 square feet) tract of land situated in the H.T.&B. R.R. Company Survey, Abstract No. 397, Harris County, Texas and being a remainder called 75 acres as conveyed to City of West University Place, Texas as recorded under Volume 3120, Page 1 of the Harris County Deed Records (H.C.D.R.), and said 73.081 acre tract being more particularly described by metes and bounds description as follows, all bearings and grid coordinates recited herein are referenced to the Texas Coordinate System, South Central Zone 4204, North American Datum of 1983, (NAD 83), 2011 adjustment, all surface distances recited herein may be converted to grid by multiplying surface values by a combined scale factor of 0.999880479;

BEGINNING at a found 5/8-inch iron rod, having grid coordinates of N 13,802,365.17; E 3,064,722.96 and being in the north right-of-way line of Ruffino Road (70-foot wide, the adjoining north 35 feet recorded under Volume 1332, Page 505 and Volume 1332, Page 508 H.C.D.R.) and being in the east line of a called 75 acre tract as conveyed to City of Bellaire, a municipal corporation as recorded under Volume 2742, Page 662 of the Harris County Deed Records (H.C.D.R.) and the southwest corner of said called remainder 75 acres (City of West University Place, Texas) and the herein described tract;

THENCE, North 02°49'27" West, along the east line of said called 75 acre (City of Bellaire) and the west line of said called 75 acre (City of West University Place, Texas), pass at a distance of 2,633.39 feet a set 5/8-inch iron rod with cap stamped "Ally", and continuing a total distance of 2708.39 feet to a point to the centerline of Keagan Bayou (Harris County Flood Control District (H.C.F.C.D.) Unit D118-00-00) and said centerline described in a called 2.097 acre tract of land, a H.C.F.C.D. Easement recorded under H.C.C.F. No. B243043 H.C.D.R., and being the northwest corner of said 2.097 acre tract and of the herein described tract;

THENCE, along the centerline of Keagan Bayou the following fifteen (15) courses and distances as follows:

1. North 71°27'21" East, a distance of 93.17 feet to a point;
2. North 52°08'21" East, a distance of 141.82 feet to a point;
3. North 19°27'51" East, a distance to 68.96 feet to a point;
4. North 07°43'21" East, a distance of 103.95 feet to a point;
5. North 01°39'51" East, a distance of 102.04 feet to a point;
6. North 49°40'21" East, a distance of 86.56 feet to a point;
7. North 61°13'21" East, a distance of 93.54 feet to a point;
8. North 80°59'21" East, a distance of 179.20 feet to a point;
9. North 37°55'51" East, a distance of 138.22 feet to a point;
10. North 22°25'21" East, a distance of 99.54 feet to a point;
11. North 32°02'21" East, a distance of 97.94 feet to a point;
12. North 39°20'51" East, a distance of 100.91 feet to a point;
13. North 21°22'21" East, a distance of 104.18 feet to a point;
14. North 28°25'21" East, a distance of 81.89 feet to a point;

15. North 80°14'21" East, a distance of 71.80 feet to a point and being the northeast corner of said called remainder 75 acre tract and the herein described tract;

THENCE, South 02°18'13" East, with the east line of called remainder 75 acre tract, pass at a distance of 58.47 feet a set 5/8-inch iron rod with cap stamped "Ally" and being the north corner of Block 19 of Braeburn Valley West Section One Subdivision as recorded under Volume 157, Page 1 of the Harris County Map Records (H.C.M.R.) and being the northwest corner of Willow Meadow Drive (60 foot wide as recorded under Volume 157, Page 1 H.C.M.R.), and pass at a distance of 1225.28 feet the southwest corner of Braeburn Valley West Section One and the northwest corner of Braeburn Valley West Section Two Subdivision as recorded under Volume 175, Page 27 H.C.M.R., and continuing for a total distance of 1364.36 feet to a set 5/8-inch iron rod with cap stamped "Ally" for an angle point;

THENCE, South 03°02'13" East, continuing with the west line of Braeburn Valley West Section Two Subdivision and the east line of called remainder 75 acre tract, a distance of 2364.45 feet to a found 5/8-inch iron rod in the north right-of-way line of Ruffino Road and being the southeast corner of the herein described tract;

THENCE, South 87°42'57" West, with the north right-of-way line of Ruffino Road, a distance of 999.20 feet to the **POINT OF BEGINNING** and containing 73.081 acres (3,183,410 square feet) of land.

The above description was prepared in conjunction with a Parcel Map of the same date and submitted to Houston Public Works - Houston, Texas.

Grace Y. Cervin, RPLS No. 5564
Ally General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd Street, Ste. 203
Houston, Texas 77092
281-888-7682 (Office)
TBPELS Firm No. 10194392
January 6, 2022/November 21,2022
Job No. 0014-009-41 (City of West University Place)

PARCEL NO. LY23-016
PROJECT NO. 74373
DWG NO

CHECKED
DATE 11/21/2022
APPROVED

RP-2022-604626

EXHIBIT "B"

PERMITTED ENCUMBRANCES

a) Right of Way reserved in instrument filed for record in Volume 392, Page 553, and Volume 413, Page 165, Deed Records of Harris County, Texas, and being described and located therein.

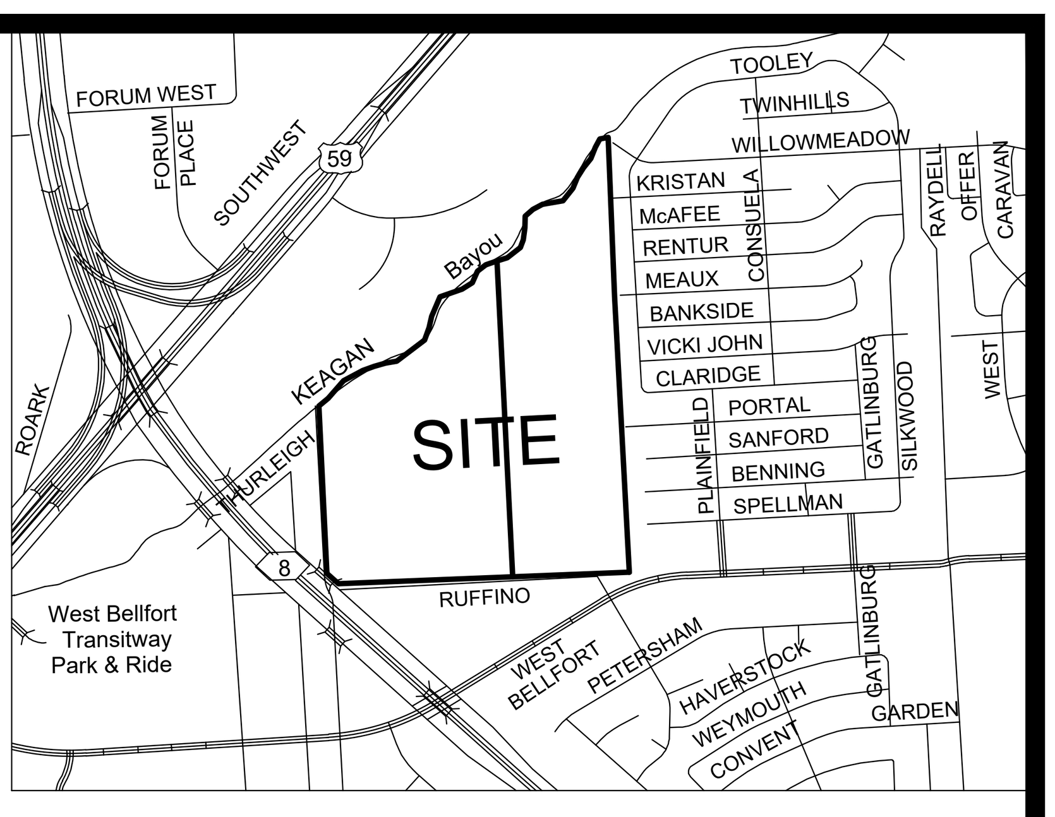
b) Right of Way granted to Harris County as set forth in instrument filed for record in Volume 1332, Page 508, Deed Records of Harris County, Texas, and being described and located therein.

c) Terms, conditions, stipulations, and provisions and any rights or claims concerning clean-up and/or environmental impact relating to Solid Waste Disposal Site as evidenced by Affidavit to the Public filed for record under Harris County Clerk's File No. R030298.

d) All the oil, gas and other minerals, and all other elements not considered a part of the surface estate, the royalties, bonuses, rentals and all other rights in connection with same all of which are expressly excepted therefrom and not insured hereunder, as the same are set forth in instrument(s) filed for record in Volume 392, Page 553, Deed Records of Harris County, Texas. (Said interest not investigated subsequent to date of reservation or conveyance.)

e) A one-half (1/2) interest in and to all the oil, gas and other minerals, and all other elements not considered a part of the surface estate, the royalties, bonuses, rentals and all other rights in connection with same all of which are expressly excepted therefrom and not insured hereunder, as the same are set forth in instrument(s) filed for record in Volume 1382, Page 270, Deed Records of Harris County, Texas. (Said interest not investigated subsequent to date of reservation or conveyance.)

Attachment I–8 Facility Metes and Bounds Survey



N

S

0 100' 200' 300' 400'

SCALE: 1" = 200'

LEGEND

B.L.	BUILDING LINE
C.M.	CONTROLLING MONUMENT
F.C.	FILM CODE
FND.	FOUND
G.I.P.	GALVANIZE IRON PIPE
H.I.C.F.	HARRIS COUNTY CLERK FILE
H.I.D.R.	HARRIS COUNTY DEED RECORDS
H.I.M.R.	HARRIS COUNTY MAP RECORDS
H.I.T.	HARRIS COUNTY TEXAS
I.R.C.	IRON ROD CAPPED
O.P.R..P.	OFFICIAL PUBLIC RECORDS OF REAL PROPERTY
P.O.B.	POINT OF BEGINNING
P.O.C.	POINT OF COMMENCING
H.L.&P.	HOUSTON LIGHT & POWER COMPANY
SET	SET 5/8–INCH STEEL ROD WITH CAP STAMPED "ALLY"

LINE TABLE

LINE	LENGTH	BEARING
L1	132.40'	N47°44'14"W
L2	104.19'	N50°45'21"E
L3	199.81'	N41°19'51"E
L4	187.95'	N61°22'21"E
L5	104.06'	N70°19'21"E
L6	100.43'	N74°58'51"E
L7	96.69'	N79°15'21"E
L8	300.60'	N52°57'21"E
L9	113.55'	N19°31'51"E
L10	98.27'	N12°18'51"E
L11	181.47'	N23°00'51"E
L12	202.08'	N70°54'51"E
L13	101.55'	N57°51'21"E
L14	110.07'	N24°40'51"E
L15	87.79'	N52°50'21"E
L16	101.94'	N71°27'21"E
L17	93.17'	N71°27'21"E
L18	141.82'	N52°08'21"E
L19	68.96'	N19°27'51"E
L20	103.95'	N07°43'21"E
L21	102.04'	N01°39'51"E
L22	86.56'	N49°40'21"E
L23	93.54'	N61°13'21"E
L24	179.20'	N80°59'21"E
L25	138.22'	N37°55'51"E
L26	99.54'	N22°25'21"E
L27	97.94'	N32°02'21"E
L28	100.91'	N39°20'51"E
L29	104.18'	N21°22'21"E
L30	81.89'	N28°25'21"E
L31	71.80'	N80°14'21"E

A
65' HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
(LOT 5/BLOCK 13)
H.C.C.F. NO. B513354
H.C.D.R.

B
65' HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
(LOT 3&4, BLOCK 13)
H.C.C.F. NO. B516511
H.C.D.R.

C
65' HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
(LOT 2, BLOCK 13)
H.C.C.F. NO. B530969
H.C.D.R.

D
65' HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
(LOT 1, BLOCK 13)
H.C.C.F. NO. B532379
H.C.D.R.

E
35' HARRIS COUNTY FLOOD CONTROL DISTRICT EASEMENT
(LOT 2, BLOCK 14)
H.C.C.F. NO. B500406
H.C.D.R.

F
HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
0.2421 ACRES
H.C.C.F. NO. F084924
O.P.R.R.P.H.C.T.

G
HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
46,080 SQ. FT. & 26,087 SQ. FT.
H.C.C.F. NO. B325595
H.C.D.R.

H
HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
11,214 SQ. FT.
H.C.C.F. NO. D033287
H.C.D.R.

I
HARRIS COUNTY FLOOD CONTROL DISTRICT EASEMENT
1.1108 ACRES
H.C.C.F. NO. B511545
H.C.D.R.

J
HARRIS COUNTY FLOOD CONTROL DISTRICT FEE
2.2470 ACRES
H.C.C.F. NO. E935173
O.P.R.R.P.H.C.T.

K
HARRIS COUNTY FLOOD CONTROL DISTRICT EASEMENT
2.607 ACRES
H.C.C.F. NO. S188374
O.P.R.R.P.H.C.T.

L
HARRIS COUNTY FLOOD CONTROL DISTRICT EASEMENT
1.457 ACRES
H.C.C.F. NO. B211118
H.C.D.R.

M
HARRIS COUNTY FLOOD CONTROL DISTRICT EASEMENT
2.325 ACRES
H.C.C.F. NO. B211119
H.C.D.R.

GENERAL NOTES:

1. ALL BEARINGS AND GRID COORDINATES SHOWN HEREON THIS MAP ARE REFERENCED TO THE NORTH AMERICAN DATUM OF 1983 (NAD83),2011 ADJUSTMENT OR NAD83 (2011 ADJ.), TEXAS STATE COORDINATE SYSTEM SOUTH CENTRAL ZONE 4204. ALL DISTANCES SHOWN HEREON THIS MAP ARE SURFACE DISTANCES AND MAY BE CONVERTED TO GRID DISTANCES BY MULTIPLYING THE SURFACE VALUE BY THE COMBINED SCALE FACTOR OF 0.9999130199. IS FOR CONVERTING GRID VALUES TO SURFACE VALUES (SURFACE X 0.999880479 = GRID).

2. VERTICAL CONTROL WAS NOT ESTABLISHED FOR THIS SURVEY.

3. THE CALCULATED ACREAGE/ SQUARE FOOTAGE TOTALS SHOWN HEREON THIS MAP ARE BASED ON MATHEMATICAL CLOSURES AND DOES NOT NECESSARILY REPRESENT THE POSITIONAL ACCURACY OF THE BOUNDARY MONUMENTS.

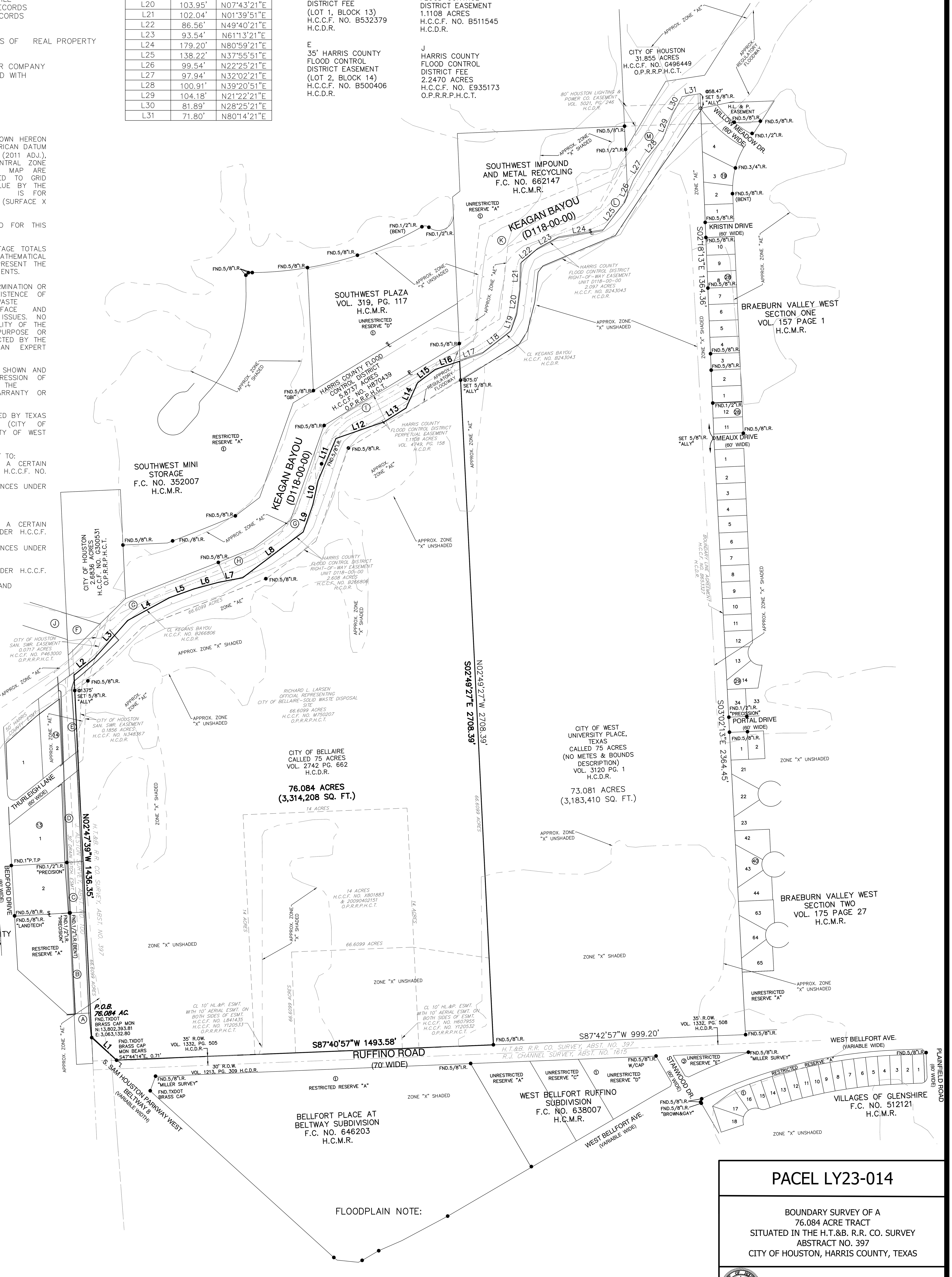
4. THIS SURVEY DOES NOT PROVIDE ANY DETERMINATION OR OPINION CONCERNING THE LOCATION OR EXISTENCE OF WETLANDS, FAULT LINES, TOXIC OR HAZARDOUS WASTE AREAS, SUBSIDENCE, OVERHEAD, SUBSURFACE AND ENVIRONMENTAL CONDITIONS OR GEOLOGICAL ISSUES. NO STATEMENT IS MADE CONCERNING THE SUITABILITY OF THE SUBJECT TRACT FOR ANY INTENDED USE, PURPOSE OR DEVELOPMENT. SUCH MATTERS SHOULD BE DIRECTED BY THE CLIENT OR PROSPECTIVE PURCHASER TO AN EXPERT CONSULTANT.

5. THE WORD "CERTIFY" OR "CERTIFICATE" AS SHOWN AND USED HEREON THIS MAP; MEANS AN EXPRESSION OF PROFESSIONAL OPINION REGARDING THE FACTS OF THE SURVEY AND DOES NOT CONSTITUTE A WARRANTY OR GUARANTEE, EXPRESSED OR IMPLIED.

6. THE ABSTRACTING SERVICES WERE PERFORMED BY TEXAS AMERICAN TITLE, GF NO. 2791022–00001, (CITY OF BELLAIRE) AND GF NO. 2791022–00002, (CITY OF WEST UNIVERSITY PLACE), DATED JANUARY 1, 2022.

7. CITY OF WEST UNIVERSITY PLACE IS SUBJECT TO:
- TERMS, CONDITIONS AND STIPULATION OF A CERTAIN AFFIDAVIT TO THE PUBLIC RECORDED UNDER H.C.C.F. NO. R030298
- BUILDING SETBACK LINES PER CITY ORDINANCES UNDER VOLUME 3799, PAGE 559 H.C.D.R. AND H.C.C.F NO. B212231 H.C.D.R.

8. CITY OF BELLAIRE IS SUBJECT TO:
- TERMS, CONDITIONS AND STIPULATION OF A CERTAIN AFFIDAVIT TO THE PUBLIC RECORDED UNDER H.C.C.F. NO.'S M750207 & X864860
- BUILDING SETBACK LINES PER CITY ORDINANCES UNDER VOLUME 3799, PAGE 559 H.C.D.R. AND H.C.C.F NO. B212231 H.C.D.R.
- STORM WATER QUALITY REQUIREMENTS UNDER H.C.C.F. NO. X801883
- GROUND LEASE BETWEEN CITY OF BELLAIRE AND RUFFINO HILLS, LP UNDER H.C.C.F. NO. 20090402151



FLOODPLAIN NOTE:

BASED ON THE FLOOD INSURANCE RATE MAP NO. 48201C0845M, MAP REVISED DATE OF MAY 2, 2019 INDICATES THAT TRACT LIES WITHIN AREA:

"X"–(UNSHADED) AREAS DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOODPLAIN.

"X"–(SHADED) AREAS 0.2% ANNUAL CHANCE FLOOD HAZARD, AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTH LESS THAN ONE FOOT OR WITH DRAINAGE AREAS OF LESS THAN ONE SQUARE MILE

"AE"–AREAS WITH BASE FLOOD ELEVATION OR DEPTH

"REGULATORY FLOODWAY"

IN ADDITION THIS MAP STATES "THIS MAP IS FOR USE IN ADMINISTERING THE NATIONAL FLOOD INSURANCE PROGRAM; IT DOES NOT NECESSARILY IDENTIFY ALL AREAS SUBJECT TO FLOODING, PARTICULARLY FROM LOCAL DRAINAGE SOURCES OF SMALL SIZE, OR ALL PLANIMETRIC FEATURES OUTSIDE SPECIAL FLOOD HAZARD AREAS. CERTAIN AREAS NOT IN SPECIAL FLOOD HAZARD AREAS MAY BE PROTECTED BY FLOOD CONTROL STRUCTURES".

I, GRACE Y. CERVIN, A REGISTERED PROFESSIONAL LAND SURVEYOR OF THE STATE OF TEXAS, HEREBY CERTIFY THAT THE ABOVE PLAT CORRECTLY REPRESENTS THE FACTS FOUND AT THE TIME OF THE SURVEY MADE ON THE GROUND UNDER MY SUPERVISION. THIS SURVEY SUBSTANTIALLY COMPLIES WITH THE CURRENT TEXAS SOCIETY OF PROFESSIONAL SURVEYOR'S STANDARDS AND SPECIFICATIONS FOR A CATEGORY 1A, CONDITION III, SURVEY.

GRACE Y. CERVIN
REGISTERED PROFESSIONAL LAND SURVEYOR
STATE OF TEXAS NO. 5564
JANUARY 6, 2022
UPDATED: 01–26–2023

STATE OF TEXAS · REGISTERED · GRACE Y. CERVIN · 5564 · PROFESSIONAL · LAND SURVEYOR

AGS ENGINEERING&CONSTRUCTION
Ally General Solutions, LLC
dba AGS Engineering & Construction
7070 W. 43rd St. Ste. 203
Houston, Texas 77092
Phone: (281) 888-7682
TX Engineer Firm No. 13574
TBPELS Firm No. 10194392
Certified: DBE/SBE/MBE/HUB/8(A)

PACEL LY23-014

BOUNDARY SURVEY OF A
76.084 ACRE TRACT
SITUATED IN THE H.T.&B. R.R. CO. SURVEY
ABSTRACT NO. 397
CITY OF HOUSTON, HARRIS COUNTY, TEXAS

HOUSTON PUBLIC WORKS

APPROVAL	1/30/2023 DATE
SURVEY SECTION	RIGHT OF WAY SECTION

KEY MAP No. 529Z	GIMS MAP No. 4953D
PARCEL NO. LY23-014	
JOB NO.	
WBS NO. M-430296-0019-3	
ILMS NO.	

HOUSTON PUBLIC WORKS · ACCEPTED AND FILED · 74373 · CITY DRAWING NUMBER · HOUSTON, TEXAS

Attachment I – 9 Core Data Forms

TCEQ Use On ly

TCEQ Core Data Form

For detailed instructions on completing this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☒ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application.)*

☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN 600128995		RN 103021457

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy)

☐ New Customer ☒ Update to Customer Information ☒ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)* | *If new Customer, enter previous Customer below:*

City of Houston

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☒ City ☐ County ☐ Federal ☐ Local ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☒ 501 and higher

13. Independently Owned and Operated?
☐ Yes ☒ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☐ Owner ☒ Operator ☐ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant ☐ Other:

15. Mailing Address:
611 Walker Street
20th Floor
City Houston **State** TX **ZIP** 77002 **ZIP + 4**

16. Country Mailing Information *(if outside USA)*

17. E-Mail Address *(if applicable)*
[redacted]

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*

(832) 395-2274		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected, a new permit application is also required.)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

City of West University Place Landfill

23. Street Address of the Regulated Entity: *(No PO Boxes)*	9610 Ruffino Road							
	City	Houston	**State**	TX	**ZIP**	77031	**ZIP + 4**	
24. County	Harris							

If no Street Address is provided, fields 25-28 are required.

25. Description to Physical Location:					
26. Nearest City			**State**		**Nearest ZIP Code**

Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).

27. Latitude (N) In Decimal:	26.656150		**28. Longitude (W) In Decimal:**	-95.555680	
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
4953		562212	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

City of West University Place Landfill

34. Mailing Address:	**611 Walker Street**							
	City	**City of Houston**	**State**	**TX**	**ZIP**	**77002**	**ZIP + 4**	
35. E-Mail Address:	**johana.clark@housotntx.gov**							

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(832) 395-2274		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☒ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
1250 (formerly)				
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Jim Norstrom		41. Title:	Senior Project Manager
42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**	
(936) 202-0746		( ) -	[redacted]	

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	City of Houston	Job Title:	Senior Assistant Director of Public Works	
Name *(In Print)*:	Johanna Clark		Phone:	(832) 395- **2274**
Signature:	DocuSigned by: Johana Clark 808098A38F5E457...		Date:	2/27/2023

TCEQ Use Only

TCEQ Core Data Form

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2. Customer Reference Number (*if issued*)	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number (*if issued*)
CN 600128995		RN 106916414

SECTION II: Customer Information

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City of Houston

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11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☒ City ☐ County ☐ Federal ☐ Local ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☒ 501 and higher

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☐ Yes ☒ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

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☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant

15. Mailing Address: 611 Walker Street
20th Floor

City	Houston	State	TX	ZIP	77002	ZIP + 4	

16. Country Mailing Information (*if outside USA*)

17. E-Mail Address (*if applicable*) [redacted]

18. Telephone Number	19. Extension or Code	20. Fax Number (*if applicable*)

(832) 395-2274		( ) -

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☐ New Regulated Entity ☐ Update to Regulated Entity Name ☒ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

City of Bellaire Landfill

23. Street Address of the Regulated Entity: *(No PO Boxes)*	9800 Ruffino Road							
	City	Houston	**State**	TX	**ZIP**	77031	**ZIP + 4**	
24. County	Harris							

If no Street Address is provided, fields 25-28 are required.

25. Description to Physical Location:					
26. Nearest City			**State**		**Nearest ZIP Code**

Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).

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Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
4953		562212	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

City of West University Place Landfill

34. Mailing Address:	**4440 Edith Street**							
	City	**Bellaire**	**State**	**TX**	**ZIP**	**77401**	**ZIP + 4**	
35. E-Mail Address:	**MLeech@bellairetx.gov**							

36. Telephone Number	**37. Extension or Code**	**38. Fax Number** *(if applicable)*
(713) 662-8154		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☒ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
1238 (formerly)				
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Jim Norstrom	41. Title:	Senior Project Manager

42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(936) 202-0746		( ) -	[redacted]

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	City of Houston	Job Title:	Senior Assistant Director of Public Works
Name *(In Print):*	Johana Clark	Phone:	(832) 395- 2274
Signature:	Johana Clark	Date:	02/23/23

TCEQ Use Only

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☐ Renewal *(Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN 600690291		RN 106916414

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy)

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☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If on individual, print last name first: eg: Doe, John)* — *If new Customer, enter previous Customer below:*

City of Bellaire

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
NA	17460003399	74-6000339	072188113

11. Type of Customer: ☐ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☒ City ☐ County ☐ Federal ☐ Local ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees ☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☒ 501 and higher

13. Independently Owned and Operated? ☐ Yes ☒ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*

☒ Owner ☐ Operator ☐ Owner & Operator ☐ Other:
☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant

15. Mailing Address: 4440 Edith Street

City	Bellaire	State	TX	ZIP	77401	ZIP + 4	

16. Country Mailing Information *(if outside USA)*

17. E-Mail Address *(if applicable)*

~~MLeech@bellairetx.gov~~ [redacted]

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
~~(713) 662-8154~~ (713) 662-8228		( ) -

SECTION III: Regulated Entity Information

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City of Bellaire Landfill

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24. County	Harris							

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4953		562212	

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

City of Bellaire Landfill

34. Mailing Address:	4440 Edith Street							
	City	Bellaire	State	TX	ZIP	77401	ZIP + 4	
35. E-Mail Address:	scitino@bellairetx.gov							

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
(713) 662-8228		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☒ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
1238 (formerly)				
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Jim Norstrom	41. Title:	Senior Project Manager

42. Telephone Number	43. Ext./Code	44. Fax Number	45. E-Mail Address
(936) 202-0746		( ) -	[redacted]

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	City of Bellaire	Job Title:	City Manager	
Name *(In Print)*:	Sharon Citino	Phone:	(713) 662-8228	
Signature:	[signature]	Date:	4.5.23	

Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, Texas

Part II Supplement
Existing Conditions

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

936-202-0746

April 2023

Part II Supplement
Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, TX

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2.0 PART II - SUMMARY OF EXISTING CONDITIONS, SURROUNDING LAND USE AND IMPACTS, TRAFFIC, AND LOCATION RESTRICTIONS

In accordance with 30 TAC §330.61, the following sections include the required portions of Part II of the registration application that summarize the existing conditions of both the facility property and the surrounding area. The main topics include land use and zoning, population and community growth trends, locations of water and oil/gas wells, prevailing wind direction, transportation analysis, general geology, soils, groundwater and surface water information, and floodplain, wetlands, and endangered species data.

Registration Justification (30 TAC Chapter 330.61(b)(2)

330.9(i) - A registration is required for the following material recovery operations from a landfill. The following operations are subject to the general requirements found in §330.601 of this title (relating to General Requirements), and the requirements set for soil end-product standards in §330.615 of this title (relating to Final Soil Product Grades and Allowable Uses), and the air quality requirements in §330.607 of this title (relating to Air Quality Requirements):

(1) operations that recover reusable or recyclable material buried in permitted or closed MSW landfill facilities, or MSW landfill facilities that were never permitted;

(2) operations that reclaim soil from permitted or closed MSW landfills, or from MSW landfill facilities that were never permitted; and

(3) facilities that have received prior approval for excavation of buried materials through permits, permit amendments, or other agency authorization, which are exempt from further authorization requirements, as established in this subchapter, for the specific authorization received. Soil final product standards shall be applicable for all registered facilities.

2.1 Facility Background Information

The City of Houston plans to relocate all buried waste from the closed City of Bellaire and City of West University Landfills to create a stormwater detention pond to prevent or reduce the potential for future flooding along Keegans and Brays Bayous. Creating volume for the pond is the primary reason for relocating the waste. Although separating soil during the excavation process will likely occur, recovering materials from excavated waste is not the City's primary objective and the quantity of soil available has no bearing on the feasibility of this project.

The entire property being considered for stormwater detention is 150 acres. The City of Bellaire Landfill property is owned by the City of Bellaire and was operated as a municipal solid waste landfill from 1954 to 1988. Municipal solid waste as identified in regulatory affidavits included brush, refuse/rubbish/trash, and construction/demolition materials. The property occupies approximately 75 acres bounded on the north by Keegan's Bayou (south fork of Brays Bayou), on the west by the Sam Houston Tollway, on the south by Ruffino Road, and on the east by the closed City of West University Landfill (Revoked MSW Permit 1250).

The City of West University Landfill is owned by the City of West University Place and operated from 1959 to 1992. Municipal solid waste as identified in regulatory affidavits included brush, refuse/rubbish/trash, and construction/demolition materials. The property occupies approximately 75 acres bounded on the north by Keegan's Bayou (south fork of Brays Bayou), on the west by the closed City of Bellaire Landfill (Revoked MSW Permit No. 1238), on the south by Ruffino Road, and on the east by a residential neighborhood.

Records indicate that the landfills accepted municipal solid waste and construction / demolition debris. Elevations range from about 68 feet to 84 feet, according to 2018 LiDAR topographic data.

A Neill Engineering Corporation report from 1979 states that waste was deposited in trenches lined with three feet of low-permeability clay. Trenches were six to eight feet deep and 22 to 42 feet wide. Waste trenches were at least 50 feet from the east, north, and west property lines and varying distances from Ruffino Road. TDH and post closure TCEQ reports indicate a 12-foot depth of waste in trenches with a clay cover thickness ranging from 6 inches to 4 feet.

Following operations, the landfills were capped with clay and the surface is vegetated except for a 14-acre parcel on the south end of the Bellaire property that is occupied by an active waste transfer station operated by GFL Environmental (TCEQ MSW Permit 1355A). The West University property has a grass cover with good access. The Bellaire property (west 75 acres) is covered with trees and brush and access is difficult.

Following landfill closure, the Houston Hills Golf Course was constructed on the Bellaire property. The Course operated until 2002 and the contouring and ponds remain. In the golf course area, there is additional fill material containing topsoil mixed with some concrete and rebar.

Soil borings from 1979 on the West University side show clay from the surface to elevation 52 feet and deeper, with an intermittent sand layer below. On the south end of the property, the sand layer is shallower with elevations as high as 65 feet. Shallow groundwater appears to flow from southwest to northeast with elevations in monitoring wells in 1994 ranging from 69 to 60 feet.

Both landfills completed post-closure monitoring and maintenance and the permits were voluntarily revoked. Voluntary revocation means that both landfills completed post-closure to the satisfaction of the TCEQ and that there were no indications of offsite contamination. ENSR post-closure groundwater monitoring reports for the West University Landfill from the early 2000s conclude that the landfill was not impacting shallow groundwater quality.

2.2 Impact on Surrounding Area 30TAC330.61(h)

A land use and zoning compatibility analysis was performed for the proposed site. The results of the analysis are summarized in the following sections.

2.2.1 Zoning

The Ruffino Road site is located within the City of Houston in Harris County, Texas. The area within a one-mile radius surrounding the facility is located within the City of Houston. The City of Houston does not have a zoning ordinance, therefore, there are no zoning restrictions for the facility.

2.2.2 Character of Surrounding Land Use

Existing uses of the site and the surrounding area are shown on Attachment II-5, Land Use Map. The map was prepared based on field reconnaissance studies (Tetra Tech, July 2021 and February 2023) and a review of recent aerial photographs (GoogleEarth™ and landfill aerial photography) of the surrounding area. Portions of the land within a one-mile radius are developed with a wide variety of commercial, industrial, residential, and recreational uses. Several subdivisions/home communities, scattered homes, schools, day care centers, government facilities, ponds, and a cemetery are located within a one-mile radius of the site. Commercial/Industrial represents the largest percentage of land use within a one-mile radius of the site. The

second most common land use within a one-mile radius of the site is residential. The breakdown of overall land use within the one-mile radius is shown below.

Land Use Within One Mile of Site Boundary

Land Use	Area, acres	Percentage of Total Area, %
Residential	1,417.0	42.7
Commercial / Industrial	1,495.6	45.1
Transportation Corridors	193.7	6.8
Agricultural or Open Space	25.7	0.8
Cemetery	8.7	0.2
Ruffino Transfer Station	20.0	0.1
Ruffino Road Landfill Mining Project Site	147.1	4.3
Total	3,307.8	100

2.2.3 Population and Community Growth Trends

Population projections for Harris County, as tabulated by the Houston-Galveston Area Council (H-GAC), were reviewed and are summarized below. The data is from the 2018 Regional Growth Forecast.

H-GAC Regional Growth forecast: Counties

Year	Projected Population of Harris County
2020	4,810,000
2025	5,189,000
2030	5,567,000
2035	5,595,000
2040	6,212,000
2045	6,434,000

2.2.4 Growth Trends

The facility is located within the City of Houston. According to HGAC Regional Population Growth Trends, the household population growth trends for the areas shown are presented in the table below for the period 2020 to 2040.

Houston and Southwest Sector Growth Forecast

Houston Sector	Area, square miles	2020 Population Forecast	2030 Population Forecast	2040 Population Forecast
Concentric Area between I-610 & Beltway 8	435	1,752,683	1,996,614	2,254,308
Four Sectors Surrounding Landfill Mining Site	471	1,540,943	1,810,772	1,971,778
City of Houston	671	2,407,492	2,688,163	3,045,030

According to the data above, from 2020 - 2040, the population of the four sectors surrounding the facility will increase approximately 28 percent.

H-GAC predicts that the population and employment growth will increase strongly around the site and in Houston in general. Population is predicted to increase most significantly in the sector south of the site.

Five Mile Growth Forecast

	2018	2045	Percent Increase
Population	596,953	836,995	40
Households	217,340	329,074	51
Jobs	314,526	408,454	30

The 2018 H-GAC Regional Growth Mapping Tool predicts the following growth in quadrants around the Site:

Percent Growth	Northwest	Northeast	Southeast	Southwest
Population	30	63	5	32
Households	38	75	14	41
Jobs	35	24	33	19

2.2.5 Proximity to Residential and Other Uses

In accordance with 30 TAC §330.61(h)(4), the following paragraphs describe certain specific uses of the properties within one mile of the site boundary. The locations of ponds, licensed day care facilities, residences, churches, parks, cemeteries, commercial and industrial areas within a one-mile radius of the facility are shown on Attachment II-5 and are discussed in further detail below.

No known hospitals, archeological or historical sites, or sites with exceptional aesthetic qualities were identified within one mile of the facility boundary.

<u>Ponds and Lakes</u>

There are 5 ponds on the Ruffino Landfill property (not over buried waste) and no significant ponds within 1 mile of the property boundary based on our review of USGS Topographic maps and Google Earth aerial photos.

Residential

Our review of a Google Earth aerial photo, Google Maps, and our driving surveys of the area in 2021 and 2023 indicate several residential areas within one mile of the site boundary. There are several subdivisions and scattered single family homes surrounding the facility. There are approximately 1,365 single-family homes and over 200 apartment buildings within one mile of the facility. The nearest existing residence is approximately 15 feet east of the site boundary. All residential areas are shown on the Land Use Map, Attachment II - 5.

Churches

Our review of a Google Earth aerial photo, Google Maps, and our driving surveys of the area in 2021 and 2023 indicate that there are 44 existing churches within one mile of the facility. The closest churches are the La Luz del Mundo and The Light of The World located on Ruffino Road about 60 feet east of the site boundary and the Celestial Church of Christ- God's Promise Parish (Ileri-Oluwa Parish) located on Ruffino Road about 90 feet east of the site boundary.

Licensed Day Care Facilities

Our review of a Google Earth aerial photo, Google Maps, and our driving surveys of the area in 2021 and 2023 indicate that there are eight licensed day care centers within one mile of the facility, with Atlas Childcare about 0.72 miles to the northeast, Kidz School Daycare Learning Center about 0.9 miles to the west, and Little Angels Mercy Daycare Academy about 1.1 miles to the east.

Parks and Recreational Areas

Driving surveys of the area in 2021 and 2023 and review of recent aerial photography indicated that there are two golf courses located slightly over one mile north of the site boundary. The Soccer Locker Complex is located approximately 3,650 feet northeast of the facility.

Cemeteries

One cemetery, the Riceville Cemetery, is located about 2,700 feet northeast of the site boundary.

Schools

Our review of a Google Earth aerial photo, Google Maps, and our driving surveys of the area in 2021 and 2023 indicate that there are seven schools within one mile of the property boundary or slightly beyond. The nearest school is Best Elementary School which is about 0.6 miles to the north. All schools are shown on the Land Use Map, Attachment II-5.

Commercial and Industrial

Driving surveys of the area in 2021 and 2023 and review of recent aerial photography indicated that there are over 100 commercial and industrial properties within one mile of the facility. All commercial and industrial areas are shown on the Land Use Map, Attachment II-5.

Historic Site and Cultural Resources

In accordance with 30 TAC §330.61(0), a letter was sent to the Texas Historical Commission (THC) for concurrence that there are no historical, archeological, or site with exceptional aesthetic quality on the facility property or in the surrounding area that would be affected by the proposed landfill mining project. The THC responded that there are no historic properties in the site vicinity and the project may proceed. A copy of the THC correspondence is included in Attachment II-7.

Miscellaneous Uses

A solid waste transfer station is located on property owned by the City of Bellaire which is adjacent to the proposed landfill mining project. The Type V transfer station is owned by the City of Bellaire and operated by GFL Environmental, Inc.

Structures and Inhabitable Buildings Within 500 Feet of the Site

In accordance with §330.61(c)(3), the structures and inhabitable buildings within 500 feet of the site boundary have been identified on Attachment II-1.2. A residential subdivision is located immediately east of the site, with the nearest houses about 15 feet from the site boundary.

2.2.6 Oil / Gas Wells and Water Wells

The locations of groundwater wells and oil/gas wells within 500 feet of the site boundary were determined by our database searches using the Texas Water Development Board's Groundwater Data Viewer (https://www3.twdb.texas.gov/apps/WaterDataInteractive/GroundWaterDataViewer) and the Texas Railroad Commission's Public GIS Viewer (https://www.rrc.texas.gov/resource-center/research/gis-viewer/).

All known water well locations within 500 feet of the facility are shown on Attachment II-1.3. One water well appears on the Ruffino Site, on the Bellaire property, that was plugged in 2004. The next nearest well is 95 feet to the northwest across Keegans Bayou which was plugged in 2016. A group of wells about 560 feet to the east have been plugged. An active well exists about 630 feet to the West. Well and plugging reports for these wells can be provided at TCEQ's request.

There are no active, inactive, or plugged oil or natural gas wells on the Ruffino site (Bellaire and West University properties) nor within 500 feet of the site boundary based on our search using the Texas Railroad Commission Public GIS Viewer (see Attachment II-1.3).

2.2.7 Prevailing Wind Direction

Attachment II-1.1 presents the wind rose for the Houston Hobby Airport for the period December 1972 to April 2021. The prevailing wind is from the south-southeast. The average wind speed is 8.3 miles per hour, with calm winds 12.4 percent of the time.

2.3 Transportation 30TAC330.61(i)

Jones|Carter Engineers (now known as Quiddity) conducted a Transportation Study that is presented in Attachment II-9. The transportation analysis includes data on the availability and adequacy of roads that the owner or operator will use to access the facility; data on the volume of vehicular traffic on access roads within one mile of the facility, both existing and expected, during the expected life of the facility; and projected volume of traffic expected to be generated by the facility on the access roads within one mile of the facility.

Coordination of designs associated with site entrances with the agency exercising maintenance responsibility of the public roadway involved (City of Houston) is underway. The Texas Department of Transportation (TxDOT) was provided with the Traffic Study and has no objections to the project.

2.3.1 Site Access

Public access to the facility will be provided by one entrance / exit on Ruffino Road (address 9610 Ruffino Road, Houston, TX 77031). See Jones|Carter Transportation Study.

An email from TxDOT is in Attachment II-7 and coordination with the City of Houston is underway.

2.3.2 Traffic Volumes

See Jones|Carter Transportation Study.

2.3.3 Facility Generated Traffic Volumes

See Jones|Carter Transportation Study.

2.3.4 Airport Locations

No public-use airports exist within six miles of the proposed landfill mining site. The closest public-use airport to the facility is the Sugarland Regional Airport, which is located approximately 6.4 miles west of the site, as shown on Attachment II-1.1. In accordance with Title 30 TAC §330.61, an airport impact evaluation of the facility is required if airports are within six miles of a landfill mining operation and thus is not required for this project. Tetra Tech described the project in a letter to the FAA which is presented along with subsequent email correspondence from FAA in Attachment II-7.

2.3.5 TxDOT Correspondence

In accordance with 30 TAC §330.61(i)(4), TxDOT has been notified of the project and provided a copy of the final Transportation Study. A copy of correspondence with TxDOT is included in Attachment II-7.

2.4 General Geology and Soils Statement 30TAC330.61(j)

In accordance with 30 TAC §330.6l(j), a general discussion of the geology and soils at the Ruffino Road Landfill Mining site is included in the following sections.

2.4.1 Physiography and Topography

The site is located in Harris County, Texas. The topography of Harris County slopes downward toward Galveston Bay, generally from northwest to southeast. The topography is relatively flat with elevation changes on the order of 1 foot per mile. The site is located in the Coastal Prairie portion of the Gulf Coastal Plain physiographic province. The generally featureless depositional plain of the Gulf Coast region is typically flat with primary relief provided by shallow valleys cut by streams that drain the region.

The major rivers in the area are the Brazos, Colorado, San Jacinto, and Trinity Rivers. Numerous constructed lakes and reservoirs are present in the area and influence the water table on a local scale. The Gulf of Mexico and Galveston Bay have a large effect on both the downdip ground-water system and the climate of the study area. Winter in the area is short and mild with a few days of freezing temperatures. Relative humidity is moderate and prevailing winds are from the northwest. During the winter months, moisture-laden Pacific and Canadian air masses produce regionally extensive bands of moderate rainfall. In contrast, summer is long and hot. The relative humidity is high, and the prevailing winds are from the southwest. During the summer months, atmospheric convective cells can produce low to high rates of localized rainfall, and infrequently, moisture-laden tropical air masses produce moderate to extremely high rates of rainfall (Kasmarek and Strom, USGS, 2002). Area rainfall averages approximately 49.77 inches per year (averaged between 1981 and 2010 for the Houston, Texas area (www.noaa.gov)).

The natural surface drainage in the site area drains to Keegans Bayou. The approximate existing ground elevation of the facility is 72 ft-msl.

2.4.2 Geologic Setting

The site is located within the Gulf Coast sedimentary basin, which consists of thousands of feet of sediments deposited through deltaic, alluvial, eolian dune, bay-estuarine, and barrier island-shoreline geologic processes. The thick mass of sediments (in excess of 30,000 feet) dips and thickens toward the Gulf of Mexico and successively older geologic formations are exposed progressively further inland.

The Pleistocene age upper Lissie Formation (formerly Montgomery Formation) underlies the project site and is characterized by clay, silt, sand, and minor amounts of siliceous gravel. Locally, the sediments may be calcareous and contain minor amounts of calcareous nodules and iron/iron-manganese nodules. The lower Lissie Formation (formerly Bentley Formation) is similar in composition, but the gravel is coarser. The sediments are non-calcareous and the iron/iron-manganese concretions are more abundant. The Lissie Formation is fluvial in origin and has a thickness of approximately 600 feet, but 200 feet at the site (Barnes, 1992). The Lissie Formation dips to the southeast at an approximate rate of 3 feet per mile and is exposed in the northern portions of Harris County (Sandeen, 1973).

Underlying the Lissie Formation is the Willis Formation. The Willis Formation is fluvial in origin and is believed to be Pliocene to Pleistocene in age. The formation consists of clay, silt, sand, and minor siliceous gravel of granule to pebble size and includes numerous iron oxide concretions and some petrified wood. The formation is deeply weathered, lateritic, non-calcareous, and is locally cemented by iron oxide. The formation dips to the southeast at an approximate rate of 10 feet per mile and has a maximum thickness of approximately 75 feet (Bureau of Economic Geology, 1982; Popkin, 1971).

Underlying the Willis Formation is the Pliocene age Goliad Formation. The formation is fluvial in origin and consists of bentonitic clays, sands with grains of chert, gravelly beds, and lenses of lime-cemented sandstones. The Goliad Formation dips to the southeast at an approximate rate of 40 feet per mile and has a maximum thickness of approximately 250 feet in the Houston area (Lang et al., 1950; Popkin, 1971).

Underlying the Goliad Formation is the Miocene age Fleming Formation. Sediments of the Fleming Formation were deposited by fluvial and fluvial-deltaic processes that were active during the Miocene. The marginal-fluvial and fluvial-deltaic deposits are represented by calcareous clays and muds with some sparsely distributed thin sand layers and lignites. Pluvial lithologies are comprised of sand, silt, and clay. The thickness of the Fleming Formation in the area ranges from approximately 1,300 to 1,450 feet. The Burkeville aquiclude is principally a clay section within the Fleming Formation and ranges in thickness from 130 to 300 feet.

2.4.3 On-Site Geology

Based on borings done by National Soil Services in February 1979, the strata at the facility have been divided into three units (I, II, III). Not all units are present in all borings. Unit I consists of an organic, silty clay topsoil that is not always present, overlying primarily fine grained deposits represented predominantly by clays, silty clays and clayey silts. Unit II consists primarily of coarser grained strata, primarily fine sand or clayey sand generally encountered below a surficial clay. Units I and II are generally interbedded and some of the beds within Unit II are laterally discontinuous. Underlying Units I and II is a clay unit, which has been designated as Unit III.

2.4.4 On-Site Soils

Subsurface soil conditions described in a 1980 Texas Department of Health (TDH) report show a combination of sand and clay with stiff clay below 15 to 25 feet. A plan of borings and the associated subsurface cross sections done by National Soil Services in February 1979 are presented in Attachments III-6.1 and III-6.2. TDH and post closure TCEQ reports indicate a depth of waste in trenches of about 12 feet with a clay cover thickness ranging from 6 inches to 4 feet.

2.5 Ground and Surface Water 30TAC330.61(k)

In accordance with 30 TAC §330.61(k), a general discussion of the groundwater and surface water conditions is presented in the following sections.

2.5.1 Groundwater Conditions

The Chicot and Evangeline aquifers are the major hydrologic units utilized for groundwater supply in Harris County. They are usually grouped together as one unit known as the Gulf Coast Aquifer. These aquifers are composed of gravel, sand, silt, and clay of Pliocene, Pleistocene, and Holocene ages. Groundwater is produced from coarser-grained members (sands) of the aquifers (Gabrysch, R.K., 1980). Units of the Chicot aquifer comprise the uppermost aquifer in the facility area. In the facility area, the Chicot aquifer is approximately 400 feet thick. The transmissivity of the Chicot aquifer ranges from about 3,000 to about 50,000 square feet per day (Kasmarek and Strom, USGS, 2002), and the estimated regional flow rate is 60 feet per year to the southeast (Harris-Galveston Subsidence District). The average coefficient of permeability is approximately 500 gallons per day per square foot for the Chicot aquifer (Popkin, 1971). In the Houston area the storage coefficient for the Chicot aquifer ranges from 0.0004 to 0.1. The underlying Evangeline aquifer is comprised of the Goliad Formation and part of the Fleming Formation, and is underlain by the Burkeville confining unit. In the facility area, the Evangeline aquifer is approximately 1,000 feet thick. The transmissivity of the Evangeline ranges from 3,000 to 15,000 square feet per day (Kasmarek and Strom, USGS, 2002). The average coefficient of permeability is approximately 250 gallons per day per square foot for the Evangeline aquifer, and the estimated regional flow rate is 40 feet per year to the southeast (Popkin, 1971). In the Houston area, the storage coefficient of the Evangeline ranges from about 0.0005 to 0.1 where similar to the Chicot aquifer, the larger storativities are under water table conditions in the updip outcrop area while smaller storativities are in confined conditions.

Groundwater conditions at the Ruffino site were investigated by National Soil Services in February 1979. A plan of borings and the associated subsurface cross sections done by are presented in Attachments III-6.1 and III-6.2. Groundwater conditions and groundwater protection are described in the Part III Supplement, Section 3.3.C.1.

2.5.2 Surface Water Features

The property is drained by surface sheet flow, shallow swales, and small earthen ditches to Channel D118-05-00, Ruffino Road, and Keegans Bayou. One small drainage ditch closely follows the boundary between the West University Place property and Bellaire tract. Review of a topographic map created from LiDAR data indicates that over 90 percent of the site drains directly to Keegans Bayou, with minor areas potentially draining either to Channel D118-05-00 or Ruffino Road. Water levels in the ponds appear to be two to three feet below surrounding ground surface.

Review of Harris County Flood Insurance Rate Map (FIRM) Panel No. 48201C0845M dated May 2, 2019 (Attachment ___) shows small areas within the 100-year floodplain of Keegans Bayou. The 100-year floodplain elevation adjacent to the site ranges from about 68.1 feet to about 69.9 feet.

2.5.3 Texas Pollutant Discharge Elimination System (TPDES)

Since the facility will not perform vehicle or equipment maintenance activities, vehicle or equipment rehabilitation, mechanical repairs, painting, fueling, lubrication, or cleaning with the registration boundary of the facility, the site is not subject to the requirements of the TPDES multi-sector general permit, as required by 402 of the Clean Water Act. The facility will, however, obtain a stormwater permit for "construction only" prior to excavation of waste, separation of soil, and transport of materials offsite.

2.6 Abandoned Oil and Water Wells 30TAC330.61(l)

The locations of groundwater wells and oil/gas wells within 500 feet of the site boundary were determined by our database searches using the Texas Water Development Board's Groundwater Data Viewer (https://www3.twdb.texas.gov/apps/WaterDataInteractive/GroundWaterDataViewer) and the Texas Railroad Commission's Public GIS Viewer (https://www.rrc.texas.gov/resource-center/research/gis-viewer/).

All known water well locations within 500 feet of the facility are shown in Attachment II-1.3. One water well appears on the Ruffino Site, on the Bellaire property, that was plugged in 2004. The next nearest well is 95 feet to the northwest across Keegans Bayou which was plugged in 2016. A group of wells about 560 feet to the east have been plugged. An active well exists about 630 feet to the West. Well and plugging reports for these wells are presented in Attachment II-1.3.

There are no active, inactive, or plugged oil or natural gas wells on the Ruffino site (Bellaire and West University properties) nor within 500 feet of the site boundary based on our search using the Texas Railroad Commission Public GIS Viewer (see Attachment II-1.3).

2.7 Floodplains and Wetlands Statement 30TAC330.61(m)

The 100-year floodplain, Zone AE, is shown on the Harris County Flood Insurance Rate Map (FIRM) Panel No. 48201C0845M dated May 2, 2019 and the Metes and Bounds drawing, Attachment I-8. The 100-year floodplain along Keegan's Bayou may extend into areas proposed for landfill mining. However, we propose to remove waste from these areas rather than place waste in the floodplain. During the landfill mining project, exposed waste will be protected from washout, contact water will be minimized, and contaminated water will be contained and disposed of in the sanitary sewer.

No regulated wetlands were identified during Tetra Tech's investigation (Attachment II-6).

2.8 Texas Historical Commission (THC) Review 30TAC330.61(o)

The Texas Historical Commission response to our submittal is presented in Attachment II-7 and states, "No effect on identified archeological sites or other cultural resources."

2.9 Council of Governments and Local Government Review 30TAC330.61(p)

Parts I and II of the Ruffino Road Type IX Landfill Mining Registration Application have been submitted to the HGAC. The HGAC has not responded to date..

2.10 Endangered or Threatened Species 30TAC330.61(n)

Tetra Tech's Federal and State Listed Species Assessment is presented in Attachment II-8. It states, "Project activities are anticipated to have no effect on threatened or endangered species, as habitat within the Project area is of low quality or is not present for listed species with the potential to occur within Harris County. Additionally, no listed species or their sign (e.g., nests, tracks, scat, and

burrows) were identified within the survey areas."

2.11 Location Restrictions

In accordance with Subchapter M of Chapter 330, the applicability of location restrictions is addressed in the following sections.

2.11.1 Easements and Buffer Zones 30TAC330.543

No solid waste unloading, storage, or processing activity will occur within any easements, buffer zones, or right-of-way that cross the facility. There will be no solid waste disposal at the facility. As applicable, all pipeline and utility easements will be clearly marked with posts that extend at least six feet above ground level, spaced at intervals no greater than 300 feet. The easements at the facility are shown on Attachment I-8.

A minimum separating distance of 50 feet will be maintained from the solid waste processing and storage areas to the facility registration boundary.

2.11.2 Airport Safety 30TAC330.545

No public-use airports exist within six miles of the proposed landfill mining site. The closest public-use airport to the facility is the Sugarland Regional Airport, which is located approximately 6.4 miles west of the site, as shown on Attachment II-1.1. In accordance with Title 30 TAC §330.61, an airport impact evaluation of the facility is required if airports are within six miles of a landfill mining operation and thus is not required for this project. Tetra Tech described the project in a letter to the FAA which is presented along with subsequent email correspondence from FAA in Attachment II-7.

2.11.3 Floodplains 30TAC330.547

The 100-year floodplain, Zone AE, is shown on the Harris County Flood Insurance Rate Map (FIRM) Panel No. 48201C0845M dated May 2, 2019 and the Metes and Bounds drawing, Attachment I-6.

The 100-year floodplain along Keegan's Bayou may extend into areas proposed for landfill mining. However, we propose to remove waste from these areas rather than place waste in the floodplain. During the landfill mining project, exposed waste will be protected from washout, contact water will be minimized, and contaminated water will be contained and disposed of in the sanitary sewer.

2.11.4 Groundwater 30TAC330.549

The proposed site is not located over the recharge zone of the Edwards Aquifer; therefore, this regulatory requirement is not applicable to this registration application.

2.11.5 Endangered or Threatened Species 30TAC330.551

See Section 2.10 above.

2.11.6 Wetlands 30TAC330.553

No regulated wetlands were identified during Tetra Tech's investigation (Attachment II-6).

2.11.7 Fault Areas 30TAC330.555

This requirement applies to new municipal solid waste landfill units and lateral expansions and therefore is not applicable to this registration application.

2.11.8 Seismic Impact Zones 30TAC330.557

This requirement applies to new municipal solid waste landfill units and lateral expansions and therefore is not applicable to this registration application.

2.11.9 Unstable Areas 30TAC330.559

This requirement applies to new municipal solid waste landfill units, existing landfill units, and lateral expansions and therefore is not applicable to this registration application. The Bellaire and West University Landfill permits have been revoked and therefore they are not existing landfill units.

2.12 Attachments to Part II of the Application

II-1.1 General Location Map

II-1.2 Buildings within 500 Feet

II-1.3 Water Wells, Oil and Gas Wells

II-2 Facility Layout Maps

II-3 General Topographic Map

II-4 Aerial Photograph

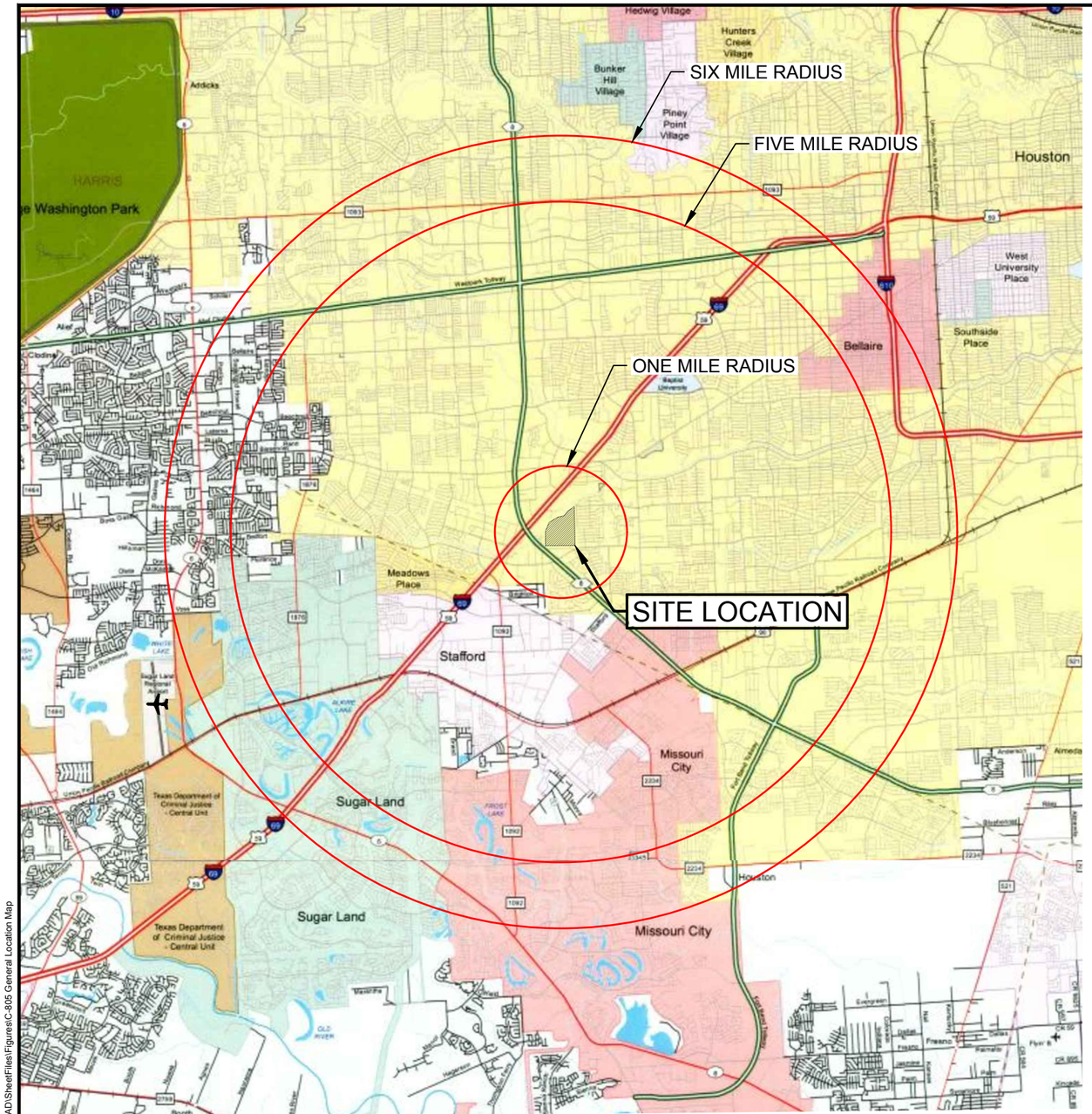
II-5 Land Use Map

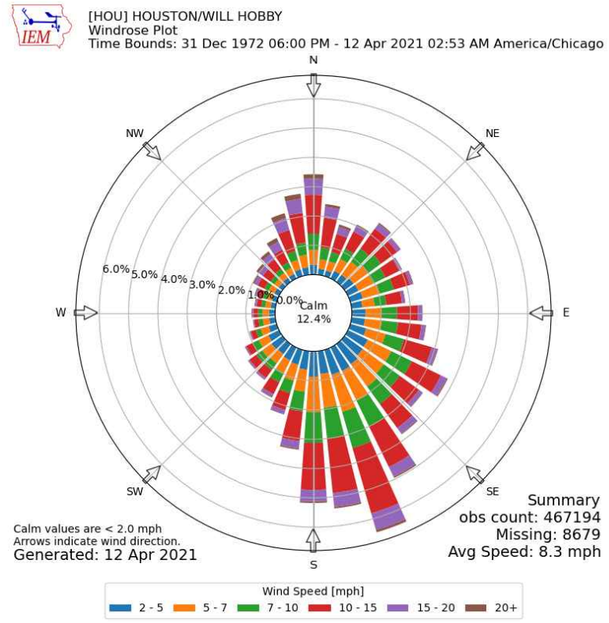
II-6 Floodplain and Wetland Documentation

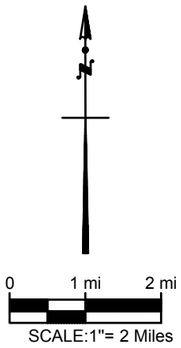
II-7 Copies of Coordination Letters (TX Historical Commission, HGAC, FAA)

II-8 Endangered Species Report

II-9 Transportation Study







LEGEND

ONE MILE RADIUS

Legend

- IH, BI
- US, BU, UA, UP
- SH, BS
- SL, SS, PR
- FM, BF, RM, RR, RE, RS, PA
- Tollroad
- County Road
- City Street or other Non-County Maintained Road
- Railroad
- County Line
- River
- Flowing Stream
- Intermittent Stream
- Canal
- Gulf Intracoastal Waterway
- Body of Water
- Dam
- Airport
- Airport
- Airport Runway
- Cemetery
- Campground
- Park or Protected Land
- School
- Military Installation
- Prison
- Incorporated City
- Unincorporated Community

NOTES:

1. THE NEAREST AIRPORT IS SUGARLAND REGIONAL (OVER 6 MILES TO THE WEST).
2. THERE ARE NO ARCHEOLOGICAL, HISTORIC, OR EXCEPTIONAL AESTHIC SITES ADJACENT TO THE FACILITY.
3. DISTANCE FROM SITE TO NEAREST AIRPORTS:
   HOBBY: 15.9 MILES
   PEARLAND: 20 MILES
   HOUSTON SOUTHWEST: 11.3 MILES
   SUGARLAND REGIONAL: 6.4 MILES

REFERENCE: TEXAS DEPARTMENT OF TRANSPORTATION, OFFICIAL TRAVEL MAP - HOUSTON, TX (2014)

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
PROFESSIONAL LICENSED ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 & 832.251.5160

AGENCY NAME

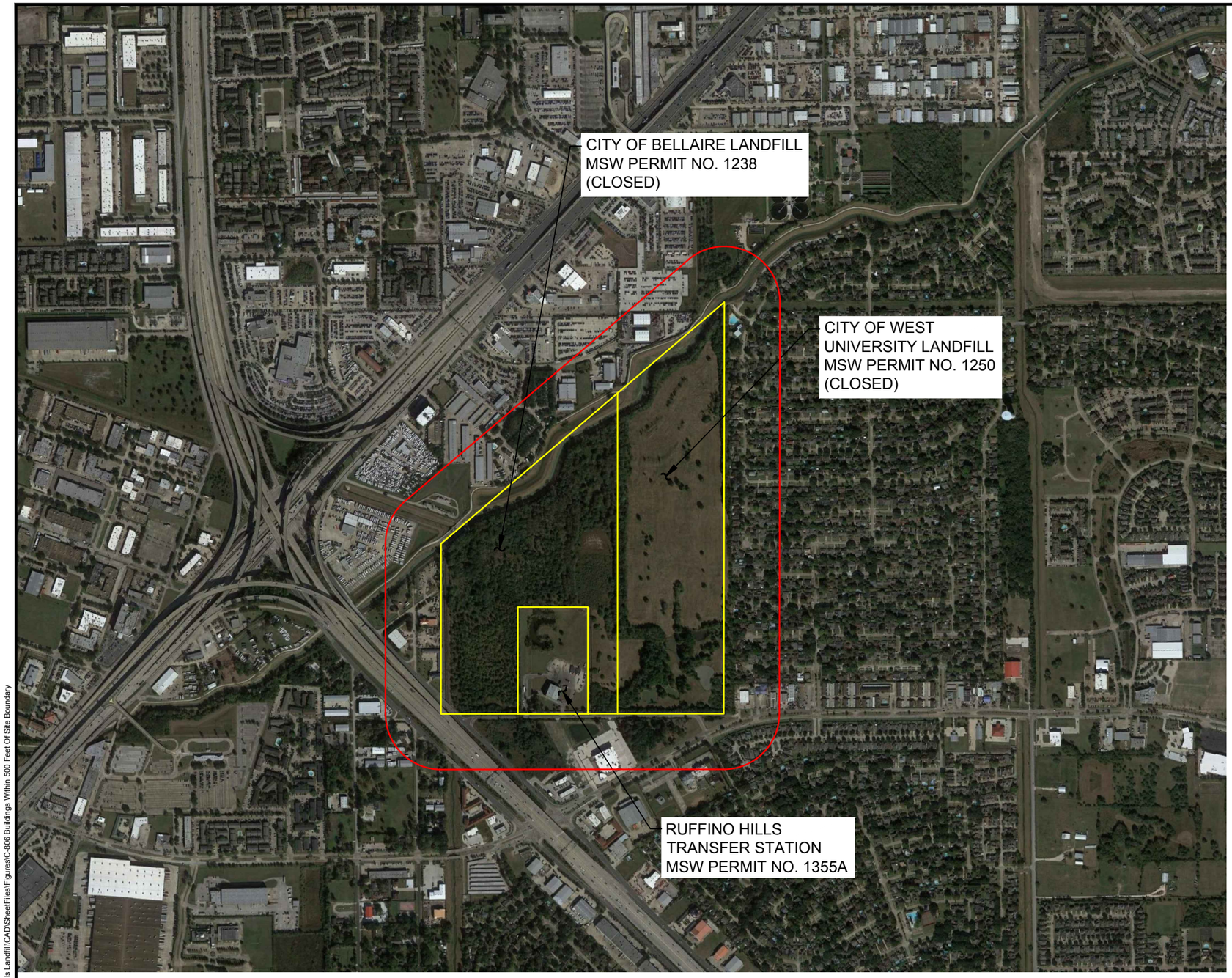
DESIGNED BY: -
DRAWN BY: A.K. / D.B.
CHECKED BY: V.Y.
APPROVED BY: J.N.
DATE: 08-2021
PROJ. NO.: 2020-0072

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

GENERAL LOCATION MAP

Attach II-1.1

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-605 General Location Map



REFERENCE: GOOGLE EARTH AERIAL IMAGE, NOVEMBER 2020

N

0 500 1000

SCALE:1"= 1000'

LEGEND

APPROXIMATE PROPERTY BOUNDARY

500 FEET FROM LANDFILL MINING SITE BOUNDAEY

NOTES:

1. ALL INHABITABLE STRUCTURES WITHIN 500 FEET ARE SHOWN ON THIS FIGURE. LAND USE WITHIN A 500-FOOT RADIUS OF THE REGISTRATION BOUNDARY CONSISTS MAINLY OF RESIDENTIAL AND COMMERCIAL / INDUSTRIAL. THE NEAREST RESIDENCE IS APPROXIMATELY 15 FEET EAST OF THE REGISTRATION BOUNDARY. THE NEAREST CHURCH IS ABOUT 60 FEET EAST OF THE REGISTRATION BOUNDARY.

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
PROFESSIONAL LICENSED ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

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AGENCY NAME

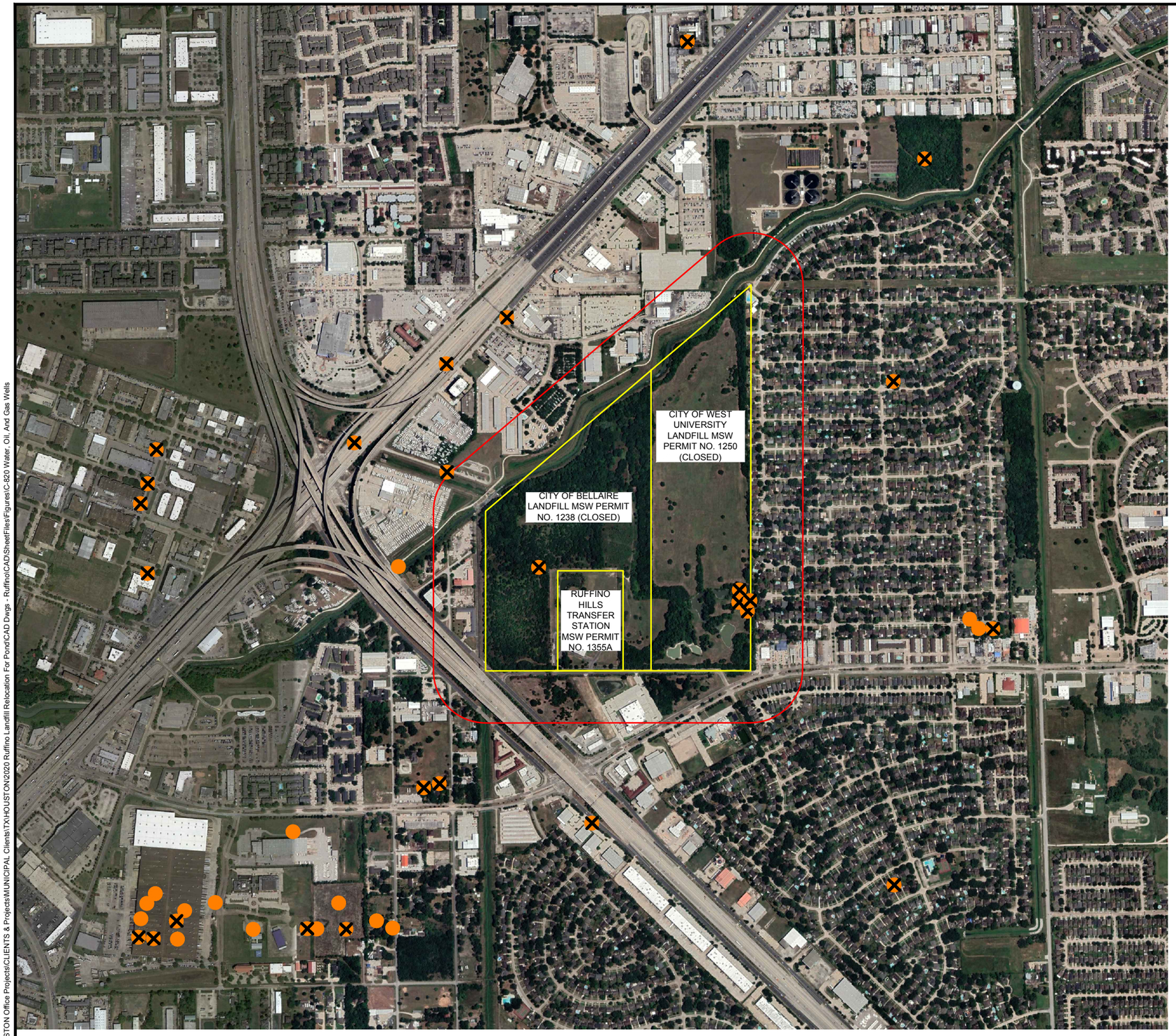
DESIGNED BY: -
DRAWN BY: A.K. / D.B.
CHECKED BY: V.Y.
APPROVED BY: J.N.
DATE: 08-2021
PROJ. NO.: 2020-0072

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

BUILDINGS WITHIN 500 FEET OF SITE BOUNDARY

Attach II-1.2

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-806 Buildings Within 500 Feet Of Site Boundary



REFERENCE: GOOGLE EARTH AERIAL IMAGE, NOVEMBER 2020

N

0 500 1000

SCALE:1"= 1000'

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- 500 FEET FROM LANDFILL MINING SITE BOUNDAEY
- WATER WELL PLUGGING REPORTS
- WATER WELL REPORTS

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

NOTES:

1. THERE ARE NO ACTIVE, INACTIVE, OR PLUGGED OIL OR NATURAL GAS WELLS ON THE PROPOSED TRANSFER STATION PROPERTY NOR WITHIN 500 FEET OF THE PROPOSED TRANSFER STATION SITE BOUNDARY BASED ON TETRA TECH'S SEARCH USING THE TEXAS RAILROAD COMMISSION PUBLIC GIS VIEWER.

TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 & 832.251.5160

AGENCY NAME

DESIGNED BY : -
DRAWN BY : R.C.W.
CHECKED BY : J.N.
APPROVED BY : J.N.
DATE: 08-2021
PROJ. NO.: 2020-0072

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

WATER AND OIL AND NATURAL GAS WELLS WITHIN 500 FEET OF SITE BOUNDARY

ATTACH II-1.3

J:\HOUSTON Office Projects\CLIENTS & Projects\MUNICIPAL Clients\TX\HOUSTON\2020 Ruffino Landfill Relocation For Pond\CAD Dwgs - Ruffino\CAD\SheetFiles\Figures\C-820 Water, Oil, And Gas Wells

N

0 150 300

SCALE:1"= 300'

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED
PROFESSIONAL ENGINEER
3/1/23

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

MAIN SITE HAUL ROAD

PROPERTY BOUNDARY

MAIN SITE HAUL ROAD

MAIN SITE HAUL ROAD

MAIN SITE HAUL ROAD ENTRANCE

DIRECTION OF EXCAVATION

LINER ELEV.: 56.5'

LINER ELEV.: 59.6'

10' HIGH VISUAL SCREENING BERM

30.00'

50.00'

2:1

DATE OF TOPOGRAPHY: 2018

LEGEND

- APPROXIMATE LIMIT OF PROPERTY LINE
- LIMIT OF GRADING / DAYLIGHT
- MAJOR CONTOUR
- MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- UNPAVED ROAD / BENCH
- PROPOSED HAUL ROAD

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-814 Excavation-Schematic View

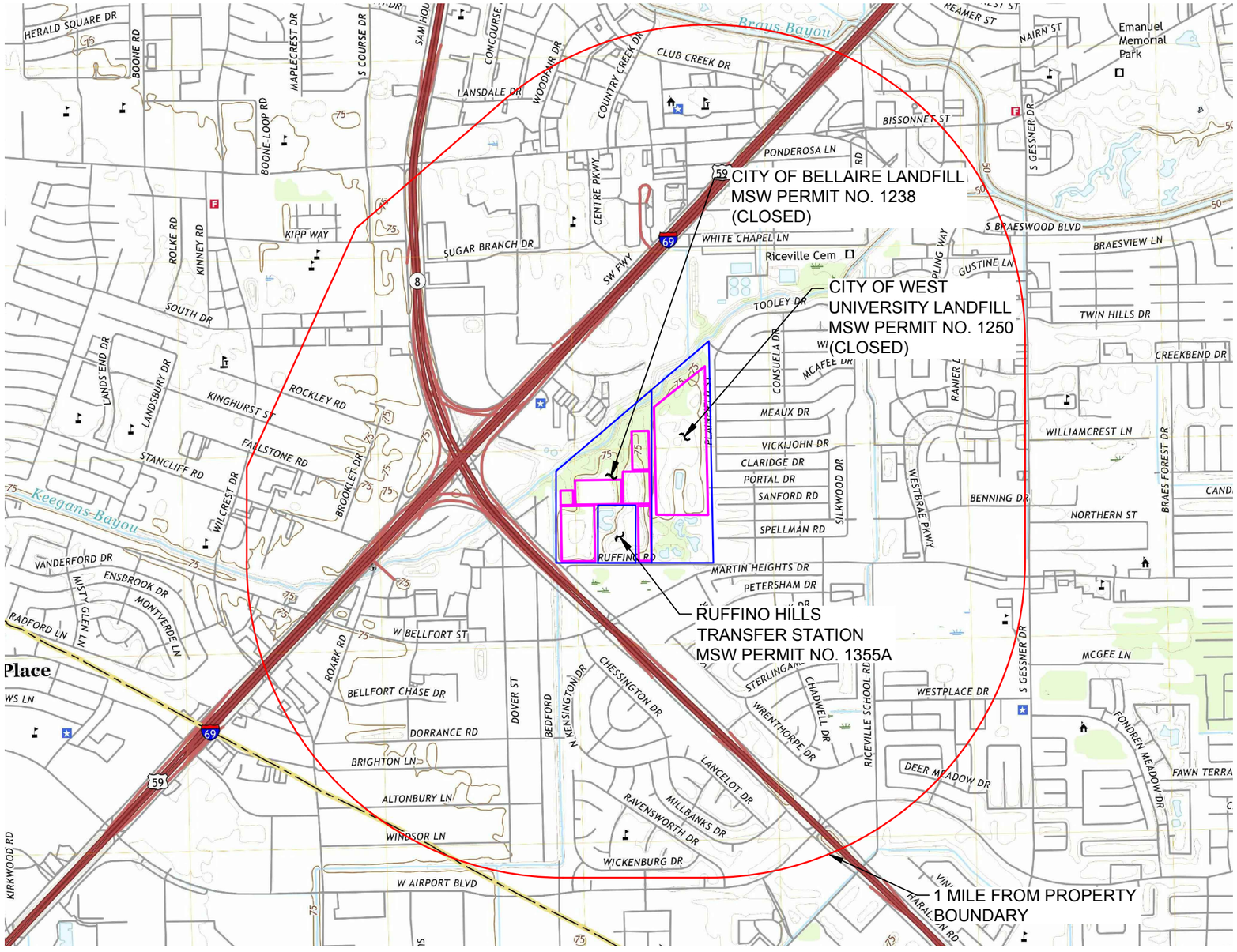
TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 & 832.251.5160

AGENCY		
DESIGNED BY :	J.N.	DATE: 08-2021
DRAWN BY :	A.K. / D.B.	PROJ. NO.: 2020-0072
CHECKED BY :	V.Y.	
APPROVED BY :	J.N.	

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

FACILITY LAYOUT MAP

Attach II-2



0 1000 2000

SCALE:1"= 2000'

LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF WASTE
- ONE MILE RADIUS

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD

Interstate Route · US Route · State Route

Produced by the United States Geological Survey

North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
1 000-meter grid:Universal Transverse Mercator, Zone 15R

This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery.....NAIP, September 2016 - November 2016
Roads..... U.S. Census Bureau, 2015
Names.....GNIS, 1979 - 2018
Hydrography.....National Hydrography Dataset, 2002
Contours.....National Elevation Dataset, 2010
Boundaries.....Multiple sources; see metadata file 2016 - 2017

Wetlands.....FWS National Wetlands Inventory 1992

MN
GN
2°26´ 43 MILS
1°16´ 23 MILS

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000 - m Square ID
TN
Grid Zone Designation 15R

NOTE:
1. STREAM NAME INFORMATION OBTAINED FROM HARRIS COUNTY FLOOD CONTROL, FLOOD EDUCATION MAPPING TOOL, AUGUST 2016.
2. ROAD TYPES WITHIN ONE MILE OF PROPERTY BOUNDARY ARE EITHER CONCRETE OR ASPHALT.

REFERENCE: U.S. DEPARTMENT OF THE INTERIOR USGS - HOUSTON, TX, 7.5 MINUTE QUADRANGLE MAP (2019)

STATE OF TEXAS
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APPROVED BY: J.N.
DATE: 08-2021
PROJ. NO.: 2020-0072

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

GENERAL TOPOGRAPHIC MAP

Attach II-3

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-809 General Topographic Map

N

0 1000 2000

SCALE:1"= 2000'

LEGEND

APPROXIMATE PROPERTY BOUNDARY

REFERENCE: GOOGLE EARTH AERIAL IMAGE, 2018.

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AGENCY NAME

DESIGNED BY : -
DATE: 08-2021
DRAWN BY : A.K. / D.B.
PROJ. NO.: 2020-0072
CHECKED BY : V.Y.
APPROVED BY : J.N.

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

AERIAL PHOTOGRAPH

Attach II-4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-810 Aerial Photograph

REFERENCE: GOOGLE EARTH AERIAL IMAGE, 2018

N

0 1500 3000

SCALE:1"= 3000'

LEGEND

- ONE MILE FROM LANDFILL MINING SITE BOUNDARY
- (A) AGRICULTURAL OR OPEN SPACE
- (C) CEMETERY
- (CI) COMMERCIAL/INDUSTRIAL
- (TS) TRANSFER STATION
- (R) RESIDENTIAL
- (T) TRANSPORTATION CORRIDOR
- (P&R) PARK & RIDE
- CHURCH
- SCHOOL
- DAYCARE
- CEMETARY

STATE OF TEXAS
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DESIGNED BY: -
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CHECKED BY: V.Y.
APPROVED BY: J.N.
DATE: 08-2021
PROJ. NO.: 2020-0072

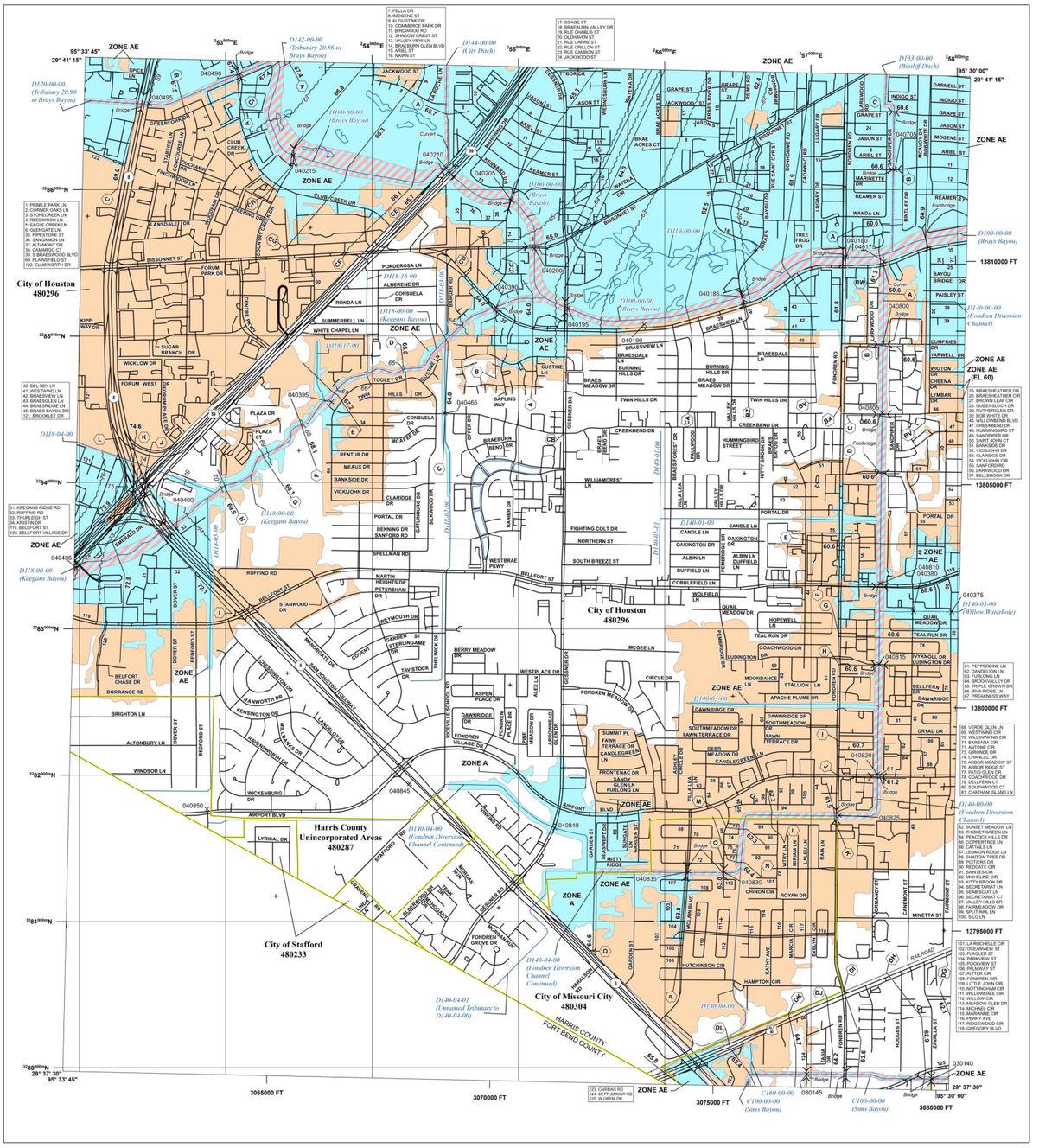
RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

LAND USE MAP

ATTACH II - 5

J:\HOUSTON Office Projects\CLIENTS & Projects\MUNICIPAL Clients\TX\HOUSTON\2020 Ruffino Landfill Relocation For Pond\CAD Dwgs - Ruffino\CAD\SheetFilesFigures\C-812 Land Use Map

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-819 Floodplain Map



FLOOD HAZARD INFORMATION

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

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT HTTPS://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A,V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee See Notes. Zone X
	Area with Flood Risk due to Levee Zone D
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard Zone X
	Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	18.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
	Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
OTHER FEATURES	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

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

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

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

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

Base map information shown on this FIRM was provided in digital format by the Houston-Galveston Area Council (H-GAC) and was revised and enhanced by Harris County (2015). The Texas Natural Resources Information System (TNRIS) provided the Texas Department of Transportation (TXDOT) community boundaries and transportation layers dated 2015.

Vertical Datum Adjustment due to subsidence is the 2001 adjustment.

Benchmarks shown on this map were provided by either Harris County or the National Geodetic Survey. To obtain elevation, description, and location information for benchmarks provided by Harris County, please contact the Permits Office of the Engineering Department at 713-274-3900 or visit their website at https://www.eng.hctx.net/permits. For information regarding the benchmarks provided by National Geodetic Survey, please contact the Information Services Branch of the National Geodetic Survey at 301-713-3242 or visit the website at https://www.ngs.noaa.gov.

SCALE

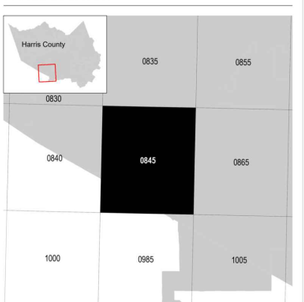
Map Projection:
Universal Transverse Mercator Zone 15N; North American Datum 1983;
Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 1,000 2,000 4,000 Feet

0 250 500 1,000 Meters

PANEL LOCATOR



FEMA National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

HARRIS COUNTY, TEXAS
and Incorporated Areas

PANEL 845 OF 1150

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
HARRIS COUNTY	480287	0845	M
HOUSTON, CITY OF	480296	0845	M
MISSOURI CITY, CITY OF	480304	0845	M
STAFFORD, CITY OF	480233	0845	M

VERSION NUMBER
2.3.3.3

MAP NUMBER
48201C0845M

MAP REVISED
MAY 2, 2019

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

Attachment II-6

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

FLOODPLAIN MAP

AGENCY NAME

DESIGNED BY : -	DATE: 08-2021
DRAWN BY : A.K. / D.B.	PROJ. NO.: 2020-0072
CHECKED BY : V.Y.	
APPROVED BY : J.N.	

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Ruffino Road Landfill Mining Project

Wetland and Waterbody Determination and Delineation Report

Prepared for:

City of Houston – Department of Public Works
611 Walker Street, Houston, TX 77002

Jones | Carter
6330 West Loop South, Suite 150,
Bellaire, Texas 77401

Prepared by:

Tetra Tech, Inc.
1500 CityWest Boulevard, Suite 1000
Houston, Texas 77042
(832) 251-5160
Tetra Tech Project No. 212IC-HN-01533

August 2021

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Appendix C Waterbody Identification Data Forms and Photographic Record
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Appendix E Vegetation Data Forms and Photographic Record

LIST OF ACRONYMS AND ABBREVIATIONS

cm	centimeter
COH	City of Houston
CWA	Clean Water Act
DAREM	Direct Antecedent Rainfall Evaluation Method
ESRI	Environmental Sciences Research Institute, Inc.
FAC	facultative
FACW	facultative wetland
GIS	Geographic Information System
Google	Google Inc.
GPS	Global Positioning System
Jones-Carter	Jones - Carter
LRR	Land Resource Region
NHD	National Hydrography Dataset
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
OBL	obligate
OHWL	ordinary high water line
PFO	palustrine forested
Project	Ruffino Road Landfill Mining
ROW	right-of-way
SSURGO	Soil Survey Geographic
Tetra Tech	Tetra Tech, Inc.
Trimble	Trimble, Inc.
TX	Texas
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOTUS	Waters of the United States

1.0 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) was contracted by Jones | Carter on behalf of the City of Houston (COH) to conduct wetland and waterbody delineations for the Ruffino Road Landfill Mining Project (Project) in Harris County, Texas (TX). The Project will include the excavation and transfer of existing waste to other waste disposal facilities, and the existing property will be converted to a stormwater detention facility. Please refer to the Project Location Map (Figure 1, Appendix A) for an overview of the proposed project area.

Tetra Tech is also preparing a Type IX Landfill Mining Registration Application for submittal to TCEQ, whose regulations require evaluation of regulated wetlands for sites being considered for solid waste permits and registrations. This report will become part of the registration application.

The purpose of this investigation was to determine the presence and extent of areas within the 145-acre Project site that meet the criteria for the identification as potential waters of the United States (WOTUS) as established by the United States (U.S.) Army Corps of Engineers (USACE) guidelines. Areas identified and delineated are potentially jurisdictional and regulated pursuant to Section 404 of the Clean Water Act (CWA) and applicable state water quality regulations. The identification of these areas will assist Jones Carter in Project planning in regard to wetland and waterbody impact avoidance and minimization as well as determination of the need for applicable environmental permits and clearances.

Section 2.0 of this report provides an overview of the wetland and waterbody background review and survey methods, Section 3.0 provides results, Section 4.0 provides a summary of findings, and Section 5.0 contains a list of references. All figures are located in Appendix A, including: Figure 1 – Site Location Map, Figure 2 – Soil map, Figure 3 – National Wetlands Inventory (NWI) amd National Hydrography Dataset (NHD) features, and Figure 4 – Delineated Features. Appendix B contains copies of the wetland delineation data forms and the photographic record for these features. Appendix C contains copies of the waterbody identification data forms and the photographic record for these features. Appendix D contains copies of the pond identification forms and the photographic record for these features. Appendix E contains copies of the vegetation data forms and photographic record for the habitats documented for the Project.

2.0 METHODS

2.1 WETLAND DELINEATION

During the July 2021 field event, the survey area was evaluated for the presence and extent of wetlands using the method described in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (Version 2.0) (USACE 2010). Wetlands identified and delineated were subsequently classified in accordance with the Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1979).

2.2 BACKGROUND RESEARCH

Prior to conducting fieldwork, Tetra Tech reviewed existing information for the survey area, including:

- U.S. Geological Survey (USGS) 7.5-minute series topographic quadrangle maps for the survey area (Alief, TX 2019) (USGS 2021a);
- Soil survey maps, descriptions, and lists, to determine presence and extent of hydric and upland soils via review of the United States Department of Agriculture (USDA)/Natural Resources Conservation Service (NRCS), Soil Survey Geographic (SSURGO) database for Harris County, TX (USDA/NRCS 2019a, 2020b);
- NWI maps available from the U.S. Fish and Wildlife Service (USFWS) for the survey area (USFWS 2021);
- NHD maps available from the USGS (USGS 2021b); and
- Aerial photographs to identify drainage and other hydrologic features via review of Environmental Sciences Research Institute, Inc. (ESRI) online mapping services (ESRI 2019) and Google Earth aerial photography (Google Inc. [Google] 2021).

2.3 ON-SITE DELINEATION

Following the review of background information, one team consisting of two wetland scientists performed field surveys for the Project from July 21 – July 22, 2021. The surveys consisted of a walkover inspection of the field survey area to identify topographic, drainage, and vegetation features that would indicate potential wetland and/or waterbody occurrence. Potential wetlands were further evaluated by collecting soil, vegetation, and hydrology data at upland and wetland sample locations of suspected wetland boundaries. Sample plot data were recorded on Atlantic and Gulf Coastal Plain Region Wetland Determination Data Forms provided within the regional supplement.

All sample plots were investigated according to the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) and *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (Version 2.0) (USACE 2010), which involves a detailed examination of the vegetation, soils, and hydrologic indicators. Each potential wetland and/or waterbody was further evaluated to characterize the hydrological connection to adjacent upland, wetland, and waterbody regions occurring in proximity to the survey area investigated. Specified methods for characterizing and evaluating the soils, vegetation, and hydrologic indicators are described below.

Vegetation: Dominant plant species in each major vegetation stratum (e.g., tree, sapling/shrub, herbaceous, and woody vine) were identified within up to a 30-foot radius sample plot. The wetland indicator status of each species was assigned according to the Atlantic and Gulf Coastal Plain Region National Wetlands Plant List: Update of Wetland Ratings (USACE 2018). Hydrophytic vegetation was determined to be present where more than 50 percent of the dominant species from all vegetation strata were classified as facultative (FAC), facultative wetland (FACW), or obligate (OBL). Other tests used to evaluate the dominance of hydrophytic species included the Prevalence Index, Morphological Adaptations, and Problematic Hydrophytic Vegetation (USACE 2010).

Soils: A shovel was used at each sample plot to extract a core sample to a depth of approximately 20 inches, or until rocky substrate resulted in refusal. The soils were characterized by determining the color and texture of each soil horizon. Soil matrix and mottle colors were identified using Munsell Soil Color Charts (Munsell Color 2009). Mineral soils were considered hydric if they exhibited one or more of the following indicators: histosol, histic epipedon, black histic, hydrogen sulfide, stratified layers, organic bodies, 5 centimeters (cm) mucky mineral, muck presence, 1 cm muck, 2 cm muck, depleted below dark surface, thick dark surface, coast prairie redox, sandy mucky mineral, sandy gleyed matrix, sandy redox, stripped matrix, dark surface, polyvalue below surface, thin dark surface, loamy mucky mineral, loamy gleyed matrix, depleted matrix, redox dark surface, depleted dark surface, redox depressions, marl, depleted ochric, iron-manganese masses, umbric surface, delta ochric, reduced vertic, piedmont floodplain soils, anomalous bright loamy soils, red parent material, and very shallow dark surface. These indicators support a hydric soil determination, although secondary or additional indicators might also be present. See the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (Version 2.0) (USACE 2010), for a detailed description of each hydric soil indicator eligible for use in the Land Resource Region (LRR) 'T'.

Hydrology: Each sample plot was examined for evidence of wetland hydrology. At least one primary indicator is needed for wetland hydrology; primary indicators of wetland hydrology in the Atlantic and Gulf Coastal Plain Region include: surface water, high water table, saturation, water marks, sediment deposits, drift deposits, algal mat or crust, iron deposits, inundation visible on aerial imagery, water-stained leaves, aquatic fauna, marl deposits, hydrogen sulfide odor, oxidized rhizospheres along living roots, presence of reduced iron, recent iron reduction in tilled soils, and thin muck surface. At least two secondary indicators are needed for wetland hydrology; secondary indicators of wetland hydrology in the Atlantic and Gulf Coastal Plain Region include: surface soil cracks, sparsely vegetated concave surface, drainage patterns, moss trim lines, dry-season water table, crayfish burrows, saturation visible on aerial imagery, geomorphic position, shallow aquitard, FAC-neutral test, and sphagnum moss. Presence of standing water or depth to soil saturation was recorded at each sampling location.

All areas found to meet wetland criteria were assigned an alphanumeric code based on their order of identification within the survey area. Delineated wetlands were classified according to the USFWS Classification of Wetlands and Deepwater Habitats of the U.S. (Cowardin et al. 1979). Wetland boundaries were marked via GPS, and each wetland area was photographed.

Vegetation and Habitat Data

During the field event, a number of vegetation data points were collected as part of the delineation in order to provide a vegetative profile at those points. Data recorded at these locations included general habitat type (herbaceous habitat, scrub-shrub habitat), vegetation species percent cover and height for tree, shrub, and herbaceous strata, and location photographs.

2.4 WATERBODY IDENTIFICATION

Prior to field surveys, known waterbodies in the survey area were identified on digital USGS topographic quadrangle maps (USGS 2021a) and NHD maps (USGS 2021b). During field investigations, a qualified biologist examined the entire survey area for mapped and unmapped waterbodies. Potential waterbodies surveyed include perennial, intermittent, and ephemeral streams, drainage ditches, and ponds. Data recorded include waterbody name (if available), associated wetlands, flow conditions (perennial, intermittent, or ephemeral), direction of flow, water width, bank-to-bank width, bank height and slope, water depth, bottom and bank substrates, observed water quality, channel meander, and adjacent vegetation type. In addition, indicators of aquatic habitat, wildlife use, and soil erosion potential were recorded.

2.5 RAINFALL ANALYSIS

During the spring and early summer of 2021, the Houston area experienced several, extended rainfall events that significantly influenced hydrology within the Project area. Because significant portions of the Project area are located within close proximity to known floodzones, hydrology indicators observed during the field events were often misleading and not likely present during periods of normal rainfall. As such, wetland determination required a greater emphasis on soils and vegetation located at each sample point. Because hydrologic indicators can be influenced seasonally by abnormal precipitation, the hydrology analysis was expanded to include a desktop analysis of measured rainfall in the months preceding the July field effort, when the potential wetlands were assessed. Precipitation data were evaluated through the application of the DAREM.

The DAREM procedure computes a score for the prior 3-month period that is used to assess whether the precipitation is “normal”, “drier than normal”, or “wetter than normal”. This score is based on long term (i.e., 30-year) average precipitation records provided in Wetland (WETS) Climate Tables developed by the USDA/NRCS National Water and Climate Center (Sprecher and Warne 2000, Berkowitz and Noble 2015). The score is a sum of individual scores for each of the three months of data used. Each monthly score is based on two numbers, one for rainfall “condition” and the second for the “monthly weight”, as follows:

Rainfall “Condition” Scores

- 1 = Measured rainfall below the 30th percentile, and therefore rainfall is “drier than normal”;
- 2 = Measured rainfall is between the 30th and 70th percentile, and therefore rainfall is “normal”; and
- 3 = Measured rainfall above the 70th percentile, and therefore rainfall is “wetter than normal”.

“Monthly Weight” Scores

- 3 = First month proximate (most recent) to the assessment month
- 2 = Second month proximate (second most recent) to the assessment month and
- 1 = Third month proximate (third most recent) to the assessment month.

The two ratings are multiplied together for each month, and then summed to compute a cumulative score that is used to describe whether the prior 3-month period of precipitation was within the range of normal, drier than normal, or wetter than normal (Sprecher and Warne 2000), as follows:

Cumulative DAREM Scores (Sum of Rainfall "Condition" and "Monthly Weight" Scores)

- 6-9 = precipitation for the prior 3-month period is "drier than normal";
- 10-14 = precipitation for the prior 3-month period is "normal"; and
- 15-18 = precipitation for the prior 3-month period is "wetter than normal".

As demonstrated in Table 1, increased rainfall totals prior to the July 2021 field surveys created wetter than normal conditions (cumulative DAREM score of 17) in Harris County, TX. This data was integrated into the assessment of wetland hydrology (present or absent), particularly for areas located in floodzones, that required a greater emphasis on hydrology, and in turn into the wetland determination.

Table 1. Rainfall Summary for Harris County, TX Summer 2021

		WETS Rainfall Percentile (in)		Evaluation Month: July 2021			
Prior Month		30th	70th	Measured Rainfall	Condition[2]	Month Weight[3]	Score[4]
1st	June 2021	3.31	7.46	7.65	3	3	9
2nd	May 2021	2.56	6.74	9.45	3	2	6
3rd	April 2021	1.98	4.96	3.17	2	1	2
						Sum	17
					Description[5]	Wetter than Normal	

1 WETS Climate Table data range 1991-2021
2 Condition values are 1 for <30th percentile, 2 for between 30th and 70th percentile, 3 for >70th percentile.
3 Month Weight is 3 for the most recent month, 2 to the previous month, and so on.
4. Score is the product of the rainfall condition and month weight.
5. Drier than normal (sum is 6-9), normal (sum is 10-14), wetter than normal (sum is 15-18)
Sources: ACIS 2021

3.0 RESULTS

3.1 BACKGROUND DATA REVIEW

3.1.1 General Area Description

The majority of the Project area is located within two former landfill sites, and a portion of the Project area currently includes a transfer station facility. Additional historical land uses and vegetative communities include: ditches, easements, scrub-shrub upland, herbaceous upland, commercial, roadways, and waterbodies. Figure 2 and Figure 4 in Appendix A provide aerial photographs of the survey area.

3.1.2 Soils

A review of published and publicly available soils data (USDA/NRCS 2020) for Harris county, TX indicate that three soil series are mapped within the survey boundary (see Table 2 below and Figure 2 in Appendix A). Given the Project area's previous usage as a landfill, the soils found on site are likely urban fill as opposed to native soils, and that native soils would likely be deeply buried on site. All three mapped soil series are designated by the USDA/NRCS as potentially containing hydric inclusions. Table 2 lists and describes the soils mapped for the survey area.

Table 2. Mapped Soil Types for the Ruffino Road Landfill Mining Project

Soil Symbol	Soil Name and Brief Description[1]	Hydric Soil Classification
Harris County		
Be	Bernard-Edna complex, 0 to 1 percent slopes	No
Ed	Edna loam, 0 to 1 percent slopes	No
LcA	Lake Charles clay, 0 to 1 percent slopes	No

1 USDA/NRCS, Soil Series Descriptions for Harris county, Texas, July 2021.

3.1.3 Mapped Wetlands

USFWS NWI digital mapping (USFWS 2020), Google Earth aerial photography (Google 2021), digital USGS 7.5-minute topographic maps (USGS 2021a), and digital NHD mapping (USGS 2021b) were reviewed to assess the presence of potential WOTUS, including wetlands and waterbodies. Four (4) NWI features are mapped within the approximately 145-acre survey area(see Figure 3 in Appendix A).

3.1.4 Mapped Waterbodies

The USGS 7.5-minute series topographic quadrangle maps do not depict any streams that traverse the survey area (USGS 2021). However, one mapped named waterbody, Keegan's Bayou, does run parallel to the northern boundary of the Project area, and a concrete lined tributary drainage to the Bayou runs parallel to the western boundary.

3.2 FIELD INVESTIGATION

The survey for the Project was conducted by a Tetra Tech field team with the field investigation occurring on July 21 and July 22, 2021. None of the surveyed area met the USACE criteria for wetland identification. A total of seven waterbodies, inclusive of three ditches and four ponds fall within the survey area. Figure 4 of Appendix A depicts the boundaries and alignments of field delineated waterbodies. Appendix B provides completed wetland delineation data forms and the photographic records for these features. Appendix C provides ditch identification data forms and the photographic records of these features. Appendix D provides pond identification data forms and the photographic records of these features. Appendix E contains the vegetation data forms and photographic records for representative habitats in the survey area.

3.2.1 Wetland Delineation

None of the areas in the 145-acre survey area were determined to meet USACE criteria for wetland identification. The two mapped NWI wetland features, one mapped as an emergent wetland and one mapped as a forested wetland, were thoroughly inspected, but did not meet the criteria for either hydrology or soils during field investigations. However, it should be noted that soils present on the Project site are likely not native soils, as fill material was observed during shovel tests.

3.2.2 Waterbody Identification

Tetra Tech identified seven waterbodies (three ditches and four ponds) as occurring within the 145-acre Project survey area. It appears that two ditches (S1A and S2A) were engineered for stormwater management to facilitate drainage from ponds P1A and P4A. Table 3 below summarizes the ditch data, and Table 4 summarizes the pond data. Figure 4 in Appendix A shows the locations and alignments for each water feature.

Table 3. Ditches Summary for the Ruffino Road Landfill Mining

Ditch ID	Ditch Name	Flow Regime	Bank Width (feet)	OHWL (feet)	Water Depth (inches)
S1A	Unnamed drainage ditch	Ephemeral	20	15	0
S2A	Unnamed drainage ditch	Ephemeral	12	6	4
S3A	Unnamed drainage ditch	Ephemeral	8	2	0

Table 4. Ponds Summary for the Ruffino Road Landfill Mining

Pond ID	Pond Name	Flow Regime	Pond Acreage Within Survey Area
P1A	Unnamed man-made pond	Perennial	1.37
P2A	Unnamed man-made pond	Perennial	0.38
P3A	Unnamed man-made pond	Perennial	1.34
P4A	Unnamed man-made pond	Perennial	0.78

4.0 SUMMARY

Tetra Tech is preparing a Type IX Landfill Mining Registration Application for submittal to TCEQ, whose regulations require evaluation of regulated wetlands for sites being considered for solid waste permits and registrations. This study will become part of the registration application.

In July of 2021, Tetra Tech performed a field survey for aquatic resources occurring within the proposed Ruffino Road Landfill Mining Project area in Harris County, TX. The Project area has historically been disturbed from various land use activites. The field survey included an approximately 145-acre Project survey area. The purpose of this investigation was to determine the presence and extent of wetland and waterbody features within the identified Project area that meet the criteria for potential WOTUS as established by the USACE guidelines.

The survey identified three ditches and four ponds as occurring within the Project survey area. Table 2 summarizes the mapped soil types occurring within the survey area; mapped soil types are likely urban soils and not native soils, given the Project area's historic land use as a landfill. No wetlands were identified during the field investigation. Table 3 summarizes the ditch data, including the feature ID, flow regime, bank-to-bank width, water width, and water depth. Table 4 summarizes the pond data, including the feature ID, flow regime, and acreages within the survey area. Appendix A contains four figures: Figure 1 – Site Location Map, Figure 2 – Soil mapping, Figure 3 – NWI and NHD Features, and Figure 4 – Delineated Features. Appendix B contains copies of the wetland delineation data forms and the photographic records for these features. Appendix C contains copies of the ditch identification data forms and the photographic records for these features. Appendix D contains copies of the vegetation data forms and photographic record for large areas of upland habitat.

This baseline, existing environmental data will be used as part of Project planning, specifically in regard to assistance with impact avoidance and aquatic resource protection.

5.0 REFERENCES

ACIS. 2021. AgACIS for Harris County. Available at: http://agacis.rcc-acis.org/?fips=48201. Accessed July 2021.

Berkowitz, J.F., and C.V. Noble. 2015. Development of new hydric soil field indicators: Guidelines for data collection and submission. Soil Horizons 56(1).

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. FWS/OBS-79/31, Washington, D.C. 131 pp.

Environmental Laboratory. 1987. United States Army Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineers Waterways Experiment Station, Vicksburg, MS. 100 pp.

Environmental Sciences Research Institute, Inc. (ESRI). 2019. ESRI online mapping services. Available at: http://services.arcgisonline.com/ArcGIS/rest/services. Accessed July 2021.

Google Inc. (Google). 2021. Google Earth aerial photography. Available at: https://www.google.com/earth. Accessed July 2021.

Munsell Color. 2009. Munsell Soil Color Book. Munsell Color X-Rite. Grand Rapids, MI.

Sprecher, S.W., and A.G. Warne. 2000. Accessing and using meteorological data to evaluate wetland hydrology. ERDC/EL TR-WRAP-00-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.

Trimble, Inc. (Trimble). 2018. Trimble sub-meter accuracy standards. Available at: http://www.trimble.com/positioning-services. Accessed July 2021.

United States Army Corps of Engineers (USACE). 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: *Atlantic and Gulf Coastal Plain Region* (Version 2.0). Vicksburg, MS. 180 pp.

USACE. 2018. National Wetland Plant List, version 3.4. U.S. Army Corps of Engineers Engineer Research and Development Center. Cold Regions Research and Engineering Laboratory, Hanover, NH. Available at: http://wetland-plants.usace.army.mil/. Accessed July 2021

United States Department of Agriculture, National Resources Conservation Service (USDA/NRCS). 2019. Soil Series Description for Harris County, Texas.

United States Fish and Wildlife Service (USFWS). 2020. National Wetlands Mapper. Available at: http://www.fws.gov/wetlands/Data/Mapper.html. Accessed July 2021.

United States Geological Survey (USGS). 2021a. USGS 7.5 Minute Quadrangles/DRG (Digital Raster Graphic). DRG used: (Alief, TX 2019). Available at: http://www.metzgerwillard.us/quads/quads.html. Accessed July 2021.

USGS. 2021b. National Hydrography Dataset (NHD) v2.2. Harris County, Texas. Available at: https://gdg.sc.egov.usda.gov. Accessed July 2021.

Appendix A

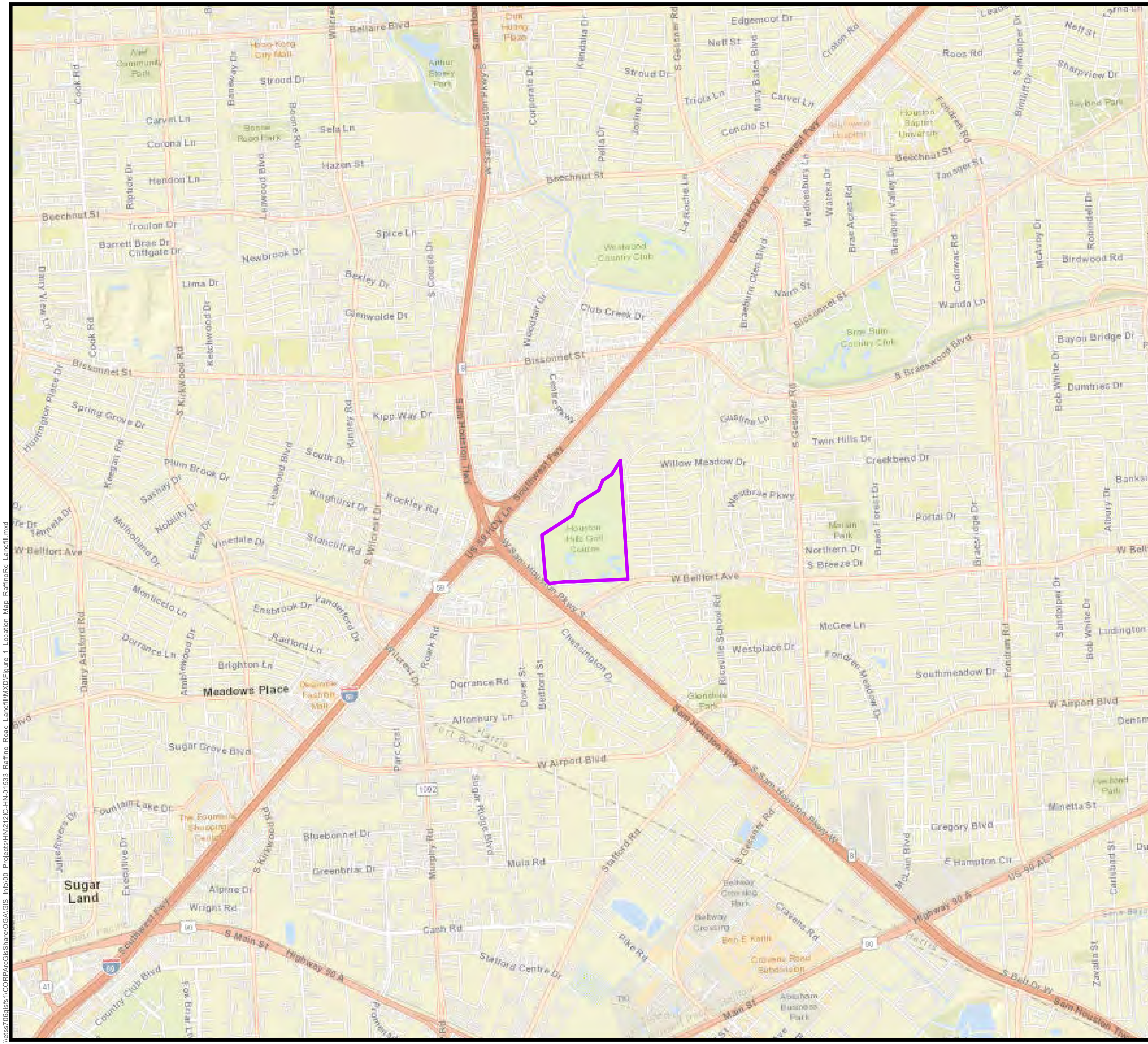
FIGURES

FIGURE 1. SITE LOCATION MAP OF THE RUFFINO ROAD LANDFILL MINING PROJECT

FIGURE 2. SOILS WITHIN THE RUFFINO ROAD LANDFILL MINING PROJECT

FIGURE 3. NWI AND NHD FEATURES WITHIN THE RUFFINO ROAD LANDFILL MINING PROJECT

FIGURE 4. DELINEATED FEATURES WITHIN THE RUFFINO ROAD LANDFILL MINING PROJECT



JONES|CARTER

FIGURE 1.

SITE LOCATION MAP OF THE RUFFINO ROAD LANDFILL MINING PROJECT

HARRIS COUNTY, TEXAS

LEGEND

Project Limits

N

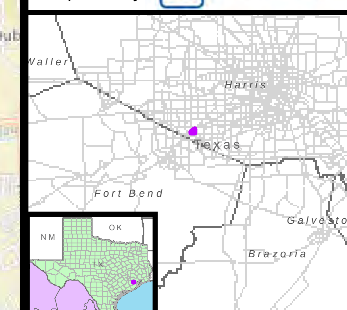
SCALE: 1 Inch = 4,000 feet

Feet 0 2,000 4,000

Sheet 1 of 1

Date: August 2021
Project: 212IC-HN-01533

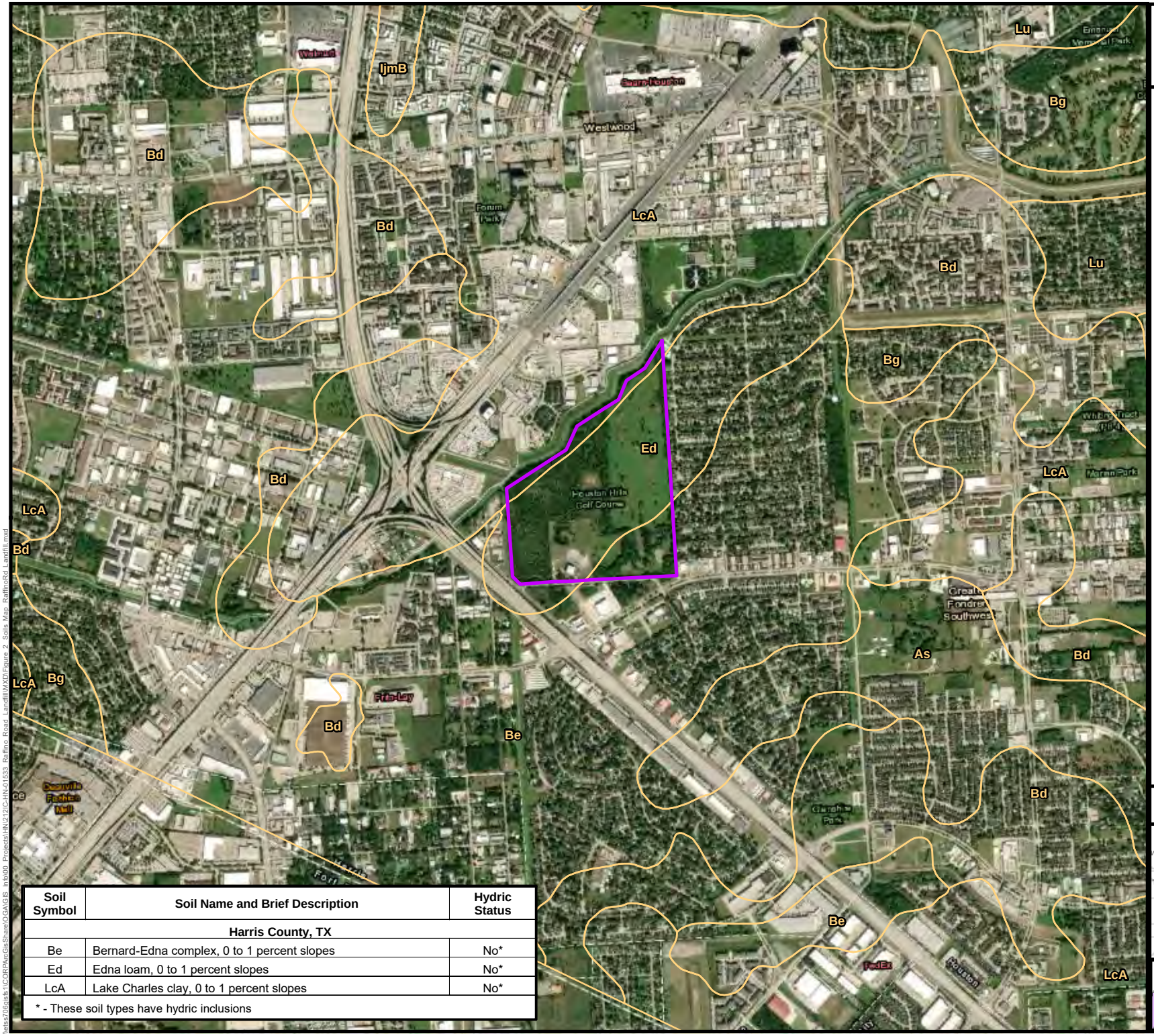
Prepared By: TETRA TECH



\\ets706gis1\CORPArcGisShare\OGA\GIS_Info\00_Projects\HN\212IC-HN-01533_Ruffino_Road_Landfill\MXD\Figure_1_Location_Map_RuffinoRd_Landfill.mxd

Drawn By: stephanie.aselage

Source: Aerial - Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016; Soils - USDA-NRCS, 2016.



Soil Symbol	Soil Name and Brief Description	Hydric Status
	Harris County, TX	
Be	Bernard-Edna complex, 0 to 1 percent slopes	No*
Ed	Edna loam, 0 to 1 percent slopes	No*
LcA	Lake Charles clay, 0 to 1 percent slopes	No*

* - These soil types have hydric inclusions

JONES|CARTER

FIGURE 2.

SOILS WITHIN THE RUFFINO ROAD LANDFILL MINING PROJECT

HARRIS COUNTY, TEXAS

LEGEND

Project Limits

Soils

N

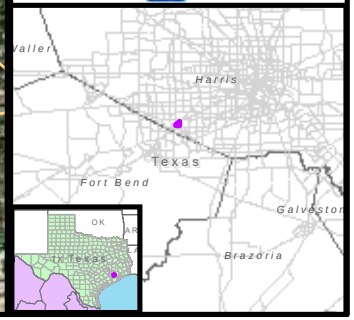
SCALE: 1 IN = 2,000 FEET

Feet 0 1,000 2,000

Sheet 1 of 1

Date: August 2021
Project: 212IC-HN-01533

Prepared By: TETRA TECH



Drawn By: stephanie.aselage

Source: Aerial - Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016; Soils - USDA-NRCS, 2016.

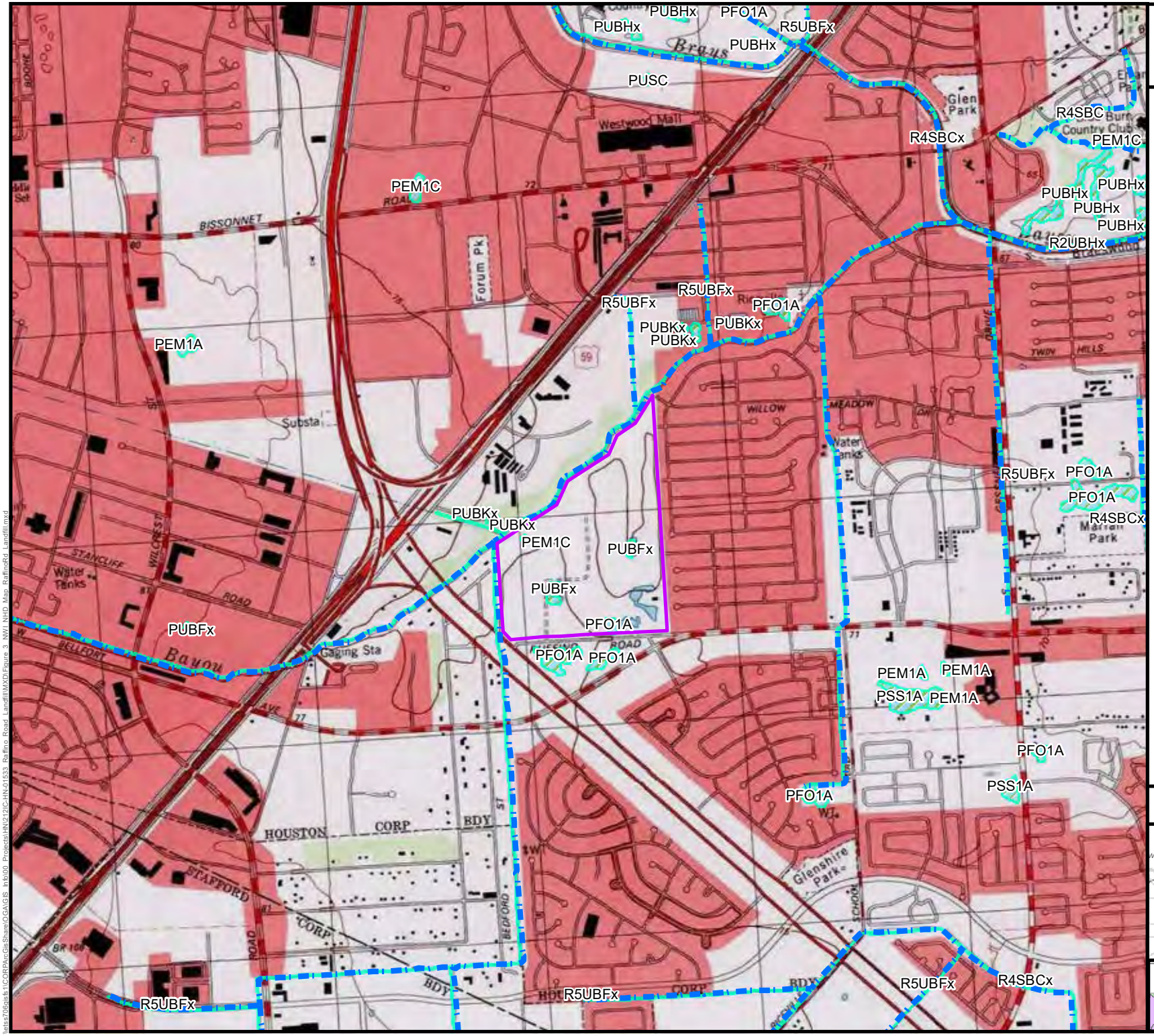


FIGURE 3.

NWI AND NHD FEATURES WITHIN THE RUFFINO ROAD LANDFILL MINING PROJECT

HARRIS COUNTY, TEXAS

LEGEND

- Project Limits
- USFWS NWI
- USGS NHD Flowline

N

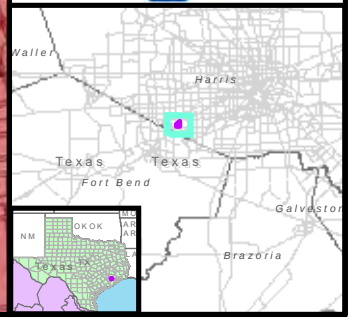
SCALE: 1 IN = 2,000 FEET

Feet 0 1,000 2,000

Sheet 1 of 1

Date: August 2021
Project: 212IC-HN-01533

Prepared By: TETRA TECH



Drawn By: stephanie.aselage

Source: Topo - Copyright:© 2013 National Geographic Society, i-cubed; NWI - USFWS-NRCS, 2017

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FIGURE 4.

DELINEATED FEATURES WITHIN THE RUFFINO ROAD LANDFILL MINING PROJECT

HARRIS COUNTY, TEXAS

LEGEND

- Vegetation Data Point
- Upland Data Point
- Dry Ditch
- Delineated Pond
- Project Limits

N

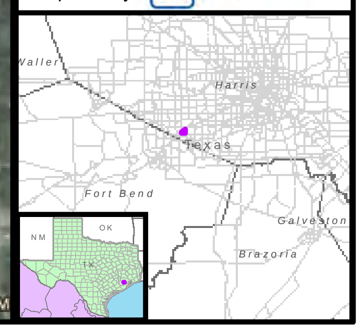
SCALE: 1 Inch = 500 feet

Feet 0 250 500

Sheet 1 of 1

Date: August 2021
Project: 212IC-HN-01533

Prepared By: TETRA TECH



\\etss706gisfs1\CORPArcGisShare\OGA\GIS_Info\00_Projects\HN\212IC-HN-01533_Raffino_Road_Landfill\MXD\Figure_4_DelineatedFeatures_Map_RaffinoRd_Landfill.mxd

Drawn By: stephanie.aselage

Source: Aerial - Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016; Soils - USDA-NRCS, 2016.

APPENDIX B

WETLAND DELINEATION DATA FORMS AND PHOTOGRAPHIC RECORD

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Ruffino Hills Landfill Relocation City/County: Houston/Harris Sampling Date: 7/21/2021

Applicant/Owner: Jones Carter Civil Engineering State: TX Sampling Point: U1A

Investigator(s): Jason Speights, Regina Sammon Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Plains Local relief (concave, convex, none): None Slope (%): 0-1%

Subregion (LRR or MLRA): LRR T Lat: 29.659690° Long: -95.546448° Datum: WGS 84

Soil Map Unit Name: Edna loam, 0 to 1 percent slopes NWI classification: PUBFx

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil Yes, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
The project area was the previous site of a golf course, but has since been used as a landfill. This portion that was surveyed contained landfill material for the landfill cap.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: U1A

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		
Herb Stratum (Plot size: 30')			
1. Sorghum halepense	50	Yes	FACU
2. Cynodon dactylon	30	Yes	FACU
3. Sesbania vesicaria	10	No	FAC
4. Paspalum notatum	10	No	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
50% of total cover: 50	20% of total cover: 20		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
50% of total cover: 0	20% of total cover: 0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: U1A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1	100					Clay loam	No redox
4-16	10YR 6/2	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Fill material for landfill cap.

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: U1A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021


North


East


West


South

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: U1A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Soil Sample

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Ruffino Hills Landfill Relocation City/County: Houston/Harris Sampling Date: 7/21/2021

Applicant/Owner: Jones Carter Civil Engineering State: TX Sampling Point: U2A

Investigator(s): Jason Speights, Regina Sammon Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Plains Local relief (concave, convex, none): None Slope (%): 0-1%

Subregion (LRR or MLRA): LRR T Lat: 29.657012° Long: -95.547757° Datum: WGS 84

Soil Map Unit Name: Bernard-Edna complex, 0 to 1 percent slopes NWI classification: PFO1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☒ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present? Yes X No ____ Depth (inches): 2-4 inches

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes X No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: U2A

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Triadica sebifera	10	No	FAC
2. Ulmus americana	20	Yes	FAC
3. Celtis occidentalis	40	Yes	FACU
4.			
5.			
6.			
7.			
8.			
	70	= Total Cover	
50% of total cover: 35	20% of total cover: 14		
Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex vomitoria	40	Yes	FAC
2. Celtis occidentalis	20	Yes	FACU
3. Triadica sebifera	20	Yes	FAC
4. Ulmus americana	15	No	FAC
5.			
6.			
7.			
8.			
	95	= Total Cover	
50% of total cover: 47.5	20% of total cover: 19		
Herb Stratum (Plot size: 30')			
1. Paspalum notatum	30	Yes	FACU
2. Paspalum urvillei	20	Yes	FAC
3. Setaria pumila	10	No	FAC
4. Eleocharis palustris	20	Yes	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80	= Total Cover	
50% of total cover: 40	20% of total cover: 16		
Woody Vine Stratum (Plot size: 30')			
1. Lonicera japonica	30	Yes	FACU
2. Toxicodendron radicans	20	Yes	FAC
3. Ampelopsis arborea	10	No	FAC
4.			
5.			
	80	= Total Cover	
50% of total cover: 40	20% of total cover: 16		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 10 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: U2A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 4/2	100					Clay loam	
6-16	10YR 4/1	100					Clay	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: U2A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021


North


East


West


South

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: U2A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Soil Sample

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Ruffino Hills Landfill Relocation City/County: Houston/Harris Sampling Date: 7/22/2021

Applicant/Owner: Jones Carter Civil Engineering State: TX Sampling Point: U3A

Investigator(s): Jason Speights, Regina Sammon Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): None Slope (%): 0-1%

Subregion (LRR or MLRA): LRR T Lat: 29.659953° Long: -95.552196° Datum: WGS 84

Soil Map Unit Name: Edna loam, 0 to 1 percent slopes NWI classification: None

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil Yes, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: U3A

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Ulmus americana	40	Yes	FAC
2. Celtis occidentalis	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	80	= Total Cover	
50% of total cover: 40	20% of total cover: 16		

Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex vomitoria	10	No	FAC
2. Celtis occidentalis	40	Yes	FACU
3. Ulmus americana	30	Yes	FAC
4.			
5.			
6.			
7.			
8.			
	80	= Total Cover	
50% of total cover: 40	20% of total cover: 16		

Herb Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	0	= Total Cover	
50% of total cover:	20% of total cover:		

Woody Vine Stratum (Plot size: 30')			
1. Smilax bona-nox	10	No	FAC
2. Ampelopsis arborea	10	No	FAC
3.			
4.			
5.			
	20	= Total Cover	
50% of total cover: 10	20% of total cover: 4		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: U3A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-16	2.5 Y 2.5/1	100					Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: U3A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021


North


East


West


South

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: U3A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

Soil Sample

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Ruffino Hills Landfill Relocation City/County: Houston/Harris Sampling Date: 7/22/2021

Applicant/Owner: Jones Carter Civil Engineering State: TX Sampling Point: U4A

Investigator(s): Jason Speights, Regina Sammon Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Plain Local relief (concave, convex, none): None Slope (%): 0-1%

Subregion (LRR or MLRA): LRR T Lat: 29.660748° Long: -95.551591° Datum: WGS 84

Soil Map Unit Name: Lake Charles clay, 0 to 1 percent slopes NWI classification: PEM1C

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation No, Soil No, or Hydrology No significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation No, Soil No, or Hydrology No naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: U4A

Tree Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Celtis occidentalis	50	Yes	FACU
2. Ulmus americana	20	Yes	FAC
3. Triadica sebifera	10	No	FAC
4.			
5.			
6.			
7.			
8.			
	80	= Total Cover	

50% of total cover: 40 20% of total cover: 16

Sapling/Shrub Stratum (Plot size: 15')			
1. Ilex vomitoria	20	Yes	FAC
2. Celtis occidentalis	40	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	60	= Total Cover	

50% of total cover: 30 20% of total cover: 12

Herb Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
		= Total Cover	

50% of total cover: 20% of total cover:

Woody Vine Stratum (Plot size:)			
1. Parthenocissus quinquefolia	30	Yes	FACU
2.			
3.			
4.			
5.			
	30	= Total Cover	

50% of total cover: 15 20% of total cover: 6

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☐ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: U4A

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100					Clay loam	
2-16	10YR 6/1	100					Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

[2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) **(LRR P, T, U)**
- ☐ 5 cm Mucky Mineral (A7) **(LRR P, T, U)**
- ☐ Muck Presence (A8) **(LRR U)**
- ☐ 1 cm Muck (A9) **(LRR P, T)**
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) **(MLRA 150A)**
- ☐ Sandy Mucky Mineral (S1) **(LRR O, S)**
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) **(LRR P, S, T, U)**
- ☐ Polyvalue Below Surface (S8) **(LRR S, T, U)**
- ☐ Thin Dark Surface (S9) **(LRR S, T, U)**
- ☐ Loamy Mucky Mineral (F1) **(LRR O)**
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) **(LRR U)**
- ☐ Depleted Ochric (F11) **(MLRA 151)**
- ☐ Iron-Manganese Masses (F12) **(LRR O, P, T)**
- ☐ Umbric Surface (F13) **(LRR P, T, U)**
- ☐ Delta Ochric (F17) **(MLRA 151)**
- ☐ Reduced Vertic (F18) **(MLRA 150A, 150B)**
- ☐ Piedmont Floodplain Soils (F19) **(MLRA 149A)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 149A, 153C, 153D)**

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) **(LRR O)**
- ☐ 2 cm Muck (A10) **(LRR S)**
- ☐ Reduced Vertic (F18) **(outside MLRA 150A,B)**
- ☐ Piedmont Floodplain Soils (F19) **(LRR P, S, T)**
- ☐ Anomalous Bright Loamy Soils (F20) **(MLRA 153B)**
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: U4A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021


North


East


West


South

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: U4A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

Soil Sample

APPENDIX C

WATERBODY IDENTIFICATION DATA FORMS AND PHOTOGRAPHIC RECORD

TETRA TECH

Water Resources Field Data Form — **Feature Identification No.** S1A

Project Name: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

OHWM Present: *Yes [X] **No [ ] ***If yes, is the feature: Stream [ ] Ditch [X]**

****If no, NHD feature confirmed not present and upland conditions exist [ ]**

Feature Information

Name/Feature ID: S1A

Water Flow Observed: Yes [ ] No [X]

Direction of Flow: N/A

Water Depth (in): N/A

Bank to Bank (ft): 20

OHWL (ft): 15

Ephemeral [X] Intermittent [ ] Perennial [ ]

Probed Stream Depth:

- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate:

- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [X] Silt (0.004-0.06 mm)
- [ ] Organic:
  - [ ] Detritus (sticks, wood, coarse plant materials)
  - [ ] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments)

Observed Water:

- [ ] Clear
- [ ] Slightly Turbid
- [X] Turbid
- [ ] Very Turbid
- [ ] N/A

Aquatic Habitat:

- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [ ] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [X] Other: N/A

Wildlife Observed (species):

- [ ] Waterfowl:
- [ ] Fish:
- [ ] Turtles:
- [ ] Frogs:
- [ ] Invertebrates:
- [ ] Salamanders:
- [ ] Other:
- [X] N/A

Observed Use:

- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other:

Left Bank *Height and Slope:

[ ] 0-3'	[ ] 0-20% (0-11°)
[X] 3-6'	[X] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Right Bank *Height and Slope:

[ ] 0-3'	[ ] 0-20% (0-11°)
[X] 3-6'	[X] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

***Direction when facing downstream**

Bank Substrate:

[ ] Shale [ ] Bedrock [ ] Cobble
[ ] Sand [X] Silt/Clay [ ] Organic
[ ] N/A

Erosion Potential:

- [X] Low
- [ ] Moderate
- [ ] High

Channel Meander:

- [X] Low
- [ ] Medium
- [ ] High

Recommended Stream Crossing Technique

- [ ] Directional Drill
- [ ] Pump around with coffer dams
- [ ] Flume
- [ ] Open-cut
- [ ] Other:
- [X] N/A:

TETRA TECH

Feature Info. Continued **Feature Identification No.** S1A

Adjacent Vegetation Type: Forested

Dominant Vegetative Species:

Trees: Celtis occidentalis, Ulmus americana, Ulmus crassifolia

Shrubs: Ligustrum sinense, Ulmus crassifolia, Ilex vomitoria

Herbs: N/A

Estimated % of canopy cover over channel: [ ] 0-25% [ ] 26-50% [ ] 52-75% [X] 76-100%

Predominant Surrounding Land Use:

[ ] Forest [ ] Field/Pasture [ ] Agriculture [X] Commercial [ ] Industrial [X] Residential

[ ] Other:

Presence of threatened/endangered species (fish, reptiles, or amphibians)?

[ ] Unknown [X] No [ ] Yes (identify):

If a FERC Regulated Project:

Spring Information:	**Water Well Information:**
Within 150' of CROW: *Yes [ ] No [ ] ***If yes:** Private [ ] Public [ ]	Within 150' of CROW: *Yes [ ] No [ ] ***If yes:** Private [ ] Public [ ]
Approximate distance and direction from centerline (ft): _____	Approximate distance and direction from centerline (ft): _____
Associated Wetland: *Yes [ ] No [ ] ***If yes**: data form no.: _____	Surrounding Land Use: _____
Surrounding Land Use: _____	

Notes:

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: S1A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

West

East

TETRA TECH

Water Resources Field Data Form | **Feature Identification No.**

Project Name: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

OHWM Present: *Yes [X] **No [ ] ***If yes, is the feature: Stream [ ] Ditch [X]**

****If no, NHD feature confirmed not present and upland conditions exist [ ]**

Feature Information

Name/Feature ID: S2A

Water Flow Observed: Yes [X] No [ ]

Direction of Flow: South

Water Depth (in): 2-4

Bank to Bank (ft): 12

OHWL (ft): 6

Ephemeral [X] Intermittent [ ] Perennial [ ]

Probed Stream Depth:

- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate:

- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [X] Silt (0.004-0.06 mm)
- [ ] Organic:
  - [ ] Detritus (sticks, wood, coarse plant materials)
  - [ ] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments)

Observed Water:

- [ ] Clear
- [ ] Slightly Turbid
- [X] Turbid
- [ ] Very Turbid
- [ ] N/A

Aquatic Habitat:

- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [ ] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [X] Other: N/A

Wildlife Observed (species):

- [ ] Waterfowl:
- [ ] Fish:
- [ ] Turtles:
- [ ] Frogs:
- [ ] Invertebrates:
- [ ] Salamanders:
- [ ] Other:
- [X] N/A

Observed Use:

- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other:

Left Bank *Height and Slope:

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Right Bank *Height and Slope:

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

***Direction when facing downstream**

Bank Substrate:

[ ] Shale [ ] Bedrock [ ] Cobble
[ ] Sand [X] Silt/Clay [ ] Organic
[ ] N/A

Erosion Potential:

- [X] Low
- [ ] Moderate
- [ ] High

Channel Meander:

- [X] Low
- [ ] Medium
- [ ] High

Recommended Stream Crossing Technique

- [ ] Directional Drill
- [ ] Pump around with coffer dams
- [ ] Flume
- [ ] Open-cut
- [ ] Other:
- [X] N/A:

TETRA TECH

Feature Info. Continued **Feature Identification No.** S2A

Adjacent Vegetation Type: Maintained Field

Dominant Vegetative Species:

Trees: Celtis occidentalis, Salix nigra

Shrubs: Ligustrum sinense, Ulmus crassifolia, Salix nigra

Herbs: Persicaria hydropiperoides, Cynodon dactylon

Estimated % of canopy cover over channel: [X] **0-25%** [ ] **26-50%** [ ] **52-75%** [X] **76-100%**

Predominant Surrounding Land Use:

[ ] Forest [ ] Field/Pasture [ ] Agriculture [X] Commercial [ ] Industrial [X] Residential

[ ] Other:

Presence of threatened/endangered species (fish, reptiles, or amphibians)?

[ ] Unknown [X] No [ ] Yes (identify):

If a FERC Regulated Project:

Spring Information:

Within 150' of CROW: *Yes [ ] No [ ] ***If yes:** Private [ ] Public [ ]

Approximate distance and direction from centerline (ft): _____

Associated Wetland: *Yes [ ] No [ ] ***If yes**: data form no.: _____

Surrounding Land Use: _____

Water Well Information:

Within 150' of CROW: *Yes [ ] No [ ] ***If yes:** Private [ ] Public [ ]

Approximate distance and direction from centerline (ft): _____

Surrounding Land Use: _____

Notes:

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: S2A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

North

South

TETRA TECH

Water Resources Field Data Form — **Feature Identification No.** S3A

Project Name: Ruffino Hills Landfill Relocation

Date: 7/22/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

OHWM Present: *Yes [X] **No [ ] ***If yes, is the feature: Stream [ ] Ditch [X]**

****If no, NHD feature confirmed not present and upland conditions exist [ ]**

Feature Information

Name/Feature ID: S3A

Water Flow Observed: Yes [ ] No [X]

Direction of Flow: South

Water Depth (in): 0-1

Bank to Bank (ft): 6-8

OHWL (ft): 4

Ephemeral [X] Intermittent [ ] Perennial [ ]

Probed Stream Depth:

- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate:

- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [X] Silt (0.004-0.06 mm)
- [ ] Organic:
  - [X] Detritus (sticks, wood, coarse plant materials)
  - [ ] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments)

Observed Water:

- [ ] Clear
- [ ] Slightly Turbid
- [ ] Turbid
- [ ] Very Turbid
- [X] N/A

Aquatic Habitat:

- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [ ] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [X] Other: N/A

Wildlife Observed (species):

- [ ] Waterfowl:
- [ ] Fish:
- [ ] Turtles:
- [ ] Frogs:
- [ ] Invertebrates:
- [ ] Salamanders:
- [ ] Other:
- [X] N/A

Observed Use:

- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other:

Left Bank *Height and Slope:

- [X] 0-3'
- [ ] 3-6'
- [ ] 6'+
- [X] 0-20% (0-11°)
- [ ] 21-50% (12-27°)
- [ ] 51-100% (28-45°)

Right Bank *Height and Slope:

- [X] 0-3'
- [ ] 3-6'
- [ ] 6'+
- [X] 0-20% (0-11°)
- [ ] 21-50% (12-27°)
- [ ] 51-100% (28-45°)

***Direction when facing downstream**

Bank Substrate:

- [ ] Shale [ ] Bedrock [ ] Cobble
- [ ] Sand [X] Silt/Clay [ ] Organic
- [ ] N/A

Erosion Potential:

- [X] Low
- [ ] Moderate
- [ ] High

Channel Meander:

- [X] Low
- [ ] Medium
- [ ] High

Recommended Stream Crossing Technique

- [ ] Directional Drill
- [ ] Pump around with coffer dams
- [ ] Flume
- [ ] Open-cut
- [ ] Other:
- [X] N/A:

TETRA TECH

Feature Info. Continued **Feature Identification No.** S2A

Adjacent Vegetation Type: Forested

Dominant Vegetative Species:

Trees: Celtis occidentalis, Ulmus americana

Shrubs: Ligustrum sinense, Ulmus americana, Ilex vomitoria

Herbs: Greenbriar, Virginia briar

Estimated % of canopy cover over channel: ☒ **0-25%** [ ] **26-50%** ☒ **52-75%** ☒ **76-100%**

Predominant Surrounding Land Use:

[ ] Forest [ ] Field/Pasture [ ] Agriculture ☒ Commercial [ ] Industrial ☒ Residential

[ ] Other:

Presence of threatened/endangered species (fish, reptiles, or amphibians)?

[ ] Unknown ☒ No [ ] Yes (identify):

If a FERC Regulated Project:

Spring Information:

Within 150' of CROW: *Yes [ ] No [ ] ***If yes:** Private [ ] Public [ ]

Approximate distance and direction from centerline (ft): _____

Associated Wetland: *Yes [ ] No [ ] ***If yes**: data form no.: _____

Surrounding Land Use: _____

Water Well Information:

Within 150' of CROW: *Yes [ ] No [ ] ***If yes:** Private [ ] Public [ ]

Approximate distance and direction from centerline (ft): _____

Surrounding Land Use: _____

Notes:

Photographic Record

Company: Jones Carter Civil Engineering

Photographer: Regina Sammon

Location: Houston/Harris County

Feature ID: S3A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

South

APPENDIX D

POND IDENTIFICATION DATA FORMS AND PHOTOGRAPHIC RECORD

TETRA TECH

Water Resources Field Data Form — **Feature Identification No.** P1A

Project Name: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

Manmade [X] Natural [ ]

Feature Information

Does Feature Cross Centerline:
[ ] Yes [ ] No

Facing centerline, from what direction is data being recorded: [ ] North [ ] East [ ] South [ ] West

Feature Width:

water depth:	3	ft.
bank to bank:	200	ft.
ordinary high water line:	150	ft.

Perennial [X] Intermittent [ ] Ephemeral [ ]

Probed Pond Depth
- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate
- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [ ] Silt (0.004-0.06 mm)
- [X] Clay (<0.004 mm, slick)
- [ ] Organic:
  - [ ] Detritus (sticks, wood, coarse plant materials)
  - [X] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments)

Observed Water Quality
- [ ] Clear
- [ ] Slightly Turbid
- [X] Turbid
- [ ] Very Turbid
- [ ] N/A

Aquatic Habitat
- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [X] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [ ] Other: _____

Wildlife Observed (species)
- [ ] Waterfowl _____
- [X] Fish _____
- [X] Turtles _____
- [X] Frogs _____
- [ ] Invertebrates _____
- [ ] Salamanders _____
- [ ] Other: _____
- [ ] N/A

Observed Use
- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other: _____

Left Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Right Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Bank Substrate

[ ] Shale	[ ] Sand
[ ] Bedrock	[X] Silt/Clay
[ ] Cobble	[ ] Organic

Erosion Potential
- [X] Low
- [ ] Moderate
- [ ] High

Recommended Pond Crossing Technique

[ ] Directional drill	[ ] Flume	[ ] Other: _____
[ ] Pump around with coffer dams	[ ] Open-cut	[X] N/A: _____

Feature Info. Cont'd **Feature Identification No.** P1A

Adjacent Vegetation Type: Maintained field

Dominant Vegetative Species:

Trees: Salix nigra, Celtis occidentalis, Triadica sebifera

Shrubs: Morella cerifera, Baccharis halimifolia, Salix nigra

Herbs: Stenotaphrum secundatum, paspalum urvillei, Mimosa pudica, Cynodon dactylon

Estimated % of canopy closure over pond:

[X] 0-25% | | 26-50% | | 51-75% | | 76-100%

Presence of threatened/endangered species (fish, plants, reptiles, or amphibians)?

[ ] Unknown [X] No [ ] Yes (identify): _____

Predominant Surrounding Land Use:

[ ] Forest [ ] Field/Pasture [ ] Agriculture [X] Commercial [ ] Industrial [X] Residential

[ ] Other: _____

If a FERC Regulated Project:

Spring Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and direction from centerline: _____

Associated Wetland [ ] Yes: Data Form No. _____

[ ] No

Surrounding Land Use: _____

Associated Vegetation Type: _____

Water Well Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and directions from centerline: _____

Surrounding Land Use: _____

Notes/Constructability Issues:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: P1A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

South

Southwest

TETRA TECH

Water Resources Field Data Form — **Feature Identification No.** P2A

Project Name: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

Manmade [X] Natural [ ]

Feature Information

Does Feature Cross Centerline:
[ ] Yes [ ] No

Facing centerline, from what direction is data being recorded: [ ] North [ ] East [ ] South [ ] West

Feature Width:

water depth:	3	ft.
bank to bank:	100	ft.
ordinary high water line:	75	ft.

Perennial [X] Intermittent [ ] Ephemeral [ ]

Probed Pond Depth
- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate
- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [ ] Silt (0.004-0.06 mm)
- [X] Clay (<0.004 mm, slick)
- [ ] Organic:
  - [ ] Detritus (sticks, wood, coarse plant materials)
  - [X] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments)

Observed Water Quality
- [ ] Clear
- [ ] Slightly Turbid
- [X] Turbid
- [ ] Very Turbid
- [ ] N/A

Aquatic Habitat
- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [X] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [ ] Other: _____

Wildlife Observed (species)
- [ ] Waterfowl _____
- [X] Fish _____
- [X] Turtles _____
- [X] Frogs _____
- [ ] Invertebrates _____
- [ ] Salamanders _____
- [ ] Other: _____
- [ ] N/A

Observed Use
- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other: _____

Left Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Right Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Bank Substrate

[ ] Shale	[ ] Sand
[ ] Bedrock	[X] Silt/Clay
[ ] Cobble	[ ] Organic

Erosion Potential
- [X] Low
- [ ] Moderate
- [ ] High

Recommended Pond Crossing Technique

[ ] Directional drill	[ ] Flume	[ ] Other: _____
[ ] Pump around with coffer dams	[ ] Open-cut	[X] N/A: _____

Feature Info. Cont'd **Feature Identification No.** P2A

Adjacent Vegetation Type: Maintained field

Dominant Vegetative Species:

Trees: Salix Nigra, Celtis occidentalis, Triadica sebifera

Shrubs: Salix nigra, Baccharis halimifolia

Herbs: Sorghum halepense, Paspalum urvillei, Ampelopsis arborea, Mimosa pudica, Cynodon dactylon

Estimated % of canopy closure over pond:

[X] 0-25% | [ ] 26-50% | [ ] 51-75% | [ ] 76-100%

Presence of threatened/endangered species (fish, plants, reptiles, or amphibians)?

[ ] Unknown [X] No [ ] Yes (identify): _____

Predominant Surrounding Land Use:

[ ] Forest [ ] Field/Pasture [ ] Agriculture [X] Commercial [ ] Industrial [X] Residential

[ ] Other: _____

If a FERC Regulated Project:

Spring Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and direction from centerline: _____

Associated Wetland [ ] Yes: Data Form No. _____

[ ] No

Surrounding Land Use: _____

Associated Vegetation Type: _____

Water Well Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and directions from centerline: _____

Surrounding Land Use: _____

Notes/Constructability Issues:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: P2A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Northwest

Northeast

TETRA TECH

Water Resources Field Data Form — **Feature Identification No.** P3A

Project Name: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

Manmade [X] Natural [ ]

Feature Information

Does Feature Cross Centerline:
[ ] Yes [ ] No

Facing centerline, from what direction is data being recorded: [ ] North [ ] East [ ] South [ ] West

Feature Width:

water depth:	3	ft.
bank to bank:	75	ft.
ordinary high water line:	65	ft.

Perennial [X] Intermittent [ ] Ephemeral [ ]

Probed Pond Depth
- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate
- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [ ] Silt (0.004-0.06 mm)
- [X] Clay (<0.004 mm, slick)
- [ ] Organic:
  - [ ] Detritus (sticks, wood, coarse plant materials)
  - [X] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments

Observed Water Quality
- [ ] Clear
- [ ] Slightly Turbid
- [X] Turbid
- [ ] Very Turbid
- [ ] N/A

Aquatic Habitat
- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [X] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [ ] Other: _____

Wildlife Observed (species)
- [ ] Waterfowl _____
- [X] Fish _____
- [X] Turtles _____
- [X] Frogs _____
- [ ] Invertebrates _____
- [ ] Salamanders _____
- [ ] Other: _____
- [ ] N/A

Observed Use
- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other: _____

Left Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Right Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Bank Substrate

[ ] Shale	[ ] Sand
[ ] Bedrock	[X] Silt/Clay
[ ] Cobble	[ ] Organic

Erosion Potential
- [X] Low
- [ ] Moderate
- [ ] High

Recommended Pond Crossing Technique

[ ] Directional drill	[ ] Flume	[ ] Other: _____
[ ] Pump around with coffer dams	[ ] Open-cut	[X] N/A: _____

Feature Info. Cont'd **Feature Identification No.** P3A

Adjacent Vegetation Type: Maintained field

Dominant Vegetative Species:

Trees: Salix nigra, Celtis occidentalis, Triadica sebifera

Shrubs: Ligustrum sinense, Salix nigra, Myrica cerifera, Baccharis halimifolia

Herbs: St. Augustine, Peppervine, vasy grass, mimosa, Bermuda, green bristle grass, Johnson gra
Poison ivy

Estimated % of canopy closure over pond:
| | 0-25% | X | 26-50% | | | 51-75% | | | 76-100%

Presence of threatened/endangered species (fish, plants, reptiles, or amphibians)?
[ ] Unknown [X] No [ ] Yes (identify): _____

Predominant Surrounding Land Use:
[ ] Forest [ ] Field/Pasture [ ] Agriculture [X] Commercial [ ] Industrial [X] Residential
[ ] Other: _____

If a FERC Regulated Project:

Spring Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and direction from centerline: _____

Associated Wetland [ ] Yes: Data Form No. _____
[ ] No

Surrounding Land Use: _____

Associated Vegetation Type: _____

Water Well Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and directions from centerline: _____

Surrounding Land Use: _____

Notes/Constructability Issues:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: P3A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

West

South

TETRA TECH

Water Resources Field Data Form — **Feature Identification No.** P4A

Project Name: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Surveyors: Jason Speights, Regina Sammon

County/State: Harris/TX

Township/Range/Section (if applicable): N/A

Manmade [X] Natural [ ]

Feature Information

Does Feature Cross Centerline:
[ ] Yes [ ] No

Facing centerline, from what direction is data being recorded: [ ] North [ ] East [ ] South [ ] West

Feature Width:

water depth:	3	ft.
bank to bank:	290	ft.
ordinary high water line:	260	ft.

Perennial [X] Intermittent [ ] Ephemeral [ ]

Probed Pond Depth
- [X] 0-6"
- [ ] 7-12"
- [ ] 13-24"
- [ ] 25-36"
- [ ] >36"

Bottom Substrate
- [ ] Shale
- [ ] Bedrock
- [ ] Boulder (> 256 mm or 10" diameter)
- [ ] Cobble (64-256 mm or 2.5"-10" diameter)
- [ ] Gravel (2-64 mm or 0.1"-2.5" diameter)
- [ ] Sand (0.06-2 mm diameter, gritty)
- [ ] Silt (0.004-0.06 mm)
- [X] Clay (<0.004 mm, slick)
- [ ] Organic:
  - [ ] Detritus (sticks, wood, coarse plant materials)
  - [X] Muck-Mud (black, very fine organic)
  - [ ] Marl (grey, shell fragments

Observed Water Quality
- [ ] Clear
- [ ] Slightly Turbid
- [X] Turbid
- [ ] Very Turbid
- [ ] N/A

Aquatic Habitat
- [ ] Sand Bar
- [ ] Sand/Gravel Beach Bar
- [ ] Mud Bar
- [ ] Overhanging Trees/Shrubs
- [ ] Cobble Riffles
- [X] Deep Pods/Holes
- [ ] Aquatic Vegetation
- [ ] Other: _____

Wildlife Observed (species)
- [ ] Waterfowl _____
- [X] Fish _____
- [X] Turtles _____
- [X] Frogs _____
- [ ] Invertebrates _____
- [ ] Salamanders _____
- [ ] Other: _____
- [ ] N/A

Observed Use
- [ ] Drinking
- [ ] Irrigation
- [ ] Swimming
- [ ] Fishing
- [X] Drainage
- [ ] Boating
- [ ] Other: _____

Left Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Right Bank Height and Slope

[X] 0-3'	[X] 0-20% (0-11°)
[ ] 3-6'	[ ] 21-50% (12-27°)
[ ] 6'+	[ ] 51-100% (28-45°)

Bank Substrate

[ ] Shale	[ ] Sand
[ ] Bedrock	[X] Silt/Clay
[ ] Cobble	[ ] Organic

Erosion Potential
- [X] Low
- [ ] Moderate
- [ ] High

Recommended Pond Crossing Technique

[ ] Directional drill	[ ] Flume	[ ] Other: _____
[ ] Pump around with coffer dams	[ ] Open-cut	[X] N/A: _____

Feature Info. Cont'd **Feature Identification No.** P4A

Adjacent Vegetation Type: Maintained field

Dominant Vegetative Species:

Trees: Salix nigra, Ulmus americana, Celtis occidentalis

Shrubs: Wax myrtle, Baccharis halimifolia, Salix nigra, Triadica sebifera

Herbs: Cynodon dactylon, Rumex crispus

Estimated % of canopy closure over pond:

| | 0-25% | X | 26-50% | | | 51-75% | | | 76-100%

Presence of threatened/endangered species (fish, plants, reptiles, or amphibians)?

[ ] Unknown [X] No [ ] Yes (identify): _____

Predominant Surrounding Land Use:

[ ] Forest [ ] Field/Pasture [ ] Agriculture [X] Commercial [ ] Industrial [X] Residential
[ ] Other: _____

If a FERC Regulated Project:

Spring Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and direction from centerline: _____

Associated Wetland [ ] Yes: Data Form No. _____
[ ] No

Surrounding Land Use: _____

Associated Vegetation Type: _____

Water Well Information:

Within 150' of CROW: [ ] Yes [ ] No **If yes:** [ ] Private [ ] Public

Approximate distance and directions from centerline: _____

Surrounding Land Use: _____

Notes/Constructability Issues:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: P4A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

Southeast

Northeast

APPENDIX E

VEGETATION DATA FORMS AND PHOTOGRAPHIC RECORD

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/21/2021	**Sample Point:** V1A
General Habitat Type: Herbaceous Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1. Carya texana	5	20
2.		
3.		
4.		
5.		
Total Cover:	5%	
Shrub Stratum (Plot Size: 15')		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
Total Cover:	0%	
Herb Stratum (Plot Size: 5')		
1. Sorghum halepense	30	4
2. Phyla nodiflora	20	1
3. Mimosa pudica	10	1
4. Cynodon dactylon	40	1
5.		
6.		
7.		
Total Cover:	100%	
Woody Vine Stratum (Plot Size: 30')		
1. Ampelopsis arborea	20	2
2. Vitis rotundifolia	10	2
Total Cover:	30%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V1A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/21/2021	**Sample Point:** V2A
General Habitat Type: Herbaceous Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1. Celtis occidentalis	10	20
2.		
3.		
4.		
5.		
Total Cover:	10%	
Shrub Stratum (Plot Size: 15')		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
Total Cover:	0	
Herb Stratum (Plot Size: 5')		
1. Sorghum halepense	50	5
2. Mimosa pudica	10	1
3. Cynodon dactylon	20	1
4. Eleocharis palustris	10	1
5.		
6.		
7.		
Total Cover:	90%	
Woody Vine Stratum (Plot Size: 30')		
1. Ampelopsis arborea	20	3
2.		
Total Cover:	20%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V2A

Project: Ruffino Hills Landfill Relocation

Date: 7/21/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/22/2021	**Sample Point:** V3A
General Habitat Type: Scrub-Shrub Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1. Pinus taeda	20	30
2. Celtis occidentalis	10	20
3.		
4.		
5.		
Total Cover:	30%	
Shrub Stratum (Plot Size: 15')		
1. Ligustrum sinense	40	8
2. Celtis occidentalis	20	10
3. Ilex vomitoria	10	6
4. Ulmus crassifolia	10	10
5.		
6.		
7.		
Total Cover:	80%	
Herb Stratum (Plot Size: 5')		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
Total Cover:		
Woody Vine Stratum (Plot Size: 30')		
1. Ampelopsis arborea	20	2
2. Toxicodendron radicans	20	4
Total Cover:	40%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V3A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/22/2021	**Sample Point:** V4A
General Habitat Type: Herbaceous Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1.		
2.		
3.		
4.		
5.		
Total Cover:	0%	
Shrub Stratum (Plot Size: 15')		
1. Baccharis halimifolia	40	6
2. Cornus drummondii	20	8
3.		
4.		
5.		
6.		
7.		
Total Cover:	60%	
Herb Stratum (Plot Size: 5')		
1. Solidago altissima	60	4
2. Schizachyrium scoparium	40	2
3.		
4.		
5.		
6.		
7.		
Total Cover:	100%	
Woody Vine Stratum (Plot Size: 30')		
1. Vitis rotundifolia	40	6
2. Ampelopsis arborea	30	3
Total Cover:	70%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V4A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/22/2021	**Sample Point:** V5A
General Habitat Type: Scrub-Shrub Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1. Celtis occidentalis	60	20
2.		
3.		
4.		
5.		
Total Cover:	60%	
Shrub Stratum (Plot Size: 15')		
1. Ligustrum sinense	30	8
2. Ilex vomitoria	10	6
3.		
4.		
5.		
6.		
7.		
Total Cover:	40%	
Herb Stratum (Plot Size: 5')		
1. Solidago altissima	60	2
2. Ambrosia psilostachya	20	2
3. Schizachyrium scoparium		1
4.		
5.		
6.		
7.		
Total Cover:	80%	
Woody Vine Stratum (Plot Size: 30')		
1. Lonicera japonica	30	4
2. Vitis rotundifolia	20	4
Total Cover:	50%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V5A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/22/2021	**Sample Point:** V6A
General Habitat Type: Scrub-Shrub Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1. Celtis occidentalis	50	25
2.		
3.		
4.		
5.		
Total Cover:	50%	
Shrub Stratum (Plot Size: 15')		
1. Ligustrum sinense	40	10
2.		
3.		
4.		
5.		
6.		
7.		
Total Cover:	40%	
Herb Stratum (Plot Size: 5')		
1. Solidago altissima	70	3
2. Ambrosia psilostachya	20	2
3.		
4.		
5.		
6.		
7.		
Total Cover:	90%	
Woody Vine Stratum (Plot Size: 30')		
1. Campsis radicans	35	12
2. Ampelopsis arborea	20	4
Total Cover:	55%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes: Forested/scrub shrub mosaic

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V6A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/22/2021	**Sample Point:** V7A
General Habitat Type: Scrub-Shrub Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1. Celtis occidentalis	40	20
2. Ligustrum sinense	15	16
3.		
4.		
5.		
Total Cover:	55%	
Shrub Stratum (Plot Size: 15')		
1. Celtis occidentalis	30	12
2. Triadica sebifera	20	12
3. Ilex vomitoria	10	8
4.		
5.		
6.		
7.		
Total Cover:	60%	
Herb Stratum (Plot Size: 5')		
1. Solidago altissima	60	3
2. Ambrosia psilostachya	10	2
3. Mimosa pudica	10	1
4.		
5.		
6.		
7.		
Total Cover:	80%	
Woody Vine Stratum (Plot Size: 30')		
1. Campsis radicans	20	6
2. Ampelopsis arborea	10	4
Total Cover:	30%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V7A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

East

West

South

VEGETATION DATA FORM

Project: Ruffino Hills Landfill Relocation	**County:** Harris
Date: 7/22/2021	**Sample Point:** V8A
General Habitat Type: Herbaceous Upland	

DOMINANT VEGETATION		
Tree Stratum (Plot Size: 30')	**% Cover**	**Height (ft.)**
1.		
2.		
3.		
4.		
5.		
Total Cover:	0%	
Shrub Stratum (Plot Size: 15')		
1.		
2.		
3.		
4.		
5.		
6.		
7.		
Total Cover:	0%	
Herb Stratum (Plot Size: 5')		
1. Cynodon dactylon	30	2
2. Sorghum halepense	20	3
3. Solidago altissima	20	2
4. Ambrosia psilostachya	20	2
5. Eleocharis palustris	10	1
6.		
7.		
Total Cover:	100%	
Woody Vine Stratum (Plot Size: 30')		
1.		
2.		
Total Cover:	0%	

Definitions of Habitat Type:

Forested Upland – Upland areas with a canopy primarily composed of trees; woody vegetation is typically thick.
Scrub-Shrub Upland – Upland areas with a canopy primarily composed of shrubs or saplings. Vegetation ranges from being open to moderately thick.
Herbaceous Upland – Upland areas primarily devoid of woody vegetation (or with minimal woody vegetation). Vegetation typically dominated by grasses and forbs.
Agriculture – Fields used annually for crop growing. Most are very large areas with no medians or boundaries, except for intersecting roads.
Pastureland – Land used for grazing livestock.
Other – Please see description in the "Notes" section below.

Definitions of Vegetation Strata:

Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Shrub – Woody plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size. Include woody plants, except woody vines, less than approximately 3 ft. (1 m) in height.
Woody vine – All woody vines, regardless of height.

Notes:

Photographic Record

Company: Jones Carter Civil Engineering
Photographer: Regina Sammon
Location: Houston/Harris County
Feature ID: V8A

Project: Ruffino Hills Landfill Relocation

Date: 7/22/2021

North

East

West

South

Attachment II–7 Copies of Coordination Letters and Responses

Norstrom, Jim

From: [redacted]
Sent: Monday, August 2, 2021 4:57 PM
To: Norstrom, [redacted]
Subject: Section 106 Submission

Re: Project Review under the Antiquities Code of Texas
THC Tracking #202112317
Date: 08/02/2021
City of Houston - Ruffino Road Landfills
9800 Ruffino Road
Houston,TX

Description: proposed Type IX Landfill Mining project

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the Executive Director of the Texas Historical Commission (THC), pursuant to review under the Antiquities Code of Texas.

The review staff, led by Bill Martin, has completed its review and has made the following determinations based on the information submitted for review:

Archeology Comments

- No effect on identified archeological sites or other cultural resources. However, if cultural materials are encountered during project activities, work should cease in the immediate area; work can continue where no cultural materials are present. Please contact the THC's Archeology Division at 512-463-6096 to consult on further actions that may be necessary to protect the cultural remains.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If the project changes, or if new historic properties are found, please contact the review staff. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: bill.martin@thc.texas.gov.

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit http://thc.texas.gov/etrac-system.

Sincerely,

for Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

cc [redacted]

Norstrom, Jim

From: Samir Goe[redacted]
Sent: Tuesday, October 12, 2021 11:23 AM
To: Norstrom, Jim
Cc: 'Emily Moran'; Colby Wright; Gayatri Bitracanti; Robert Pedersen
Subject: RE: Ruffino Road Landfill Mining Project - Transportation Study Submittal

Jim,

We do not have objections to the proposed vehicle usage projected to use the surrounding transportation network as a result of this application.

Thank you,
Samir K. Goel, P.E.
TxDOT Houston District Traffic Engineering
Work: (713) 802-5498
Email: Samir.Goel@txdot.gov

From: Norstrom,[redacted]
Sent: Thursday, September 16, 2021 5:00 PM
Cc[redacted]
Subject: RE: Ruffino Road Landfill Mining Project - Transportation Study Submittal

The TCEQ reviewers for our project are Ms. Gayatri Bitracanti and Mr. Robert Pedersen.
The complete Type IX Landfill Mining Registration Application has not been submitted yet.
Your response to the traffic study is supposed to be part of our application when submitted.
Please let me know if I can provide more information about the proposed project.

Thanks for your review.

Jim Norstrom, P.E. | Senior Project Manager
Cell **936-202-0746** | Direct 832-251-5165 | Main 832-251-5160 | Fax 713-784-2962[redacted]

Tetra Tech | *Leading with Science®*
1500 CityWest Boulevard, Suite 1000 | Houston, TX 77042 | tetratech.com

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From: Emily Moran[redacted]
Sent: Thursday, September 16, 2021 4:27 PM
Cc: Colby Wrigl[redacted]
Subject: Ruffino Road Landfill Mining Project - Transportation Study Submittal

Good afternoon, we have completed the Transportation Study as required for the TCEQ application for the Ruffino Road Landfill Mining Project. I have attached the completed study which includes a memo at the beginning of the document describing the purpose of the submittal. Can you aid in getting the submittal of this study processed and reviewed?

Please let me know if you have any questions related to the submittal or Transportation Study.

Thanks,
Emily F. Moran, P.E., PTOE
Project Engineer
[redacted]

JONES | CARTER
6330 West Loop South, Suite 150
Bellaire, Texas 77401
Telephone 713.777.5337, Ext. 2361
Direct 346.231.0861
[redacted]

TETRA TECH

September 7, 2021

Ms. Cheryl Mergo
Solid Waste Program Coordinator
Houston-Galveston Area Council of Governments
P.O. Box 22777
Houston, Texas 77227-2777

Subject: Regional Solid Waste Management Plan Review by Local Council of Governments
MSW TYPE IX Landfill Mining Registration Application
Ruffino Road Landfills – Houston, Harris County, Texas

Dear Ms. Mergo:

On behalf of the City of Houston, Tetra Tech (TT) plans to submit a Type IX Registration Application to the TCEQ Solid Waste Permits Division for the proposed Ruffino Road Landfill Mining Project. The proposed project is located in Houston and Harris County, Texas at 9610 Ruffino Road, Houston, TX 77031. A General Location Map is enclosed with Parts I and II of the application.

The City of Houston's objective for this project is to excavate and relocate all buried waste from the closed City of Bellaire and City of West University Landfills (permits 1238 and 1250 voluntarily revoked) to allow construction of a stormwater detention pond to reduce future flooding along Keegans Bayou (adjacent to the site's north side) and Brays Bayou (downstream). With the Type IX Registration, the City plans to recover much of the soil from excavations for beneficial use.

Under 30 TAC Section 330.6l (p), the applicant is required to submit Parts I and II of the application to the applicable Council of Governments for review and confirmation that the proposed project is consistent with regional solid waste plans. If you find that the project is consistent with your solid waste plan, please respond via email to [redacted]

Or, if you have any questions about the project or would like to visit the site, please email or call me at 936-202-0746.

Sincerely,

Jim Norstrom, P.E.
Senior Project Manager

Attachment - Type IX Registration Application Parts I & II

cc: Paresh Lad – City of Houston Public Works, Transportation and Drainage Operations
Martin Murdock – Jones | Carter

Tetra Tech
1500 CityWest Boulevard, Suite 1000, Houston, TX 77042
Cell 936-202-0746 Tel 832-251-5160[redacted]

Attachment II–8 Endangered Species Report

August 13, 2021

Mr. Martin Murdock
Jones Carter Civil Engineering
6330 West Loop South, Suite 150
Bellaire, Texas 77401

Re: Jones Carter Civil Engineering
Ruffino Hills Landfill Relocation Project
Harris County, Texas
Federal and State Listed Species Assessment

At the request of Jones Carter Civil Engineering (Jones Carter), Tetra Tech, Inc. (Tetra Tech) conducted desktop evaluations and an in-field pedestrian survey for potential habitat for federally- and state-listed threatened and endangered (T&E) species with potential to occur in the vicinity of the proposed Ruffino Hills Landfill Relocation Project (Project) in Harris County, Texas (TX) (see Site Location Map, Figure 1) to provide information needed to develop species-specific impact assessments associated with Project implementation. The purpose of this Federal and State Listed Species Assessment is to assess and document Project compliance with Section 7 and Section 10 of the Endangered Species Act of 1973 (ESA), the Migratory Bird Treaty Act of 1918 (MBTA), the Bald and Golden Eagle Protection Act of 1940 (BGEPA), and Subchapter G, Sections 65.171 – 65.176 of the Texas Administrative Code.

1.0 Project Purpose and Description

Jones Carter, on behalf of the City of Houston, will be performing project planning for the proposed landfill relocation activities at the existing Ruffino Hills Landfill, located near the interchange of the Southwest Freeway (I-69/SH 59) and the Sam Houston Tollway (Beltway 8) (see Site Location Map, Appendix A, Figure 1). The City of Houston plans to transfer existing waste to other landfill waste facilities and ultimately convert the existing property to a stormwater retention facility. To prepare the property for the proposed use as a stormwater retention facility, the City of Houston proposes to excavate all landfill waste on site and clear the property of vegetation. Once the excavation and vegetation clearing activities are complete, and the property has been adequately prepared, the City of Houston will construct the proposed stormwater retention facilities. This Federal and State Listed Species Assessment (FSLSA) will support necessary Texas Commission on Environmental Quality (TCEQ) permitting of the proposed activities.

The survey area (Survey Area) for the Project was comprised of a 145-acre parcel that currently contains areas historically used as landfill sites, a waste transfer station, and a scale house.

2.0 Existing Environmental Habitats and Conditions

Prior to the onsite evaluation, Tetra Tech consulted available aerial imagery and readily available background hardcopy and on-line resources to assess existing conditions and develop a preliminary map of habitats to guide the in-field survey. During field surveys, Tetra Tech biologists

conducted vegetation/habitat and land use characterization surveys within the Project area. This included rare, threatened, or endangered species (RTE) potential habitat observations, characterization, and assessment information and evidence of wildlife use – avian stick nests, bird rookeries, and animal burrows. Surveys were completed by conducting meandering transects across the property, with data collected for each of the identified habitat types on site.

Outside the areas of the parcel that are occupied by the waste transfer station and the scale house, the majority of the Project area consists of a mix of early successional forest dominated by pioneering type vegetative species, scrub-shrub maintained herbaceous lands, and range lands. Examples of early successional habitats include weedy areas, grasslands, old fields or pastures, shrub thickets, and young forest. Refer to Table 1 for complete descriptions of each habitat type found within the Project area, as well as the acreage and percentage of the Project area that they cover. Several ponds and drainage ditches are also located on the property. Refer to the Habitats within the Ruffino Hills Landfill Relocation Project Survey Area (Figure 2) for a detailed view of the survey area.

No avian stick nests, bird rookeries, or obvious animal burrows were identified within the Project area during the in-field survey conducted in July 2021.

Table 1: Habitat Types found within the Ruffino Hills Landfill Relocation Project

Habitat Type	Description	Acreage	Percentage of Project Area
Successional Forest	Habitat with vigorously growing grasses, forbs, shrubs, and trees which provide food and cover for wildlife. Successional forest is characterized by trees no taller than 25-30ft.	22.21	15.3
Scrub-shrub Herbaceous Lands	Scrub/shrub habitats are areas where the vegetation is dominated by small woody plants such as shrubs and young trees. Young trees found in this habitat are typically between 15-20ft in height. These habitats often occur in abandoned fields or disturbed land where pioneer tree species such as aspens, birches, and cottonwood colonize the area and start the process of succession.	50.46	34.8
Rangelands	Rangelands are described as lands on which the indigenous vegetation is predominately grasses, grass-like plants, forbs, and scattered shrubs or dispersed trees. Existing plant communities can include both native and introduced plants. Disturbed lands that have been revegetated naturally or artificially are included.	53.73	37.1
Sources: United States Department of Agriculture Natural Resources Conservation Service (USDA/NRCS) 2009, 2012, 2020; Field Investigation July 2021.			

3.0 Federal and State Regulations

Federal Jurisdiction

Section 7 of the ESA Applicability

Pursuant to Section 7(a)(2) of the ESA, a federal agency shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat via consultation with the United States Fish and Wildlife Service (USFWS). As currently planned, the Project is proposed, funded, and being implemented by the City of Houston, but may involve assistance from the Federal Emergency Management Agency (FEMA). The Project avoids crossing any federally-owned or -administered lands.

The Project may involve dredge and fill activity in federally-jurisdictional waters of the United States (WUS), however, jurisdictional determination would be needed. The mapped water features are likely non-jurisdictional, pending review by the USACE. If it is determined that the mapped features are jurisdictional, then the Project would require a permit from the U.S. Army Corps of Engineers (USACE)-Galveston District pursuant to Section 404 of the Clean Water Act (CWA).

Section 10 of the ESA Applicability

Pursuant to Section 9(a)(1)(B) of the ESA, it is unlawful for any "person" (i.e., company) subject to the jurisdiction of the United States to "take" any federally-listed fish or wildlife species within the United States, except under USFWS permit issued pursuant to Section 10 of the ESA. Even if no federal agency has overarching jurisdiction or responsibility to ensure Project-wide compliance pursuant to Section 7 of the ESA, the Project would still be subject to compliance pursuant to Section 10 of the ESA.

Migratory Bird Treaty Act

The current USFWS treatment of the Migratory Bird Treaty Act of 1918 (MBTA) (16 United States Code [U.S.C.] §§ 703-708, 710-712) is in a state of flux and Tetra Tech recommends that, based on the anticipated current Biden Administration's interpretation, that any proposed Project construction activities implement mitigation measures to avoid either direct or indirect impacts to migratory species. A U.S. Department of the Interior (USDOI) 2017 legal opinion severely limited the breadth of activities that are subject to the MBTA, and stated that the MBTA does not prohibit the "incidental take" or accidental actions (e.g., vegetation clearing, noise disturbance) that result in the take or killing of migratory birds, their nests, or their eggs (USDOI 2017). This opinion limited the MBTA to "take" associated with affirmative and purposeful actions, such as hunting or poaching, that reduce migratory birds, their nests, and their eggs, by killing or capturing, to human control. Conversely, the take of birds, eggs, or nests occurring as a result of an activity, the purpose of which is not to take birds, eggs, or nests, would not be prohibited by the MBTA (USDOI 2018). The USFWS published a final rule in January 2021 that was to become effective on February 8, 2021 that would have reaffirmed that the MBTA applies only to actions directed at

migratory birds, their nests, or their eggs, and not "incidental" take. However, the recently installed Biden Administration delayed the effective date until March 8, 2021 to allow for additional public comments regarding the revised rule, and subsequently on March 8, 2021, withdrew the USDOI legal opinion which preceded and formed the basis of the proposed rule. As such, it is our opinion that that the Biden Administration will return to policies in effect prior to the 2017 legal opinion, in which MBTA policies will be considered applicable to any "take" of migratory, whether intentional or incidental.

Therefore, we recommend that Jones Carter consider mitigation measures to ensure compliance with the MBTA assuming prohibition of incidental "take." Such mitigation measures may include conducting clearing activities outside the nesting and brood rearing periods for migratory birds potentially in a project area, or, if seasonal timing windows cannot be adopted, conducting pre-construction surveys in advance of clearing to identify the presence/absence of breeding birds. If active nests are located, coordination with the USFWS is recommended to develop further mitigation measures, such as establishing buffers around nests until the young fledge, relocating nests off-ROW, or monitoring nest activity and delaying vegetation clearing until the young fledge. Implementing mitigation measures will demonstrate good-faith efforts to adhere to the MBTA regulations and reduce the potential for violations if an inadvertent "take" does occur in conjunction with construction.

Bald and Golden Eagle Protection Act

The BGEPA (16 U.S.C. §§ 668-668d, 54 Stat. 250 and as amended) protects the bald eagle and golden eagle and is administered by the USFWS (16 U.S.C. §§ 1801-1884 and 668-668c). The BGEPA makes it unlawful to, without a permit, "take, posses, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import… any bald eagle… or any golden eagle, alive or dead, or any part, nest, or egg thereof" (16 U.S.C. § 668(a)). "Take" is defined as: "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, or molest or disturb." "Disturb" is defined as: "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior".

State Jurisdiction

Texas

In 1975 and 1988 respectively, Texas established state-level protections for native animals and plants. The current state law, entitled Threatened and Endangered Nongame Species, serves as Title 31, Part 2, Chapter 65, Subchapter G, Sections 65.171 – 65.176 of the Texas Administrative Code. Sections 65.171 – 65.176 are interpreted and enforced by the Texas Parks and Wildlife Department (TPWD). Under Sections 65.171 – 176, the Texas Parks and Wildlife Department is authorized with the following:

- to develop and administer management programs to ensure the continued ability of nongame species of fish and wildlife to perpetuate themselves successfully.

- to designate a state list of endangered and threatened species by rule. A threatened species is any species that the department has determined is likely to become endangered in the future.

Additionally, under Subchapter G the Texas Parks and Wildlife Department is authorized to perform the following:

- Conduct ongoing investigations of nongame fish and wildlife to develop information on populations, distribution, habitat needs, limiting factors, and any other biological or ecological data to determine appropriate management and regulatory information;
- Establish by regulation any limits on the taking, possession, propagation, transportation, importation, exportation, sale, or offering for sale nongame fish and wildlife that the department considers necessary to manage the species; and,
- Issue permits for the taking, possession, propagation, transportation, sale, importation, or exportation, of any nongame species of fish or wildlife, if necessary. to properly manage that species.

According to the current state law in Texas, no person may capture, trap, take, or kill, or attempt to capture, trap, take, or kill, endangered fish or wildlife. Per the TPWD county list for state-listed T&E species, 88 state-listed protected (listed as threatened, endangered, of special concern, or rare) plant and animal species potentially occur in Harris County, TX. However, many of these listed species are marine and riverine species that have no potential to occur on site due to lack of habitat. While there is minimal potential for other species of concern to occur within the Project area, Tetra Tech's analysis includes any species that could potentially utilize habitats that exist on site as discussed in Section 2 above. The specific species considered as part of this analysis are presented in Table 2. A complete list of all T&E species can be found on the USFWS and TPWD's websites.

Under Section 12.0011 of the Texas Parks and Wildlife Code, TPWD is charged with providing recommendations that will protect fish and wildlife resources to local, state, and federal agencies that approve, permit, license, or construct developmental projects and providing information on fish and wildlife resources to any local, state, and federal agencies or private organizations that make decisions affecting those resources. Project types reviewed by TPWD include reservoirs, highway projects, pipelines, urban infrastructure, utility construction, renewable energy, and residential and commercial construction. It is recommended that Jones Carter submit an information request for the Project to TPWD's Wildlife Habitat Assessment (WHAB) Program to assist in identifying, evaluating, and addressing potential impacts to natural resources of conservation concern in Texas.

Protected Resources

The list of federally- and state-listed species of concern having the potential to occur in the vicinity of the Project was developed via review of online and hard copy resources and agency database requests. Initially, Tetra Tech reviewed the USFWS *Information for Planning and Consultation* (IPaC) website for a list of federally-listed species and critical habitat that might be present within

the proposed Project area (USFWS 2021). This list was supplemented by a county search of the TPWD *Rare, Threatened, and Endangered species* website (TPWD 2021) for T&E species that could potentially occur in the Project area. According to the generated lists of T&E species by county, five federally-listed species (USFWS 2021) potentially occur in Harris County, TX (Table 2). The Texas Natural Diversity Database (TXNDD) was consulted prior to field investigations and indicated that the closest documented occurrence of any species of concern is approximately 3.5 miles east of the Project area.

Table 2 outlines the federally-listed and state-listed T&E species that were considered as part of this assessment. In addition, a brief evaluation of the potential effect of the Project on each species is provided.

Table 2. Federally- and State-Listed Species and Their Habitats Evaluated for the Ruffino Hills Landfill Relocation Project; Harris County, Texas

Common Name	Scientific Name	Federal Status[1]	State Status[2]	County (-ies)	Preferred Habitat of Species	Quality of Preferred Habitat Present
Mammals						
Big Free-tailed Bat	*Nyctinomops macrotis*	NL	C	Harris	Species prefers to roost in crevices and cracks in high canyon walls but will use buildings as well.	None
Eastern Red Bat	*Lasiurus borealis*	NL	C	Harris	Common along the coastline, prefer forests for foliage roosting.	Low
Eastern Spotted Skunk	*Spilogale putorius*	NL	C	Harris	Habitat includes open fields, prairies, croplands, fence rows, farmyards, forest edges and woodlands. Prefer wooded, brushy areas and tallgrass prairies.	Low
Hoary Bat	*Lasiurus cinereus*	NL	C	Harris	Commonly associated with forests but are found in unforested parts of the state and lowland deserts.	Low
Long-tailed Weasel	*Mustela frenata*	NL	C	Harris	Habitat includes brushlands, fence rows, upland woods and bottomland hardwoods, forest edges and rocky desert scrub. Usually live close to water.	Low
Louisiana Black Bear	*Ursus americanus luteolus*	NL	T	Harris	Bottomland hardwoods, floodplain forests, upland hardwoods with mixed pine, marsh.	None
Mountain Lion	*Puma concolor*	NL	C	Harris	Found in a wide range of habitats statewide. Found most frequently in rugged mountains and riparian zones.	None
Muskrat	*Ondatra zibethicus*	NL	C	Harris	Found in fresh or brackish marshes, lakes, ponds, swamps, and other bodies of slow-moving water. Most abundant in areas with cattail.	Low
Northern Yellow Bat	*Lasiurus intermedius*	NL	C	Harris	Occurs mainly along the Gulf Coast, prefers roosting in Spanish moss and in the hanging fronds of palm trees. Found near water and forages over grassy, open areas.	None
Rafinesque's Big-Eared Bat	*Corynorhinus rafinesquii*	NL	T	Harris	Habitat includes lowland pine and hardwood forests with large hollow trees. Roosts in cavity trees of bottomland hardwoods, concrete culverts, and abandoned man-made structures.	None

Common Name	Scientific Name	Federal Status[1]	State Status[2]	County (-ies)	Preferred Habitat of Species	Quality of Preferred Habitat Present
Southeastern Myotis Bat	*Myotis austroriparius*	NL	C	Harris	Roosts in a variety of shelters including caves, mines, bridges, buildings, culverts, and tree hollows. Prefers oak-hickory to mixed conifer-hardwood habitats and is often associated with human habitations near streams or lakes.	Low
Swamp Rabbit	*Sylvilagus aquaticus*	NL	C	Harris	Primarily found in lowland areas near water including cypress bogs and marshes, floodplains, creeks, and rivers.	Low
Tricolored Bat	*Perimyotis subflavus*	NL	C	Harris	Forest, woodland, and riparian areas are important habitat for this species.	Low
Birds						
Black Rail	*Laterallus jamaicensis*	LT	T	Harris	Salt, brackish, and freshwater marshes, pond borders, wet meadows, and grassy swamps; nests in or along edge of marsh, sometimes on damp ground, but usually on mats of dead grass.	Low
Reddish Egret	*Egretta rufescens*	NL	T	Harris	Resident of the Texas Gulf Coast; habitat includes brackish marshes and shallow salt ponds and tidal flats; nests on ground or in trees and bushes, on dry coastal islands in brushy thickets of yucca and prickly pear.	None
Rufa Red Knot	*Calidris canutus rufa*	LT	T	Harris	Prefers the shoreline of coast and bays and also uses mudflats during rare inland encounters.	None
Swallow-tailed Kite	*Elanoides forficatus*	NL	T	Harris	Lowland forested regions, especially swampy areas, ranging into open woodland; marshes, along rivers, lakes, and ponds; nests high in tall trees in clearing or on forest woodland edge, usually in pine, cypress, or various deciduous trees.	Low
Whooping Crane	*Grus americana*	LE	E	Harris	Small ponds, marshes, and flooded grain fields for both roosting and foraging. Potential migrant via plains throughout most of state to coast.	None
Reptiles						
Alligator Snapping Turtle	*Macrochelys temminckii*	NL	T	Harris	Habitat includes perennial waterbodies; rivers, canals, lakes, and oxbows; also swamps, bayous, and ponds near running water.	Low
Amphibians						
Houston Toad	*Anaxyrus houstonensis*	LE	E	Harris	Primary terrestrial habitat is forests with deep sandy soils. Aquatic habitats can include any water body from a tire rut to a large lake.	None
Flowering Plants						
Houston Daisy	*Rayjacksonia aurea*	NL	T	Harris	On and around naturally barren or sparsely vegetated saline slick spots or pimple mounds on coastal prairies, usually on sandy to sandy loam soils, occasionally in pastures and on roadsides in similar soil types where mowing may mimic natural prairie disturbance regimes.	None
Texas Prairie Dawn Flower	*Hymenoxys texana*	LE	E	Harris	In poorly drained, sparsely vegetated areas (slick spots) at the base of mima mounds in open grassland or almost barren areas on slightly saline soils that are sticky when wet and powdery when dry.	None

Common Name	Scientific Name	Federal Status[1]	State Status[2]	County (-ies)	Preferred Habitat of Species	Quality of Preferred Habitat Present

1 C – Candidate, DL – Delisted, LE – Listed Endangered, LT – Listed Threatened, NL – Not Listed
2 E – Endangered, T – Threatened, NL – Not Listed

Sources: USFWS 2021; TPWD 2021.

Certain birds are protected under the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). The IPaC review listed six additional bird species of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in the Project area.

Table 3. Birds of Conservation Concern Species and Their Habitats Evaluated for the Ruffino Hills Landfill Relocation Project; Harris County, Texas

Common Name	Scientific Name	Breeding Period	Habitat	Quality of Preferred Habitat Present
Bald Eagle	*Haliaeetus leucocephalus*	September 1 to July 31	Coasts, rivers, large lakes. Also found in mountains and open country during migration. Found in a variety of waterside settings where prey is abundant including swamps, edges of conifer forests, and desert rivers.	None
Le Conte's Sparrow	*Ammodramus leconteii*	Breeds elsewhere	Preferred habitat includes wet fields, prairies, and marsh edges. They are especially fond of fields of bluestem grasses.	Low
Least Tern	*Sterna antillarum*	April 20 to September 10	Sea beaches, bays, large rivers, salt flats. Along coast generally where sand beaches close to extensive shallow waters for feeding. Inland, found along rivers with broad exposed sandbars, lakes with salt flats nearby.	None
Lesser Yellowlegs	*Tringa flavipes*	Breeds elsewhere	Marshes, mudflats, shores, ponds. Found in boreal woods in the summer. Migratory habitats include coastal estuaries, salt and fresh marshes, and edges of lakes and ponds.	Low
Semipalmated Sandpiper	*Calidris pusilla*	Breeds elsewhere	Beaches, mudflats; tundra in summer. During migration along coast found on mudflats in intertidal zone, shallow estuaries and inlets, beaches. Inland, occurs on edges of lakes and marshes next to very shallow water.	None
Sprague's Pipit	*Anthus spragueii*	Breeds elsewhere	Plains, shortgrass prairies. Breeds in relatively dry grassland, especially native prairie, avoiding brushy areas and cultivated fields. Winters in similar shortgrass habitats including pastures and prairies, and grassy patches within fields of crops such as alfalfa.	Low

4.0 Compliance Assessment

Federal and State Regulatory Compliance

Section 7 of the ESA requires each federal agency to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat. Section 9 of the ESA prohibits anyone from "taking" or harming an endangered species. This includes non-federal projects; if an action might harm an endangered species, a permit may be obtained from the Services under Section 10 of the ESA. Based on background research conducted prior to field surveys and subsequent field investigations, it is anticipated that the Project will have no effect on federally-listed species, as their specific range or baseline habitat requirements do not occur within the Project area. While a single federally-protected species, the black rail, is identified as have a low potential to occur on the site, based on available habitat, any occurrence of this species would be considered transitory, limited to foraging activities. The Project area lacks the marshy habitat required to support breeding activities for this species. Based on the successional nature of the habitats on-site, coupled with the isolation of the site in a highly urbanized setting, It is also anticipated that there will be no significant impact to any state-protected species with the potential to occur in the Project area, as on-site habitat would be considered marginal, at best, and the Project area lacks interconnectedness with higher quality habits required to maintain a viable populations.

MBTA and BGEPA Compliance

No avian stick nests were observed during the in-field surveys conducted in July 2021. If construction is anticipated to occur during the migratory bird nesting season (April through September), it is recommended that the Project area be surveyed prior to clearing activities, and that active nests be avoided, and that nesting activity be monitored during construction activities.

While there are scattered trees present in which eagles could potentially nest, they are not near suitable waterside habitat. No eagle nests were observed during the in-field survey. As such, it is anticipated that the Project will not result in the "take" of bald or golden eagles.

We recommend that Jones Carter consider mitigation measures to ensure compliance with the MBTA assuming prohibition of incidental "take." Such mitigation measures may include conducting clearing activities outside the nesting and brood rearing periods for migratory birds potentially in a project area, or, if seasonal timing windows cannot be adopted, conducting pre-construction surveys in advance of clearing to identify the presence/absence of breeding birds. If active nests are located, coordination with the USFWS is recommended to develop further mitigation measures, such as establishing buffers around nests until the young fledge, relocating nests off-ROW, or monitoring nest activity and delaying vegetation clearing until the young fledge. Implementing mitigation measures will demonstrate good-faith efforts to adhere to the MBTA

regulations and reduce the potential for violations if an inadvertent “take” does occur in conjunction with construction.

5.0 Impact Assessment Summary

Based on the anticiapted Project design and waste removal and transfer procedures, rangeland, scrub/shrub, successional forest, and aquatic habitat within the Project area will be impacted. However, specific acreage of impacts to individual habitat types are unknown at this time. Project activities are anticipated to have no effect on threatened or endangered species, as habitat within the Project area is of low quality or is not present for listed species with the potential to occur within Harris County. Additionally, no listed species or their sign (e.g., nests, tracks, scat, and burrows) were identified within the survey areas. As listed in Table 2, federal and state-listed T&E species occurring in Harris County area have little to no potential to be affected by the proposed Project, as their specific range or baseline habitat requirements do not occur within or adjacent to the Project area.

We appreciate your assistance and look forward to your participation in the evaluation of the proposed Project. If you have any questions or require additional information, please contact Jason Speights via e-mail at [redacted] or via phone at 832-251-6024 with any questions regarding this request.

Sincerely,

Jason Speights
Project Manager

Enclosures:
Figure 1 – Site Location of the Ruffino Hills Landfill Relocation Project
Figure 2 – Habitats within the Ruffino Hills Landfill Relocation Project

References

Bald and Golden Eagle Protection Act of 1940 (BGEPA) (16 United States Code [U.S.C.] §§ 668-668d, 54 Stat. 250). 1940 and as amended. Available at: https://www.fws.gov/laws/lawsdigest/BALDEGL.HTML. Accessed August 2, 2021.

Endangered Species Act of 1973 (16 U.S.C. §§1531-1544, 87 Stat. 884). 1973 and as amended. Available at: www.fws.gov/laws/lawsdigest/esact.html. Accessed August 2021.

Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. §§ 703-712). 1918 and as amended. Available at: https://www.fws.gov/laws/lawsdigest/migtrea.html. Accessed August 2021.

Texas Administrative Code (TAC) – Texas Parks and Wildlife Department, (Chapter 65, 67, 68). Available at: https://www.sos.texas.gov/tac/index.shtml. Accessed August 2, 2021.

Texas Parks and Wildlife Department (TPWD). 2021. Rare, Threatened, and Endangered Species of Texas [Harris County, TX, 2021]. Available at: https://tpwd.texas.gov/gis/rtest/. Accessed July 30, 2021.

United States Department of Agriculture/National Resources Conservation Service (USDA/NRCS). 2012. Conservation Delivery Streamlining Initiative. Land Use/Land Cover Categories and Definitions. Available at: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1142489.pdf. Accessed August 3, 2021.

United States Department of the Interior (USDOI). 2017. The Migratory Bird Treaty Act Does Not Prohibit Incidental Take. Available at: https://www.doi.gov/sites/doi.gov/files/uploads/m-37050.pdf. Accessed August 3, 2021.

USDOI. 2018. Guidance on the recent M-Opinion affecting the Migratory Bird Treaty Act. Available at: https://www.akingump.com/images/content/7/0/v2/70445/m-opinion-memo-signed-4.11.18.pdf. Accessed August 3, 2021.

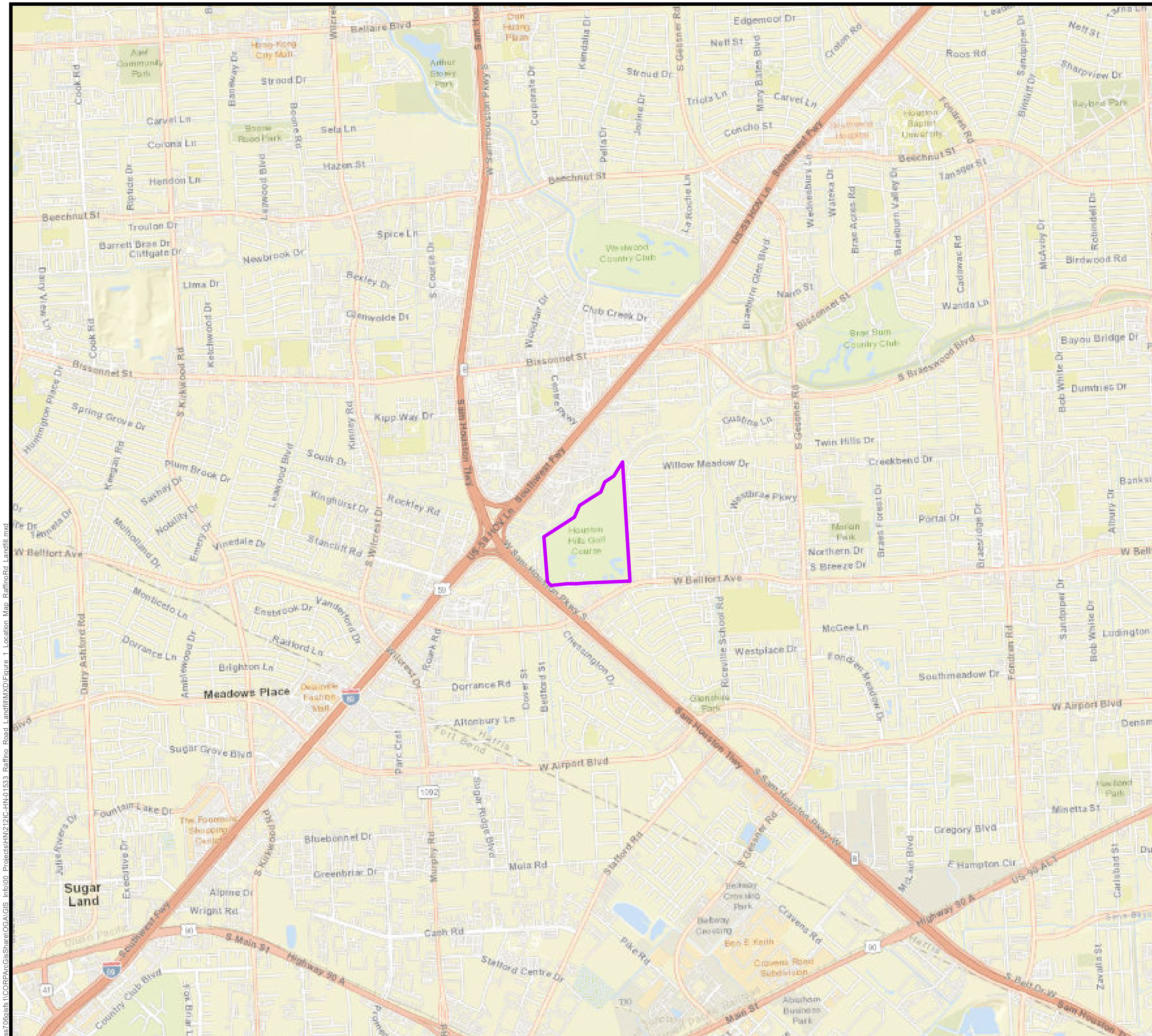
USFWS. 2021a. IPaC – Information for Planning and Consultation [Harris County, TX]. Available at: http://ecos.fws.gov/ipac/. Accessed July 30, 2021.

USFWS. 2021b. Endangered Species [Harris County, TX]. Available at: http://www.fws.gov/endangered/. Accessed July 30, 2021.

FIGURES

FIGURE 1. SITE LOCATION MAP OF THE RUFFINO HILLS LANDFILL RELOCATION PROJECT

FIGURE 2. HABITATS WITHIN THE RUFFINO HILLS LANDFILL RELOCATION PROJECT



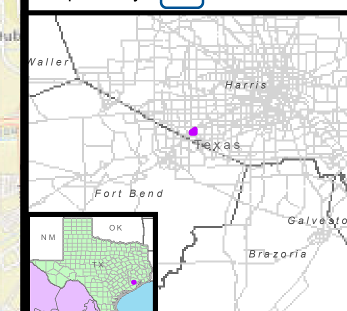


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FIGURE 1.

SITE LOCATION MAP OF THE RUFFINO HILLS LANDFILL RELOCATION PROJECT

HARRIS COUNTY, TEXAS

LEGEND

Project Limits

N

SCALE: 1 Inch = 4,000 feet

Feet 0 2,000 4,000

Sheet 1 of 1

Date: August 2021
Project: 212IC-HN-01533

Prepared By: TETRA TECH

Drawn By: stephanie.aselage

Source: Aerial - Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016; Soils - USDA-NRCS, 2016.

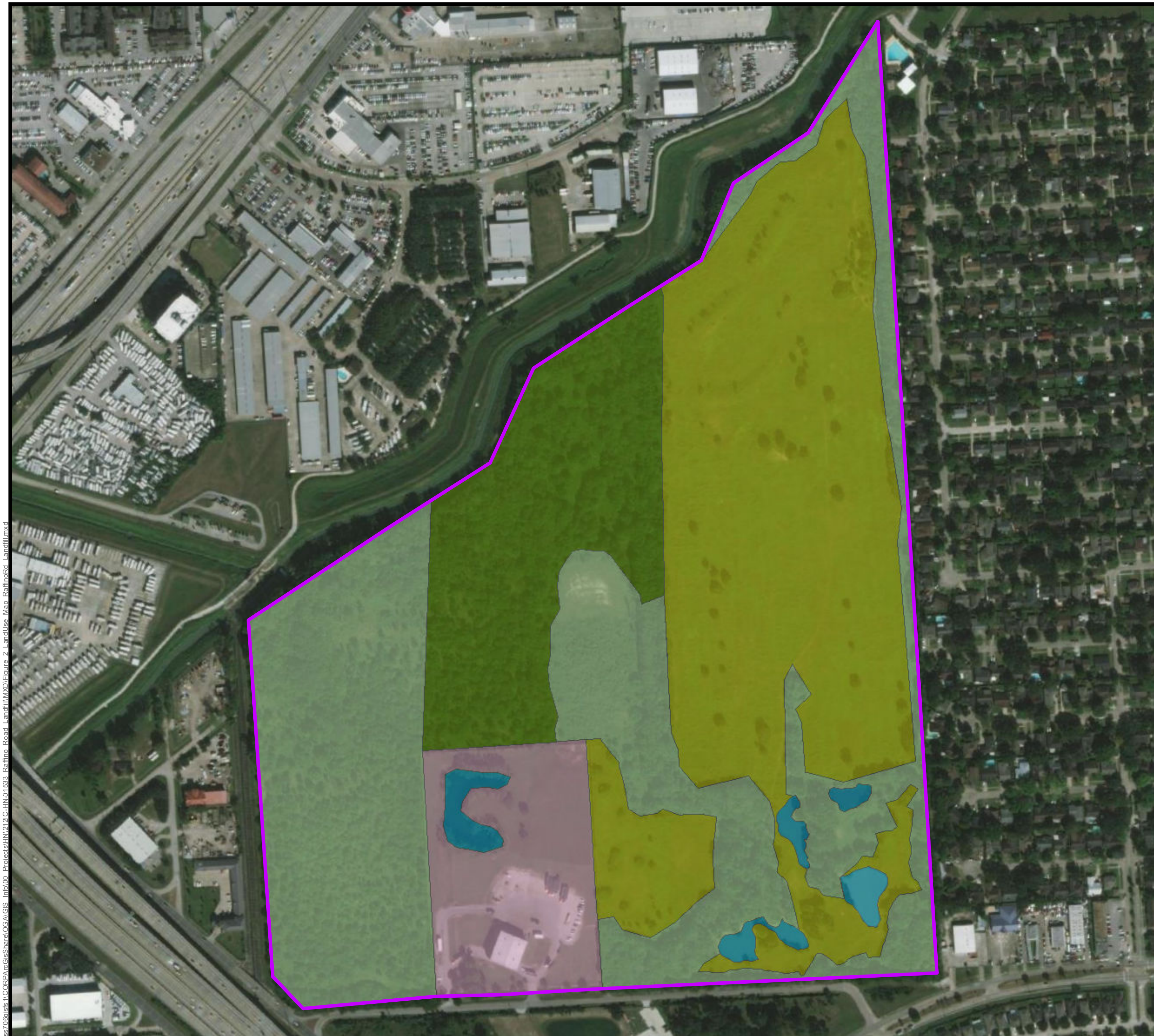

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FIGURE 2.

HABITATS WITHIN THE RUFFINO HILLS LANDFILL RELOCATION PROJECT

HARRIS COUNTY, TEXAS

LEGEND

- Project Limits
- Commercial
- Forested
- Rangeland
- Scrub-Shrub
- Waterbody

N

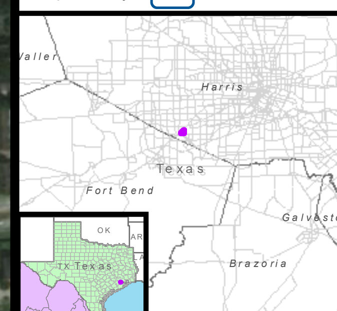
SCALE: 1 IN = 500 FEET

Feet 0 250 500

Sheet 1 of 1

Date: August 2021
Project: 212IC-HN-01533

Prepared By: TETRA TECH



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Drawn By: samantha.lai

Source: Aerial - Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, 2016;

Attachment II–9 Transportation Study

Ruffino Road Landfill Mining Project

Transportation Study

September 2021

Prepared for:

Tetra Tech

Prepared by:

JONES | CARTER

ENGINEERS. PLANNERS. SURVEYORS.

Texas Board of Professional Engineers Registration No. F-439

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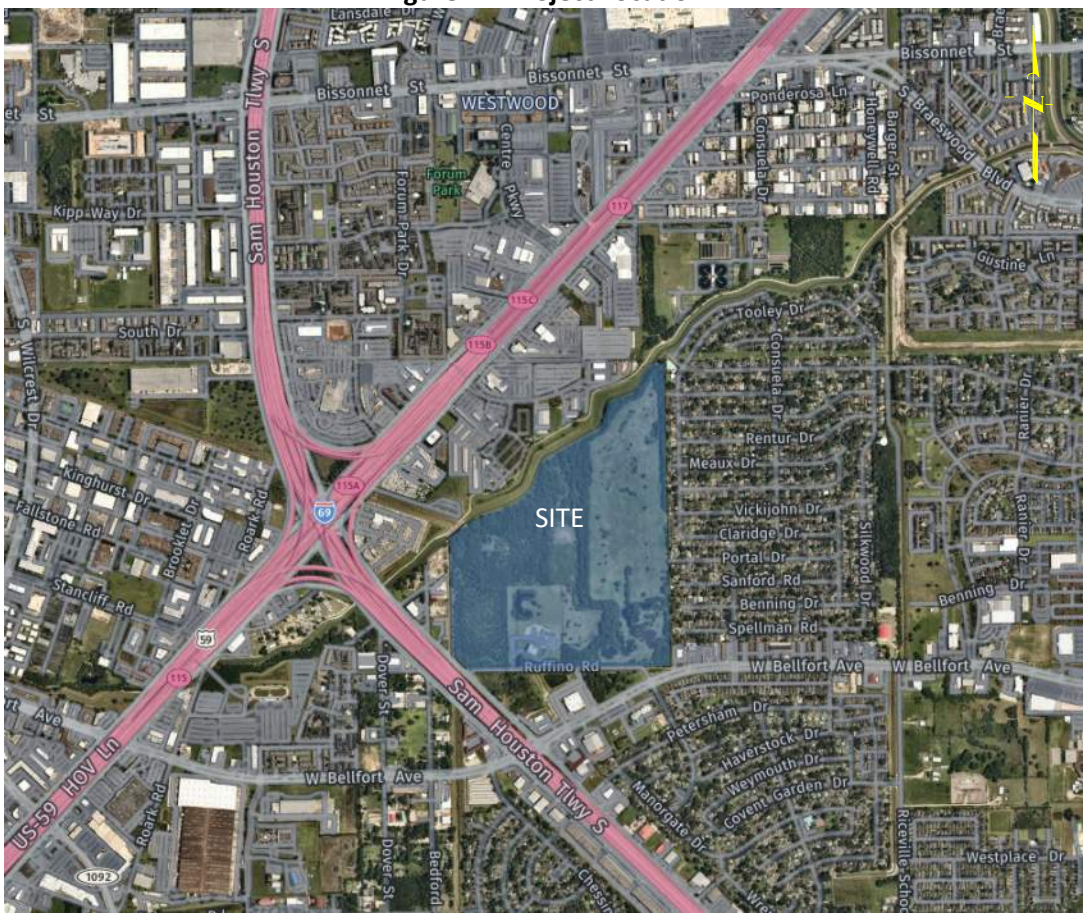
Introduction

Tetra Tech proposes a Type IX Landfill Mining operation for the Ruffino Hills Landfill Facility (City of West University Landfill and City of Bellaire Landfill) located on the north side of Ruffino Road at US 59 and Beltway 8 in City of Houston, Texas, as shown in **Figure 1**. The entrance for the mining operations will be located at 9610 Ruffino Road. The purpose of this study is to provide a traffic analysis and control plan for the Type IX Landfill Mining Registration Application. The plan will indicate anticipated daily numbers and types of trucks generated by the waste relocation project, site ingress and egress areas, truck scales, routes to disposal and other facilities, and other control features as necessary to minimize the effects of traffic on the area.

This study has been completed in accordance with requirements listed in TCEQ Municipal Solid Waste Land Mining Registration Application, Section 30 TAC 330.61(i), which includes:

1. Provide data on the availability and adequacy of roads that the owner or operator will use to access the site;
2. Provide data on the volume of vehicular traffic on access roads within one mile of the proposed facility, both existing and expected, during the expected life of the proposed facility;
3. Project the volume of traffic expected to be generated by the facility on the access roads within one mile of the proposed facility; and
4. Submit documentation of coordination with public agencies.

Figure 1 – Project Location



Traffic Information

A field study was conducted to document the existing conditions of the study area roadways and site. Existing lane assignments and traffic control at the study area intersections can be found in **Appendix A**.

Traffic Data

The intersections included in the study area are:

- Ruffino Road at West Bellfort Avenue
- Beltway 8 Northbound Frontage Road at Ruffino Road
- Beltway 8 Northbound Frontage Road at West Bellfort Avenue
- Beltway 8 Southbound Frontage Road at West Bellfort Avenue

Turning movement counts were taken by CJ Hensch & Associates, Inc. on Thursday August 12, 2021. The peak hours were reached during the weekday between 7:30-8:30 AM for the AM peak hour and 4:45-5:45 PM for the PM peak hour. The AM and PM Peak Hour Factor (PHF) at each of the study intersections was determined from collected traffic data. PHF at proposed intersections was assumed to be 0.92.

Truck traffic was reviewed at the intersections where turning movement counts were collected. Ruffino Road experiences approximately 80% trucks, however the volume on Ruffino Road is a small portion of the overall intersection volume. The highest truck traffic percentage observed at the overall study intersections was 6.8%, this truck traffic percentage was utilized in analysis models.

A 10% adjustment factor was used to account for changes in traffic patterns due to the COVID-19 outbreak and to account for data collection during summer months. The adjustment factor was applied to collected turning movement counts to depict typical roadway volumes during the peak hours.

Historical 24-hour volume data was obtained from TxDOT's Traffic Count Database System. This data is summarized in **Appendix B**.

The existing traffic volumes can be found in **Appendix A** and raw traffic count data can be found in **Appendix B.**

Roadways

The following area roadways within one mile of the landfill are anticipated to be utilized and descriptions are provided:

- Ruffino Road
- W Bellfort Avenue
- Beltway 8 Frontage Roads
- US 59 Frontage Roads

Ruffino Road – Ruffino Road is currently a two-lane asphalt-surfaced roadway consisting of 12-foot travel lanes adjacent to the site. There is no posted speed limit on the roadway. An assumed 35 mph was utilized for the analysis. The City of Houston 2020 Major Thoroughfare & Freeway Plan (MTFP) was consulted regarding the future roadway upgrade plans for Ruffino Road. Based on the information obtained from the City of Houston MTFP, no improvements are planned along this roadway. There are

no known weight restrictions on Ruffino Road in the proximity of the site other than the maximum legal weight limit of 80,000 lbs (Tex. Transportation Code Ann. §623.011).

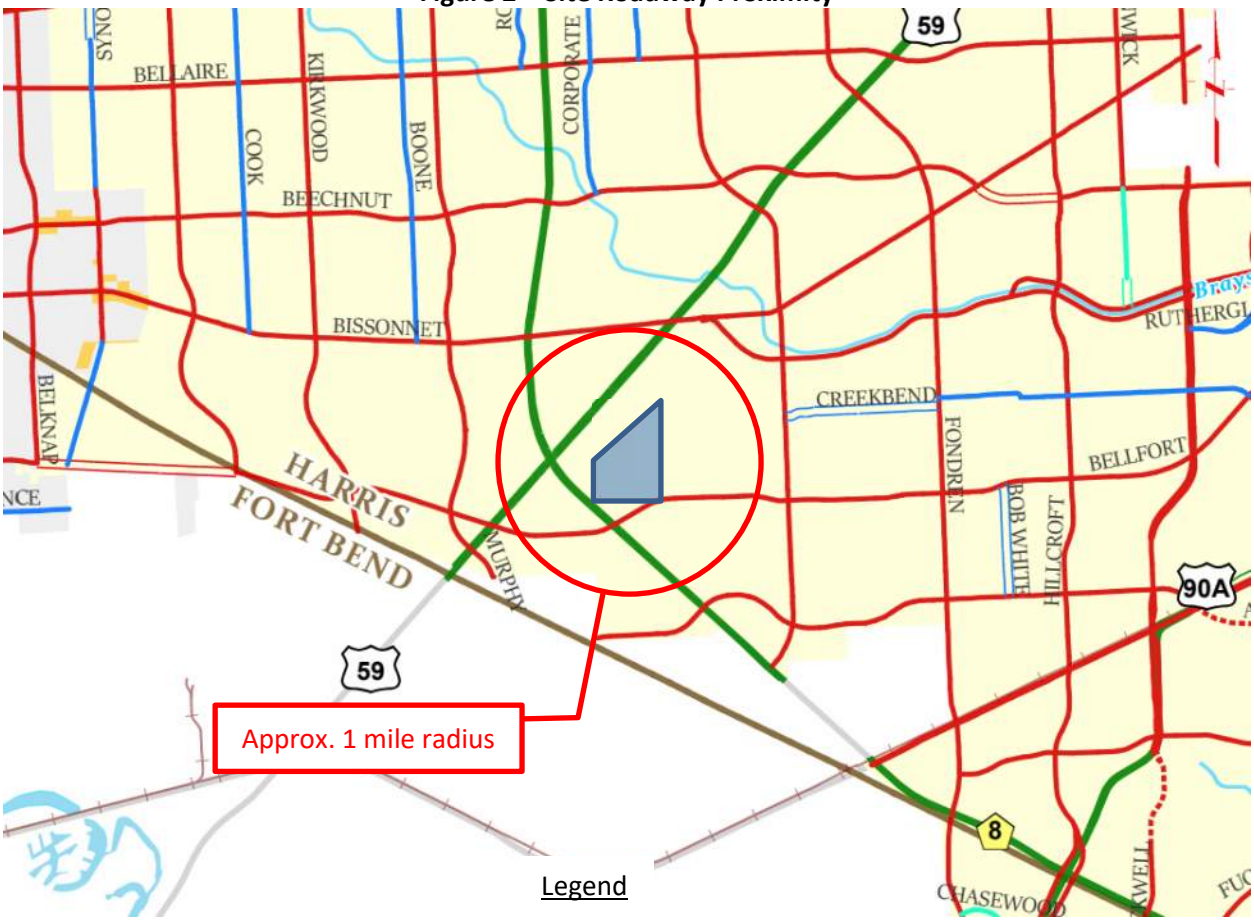
W Bellfort Avenue – W Bellfort Avenue is currently a four-lane concrete-surfaced roadway consisting of 12-foot travel lanes and a 30-foot median in the vicinity of the site. The posted speed limit is 35 mph. The City of Houston 2020 Major Thoroughfare & Freeway Plan (MTFP) was consulted regarding the future roadway upgrade plans for W Bellfort Avenue. Based on the information obtained from the City of Houston MTFP, no improvements are planned along this roadway. There are no known weight restrictions on W Bellfort Avenue in the proximity of the site other than the maximum legal weight limit of 80,000 lbs (Tex. Transportation Code Ann. §623.011).

Beltway 8 Frontage Roads – The Beltway 8 Frontage Roads are asphalt-surfaced roadways. Each one-way Beltway 8 Frontage Road provides three 12-foot travel lanes in the vicinity of the site. The posted speed limit is 50 mph. TxDOT Project Tracker and the Harris County Toll Road Authority (HCTRA) were consulted regarding future roadway upgrade plans for Beltway 8 Frontage Roads. Based on the information obtained from the previously mentioned resources, no improvements are planned along this roadway in the vicinity of the site. There are no known weight restrictions on Beltway 8 Frontage Roads in the proximity of the site other than the maximum legal weight limit of 80,000 lbs (Tex. Transportation Code Ann. §623.011).

US 59 Frontage Roads – The US 59 Frontage Roads are concrete-surfaced roadways. Each one-way US 59 Frontage Road provides three 12-foot travel lanes in the vicinity of the site. The posted speed limit is 45 mph. TxDOT Project Tracker was consulted regarding future roadway upgrade plans for US 59 Frontage Roads. Based on the information obtained from the previously mentioned resources, no improvements are planned along this roadway in the vicinity of the site. There are no known weight restrictions on US 59 Frontage Roads in the proximity of the site other than the maximum legal weight limit of 80,000 lbs (Tex. Transportation Code Ann. §623.011).

Figure 2 shows the City of Houston Major Thoroughfare & Freeway Plan for the study area.

Figure 2 – Site Roadway Proximity



Legend

Traffic Projections

Traffic projections were developed using the Traffic Count Database System (TCDS). The forecasted traffic data provided by TCDS in the study area indicate the traffic growth at the study area is 2.1% per year from 2015-2019; therefore, it is recommended a 2.1% background growth rate per year be used. A summary of the data provided by the TCDS are provided in **Table 1.**

Table 1 – Traffic Count Database System Data Summary

Traffic Count Database System (TCDS)			
Location	Year	Volume	Annual Linear Growth Rate
Beltway 8 NBFR	2015	16,132	-
	2016	17,394	7.8%
	2017	17,606	1.2%
	2018	18,000	2.2%
	2019	17,234	-4.3%
Beltway 8 SBFR	2015	15,840	-
	2016	17,115	8.0%
	2017	-	-
	2018	14,757	-7.1%
	2019	16,166	9.5%
Beltway 8	2015	111,250	-
	2016	114,727	3.1%
	2017	118,504	3.3%
	2018	116,784	-1.5%
	2019	117,889	0.9%
		Average	**2.1%**

Trip Generation and Distribution

The Landfill Mining and relocation for Ruffino Road Landfill will require the transport of materials to various existing Type I MSW landfills and Type IV C & D landfills. The relocation is anticipated to begin in 2023 and projected to be completed in approximately 2 years. The waste can be transported to disposal facilities in tarped, end-dump trucks or by transfer trailers. The anticipated number of truck loads per day was determined by Tetra Tech and is shown in **Table 2**.

Table 2 – Estimated Truckloads

Description	Amount
Estimated Excavation per day	5,184 loose CY
Truckload Capacity	18 loose CY
Estimated Truckloads per day	288

Transfer operations during the 2-year mining period were analyzed with the following assumptions:

- Transfer trucks will be stored off site and will be driven to the site in the AM Peak Hour and from the site in PM Peak Hour
- 50 trucks/drivers will be in operation
- 20 additional on-site workers (heavy equipment operators, supervisors, laborers, engineers, technicians, etc.)

To analyze worst case conditions, all staff was expected to enter the facility in the AM Peak Hour and exit in the PM Peak Hour. 10% of trucks are assumed to enter and exit the Ruffino Landfill site in the AM and PM Peak Hours. **Table 3** provides a summary of the trip generation volumes.

Table 3 – Peak Landfill Mining Conditions Trip Generation Volumes

Vehicle Type	Total Daily Vehicles	AM Peak			PM Peak		
		Enter	Exit	Total	Enter	Exit	Total
Transfer Trucks	600*	60	60	120	60	60	120
Employee Vehicles	40	20	0	20	0	20	20
Total	640	80	60	140	60	80	140

*Estimated 288 truckloads rounded to 300 to assume worst case conditions. 600 daily trips based on 300 trucks entering and exiting the facility daily.

Surrounding landfill facilities where excavated materials will be transported to were provided by Tetra Tech. The fastest route to these facilities was utilized to determine Trip Distribution Percentages for the duration of the landfill mining operations. Routes to the following facilities were considered:

- Blue Ridge Landfill (Type I), 2200 FM 521, Fresno, TX, 77545
- Lone Star Recycling and Disposal Facility (Type IV), 4107 S. Sam Houston Pkwy W., Houston, TX, 77086
- Casco Landfill (Type IV), 1306 E. Anderson, Houston, TX, 77047
- Sprint Fort Bend County Landfill (Type IV), 16007 W Bellfort St, Sugar Land, TX, 77498
- Fort Bend Regional Landfill (Type I), 14115 Davis Estate Rd, Needville, TX, 77461

The directional distribution of vehicles traveling to/from the landfill, Trip Distribution Percentages, and Site Generated Traffic Volumes are shown in **Appendix A.** The Projected Traffic Volumes for 2025 Peak Mining Conditions are shown in **Appendix A.**

After the completion of the Ruffino Landfill Mining project, traffic volumes are expected to return to the Background Condition and no trips are expected to be generated related to the completed project. **Table 4** provide a summary of the trip generation volumes.

Table 4 – Background/Post Landfill Mining Conditions Trip Generation Volumes

Vehicle Type	Total Daily Vehicles	AM Peak			PM Peak		
		Enter	Exit	Total	Enter	Exit	Total
Transfer Trucks	0	0	0	0	0	0	0
Employee Vehicles	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0

The projected traffic volumes for 2025 Background/Post Mining Conditions are shown in **Appendix A.**

Capacity Analysis

Intersection Analysis

Capacity Analysis was performed using the computer program *Synchro 11*, which is based on the procedures in the *Highway Capacity Manual (HCM).* Capacity Analysis provides information regarding traffic operations at an intersection and is expressed in terms of the level of service (LOS). The LOS indicates the average seconds of delay experienced by a motorist at a signalized intersection, at stop sign controlled approaches and left turn movements at an unsignalized intersection. Intersection LOS range from A to F, with LOS A representing free flow conditions and LOS F representing highly congested conditions. An intersection operating at or above LOS D is typically characterized by acceptable delays. The Level of Service Measurement and Qualitative Descriptions for Signalized and Unsignalized intersections are shown in **Table 5.**

Table 5 – Level of Service Measurement and Qualitative Descriptions

Level Of Service	Unsignalized	Signalized	
	Control Delay Per Vehicle (Sec)	Control Delay Per Vehicle (Sec)	Description
A	≤ 10	≤ 10	Good progression and short cycle lengths
B	> 10 and ≤ 15	> 10 and ≤ 20	Good progression or short cycle lengths, more vehicle stops
C	> 15 and ≤ 25	> 20 and ≤ 35	Fair progression and/or longer cycle lengths, some cycle failures
D	> 25 and ≤ 35	> 35 and ≤ 55	Congestion becomes noticeable, high volume to capacity ratio
E	> 35 and ≤ 50	> 55 and ≤ 80	Limit of acceptable delay, poor progression, long cycles, and/or high volume
F	> 50	> 80	Unacceptable to drivers, volume greater than capacity

The impact of the proposed development at the study area intersections was analyzed using Capacity Analysis for the following scenarios and the *Synchro 11* capacity analysis reports can be found in **Appendix C-E.**

2021 Existing Conditions

- Existing Traffic Volumes

2025 Background/Post Mining Conditions

- 2.1% percent annual background growth rate for 4 years
- Traffic operations without the Ruffino Landfill Mining/Completion of Ruffino Landfill Mining

2025 Peak Mining Conditions

- 2.1% percent annual background growth rate for 4 years
- Traffic operations with Peak Mining/Relocation Volumes

Table 6 and **Table 7** summarize the capacity analysis results for the AM and PM Peak Hours, respectively. All signalized intersections and unsignalized approaches are projected to operate at an acceptable LOS during the Peak Hours except for those in red.

Table 6 – Capacity Analysis: AM Peak Hour

Intersection	2021 Existing Conditions		2025 Background/Post Mining Conditions		2025 Peak Mining Conditions	
	LOS	Sec. of Delay	LOS	Sec. of Delay	LOS	Sec. of Delay
Signalized Intersections						
3. Beltway 8 SBFR at W Bellfort Avenue	**B**	**18.7**	**C**	**30.5**	**C**	**30.6**
Eastbound	C	24.7	D	41.5	D	41.5
Westbound	A	5.5	A	6.5	A	7.5
Southbound	C	22.8	D	37.9	D	37.5
4. Beltway 8 NBFR at W Bellfort Avenue	**B**	**19.8**	**C**	**26.9**	**C**	**27.4**
Eastbound	A	9.1	B	13.2	B	14.2
Westbound	C	25.7	C	26.1	C	26.7
Northbound	C	22.6	D	37.3	D	36.8
Unsignalized Intersections						
1. W Bellfort Avenue at Ruffino Road/Stanwood Drive						
Eastbound	A	0.0*	A	0.0*	A	9.5*
Westbound	A	8.9*	A	9.1*	A	9.1*
Northbound	C	16.1	C	17.3	C	17.9
Southbound	B	10.9	B	11.1	B	11.3
2. Beltway 8 NBFR at Ruffino Road						
Westbound	C	16.4	C	17.7	C	20.5

*indicates left turn LOS

Table 7 – Capacity Analysis: PM Peak Hour

Intersection	2021 Existing Conditions		2025 Background/Post Mining Conditions		2025 Peak Mining Conditions	
	LOS	Sec. of Delay	LOS	Sec. of Delay	LOS	Sec. of Delay
Signalized Intersections						
3. Beltway 8 SBFR at W Bellfort Avenue	**C**	**21.8**	**C**	**33.1**	**C**	**33.2**
Eastbound	C	31.7	D	49.6	D	49.2
Westbound	B	10.9	B	12.6	B	13.5
Southbound	C	22.0	C	34.7	C	34.9
4. Beltway 8 NBFR at W Bellfort Avenue	**C**	**20.4**	**C**	**28.5**	**C**	**25.7**
Eastbound	B	12.7	B	18.6	B	13.4
Westbound	C	25.9	C	27.9	C	25.6
Northbound	C	22.7	D	37.3	D	35.9
Unsignalized Intersections						
1. W Bellfort Avenue at Ruffino Road/Stanwood Drive						
Eastbound	A	0.0*	A	0.0*	A	9.7*
Westbound	B	10.8*	B	11.3*	B	11.2*
Northbound	C	22.7	D	25.7	D	25.9
Southbound	C	19.2	C	20.9	B	12.9
2. Beltway 8 NBFR at Ruffino Road						
Westbound	C	16.7	C	17.9	C	18.9

*indicates left turn LOS

Roadway Analysis

Roadway capacity analysis was performed on roadways that will be used to access the site and access roadways within one mile of the landfill in accordance with the *Highway Capacity Manual (HCM)* for 2021 Existing Conditions, 2025 Peak Mining Conditions and 2025 Post Mining Conditions. HCM LOS Measurement and Qualitative Descriptions are provided in **Table 8**. The peak hour volume was chosen as the highest hour of traffic between 7-9 AM and 4-6 PM. The volume to capacity ratio per lane was used to determine the LOS per link.

Table 8 – HCM LOS Measurement and Qualitative Descriptions – Roadway Capacity Analysis

Level of Service	Roadway	
	Volume/Capacity Volume (Peak Hour Direction)/ Capacity (Per Lane Direction Capacity)	Description
A	0.00-0.19	Primarily free-flow operation. Vehicles are completely unimpeded in their ability to maneuver within traffic. Control delay at boundary intersections is minimal.
B	0.20-0.44	Reasonably unimpeded operation. The ability to maneuver within the traffic stream is only slightly restricted and control delay at boundary intersections is not significant.
C	0.45-0.64	Stable operations. The ability to maneuver and change lanes at midsegment locations may be more restricted than LOS B. Longer queues at boundary intersections may contribute to lower travel speeds.
D	0.65-0.79	Less stable condition in which small increased in flow may cause substantial increase in delay and decreased in travel speed. This operation may be due to adverse signal progression, high volume or inappropriate signal timing at the boundary intersections.
E	0.80-0.99	Unstable operation and significant delay. Such operations may be due to some combination of adverse progression, high volume, and inappropriate signal timing at the boundary intersections.
F	1.00 or more	Flow at extremely low speeds. Congestion is likely occurring at the boundary locations, as indicated by high delay and extensive queuing.

Table 9 and **Table 10** provide a summary of Roadway Analysis for the AM and PM Peak Hour, respectively. All roadways are projected to operate at an acceptable LOS during the Peak Hours except for those in red. W Bellfort Avenue is projected to operate at LOS E or LOS F on various segments in the AM and PM Peak Hours; The LOS E or F is maintained from 2025 Background/Post Mining Conditions to 2025 Peak Mining Conditions. Trips generated by the Ruffino Landfill relocation have a negligible effect on the study roadways when compared to 2025 Background/Post Mining Conditions and do not contribute to a change from an acceptable LOS to an unacceptable LOS.

Table 9 – Roadway Analysis: AM Peak Hour

Road	Node ID	Capacity per Lane (vehicles)	Direction	# of Lanes	2021 Existing Conditions			2025 Background/Post Mining Conditions			2025 Peak Mining Conditions			% of Landfill Vehicles on Roadway
					Total Volume per Direction (vehicles)	Volume/ Capacity	LOS	Total Volume per Direction (vehicles)	Volume/ Capacity	LOS	Total Volume per Direction (vehicles)	Volume/ Capacity	LOS	
AM Peak Hour														
Ruffino Road	A	700	EB	2	23	0.02	A	25	0.02	A	97	0.07	A	74.23%
		700	WB	2	28	0.02	A	30	0.02	A	75	0.05	A	60.00%
W Bellfort Avenue	B	700	EB	2	789	0.56	C	857	0.61	C	857	0.61	C	0.00%
		700	WB	2	1280	0.91	E	1391	0.99	E	1391	0.99	E	0.00%
	C	700	EB	2	904	0.65	D	982	0.70	D	988	0.71	D	0.61%
		700	WB	2	1397	1.00	F	1518	1.08	F	1538	1.10	F	1.30%
	D	700	EB	2	821	0.59	C	892	0.64	C	892	0.64	C	0.00%
		700	WB	2	936	0.67	D	1017	0.73	D	1017	0.73	D	0.00%
Beltway 8	E	2000	NB	3	3082	0.51	C	3349	0.56	C	3409	0.57	C	1.76%
	F	2000	SB	3	2445	0.41	B	2657	0.44	B	2721	0.45	C	2.35%
	G	2000	NB	3	1742	0.29	B	1893	0.32	B	1965	0.33	B	3.66%
	H	2000	SB	3	1045	0.17	A	1136	0.19	A	1151	0.19	A	1.30%
US 69	I	2000	EB	3	3127	0.52	C	3398	0.57	C	3413	0.57	C	0.44%
	J	2000	WB	3	1744	0.29	B	1895	0.32	B	1915	0.32	B	1.04%
	K	2000	EB	3	2218	0.37	B	2410	0.40	B	2410	0.40	B	0.00%
	L	2000	WB	3	1025	0.17	A	1114	0.19	A	1114	0.19	A	0.00%
Beltway 8	M	2000	SB	3	1316	0.22	B	1430	0.24	B	1430	0.24	B	0.00%
	N	2000	NB	3	2078	0.35	B	2258	0.38	B	2258	0.38	B	0.00%

Table 10 – Roadway Analysis: PM Peak Hour

Road	Node ID	Capacity per Lane (vehicles)	Direction	# of Lanes	2021 Existing Conditions			2025 Background/Post Mining Conditions			2025 Peak Mining Conditions			% of Landfill Vehicles on Roadway
					Total Volume per Direction (vehicles)	Volume/ Capacity	LOS	Total Volume per Direction (vehicles)	Volume/ Capacity	LOS	Total Volume per Direction (vehicles)	Volume/ Capacity	LOS	
PM Peak Hour														
Ruffino Road	A	700	EB	2	10	0.01	A	11	0.01	A	65	0.05	A	83.08%
		700	WB	2	8	0.01	A	9	0.01	A	69	0.05	A	86.96%
W Bellfort Avenue	B	700	EB	2	1204	0.86	E	1308	0.93	E	1308	0.93	E	0.00%
		700	WB	2	1021	0.73	D	1110	0.79	D	1110	0.79	D	0.00%
	C	700	EB	2	1349	0.96	E	1466	1.05	F	1474	1.05	F	0.54%
		700	WB	2	1035	0.74	D	1125	0.80	E	1140	0.81	E	1.32%
	D	700	EB	2	1151	0.82	E	1251	0.89	E	1251	0.89	E	0.00%
		700	WB	2	863	0.62	C	938	0.67	D	938	0.67	D	0.00%
Beltway 8	E	2000	NB	3	2800	0.47	C	3043	0.51	C	3103	0.52	C	1.93%
	F	2000	SB	3	3059	0.51	C	3324	0.55	C	3372	0.56	C	1.42%
	G	2000	NB	3	1212	0.20	B	1317	0.22	B	1371	0.23	B	3.94%
	H	2000	SB	3	1558	0.26	B	1693	0.28	B	1708	0.28	B	0.88%
US 69	I	2000	EB	3	2014	0.34	B	2189	0.36	B	2204	0.37	B	0.68%
	J	2000	WB	3	2784	0.46	C	3025	0.50	C	3040	0.51	C	0.49%
	K	2000	EB	3	1495	0.25	B	1625	0.27	B	1625	0.27	B	0.00%
	L	2000	WB	3	1969	0.33	B	2140	0.36	B	2140	0.36	B	0.00%
Beltway 8	M	2000	SB	3	1715	0.29	B	1864	0.31	B	1864	0.31	B	0.00%
	N	2000	NB	3	1881	0.31	B	2044	0.34	B	2044	0.34	B	0.00%

Summary and Conclusions

Tetra Tech proposes Mining of the Ruffino Road Landfill Facilities (City of West University Landfill and City of Bellaire Landfill). The Ruffino Road Landfills are located on the northside of Ruffino Road at US 59 and Beltway 8 in City of Houston, Texas. The Ruffino Mining Facility will be located at 9610 Ruffino Road. The purpose of this study is to provide a traffic analysis and control plan for the Type IX Landfill Mining Registration Application.

The Landfill Mining and relocation for Ruffino Road Landfill will require the transport of materials to various existing Type I MSW landfills and Type IV C & D landfills. The relocation is anticipated to begin in 2023 and projected to be completed in approximately 2 years. After the completion of the Ruffino Landfill Mining project, traffic volumes are expected to return to the Background Condition and no trips are expected to be generated related to the completed project.

Capacity Analysis

Intersection capacity analysis was performed at the study intersections for 2021 Existing Conditions, 2025 Peak Mining Conditions and 2025 Post Mining Conditions. Seconds of Delay for each approach at the study intersections were used to determine a Level of Service (LOS). The Ruffino Landfill Mining site generated trips do not contribute to a change from an acceptable LOS to an unacceptable LOS.

Roadway capacity analysis was performed on roadways that will be used to access the site and access roadways within one mile of the landfill in accordance with the *Highway Capacity Manual (HCM)* for 2021 Existing Conditions, 2025 Peak Mining Conditions and 2025 Post Mining Conditions. The Ruffino Landfill Mining site generated trips do not contribute to a change from an acceptable LOS to an unacceptable LOS.

Conclusions

The traffic analysis has provided data on the following:

1. The availability and adequacy of roads that the owner or operator will use to access the site;
2. The volume of vehicular traffic on access roads within one mile of the proposed facility, both existing and expected, during the expected life of the proposed facility;
3. Projections of the volume of traffic expected to be generated by the facility on the access roads within one mile of the proposed facility; and
4. Documentation of coordination with the agency exercising maintenance responsibility of the public roadways involved, as necessary, and documentation of coordination with the Texas Department of Transportation will be provided in the TCEQ-20719 Form.

Based on this analysis, it is concluded that the traffic generated by the Ruffino Road Landfill Mining is a very small percentage of the traffic on the study roadways within 1 mile of the site and does not contribute to unacceptable availability or adequacy of the area roadway network. There are no known weight restrictions in the proximity of the site other than the maximum legal weight limit of 80,000 lbs.

Appendix

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Appendix A
Lane Assignment and Volume Figures

LEGEND

(X) VEHICLE VOLUME NODE

(#) INTERSECTION NODE

NODE IDENTIFICATION FIGURE

JONES | CARTER

Ruffino Landfill
North ^

Lane Assignment

08/29/2021
Jones|Carter

Ruffino Landfill
North ^

2021 Existing Conditions
AM PEAK HOUR

08/27/2021
Jones|Carter

Ruffino Landfill
North ^

2021 Existing Conditions
PM PEAK HOUR

08/27/2021
Jones|Carter

Ruffino Landfill
North ^

Trip Distribution Percentages
Inbound

08/28/2021
Jones|Carter

Ruffino Landfill
North ^

Trip Distribution Percentages
Outbound

08/28/2021
Jones|Carter

Ruffino Landfill
North ^

Site Generated Volumes
AM Peak Hour

08/30/2021
Jones|Carter

Ruffino Landfill
North ^

Site Generated Volumes
PM Peak Hour

08/30/2021
Jones|Carter

Ruffino Landfill
North ^

2025 Background/Post Mining Conditions
AM PEAK HOUR

08/30/2021
Jones|Carter

Ruffino Landfill
North ^

2025 Background/Post Mining Conditions
PM PEAK HOUR

08/30/2021
Jones|Carter

Ruffino Landfill
North ^

2025 Peak Mining Conditions
AM Peak Hour

08/30/2021
Jones|Carter

Ruffino Landfill
North ^

2025 Peak Mining Conditions
PM PEAK HOUR

08/30/2021
Jones|Carter

Appendix B
Traffic Counts

W Bellfort Ave at Stanwood Dr/Ruffino Rd - TMC

Thu Aug 12, 2021
Full Length (6 AM-7 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 862097, Location: 29.655752, -95.54555

Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg	Stanwood Dr/Ruffino Rd						Stanwood Dr/Ruffino Rd						W Bellfort Ave						W Bellfort Ave						
Direction	Northbound						Southbound						Eastbound						Westbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2021-08-12 6:00AM	3	0	1	0	**4**	1	0	0	2	0	**2**	0	0	27	0	0	**27**	0	0	75	0	0	**75**	0	**108**
6:15AM	4	0	1	0	**5**	0	0	0	1	0	**1**	1	0	49	2	0	**51**	0	0	88	1	0	**89**	0	**146**
6:30AM	9	0	0	0	**9**	1	0	0	0	0	**0**	1	0	49	3	0	**52**	0	0	118	0	0	**118**	0	**179**
6:45AM	3	0	0	0	**3**	0	0	0	0	0	**0**	1	0	65	2	0	**67**	0	0	121	0	0	**121**	0	**191**
Hourly Total	19	0	2	0	**21**	2	0	0	3	0	**3**	3	0	190	7	0	**197**	0	0	402	1	0	**403**	0	**624**
7:00AM	5	0	0	0	**5**	0	0	0	5	0	**5**	0	0	91	3	0	**94**	0	0	127	0	0	**127**	1	**231**
7:15AM	8	0	0	0	**8**	0	0	0	2	0	**2**	1	0	110	5	0	**115**	0	0	139	1	0	**140**	0	**265**
7:30AM	8	0	5	0	**13**	1	0	0	1	0	**1**	0	0	101	4	0	**105**	0	0	173	1	1	**175**	0	**294**
7:45AM	12	0	2	0	**14**	0	0	0	1	0	**1**	0	0	146	1	0	**147**	0	1	152	1	0	**154**	0	**316**
Hourly Total	33	0	7	0	**40**	1	0	0	9	0	**9**	1	0	448	13	0	**461**	0	1	591	3	1	**596**	1	**1106**
8:00AM	4	0	3	0	**7**	0	0	0	2	0	**2**	1	0	117	2	0	**119**	0	2	148	1	0	**151**	0	**279**
8:15AM	5	0	1	0	**6**	0	0	0	2	0	**2**	0	0	157	2	0	**159**	0	1	142	2	2	**147**	0	**314**
8:30AM	5	0	0	0	**5**	0	1	0	0	0	**1**	0	0	127	3	0	**130**	0	0	150	1	1	**152**	0	**288**
8:45AM	9	0	1	0	**10**	0	0	0	2	0	**2**	0	0	161	4	0	**165**	0	0	130	2	0	**132**	0	**309**
Hourly Total	23	0	5	0	**28**	0	1	0	6	0	**7**	1	0	562	11	0	**573**	0	3	570	6	3	**582**	0	**1190**
9:00AM	4	0	2	0	**6**	0	0	0	0	0	**0**	0	0	131	3	0	**134**	0	3	116	0	0	**119**	0	**259**
9:15AM	5	1	6	0	**12**	0	0	0	3	0	**3**	0	0	117	4	0	**121**	0	0	107	1	0	**108**	0	**244**
9:30AM	5	0	1	0	**6**	0	0	0	1	0	**1**	0	0	111	4	0	**115**	0	0	110	2	1	**113**	0	**235**
9:45AM	4	1	0	0	**5**	0	0	1	0	0	**1**	0	0	122	3	0	**125**	0	2	133	3	0	**138**	0	**269**
Hourly Total	18	2	9	0	**29**	0	0	1	4	0	**5**	0	0	481	14	0	**495**	0	5	466	6	1	**478**	0	**1007**
10:00AM	9	0	2	0	**11**	0	0	0	3	0	**3**	0	0	121	5	0	**126**	0	2	106	1	0	**109**	0	**249**
10:15AM	5	0	0	0	**5**	1	0	0	1	0	**1**	0	0	123	7	0	**130**	0	1	134	0	0	**135**	0	**271**
10:30AM	5	0	1	0	**6**	0	0	1	4	0	**5**	0	0	134	8	0	**142**	0	2	126	2	0	**130**	0	**283**
10:45AM	7	0	1	0	**8**	0	0	0	1	0	**1**	0	0	139	7	0	**146**	0	1	118	1	0	**120**	0	**275**
Hourly Total	26	0	4	0	**30**	1	0	1	9	0	**10**	0	0	517	27	0	**544**	0	6	484	4	0	**494**	0	**1078**
11:00AM	4	0	1	0	**5**	0	0	0	5	0	**5**	0	0	129	6	0	**135**	0	3	125	2	0	**130**	0	**275**
11:15AM	8	0	1	0	**9**	0	0	0	2	0	**2**	0	0	120	9	0	**129**	0	1	141	1	0	**143**	0	**283**
11:30AM	8	1	0	0	**9**	0	0	0	2	0	**2**	0	0	130	10	0	**140**	0	3	128	0	0	**131**	0	**282**
11:45AM	5	0	1	0	**6**	0	1	0	3	0	**4**	0	0	149	10	0	**159**	0	2	152	0	1	**155**	0	**324**
Hourly Total	25	1	3	0	**29**	0	1	0	12	0	**13**	0	0	528	35	0	**563**	0	9	546	3	1	**559**	0	**1164**
12:00PM	7	0	2	0	**9**	0	0	0	4	0	**4**	0	0	139	6	0	**145**	0	2	134	4	0	**140**	0	**298**
12:15PM	3	0	1	0	**4**	0	0	0	1	0	**1**	1	0	120	6	0	**126**	0	1	150	0	2	**153**	0	**284**
12:30PM	4	0	0	0	**4**	0	0	0	3	0	**3**	0	0	140	8	0	**148**	0	2	154	0	0	**156**	0	**311**
12:45PM	7	0	3	0	**10**	0	1	0	1	0	**2**	0	0	171	8	0	**179**	0	2	158	0	1	**161**	0	**352**
Hourly Total	21	0	6	0	**27**	0	1	0	9	0	**10**	1	0	570	28	0	**598**	0	7	596	4	3	**610**	0	**1245**
1:00PM	7	0	4	0	**11**	0	0	0	1	0	**1**	0	0	124	9	0	**133**	0	2	133	0	0	**135**	0	**280**
1:15PM	2	0	0	0	**2**	0	0	0	4	0	**4**	0	0	148	2	0	**150**	0	1	145	2	1	**149**	0	**305**
1:30PM	4	1	1	0	**6**	0	0	0	1	0	**1**	0	0	153	1	0	**154**	0	1	126	1	1	**129**	0	**290**
1:45PM	6	0	1	0	**7**	0	0	0	3	0	**3**	0	0	150	9	0	**159**	0	2	136	0	0	**138**	0	**307**
Hourly Total	19	1	6	0	**26**	0	0	0	9	0	**9**	0	0	575	21	0	**596**	0	6	540	3	2	**551**	0	**1182**
2:00PM	3	0	5	0	**8**	0	0	0	0	0	**0**	0	0	166	4	0	**170**	0	1	150	0	2	**153**	0	**331**
2:15PM	7	0	1	0	**8**	0	0	0	2	0	**2**	1	0	163	7	1	**171**	0	3	165	0	1	**169**	0	**350**
2:30PM	6	0	0	0	**6**	0	2	0	1	0	**3**	0	0	136	9	1	**146**	0	4	164	0	0	**168**	0	**323**
2:45PM	2	0	1	0	**3**	0	0	0	4	0	**4**	1	0	167	6	0	**173**	0	2	151	1	0	**154**	0	**334**
Hourly Total	18	0	7	0	**25**	0	2	0	7	0	**9**	2	0	632	26	2	**660**	0	10	630	1	3	**644**	0	**1338**
3:00PM	3	0	1	0	**4**	0	0	0	2	0	**2**	0	0	144	7	0	**151**	0	1	174	1	1	**177**	0	**334**
3:15PM	7	0	3	0	**10**	1	0	0	2	0	**2**	0	0	176	11	0	**187**	0	0	178	2	0	**180**	0	**379**
3:30PM	4	0	0	0	**4**	0	1	1	4	0	**6**	0	1	193	10	0	**204**	0	0	174	0	1	**175**	0	**389**
3:45PM	5	0	1	0	**6**	1	0	0	0	0	**0**	0	0	191	17	3	**211**	0	1	165	0	1	**167**	0	**384**
Hourly Total	19	0	5	0	**24**	2	1	1	8	0	**10**	0	1	704	45	3	**753**	0	2	691	3	3	**699**	0	**1486**
4:00PM	8	0	1	0	**9**	0	0	0	3	0	**3**	0	0	192	9	0	**201**	0	0	173	3	0	**176**	0	**389**
4:15PM	5	0	1	0	**6**	0	1	0	1	0	**2**	0	0	205	15	0	**220**	0	2	170	1	0	**173**	2	**401**
4:30PM	4	0	3	0	**7**	0	0	0	0	0	**0**	0	0	210	8	1	**219**	0	3	180	0	0	**183**	0	**409**
4:45PM	0	1	1	0	**2**	1	1	1	0	0	**2**	0	0	221	11	0	**232**	0	3	159	0	0	**162**	0	**398**
Hourly Total	17	1	6	0	**24**	1	2	1	4	0	**7**	0	0	828	43	1	**872**	0	8	682	4	0	**694**	2	**1597**
5:00PM	3	0	2	0	**5**	1	0	0	0	0	**0**	0	0	205	8	0	**213**	0	4	164	0	0	**168**	0	**386**
5:15PM	2	0	1	0	**3**	0	0	0	1	0	**1**	1	0	233	7	1	**241**	0	0	174	1	0	**175**	0	**420**
5:30PM	5	0	0	0	**5**	0	0	0	0	0	**0**	0	0	211	13	0	**224**	0	2	177	0	1	**180**	0	**409**
5:45PM	5	0	3	0	**8**	0	0	1	0	0	**1**	0	0	200	16	0	**216**	0	1	173	2	0	**176**	0	**401**
Hourly Total	15	0	6	0	**21**	1	0	1	1	0	**2**	1	0	849	44	1	**894**	0	7	688	3	1	**699**	0	**1616**

Leg Direction	Stanwood Dr/Ruffino Rd Northbound						Stanwood Dr/Ruffino Rd Southbound						W Bellfort Ave Eastbound						W Bellfort Ave Westbound						
Time	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	**Int**
6:00PM	7	0	2	0	**9**	1	1	0	1	0	**2**	0	0	211	15	0	**226**	0	1	159	1	0	**161**	0	**398**
6:15PM	3	0	1	0	**4**	0	1	0	3	0	**4**	0	0	208	14	0	**222**	0	2	174	2	0	**178**	0	**408**
6:30PM	3	0	5	0	**8**	0	0	0	0	0	**0**	1	0	189	10	0	**199**	0	3	142	0	1	**146**	0	**353**
6:45PM	4	0	2	0	**6**	0	0	0	0	0	**0**	0	0	197	7	0	**204**	1	2	159	0	1	**162**	0	**372**
Hourly Total	17	0	10	0	**27**	1	2	0	4	0	**6**	1	0	805	46	0	**851**	1	8	634	3	2	**647**	0	**1531**
Total	270	5	76	0	**351**	9	10	5	85	0	**100**	10	1	7689	360	7	**8057**	1	72	7520	44	20	**7656**	3	**16164**
% Approach	76.9%	1.4%	21.7%	0%	**-**	-	10.0%	5.0%	85.0%	0%	**-**	-	0%	95.4%	4.5%	0.1%	**-**	-	0.9%	98.2%	0.6%	0.3%	**-**	-	**-**
% Total	1.7%	0%	0.5%	0%	**2.2%**	-	0.1%	0%	0.5%	0%	**0.6%**	-	0%	47.6%	2.2%	0%	**49.8%**	-	0.4%	46.5%	0.3%	0.1%	**47.4%**	-	**-**
Lights	267	4	74	0	**345**	-	8	5	20	0	**33**	-	1	7534	355	4	**7894**	-	68	7362	32	20	**7482**	-	15754
% Lights	98.9%	80.0%	97.4%	0%	**98.3%**	-	80.0%	100%	23.5%	0%	**33.0%**	-	100%	98.0%	98.6%	57.1%	**98.0%**	-	94.4%	97.9%	72.7%	100%	**97.7%**	-	97.5%
Articulated Trucks	0	0	0	0	**0**	-	0	0	5	0	**5**	-	0	25	0	3	**28**	-	0	15	1	0	**16**	-	49
% Articulated Trucks	0%	0%	0%	0%	**0%**	-	0%	0%	5.9%	0%	**5.0%**	-	0%	0.3%	0%	42.9%	**0.3%**	-	0%	0.2%	2.3%	0%	**0.2%**	-	0.3%
Buses and Single-Unit Trucks	3	1	2	0	**6**	-	2	0	60	0	**62**	-	0	130	5	0	**135**	-	4	143	11	0	**158**	-	361
% Buses and Single-Unit Trucks	1.1%	20.0%	2.6%	0%	**1.7%**	-	20.0%	0%	70.6%	0%	**62.0%**	-	0%	1.7%	1.4%	0%	**1.7%**	-	5.6%	1.9%	25.0%	0%	**2.1%**	-	2.2%
Pedestrians	-	-	-	-	-	4	-	-	-	-	-	4	-	-	-	-	-	1	-	-	-	-	-	3	
% Pedestrians	-	-	-	-	-	44.4%	-	-	-	-	-	40.0%	-	-	-	-	-	100%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	5	-	-	-	-	-	6	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	55.6%	-	-	-	-	-	60.0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

W Sam Houston Pkwy NBFR at Ruffino Rd - TMC

Thu Aug 12, 2021
Full Length (6 AM-7 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 862098, Location: 29.656078, -95.552395

Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg	W Sam Houston Pkwy NBFR					W Sam Houston Pkwy NBFR					Ruffino Rd					
Direction	Northbound					Southbound					Westbound					
Time	T	R	U	**App**	Ped*	L	T	U	**App**	Ped*	L	R	U	**App**	Ped*	**Int**
2021-08-12 6:00AM	100	8	0	**108**	0	0	0	0	**0**	0	0	8	0	**8**	0	**116**
6:15AM	134	5	0	**139**	0	0	0	0	**0**	0	0	7	0	**7**	0	**146**
6:30AM	162	12	0	**174**	0	0	0	0	**0**	0	0	5	0	**5**	0	**179**
6:45AM	207	5	0	**212**	0	0	0	0	**0**	0	0	5	0	**5**	0	**217**
Hourly Total	603	30	0	**633**	0	0	0	0	**0**	0	0	25	0	**25**	0	**658**
7:00AM	226	8	0	**234**	0	0	0	0	**0**	0	0	4	0	**4**	0	**238**
7:15AM	250	9	0	**259**	0	0	0	0	**0**	0	0	9	0	**9**	0	**268**
7:30AM	292	4	0	**296**	0	0	0	0	**0**	0	0	6	0	**6**	0	**302**
7:45AM	318	7	0	**325**	0	0	0	0	**0**	0	0	4	0	**4**	0	**329**
Hourly Total	1086	28	0	**1114**	0	0	0	0	**0**	0	0	23	0	**23**	0	**1137**
8:00AM	212	5	0	**217**	0	0	0	0	**0**	0	0	3	0	**3**	0	**220**
8:15AM	209	3	0	**212**	0	0	0	0	**0**	0	0	5	0	**5**	0	**217**
8:30AM	219	6	0	**225**	0	0	0	0	**0**	0	0	4	0	**4**	0	**229**
8:45AM	212	6	0	**218**	0	0	0	0	**0**	0	0	5	0	**5**	0	**223**
Hourly Total	852	20	0	**872**	0	0	0	0	**0**	0	0	17	0	**17**	0	**889**
9:00AM	215	6	0	**221**	0	0	0	0	**0**	0	0	6	0	**6**	0	**227**
9:15AM	202	4	0	**206**	0	0	0	0	**0**	0	0	6	0	**6**	0	**212**
9:30AM	175	5	0	**180**	0	0	0	0	**0**	0	0	5	0	**5**	0	**185**
9:45AM	178	9	0	**187**	0	0	0	0	**0**	0	0	4	0	**4**	0	**191**
Hourly Total	770	24	0	**794**	0	0	0	0	**0**	0	0	21	0	**21**	0	**815**
10:00AM	164	3	0	**167**	0	0	0	0	**0**	0	0	10	0	**10**	0	**177**
10:15AM	182	5	0	**187**	0	0	0	0	**0**	0	0	4	0	**4**	0	**191**
10:30AM	196	4	0	**200**	0	0	0	0	**0**	0	0	6	0	**6**	0	**206**
10:45AM	195	7	0	**202**	0	0	0	0	**0**	0	0	3	0	**3**	0	**205**
Hourly Total	737	19	0	**756**	0	0	0	0	**0**	0	0	23	0	**23**	0	**779**
11:00AM	166	5	0	**171**	0	0	0	0	**0**	0	0	3	0	**3**	0	**174**
11:15AM	191	13	0	**204**	0	0	0	0	**0**	0	0	4	0	**4**	0	**208**
11:30AM	156	10	0	**166**	0	0	0	0	**0**	0	0	4	0	**4**	0	**170**
11:45AM	194	6	0	**200**	0	0	0	0	**0**	0	0	7	0	**7**	0	**207**
Hourly Total	707	34	0	**741**	0	0	0	0	**0**	0	0	18	0	**18**	0	**759**
12:00PM	192	6	0	**198**	0	0	0	0	**0**	0	0	9	0	**9**	0	**207**
12:15PM	210	10	0	**220**	0	0	0	0	**0**	0	0	8	0	**8**	0	**228**
12:30PM	203	9	0	**212**	0	0	0	0	**0**	0	0	2	0	**2**	0	**214**
12:45PM	197	7	0	**204**	0	0	0	0	**0**	0	0	4	0	**4**	0	**208**
Hourly Total	802	32	0	**834**	0	0	0	0	**0**	0	0	23	0	**23**	0	**857**
1:00PM	211	6	0	**217**	0	0	0	0	**0**	0	0	8	0	**8**	0	**225**
1:15PM	205	8	0	**213**	0	0	0	0	**0**	0	0	9	0	**9**	0	**222**
1:30PM	193	8	0	**201**	0	0	0	0	**0**	0	0	9	0	**9**	0	**210**
1:45PM	196	6	0	**202**	0	0	0	0	**0**	0	0	4	0	**4**	0	**206**
Hourly Total	805	28	0	**833**	0	0	0	0	**0**	0	0	30	0	**30**	0	**863**
2:00PM	199	7	0	**206**	0	0	0	0	**0**	0	0	6	0	**6**	0	**212**
2:15PM	227	6	0	**233**	0	0	0	0	**0**	0	0	2	0	**2**	0	**235**
2:30PM	197	5	0	**202**	0	0	0	0	**0**	0	0	4	0	**4**	0	**206**
2:45PM	224	5	0	**229**	0	0	0	0	**0**	0	0	4	0	**4**	0	**233**
Hourly Total	847	23	0	**870**	0	0	0	0	**0**	0	0	16	0	**16**	0	**886**
3:00PM	231	6	0	**237**	0	0	0	0	**0**	0	0	3	0	**3**	0	**240**
3:15PM	284	5	0	**289**	0	0	0	0	**0**	0	0	6	0	**6**	0	**295**
3:30PM	245	9	0	**254**	0	0	0	0	**0**	0	0	6	0	**6**	0	**260**
3:45PM	245	3	0	**248**	0	0	0	0	**0**	0	0	5	0	**5**	0	**253**
Hourly Total	1005	23	0	**1028**	0	0	0	0	**0**	0	0	20	0	**20**	0	**1048**
4:00PM	272	2	0	**274**	0	0	0	0	**0**	0	0	3	0	**3**	0	**277**
4:15PM	248	1	0	**249**	0	0	0	0	**0**	0	0	2	0	**2**	0	**251**

Leg Direction	W Sam Houston Pkwy NBFR Northbound					W Sam Houston Pkwy NBFR Southbound					Ruffino Rd Westbound					
Time	T	R	U	**App**	Ped*	L	T	U	**App**	Ped*	L	R	U	**App**	Ped*	**Int**
4:30PM	272	4	0	**276**	0	0	0	0	**0**	0	0	3	0	**3**	0	**279**
4:45PM	245	1	0	**246**	0	0	0	0	**0**	0	0	2	0	**2**	0	**248**
Hourly Total	1037	8	0	**1045**	0	0	0	0	**0**	0	0	10	0	**10**	0	**1055**
5:00PM	293	0	0	**293**	0	0	0	0	**0**	0	0	2	0	**2**	0	**295**
5:15PM	278	2	0	**280**	0	0	0	0	**0**	0	0	3	0	**3**	0	**283**
5:30PM	275	0	0	**275**	0	0	0	0	**0**	0	0	2	0	**2**	0	**277**
5:45PM	284	3	0	**287**	0	0	0	0	**0**	0	0	0	0	**0**	0	**287**
Hourly Total	1130	5	0	**1135**	0	0	0	0	**0**	0	0	7	0	**7**	0	**1142**
6:00PM	262	1	0	**263**	0	0	0	0	**0**	0	0	2	0	**2**	0	**265**
6:15PM	227	0	0	**227**	0	0	0	0	**0**	0	0	2	0	**2**	0	**229**
6:30PM	205	0	0	**205**	0	0	0	0	**0**	0	0	0	0	**0**	0	**205**
6:45PM	199	0	0	**199**	0	0	0	0	**0**	0	0	0	0	**0**	0	**199**
Hourly Total	893	1	0	**894**	0	0	0	0	**0**	0	0	4	0	**4**	0	**898**
Total	11274	275	0	**11549**	0	0	0	0	**0**	0	0	237	0	**237**	0	**11786**
% Approach	97.6%	2.4%	0%	**-**	-	0%	0%	0%	**-**	-	0%	100%	0%	**-**	-	**-**
% Total	95.7%	2.3%	0%	**98.0%**	-	0%	0%	0%	**0%**	-	0%	2.0%	0%	**2.0%**	-	**-**
Lights	10897	33	0	**10930**	-	0	0	0	**0**	-	0	48	0	**48**	-	10978
% Lights	96.7%	12.0%	0%	**94.6%**	-	0%	0%	0%	**-**	-	0%	20.3%	0%	**20.3%**	-	93.1%
Articulated Trucks	68	55	0	**123**	-	0	0	0	**0**	-	0	46	0	**46**	-	169
% Articulated Trucks	0.6%	20.0%	0%	**1.1%**	-	0%	0%	0%	**-**	-	0%	19.4%	0%	**19.4%**	-	1.4%
Buses and Single-Unit Trucks	309	187	0	**496**	-	0	0	0	**0**	-	0	143	0	**143**	-	639
% Buses and Single-Unit Trucks	2.7%	68.0%	0%	**4.3%**	-	0%	0%	0%	**-**	-	0%	60.3%	0%	**60.3%**	-	5.4%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

W Sam Houston Pkwy SBFR at W Bellfort Ave - TMC

Thu Aug 12, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 862099, Location: 29.653281, -95.550711

Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg	W Sam Houston Pkwy SBFR						W Sam Houston Pkwy SBFR						W Bellfort Ave						W Bellfort Ave						
Direction	Northbound						Southbound						Eastbound						Westbound						
Time	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	L	T	R	U	App	Ped*	Int
2021-08-12 7:00AM	0	0	0	9	**9**	1	49	124	9	18	**200**	0	0	70	51	0	**121**	0	17	90	0	0	**107**	0	**437**
7:15AM	0	0	0	6	**6**	1	42	109	7	13	**171**	1	0	80	57	0	**137**	0	20	102	0	0	**122**	0	**436**
7:30AM	0	0	0	8	**8**	0	50	155	4	9	**218**	0	0	72	59	0	**131**	0	16	97	0	0	**113**	0	**470**
7:45AM	0	0	0	17	**17**	0	60	116	11	10	**197**	1	0	86	59	0	**145**	0	10	129	0	0	**139**	0	**498**
Hourly Total	0	0	0	40	**40**	2	201	504	31	50	**786**	2	0	308	226	0	**534**	0	63	418	0	0	**481**	0	**1841**
8:00AM	0	0	0	4	**4**	0	55	121	7	8	**191**	0	0	63	66	0	**129**	0	13	95	0	0	**108**	0	**432**
8:15AM	0	0	0	6	**6**	0	58	109	5	17	**189**	0	0	105	57	0	**162**	0	7	121	0	0	**128**	0	**485**
8:30AM	0	0	0	9	**9**	0	48	108	5	13	**174**	0	0	62	59	0	**121**	0	8	115	0	0	**123**	0	**427**
8:45AM	0	0	0	9	**9**	0	58	106	10	13	**187**	0	0	103	65	0	**168**	0	13	87	0	0	**100**	0	**464**
Hourly Total	0	0	0	28	**28**	0	219	444	27	51	**741**	0	0	333	247	0	**580**	0	41	418	0	0	**459**	0	**1808**
4:00PM	0	0	0	18	**18**	1	81	161	12	10	**264**	1	0	121	53	0	**174**	3	20	124	0	0	**144**	0	**600**
4:15PM	0	0	0	13	**13**	0	87	164	18	4	**273**	2	0	117	72	0	**189**	0	13	131	0	0	**144**	0	**619**
4:30PM	0	0	0	21	**21**	0	93	213	12	11	**329**	0	0	158	58	0	**216**	0	15	149	0	0	**164**	0	**730**
4:45PM	0	0	0	11	**11**	0	85	162	14	21	**282**	2	0	124	76	0	**200**	0	14	155	0	0	**169**	0	**662**
Hourly Total	0	0	0	63	**63**	1	346	700	56	46	**1148**	5	0	520	259	0	**779**	3	62	559	0	0	**621**	0	**2611**
5:00PM	0	0	0	9	**9**	0	108	224	15	8	**355**	0	0	125	73	0	**198**	0	10	178	0	0	**188**	0	**750**
5:15PM	0	0	0	14	**14**	0	104	212	12	9	**337**	1	0	124	79	0	**203**	0	16	181	0	0	**197**	0	**751**
5:30PM	0	0	0	12	**12**	0	103	222	13	9	**347**	1	0	120	89	0	**209**	0	11	192	0	0	**203**	0	**771**
5:45PM	0	0	0	5	**5**	0	91	164	20	9	**284**	0	0	122	59	0	**181**	0	8	169	0	0	**177**	0	**647**
Hourly Total	0	0	0	40	**40**	0	406	822	60	35	**1323**	2	0	491	300	0	**791**	0	45	720	0	0	**765**	0	**2919**
Total	0	0	0	171	**171**	3	1172	2470	174	182	**3998**	9	0	1652	1032	0	**2684**	3	211	2115	0	0	**2326**	0	**9179**
% Approach	0%	0%	0%	100%	**-**	-	29.3%	61.8%	4.4%	4.6%	**-**	-	0%	61.5%	38.5%	0%	**-**	-	9.1%	90.9%	0%	0%	**-**	-	**-**
% Total	0%	0%	0%	1.9%	**1.9%**	-	12.8%	26.9%	1.9%	2.0%	**43.6%**	-	0%	18.0%	11.2%	0%	**29.2%**	-	2.3%	23.0%	0%	0%	**25.3%**	-	**-**
Lights	0	0	0	161	**161**	-	1155	2397	168	139	**3859**	-	0	1607	1001	0	**2608**	-	193	2045	0	0	**2238**	-	8866
% Lights	0%	0%	0%	94.2%	**94.2%**	-	98.5%	97.0%	96.6%	76.4%	**96.5%**	-	0%	97.3%	97.0%	0%	**97.2%**	-	91.5%	96.7%	0%	0%	**96.2%**	-	96.6%
Articulated Trucks	0	0	0	1	**1**	-	5	14	0	20	**39**	-	0	12	5	0	**17**	-	3	11	0	0	**14**	-	71
% Articulated Trucks	0%	0%	0%	0.6%	**0.6%**	-	0.4%	0.6%	0%	11.0%	**1.0%**	-	0%	0.7%	0.5%	0%	**0.6%**	-	1.4%	0.5%	0%	0%	**0.6%**	-	0.8%
Buses and Single-Unit Trucks	0	0	0	9	**9**	-	12	59	6	23	**100**	-	0	33	26	0	**59**	-	15	59	0	0	**74**	-	242
% Buses and Single-Unit Trucks	0%	0%	0%	5.3%	**5.3%**	-	1.0%	2.4%	3.4%	12.6%	**2.5%**	-	0%	2.0%	2.5%	0%	**2.2%**	-	7.1%	2.8%	0%	0%	**3.2%**	-	2.6%
Pedestrians	-	-	-	-	-	3	-	-	-	-	-	6	-	-	-	-	-	3	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	66.7%	-	-	-	-	-	100%	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	33.3%	-	-	-	-	-	0%	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

W Sam Houston Pkwy NBFR at W Bellfort Ave - TMC

Thu Aug 12, 2021
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks, Pedestrians, Bicycles on Crosswalk)
All Movements
ID: 862100, Location: 29.653757, -95.549767

Provided by: C. J. Hensch & Associates Inc.
5215 Sycamore Ave.,
Pasadena, TX, 77503, US

Leg	W Sam Houston Pkwy NBFR						W Sam Houston Pkwy NBFR						W Bellfort Ave						W Bellfort Ave						
Direction	Northbound						Southbound						Eastbound						Westbound						
Time	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	L	T	R	U	**App**	Ped*	**Int**
2021-08-12 7:00AM	41	129	11	10	**191**	1	0	0	0	19	**19**	0	18	111	0	0	**129**	0	0	60	59	0	**119**	0	**458**
7:15AM	54	140	17	7	**218**	1	0	0	0	13	**13**	1	22	94	0	0	**116**	0	0	73	86	0	**159**	0	**506**
7:30AM	34	152	11	8	**205**	0	0	0	0	9	**9**	0	20	119	0	2	**141**	0	0	73	93	0	**166**	0	**521**
7:45AM	51	208	10	20	**289**	0	0	0	0	17	**17**	1	15	126	0	2	**143**	0	0	84	86	0	**170**	0	**619**
Hourly Total	180	629	49	45	**903**	2	0	0	0	58	**58**	2	75	450	0	4	**529**	0	0	290	324	0	**614**	0	**2104**
8:00AM	36	133	9	8	**186**	0	0	0	0	8	**8**	0	10	126	0	1	**137**	0	0	79	77	0	**156**	0	**487**
8:15AM	46	125	8	6	**185**	0	0	0	0	18	**18**	0	14	150	0	2	**166**	0	0	83	78	0	**161**	0	**530**
8:30AM	54	125	12	8	**199**	0	0	0	0	13	**13**	0	10	122	0	0	**132**	0	0	84	69	0	**153**	0	**497**
8:45AM	39	162	12	20	**233**	0	0	0	0	14	**14**	0	17	140	0	0	**157**	0	0	69	68	0	**137**	0	**541**
Hourly Total	175	545	41	42	**803**	0	0	0	0	53	**53**	0	51	538	0	3	**592**	0	0	315	292	0	**607**	0	**2055**
4:00PM	41	146	16	20	**223**	0	0	0	0	10	**10**	0	13	198	0	2	**213**	0	0	101	87	0	**188**	0	**634**
4:15PM	63	148	23	12	**246**	0	0	0	0	4	**4**	0	7	185	0	0	**192**	0	0	89	88	0	**177**	0	**619**
4:30PM	64	159	17	22	**262**	0	0	0	0	14	**14**	0	20	220	0	2	**242**	0	0	98	71	0	**169**	0	**687**
4:45PM	69	142	27	10	**248**	0	0	0	0	22	**22**	0	21	198	0	1	**220**	0	0	103	80	0	**183**	0	**673**
Hourly Total	237	595	83	64	**979**	0	0	0	0	50	**50**	0	61	801	0	5	**867**	0	0	391	326	0	**717**	0	**2613**
5:00PM	82	152	16	14	**264**	0	0	0	0	9	**9**	0	19	196	1	1	**217**	0	0	105	68	0	**173**	0	**663**
5:15PM	83	170	21	16	**290**	0	0	0	0	10	**10**	1	12	175	0	3	**190**	0	0	119	72	0	**191**	0	**681**
5:30PM	68	147	12	16	**243**	0	0	0	0	9	**9**	1	12	196	0	0	**208**	0	0	114	68	0	**182**	0	**642**
5:45PM	73	152	20	5	**250**	0	0	0	0	11	**11**	0	24	140	0	0	**164**	0	0	108	83	0	**191**	0	**616**
Hourly Total	306	621	69	51	**1047**	0	0	0	0	39	**39**	2	67	707	1	4	**779**	0	0	446	291	0	**737**	0	**2602**
Total	898	2390	242	202	**3732**	2	0	0	0	200	**200**	4	254	2496	1	16	**2767**	0	0	1442	1233	0	**2675**	0	**9374**
% Approach	24.1%	64.0%	6.5%	5.4%	**-**	-	0%	0%	0%	100%	**-**	-	9.2%	90.2%	0%	0.6%	**-**	-	0%	53.9%	46.1%	0%	**-**	-	-
% Total	9.6%	25.5%	2.6%	2.2%	**39.8%**	-	0%	0%	0%	2.1%	**2.1%**	-	2.7%	26.6%	0%	0.2%	**29.5%**	-	0%	15.4%	13.2%	0%	**28.5%**	-	-
Lights	856	2314	233	184	**3587**	-	0	0	0	157	**157**	-	239	2450	1	16	**2706**	-	0	1392	1213	0	**2605**	-	9055
% Lights	95.3%	96.8%	96.3%	91.1%	**96.1%**	-	0%	0%	0%	78.5%	**78.5%**	-	94.1%	98.2%	100%	100%	**97.8%**	-	0%	96.5%	98.4%	0%	**97.4%**	-	96.6%
Articulated Trucks	10	13	5	1	**29**	-	0	0	0	16	**16**	-	2	9	0	0	**11**	-	0	7	2	0	**9**	-	65
% Articulated Trucks	1.1%	0.5%	2.1%	0.5%	**0.8%**	-	0%	0%	0%	8.0%	**8.0%**	-	0.8%	0.4%	0%	0%	**0.4%**	-	0%	0.5%	0.2%	0%	**0.3%**	-	0.7%
Buses and Single-Unit Trucks	32	63	4	17	**116**	-	0	0	0	27	**27**	-	13	37	0	0	**50**	-	0	43	18	0	**61**	-	254
% Buses and Single-Unit Trucks	3.6%	2.6%	1.7%	8.4%	**3.1%**	-	0%	0%	0%	13.5%	**13.5%**	-	5.1%	1.5%	0%	0%	**1.8%**	-	0%	3.0%	1.5%	0%	**2.3%**	-	2.7%
Pedestrians	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	25.0%	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	75.0%	-	-	-	-	-	-	-	-	-	-	-	-	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

A	Ruffino Road	
	East of Beltway 8 NBFR	
	Midweek August 2021	
Time	EB 2021 Total	WB 2021 Total
12:00 AM		
1:00 AM		
2:00 AM		
3:00 AM		
4:00 AM		
5:00 AM		
6:00 AM	25	30
7:00 AM	23	28
8:00 AM	17	20
9:00 AM	21	24
10:00 AM	23	19
11:00 AM	18	34
12:00 PM	23	32
1:00 PM	30	28
2:00 PM	16	23
3:00 PM	20	23
4:00 PM	10	8
5:00 PM	7	5
6:00 PM	4	1
7:00 PM		
8:00 PM		
9:00 PM		
10:00 PM		
11:00 PM		
Total*	**296**	**344**

*13 Hour Count Data assumed to represent 80% of 24 Hour Volumes

B	W Bellfort Avenue			
	East of Ruffino Road			
	Midweek February 2016			
Time	EB 2016 Total	EB 2021 Total	WB 2016 Total	WB 2021 Total
12:00 AM	92	102	68	75
1:00 AM	59	65	41	45
2:00 AM	29	32	35	39
3:00 AM	30	33	34	38
4:00 AM	49	54	94	104
5:00 AM	124	138	251	278
6:00 AM	360	399	652	723
7:00 AM	711	789	1154	1280
8:00 AM	585	649	749	831
9:00 AM	495	549	613	680
10:00 AM	512	568	601	667
11:00 AM	548	608	569	631
12:00 PM	626	695	641	711
1:00 PM	705	782	710	788
2:00 PM	680	754	746	828
3:00 PM	840	932	754	837
4:00 PM	961	1066	920	1021
5:00 PM	1070	1187	889	986
6:00 PM	1085	1204	908	1007
7:00 PM	813	902	720	799
8:00 PM	548	608	533	591
9:00 PM	472	524	467	518
10:00 PM	291	323	275	305
11:00 PM	181	201	141	156
Total	**11866**	**13164**	**12565**	**13938**

C	W Bellfort Avenue			
	East of Beltway 8 NBFR			
	Midweek February 2016			
Time	EB 2016 Total	EB 2021 Total	WB 2016 Total	WB 2021 Total
12:00 AM	98	109	69	77
1:00 AM	59	65	41	45
2:00 AM	32	36	33	37
3:00 AM	31	34	34	38
4:00 AM	54	60	89	99
5:00 AM	124	138	250	277
6:00 AM	410	455	696	772
7:00 AM	815	904	1259	1397
8:00 AM	646	717	796	883
9:00 AM	540	599	636	706
10:00 AM	533	591	623	691
11:00 AM	602	668	605	671
12:00 PM	690	766	652	723
1:00 PM	746	828	744	825
2:00 PM	729	809	790	877
3:00 PM	895	993	815	904
4:00 PM	1038	1152	921	1022
5:00 PM	1137	1262	914	1014
6:00 PM	1216	1349	933	1035
7:00 PM	873	969	728	808
8:00 PM	587	651	551	611
9:00 PM	505	560	510	566
10:00 PM	317	352	306	340
11:00 PM	185	205	142	158
Total	**12862**	**14272**	**13137**	**14576**

D	W Bellfort Avenue			
	West of Beltway 8 NBFR			
	Midweek February 2016			
Time	EB 2016 Total	EB 2021 Total	WB 2016 Total	WB 2021 Total
12:00 AM	74	82	73	81
1:00 AM	40	44	42	47
2:00 AM	26	29	28	31
3:00 AM	28	31	33	37
4:00 AM	70	78	78	87
5:00 AM	225	250	220	244
6:00 AM	433	480	511	567
7:00 AM	740	821	844	936
8:00 AM	662	734	597	662
9:00 AM	529	587	458	508
10:00 AM	505	560	417	463
11:00 AM	513	569	448	497
12:00 PM	556	617	515	571
1:00 PM	633	702	551	611
2:00 PM	652	723	597	662
3:00 PM	749	831	704	781
4:00 PM	885	982	724	803
5:00 PM	1018	1129	775	860
6:00 PM	1037	1151	778	863
7:00 PM	684	759	612	679
8:00 PM	419	465	434	482
9:00 PM	377	418	390	433
10:00 PM	232	257	223	247
11:00 PM	128	142	129	143
Total	**11215**	**12441**	**10181**	**11295**

E	Beltway 8 NBFR South of W Bellfort Avenue Midweek March 2019	
Time	2019 Total	2021 Total
12:00 AM	360	375
1:00 AM	200	208
2:00 AM	177	185
3:00 AM	167	174
4:00 AM	432	450
5:00 AM	984	1026
6:00 AM	2131	2221
7:00 AM	2957	3082
8:00 AM	2659	2772
9:00 AM	2318	2416
10:00 AM	1853	1932
11:00 AM	1902	1983
12:00 PM	1951	2034
1:00 PM	1976	2060
2:00 PM	2104	2193
3:00 PM	2512	2619
4:00 PM	2639	2751
5:00 PM	2686	2800
6:00 PM	2437	2540
7:00 PM	1885	1965
8:00 PM	1287	1342
9:00 PM	959	1000
10:00 PM	833	868
11:00 PM	542	565
Total	**37951**	**39561**

F	Beltway 8 SBFR South of W Bellfort Avenue Midweek May 2017	
Time	2017 Total	2021 Total
12:00 AM	492	535
1:00 AM	288	313
2:00 AM	242	263
3:00 AM	252	274
4:00 AM	426	463
5:00 AM	1138	1237
6:00 AM	1742	1893
7:00 AM	2250	2445
8:00 AM	1984	2156
9:00 AM	1701	1848
10:00 AM	1673	1818
11:00 AM	1826	1984
12:00 PM	1881	2044
1:00 PM	2012	2186
2:00 PM	2183	2372
3:00 PM	2561	2783
4:00 PM	2727	2963
5:00 PM	2815	3059
6:00 PM	2435	2646
7:00 PM	2149	2335
8:00 PM	1795	1951
9:00 PM	1600	1739
10:00 PM	1220	1326
11:00 PM	741	805
Total	**38133**	**41438**

G	Beltway 8 NBFR North of W Bellfort Avenue Midweek March 2019	
Time	2019 Total	2021 Total
12:00 AM	153	159
1:00 AM	88	92
2:00 AM	74	77
3:00 AM	78	81
4:00 AM	135	141
5:00 AM	339	353
6:00 AM	893	931
7:00 AM	1671	1742
8:00 AM	1478	1541
9:00 AM	942	982
10:00 AM	867	904
11:00 AM	911	950
12:00 PM	879	916
1:00 PM	915	954
2:00 PM	936	976
3:00 PM	1091	1137
4:00 PM	1163	1212
5:00 PM	1135	1183
6:00 PM	1084	1130
7:00 PM	797	831
8:00 PM	563	587
9:00 PM	478	498
10:00 PM	324	338
11:00 PM	240	250
Total	**17234**	**17965**

H	Beltway 8 SBFR North of W Bellfort Avenue Midweek March 2019	
Time	2019 Total	2021 Total
12:00 AM	154	161
1:00 AM	115	120
2:00 AM	71	74
3:00 AM	76	79
4:00 AM	147	153
5:00 AM	305	318
6:00 AM	639	666
7:00 AM	1002	1045
8:00 AM	900	938
9:00 AM	784	817
10:00 AM	707	737
11:00 AM	778	811
12:00 PM	814	849
1:00 PM	836	871
2:00 PM	955	996
3:00 PM	1056	1101
4:00 PM	1441	1502
5:00 PM	1495	1558
6:00 PM	1254	1307
7:00 PM	917	956
8:00 PM	605	631
9:00 PM	505	526
10:00 PM	363	378
11:00 PM	247	257
Total	**16166**	**16851**

I	US 69 EBFR East of W Bellfort Avenue Midweek March 2016	
Time	2016 Total	2021 Total
12:00 AM	185	205
1:00 AM	124	138
2:00 AM	114	126
3:00 AM	109	121
4:00 AM	290	322
5:00 AM	907	1006
6:00 AM	2107	2338
7:00 AM	2818	3127
8:00 AM	2456	2725
9:00 AM	2109	2340
10:00 AM	1856	2059
11:00 AM	1831	2032
12:00 PM	1948	2161
1:00 PM	2097	2327
2:00 PM	1919	2129
3:00 PM	1804	2002
4:00 PM	1815	2014
5:00 PM	1776	1970
6:00 PM	1621	1799
7:00 PM	1296	1438
8:00 PM	1049	1164
9:00 PM	999	1108
10:00 PM	526	584
11:00 PM	365	405
Total	**32121**	**35640**

J	US 69 WBFR East of W Bellfort Avenue Midweek February 2016	
Time	2016 Total	2021 Total
12:00 AM	368	408
1:00 AM	199	221
2:00 AM	156	173
3:00 AM	171	190
4:00 AM	210	233
5:00 AM	511	567
6:00 AM	1032	1145
7:00 AM	1572	1744
8:00 AM	1449	1608
9:00 AM	1391	1543
10:00 AM	1481	1643
11:00 AM	1699	1885
12:00 PM	2035	2258
1:00 PM	1970	2186
2:00 PM	2068	2294
3:00 PM	2267	2515
4:00 PM	2509	2784
5:00 PM	2501	2775
6:00 PM	2467	2737
7:00 PM	2019	2240
8:00 PM	1591	1765
9:00 PM	1283	1423
10:00 PM	915	1015
11:00 PM	595	660
Total	**32459**	**36012**

K	US 69 EBFR	
	Noth of Beltway 8	
	Midweek March 2016	
Time	2016 Total	2021 Total
12:00 AM	92	102
1:00 AM	91	101
2:00 AM	62	69
3:00 AM	54	60
4:00 AM	122	135
5:00 AM	371	412
6:00 AM	1118	1240
7:00 AM	1999	2218
8:00 AM	1310	1453
9:00 AM	1163	1290
10:00 AM	1153	1279
11:00 AM	1192	1323
12:00 PM	1324	1469
1:00 PM	1359	1508
2:00 PM	1209	1341
3:00 PM	1272	1411
4:00 PM	1347	1495
5:00 PM	1231	1366
6:00 PM	1099	1219
7:00 PM	683	758
8:00 PM	501	556
9:00 PM	376	417
10:00 PM	244	271
11:00 PM	144	160
Total	**19516**	**21653**

L	US 69 WBFR	
	Noth of Beltway 8	
	Midweek March 2016	
Time	2016 Total	2021 Total
12:00 AM	205	227
1:00 AM	158	175
2:00 AM	145	161
3:00 AM	89	99
4:00 AM	143	159
5:00 AM	241	267
6:00 AM	648	719
7:00 AM	924	1025
8:00 AM	819	909
9:00 AM	941	1044
10:00 AM	990	1098
11:00 AM	1083	1202
12:00 PM	1301	1443
1:00 PM	1384	1536
2:00 PM	1351	1499
3:00 PM	1475	1637
4:00 PM	1628	1806
5:00 PM	1775	1969
6:00 PM	1725	1914
7:00 PM	1110	1232
8:00 PM	713	791
9:00 PM	516	573
10:00 PM	384	426
11:00 PM	258	286
Total	**20006**	**22197**

M	Beltway 8 SBFR	
	North of US 59	
	Midweek March 2019	
Time	2019 Total	2021 Total
12:00 AM	139	145
1:00 AM	88	92
2:00 AM	55	57
3:00 AM	69	72
4:00 AM	145	151
5:00 AM	328	342
6:00 AM	712	742
7:00 AM	1262	1316
8:00 AM	967	1008
9:00 AM	816	851
10:00 AM	756	788
11:00 AM	790	824
12:00 PM	930	969
1:00 PM	910	949
2:00 PM	969	1010
3:00 PM	1200	1251
4:00 PM	1645	1715
5:00 PM	1613	1681
6:00 PM	1367	1425
7:00 PM	816	851
8:00 PM	553	576
9:00 PM	455	474
10:00 PM	390	407
11:00 PM	225	235
Total	**17200**	**17931**

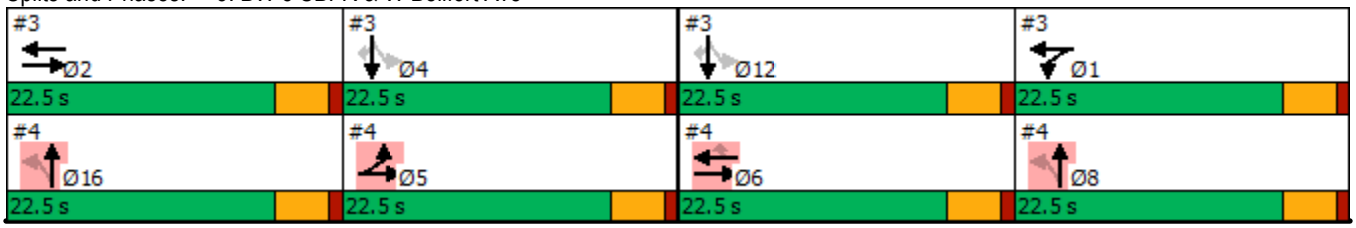
N	Beltway 8 NBFR	
	North of US 59	
	Midweek May 2017	
Time	2017 Total	2021 Total
12:00 AM	358	389
1:00 AM	195	212
2:00 AM	115	125
3:00 AM	119	129
4:00 AM	150	163
5:00 AM	422	459
6:00 AM	1066	1158
7:00 AM	1912	2078
8:00 AM	1445	1570
9:00 AM	1152	1252
10:00 AM	1161	1262
11:00 AM	1250	1358
12:00 PM	1320	1434
1:00 PM	1322	1437
2:00 PM	1339	1455
3:00 PM	1579	1716
4:00 PM	1719	1868
5:00 PM	1731	1881
6:00 PM	1602	1741
7:00 PM	1244	1352
8:00 PM	1085	1179
9:00 PM	896	974
10:00 PM	706	767
11:00 PM	448	487
Total	**24336**	**26446**

Appendix C
Capacity Analysis – 2021 Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	359	265	51	486	0	0	0	0	245	551	30
Future Volume (vph)	0	359	265	51	486	0	0	0	0	245	551	30
Satd. Flow (prot)	0	5717	0	1687	4848	0	0	0	0	0	4775	1509
Flt Permitted				0.950							0.985	
Satd. Flow (perm)	0	5717	0	1687	4848	0	0	0	0	0	4775	1509
Satd. Flow (RTOR)		186										73
Lane Group Flow (vph)	0	657	0	54	512	0	0	0	0	0	838	32
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		2		1	1 2						4 12	
Permitted Phases										4 12		4 12
Total Split (s)		22.5		22.5								
Total Lost Time (s)		4.5		4.5								
Act Effct Green (s)		15.7		27.2	47.4						30.0	30.0
Actuated g/C Ratio		0.18		0.31	0.55						0.35	0.35
v/c Ratio		0.55		0.10	0.19						0.51	0.06
Control Delay		24.7		13.1	4.7						23.6	0.7
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		24.7		13.1	4.7						23.6	0.7
LOS		C		B	A						C	A
Approach Delay		24.7			5.5						22.8	
Approach LOS		C			A						C	
Queue Length 50th (ft)		68		9	66						135	0
Queue Length 95th (ft)		98		m55	95						168	3
Internal Link Dist (ft)		1420			253			253			153	
Turn Bay Length (ft)												
Base Capacity (vph)		1341		531	2792						2138	716
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		0		0	0						0	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.49		0.10	0.18						0.39	0.04

Intersection Summary			
Cycle Length: 90			
Actuated Cycle Length: 86.5			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 18.7		Intersection LOS: B	
Intersection Capacity Utilization 55.9%		ICU Level of Service B	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: BW 8 SBFR & W Bellfort Ave



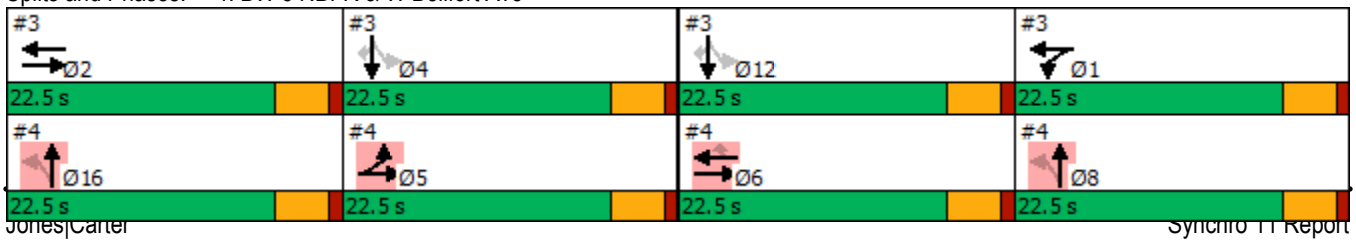
Lane Group	Ø4	Ø5	Ø6	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	4	5	6	8	12	16
Permitted Phases						
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	65	573	0	0	351	367	184	680	42	0	0	0
Future Volume (vph)	65	573	0	0	351	367	184	680	42	0	0	0
Satd. Flow (prot)	3273	3374	0	0	6108	1509	0	4766	0	0	0	0
Flt Permitted	0.950							0.990				
Satd. Flow (perm)	3273	3374	0	0	6108	1509	0	4766	0	0	0	0
Satd. Flow (RTOR)						298		10				
Lane Group Flow (vph)	75	659	0	0	403	422	0	1041	0	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16					
Total Split (s)	22.5				22.5	22.5						
Total Lost Time (s)	4.5				4.5	4.5						
Act Effct Green (s)	22.0	44.6			18.1	18.1		32.9				
Actuated g/C Ratio	0.25	0.52			0.21	0.21		0.38				
v/c Ratio	0.09	0.38			0.32	0.77		0.57				
Control Delay	16.8	7.8			30.5	21.1		22.6				
Queue Delay	0.0	0.4			0.0	0.0		0.0				
Total Delay	16.8	8.2			30.5	21.1		22.6				
LOS	B	A			C	C		C				
Approach Delay		9.1			25.7			22.6				
Approach LOS		A			C			C				
Queue Length 50th (ft)	9	102			56	61		171				
Queue Length 95th (ft)	32	145			77	#189		186				
Internal Link Dist (ft)		253			511			148			240	
Turn Bay Length (ft)												
Base Capacity (vph)	848	1716			1275	551		2190				
Starvation Cap Reductn	0	562			0	0		0				
Spillback Cap Reductn	0	0			0	0		0				
Storage Cap Reductn	0	0			0	0		0				
Reduced v/c Ratio	0.09	0.57			0.32	0.77		0.48				

Intersection Summary		
Cycle Length: 90		
Actuated Cycle Length: 86.5		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.77		
Intersection Signal Delay: 19.8	Intersection LOS: B	
Intersection Capacity Utilization 55.9%	ICU Level of Service B	
Analysis Period (min) 15		
# 95th percentile volume exceeds capacity, queue may be longer.		
Queue shown is maximum after two cycles.		

Splits and Phases: 4: BW 8 NBFR & W Bellfort Ave



Lane Group	Ø1	Ø2	Ø4	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	4	8	12	16
Permitted Phases						
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	573	10	4	677	6	32	0	12	0	0	7
Future Vol, veh/h	0	573	10	4	677	6	32	0	12	0	0	7
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	0	603	11	4	713	6	34	0	13	0	0	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	719	0	0	614	0	0	974	1336	307	1026	1338	360
Stage 1	-	-	-	-	-	-	609	609	-	724	724	-
Stage 2	-	-	-	-	-	-	365	727	-	302	614	-
Critical Hdwy	4.24	-	-	4.24	-	-	7.64	6.64	7.04	7.64	6.64	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Follow-up Hdwy	2.27	-	-	2.27	-	-	3.57	4.07	3.37	3.57	4.07	3.37
Pot Cap-1 Maneuver	846	-	-	928	-	-	199	146	674	182	145	622
Stage 1	-	-	-	-	-	-	437	471	-	372	417	-
Stage 2	-	-	-	-	-	-	613	415	-	669	469	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	846	-	-	928	-	-	196	145	674	178	144	622
Mov Cap-2 Maneuver	-	-	-	-	-	-	317	267	-	288	266	-
Stage 1	-	-	-	-	-	-	437	471	-	372	415	-
Stage 2	-	-	-	-	-	-	603	413	-	656	469	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	16.1	10.9
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	371	846	-	-	928	-	-	622
HCM Lane V/C Ratio	0.125	-	-	-	0.005	-	-	0.012
HCM Control Delay (s)	16.1	0	-	-	8.9	-	-	10.9
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	20	1134	21	0	0
Future Vol, veh/h	0	20	1134	21	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	0	23	1319	24	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	660	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.24	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.97	-	-
Pot Cap-1 Maneuver	0	339	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	339	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

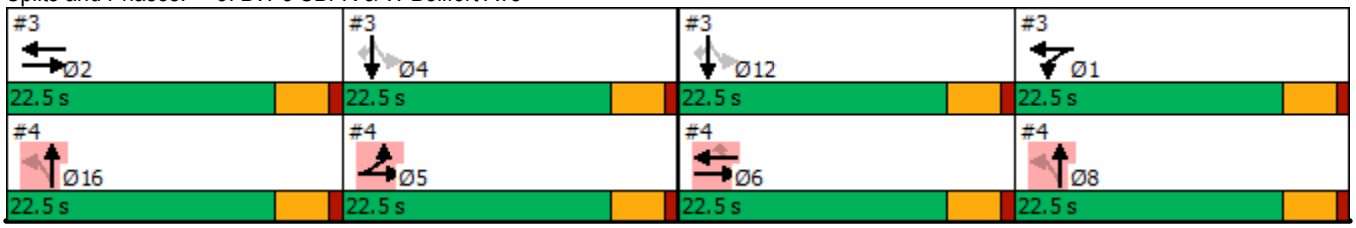
Approach	WB	NB
HCM Control Delay, s	16.4	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	339
HCM Lane V/C Ratio	-	0.069
HCM Control Delay (s)	-	16.4
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	542	349	56	777	0	0	0	0	440	902	59
Future Volume (vph)	0	542	349	56	777	0	0	0	0	440	902	59
Satd. Flow (prot)	0	5748	0	1687	4848	0	0	0	0	0	4770	1509
Flt Permitted				0.950							0.984	
Satd. Flow (perm)	0	5748	0	1687	4848	0	0	0	0	0	4770	1509
Satd. Flow (RTOR)		161										73
Lane Group Flow (vph)	0	938	0	59	818	0	0	0	0	0	1412	62
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		2		1	1 2						4 12	
Permitted Phases										4 12		4 12
Total Split (s)		22.5		22.5								
Total Lost Time (s)		4.5		4.5								
Act Effct Green (s)		18.0		20.0	42.5						38.5	38.5
Actuated g/C Ratio		0.20		0.22	0.47						0.43	0.43
v/c Ratio		0.73		0.16	0.36						0.69	0.09
Control Delay		31.7		22.8	10.0						22.8	3.3
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		31.7		22.8	10.0						22.9	3.3
LOS		C		C	B						C	A
Approach Delay		31.7			10.9						22.0	
Approach LOS		C			B						C	
Queue Length 50th (ft)		121		28	114						221	0
Queue Length 95th (ft)		158		m59	143						272	18
Internal Link Dist (ft)		1420			253			253			153	
Turn Bay Length (ft)												
Base Capacity (vph)		1278		375	2290						2146	719
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		2		0	0						47	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.74		0.16	0.36						0.67	0.09

Intersection Summary			
Cycle Length: 90			
Actuated Cycle Length: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 21.8		Intersection LOS: C	
Intersection Capacity Utilization 55.5%		ICU Level of Service B	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 3: BW 8 SBFR & W Bellfort Ave



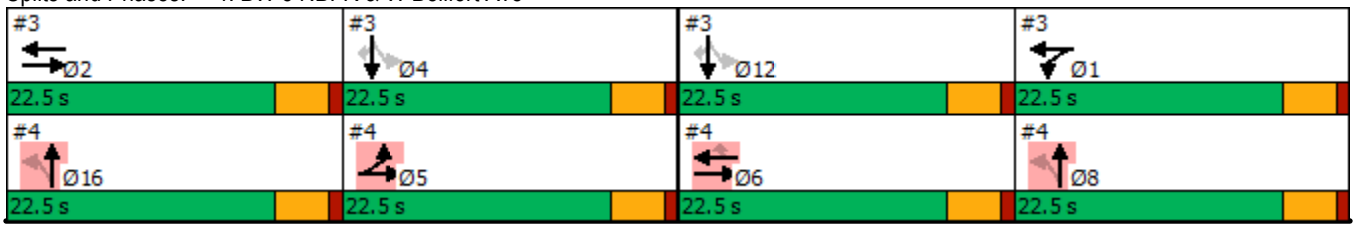
Lane Group	Ø4	Ø5	Ø6	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	4	5	6	8	12	16
Permitted Phases						
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	842	1	0	485	317	332	672	84	0	0	0
Future Volume (vph)	70	842	1	0	485	317	332	672	84	0	0	0
Satd. Flow (prot)	3273	3374	0	0	6108	1509	0	4718	0	0	0	0
Flt Permitted	0.950							0.985				
Satd. Flow (perm)	3273	3374	0	0	6108	1509	0	4718	0	0	0	0
Satd. Flow (RTOR)						293		20				
Lane Group Flow (vph)	80	969	0	0	557	364	0	1251	0	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16					
Total Split (s)	22.5				22.5	22.5						
Total Lost Time (s)	4.5				4.5	4.5						
Act Effct Green (s)	22.0	44.5			18.0	18.0		36.5				
Actuated g/C Ratio	0.24	0.49			0.20	0.20		0.41				
v/c Ratio	0.10	0.58			0.46	0.68		0.65				
Control Delay	23.0	10.8			33.1	14.9		22.7				
Queue Delay	0.0	1.1			0.0	0.0		0.0				
Total Delay	23.0	11.9			33.1	14.9		22.7				
LOS	C	B			C	B		C				
Approach Delay		12.7			25.9			22.7				
Approach LOS		B			C			C				
Queue Length 50th (ft)	15	174			81	34		200				
Queue Length 95th (ft)	m26	246			105	115		218				
Internal Link Dist (ft)		253			511			148			240	
Turn Bay Length (ft)												
Base Capacity (vph)	798	1666			1221	536		2134				
Starvation Cap Reductn	0	432			0	0		0				
Spillback Cap Reductn	0	0			0	0		0				
Storage Cap Reductn	0	0			0	0		0				
Reduced v/c Ratio	0.10	0.79			0.46	0.68		0.59				

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 20.4	Intersection LOS: C
Intersection Capacity Utilization 56.6%	ICU Level of Service B
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: BW 8 NBFR & W Bellfort Ave



Lane Group	Ø1	Ø2	Ø4	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	4	8	12	16
Permitted Phases						
Total Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	957	43	10	741	1	11	1	4	1	1	1
Future Vol, veh/h	0	957	43	10	741	1	11	1	4	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	0	1007	45	11	780	1	12	1	4	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	781	0	0	1052	0	0	1443	1833	526	1307	1855	391
Stage 1	-	-	-	-	-	-	1030	1030	-	803	803	-
Stage 2	-	-	-	-	-	-	413	803	-	504	1052	-
Critical Hdwy	4.24	-	-	4.24	-	-	7.64	6.64	7.04	7.64	6.64	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Follow-up Hdwy	2.27	-	-	2.27	-	-	3.57	4.07	3.37	3.57	4.07	3.37
Pot Cap-1 Maneuver	800	-	-	628	-	-	89	71	484	112	69	594
Stage 1	-	-	-	-	-	-	241	298	-	333	383	-
Stage 2	-	-	-	-	-	-	574	383	-	506	291	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	800	-	-	628	-	-	87	70	484	109	68	594
Mov Cap-2 Maneuver	-	-	-	-	-	-	186	183	-	228	177	-
Stage 1	-	-	-	-	-	-	241	298	-	333	376	-
Stage 2	-	-	-	-	-	-	561	376	-	500	291	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	22.7	19.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	220	800	-	-	628	-	-	256
HCM Lane V/C Ratio	0.077	-	-	-	0.017	-	-	0.012
HCM Control Delay (s)	22.7	0	-	-	10.8	-	-	19.2
HCM Lane LOS	C	A	-	-	B	-	-	C
HCM 95th %tile Q(veh)	0.2	0	-	-	0.1	-	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	1200	3	0	0
Future Vol, veh/h	0	10	1200	3	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	0	12	1395	3	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	698	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.24	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.97	-	-
Pot Cap-1 Maneuver	0	319	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	319	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	16.7	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	319
HCM Lane V/C Ratio	-	0.036
HCM Control Delay (s)	-	16.7
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.1

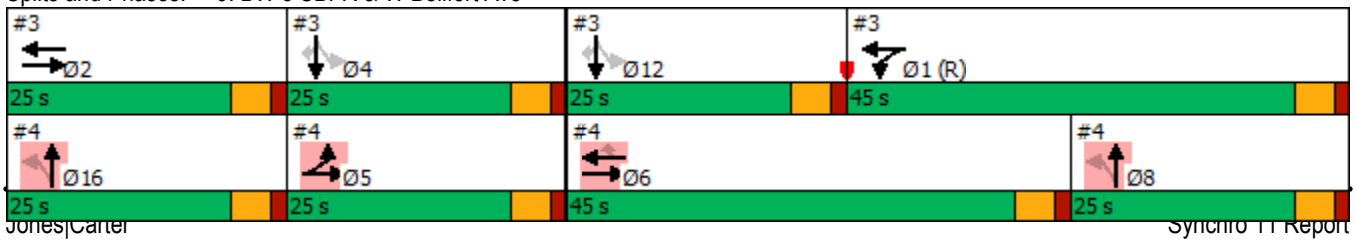
Appendix D
Capacity Analysis – 2025 Post Mining Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	390	288	55	528	0	0	0	0	266	599	33
Future Volume (vph)	0	390	288	55	528	0	0	0	0	266	599	33
Satd. Flow (prot)	0	5717	0	1687	4848	0	0	0	0	0	4775	1509
Flt Permitted				0.950							0.985	
Satd. Flow (perm)	0	5717	0	1687	4848	0	0	0	0	0	4775	1509
Satd. Flow (RTOR)		133										109
Lane Group Flow (vph)	0	714	0	58	556	0	0	0	0	0	911	35
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		2		1	1 2						4 12	
Permitted Phases										4 12		4 12
Total Split (s)		25.0		45.0								
Total Lost Time (s)		5.0		5.0								
Act Effct Green (s)		20.0		50.0	75.0						35.0	35.0
Actuated g/C Ratio		0.17		0.42	0.62						0.29	0.29
v/c Ratio		0.67		0.08	0.18						0.65	0.07
Control Delay		41.5		17.1	5.3						39.4	0.2
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		41.5		17.1	5.3						39.4	0.2
LOS		D		B	A						D	A
Approach Delay		41.5			6.5						37.9	
Approach LOS		D			A						D	
Queue Length 50th (ft)		124		22	82						228	0
Queue Length 95th (ft)		160		m64	116						256	0
Internal Link Dist (ft)		319			253			253			153	
Turn Bay Length (ft)												
Base Capacity (vph)		1063		702	3029						1790	634
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		1		0	0						29	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.67		0.08	0.18						0.52	0.06

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 30.5 — Intersection LOS: C
Intersection Capacity Utilization 60.7% — ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: BW 8 SBFR & W Bellfort Ave



Lane Group	Ø4	Ø5	Ø6	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	4	5	6	8	12	16
Permitted Phases						
Total Split (s)	25.0	25.0	45.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

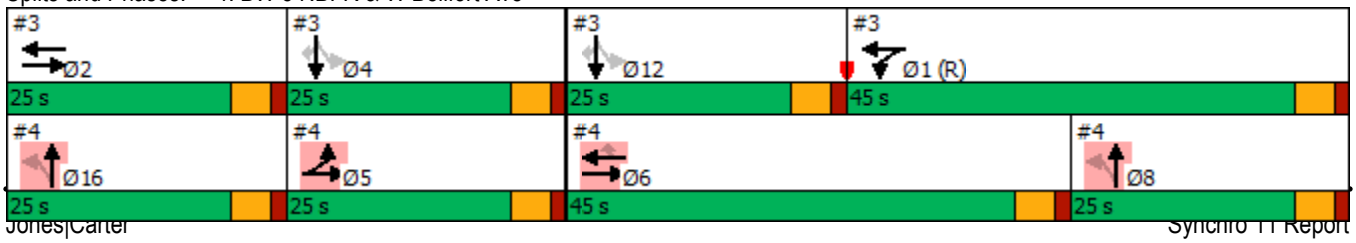
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	623	0	0	381	399	200	739	46	0	0	0
Future Volume (vph)	71	623	0	0	381	399	200	739	46	0	0	0
Satd. Flow (prot)	3273	3374	0	0	6108	1509	0	4766	0	0	0	0
Flt Permitted	0.950							0.990				
Satd. Flow (perm)	3273	3374	0	0	6108	1509	0	4766	0	0	0	0
Satd. Flow (RTOR)						229		7				
Lane Group Flow (vph)	82	716	0	0	438	459	0	1132	0	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16					
Total Split (s)	25.0				45.0	45.0						
Total Lost Time (s)	5.0				5.0	5.0						
Act Effct Green (s)	25.1	70.1			40.0	40.0		39.9				
Actuated g/C Ratio	0.21	0.58			0.33	0.33		0.33				
v/c Ratio	0.12	0.36			0.22	0.70		0.71				
Control Delay	28.0	10.3			29.1	23.3		37.3				
Queue Delay	0.0	1.2			0.0	0.0		0.0				
Total Delay	28.0	11.5			29.1	23.3		37.3				
LOS	C	B			C	C		D				
Approach Delay		13.2			26.1			37.3				
Approach LOS		B			C			D				
Queue Length 50th (ft)	23	166			70	156		276				
Queue Length 95th (ft)	m44	233			89	263		294				
Internal Link Dist (ft)		253			511			148			240	
Turn Bay Length (ft)												
Base Capacity (vph)	685	1972			2036	655		1791				
Starvation Cap Reductn	0	975			0	0		0				
Spillback Cap Reductn	0	0			0	0		0				
Storage Cap Reductn	0	0			0	0		0				
Reduced v/c Ratio	0.12	0.72			0.22	0.70		0.63				

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 26.9 Intersection LOS: C
Intersection Capacity Utilization 60.7% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: BW 8 NBFR & W Bellfort Ave



Lane Group	Ø1	Ø2	Ø4	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	4	8	12	16
Permitted Phases						
Total Split (s)	45.0	25.0	25.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	623	11	4	736	7	35	0	13	0	0	8
Future Vol, veh/h	0	623	11	4	736	7	35	0	13	0	0	8
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	0	656	12	4	775	7	37	0	14	0	0	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	782	0	0	668	0	0	1058	1452	334	1115	1455	391
Stage 1	-	-	-	-	-	-	662	662	-	787	787	-
Stage 2	-	-	-	-	-	-	396	790	-	328	668	-
Critical Hdwy	4.24	-	-	4.24	-	-	7.64	6.64	7.04	7.64	6.64	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Follow-up Hdwy	2.27	-	-	2.27	-	-	3.57	4.07	3.37	3.57	4.07	3.37
Pot Cap-1 Maneuver	800	-	-	885	-	-	172	124	647	156	123	594
Stage 1	-	-	-	-	-	-	406	445	-	340	389	-
Stage 2	-	-	-	-	-	-	587	388	-	645	443	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	800	-	-	885	-	-	169	123	647	152	122	594
Mov Cap-2 Maneuver	-	-	-	-	-	-	291	244	-	262	243	-
Stage 1	-	-	-	-	-	-	406	445	-	340	387	-
Stage 2	-	-	-	-	-	-	576	386	-	631	443	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0	17.3	11.1
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	342	800	-	-	885	-	-	594
HCM Lane V/C Ratio	0.148	-	-	-	0.005	-	-	0.014
HCM Control Delay (s)	17.3	0	-	-	9.1	-	-	11.1
HCM Lane LOS	C	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	22	1232	23	0	0
Future Vol, veh/h	0	22	1232	23	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	0	26	1433	27	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	717	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.24	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.97	-	-
Pot Cap-1 Maneuver	0	310	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	310	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	17.7	0
HCM LOS	C	

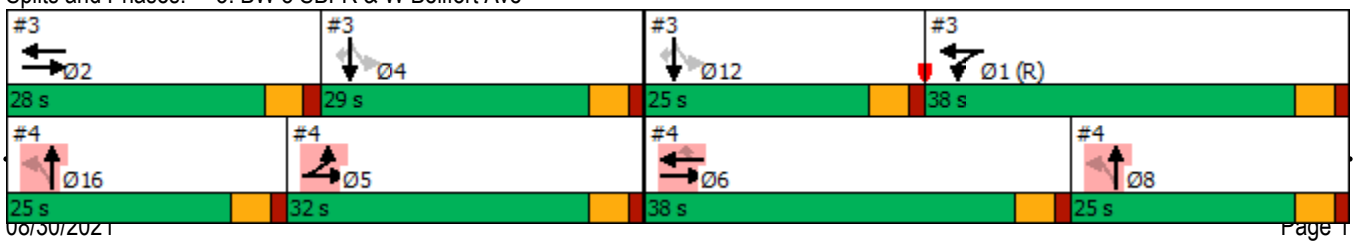
Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	310
HCM Lane V/C Ratio	-	0.083
HCM Control Delay (s)	-	17.7
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	589	379	61	844	0	0	0	0	478	980	64
Future Volume (vph)	0	589	379	61	844	0	0	0	0	478	980	64
Satd. Flow (prot)	0	5748	0	1687	4848	0	0	0	0	0	4770	1509
Flt Permitted				0.950							0.984	
Satd. Flow (perm)	0	5748	0	1687	4848	0	0	0	0	0	4770	1509
Satd. Flow (RTOR)		119										109
Lane Group Flow (vph)	0	1019	0	64	888	0	0	0	0	0	1535	67
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		2		1	1 2						4 12	
Permitted Phases										4 12		4 12
Total Split (s)		28.0		38.0								
Total Lost Time (s)		5.0		5.0								
Act Effct Green (s)		23.0		34.0	62.0						48.0	48.0
Actuated g/C Ratio		0.19		0.28	0.52						0.40	0.40
v/c Ratio		1.02dr		0.13	0.35						0.80	0.10
Control Delay		49.2		28.2	10.8						35.7	1.2
Queue Delay		0.4		0.0	0.6						0.5	0.0
Total Delay		49.6		28.2	11.5						36.2	1.2
LOS		D		C	B						D	A
Approach Delay		49.6			12.6						34.7	
Approach LOS		D			B						C	
Queue Length 50th (ft)		199		40	153						374	0
Queue Length 95th (ft)		242		m70	183						436	8
Internal Link Dist (ft)		319			253			253			153	
Turn Bay Length (ft)												
Base Capacity (vph)		1197		477	2503						1947	680
Starvation Cap Reductn		0		0	1154						0	0
Spillback Cap Reductn		24		0	0						121	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.87		0.13	0.66						0.84	0.10

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 33.1 Intersection LOS: C
Intersection Capacity Utilization 94.1% ICU Level of Service F
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 3: BW 8 SBFR & W Bellfort Ave



Lane Group	Ø4	Ø5	Ø6	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	4	5	6	8	12	16
Permitted Phases						
Total Split (s)	29.0	32.0	38.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

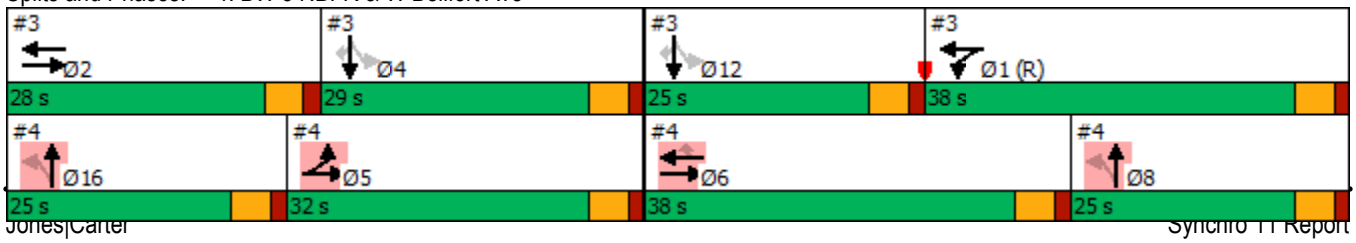
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	915	0	0	527	344	361	730	91	0	0	0
Future Volume (vph)	76	915	0	0	527	344	361	730	91	0	0	0
Satd. Flow (prot)	3273	3374	0	0	6108	1509	0	4718	0	0	0	0
Flt Permitted	0.950							0.985				
Satd. Flow (perm)	3273	3374	0	0	6108	1509	0	4718	0	0	0	0
Satd. Flow (RTOR)						284		13				
Lane Group Flow (vph)	87	1052	0	0	606	395	0	1359	0	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16					
Total Split (s)	32.0				38.0	38.0						
Total Lost Time (s)	5.0				5.0	5.0						
Act Effct Green (s)	28.2	66.2			33.0	33.0		43.8				
Actuated g/C Ratio	0.24	0.55			0.28	0.28		0.36				
v/c Ratio	0.11	0.57			0.36	0.64		0.79				
Control Delay	28.2	11.7			35.8	15.9		37.3				
Queue Delay	0.0	6.1			0.0	0.0		0.0				
Total Delay	28.2	17.8			35.8	15.9		37.3				
LOS	C	B			D	B		D				
Approach Delay		18.6			27.9			37.3				
Approach LOS		B			C			D				
Queue Length 50th (ft)	25	282			110	69		331				
Queue Length 95th (ft)	m29	328			133	163		371				
Internal Link Dist (ft)		253			511			148			240	
Turn Bay Length (ft)												
Base Capacity (vph)	769	1861			1679	620		1777				
Starvation Cap Reductn	0	746			0	0		0				
Spillback Cap Reductn	0	0			0	0		0				
Storage Cap Reductn	0	0			0	0		0				
Reduced v/c Ratio	0.11	0.94			0.36	0.64		0.76				

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 28.5 — Intersection LOS: C
Intersection Capacity Utilization 94.1% — ICU Level of Service F
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: BW 8 NBFR & W Bellfort Ave



Lane Group	Ø1	Ø2	Ø4	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	4	8	12	16
Permitted Phases						
Total Split (s)	38.0	28.0	29.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	1040	47	11	805	1	12	1	4	1	1	1
Future Vol, veh/h	0	1040	47	11	805	1	12	1	4	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	0	1095	49	12	847	1	13	1	4	1	1	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	848	0	0	1144	0	0	1568	1992	572	1420	2016	424
Stage 1	-	-	-	-	-	-	1120	1120	-	872	872	-
Stage 2	-	-	-	-	-	-	448	872	-	548	1144	-
Critical Hdwy	4.24	-	-	4.24	-	-	7.64	6.64	7.04	7.64	6.64	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Follow-up Hdwy	2.27	-	-	2.27	-	-	3.57	4.07	3.37	3.57	4.07	3.37
Pot Cap-1 Maneuver	754	-	-	579	-	-	71	56	451	92	55	565
Stage 1	-	-	-	-	-	-	212	270	-	302	355	-
Stage 2	-	-	-	-	-	-	547	355	-	476	263	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	754	-	-	579	-	-	69	55	451	89	54	565
Mov Cap-2 Maneuver	-	-	-	-	-	-	163	163	-	205	157	-
Stage 1	-	-	-	-	-	-	212	270	-	302	348	-
Stage 2	-	-	-	-	-	-	533	348	-	470	263	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.2	25.7	20.9
HCM LOS			D	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	192	754	-	-	579	-	-	230
HCM Lane V/C Ratio	0.093	-	-	-	0.02	-	-	0.014
HCM Control Delay (s)	25.7	0	-	-	11.3	-	-	20.9
HCM Lane LOS	D	A	-	-	B	-	-	C
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	11	1304	3	0	0
Future Vol, veh/h	0	11	1304	3	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	0	13	1516	3	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	758	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.24	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.97	-	-
Pot Cap-1 Maneuver	0	291	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	291	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	17.9	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	291
HCM Lane V/C Ratio	-	0.044
HCM Control Delay (s)	-	17.9
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.1

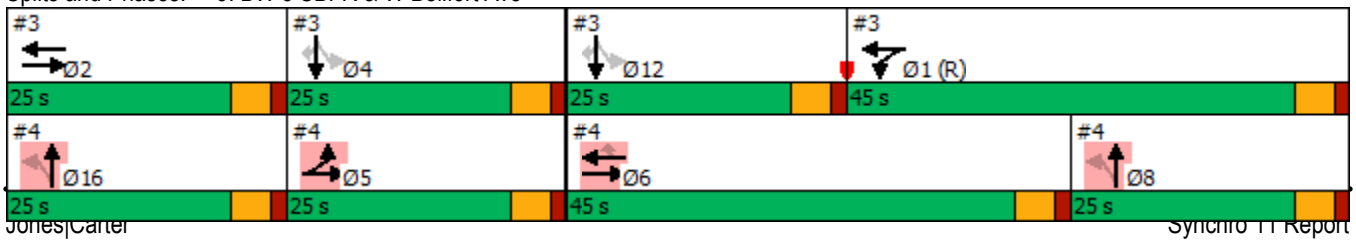
Appendix E
Capacity Analysis – 2025 Peak Mining Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	390	288	70	528	0	0	0	0	274	632	33
Future Volume (vph)	0	390	288	70	528	0	0	0	0	274	632	33
Satd. Flow (prot)	0	5717	0	1687	4848	0	0	0	0	0	4775	1509
Flt Permitted				0.950							0.985	
Satd. Flow (perm)	0	5717	0	1687	4848	0	0	0	0	0	4775	1509
Satd. Flow (RTOR)		133										109
Lane Group Flow (vph)	0	714	0	74	556	0	0	0	0	0	953	35
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		2		1	1 2						4 12	
Permitted Phases										4 12		4 12
Total Split (s)		25.0		45.0								
Total Lost Time (s)		5.0		5.0								
Act Effct Green (s)		20.0		48.9	73.9						36.1	36.1
Actuated g/C Ratio		0.17		0.41	0.62						0.30	0.30
v/c Ratio		0.67		0.11	0.19						0.66	0.07
Control Delay		41.5		18.2	6.1						38.8	0.2
Queue Delay		0.0		0.0	0.0						0.0	0.0
Total Delay		41.5		18.2	6.1						38.9	0.2
LOS		D		B	A						D	A
Approach Delay		41.5			7.5						37.5	
Approach LOS		D			A						D	
Queue Length 50th (ft)		124		41	86						237	0
Queue Length 95th (ft)		160		m79	119						266	0
Internal Link Dist (ft)		319			253			253			153	
Turn Bay Length (ft)												
Base Capacity (vph)		1063		687	2986						1790	634
Starvation Cap Reductn		0		0	0						0	0
Spillback Cap Reductn		1		0	0						28	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.67		0.11	0.19						0.54	0.06

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 30.6 Intersection LOS: C
Intersection Capacity Utilization 61.9% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: BW 8 SBFR & W Bellfort Ave



Lane Group	Ø4	Ø5	Ø6	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	4	5	6	8	12	16
Permitted Phases						
Total Split (s)	25.0	25.0	45.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

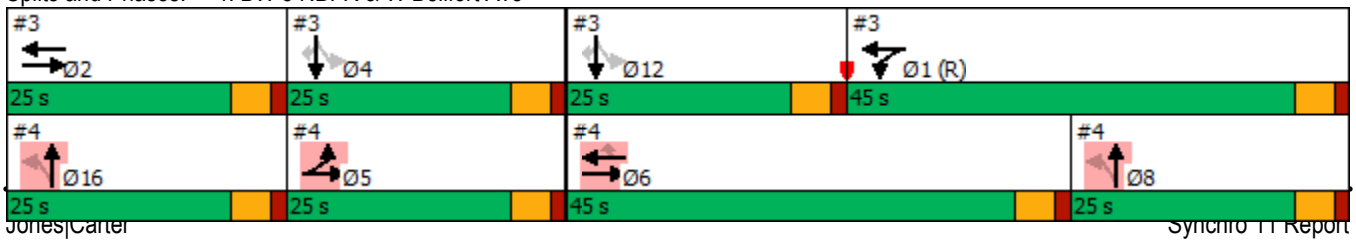
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	631	0	0	396	399	200	799	46	0	0	0
Future Volume (vph)	71	631	0	0	396	399	200	799	46	0	0	0
Satd. Flow (prot)	3273	3374	0	0	6108	1509	0	4770	0	0	0	0
Flt Permitted	0.950							0.991				
Satd. Flow (perm)	3273	3374	0	0	6108	1509	0	4770	0	0	0	0
Satd. Flow (RTOR)						221		7				
Lane Group Flow (vph)	82	725	0	0	455	459	0	1201	0	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16					
Total Split (s)	25.0				45.0	45.0						
Total Lost Time (s)	5.0				5.0	5.0						
Act Effct Green (s)	23.6	68.6			40.0	40.0		41.4				
Actuated g/C Ratio	0.20	0.57			0.33	0.33		0.34				
v/c Ratio	0.13	0.38			0.22	0.71		0.73				
Control Delay	29.8	11.1			29.2	24.2		36.8				
Queue Delay	0.0	1.4			0.0	0.0		0.0				
Total Delay	29.8	12.5			29.2	24.2		36.8				
LOS	C	B			C	C		D				
Approach Delay		14.2			26.7			36.8				
Approach LOS		B			C			D				
Queue Length 50th (ft)	25	167			73	163		291				
Queue Length 95th (ft)	m44	232			92	270		317				
Internal Link Dist (ft)		253			511			148			240	
Turn Bay Length (ft)												
Base Capacity (vph)	643	1928			2036	650		1793				
Starvation Cap Reductn	0	950			0	0		0				
Spillback Cap Reductn	0	0			0	0		0				
Storage Cap Reductn	0	0			0	0		0				
Reduced v/c Ratio	0.13	0.74			0.22	0.71		0.67				

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 27.4 Intersection LOS: C
Intersection Capacity Utilization 61.9% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: BW 8 NBFR & W Bellfort Ave



Lane Group	Ø1	Ø2	Ø4	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	4	8	12	16
Permitted Phases						
Total Split (s)	45.0	25.0	25.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	623	11	4	736	7	35	0	13	0	0	23
Future Vol, veh/h	8	623	11	4	736	7	35	0	13	0	0	23
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	8	656	12	4	775	7	37	0	14	0	0	24

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	782	0	0	668	0	0	1074	1468	334	1131	1471	391
Stage 1	-	-	-	-	-	-	678	678	-	787	787	-
Stage 2	-	-	-	-	-	-	396	790	-	344	684	-
Critical Hdwy	4.24	-	-	4.24	-	-	7.64	6.64	7.04	7.64	6.64	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Follow-up Hdwy	2.27	-	-	2.27	-	-	3.57	4.07	3.37	3.57	4.07	3.37
Pot Cap-1 Maneuver	800	-	-	885	-	-	168	121	647	152	120	594
Stage 1	-	-	-	-	-	-	397	438	-	340	389	-
Stage 2	-	-	-	-	-	-	587	388	-	631	435	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	800	-	-	885	-	-	159	118	647	147	117	594
Mov Cap-2 Maneuver	-	-	-	-	-	-	278	237	-	256	238	-
Stage 1	-	-	-	-	-	-	391	431	-	335	387	-
Stage 2	-	-	-	-	-	-	561	386	-	608	428	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0	17.9	11.3
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	329	800	-	-	885	-	-	594
HCM Lane V/C Ratio	0.154	0.011	-	-	0.005	-	-	0.041
HCM Control Delay (s)	17.9	9.5	0.1	-	9.1	-	-	11.3
HCM Lane LOS	C	A	A	-	A	-	-	B
HCM 95th %tile Q(veh)	0.5	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	67	1232	95	0	0
Future Vol, veh/h	0	67	1232	95	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	0	78	1433	110	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	717	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.24	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.97	-	-
Pot Cap-1 Maneuver	0	310	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	310	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	20.5	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	310
HCM Lane V/C Ratio	-	0.251
HCM Control Delay (s)	-	20.5
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	1

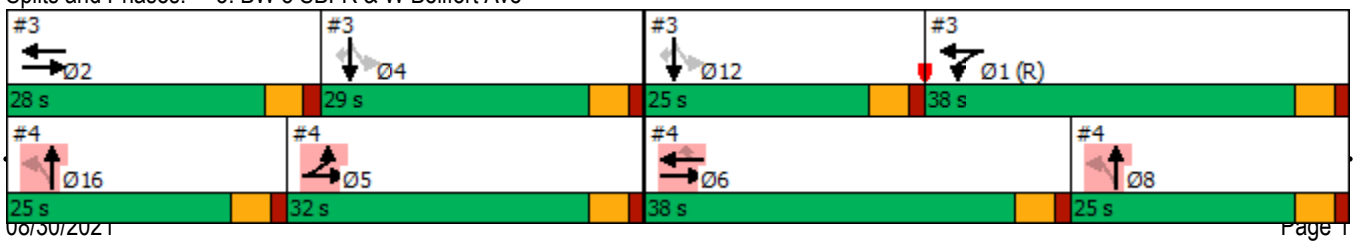
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	589	379	81	844	0	0	0	0	484	1024	64
Future Volume (vph)	0	589	379	81	844	0	0	0	0	484	1024	64
Satd. Flow (prot)	0	5748	0	1687	4848	0	0	0	0	0	4770	1509
Flt Permitted				0.950							0.984	
Satd. Flow (perm)	0	5748	0	1687	4848	0	0	0	0	0	4770	1509
Satd. Flow (RTOR)		119										109
Lane Group Flow (vph)	0	1019	0	85	888	0	0	0	0	0	1587	67
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		2		1	1 2						4 12	
Permitted Phases										4 12		4 12
Total Split (s)		28.0		38.0								
Total Lost Time (s)		5.0		5.0								
Act Effct Green (s)		23.0		33.3	61.3						48.7	48.7
Actuated g/C Ratio		0.19		0.28	0.51						0.41	0.41
v/c Ratio		1.02dr		0.18	0.36						0.82	0.10
Control Delay		49.2		28.5	11.3						36.0	1.2
Queue Delay		0.0		0.0	0.7						0.2	0.0
Total Delay		49.2		28.5	12.0						36.3	1.2
LOS		D		C	B						D	A
Approach Delay		49.2			13.5						34.9	
Approach LOS		D			B						C	
Queue Length 50th (ft)		199		53	155						393	0
Queue Length 95th (ft)		242		m93	185						457	8
Internal Link Dist (ft)		319			253			253			153	
Turn Bay Length (ft)												
Base Capacity (vph)		1197		467	2476						1947	680
Starvation Cap Reductn		0		0	1135						0	0
Spillback Cap Reductn		3		0	0						53	0
Storage Cap Reductn		0		0	0						0	0
Reduced v/c Ratio		0.85		0.18	0.66						0.84	0.10

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 33.2 — Intersection LOS: C
Intersection Capacity Utilization 94.1% — ICU Level of Service F
Analysis Period (min) 15

m Volume for 95th percentile queue is metered by upstream signal.
dr Defacto Right Lane. Recode with 1 though lane as a right lane.

Splits and Phases: 3: BW 8 SBFR & W Bellfort Ave



Lane Group	Ø4	Ø5	Ø6	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	4	5	6	8	12	16
Permitted Phases						
Total Split (s)	29.0	32.0	38.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

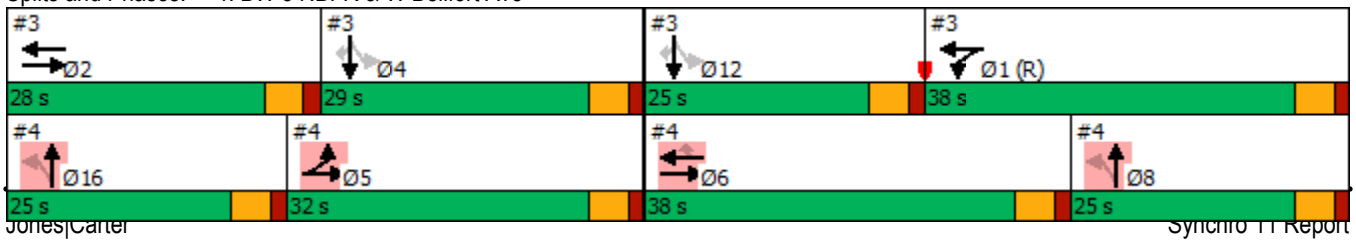
Intersection Summary

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	921	0	0	547	344	361	775	91	0	0	0
Future Volume (vph)	76	921	0	0	547	344	361	775	91	0	0	0
Satd. Flow (prot)	3273	3374	0	0	6108	1509	0	4727	0	0	0	0
Flt Permitted	0.950							0.986				
Satd. Flow (perm)	3273	3374	0	0	6108	1509	0	4727	0	0	0	0
Satd. Flow (RTOR)						303		12				
Lane Group Flow (vph)	78	940	0	0	558	351	0	1252	0	0	0	0
Turn Type	Prot	NA			NA	Perm	Perm	NA				
Protected Phases	5	5 6			6			8 16				
Permitted Phases						6	8 16					
Total Split (s)	32.0				38.0	38.0						
Total Lost Time (s)	5.0				5.0	5.0						
Act Effct Green (s)	28.8	66.8			33.0	33.0		43.2				
Actuated g/C Ratio	0.24	0.56			0.28	0.28		0.36				
v/c Ratio	0.10	0.50			0.33	0.55		0.73				
Control Delay	28.6	9.3			35.4	10.2		35.9				
Queue Delay	0.0	2.8			0.0	0.0		0.0				
Total Delay	28.6	12.1			35.4	10.2		35.9				
LOS	C	B			D	B		D				
Approach Delay		13.4			25.6			35.9				
Approach LOS		B			C			D				
Queue Length 50th (ft)	21	221			100	28		295				
Queue Length 95th (ft)	m24	282			127	116		351				
Internal Link Dist (ft)		253			511			148			240	
Turn Bay Length (ft)												
Base Capacity (vph)	786	1879			1679	634		1780				
Starvation Cap Reductn	0	794			0	0		0				
Spillback Cap Reductn	0	0			0	0		0				
Storage Cap Reductn	0	0			0	0		0				
Reduced v/c Ratio	0.10	0.87			0.33	0.55		0.70				

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 1:WBTL, Start of Green
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 25.7 Intersection LOS: C
Intersection Capacity Utilization 94.1% ICU Level of Service F
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: BW 8 NBFR & W Bellfort Ave



Lane Group	Ø1	Ø2	Ø4	Ø8	Ø12	Ø16
Lane Configurations						
Traffic Volume (vph)						
Future Volume (vph)						
Satd. Flow (prot)						
Flt Permitted						
Satd. Flow (perm)						
Satd. Flow (RTOR)						
Lane Group Flow (vph)						
Turn Type						
Protected Phases	1	2	4	8	12	16
Permitted Phases						
Total Split (s)	38.0	28.0	29.0	25.0	25.0	25.0
Total Lost Time (s)						
Act Effct Green (s)						
Actuated g/C Ratio						
v/c Ratio						
Control Delay						
Queue Delay						
Total Delay						
LOS						
Approach Delay						
Approach LOS						
Queue Length 50th (ft)						
Queue Length 95th (ft)						
Internal Link Dist (ft)						
Turn Bay Length (ft)						
Base Capacity (vph)						
Starvation Cap Reductn						
Spillback Cap Reductn						
Storage Cap Reductn						
Reduced v/c Ratio						

Intersection Summary

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	1040	47	11	805	1	12	1	4	1	1	21
Future Vol, veh/h	6	1040	47	11	805	1	12	1	4	1	1	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	1	-	-	1	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	7	7	7	7	7	7	7	7	7	7	7	7
Mvmt Flow	6	1072	48	11	830	1	12	1	4	1	1	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	831	0	0	1120	0	0	1546	1961	560	1402	1985	416
Stage 1	-	-	-	-	-	-	1108	1108	-	853	853	-
Stage 2	-	-	-	-	-	-	438	853	-	549	1132	-
Critical Hdwy	4.24	-	-	4.24	-	-	7.64	6.64	7.04	7.64	6.64	7.04
Critical Hdwy Stg 1	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.64	5.64	-	6.64	5.64	-
Follow-up Hdwy	2.27	-	-	2.27	-	-	3.57	4.07	3.37	3.57	4.07	3.37
Pot Cap-1 Maneuver	766	-	-	591	-	-	74	59	459	95	57	572
Stage 1	-	-	-	-	-	-	215	273	-	310	362	-
Stage 2	-	-	-	-	-	-	554	362	-	475	266	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	766	-	-	591	-	-	69	57	459	91	55	572
Mov Cap-2 Maneuver	-	-	-	-	-	-	161	164	-	204	158	-
Stage 1	-	-	-	-	-	-	210	267	-	303	355	-
Stage 2	-	-	-	-	-	-	522	355	-	459	260	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.2	25.9	12.9
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	190	766	-	-	591	-	-	480
HCM Lane V/C Ratio	0.092	0.008	-	-	0.019	-	-	0.049
HCM Control Delay (s)	25.9	9.7	0.1	-	11.2	-	-	12.9
HCM Lane LOS	D	A	A	-	B	-	-	B
HCM 95th %tile Q(veh)	0.3	0	-	-	0.1	-	-	0.2

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	71	1304	57	0	0
Future Vol, veh/h	0	71	1304	57	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	Free	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	7	7	7	7	7	7
Mvmt Flow	0	73	1344	59	0	0

Major/Minor	Minor1		Major1	
Conflicting Flow All	-	672	0	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	7.24	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	3.97	-	-
Pot Cap-1 Maneuver	0	332	-	0
Stage 1	0	-	-	0
Stage 2	0	-	-	0
Platoon blocked, %			-	
Mov Cap-1 Maneuver	-	332	-	-
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	WB	NB
HCM Control Delay, s	18.9	0
HCM LOS	C	

Minor Lane/Major Mvmt	NBT	WBLn1
Capacity (veh/h)	-	332
HCM Lane V/C Ratio	-	0.22
HCM Control Delay (s)	-	18.9
HCM Lane LOS	-	C
HCM 95th %tile Q(veh)	-	0.8

Appendix F
Signal Timings

Controller Database Timing Sheet

Station: 3260 - Sam Houston @ Bellfort (Standard-11/15/2019 2:19:11 PM)

Type: NTCIP 80.x OS9 Ethernet **Firmware:** 80.04c

Created By: salvare **Modified By:** **Reviewed By:**

Controller Phase Times(1.1.1)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TABLE - 1																
Min Grn	5	5	0	5	5	5	0	5	0	0	0	0	0	0	0	0
Gap Ext	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	0	0	0	0	0	0	0	0
Max 1	25	25	25	25	25	25	25	25	0	0	0	0	0	0	0	0
Max 2	50	50	50	50	50	50	50	50	0	0	0	0	0	0	0	0
Yel Clr	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Red Clr	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Walk	0	5	0	6	0	5	0	6	0	0	0	0	0	0	0	0
Ped Clr	0	9	0	10	0	9	0	10	0	0	0	0	0	0	0	0
Red Revt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Add Init	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max Init	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gap Reduce Time B4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gap Reduce Cars B4 Reduce	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gap Reduce Time To	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gap Reduce ReduceBy	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gap Reduce Min Gap	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DyMaxLim	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Max Step	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Controller Phase Options(1.1.2)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Enable P	X	X	.	X	X	X	.	X	.	.	.	.	.	.	.	.
Min Recall	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Max Recall	X	X	.	X	X	X	.	X	.	.	.	.	.	.	.	.
Ped Recall	.	X	.	X	.	X	.	X	.	.	.	.	.	.	.	.
Soft Recall	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Lock Calls	.	.	.	.	.	.	.	.	X	X	X	X	X	X	X	X
Auto Flash Entry	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Auto Flash Exit	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Dual Entry	.	X	.	X	.	X	.	X	.	.	.	.	.	.	.	.
Enable Simul Gap	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Guarantd Passage	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Rest In Walk	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Condit'l Service	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Non-Actuated 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Non-Actuated 2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Added Init Calc	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Hold to Max	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Controller Phase Options+ (1.1.3)																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
TABLE - 1																															
Reservice	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
PedClr Thru Yel	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Skip Red-NoCall	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Red Rest	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Max II	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Max Inhibit	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Ped Delay	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
RedRest On Gap	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Grn/Ped Delay Time	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Omit Yel/Yel P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped Out/Ovlp P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Start Yel/Nxt P	0	4	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ring Sequences (1.2.4)																															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
TABLE - 1																																
1	2	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 2																																
1	1	2	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 3																																
1	2	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	6	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 4																																
1	2	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 5																																
1	1	2	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	6	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 6																																
1	1	2	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 7																																
1	2	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	6	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 8																																
1	2	1	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	8	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 9																																
1	1	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	6	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 10																																
1	1	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 11																																
1	2	1	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	6	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 12																																
1	2	1	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	6	5	7	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TABLE - 13																																

Coordination Modes, + (2.1)	
	Value
Closed Loop	X
External	.
Latch Sec Frc	.
Stop In Walk	X
Walk Recycle	NO_RECYCLE
FreeOnSeqChang	X
ExtPattern	.
DynShortway	.
SyncPulsetime	0
Plan A	0
Plan C	0
Easy Float	.
Auto Err Reset	X
NTCIP Yield Sign	+
NTCIP Yield	0
Leave Walk Before	TIMED
Leave Walk After	TIMED
NoAddedInit	.
PedCallInh	.
ExtFailPattern	0
ExtOnCommFail	.
Plan B	0
Plan D	0

Patterns(2.4)				
	Cycle	Offset	Split	Seqnc
TABLE - 1				
1	90	0	1	1
2	120	0	2	1
3	120	0	3	1
4	70	0	4	1
5	0	0	5	1
6	0	0	6	1
7	0	0	7	1
8	0	0	8	1
9	0	0	9	1
10	0	0	10	1

Pattern Alt Tables+(2.6)							
	POpt	PTime	DetGrp	Call/Inh	ASC	CNA1	Max2	Dia
2	0	0	0	0	0	.	.	DFT
3	0	0	0	0	0	.	.	DFT
4	0	0	0	0	0	.	.	DFT
5	0	0	0	0	0	.	.	DFT
6	0	0	0	0	0	.	.	DFT
7	0	0	0	0	0	.	.	DFT
8	0	0	0	0	0	.	.	DFT

Splits Expanded(2.7.X.1)																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
TABLE - 1																
Time	20	30	0	40	20	30	0	40	0	0	0	0	0	0	0	0
Coord Phase	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mode	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
TABLE - 2																
Time	25	40	0	55	25	40	0	55	0	0	0	0	0	0	0	0
Coord Phase	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mode	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
TABLE - 3																
Time	25	40	0	55	25	40	0	55	0	0	0	0	0	0	0	0
Coord Phase	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mode	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
TABLE - 4																
Time	15	25	0	30	15	25	0	30	0	0	0	0	0	0	0	0
Coord Phase	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mode	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
TABLE - 5																
Time	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coord Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mode	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
TABLE - 6																
Time	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coord Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mode	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON	NON
TABLE - 7																
Time	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coord Phase	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Preempt+ Options(3.1.X.6)

	Value
Type	EMERG
Output Mode	TS2
Lnk Aft Dwell	.
Pattern	0
Skip Track if Override	.
Coord in Preempt	X
MCE override	.
Return Max/Min	MAX
TABLE -6	
Enable	.
Type	EMERG
Output Mode	TS2
Lnk Aft Dwell	.
Pattern	0
Skip Track if Override	.
Coord in Preempt	X
MCE override	.
Return Max/Min	MAX

Adv Schedule(4.3)

	SUN	MON	TUE	WED	THU	FRI	SAT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Plan
TABLE - 1																																																			
1	.	X	X	X	X	X	.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1
2	.	.	.	.	.	.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2
3	X	.	.	.	.	.	.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	2

Day Plan(4.4)

	1	2	3	4	5	6	7	8	9	10
TABLE - 1										
Hour	5	6	9	15	19	0	0	0	0	0
Minute	45	0	0	30	0	0	0	0	0	0
Action	1	2	1	3	1	0	0	0	0	0
TABLE - 2										
Hour	5	19	0	0	0	0	0	0	0	0
Minute	45	0	0	0	0	0	0	0	0	0
Action	1	1	0	0	0	0	0	0	0	0

Appendix G
Landfill Permit Application Documents

3.3 Transportation—30 TAC 330.61(i)

A. Access Roads

Complete the following table regarding the roads that will be used to access the site.

Table II-1. Roads That Will be Used to Access the Site.

Name of Road	Surface Type and Number of Lanes
Ruffino Road	Asphalt, 2 Lanes

B. Daily Traffic Volume

Complete the following table regarding existing and expected volume of vehicular traffic on access roads within one mile of the facility, and the projected volume of traffic expected to be generated by the facility on access roads within one mile of the facility.

Table III-2. Traffic Volume.

Vehicle Traffic	Volume (vehicles per day)
Existing Vehicle Traffic	640
Expected Vehicle Traffic	1,280
Projected Vehicle Traffic Generated by the Facility	640

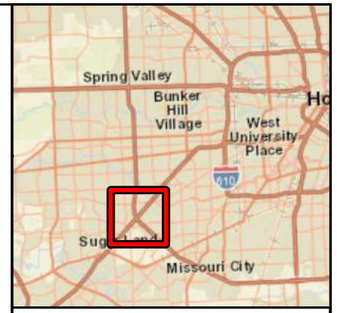
1. Describe the source or method used to obtain the volumes: Collected traffic counts (8/12/2021) and historical traffic data obtained from TxDOT's Traffic Count Database System

2. If traffic volume was determined by counts in the field, indicate the locations where the counts were conducted: Ruffino Road at West Bellfort Avenue, Beltway 8 Northbound Frontage Road at Ruffino Road, Beltway 8 Northbound Frontage Road at West Bellfort Avenue & Beltway 8 Southbound Frontage Road at West Bellfort Avenue

3. Has a response from the Texas Department of Transportation (TxDOT) for the coordination regarding traffic and location restrictions been received?

   ☐ Yes ☒ No

   If "Yes", include a copy of the response in the attachment. If "No", obtain a response.



VICINITY MAP

1 INCH = 10 MILES

LEGEND

- Ruffino Hills Landfill
- Streams

EXHIBIT 1
VICINITY MAP

RUFFINO HILLS LANDFILL
HARRIS COUNTY, TEXAS

N W E S

0 1,000
Feet
1 INCH = 1,000 FEET

JONES | CARTER
Texas Board of Professional Engineers Registration No. F-439

Path: K:\0005\0050\0083-06 Ruffino Hills Landfill – Task 1\2 Design Phase\Analysis\Vic Map.mxd Project Number: 00050-0083-06 Date: 3/16/2021 User Name: crr2

Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, Texas

Part III Supplement
Site Development Plan

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

936-202-0746

April 2023

Part III Supplement Site Development Plan
Type IX Landfill Mining Registration Application
Ruffino Road Landfills

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3.0 PART III – SITE DEVELOPMENT PLAN

3.1 General facility design 30TAC330.63 (B)

The general facility design is presented in the following attachments:

II-2 Facility Layout Map
III-2 Flow Diagram
III-3 Excavation Schematic View
III-4 Process Diagram

3.2 Facility Surface Water Drainage Report Statement 30TAC330.63(c)

3.2.1 Drainage Design

The facility was designed and constructed, and will be operated, to comply with the requirements of §330.303. The design of the facility will manage run-on and runoff during the peak discharge of a 25- year rainfall event and will prevent the off-site discharge of waste and soil, including, but not limited to, recyclable soil. Surface water drainage in and around the facility will be controlled to minimize surface water running onto, into, and off of excavation, soil separation, and material loading areas.

Drainage calculations and findings are presented in Attachment III-7 (Drainage Calculations and Pre-development Drainage Sub-Areas) for the following parameters:

- Design precipitation depth for the 25-year, 24-hour storm event
- Time of concentration
- Rainfall intensity
- Measurements of six drainage sub-areas onsite
- For each sub-area and the design storm:
    - Peak flows
    - Runoff volume
    - Drainage velocity

Post-development drainage parameters were not calculated because excavations to remove waste will detain stormwater and be pumped as necessary by the excavation contractor. Earthen berms will be necessary to:

1. Contain water in the bottom of excavations that has been in contact with waste (contaminated water) for proper collection, storage, and disposal
2. Divert stormwater away from excavations

Required berm heights for various configurations of upslope runoff areas and waste excavation geometries are presented in Attachment III-7, Drainage Calculations.

3.2.2 Floodplain Considerations

The 100-year floodplain, Zone AE, is shown on the Harris County Flood Insurance Rate Map (FIRM) Panel No. 48201C0845M dated May 2, 2019 (Attachment II-6) and the Metes and Bounds drawing, Attachment I-8. The 100-year floodplain along Keegan's Bayou may extend into areas proposed for landfill mining. However, we propose to remove waste from these areas rather than place waste in the floodplain. During the landfill mining project, exposed waste will be protected from washout, contact water will be minimized, and contaminated water will be contained and disposed of in the sanitary sewer.

Exposed waste in excavations and stockpiled waste materials will be covered at the end of each day with soil, plastic sheets, or spray-on cover and protected from flooding by berms. The ultimate purpose of the site will be stormwater detention which will mitigate future flooding along Keegans Bayou.

3.3 Waste Management Unit Design 30TAC330

3.3.A Test Pit Evaluation Report

The Test Pit Evaluation Report is presented in Attachment III-1.

3.3.B. Process Descriptions

Please see Part IV Supplement, Site Operating Plan, Section 4.0, Mining Operation Plan.

3.3.C Design Criteria

3.3.C.1 Groundwater Protection

Records from the West University and Bellaire Landfills indicate that clay liners (compacted or in-situ) were present to protect groundwater. The presence and top elevations of clay liners (or protective cover) was confirmed by our field investigation borings. The excavations that we propose for removing wastes from the landfills will not extend below the surface of the clay liners, or surface of protective cover if present. To comply with the requirements of 30 TAC 330.337(b)(1), this section presents a ballast calculation to confirm that sufficient weight of soil will remain in place above a deep confined groundwater layer to prevent uplift of the excavation bottom.

A Fugro-McClelland report drawing showing groundwater monitoring wells and landfill gas probes around the West University Landfill is presented on Figure III-6.1, along with cross section locations. Soil cross sections are shown on Figure III-6.2.

Figure III-6.1 also shows groundwater elevation contours for the West University Landfill that were measured on June 27, 1993, which were the highest groundwater elevations reported for the period May 21, 1993 to August 25, 1993.

Thin sand and silty sand layers appear to be present between elevations 55 feet and 63 feet for the south half of the West University Landfill Area. Based on reported groundwater levels, these are confined water-bearing layers that are in the elevation range of the clay liners (our borings encountered clay liners at an average elevation of 59.6 feet). We presume that groundwater from these shallow sand layers was controlled by channels, sumps, and pumps during excavation for landfill development.

The shallow sand layer is not present in borings to the north, but a deep silty sand layer is present in some northern borings. The deep silty sand is also a confined water-bearing layer.

To address the requirements of 30 TAC 330.337(b)(1), we calculated uplift on the clay liner of the West University Landfill, using the silty sand layer depth and piezometric surface measured in Piezometer P-4 on June 27, 1993.

Uplift Calculation Assumptions:

Top of clay liner (and bottom of excavation to remove waste)	Elevation 59.6 ft
Top of silty sand layer (P-4)	Elevation 49.0 ft
Piezometric surface measured in P-4 on 6/27/93	Elevation 63.8 ft
Density of in-situ clay	110 lbs/ft^3

Uplift Calculation

Hydrostatic pressure at top of silty sand layer = (63.8 – 49) x (62.4 lbs/ft^3) = 924 lbs/ft^2

Resisting pressure from clay between top of liner and top of silty sand layer = (59.6 – 49) x (110 lbs/ft^3) = 1,166 lbs/ft^2

Factor of safety against uplift = 1,166 / 924 = 1.26

Therefore, the weight of the clay liner plus natural clay above the confined silty sand layer offsets the unbalanced hydrostatic force by a factor of safety of 1.2

3.3.C.2 Excavation of Buried Waste

See Part IV Supplement, Section 4.0, Mining Operation Plan, and the following:

Waste Volumes and Classification

Jones - Carter calculated the volume of waste (including daily, intermediate, and final cover soils) using the LIDAR topographic map from 2018 and our estimates of bottom of waste elevations (top of clay liner) described below.

Based on plans discovered during our document search and borings conducted during our field investigation, our estimate of average liner (base of waste) elevation is 57 feet MSL for the Bellaire Landfill and 60 feet MSL for the West University Landill.

Waste volume calculations are presented below:

Bellaire Volume to Excavate Below Grade (el 70 to 57), cubic yards	Bellaire Volume to Excavate Above Grade (el 70), cubic yards	West U Volume to Excavate Below Grade (el 70 to 60), cubic yards	West U Volume to Excavate Above Grade (el 70), cubic yards	Total Volume to Excavate, cubic yards
627,370	524,555	698,930	523,807	2,374,662

Samples of excavated solid materials were collected, preserved, and shipped to a laboratory qualified to test contaminated materials and to determine concentrations of various compounds necessary to classify the wastes. Samples were tested for the following parameters: 40 CFR 261.24 Table 1 Contaminants for the Toxicity Characteristic (plus TCLP antimony, beryllium, nickel), Total Petroleum Hydrocarbons, total sulfates and cyanides, reactive sulfates and cyanides, pH, PAH, herbicides, pesticides, dioxins, furans, PCBs, and asbestos.

According to the TCEQ MSW Permits Section, the waste excavated from these closed landfills will be classified as Municipal Solid Waste, which is acceptable at any Type I Landfill (eg. Republic Services Blue Ridge Landfill). Based on our experience, excavated waste is sometimes classified as Class II Industrial Solid Waste, which is also acceptable for disposal at Type I MSW Landfills.

If possible, it will be advantageous to classify qualifying excavated material as construction and demolition debris because there are three Type IV (C&D) landfills within 12 miles of Ruffino Road.

Excavation and Hauling

Excavation of waste and soil should begin along the east side of the site so that a berm can be constructed between the excavation and residential neighborhood to reduce potential nuisances and screen the activity from view. Considering the general slope of the proposed detention pond base, excavating from east to west will also promote stormwater drainage toward the west. Large excavators (eg. CAT 330) will excavate materials and either load end-dump trucks or scalping screens designed to separate soil from waste (eg. Powerscreen Warrior 2400). Excavators can be fitted with a pulverizer to break up large pieces of concrete.

Separate material stockpiles will be built and shaped by large rubber-tire loaders (eg CAT 950) which can also load end dump trucks. The loader bucket can be used to segregate the waste, soil, and C&D materials, and laborers can assist in the removal of waste materials such as wood and vegetation from material stockpiles. Roll off boxes will be provided to store recyclable wastes such as tires.

Wastes can be transported to disposal facilities in tarped, end-dump trucks or by transfer trailers from the Ruffino Hills Transfer Station if that is a feasible option. Soils can be transported to disposal sites or other locations for beneficial use in tarped end-dump trucks. Broken concrete can be transported to concrete recycling facilities in end-dump trucks.

Disposal of Waste and Soil - Landfills, Transfer Stations, and Recycling Facilities

HGAC provides maps and lists of active landfills and transfer stations in the Houston area. Disposal and recycling facilities within 15 miles of the Ruffino Road site are presented in the table below.

Landfill or Transfer Station	Distance from 9610 Ruffino Road (road miles)	Hours of Operation
Ruffino Hills Transfer Station (Type V - MSW) 9720 Ruffino Rd, Houston	0	M-F 3am-5pm Sat 7am-12pm Sun Closed
Republic Services Blue Ridge Landfill (Type I – MSW) 2200 FM 521 Rd, Fresno	14	M-F 4am-5pm Sat 530am-12pm Sun Closed
Sprint Fort Bend County Landfill (Type IV – C&D) 16007 W Bellfort Ave, Sugarland	8	M-F 7am-5pm Sat 7am-1pm Sun Closed
Lone Star Landfill (Type IV – C&D) 4107 S Sam Houston Pkwy, Houston	10	M-F 6am-530pm Sat 6am-3pm Sun Closed
Casco Landfill (Type IV – C&D) 14001 Hooper Road, Houston	12	M-Sat 7am-445pm Sun Closed
Recycling		

Southern Crushed Concrete (Recycling) 5001 Gasmer Rd, Houston	8	M-F 630am-5pm Sat 630am-12pm Sun Closed
Cherry Crushed Concrete (Recycling) 616 FM 521 Rd, Fresno	11	M-F 7am-5pm Sat 7am-12pm Sun Closed

Description of Alternatives

1. Direct Haul All Excavated Material to a Type I (MSW) Landfill

All materials would be excavated, loaded into end-dump trucks, and hauled to a Type I Landfill permitted to accept MSW, C&D, soil, and non-hazardous industrial wastes. No effort would be made to separate or recycle any material.

The most cost-effective way to dispose of all unsegregated material at a Type I landfill is to haul it to the Republic Services Blue Ridge Landfill which has agreed to accept MSW, C&D, and soil (contaminated and clean).

2. Separation of MSW, C&D, and Soil (Type I and Type IV Landfills)

Waste materials would be separated into MSW, construction and demolition debris (eg. Brush, clean soil, concrete, asphalt, inert construction materials) and soil. MSW would be disposed of at the Blue Ridge Landfill. C&D and soil would be trucked to a Type IV Landfill (eg. Sprint Fort Bend County Landfill, Lone Star Landfill, Casco Landfill).

The material separation process will involve:

- C&D will be visually identified by onsite technicians or equipment operators and separated by the excavator
- The excavator will place excavated waste into a scalping screen (eg. Powerscreen Warrior 2400) capable of separating soil from waste materials
- The scalping screen includes conveyor belts that will produce stockpiles of waste and soil
- Rubber tired loaders will load waste materials from stockpiles into end-dump trucks for transport to disposal sites
- Loaders will move soil from the end of conveyors to designated locations for sample collection, storage while awaiting lab reports, and ultimately load the soil into end-dumps for transport to disposal or beneficial use sites

3. Separation of MSW, C&D, and Soil (Ruffino Road Transfer Station and Type IV Landfills)

Waste materials would be separated into MSW, construction and demolition debris, and soil. MSW would be disposed of at the Ruffino Hills Transfer Station. C&D and soil would be trucked to a Type IV Landfill. The material separation process will be identical to that described in Alternative 2, except that MSW will be moved via onsite dump trucks to the Ruffino Hills Transfer Station for disposal.

4. Separation of MSW, C&D, and Soil (Ruffino Hills Transfer Station, Type IV landfills, and Clean Soil to Beneficial Use Projects respectively)

Waste materials would be separated into MSW, construction and demolition debris, and soil. Wastes will be disposed of at the facility with the lowest combined transport and disposal costs. Clean soil will be transported to construction projects or other projects requiring clean soil for no or minimal disposal cost. The material separation process will be identical to that described in Alternative 2, except that MSW will be moved via onsite dump truck to the Ruffino Hills Transfer station for disposal and clean soil (Grades 1 and 2) will be transported to beneficial use sites (eg. Structural fill for construction).

Project Schedule

Our current estimate of project duration is two years and includes these assumptions:

- Excavation Rate:
    - Production of Each Excavator: CAT 330, 2.3 cy bucket, cycle time 30 sec = 270 bank cy/hour
    - Assume 20 percent volume increase (fluff) from in-place to excavated material
    - Two CAT 330 = 4,320 bank cy = 5,184 loose cy per day (FYI – Creekview 2,500 cy/day)
    - Assume, 6 days/wk, 8 hrs/day, 0.5 weather days/week

Project duration can be adjusted based on several variables, including:

- Number and size of excavators and loaders
- Number and size of soil scalping machines
- Efficiency of the excavation design, stockpiling process, temporary road layout, and operating methods
- Number and size of end-dump trucks hauling from the project, possibly limited by:
    - Type IX Registration Conditions
    - Local traffic restrictions
    - Availability of trucks
- Distance to disposal or beneficial use sites and turnaround time at disposal sites
- The number of disposal sites used simultaneously

3.3.C.3 Detention of Waste at the Facility

See Part IV Supplement, Section 4.0, Mining Operation Plan.

3.3.C.4 Prevention of Nuisances

The following environmental issues associated with the Landfill Mining project should be anticipated and will be planned for:

- Odors
- Dust
- Noise
- Stormwater
- Aesthetics
- Ground vibration
- Vectors
- Traffic

Odors

Landfill gas was not detected during drilling and sampling at either landfill by personnel or the GEM-2000 Landfill Gas Monitor. Because these landfills closed more than 30 years ago, the organic fraction of waste has probably decomposed and no longer produces methane or carbon dioxide.

Odor monitoring will be conducted at the beginning of waste excavation and the frequency may be adjusted based on our experience as the excavation progresses.

Dust Control

Excess dust can generally be controlled through the application of moisture on surfaces such as haul roads, stockpiles, and material loading into either the transport trucks or the soil separator. Water misters will be provided for soil separation equipment.

Noise Control

Land use around the project site is a combination of residential, commercial, industrial, and undeveloped. Equipment that generates periodic high impact noise should not be used during the landfill mining project. For example, concrete size reduction should be attained using an excavator with a pulverizer rather than an impact hammer.

Noise generation can be minimized by implementation of control measures typically used at construction sites. For this project, the excavation and loading operation can be conducted from east to west and a berm can be placed along the east side to reduce noise and dust and screen the operation from view.

Working hours should be limited to those established by the TCEQ.

Storm Water Control

Site drainage will be directed away from the excavation working face toward settling basins and sumps to remove particulate matter prior to discharge from the site. Diversion berms should prevent stormwater from flowing onto exposed waste.

Ground Vibration

For a site this size, vibration from excavators, loaders, and end-dump trucks is not expected to impact neighboring properties. To minimize vibrations from concrete crushing operations, an excavator with a pulverizer, instead of hammer type equipment will be used to reduce large pieces of concrete.

Vectors (Disease Carrying Animals)

Rodents and coyotes have been seen on the Ruffino property, so we should expect that some animals will be displaced by the waste relocation operation. If vectors are discovered when material removal operations are underway, a professional exterminator will be hired to set traps or bait to minimize the possible offsite migration of vectors.

Traffic

Large truck traffic is common on Ruffino Road and the immediate area because of the Ruffino Road Transfer Station. A traffic study has been prepared as part of this Type IX Landfill Mining Registration Application. The study indicates anticipated daily numbers and types of trucks generated by the waste relocation project, site ingress and egress areas, routes to disposal and other facilities, and concludes that truck traffic generated by the landfill mining project will not have a significant effect on traffic in the site vicinity.

Aesthetics Enhancement

The site presently has large trees and brush around the entire perimeter. It will be aesthetically beneficial to retain as much of this vegetation as possible. Additionally, a vegetated earthen berm can be placed along the east side to visually screen the site from the residential neighborhood.

The site operator will provide a daily program of dirt, mud, and litter removal from Ruffino Road and nearby streets used by trucks hauling materials from the site.

3.3.C.5 Control of Air Pollution

The Landfill Mining Project qualifies for a TCEQ Standard Air Permit. The following application documents have been submitted to the TCEQ Air Permits Section with our request for a preliminary review:

- Standard Permit Certification for MSW Landfills TCEQ Form 20296
- Standard Permit Checklist TCEQ Form 20304
- Standard Permit Checklist Attachment with Project Description and Certification Requirements
- LandGEM Landfill Gas Emissions Model, Version 3.03
- NMOC and VOC Emissions Conversion to lbs/hour and tons/year

The following information was presented in support of the Standard Air Permit Checklist submitted to the TCEQ Air Permits Division:

30 TAC §330.985 Certification Requirements

Section (c) - Is the certification for the air emissions from the site based on the maximum capacity of the landfill for a certification period of 10 years or longer and based on EPA landfill LandGEM modeling, AP-42 methods, or other modeling approved by the USEPA with maximum capacity and modeling results based on the last year of the certification period?

Response**:** 30 TAC Chapter 330, Subchapter N: Landfill Mining states: (1) Any landfill mining process operation that has existing authority under the Texas Clean Air Act does not have to meet the air quality criteria of this subchapter. In accordance with the Texas Health and Safety Code, Texas Clean Air Act, §382.051, any new landfill mining operation that meets all of the applicable requirements of this subchapter is entitled to an air quality standard permit authorization under this subchapter in lieu of the requirement to obtain an air quality permit under Chapter 116 of this title (relating to Control of Air Pollution by Permits for New Construction or Modification).

30 TAC § 330.987 Certification Requirements

Section (2) - sufficient information to demonstrate that the project and or site will comply with all applicable conditions of this subchapter:

Response: (b) Air quality standard permit. Landfill mining operations required to obtain authorization under §330.9 of this title (relating to Registration Required) that meet the following requirements are entitled to an air quality standard permit.

The City of Houston (applicant) agrees to comply with all following Standard Air Permit Conditions during the entire duration of the Ruffino Road Landfill Mining Project.

(1) All permanent on-site roads shall be watered, treated with dust-suppressant chemicals, or paved and cleaned as necessary to achieve maximum control of dust emissions. Vehicular speeds on non-paved roads shall not exceed ten miles per hour. Leachate and gas condensate are prohibited from use as dust-suppressant.

(2) Prior to processing any material with a high odor potential, the operator shall insure that there are means to prevent nuisance odors from leaving the facility boundaries.

(3) All material shall be conveyed mechanically, or if conveyed pneumatically, the conveying air shall be vented to the atmosphere through a fabric filter(s) having a maximum filtering velocity of 4.0 feet/minute with mechanical cleaning or 7.0 feet/minute with air cleaning.

(4) Except for initial start-up and shut-down, all processing equipment not enclosed inside a building shall be equipped with low-velocity fog nozzles spaced to create a continuous fog curtain or the operator shall have portable watering equipment available during the processing operation. These controls shall be utilized as necessary for maximum control of dust when loading vehicles and stockpiling recyclable material, reusable soil, or waste material. Excavation equipment is not considered as processing equipment. Leachate from process water is prohibited from use as dust-suppressant.
(5) All conveyors that off-load materials from processing equipment at a point that is not enclosed inside a building shall have available a water or mechanical dust suppression system. These controls shall be utilized as necessary for maximum control of dust when stockpiling material.
(6) All activities that could result in increased odor emissions shall be conducted in a manner that does not create nuisance conditions or shall only be conducted inside a building maintained under negative pressure and controlled with a chemical oxidation scrubbing system or bio filter system.
(7) Excavated waste material transported from the landfill facility shall be transported in covered trucks to minimize the loss of material.
Section (3) - a description of any equipment and related processes:
Response: The landfill mining project will include excavation of waste from the closed Bellaire and West University Landfills, screening of some excavated material to separate soil from waste, stockpiling excavated material, soil, and waste, loading of materials into dump trucks, and transport of materials to offsite recycling or disposal facilities. Liquids encountered in excavations will be stored, tested, and transported offsite for disposal.

Typical equipment will include the following:

- Track excavators
- Soil screening machines (eg. Trommel) with associated conveyor belts
- Runner tire loaders
- Bull dozers
- Dump trucks
- Water trucks
- Diesel Fuel tanks
- Contaminated water tanks (eg. Leachate)

At the direction of the TCEQ Air Permits Division, our final Standard Air Permit Application will be submitted following issuance of the Type IX Landfill Mining Registration. The landfill mining project will not begin until the appropriate air authorization has been issued by the TCEQ.

Odor Management

The landfill mining operations shall follow the guidelines presented in the Odor Management Plan of the Landfill Site Operating Plan. Additionally, all processing activities that could result in increased odor emissions shall comply with current rules, manage odor emissions on-site using best management practices, and be conducted in a manner that does not create nuisance conditions.

Dust Suppression

The landfill mining operations shall follow the requirements on Part IV Supplement, Section 4.10.3, Dust Suppression. Additional guidelines shall be implemented as follows:

All mined material shall be conveyed mechanically to the processing area in such a manner to minimize fugitive dust

Except for start-up and shut-down, all processing equipment not enclosed inside a building shall be equipped with low-velocity fog nozzles, spaced to create a continuous fog curtain. Alternatively, the City shall have portable watering equipment available during the processing operation. These controls shall be utilized as necessary for maximum control of dust when loading vehicles and stockpiling reusable soil or waste material. Excavation equipment is not considered processing equipment. Leachate will not be used as dust-suppressant.

All conveyors that off-load materials from processing equipment will have available a watering or mechanical dust suppression system. These controls shall be utilized as necessary for maximum control of dust when stockpiling material.

3.4 Sampling, Analysis and Reporting Requirements for Final Soil Product 30TAC330.611 & 30TAC330.613

Analytical methods

The landfill mining project will use the following analytical methods to characterize their final product:

> Chemical and physical analysis shall utilize:
> (A) "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (SW-846); or
> (B) "Methods for Chemical Analysis of Water and Wastes" (EPA-600).
>
> Analysis of pathogens shall utilize "Standard Methods for the Examination of Water and Wastewater" (Water Pollution Control Federation, 1995).
>
> Analysis for salinity and pH shall utilize North Central Regional (NCR) Method 14 for Saturated Media Extract Method contained in "Recommended Test Procedure for Greenhouse Growth Media" NCR Publication Number 221 (Revised), Recommended Chemical Soil Test Procedures, Bulletin Number 49 (Revised), October 1988, pages 34-37.
>
> Analysis of total, fixed, and volatile solids shall utilize Method 2540 G (Total, Fixed, and Volatile Solids in Solid and Semi-solid Samples) as described in "Standard Methods for the Examination of Water and Wastewater" (Water Pollution Control Federation, 1995).

Sample collection. Sample collection, preservation, and analysis shall assure valid and representative results in accordance with 30 TAC 330 Subchapter F (Analytical Quality Assurance and Quality Control).

Documentation

> The applicant shall record and maintain all the following information regarding their activities of operation for three years after the final product is shipped off-site or upon facility closure:
>
> - batch numbers identifying the final product sampling batch
> - quantities, types, and sources of materials processed and the dates processed
> - quantity and final product grade assigned described in §330.615 of this title (relating to Final Soil Product Grades and Allowable Uses)
> - date of sampling
> - analytical data used to characterize the final product, including laboratory quality assurance/quality control data

The following records shall be maintained on-site until facility closure

- sampling plan and procedures
- training and certification records of staff
- final soil product test results

Records shall be available for inspection by executive director representatives during normal business hours.

Sampling frequencies. All final soil product must be sampled and assigned a final product grade set forth in 30 TAC 330.615 at a minimum rate of one sample for every 5,000 cubic yard batch of final soil product or annually, whichever is more frequent. Each sample will be a composite of nine grab samples

Sampling requirements. The operator shall utilize the protocol specified in 30 TAC 330 Subchapter F of this chapter.

- Sampling from stockpiles. One-third of the grab samples shall be taken from the base of the stockpile (at least 12 inches into the pile at ground level), one-third from the exposed surface, and one-third from a depth of two feet from the exposed surface of the stockpile.
- Sampling from conveyors. Sampling times shall be selected randomly at frequencies that provide the same number of subsamples per volume of mined soil product as is required in subsection (d) of this section.
    - If samples are taken from a conveyor belt, the belt shall be stopped at that time. Sampling shall be done along the entire width and depth of the belt.
    - If samples are taken as the material falls from the end of a conveyor, the conveyor does not need to be stopped. Free-falling samples need to be taken to minimize the bias created as larger particles segregate or heavier particles sink to the bottom as the belt moves. To minimize sampling bias, the sample container shall be moved in the shape of a "D" under the falling product to be sampled. The flat portion of the "D" shall be perpendicular to the beltline. The circular portion of the "D" shall be accomplished to return the sampling container to the starting point in a manner so that no product to be sampled is included.

Analytical requirements. The final product subject to the sampling requirements of this section will be tested for the following parameters:

- total metals: arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc
- percent of foreign matter, dry weight basis
- pH by the saturated media extract method
- salinity by the saturated media extract electrical conductivity method
- pathogens: salmonella and fecal coliform
- polychlorinated biphenyls
- asbestos

Data precision and accuracy. Analytical data quality shall be established as specified in 30 TAC 330 Subchapter.

Reporting requirements

The landfill mining project will report the following information to the executive director on a semiannual basis for each batch of final soil product within two months after the reporting period ends:

- batch numbers identifying the final soil product sampling batch
- quantities and types of waste materials processed and the dates processed
- quantity of final soil product
- final soil product grade or permit number of the disposal facility receiving the final product if it is not Grade 1 or Grade 2 as established in §330.615 of this title
- analytical results used to characterize the final soil product, including laboratory quality assurance/quality control data and chain-of-custody documentation
- date of sampling

3.5 Final Soil Product Grades and Allowable Uses 30TAC330.615

Final soil product grades and allowable uses

- (1) Grade 1 soil – no use restrictions
- (2) Grade 2 soil – shall not be used at a residence, recreational area, licensed child-care facility or for food chain crops
- (3) Waste grade soil

Table 1: Maximum Allowable Concentrations

PARAMETER	Grade 1 Soil (mg/kg)	Grade 2 Soil (mg/kg)
As	10	41
Cd	16	39
Cr (total)	180	1200
Cu	1020	1500
Pb	300	300
Hg	11	17
Mo	75	75
Ni	160	420
Se	36	36
Zn	2190	2800
PCBs	1	10

Table 2: Additional Final Product Standards		
PARAMETER	Grade 1 Soil	Grade 2 Soil
Salinity (mmhos/cm)[1]	10	10
pH[1]	5.0 to 8.5	5.0 to 8.5
Pathogens:		
Fecal Coliform	less than 1,000 MPNper gram of solid or meets PFRP	geometric mean density less than 2,000,000 MPN per gram of solids or meets PSRP
Salmonella	less than 3 MPN per 4 grams total solid ormeets PFRP	No value

3.6 Closure Plan

A. Closure Requirements - See Form 20876

B. Certification of Final Facility Closure - See Form 20876

C. Closure Cost Estimate - See Form 20876

D. Financial Assurance - See Form 20876

3.7 Buffer Zones and Easement Protection 30TAC330.543

Buffer zones

The Ruffino Landfill Mining Project shall maintain a minimum distance of 50 feet between waste excavation, material storage, and loading areas and the facility boundary. The buffer zone shall not be narrower than that necessary to provide for safe passage for fire-fighting and other emergency vehicles.

Easement protection

No solid waste excavation, storage, or processing operations shall occur within any easement, buffer zone, or right-of-way nor within 25 feet of the center line of any utility line or pipeline easement unless otherwise authorized by the executive director of TCEQ. All pipeline and utility easements shall be clearly marked with posts that extend at least six feet above ground level, spaced at intervals of 300 feet or less.

3.8 Attachments to Part III of the Application

III-1 Test Pit Evaluation Report

III-2 Flow Diagram

III-3 Schematic View Drawing

III-4 Process Diagram

III-5 Liner Systems Design

III-6 Air Quality Authorization

III-7 Drainage Calculations

III-8 Pre-development Drainage Sub-Areas

III-9 Plan of Borings and Groundwater Contours

III-10 Geologic Cross Sections

III-11 Closure Plan

Attachment III – 1 Test Pit Evaluation Report

Attachment III – 1
Test Pit Evaluation Report

Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, Texas

Prepared for:

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Test Pit Evaluation Report
Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, TX

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1.0 PURPOSE OF THIS TEST PIT EVALUATION REPORT

Our test pit plan was submitted to the TCEQ in July, August, and September 2021 and TCEQ approved our plan in their letter dated November 5, 2021. Our test pit plan and this report are presented to comply with the TCEQ Landfill Mining Registration Application Form 20876, which states:

Use this form to apply for a Type IX registration to operate a landfill mining facility to recover materials for beneficial use from a closed or inactive landfill unit or an active disposal facility. A test-pit plan containing the information required by Title 30 Texas Administrative Code (TAC) Chapter 330.63(d)(7)(A) must be submitted to the executive director for review and approval prior to submitting the application for a Type IX landfill mining registration.

1.1 Background

The City of Houston, with the cooperation of the Cities of Bellaire and West University Place, is planning to remove all wastes from the closed West University and Bellaire Landfills (revoked MSW Permits 1250 and 1238 respectively) to create a stormwater detention pond to prevent future flooding that takes place along Keegans and Brays Bayou. See Appendix A, Figure 1 for the site location and Figure 2 for an existing conditions map.

In 2020, to evaluate the feasibility of waste relocation, Tetra Tech conducted document searches (TCEQ Region 12 files and Austin Open Records Request) and investigated field conditions with sample borings (Subchapter T Form 20787 approvals were obtained) to determine the horizontal and vertical limits of waste, types of waste, leachate conditions, landfill gas conditions, and to initially classify wastes for future disposal (the document search report is included in Appendix B).

To meet the requirements of 30 TAC Chapter 330, Subchapter N, on December 8 and 9, 2021, Tetra Tech excavated and sampled nine test pits. The results of our investigation and implications upon the proposed landfill mining project are discussed below.

The literature review indicated old municipal landfills that accepted MSW and C&D (1950s to 1980s) with no records of industrial or hazardous wastes. The borings (2020) and test pits (December 2021) confirmed the presence of a high percentage of soil and degraded municipal solid waste including rags, plastic, metal, lumber, and rubber. No landfill gas was detected. A small volume of liquid was encountered in the borings and no liquid was encountered in the test pits. No hazardous wastes or asbestos containing materials were encountered in the borings or test pits nor indicated by lab testing.

2.0 PRIOR FIELD INVESTIGATIONS

Tech Tech conducted field investigations of the West University Landfill (former MSW Permit 1250) and Bellaire Landfill (former MSW Permit 1238) to augment data obtained during the document search and review (see Appendices B, C, D for reports). The field investigations included obtaining data on the refuse limits, volume, and characteristics through borings. Investigative methods in addition to visual observations and photo documentation included field classification and laboratory testing of samples, surface air measurements for combustible gas, and leachate depth measurements and sampling.

The locations of borings are shown in Appendix A, Figure 3 and the reports in Appendices C and D provide the details of each investigation.

2.1 City of West University Landfill – 2020 Investigation Findings

The West University Landfill Field Investigation Report is presented in Appendix C.

The five borings drilled on the closed West University Landfill added to the information obtained during our Task 1 data review.

Information obtained or confirmed by the West University Landfill boring program includes the following:

- Our understanding of the horizontal limits of the closed landfill is unchanged
- Borings encountered the top of clay liner at about Elevation 61 feet MSL, typically. Our original calculations of the subsurface volume of waste assumed a liner elevation of 62 feet MSL. Therefore, our measurements of below grade and above grade waste volume remains unchanged.
- As expected, the proportion of soil in all borings was significant. Therefore, we increased the soil proportion to 50 percent in our estimate of material volumes.
- Liquid was encountered in one of the five borings. Based on this finding, it is difficult to estimate total subsurface liquid volume or characteristics.
- There were no indications of landfill gas. Because these landfills closed more than 30 years ago, the organic fraction of waste has decomposed and no longer produces methane or carbon dioxide. The absence of odorous gas will be a benefit during waste excavation and relocation.
- There were no indications of asbestos or hazardous materials. This is good news, but the borings provide a small view of subsurface conditions and plans to safely handle, transport, and dispose of these materials will be necessary before waste excavation and relocation begins.

According to laboratory testing, the waste samples can be classified as MSW or Class II Industrial Waste, which is acceptable for disposal at any Type I MSW Landill. The nearest Type I landfill is the Republic Services Blue Ridge Landfill which is 14 miles to the southeast.

Based on the field investigation, we find no reason to change our estimate of the buried waste boundaries. In all five borings, the bottom liner was encountered and the depth to liner measured. Knowing surface elevations, we converted liner depths to elevations as shown on the boring logs and in the table below.

Boring Number	Surface Elevation, ft MSL	Depth to Clay Liner, ft	Top of Clay Liner Elevation, ft MSL
SB-1	82.00	21	61
SB-2	78.00	17	61
SB-3	78.97	24	55
SB-4	79.99	20	60
SB-5	79.54	18	61

2.2 City of Bellaire Landfill - – 2020 Investigation Findings

The Bellaire Landfill Field Investigation Report is presented in Appendix D.

The six borings drilled on the closed Bellaire Landfill confirmed our understanding of subsurface conditions developed during Task 1, with the exception of liner (base of waste) elevation.

Information obtained or confirmed by the Bellaire Landfill boring program includes the following:

- Our understanding of the horizontal limits of the closed landfill is unchanged
- Borings encountered the top of clay liner at an average Elevation of 57 feet MSL. Our original calculations of the subsurface volume of waste assumed a liner elevation of 62 feet MSL. Therefore, our calculation of below grade waste volume and associated excavation, transport, and disposal cost increased.
- As expected, the proportion of soil in all borings was significant. Therefore, we estimate that 50 percent of excavated material will be soil.

- Liquid was encountered in four borings. Based on this finding, it is difficult to estimate total subsurface liquid volume or characteristics.
- There were no indications of landfill gas. Because these landfills closed more than 30 years ago, the organic fraction of waste has decomposed and no longer produces methane or carbon dioxide. The absence of odorous gas will be a benefit during waste excavation and relocation.
- There were no indications of asbestos or hazardous materials. This is good news, but the borings provide a small view of subsurface conditions and plans to safely handle, transport, and dispose of these materials will be necessary before waste excavation and relocation begins.
- According to laboratory testing of three composite solid waste samples, the waste samples can be classified as MSW or Class II Industrial Waste, which is acceptable for disposal at any Type I MSW Landill. The nearest Type I landfill is the Republic Services Blue Ridge Landfill which is 14 miles to the southeast.

In five borings, the bottom liner was encountered and the depth to liner measured. Based on our Bellaire Landfill borings, the average clay liner elevation is 56.5 feet, compared to an average liner elevation of 59.6 feet found at the West University Landfill. Knowing surface elevations, we converted liner depths to elevations as shown on the boring logs and in the table below.

Boring Number	Surface Elevation, ft MSL	Depth to Clay Liner, ft	Top of Clay Liner Elevation, ft MSL
B-1	86.71	Not Encountered	NA
B-1A	85.98	30.0	56.0
B-2	83.01	26.0	57.0
B-3	70.48	14.0	56.5
B-4	80.00	23.0	57.0
W-1	86.06	30.0	56.1

3.0 TEST PIT FINDINGS (2021) AND REGULATIONS

Applicable 30 TAC Chapter 330 regulations are presented below followed by the findings of our test pit investigation.

3.1 30 TAC 330.63(d)(7)

Type IX energy, material, gas recovery for beneficial use, or landfill mining waste processing units. The owner or operator shall provide:

(A) For wastes to be excavated, a test pit evaluation report prepared by an engineer. Prior approval of a test pit plan must be obtained from the executive director before excavation of test pits including location and depth of all test pits, including a discussion and information on the following:

This test pit plan was prepared by Jim Norstrom, P.E. and approved by Mr. Chance Goodin, TCEQ MSW Permits Section Manager, in his letter dated November 5, 2021.

(i) a description of the characteristics of waste observed in test pits excavated on the site to include the percent of paper, plastics, ferrous metal, other metal, glass, other

constituents, and soil fraction by weight;

Test pit excavations were observed by a technician experienced in identifying and classifying waste and soil. The technician's field notes and test pit logs are included in Appendix F and include an estimate of the percentage of the materials listed above, including the soil fraction by weight.

A summary of the percentage of materials encountered is presented below:

Test Pit No.	% Soil	% Waste	Paper % of Waste	Plastic % of Waste	Metal % of Waste	Glass % of Waste	Wood % of Waste	Other % of Waste
1	100	0						
2	100	0						
3	65	35		50			50	
4	75	25		40			60	10 (brick)
5	100	0						
6	50	50	15	55	15		15	
7	20	80	20	80				
8	55	45		100				
9	75	25		75				25 (concrete)

(ii) a design for the test pits to extend four feet beneath the waste or to a depth authorized by the executive director and information submitted to include a Toxicity Characteristic Leaching Procedure (TCLP) of the soil to characterize the soil beneath the site. Liners if present shall not be disrupted;

Depth to clay liners for both landfills have been determined by the 11 borings drilled in 2020. The objective of the test pits was not to disturb the clay liner, therefore samples of soil beneath the waste were not collected.

For the 2021 test pits, we excavated between six and nine feet below ground surface and collected waste and soil samples. In comes cases, waste was encountered three feet below the surface and in three cases no waste was encountered.

Appendix F includes field logs and test pit cross sections.

(iii) a TCLP analysis of each representative type of waste excavated. Additionally, waste excavated from each test pit must be analyzed for asbestos and polychlorinated biphenyls (PCBs). Consideration should be given to the analysis of waste material from each test pit for hazardous waste constituents;

Borings in 2020 - In 2020 we completed 11 borings and conducted the following lab tests:

Solids - Six composite waste samples were tested for the following:

- TCLP for Volatile Organic Compounds (GC/MS Method 8260B)
- TCLP for Semi-volatile organic compounds (GC/MS Method 8270C)
- TCLP Non-halogenated organic compounds (GC Method 8015B)
- TCLP Organochlorine Pesticides (GC Method 8081A)
- Polychlorinated Biphenyls (PCBs) (GC Method 8082)
- TCLP Herbicides (GC Method 8151A)
- Total Petroleum Hydrocarbons (GC Method TX 1005)
- TCLP Metals (Texas 12) (Method 6010B) (for Mercury, Method 7470A)
- General Chemistry (Reactive Cyanide, Sulfide, Reactive Sulfide, pH)

Liquids - Tests were conducted on two liquid samples for parameters required by the City of Houston Public Works Industrial Wastewater Department.

Test Pits in 2021 - For the 2021 test pits, the following lab tests were conducted (Lab reports are presented in Appendix G). Please note that there was only one type of representative waste type encountered, municipal solid waste. However, we ran tests on three waste samples (or more for asbestos and PCB tests).

Lab Test on Waste Samples	Test Pit 1 (no waste)	Test Pit 3	Test Pit 4	Test Pit 5 (no waste)	Test Pit 6	Test Pit 7	Test Pit 8	Test Pit 9
TCLP (Metals, VOC, SVOC, Non-halogenated organics, Pesticides, Herbicides		1	1				1	
Corrosivity, pH		1	1				1	
Ignitability		1	1				1	
Reactive Sulfide & Cyanide		1	1				1	
TPH		1	1				1	
Asbestos		3	3		3	3	3	3
PCB		2	2		2	2	2	2

Soil sampling and testing was done as a preliminary evaluation of the soil grades that will be produced by the landfill mining project. Soil grades defined by the TCEQ will determine approved uses.

Lab Test on Soil Samples	Test Pit 1	Test Pit 3	Test Pit 4	Test Pit 5	Test Pit 6	Test Pit 7	Test Pit 8	Test Pit 9
Total Metals	1	1	1				1	
Weight fraction of foreign matter	1	1	1				1	
pH	1	1	1				1	

Salinity	1	1	1				1	
Salmonella	1	1	1				1	
Fecal Coliform	1	1	1				1	
Asbestos	1	1	1				1	
PCBs	1	1	1				1	

Liquid was not encountered in any test pits, therefore no liquid samples were collected.

(iv) a determination as to a sufficient number of test pits to establish the properties of the waste. A site of five acres or less must have a minimum of three test pits. Sites larger than five acres must have three test pits plus one for every additional five acres or fraction of an acre. The number of test pits shall be approved by the executive director prior to making the pits. The test pits should be sufficiently large enough to provide representative information;

Based on our measurements, the total landfill (buried waste) footprint for both landfills is 81 acres. We calculate that a total of 18.2 test pits (or borings) are required to satisfy the regulation above.

We drilled and sampled 11 borings as described in the reports in the Appendices.

To satisfy the regulations, the approved Test Pit Plan proposed to excavate eight test pits and we excavated nine test pits, which resulted in a total of 20 test pits / borings. Actual test pit dimensions are shown on the field logs.

(v) a description of how all test pits will be backfilled with clean high plasticity or low plasticity clay. The excavation shall be backfilled to exceed the existing grade and provide positive drainage;

All nine test pit excavations were be backfilled with clean high plasticity or low plasticity clay before the end of the day that they are excavated. There was no rain, therefore no water accumulated or ran off. Clay was trucked to the site and placed in test pit excavations, compacted with a backhoe bucket, and mounded to promote positive drainage.

(vi) a cross-section drawing using the information from the test pits to depict the top and bottom elevations of the landfill;

Information obtained from the 11 borings and nine test pits proposed was used to produce Figure 5, which is our understanding of top of clay liner elevations for both closed landfills. Figure 3 shows actual boring and test pit locations and Figure __ shows surface topography as of 2017.

(vii) a plan view map depicting the location and extent (vertical and lateral) of the waste unit and proposed extent of mining/recovery operations. In areas with liners, mining operations should not extend below the top of the protective cover of the liner. In areas where no liner exists, excavation operations may extend below the waste;

Figure ___ "base grade drawing" is our understanding of top of clay liner elevations for both closed landfills and includes:

- Horizontal limits of buried waste for both landfills
- Estimated clay liner surface elevations
- Horizontal and vertical limits of proposed waste excavation and landfill mining

Because the objective of this project is removal of all waste, excavations will extend to the surface of the clay liner.

(viii) an evaluation of historical records of landfill operations, where available, to determine such things as hazardous waste potential, receipt of special waste, types of waste received, special waste disposal areas, construction or demolition waste disposal areas, methane and leachate records, age, volume, disposal methods, existence of liners, gas collection systems, and leachate collection systems; and

Tetra Tech investigated both closed landfills by searching for and reviewing information provided by the COH and the Cities of Bellaire and West University. We reviewed files available in the TCEQ Region 12 office in Houston and were provided documents by TCEQ Central Records in Austin in response to our open records request. Our report is provided in Appendix B.

(ix) a description of how all waste removed in test pit evaluation will be disposed of in a permitted landfill.

Waste from the test pits was transported to the Ruffino Road Transfer Station for loading and transport to the WCA Fort Bend County Type I Landfill for disposal under a waste profile that Tetra Tech executed with WCA in 2020.

Wastes were transported to the Ruffino Road Transfer Station by loader or truck the same day that each test pit was excavated.

Excavated material was not stored on the closed landfills over-night. There was no rain during excavation of the test pits. Test pits were backfilled with clean high or low plasticity clay before the end of the day that they are excavated.

30 TAC 330.955(f) - Any water that comes in contact with waste becomes contaminated water and has to be properly discharged in a manner that will not cause surface water or groundwater contamination.

The test pit program was conducted during dry weather. Clean high and low plasticity clay was available so that excavations could have been backfilled before rain showers to avoid generation of contaminated water.

There was no precipitation during excavation and backfilling of the test pits, therefore no contaminated waste was generated.

30 TAC 330.960(5) - description of the procedures for water and/or methane monitoring and excavated material disposal during construction.

Landfill Gas –

Because the Bellaire Landfill closed in 1988 and the West University Landfill closed in 1992, it is probable that most, if not all, of the gas-producing organic waste has completed biological decomposition and gas production has ceased.

During our 11-boring field investigation in 2020, our technician took periodic measurements during drilling. Landfill gas odor was not detected in any of the borings and the GEM-2000 never registered a value above zero.

For the 2021 test pits, to ensure the protection of personnel during excavation, our technician was equipped with a combustible gas detector capable of detecting levels as low at one percent methane in air. The technician took periodic measurements during excavation of each test pit. No combustible gas was detected during any test pit excavation.

4.0 CONCLUSIONS

The information provided by our document search, sample borings in 2020, and test pits in 2021 leads us to the following conclusions and recommendations for the proposed landfill mining project;

1. The closed landfills contain municipal solid waste. Although we found no evidence of hazardous waste, asbestos, or PCBs, our landfill mining plan will include procedures for the safe management of these materials if encountered.
2. Based on lab tests on waste samples, they do not exhibit characteristics that would classify them as hazardous or Class 1 non-hazardous waste. Asbestos and PCBs were not detected in any waste samples.
3. A significant amount of soil is present around and within the waste matrix of the test pits. Recovery and beneficial use of soil will have environmental and economic benefits. Lab tests on samples collected from the test pits indicates the following percentage by soil grade:
    a. Grade 1
    b. Grade 2
    c. Waste Grade
4. Recovery of materials other than soil does not appear to be economically feasible. This is not detrimental because the project's objective is waste removal prior to detention pond construction, not recovery of material.
5. Very little subsurface liquid was encountered during our investigations. However, our landfill mining plan will include procedures for the safe management of subsurface leachate if encountered.
6. No landfill gas was detected during our investigations. However, our landfill mining plan will include procedures for the safe management of landfill gas if encountered.

In summary, based on the findings of our document searches and field investigations, the waste excavation, relocation, and landfill mining project that we propose is feasible and can be done safely if plans and procedures approved by the TCEQ are implemented to protect human health and the environment.

APPENDIX A FIGURES

1. General Location Map
2. Existing Conditions Map
3. Boring and Test Pit Plan
4. Test Pit Cross Section
5. Top of Liner Elevations & Horizontal Limits of Landfill Mining Project
6. Topographic Map – LiDAR 2018

REFERENCE: Texas Department of Transportation, Official Travel Map (Houston, TX)

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	04/23/2020
1	TITLE REVISED	07/06/2020

STATE OF TEXAS
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3/1/23
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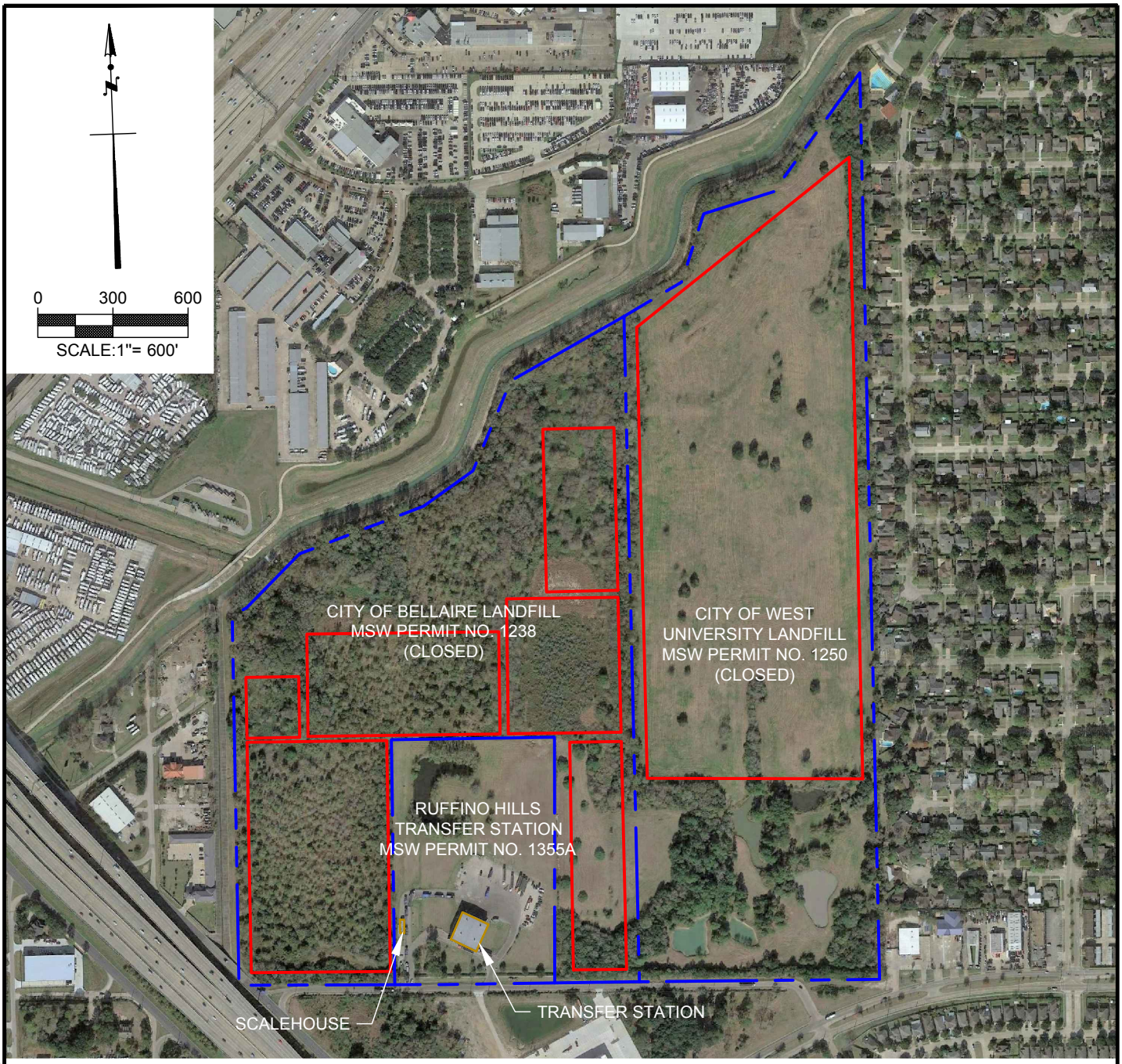
Ruffino Road Type IX Landfill Mining Registration Application

GENERAL LOCATION MAP

FIGURE 1

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-801 General Location Map.dwg 7/14/2020 3:09 PM



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF WASTE
- EXISTING STRUCTURE

REFERENCE: Google Earth, Imagery Date: December 1, 2019

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	04/23/2020
1	TITLE REVISED	07/06/2020

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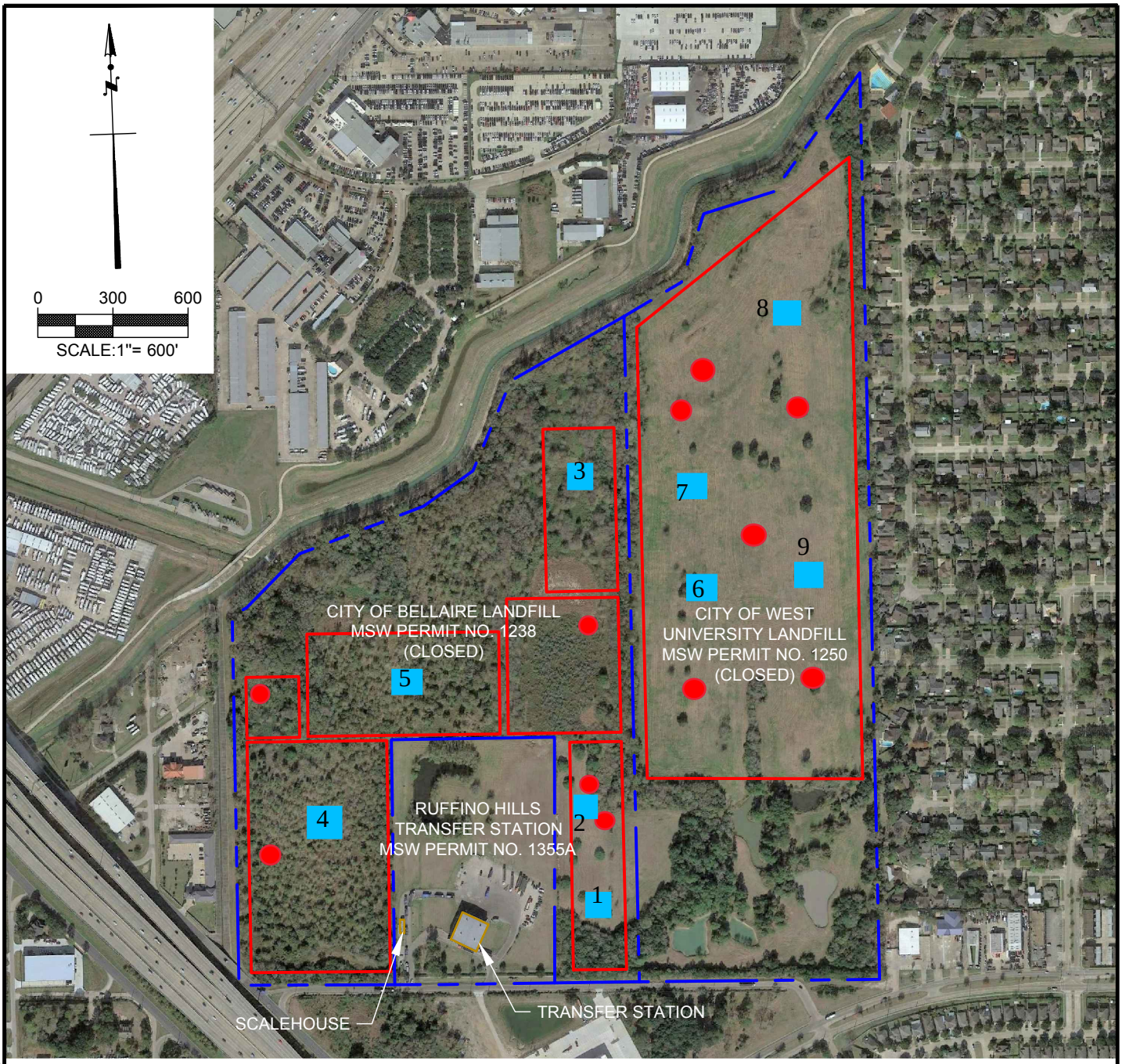
Ruffino Road Type IX Landfill Mining Registration Application

EXISTING CONDITIONS MAP

FIGURE 2

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-803 Existing Conditions Map.dwg 7/14/2020 3:10 PM



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF WASTE
- EXISTING STRUCTURE

REFERENCE: Google Earth, Imagery Date: December 1, 2019

- Completed Boring
- Actual Test Pit Location

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/10/21
1		

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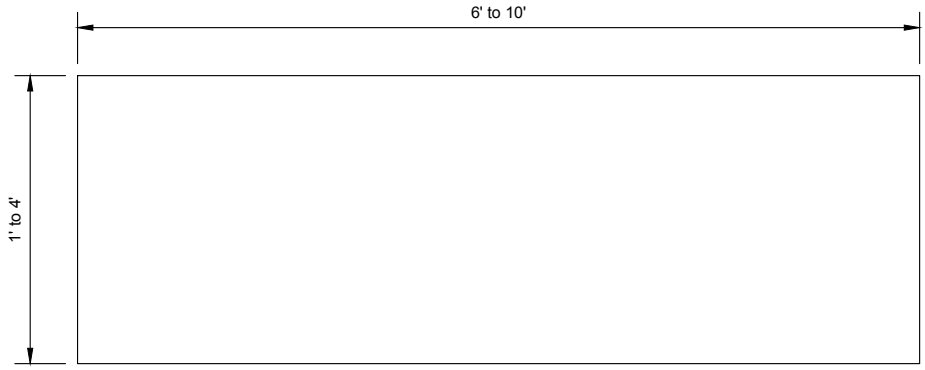
Ruffino Road Type IX Landfill Mining Registration Application

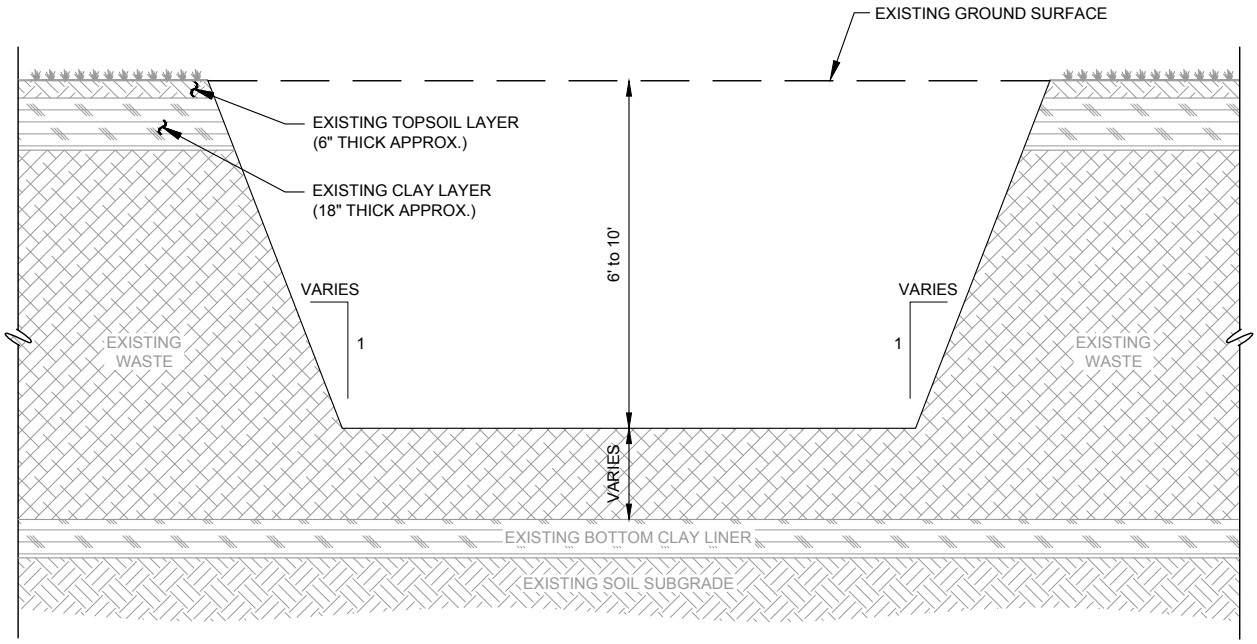
2020 Boring & 2021 Test Pit Locations

FIGURE 3

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-803 Existing Conditions Map.dwg 7/14/2020 3:10 PM



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 60 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

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Ruffino Road Type IX Landfill Mining Registration Application

TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-804 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

N

0 150 300

SCALE:1"= 300'

STATE OF TEXAS
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TETRA TECH, INC.
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10' HIGH VISUAL SCREENING BERM

30.00'

50.00'

2:1

60 70 80

MAIN SITE HAUL ROAD

PROPERTY BOUNDARY

DIRECTION OF EXCAVATION

LINER ELEV.: 56.5'

LINER ELEV.: 59.6'

MAIN SITE HAUL ROAD ENTRANCE

LEGEND

- APPROXIMATE LIMIT OF PROPERTY LINE
- LIMIT OF GRADING / DAYLIGHT
- 50 MAJOR CONTOUR
- 50 MINOR CONTOUR
- 50 PROPOSED MAJOR CONTOUR
- 50 PROPOSED MINOR CONTOUR
- UNPAVED ROAD / BENCH
- PROPOSED HAUL ROAD

DATE OF TOPOGRAPHY: 2018

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-814 Excavation-Schematic View

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AGENCY			
DESIGNED BY :	J.N.	DATE:	08-2021
DRAWN BY :	A.K. / D.B.	PROJ. NO.:	2020-0072
CHECKED BY :	V.Y.		
APPROVED BY :	J.N.		

RUFFINO ROAD TEST PIT REPORT

Top of Liner Elevations & Horizontal Limits of Landfill Mining Project

Figure 5

LEGEND

Landfill Parcels

NO.	REVISION DESCRIPTION	DATE

STATE OF TEXAS
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TETRA TECH, INC.
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0 250 500
Feet

N
W E
S

1 inch equals 500 feet

TETRA TECH

Ruffino Landfill Mining Registration Application - Test Pits

TOPOGRAPHIC MAP - 2018 LiDAR

FIGURE 6

K:\00050\00050-0083-06 Ruffino Hills Landfill – Task 1B\2 Design Phase\Analysis\City of West University Place Landfill 20200708.mxd

APPENDIX B TASK 1 DOCUMENT SEARCH REPORT

TETRA TECH

Report

To:	Martin Murdock - Jones Carter
From:	Jim Norstrom
Date:	May 27, 2020
Subject:	Ruffino Hills Landfill Relocation – Task 1 Report

Introduction

Tetra Tech's scope of work presented in our proposal to Jones–Carter dated February 13, 2020 includes the following Tasks:

1. Data Review
2. Field Investigation
3. Evaluation of Alternatives
4. Regulatory Agency Liason and Community Outreach
5. Waste Relocation Work Plan Preparation
6. TCEQ MSW Type IX Registration (Landfill Mining)

The Task 1 Scope is:

> TT will investigate current site conditions by searching for and reviewing information provided by the COH, TCEQ, and the Cities of Bellaire and West University. This task will include review of available data to determine waste classification, in-place quantity, horizontal and vertical waste limits, identification of regulatory requirements, and a preliminary assessment of site excavation, material recovery, and disposal options.

This Task 1 Report includes the following:

- Report of findings
- Changes to Task 2 scope and fee estimate based on findings
- Preliminary estimate of total waste relocation project cost and schedule

Document Searchs

- City of Houston (COH) – provided prior environmental and drainage evaluation reports
- City of Bellaire – various documents including Notice to Deed Records (TCEQ requirement)
- City of West University Place – various documents including TCEQ Approval of voluntary request to revoke MSW Permit No. 1250 as the end of the post-closure care period
- TCEQ Central Records e-file request and request to review files in Austin – One e-document provided. Our request to review files in Austin was denied because of Caronavirus precautions.
- TCEQ Open Records Request – Request made and fee paid, but still waiting for TCEQ to place e-records on FTP website
- TCEQ Region 12 Records in Houston – We reviewed files at Region 12 on March 6, 2020 and found several helpful documents, two of which are included in Appendix A.
- TCEQ Central Registry (online) – Helpful documents included MSW permit numbers, address, Regulated Entity (RN) and Customer Numbers (CN)

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- Environmental Data Resources, Inc. (EDR) search of regulatory databases and historic topographic maps and aerial photos. The EDR Radius Search meets the requirements of:
    - EPA's Standards for All Appropriate Inquiries (40 CFR Part 312)
    - ASTM Standards for Environmental Site Assessments (E 1527-13)
    - Environmental Site Assessments for Forestland or Rural Property (E 2247-16)
    - Limited Environmental Due Diligence: Transaction Screen Process (E 1528-14)

Document Search Key Findings

- The City of Bellaire Landfill operated from 1954 to 1988 and the City of West University Place Landfill operated from 1959 to 1992
- Regarding Records of Landfill Construction:
    - A Neill Engineering Corporation report from 1979 states that waste was deposited in trenches lined with three feet of low-permeability clay. Trenches were six to eight feet deep and 22 to 42 feet wide. Waste trenches were at least 50 feet from the east, north, and west property lines and varying distances from Ruffino Road.
    - TDH and post closure TCEQ reports indicate a 12-foot depth of waste in trenches with a clay cover thickness ranging from 6 inches to 4 feet.
- The landfills were both closed and covered and the surface is vegetated except for a 14-acre parcel on the south end of the Bellaire property that is occupied by an active waste transfer station operated by WCA (TCEQ MSW Permit 1355A). The West University property (east 75 acres) has a grass cover with good access. The Bellaire property (west 75 acres) is covered with trees and brush and access is difficult.
- Following landfill closure, the Houston Hills Golf Course was constructed on the Bellaire property. The Course operated until 2002 and the contouring and ponds remain. In the golf course area there is additional fill material containing topsoil mixed with some concrete and rebar. (Appendix B).
- Elevations range from about 68 feet to 84 feet, according to 2018 LiDAR data (Appendix C)
- Soil borings from 1979 on the West University side show clay from the surface to elevation 52 feet and deeper, with an intermittent sand layer below. On the south end of the property, the sand layer is shallower with elevations as high as 65 feet. Shallow groundwater appears to flow from southwest to northeast with elevations in monitoring wells in 1994 ranging from 69 to 60 feet.
- Both landfills completed post-closure monitoring and maintenance and the permits were revoked as requested by the cities. Voluntary revocation means that both landfills completed post-closure to the satisfaction of the TCEQ and that there were no indications of offsite contamination. ENSR post-closure groundwater monitoring reports for the West University Landfill from the early 2000s conclude that the landfill was not impacting shallow groundwater quality.
- Records indicate that the landfills accepted municipal solid waste and construction / demolition debris

Regulatory Requirements

Based on review of TCEQ Regulations in 30 TAC Chapter 330 Subchapters N (Landfill Mining) and T (Use of Land Over Closed MSW Landfills), and discussions with the TCEQ MSW Permits Section in Austin, we understand that the following submittals and approvals are required for this project at the state level:

- Required for field investigation - TCEQ Form 20787 Authorization to Disturb Final Cover Over Closed MSW Landfill for Non-Enclosed Structure
- Required for Landfill Excavation and Material Processing – MSW Type IX Landfill Mining Registration Application
- Required for Landfill Excavation and Material Processing – Standard Air Permit
- Not applicable - The Texas Risk Reduction Program (TRRP – 30 TAC Chapter 350) – because (1) no recorded releases of contaminants (30 TAC 350.2c), and (2) Municipal Landfill Exclusion.

Site Visits

- April 2, 2020 - Martin Murdock (JC), Jim Norstrom (TT), Troy Leitschuh (WCA), Michael Leech (City of Bellaire Director of Public Works), Edward Orozco (City of West University Public Works Manager)
- May 13, 2020 – Jim Norstrom (TT), Bill Tobin (Tolunay Wong Engineers)

Changes to Task 2 Scope and Fee

Some helpful documents were provided by the COH, Bellaire, West University, and found in the TCEQ Region 12 files. Unfortunately, closure of TCEQ Central Records in Austin and unavailability of TCEQ Open Records Request documents (so far) reduced the effectiveness of our search. We asked whether any current or retired Bellaire or West University workers with experience at the landfills were available for interviews, but none were produced. At this point, the scope and fee estimate for Task 2 remains appropriate.

Preliminary Estimate of Waste Relocation Project Cost and Schedule

A breakdown of our cost and schedule estimates are presented in Appendix A. Please note that these are preliminary and based on rough volume estimates and initial prices that have not been negotiated.

Our estimates include assumptions such as: excavating by one or two CAT 235 or equivalent excavators, a construction manager / engineer will be onsite full time, wastes disposed of at the Blue Ridge Landfill (14 miles southeast of Ruffino Hills), and that soil comprises 40 percent of the excavated material matrix.

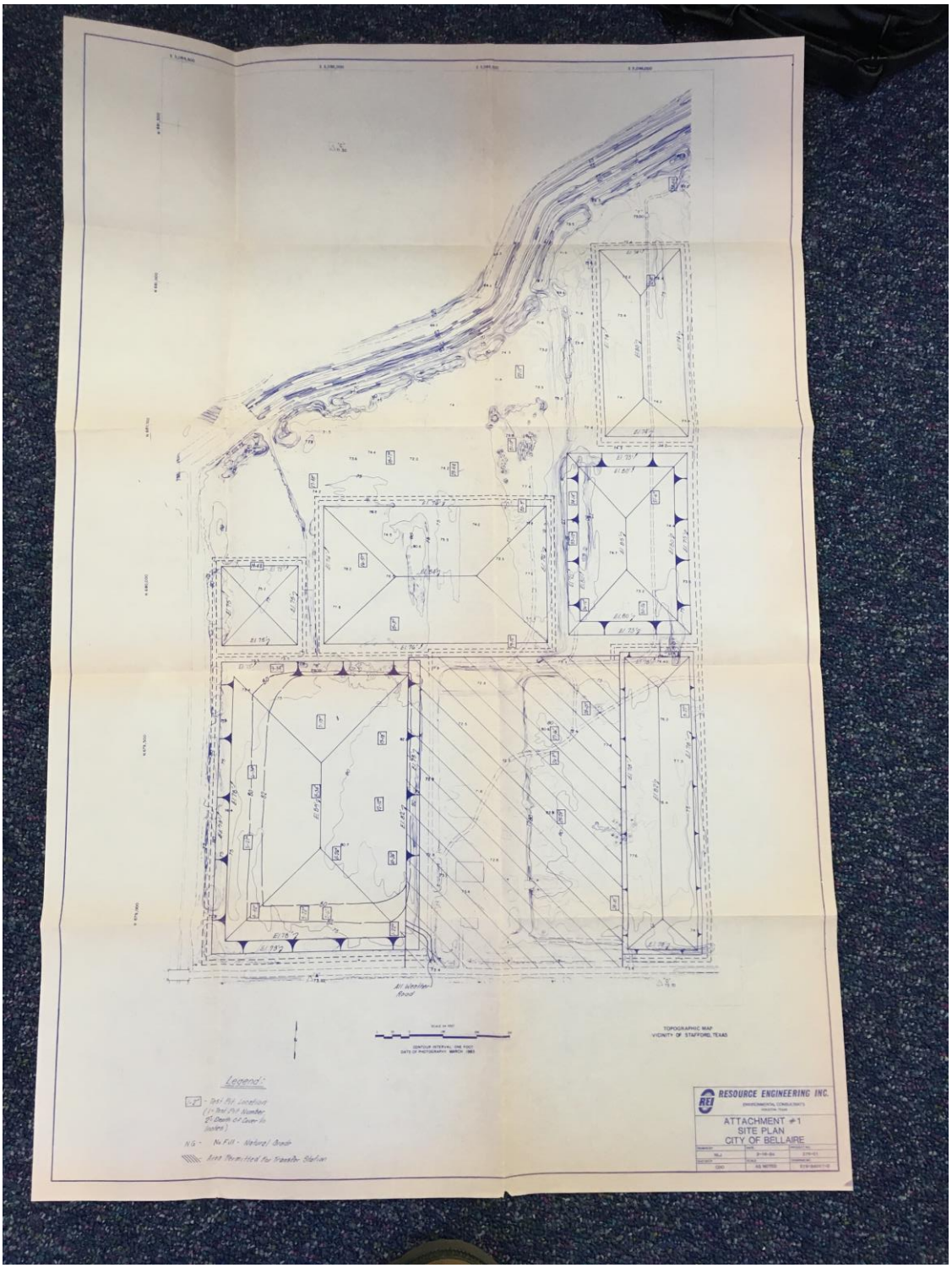
Actual costs can be affected by factors such as:

- Types of wastes encountered (at this stage, we have assumed only MSW and soil)
- Oversize materials within the buried wastes
- The need for more and different equipment to separate soil from MSW
- Changes in truck payload, availability of trucks, hauling prices, disposal prices, and demand for soil
- Local permit and ordinance requirements

Appendices

A. Preliminary Estimate of Waste Relocation Project Cost and Schedule
B. Documents from TCEQ Region 12 Files
C. Figures – Existing Conditions, Task 2 Plan of Borings and Test Pits

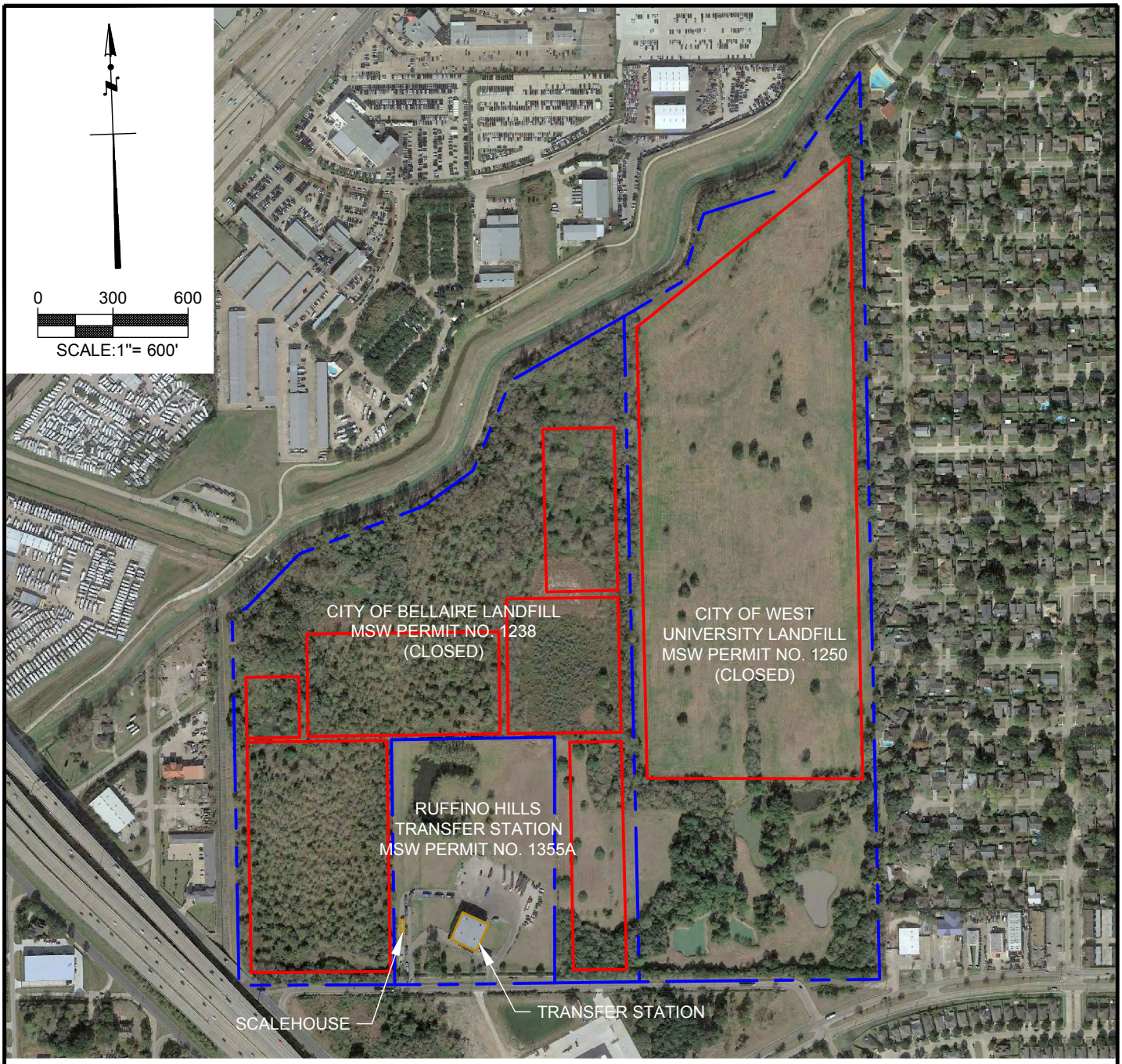
Appendix B



City of Bellaire Landfill – Site Plan 3/16/84

City of West University Landfill – Site Contour Plan 11/19/84

Houston Hills Golf Course 9720 Ruffino Road



LEGEND

APPROXIMATE PROPERTY BOUNDARY

APPROXIMATE LIMITS OF WASTE

EXISTING STRUCTURE

REFERENCE: Google Earth, Imagery Date: December 1, 2019

NO.	REVISION DESCRIPTION	DATE

TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 FAX 713.784.2962

RUFFINO HILLS LANDFILL INVESTIGATION

EXISTING CONDITIONS MAP

FIGURE 3

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-803 Existing Conditions Map.dwg 5/6/2020 10:01 AM

LEGEND

- Landfill Parcels
- 2018 2ft contours
- Test Pit
- Boring Location

NO.	REVISION DESCRIPTION	DATE

0 250 500
Feet

N
W E
S

1 inch equals 500 feet

JONES | CARTER

Disclaimer:
This product is offered for informational purposes and may not have been prepared for or be suitable for legal, engineering, or surveying purposes. It does not represent an on-the-ground survey and represents only the approximate relative location of property, governmental and/or political boundaries or related facilities to said boundary. No express warranties are made by Jones & Carter, Inc. concerning the accuracy completeness, reliability, or usability of the information included within this exhibit.

Coordinate System: NAD 83 TX S CENTRAL 4204 FEET
Vertical Datum: NAVD 1988

RUFFINO HILLS LANDFILL INVESTIGATION

TOPOGRAPHIC MAP AND INVESTIGATION PLAN

FIGURE 4

K:\00050\00050-0083-06 Ruffino Hills Landfill – Task 1B\2 Design Phase\Analysis\2018 Contours 20200507 8.5x11.mxd

APPENDIX C WEST UNIVERSITY LANDFILL FIELD INVESTIGATION BORINGS (2020)

TETRA TECH

Report

To:	Paresh Lad (City of Houston), Martin Murdock (Jones-Carter)
From:	Jim Norstrom
Date:	October 23, 2020
Subject:	Ruffino Road Landfill Project – Task 2 Report – West University Landfill Field Investigation

Contents

1. Introduction
2. Field Investigation
3. Waste Limits and Volume
4. Waste Characteristics and Classification
5. Liquids
6. Landfill Gas
7. Hazardous Materials and Asbestos
8. Changes to Future Tasks Scope and Fee
9. Updated Estimate of Waste Relocation Project Cost and Schedule
10. Conclusions and Recommendations

Appendices

A. Boring Location Map
B. Boring Logs
C. Photos
D. Laboratory Report – Solids
E. Laboratory Report – Liquids
F. Estimated Waste Relocation Project Cost
G. WCA Waste Profile for Drill Cuttings

Tetra Tech
http://www.tetratech.com/en/waste-management
1500 CityWest Boulevard, Suite 1000, Houston, TX 77042
Cell 936-202-0746 Tel 832-251-5165

1 Introduction

Tetra Tech's scope of work presented in our proposal to Jones–Carter dated February 13, 2020 includes the following Tasks:

1. Data Review
2. Field Investigation
3. Evaluation of Alternatives
4. Regulatory Agency Liason and Community Outreach
5. Waste Relocation Work Plan Preparation
6. TCEQ MSW Type IX Registration (Landfill Mining)

The Task 2 Scope is:

> TT will conduct a field investigation to augment data reviewed in Task 1. The field investigation will include obtaining data on the refuse limits and quantity through test pits, soil borings, and geophysical methods. Additional methods may include surface emissions monitoring, soil gas surveys and/or gas monitoring probe installation, laboratory testing of collected samples, and ground water quality evaluation. This Task 2 Report includes the following:

- Report of findings
- Updated estimate of total waste relocation project cost and schedule

2 Field Investigation

Tech Tech conducted a Field Investigation to augment data obtained and reviewed in Task 1. The field investigation included obtaining data on the refuse limits, volume, and characteristics through borings. Investigative methods in addition to visual observations and photo documentation included field classification and laboratory testing of collected samples, surface air measurements for combustible gas, and leachate depth measurements and sampling where present.

The locations of borings are shown in Appendix A. Our investigations were conducted as follows:

- Review and discuss our Health and Safety Plan with field personnel
- Mobilize exploration equipment, including pickup truck, track-mounted hollow stem auger drilling rig, support flatbed truck, Bobcat, and all-terrian vehicle
- Identify boring locations and record GPS coordinates. Based on current surface elevations and estimated landfill excavation depths, the terminal depth of each boring was estimated and recorded for the drill crew. In one case, a boring could not be advanced to full depth because of a subsurface obstruction and the boring was relocated (see Appendix A).
- Borings (Appendices A and B) – To determine the limits and characteristics of buried waste, five borings were drilled through the cover soils and waste materials using hollow-stem auger equipment that provided continuous core samples every five feet. Boreholes were eight inches in diameter to the depths shown in the boring logs (Appendix B). Subsurface conditions were logged by a Tetra Tech Environmental Scientist according to the Unified Soil Classification System (ASTM D2488). Samples of each of the material types encountered were collected and packaged for shipment to the laboratory. Sample depths and elevations are shown on the boring logs.
- Terminal Depth - When approaching the estimated terminal depth, the boring proceeded slowly and care was taken to prevent penetration of the clay liner.
- Leachate – Liquid and saturated conditions were encountered in one of the five borings (SB-1) and a sample was collected and tested for parameters required by the City of Houston Public Works Industrial Wastewater Service. The boring was advanced through the saturated zone. Following completion of each boring, the boreholes were backfilled with bentonite chips to the ground surface and were mounded to promote positive drainage (see Appendix C photos).

- Landfill Gas – The technician was equipped with a GEM-2000 landfill gas monitor capable of detecting levels as low at one percent methane in air. The technician took periodic measurements during drilling. Landfill gas odor was not detected in any of the borings and the GEM-2000 never registered a value above zero.
- Asbestos – The technician observed drill cuttings and samples for potential asbestos containing materials (ACM). There were no indications of ACM in any of the borings.
- Hazardous Materials – There were no visual or olfactory indications of hazardous materials in any borings
- Completion – After drilling and sampling was completed, all boreholes were backfilled with granular bentonite to ground level and mounded to promote positive drainage. Cuttings from the borehole were collected and transported to the Ruffino Road Transfer Station onsite (pre-arranged with the operator, Waste Corporation of America). The WCA waste profile is included in Appendix G.
- Data Collection and Recordkeeping – Field activities were documented in field notes and boring logs
- After completion of the borings:
    - The work site was inspected and cleaned of drill cuttings and debris
    - No borings were left open and no waste materials were exposed over night
    - Wastes from boreholes were either containerized for lab testing of transported to the Ruffino Road Transfer station for transport and disposal
    - There was no damage to the site

3 Waste Limits and Volume

Based on the field investigation, we find no reason to change our estimate of the buried waste boundaries. In all five borings, the bottom liner was encountered and the depth to liner measured. Knowing surface elevations, we converted liner depths to elevations as shown on the boring logs and in the table below.

Boring Number	Surface Elevation, ft MSL	Depth to Clay Liner, ft	Top of Clay Liner Elevation, ft MSL
SB-1	82.00	21	61
SB-2	78.00	17	61
SB-3	78.97	24	55
SB-4	79.99	20	60
SB-5	79.54	18	61

4 Waste Characteristics and Classification

Samples of excavated solid materials were collected, preserved, and shipped to a laboratory qualified to test contaminated materials and to determine concentrations of various compounds necessary to classify the wastes. Samples were tested for the following parameters: 40 CFR 261.24 Table 1 Contaminants for the Toxicity Characteristic (plus TCLP antimony, beryllium, nickel), Total Petroleum Hydrocarbons, total sulfates and cyanides, reactive sulfates and cyanides, pH, PAH, herbicides, pesticides, dioxins, furans, PCBs, and asbestos.

On the basis of the TCEQ regulations and the lab reports, the solid samples are classified as Class II Industrial Solid Waste which is suitable for disposal at Type I MSW Landfills.

5 Liquids

Liquids were encountered in one of the five borings, SB-1. Samples of the leachate were collected and the laboratory report is presented in Appendix E. Based on the one liquid sample collected, it is difficult to

estimate the total volume of liquid that will be produced by removal of the buried waste and the variability of the characteristics of the liquid. However, according to the City of Houston GIMS Portal, a COH wastewater collector runs along Ruffino Road and should be considered a possible wastewater disposal option.

Liquid disposal options include:

- City of Houston sanitary sewer (if specifically approved by the COH Public Works Department)
- Onsite use for dust control (requires TCEQ and COH approval)
- Disposal at an industrial wastewater treatment plant
- Solidification at the Republic Services Blue Ridge Landfill

Liquids were contained within SB-1 and absorbed during backfilling with bentonite chips. No liquids reached the landfill surface.

6 Landfill Gas

Landfill gas was not detected during drilling by personnel or the GEM-2000 Landfill Gas Monitor. Because these landfills closed more than 30 years ago, the organic fraction of waste has decomposed and no longer produces methane or carbon dioxide. The absence of odorous gas will be a benefit during waste excavation and relocation.

7 Hazardous Materials and Asbestos

No hazardous materials nor asbestos were detected in any of the borings.

8 Changes to Future Task Scope and Fee

Based on the findings of this Task 2 Field Investigation of the West University Landfill, we believe that the Tetra Tech scope and fee estimates for remaining Tasks 3 through 6 remain appropriate.

9 Updated Estimate of Waste Relocation Project Cost and Schedule

A breakdown of our cost and schedule estimates are presented in Appendix F. These estimates are preliminary and based on rough volume estimates and initial prices that have not been negotiated.

Our estimates include assumptions such as: excavating by two CAT 235 or equivalent excavators, a construction manager / engineer will be onsite full time, wastes will be disposed of at the Blue Ridge Landfill (14 miles southeast of Ruffino Hills), and that soil comprises 50 percent of the excavated material matrix.

Changes to our Task 1 report cost estimate include:

- Separated the topsoil volume that will remain onsite for areas that require grass cover
- Increased the percentage of soil to 50 percent of total excavated material
- Reduced excavation cost to $2.25 per cubic yard
- Reduced hauling truck volume to 18 cubic yards (loose material)
- Reduced daily excavation volume based on 180 trucks/day
- Reduced the hauling price to $150 per load
- Increased disposal cost to $15 per cubic yard
- Added a cost for clearing trees and brush from the Bellaire Landfill surface
- Added the cost of temporary stormwater detention and haul road construction & maintenance
- Added the cost of material testing (to meet TCEQ and landill classification requirements)
- Added wastewater (leachate and contact water) disposal – lump sum $300,000
- Revised the project duration based on 180 truck loads per day, six days per week, and four weather days

Actual costs can be affected by factors such as:

- Types of wastes encountered (at this stage, we have assumed only MSW and soil)
- Oversize materials within the buried wastes
- The need for more and different equipment to separate soil from MSW
- Changes in truck payload, availability of trucks, hauling prices, disposal prices, and demand for soil
- Local permit and ordinance requirements

10 Conclusions and Recommendations

The five borings drilled on the closed West University Landfill added to the information obtained during our Task 1 data review. As presented above, our estimate of total waste relocation project costs was updated and is presented in Appendix F.

Information obtained or confirmed by the West University Landfill boring program includes the following:

- Our understanding of the horizontal limits of the closed landfill is unchanged
- Borings encountered the top of clay liner at about Elevation 61 feet MSL, typically. Our original calculations of the subsurface volume of waste assumed a liner elevation of 62 feet MSL. Therefore, our measurements of below grade and above grade waste volume remains unchanged.
- As expected, the proportion of soil in all borings was significant. Therefore, we increased the soil proportion to 50 percent in our estimate of total project cost.
- Liquid was encountered in one of the five borings. Based on this finding, it is difficult to estimate total subsurface liquid volume or characteristics.
- There were no indications of landfill gas. Because these landfills closed more than 30 years ago, the organic fraction of waste has decomposed and no longer produces methane or carbon dioxide. The absence of odorous gas will be a benefit during waste excavation and relocation.
- There were no indications of asbestos or hazardous materials. This is good news, but the borings provide a small view of subsurface conditions and plans to safely handle, transport, and dispose of these materials will be necessary before waste excavation and relocation begins.
- According to laboratory testing, the waste samples can be classified as Class II Industrial Waste, which is acceptable for disposal at any Type I MSW Landill. The nearest Type I landfill is the Republic Services Blue Ridge Landfill which is 14 miles to the southeast.

We recommend proceeding with the remainder of Task 2 which is drilling and sampling the closed Bellaire Landfill following TCEQ approval of Application Form 20787 that we submitted on October 19, 2020. Tetra Tech will produce a separate Task 2 Report following the Bellaire Landill field investigation.

Appendices

A. Boring Location Map

B. Boring Logs

C. Photos

D. Laboratory Report – Solids

E. Laboratory Report – Liquids

F. Estimated Waste Relocation Project Cost

G. WCA Waste Profile for Drill Cuttings

LEGEND

- West University Borings
- Landfill Parcels
- 2018 2ft contours

NO.	REVISION DESCRIPTION	DATE

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

0 250 500
Feet

N
W E
S

1 inch equals 500 feet

TETRA TECH

CITY OF WEST UNIVERSITY LANDFILL

SAMPLE BORINGS
DRILLED SEPTEMBER 15 & 16, 2020

FIGURE 1

K:\00050\00050-0083-06 Ruffino Hills Landfill – Task 1B\2 Design Phase\Analysis\City of West University Place Landfill 20200708.mxd

Tetra Tech
1500 CityWest Blvd, #1000
Houston, TX 77042

BORING NUMBER SB-1

CLIENT City of Houston
PROJECT NAME West University Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION 82 ft MSL **HOLE SIZE** 8"
DRILLING CONTRACTOR EnviroTECH
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING 17.50 ft / Elev 64.50 ft
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING 17.50 ft / Elev 64.50 ft
AFTER DRILLING 17.50 ft / Elev 64.50 ft

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE	BORING DIAGRAM
0					Brown clayey fill material with grass and roots throughout.		Vapor = 0	
5					5.0	77.0		
					Shredded wood debris in dark brown - black muddy wet sandy clay fill. Slight hydrocarbon odor detected.		Vapor = 0	
10	SS RS-1	100	RS-1 is a composite sample of SB-1 and SB-2 collected from the indicated intervals, respectively.		10.0	72.0		
					Sandy clay with embedded plastic debris increasing with depth. Saturated with hydrocarbon odor.		Vapor = 0	Boring was filled with bentonite chips to surface at completion of drilling.
					12.5	69.5		
					Plastic debris including plastic bags and chunks of miscellaneous shredded plastic.			
15					15.0	67.0		
	SB-1		Leachate sample was collected using a bailer that produced approximately 3.5 gallons of water.		No Recovery (NR) - Drill casing was dripping wet.		Vapor = 0	
20					20.0	62.0		
					21.0 NR	61.0	Vapor = 0	
					22.0 Stiff reddish brown sandy clay with grey and brown mottling.	60.0		

Bottom of borehole at 22.0 feet.

NOTES
1.) Water recovered from the borehole had a slight hydrocarbon odor.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.

Tetra Tech
1500 CityWest Blvd, #1000
Houston, TX 77042

BORING NUMBER SB-2

CLIENT City of Houston
PROJECT NAME West University Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 9/15/20 **COMPLETED** 9/15/20
GROUND ELEVATION 78 ft MSL **HOLE SIZE** 8"
DRILLING CONTRACTOR EnviroTECH
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE	BORING DIAGRAM
0								
					Brown sandy clay with pebbles, no odor.		Vapor = 0	
5								
				5.0		73.0		
				6.0	Paper trash.	72.0	Vapor = 0	
	SS RS-1	100	RS-1 is a composite sample of SB-1 and SB-2 collected from the indicated intervals, respectively.		Brown sandy clay with pebbles and pockets of organic material.			
10				10.0		68.0		
					Dark grey sandy clay.		Vapor = 0	Boring was filled with bentonite chips to surface at completion of drilling.
				13.0		65.0		
					Very stiff dark brown clay.			
15				15.0		63.0		
					Firm to stiff, grey to light grey, sandy clay.		Vapor = 0	
				17.0		61.0		
				18.0	Light reddish brown clayey sand.	60.0		
					Stiff clay layer consisting of reddish brown fat clay with yellow mottling.			
20				20.0		58.0	Vapor = 0	

Bottom of borehole at 20.0 feet.

NOTES 1.) No liquid was encountered during drilling.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.

Tetra Tech
1500 CityWest Blvd, #1000
Houston, TX 77042

BORING NUMBER SB-3

CLIENT City of Houston
PROJECT NAME West University Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 9/16/20 **COMPLETED** 9/16/20
GROUND ELEVATION 78.974 ft MSL **HOLE SIZE** 8"
DRILLING CONTRACTOR EnviroTECH
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE	BORING DIAGRAM
0					Brown sandy clay with organic material, and grass and roots throughout.	76.0	Vapor = 0	
3.0					Reddish-brown sandy clay with pebbles.	74.0		
5.0					Soft, grayish-brown, malleable, sandy clay with small concrete chunks.	69.0	Vapor = 0	
10.0					Same as above.	64.0	Vapor = 0	
15.0	SS RS-2	100	RS-2 is a composite sample of SB-3, SB-4, and SB-5 collected from the indicated intervals, respectively.		NR	61.5	Vapor = 0	
17.5					Soft, black, sandy clay with plastic debris.	60.5		
18.5					Reddish-brown clay with brown and grey mottling.	59.0		
20.0	SS RS-3	50	RS-3 is a composite sample of SB-3, SB-4, and SB-5 collected from the indicated intervals, respectively.		NR	57.0	Vapor = 0	
22.0					Light-brown, wet, clayey sand.	55.0		
24.0					Very stiff reddish-brown clay.	54.0	Vapor = 0	
25.0					Bottom of borehole at 25.0 feet.			

Boring was filled with bentonite chips to surface at completion of drilling.

NOTES
1.) No liquid was encountered during drilling.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.

Tetra Tech
1500 CityWest Blvd, #1000
Houston, TX 77042

BORING NUMBER SB-4

CLIENT City of Houston
PROJECT NAME West University Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 9/16/20 **COMPLETED** 9/16/20
GROUND ELEVATION 79.991 ft MSL **HOLE SIZE** 8"
DRILLING CONTRACTOR EnviroTECH
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE	BORING DIAGRAM
0								
					Dark brown sandy clay with light brown mottling, clay nodules, and with grass and roots throughout.		Vapor = 0	
2.0						78.0		
					Brown sandy clay with reddish-brown mottling, and pebbles.			
5.0						75.0		
5					Grey to dark-grey sandy clay with pebbles, and reddish-brown mottling.		Vapor = 0	
8.0						72.0		
					Firm, grey, sandy clay with light-grey mottling, pebbles, and shredded wooden debris.			
10.0						70.0		
10					NR		Vapor = 0	
13.0						67.0		
14.0					Brown sandy clay with plastic debris.	66.0		
15	SS RS-2	33	RS-2 is a composite sample of SB-3, SB-4, and SB-5 collected from the indicated intervals, respectively.		Soft, brown, sandy clay with reddish-brown mottling.	65.0		
15.0					NR		Vapor = 0	
17.0						63.0		
	SS RS-3	100			Grey sandy clay with reddish-brown mottling, and small paper, plastic, and textile debris.			
20			RS-3 is a composite sample of SB-3, SB-4, and SB-5 collected from the indicated intervals, respectively.					
20.0						60.0		
					Stiff, reddish-brown, fat clay with grey mottling.		Vapor = 0	
22.0						58.0		
					Bottom of borehole at 22.0 feet.			

Boring was filled with bentonite chips to surface at completion of drilling.

NOTES 1.) No liquid was encountered during drilling.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.

Tetra Tech
1500 CityWest Blvd, #1000
Houston, TX 77042

BORING NUMBER SB-5

CLIENT City of Houston
PROJECT NAME West University Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 9/16/20 **COMPLETED** 9/16/20
GROUND ELEVATION 79.054 ft MSL **HOLE SIZE** 8"
DRILLING CONTRACTOR EnviroTECH
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE	BORING DIAGRAM
0					Very stiff, brown to reddish-brown sandy clay with grey mottling, and pebbles.		Vapor = 0	
5					5.0	74.1		
					Light-brown to dark-brown sandy clay with plastic debris.		Vapor = 0	
10					10.0	69.1		
					Same as above.		Vapor = 0	Boring was filled with bentonite chips to surface at completion of drilling.
15	SS RS-2	100	RS-2 is a composite sample of SB-3, SB-4, and SB-5 collected from the indicated intervals, respectively.		15.0	64.1		
	SS RS-3	100	RS-3 is a composite sample of SB-3, SB-4, and SB-5 collected from the indicated intervals, respectively.		Same as above.		Vapor = 0	
20					18.0	61.1		
					Stiff, reddish-brown fat clay with grey mottling.		Vapor = 0	
					20.0	59.1		
					Bottom of borehole at 20.0 feet.			

NOTES 1.) No liquid was encountered during drilling.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.

Appendix C Photos

Drill Rig, Bobcat, Support Truck, Pickup Truck

Trimble GPS Surveying

GEM-2000 Landfill Gas Meter

SB-1 Saturated Soil and Trash Near Bottom

SB-2 Topsoil, Trash, Gray Clay, Tan Clay

SB-3 Gray Clay and Trash

SB-4 Gray Clay and Trash

SB-5 Tan Clay, Gray Clay, Trash

Drill Cuttings

Backfilling Borehole with Granular Bentonite

Bentonite Backfilled Borehole

Cuttings Disposal and Transport to Transfer Station

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Houston
6310 Rothway Street
Houston, TX 77040
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Laboratory Job ID: 600-211294-1
Client Project/Site: Closed Municipal Solid Waste Landfill 09-16-20

For:
Tetra Tech, Inc.
1500 CityWest Boulevard
Houston, Texas 77042

Attn: Jim Norstrom

Dean A. Joiner

Authorized for release by:
10/13/2020 5:05:18 PM

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Job ID: 600-211294-1

Laboratory: Eurofins TestAmerica, Houston

Narrative

Job Narrative
600-211294-1

Comments
No additional comments.

Receipt
The samples were received on 9/16/2020 5:19 PM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 0.7º C and 1.0º C.

GC/MS VOA
Method 8260B: The method blank for analytical batch 600-303894 contained methylene chloride above the method detection limit. This target analyte concentration was less than the reporting limit (RL); therefore, re-extraction and/or re-analysis of samples was not performed.

Method 8260B: The Leachate blank for preparation batch 600-303892 and analytical batch 600-303894 contained Acetone above the method detection limit. Acetone hit due to the possible lab contamination.(LB 600-303892/1-A).

Method 8260B: The following samples were diluted due to the nature of the sample matrix: (600-211238-D-1-C), (600-211238-D-1-D MS), (600-211239-A-1-C), (600-211239-A-1-D MS), (600-211239-A-1-C MSD), (600-211302-A-1-C) and (600-211302-A-1-D MS). Elevated reporting limits (RLs) are provided.

Method 8260B: The Leachate blank for preparation batch 600-303892 and analytical batch 600-303894 contained Methylene Chloride, and Carbon disulfide. above the method detection limit. Methylene Chloride hit due to the possible lab contamination.(LB 600-303892/1-A).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC/MS Semi VOA
Method 8270C: The laboratory control sample for the non routine spike for preparation batch 600-304077 and analytical batch 600-304325 recovered outside control limits for the following analyte(s): Disulfoton, N-Nitrosodi-n-butylamine, N-Nitrosopyrrolidine and p-Phenylene diamine. Disulfoton, N-Nitrosodi-n-butylamine, N-Nitrosopyrrolidine and p-Phenylene diamine has been identified as a poor performing analyte when analyzed using this method; therefore, re-extraction/re-analysis was not performed. These results have been reported and qualified.

Method 8270C: The following analytes have been identified, in the reference method and/or via historical data, to be poor and/or erratic performers: Disulfoton. This analyte may have a %D >60%.

Method 8270C: The RPD of the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 600-304077 and analytical batch 600-304325 recovered outside control limits for the following analytes: 2,4-Dichlorophenol, 2,6-Dimethylphenol, Benzidine, Diphenylamine, N-Nitrosodiphenylamine and Hexachlorobutadiene

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

GC VOA
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

GC Semi VOA
Method 8082: Compound Tetrachloro-m-xylene eluted outside the retention time window on the RTX-CLPesticides 1 column for the following samples: RS-1 (600-211294-1), RS-2 (600-211294-2), RS-3 (600-211294-3), (LCS 600-303750/2-A), (MB 600-303750/1-A), (600-211270-B-4-B), (600-211270-B-4-C MS) and (600-211270-B-4-D MSD). This retention time shift was taken into account when reviewing the sample(s) for target compounds.

Method 8151A: The RPD of the laboratory control sample (LCS) and laboratory control sample duplicate (LCSD) for preparation batch 600-304026 and analytical batch 600-304356 recovered outside control limits for the following analytes: 2,4,5-TP.

Job ID: 600-211294-1 (Continued)

Laboratory: Eurofins TestAmerica, Houston (Continued)

Method 8151A: The continuing calibration verification (CCV) associated with batch 600-304356 recovered above the upper control limit for Dinoseb(22.2%). The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated sample is impacted: (CCV 600-304356/12).

Method 8081A: For Method 8081A, the continuing calibration verification (CCV) associated with batch 280-510237 recovered above the upper control limit (15%) for 4,4'-DDD (front column), 4,4'-DDT (back column) and Methoxychlor (back) but all analytes were non-detect. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated samples are impacted: RS-1 (600-211294-1), (CCV 280-510237/25) and (CCVIS 280-510237/6).

Method 8141A: The continuing calibration verification (CCV) associated with batch 280-510257 recovered above the upper control limit for see list below. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated samples are impacted: RS-1 (600-211294-1), RS-2 (600-211294-2) and RS-3 (600-211294-3).

CCVIS:
Chlormefos: Front column 26.3%, back column 34.9%, limit 15%
Dimethoate: Front column 39.1%, back column 33.3%, limit 15%
Parathion (ethyl parathion): Front column 35%, back column 28%, limit 15%
Methyl parathion: Front column 35.3%, back column 25.9%, limit 15%
Triphenylphosphate: Front column 32.2%, back column 39.5%, limit 15%

8141 preparation batch 280-509843 and 280-509977 and analytical batch 280-510257

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
Method 3546: The following samples required a sulfuric acid clean-up, via EPA Method 3665A, to reduce matrix interferences: RS-1 (600-211294-1) and RS-3 (600-211294-3).

Method 3510C: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 280-509843 and 280-509977.

RS-1 (600-211294-1), RS-2 (600-211294-2) and RS-3 (600-211294-3)
<PrepAnalyticalBatch>
Method: 1311_T/3510C/8141A

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: Tetra Tech, Inc.
Job ID: 600-211294-1
Project/Site: Closed Municipal Solid Waste Landfill 09-16-20

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL HOU
8270C	Semivolatile Organic Compounds (GC/MS)	SW846	TAL HOU
8015B	Nonhalogenated Organic Compounds - Direct Injection (GC)	SW846	TAL HOU
8081A	Organochlorine Pesticides (GC)	SW846	TAL DEN
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	SW846	TAL HOU
8141A	Organophosphorous Pesticides (GC)	SW846	TAL DEN
8151A	Herbicidas (GC)	SW846	TAL HOU
TX 1005	Texas - Total Petroleum Hydrocarbon (GC)	TCEQ	TAL HOU
6010B	Inductively Coupled Plasma - Atomic Emission Spectrometry	SW846	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)	SW846	TAL HOU
9012	Cyanide, Reactive	SW846	TAL HOU
9012A	Cyanide, Total and/or Amenable	SW846	TAL HOU
9034	Sulfide, Acid Soluble and Insoluble (Titrimetric)	SW846	TAL DEN
9034	Sulfide, Acid Soluble and Insoluble (Titrimetric)	SW846	TAL HOU
9045C	Corrosivity as pH	SW846	TAL HOU
D92	Flashpoint	ASTM	TAL HOU
1311	Toxicity Characteristic Leaching Procedure	SW846	TAL DEN
1311	Toxicity Characteristic Leachate Procedure	SW846	TAL HOU
1311	Toxicity Characteristic Leaching Procedure	SW846	TAL HOU
1311	Toxicity Characteristic Leaching Procedure (ZHE)	SW846	TAL HOU
3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals/Leachates	SW846	TAL HOU
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL DEN
3520C	Liquid-Liquid Extraction (Continuous)	SW846	TAL HOU
3546	Microwave Extraction	SW846	TAL HOU
5030B	Purge and Trap on Leachates	SW846	TAL HOU
7.3.3	Cyanide, Reactive	SW846	TAL HOU
7.3.4	Sulfide, Reactive	SW846	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)/Preparation/Leachate	SW846	TAL HOU
8151A	Chlorinated Herbicides by GC - Aqueous Prep	SW846	TAL HOU
9012A	Total and Amenable Cyanide (Auto. Colorimetric w/Off-Line Distillation) / Prep	SW846	TAL HOU
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	SW846	TAL DEN
Frozen Preserve	Freezing Samples	None	TAL HOU
TX_1005_S_Prep	Extraction - Texas Total petroleum Hyrdocarbons	TCEQ	TAL HOU

Protocol References:

ASTM = ASTM International
None = None
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TCEQ = Texas Commission of Environmental Quality

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100
TAL HOU = Eurofins TestAmerica, Houston, 6310 Rothway Street, Houston, TX 77040, TEL (713)690-4444

Sample Summary

Client: Tetra Tech, Inc.
Job ID: 600-211294-1
Project/Site: Closed Municipal Solid Waste Landfill 09-16-20

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
600-211294-1	RS-1	Solid	09/15/20 15:00	09/16/20 17:19	
600-211294-2	RS-2	Solid	09/16/20 13:00	09/16/20 17:19	
600-211294-3	RS-3	Solid	09/16/20 16:00	09/16/20 17:19	

Client Sample ID: RS-1
Lab Sample ID: 600-211294-1
Date Collected: 09/15/20 15:00
Matrix: Solid
Date Received: 09/16/20 17:19

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorodifluoromethane	0.000760	U	0.00500	0.000760	mg/L			09/21/20 17:54	1
Vinyl chloride	0.000850	U	0.00500	0.000850	mg/L			09/21/20 17:54	1
Bromomethane	0.00215	U	0.0100	0.00215	mg/L			09/21/20 17:54	1
Trichlorofluoromethane	0.00123	U	0.0100	0.00123	mg/L			09/21/20 17:54	1
1,1-Dichlorethylene	0.000760	U	0.00500	0.000760	mg/L			09/21/20 17:54	1
Acetone	**0.0113**	**B**	0.0100	0.00227	mg/L			09/21/20 17:54	1
Carbon disulfide	**0.00207**	**J B**	0.0100	0.00170	mg/L			09/21/20 17:54	1
Acetonitrile	0.00197	U	0.0500	0.00197	mg/L			09/21/20 17:54	1
Methylene Chloride	**0.00315**	**J B**	0.0100	0.00143	mg/L			09/21/20 17:54	1
Acrylonitrile	0.00509	U	0.0500	0.00509	mg/L			09/21/20 17:54	1
Methyl Ethyl Ketone (2-Butanone)	0.00157	U	0.0100	0.00157	mg/L			09/21/20 17:54	1
Methacrylonitrile	0.00122	U	0.0500	0.00122	mg/L			09/21/20 17:54	1
Carbon tetrachloride	0.000920	U	0.00500	0.000920	mg/L			09/21/20 17:54	1
Benzene	0.000560	U	0.00500	0.000560	mg/L			09/21/20 17:54	1
1,2-Dichloroethane	0.00101	U	0.00500	0.00101	mg/L			09/21/20 17:54	1
Trichloroethylene	0.00158	U	0.00500	0.00158	mg/L			09/21/20 17:54	1
1,1,1-Trichloroethane	0.000980	U	0.00500	0.000980	mg/L			09/21/20 17:54	1
1,4-Dioxane	0.135	U	0.250	0.135	mg/L			09/21/20 17:54	1
Chloroform	0.000820	U	0.0100	0.000820	mg/L			09/21/20 17:54	1
Bromodichloromethane	0.000760	U	0.00500	0.000760	mg/L			09/21/20 17:54	1
cis-1,3-Dichloropropene	0.000970	U	0.00500	0.000970	mg/L			09/21/20 17:54	1
Methyl isobutyl ketone (MIBK)	0.00111	U	0.0100	0.00111	mg/L			09/21/20 17:54	1
Toluene	0.000550	U	0.00500	0.000550	mg/L			09/21/20 17:54	1
trans-1,3-Dichloropropene	0.000590	U	0.00500	0.000590	mg/L			09/21/20 17:54	1
1,1,2-Trichloroethane	0.000530	U	0.00500	0.000530	mg/L			09/21/20 17:54	1
Tetrachloroethylene	0.00124	U	0.00500	0.00124	mg/L			09/21/20 17:54	1
1,3-Dichloropropene, Total	0.000690	U	0.00500	0.000690	mg/L			09/21/20 17:54	1
Ethylene Dibromide	0.000850	U	0.00500	0.000850	mg/L			09/21/20 17:54	1
Chlorobenzene	0.000820	U	0.00500	0.000820	mg/L			09/21/20 17:54	1
1,1,1,2-Tetrachloroethane	0.000940	U	0.00500	0.000940	mg/L			09/21/20 17:54	1
Ethylbenzene	0.00129	U	0.00500	0.00129	mg/L			09/21/20 17:54	1
m-Xylene & p-Xylene	0.00126	U	0.00500	0.00126	mg/L			09/21/20 17:54	1
Xylenes, Total	0.00198	U	0.00500	0.00198	mg/L			09/21/20 17:54	1
o-Xylene	0.000930	U	0.00500	0.000930	mg/L			09/21/20 17:54	1
Styrene	0.000560	U	0.00500	0.000560	mg/L			09/21/20 17:54	1
Tribromomethane	0.000770	U	0.00500	0.000770	mg/L			09/21/20 17:54	1
1,2,3-Trichloropropane	0.00116	U	0.00500	0.00116	mg/L			09/21/20 17:54	1
1,1,2,2-Tetrachloroethane	0.000800	U	0.00500	0.000800	mg/L			09/21/20 17:54	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*74*		*50 - 134*		*09/21/20 17:54*	*1*
Dibromofluoromethane	*80*		*62 - 130*		*09/21/20 17:54*	*1*
Toluene-d8 (Surr)	*90*		*70 - 130*		*09/21/20 17:54*	*1*
4-Bromofluorobenzene	*95*		*67 - 139*		*09/21/20 17:54*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyridine	0.00520	U	0.0500	0.00520	mg/L		09/23/20 11:13	09/28/20 14:36	1
N-Nitrosomethylethylamine	0.0112	U	0.0500	0.0112	mg/L		09/23/20 11:13	09/28/20 14:36	1
Acrylamide	0.173	U	2.50	0.173	mg/L		09/23/20 11:13	09/28/20 14:36	1

Client Sample ID: RS-1 **Lab Sample ID: 600-211294-1**
Date Collected: 09/15/20 15:00 **Matrix: Solid**
Date Received: 09/16/20 17:19

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aniline	0.00810	U	0.0500	0.00810	mg/L		09/23/20 11:13	09/28/20 14:36	1
Phenol	0.00475	U	0.0500	0.00475	mg/L		09/23/20 11:13	09/28/20 14:36	1
Bis(2-chloroethyl)ether	0.00595	U	0.0500	0.00595	mg/L		09/23/20 11:13	09/28/20 14:36	1
2-Chlorophenol	0.00335	U	0.0500	0.00335	mg/L		09/23/20 11:13	09/28/20 14:36	1
1,4-Dichlorobenzene	0.00630	U	0.0500	0.00630	mg/L		09/23/20 11:13	09/28/20 14:36	1
o-Cresol	0.00505	U	0.0500	0.00505	mg/L		09/23/20 11:13	09/28/20 14:36	1
m & p - Cresol	0.00940	U	0.100	0.00940	mg/L		09/23/20 11:13	09/28/20 14:36	1
N-Nitrosodi-n-propylamine	0.00330	U	0.0500	0.00330	mg/L		09/23/20 11:13	09/28/20 14:36	1
Hexachloroethane	0.00580	U	0.0500	0.00580	mg/L		09/23/20 11:13	09/28/20 14:36	1
N-Nitrosopyrrolidine	0.00650	U *	0.0500	0.00650	mg/L		09/23/20 11:13	09/28/20 14:36	1
Acetophenone	0.00510	U	0.0500	0.00510	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,6-Dimethylphenol	0.00515	U *1	0.0500	0.00515	mg/L		09/23/20 11:13	09/28/20 14:36	1
Nitrobenzene	0.00590	U	0.0500	0.00590	mg/L		09/23/20 11:13	09/28/20 14:36	1
Isophorone	0.00365	U	0.0500	0.00365	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,4-Dimethylphenol	0.00670	U	0.0500	0.00670	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,4-Dichlorophenol	0.00770	U *1	0.0500	0.00770	mg/L		09/23/20 11:13	09/28/20 14:36	1
1,2,4-Trichlorobenzene	0.00570	U	0.0500	0.00570	mg/L		09/23/20 11:13	09/28/20 14:36	1
Hexachloro-1,3-butadiene	0.00555	U *1	0.0500	0.00555	mg/L		09/23/20 11:13	09/28/20 14:36	1
p-Phenylene diamine	0.0500	U *	0.500	0.0500	mg/L		09/23/20 11:13	09/28/20 14:36	1
N-Nitrosodi-n-butylamine	0.00775	U *	0.0500	0.00775	mg/L		09/23/20 11:13	09/28/20 14:36	1
p-Chloro-m-cresol	0.00410	U	0.0500	0.00410	mg/L		09/23/20 11:13	09/28/20 14:36	1
Hexachlorocyclopentadiene	0.00290	U	0.250	0.00290	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,4,6-Trichlorophenol	0.00460	U	0.0500	0.00460	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,4,5-Trichlorophenol	0.00630	U	0.0500	0.00630	mg/L		09/23/20 11:13	09/28/20 14:36	1
m-Dinitrobenzene	0.0174	U	0.100	0.0174	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,6-Dinitrotoluene	0.00320	U	0.0500	0.00320	mg/L		09/23/20 11:13	09/28/20 14:36	1
Acenaphthene	0.00265	U	0.0500	0.00265	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,4-Dinitrophenol	0.00445	U	0.250	0.00445	mg/L		09/23/20 11:13	09/28/20 14:36	1
Pentachlorobenzene	0.00340	U	0.0500	0.00340	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,4-Dinitrotoluene	0.00475	U	0.0500	0.00475	mg/L		09/23/20 11:13	09/28/20 14:36	1
Diethyl phthalate	0.00570	U	0.0500	0.00570	mg/L		09/23/20 11:13	09/28/20 14:36	1
2,3,4,6-Tetrachlorophenol	0.00415	U	0.0500	0.00415	mg/L		09/23/20 11:13	09/28/20 14:36	1
Fluorene	0.00710	U	0.0500	0.00710	mg/L		09/23/20 11:13	09/28/20 14:36	1
Diphenylamine	0.00565	U *1	0.0500	0.00565	mg/L		09/23/20 11:13	09/28/20 14:36	1
N-Nitrosodiphenylamine	0.00515	U *1	0.100	0.00515	mg/L		09/23/20 11:13	09/28/20 14:36	1
1,2-Diphenylhydrazine (as Azobenzene)	0.0500	U	0.0500	0.0500	mg/L		09/23/20 11:13	09/28/20 14:36	1
Hexachlorobenzene	0.00450	U	0.0500	0.00450	mg/L		09/23/20 11:13	09/28/20 14:36	1
Pentachlorophenol	0.00445	U	0.250	0.00445	mg/L		09/23/20 11:13	09/28/20 14:36	1
Disulfoton	0.00375	U *	0.0500	0.00375	mg/L		09/23/20 11:13	09/28/20 14:36	1
Anthracene	0.00335	U	0.0500	0.00335	mg/L		09/23/20 11:13	09/28/20 14:36	1
Pronamide	0.00315	U	0.0500	0.00315	mg/L		09/23/20 11:13	09/28/20 14:36	1
Pentachloronitrobenzene	0.0129	U	0.0500	0.0129	mg/L		09/23/20 11:13	09/28/20 14:36	1
Dibutylphthalate	0.00520	U	0.0500	0.00520	mg/L		09/23/20 11:13	09/28/20 14:36	1
Fluoranthene	0.00260	U	0.0500	0.00260	mg/L		09/23/20 11:13	09/28/20 14:36	1
Benzidine	0.00305	U *1	0.250	0.00305	mg/L		09/23/20 11:13	09/28/20 14:36	1
Pyrene	0.00560	U	0.0500	0.00560	mg/L		09/23/20 11:13	09/28/20 14:36	1
Butyl benzyl phthalate	0.00305	U	0.0500	0.00305	mg/L		09/23/20 11:13	09/28/20 14:36	1
3,3'-Dichlorobenzidine	0.00290	U	0.250	0.00290	mg/L		09/23/20 11:13	09/28/20 14:36	1
Bis(2-ethylhexyl) phthalate	0.00260	U	0.0500	0.00260	mg/L		09/23/20 11:13	09/28/20 14:36	1

Client Sample ID: RS-1
Lab Sample ID: 600-211294-1
Date Collected: 09/15/20 15:00
Matrix: Solid
Date Received: 09/16/20 17:19

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol	*70*		*12 - 130*	*09/23/20 11:13*	*09/28/20 14:36*	*1*
Nitrobenzene-d5	*76*		*44 - 130*	*09/23/20 11:13*	*09/28/20 14:36*	*1*
2-Fluorobiphenyl	*82*		*37 - 130*	*09/23/20 11:13*	*09/28/20 14:36*	*1*
2,4,6-Tribromophenol	*79*		*14 - 130*	*09/23/20 11:13*	*09/28/20 14:36*	*1*
Terphenyl-d14	*87*		*10 - 149*	*09/23/20 11:13*	*09/28/20 14:36*	*1*
Phenol-d5 (Surr)	*71*		*12 - 130*	*09/23/20 11:13*	*09/28/20 14:36*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	0.537	U	5.00	0.537	mg/L			09/21/20 11:09	1
2-Methoxyethanol	0.766	U	5.00	0.766	mg/L			09/21/20 11:09	1
Ethylene glycol	3.49	U	5.00	3.49	mg/L			09/21/20 11:07	1
Isobutyl alcohol	0.180	U	5.00	0.180	mg/L			09/22/20 06:07	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,4'-DDD	0.0000770	U	0.000500	0.0000770	mg/L		09/22/20 17:52	09/26/20 06:26	1
4,4'-DDE	0.0000750	U	0.000500	0.0000750	mg/L		09/22/20 17:52	09/26/20 06:26	1
4,4'-DDT	0.000148	U	0.000500	0.000148	mg/L		09/22/20 17:52	09/26/20 06:26	1
Chlordane (technical)	0.00140	U	0.00500	0.00140	mg/L		09/22/20 17:52	09/26/20 06:26	1
Dieldrin	0.0000630	U	0.000500	0.0000630	mg/L		09/22/20 17:52	09/26/20 06:26	1
Endosulfan I	0.0000580	U	0.000500	0.0000580	mg/L		09/22/20 17:52	09/26/20 06:26	1
Endrin	0.0000790	U	0.000500	0.0000790	mg/L		09/22/20 17:52	09/26/20 06:26	1
Lindane	0.0000690	U	0.000500	0.0000690	mg/L		09/22/20 17:52	09/26/20 06:26	1
trans-Chlordane	0.0000910	U	0.000500	0.0000910	mg/L		09/22/20 17:52	09/26/20 06:26	1
Heptachlor	0.0000770	U	0.000500	0.0000770	mg/L		09/22/20 17:52	09/26/20 06:26	1
Heptachlor epoxide	0.0000750	U	0.000500	0.0000750	mg/L		09/22/20 17:52	09/26/20 06:26	1
Methoxychlor	0.000130	U	0.00100	0.000130	mg/L		09/22/20 17:52	09/26/20 06:26	1
Mirex	0.000121	U	0.000500	0.000121	mg/L		09/22/20 17:52	09/26/20 06:26	1
Toxaphene	0.00367	U	0.0200	0.00367	mg/L		09/22/20 17:52	09/26/20 06:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*80*		*34 - 122*	*09/22/20 17:52*	*09/26/20 06:26*	*1*
Tetrachloro-m-xylene	*92*		*28 - 115*	*09/22/20 17:52*	*09/26/20 06:26*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	0.00159	U *3	0.0166	0.00159	mg/Kg		09/17/20 14:00	09/21/20 17:01	1
PCB-1221	0.00858	U *3	0.0166	0.00858	mg/Kg		09/17/20 14:00	09/21/20 17:01	1
PCB-1232	0.00666	U *3	0.0166	0.00666	mg/Kg		09/17/20 14:00	09/21/20 17:01	1
PCB-1242	0.00123	U *3	0.0166	0.00123	mg/Kg		09/17/20 14:00	09/21/20 17:01	1
PCB-1248	0.00248	U *3	0.0166	0.00248	mg/Kg		09/17/20 14:00	09/21/20 17:01	1
PCB-1254	0.00220	U *3	0.0166	0.00220	mg/Kg		09/17/20 14:00	09/21/20 17:01	1
PCB-1260	0.0134	U *3	0.0166	0.0134	mg/Kg		09/17/20 14:00	09/21/20 17:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*71*	**3*	*10 - 150*	*09/17/20 14:00*	*09/21/20 17:01*	*1*
DCB Decachlorobiphenyl	*88*	**3*	*10 - 150*	*09/17/20 14:00*	*09/21/20 17:01*	*1*

Client Sample ID: RS-1
Date Collected: 09/15/20 15:00
Date Received: 09/16/20 17:19

Lab Sample ID: 600-211294-1
Matrix: Solid

Method: 8141A - Organophosphorous Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dimethoate	0.00449	U	0.0150	0.00449	mg/L		09/22/20 18:07	09/24/20 21:11	1
Methyl parathion	0.00141	U	0.0400	0.00141	mg/L		09/22/20 18:07	09/24/20 21:11	1
Parathion (ethyl parathion)	0.00144	U	0.0100	0.00144	mg/L		09/22/20 18:07	09/24/20 21:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Chlormefos	*78*		*49 - 171*	*09/22/20 18:07*	*09/24/20 21:11*	*1*
Triphenylphosphate	*75*		*60 - 154*	*09/22/20 18:07*	*09/24/20 21:11*	*1*

Method: 8151A - Herbicidas (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenoxyacetic acid	0.000200	U	0.00100	0.000200	mg/L		09/23/20 07:24	09/28/20 14:03	1
2,4,5-TP (Silvex)	0.000100	U *1	0.00100	0.000100	mg/L		09/23/20 07:24	09/28/20 14:03	1
Dinoseb	0.100	U	1.00	0.100	ug/L		09/23/20 07:24	09/28/20 14:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*56*		*10 - 130*	*09/23/20 07:24*	*09/28/20 14:03*	*1*

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	3.80	U	10.0	3.80	mg/Kg		09/22/20 08:56	09/22/20 16:57	1
>C12-C28	4.06	U	10.0	4.06	mg/Kg		09/22/20 08:56	09/22/20 16:57	1
>C28-C35	4.06	U	10.0	4.06	mg/Kg		09/22/20 08:56	09/22/20 16:57	1
C6-C35	3.80	U	10.0	3.80	mg/Kg		09/22/20 08:56	09/22/20 16:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*107*		*70 - 130*	*09/22/20 08:56*	*09/22/20 16:57*	*1*

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	0.0129	U	0.100	0.0129	mg/L		09/21/20 11:26	09/22/20 11:11	1
Arsenic	0.0466	U	0.100	0.0466	mg/L		09/21/20 11:26	09/22/20 11:11	1
Barium	**3.08**		0.200	0.0162	mg/L		09/21/20 11:26	09/22/20 11:11	1
Beryllium	0.00420	U	0.0500	0.00420	mg/L		09/21/20 11:26	09/22/20 11:11	1
Cadmium	0.0111	U	0.0500	0.0111	mg/L		09/21/20 11:26	09/22/20 11:11	1
Chromium	0.0159	U	0.100	0.0159	mg/L		09/21/20 11:26	09/22/20 11:11	1
Nickel	**0.0390**	**J**	0.100	0.00800	mg/L		09/21/20 11:26	09/22/20 11:11	1
Lead	0.0219	U	0.100	0.0219	mg/L		09/21/20 11:26	09/22/20 11:11	1
Antimony	0.0393	U	0.500	0.0393	mg/L		09/21/20 11:26	09/22/20 11:11	1
Selenium	0.0589	U	0.400	0.0589	mg/L		09/21/20 11:26	09/22/20 11:11	1
Vanadium Pentoxide	0.0303	U	0.180	0.0303	mg/L		09/21/20 11:26	09/22/20 11:11	1

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.000112**	**J**	0.000250	0.000103	mg/L		10/01/20 13:15	10/02/20 10:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Reactive	0.0840	U	0.246	0.0840	mg/Kg		09/25/20 11:50	09/28/20 18:55	1
Cyanide, Total	**0.0384**	**J**	0.112	0.0168	mg/Kg		09/28/20 14:30	09/28/20 18:34	1
Sulfide	**98.5**		9.85	5.55	mg/Kg		09/22/20 09:56	09/22/20 09:59	1
Sulfide, Reactive	13.7	U	49.1	13.7	mg/Kg		09/25/20 11:50	09/28/20 18:54	1

Client Sample ID: RS-1 — Lab Sample ID: 600-211294-1

Date Collected: 09/15/20 15:00 — **Matrix: Solid**
Date Received: 09/16/20 17:19

General Chemistry (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	8.1	H	0.01	0.01	SU			09/28/20 12:28	1
Flashpoint	>160		1.00	1.00	Degrees F			09/30/20 10:48	1

Client Sample ID: RS-2 — Lab Sample ID: 600-211294-2

Date Collected: 09/16/20 13:00 — **Matrix: Solid**
Date Received: 09/16/20 17:19

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorodifluoromethane	0.000760	U	0.00500	0.000760	mg/L			09/21/20 18:17	1
Vinyl chloride	0.000850	U	0.00500	0.000850	mg/L			09/21/20 18:17	1
Bromomethane	0.00215	U	0.0100	0.00215	mg/L			09/21/20 18:17	1
Trichlorofluoromethane	0.00123	U	0.0100	0.00123	mg/L			09/21/20 18:17	1
1,1-Dichlorethylene	0.000760	U	0.00500	0.000760	mg/L			09/21/20 18:17	1
Acetone	0.00227	U	0.0100	0.00227	mg/L			09/21/20 18:17	1
Carbon disulfide	0.00198	J B	0.0100	0.00170	mg/L			09/21/20 18:17	1
Acetonitrile	0.00197	U	0.0500	0.00197	mg/L			09/21/20 18:17	1
Methylene Chloride	0.00199	J B	0.0100	0.00143	mg/L			09/21/20 18:17	1
Acrylonitrile	0.00509	U	0.0500	0.00509	mg/L			09/21/20 18:17	1
Methyl Ethyl Ketone (2-Butanone)	0.00157	U	0.0100	0.00157	mg/L			09/21/20 18:17	1
Methacrylonitrile	0.00122	U	0.0500	0.00122	mg/L			09/21/20 18:17	1
Carbon tetrachloride	0.000920	U	0.00500	0.000920	mg/L			09/21/20 18:17	1
Benzene	0.000560	U	0.00500	0.000560	mg/L			09/21/20 18:17	1
1,2-Dichloroethane	0.00101	U	0.00500	0.00101	mg/L			09/21/20 18:17	1
Trichloroethylene	0.00158	U	0.00500	0.00158	mg/L			09/21/20 18:17	1
1,1,1-Trichloroethane	0.000980	U	0.00500	0.000980	mg/L			09/21/20 18:17	1
1,4-Dioxane	0.135	U	0.250	0.135	mg/L			09/21/20 18:17	1
Chloroform	0.000820	U	0.0100	0.000820	mg/L			09/21/20 18:17	1
Bromodichloromethane	0.000760	U	0.00500	0.000760	mg/L			09/21/20 18:17	1
cis-1,3-Dichloropropene	0.000970	U	0.00500	0.000970	mg/L			09/21/20 18:17	1
Methyl isobutyl ketone (MIBK)	0.00111	U	0.0100	0.00111	mg/L			09/21/20 18:17	1
Toluene	0.000550	U	0.00500	0.000550	mg/L			09/21/20 18:17	1
trans-1,3-Dichloropropene	0.000590	U	0.00500	0.000590	mg/L			09/21/20 18:17	1
1,1,2-Trichloroethane	0.000530	U	0.00500	0.000530	mg/L			09/21/20 18:17	1
Tetrachloroethylene	0.00124	U	0.00500	0.00124	mg/L			09/21/20 18:17	1
1,3-Dichloropropene, Total	0.000690	U	0.00500	0.000690	mg/L			09/21/20 18:17	1
Ethylene Dibromide	0.000850	U	0.00500	0.000850	mg/L			09/21/20 18:17	1
Chlorobenzene	0.000820	U	0.00500	0.000820	mg/L			09/21/20 18:17	1
1,1,1,2-Tetrachloroethane	0.000940	U	0.00500	0.000940	mg/L			09/21/20 18:17	1
Ethylbenzene	0.00129	U	0.00500	0.00129	mg/L			09/21/20 18:17	1
m-Xylene & p-Xylene	0.00126	U	0.00500	0.00126	mg/L			09/21/20 18:17	1
Xylenes, Total	0.00198	U	0.00500	0.00198	mg/L			09/21/20 18:17	1
o-Xylene	0.000930	U	0.00500	0.000930	mg/L			09/21/20 18:17	1
Styrene	0.000560	U	0.00500	0.000560	mg/L			09/21/20 18:17	1
Tribromomethane	0.000770	U	0.00500	0.000770	mg/L			09/21/20 18:17	1
1,2,3-Trichloropropane	0.00116	U	0.00500	0.00116	mg/L			09/21/20 18:17	1
1,1,2,2-Tetrachloroethane	0.000800	U	0.00500	0.000800	mg/L			09/21/20 18:17	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*76*		*50 - 134*		*09/21/20 18:17*	*1*

Client Sample ID: RS-2
Date Collected: 09/16/20 13:00
Date Received: 09/16/20 17:19

Lab Sample ID: 600-211294-2
Matrix: Solid

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP (Continued)

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dibromofluoromethane	*79*		*62 - 130*		*09/21/20 18:17*	*1*
Toluene-d8 (Surr)	*90*		*70 - 130*		*09/21/20 18:17*	*1*
4-Bromofluorobenzene	*92*		*67 - 139*		*09/21/20 18:17*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyridine	0.00520	U	0.0500	0.00520	mg/L		09/23/20 11:13	09/28/20 15:02	1
N-Nitrosomethylethylamine	0.0112	U	0.0500	0.0112	mg/L		09/23/20 11:13	09/28/20 15:02	1
Acrylamide	0.173	U	2.50	0.173	mg/L		09/23/20 11:13	09/28/20 15:02	1
Aniline	0.00810	U	0.0500	0.00810	mg/L		09/23/20 11:13	09/28/20 15:02	1
Phenol	0.00475	U	0.0500	0.00475	mg/L		09/23/20 11:13	09/28/20 15:02	1
Bis(2-chloroethyl)ether	0.00595	U	0.0500	0.00595	mg/L		09/23/20 11:13	09/28/20 15:02	1
2-Chlorophenol	0.00335	U	0.0500	0.00335	mg/L		09/23/20 11:13	09/28/20 15:02	1
1,4-Dichlorobenzene	0.00630	U	0.0500	0.00630	mg/L		09/23/20 11:13	09/28/20 15:02	1
o-Cresol	0.00505	U	0.0500	0.00505	mg/L		09/23/20 11:13	09/28/20 15:02	1
m & p - Cresol	0.00940	U	0.100	0.00940	mg/L		09/23/20 11:13	09/28/20 15:02	1
N-Nitrosodi-n-propylamine	0.00330	U	0.0500	0.00330	mg/L		09/23/20 11:13	09/28/20 15:02	1
Hexachloroethane	0.00580	U	0.0500	0.00580	mg/L		09/23/20 11:13	09/28/20 15:02	1
N-Nitrosopyrrolidine	0.00650	U *	0.0500	0.00650	mg/L		09/23/20 11:13	09/28/20 15:02	1
Acetophenone	0.00510	U	0.0500	0.00510	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,6-Dimethylphenol	0.00515	U *1	0.0500	0.00515	mg/L		09/23/20 11:13	09/28/20 15:02	1
Nitrobenzene	0.00590	U	0.0500	0.00590	mg/L		09/23/20 11:13	09/28/20 15:02	1
Isophorone	0.00365	U	0.0500	0.00365	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,4-Dimethylphenol	0.00670	U	0.0500	0.00670	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,4-Dichlorophenol	0.00770	U *1	0.0500	0.00770	mg/L		09/23/20 11:13	09/28/20 15:02	1
1,2,4-Trichlorobenzene	0.00570	U	0.0500	0.00570	mg/L		09/23/20 11:13	09/28/20 15:02	1
Hexachloro-1,3-butadiene	0.00555	U *1	0.0500	0.00555	mg/L		09/23/20 11:13	09/28/20 15:02	1
p-Phenylene diamine	0.0500	U *	0.500	0.0500	mg/L		09/23/20 11:13	09/28/20 15:02	1
N-Nitrosodi-n-butylamine	0.00775	U *	0.0500	0.00775	mg/L		09/23/20 11:13	09/28/20 15:02	1
p-Chloro-m-cresol	0.00410	U	0.0500	0.00410	mg/L		09/23/20 11:13	09/28/20 15:02	1
Hexachlorocyclopentadiene	0.00290	U	0.250	0.00290	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,4,6-Trichlorophenol	0.00460	U	0.0500	0.00460	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,4,5-Trichlorophenol	0.00630	U	0.0500	0.00630	mg/L		09/23/20 11:13	09/28/20 15:02	1
m-Dinitrobenzene	0.0174	U	0.100	0.0174	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,6-Dinitrotoluene	0.00320	U	0.0500	0.00320	mg/L		09/23/20 11:13	09/28/20 15:02	1
Acenaphthene	0.00265	U	0.0500	0.00265	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,4-Dinitrophenol	0.00445	U	0.250	0.00445	mg/L		09/23/20 11:13	09/28/20 15:02	1
Pentachlorobenzene	0.00340	U	0.0500	0.00340	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,4-Dinitrotoluene	0.00475	U	0.0500	0.00475	mg/L		09/23/20 11:13	09/28/20 15:02	1
Diethyl phthalate	0.00570	U	0.0500	0.00570	mg/L		09/23/20 11:13	09/28/20 15:02	1
2,3,4,6-Tetrachlorophenol	0.00415	U	0.0500	0.00415	mg/L		09/23/20 11:13	09/28/20 15:02	1
Fluorene	0.00710	U	0.0500	0.00710	mg/L		09/23/20 11:13	09/28/20 15:02	1
Diphenylamine	0.00565	U *1	0.0500	0.00565	mg/L		09/23/20 11:13	09/28/20 15:02	1
N-Nitrosodiphenylamine	0.00515	U *1	0.100	0.00515	mg/L		09/23/20 11:13	09/28/20 15:02	1
1,2-Diphenylhydrazine (as Azobenzene)	0.0500	U	0.0500	0.0500	mg/L		09/23/20 11:13	09/28/20 15:02	1
Hexachlorobenzene	0.00450	U	0.0500	0.00450	mg/L		09/23/20 11:13	09/28/20 15:02	1
Pentachlorophenol	0.00445	U	0.250	0.00445	mg/L		09/23/20 11:13	09/28/20 15:02	1
Disulfoton	0.00375	U *	0.0500	0.00375	mg/L		09/23/20 11:13	09/28/20 15:02	1

Client Sample ID: RS-2
Date Collected: 09/16/20 13:00
Date Received: 09/16/20 17:19

Lab Sample ID: 600-211294-2
Matrix: Solid

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anthracene	0.00335	U	0.0500	0.00335	mg/L		09/23/20 11:13	09/28/20 15:02	1
Pronamide	0.00315	U	0.0500	0.00315	mg/L		09/23/20 11:13	09/28/20 15:02	1
Pentachloronitrobenzene	0.0129	U	0.0500	0.0129	mg/L		09/23/20 11:13	09/28/20 15:02	1
Dibutylphthalate	0.00520	U	0.0500	0.00520	mg/L		09/23/20 11:13	09/28/20 15:02	1
Fluoranthene	0.00260	U	0.0500	0.00260	mg/L		09/23/20 11:13	09/28/20 15:02	1
Benzidine	0.00305	U *1	0.250	0.00305	mg/L		09/23/20 11:13	09/28/20 15:02	1
Pyrene	0.00560	U	0.0500	0.00560	mg/L		09/23/20 11:13	09/28/20 15:02	1
Butyl benzyl phthalate	0.00305	U	0.0500	0.00305	mg/L		09/23/20 11:13	09/28/20 15:02	1
3,3'-Dichlorobenzidine	0.00290	U	0.250	0.00290	mg/L		09/23/20 11:13	09/28/20 15:02	1
Bis(2-ethylhexyl) phthalate	0.00260	U	0.0500	0.00260	mg/L		09/23/20 11:13	09/28/20 15:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol	*66*		*12 - 130*	*09/23/20 11:13*	*09/28/20 15:02*	*1*
Nitrobenzene-d5	*87*		*44 - 130*	*09/23/20 11:13*	*09/28/20 15:02*	*1*
2-Fluorobiphenyl	*72*		*37 - 130*	*09/23/20 11:13*	*09/28/20 15:02*	*1*
2,4,6-Tribromophenol	*76*		*14 - 130*	*09/23/20 11:13*	*09/28/20 15:02*	*1*
Terphenyl-d14	*104*		*10 - 149*	*09/23/20 11:13*	*09/28/20 15:02*	*1*
Phenol-d5 (Surr)	*61*		*12 - 130*	*09/23/20 11:13*	*09/28/20 15:02*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	0.537	U	5.00	0.537	mg/L			09/21/20 11:22	1
2-Methoxyethanol	0.766	U	5.00	0.766	mg/L			09/21/20 11:22	1
Ethylene glycol	3.49	U	5.00	3.49	mg/L			09/21/20 13:05	1
Isobutyl alcohol	0.180	U	5.00	0.180	mg/L			09/22/20 06:12	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,4'-DDD	0.0000770	U	0.000500	0.0000770	mg/L		09/22/20 17:52	09/26/20 07:26	1
4,4'-DDE	0.0000750	U	0.000500	0.0000750	mg/L		09/22/20 17:52	09/26/20 07:26	1
4,4'-DDT	0.000148	U	0.000500	0.000148	mg/L		09/22/20 17:52	09/26/20 07:26	1
Chlordane (technical)	0.00140	U	0.00500	0.00140	mg/L		09/22/20 17:52	09/26/20 07:26	1
Dieldrin	0.0000630	U	0.000500	0.0000630	mg/L		09/22/20 17:52	09/26/20 07:26	1
Endosulfan I	0.0000580	U	0.000500	0.0000580	mg/L		09/22/20 17:52	09/26/20 07:26	1
Endrin	0.0000790	U	0.000500	0.0000790	mg/L		09/22/20 17:52	09/26/20 07:26	1
Lindane	0.0000690	U	0.000500	0.0000690	mg/L		09/22/20 17:52	09/26/20 07:26	1
trans-Chlordane	0.0000910	U	0.000500	0.0000910	mg/L		09/22/20 17:52	09/26/20 07:26	1
Heptachlor	0.0000770	U	0.000500	0.0000770	mg/L		09/22/20 17:52	09/26/20 07:26	1
Heptachlor epoxide	0.0000750	U	0.000500	0.0000750	mg/L		09/22/20 17:52	09/26/20 07:26	1
Methoxychlor	0.000130	U	0.00100	0.000130	mg/L		09/22/20 17:52	09/26/20 07:26	1
Mirex	0.000121	U	0.000500	0.000121	mg/L		09/22/20 17:52	09/26/20 07:26	1
Toxaphene	0.00367	U	0.0200	0.00367	mg/L		09/22/20 17:52	09/26/20 07:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*99*		*34 - 122*	*09/22/20 17:52*	*09/26/20 07:26*	*1*
Tetrachloro-m-xylene	*92*		*28 - 115*	*09/22/20 17:52*	*09/26/20 07:26*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	0.00159	U *3	0.0166	0.00159	mg/Kg		09/17/20 14:00	09/21/20 17:26	1
PCB-1221	0.00860	U *3	0.0166	0.00860	mg/Kg		09/17/20 14:00	09/21/20 17:26	1

Client Sample ID: RS-2
Date Collected: 09/16/20 13:00
Date Received: 09/16/20 17:19

Lab Sample ID: 600-211294-2
Matrix: Solid

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1232	0.00668	U *3	0.0166	0.00668	mg/Kg		09/17/20 14:00	09/21/20 17:26	1
PCB-1242	0.00124	U *3	0.0166	0.00124	mg/Kg		09/17/20 14:00	09/21/20 17:26	1
PCB-1248	0.00248	U *3	0.0166	0.00248	mg/Kg		09/17/20 14:00	09/21/20 17:26	1
PCB-1254	0.00220	U *3	0.0166	0.00220	mg/Kg		09/17/20 14:00	09/21/20 17:26	1
PCB-1260	0.0135	U *3	0.0166	0.0135	mg/Kg		09/17/20 14:00	09/21/20 17:26	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*60*	*3*	*10 - 150*	*09/17/20 14:00*	*09/21/20 17:26*	*1*
DCB Decachlorobiphenyl	*117*	*3*	*10 - 150*	*09/17/20 14:00*	*09/21/20 17:26*	*1*

Method: 8141A - Organophosphorous Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dimethoate	0.00449	U	0.0150	0.00449	mg/L		09/22/20 18:07	09/24/20 21:50	1
Methyl parathion	0.00141	U	0.0400	0.00141	mg/L		09/22/20 18:07	09/24/20 21:50	1
Parathion (ethyl parathion)	0.00144	U	0.0100	0.00144	mg/L		09/22/20 18:07	09/24/20 21:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Chlormefos	*100*		*49 - 171*	*09/22/20 18:07*	*09/24/20 21:50*	*1*
Triphenylphosphate	*97*		*60 - 154*	*09/22/20 18:07*	*09/24/20 21:50*	*1*

Method: 8151A - Herbicidas (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenoxyacetic acid	0.000200	U	0.00100	0.000200	mg/L		09/23/20 07:24	09/28/20 14:27	1
2,4,5-TP (Silvex)	0.000100	U *1	0.00100	0.000100	mg/L		09/23/20 07:24	09/28/20 14:27	1
Dinoseb	0.100	U	1.00	0.100	ug/L		09/23/20 07:24	09/28/20 14:27	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*58*		*10 - 130*	*09/23/20 07:24*	*09/28/20 14:27*	*1*

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	3.80	U	9.99	3.80	mg/Kg		09/22/20 08:56	09/22/20 17:29	1
>C12-C28	4.06	U	9.99	4.06	mg/Kg		09/22/20 08:56	09/22/20 17:29	1
>C28-C35	4.06	U	9.99	4.06	mg/Kg		09/22/20 08:56	09/22/20 17:29	1
C6-C35	3.80	U	9.99	3.80	mg/Kg		09/22/20 08:56	09/22/20 17:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*106*		*70 - 130*	*09/22/20 08:56*	*09/22/20 17:29*	*1*

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	0.0129	U	0.100	0.0129	mg/L		09/21/20 11:26	09/22/20 11:13	1
Arsenic	0.0466	U	0.100	0.0466	mg/L		09/21/20 11:26	09/22/20 11:13	1
Barium	**3.22**		0.200	0.0162	mg/L		09/21/20 11:26	09/22/20 11:13	1
Beryllium	0.00420	U	0.0500	0.00420	mg/L		09/21/20 11:26	09/22/20 11:13	1
Cadmium	0.0111	U	0.0500	0.0111	mg/L		09/21/20 11:26	09/22/20 11:13	1
Chromium	0.0159	U	0.100	0.0159	mg/L		09/21/20 11:26	09/22/20 11:13	1
Nickel	**0.0320**	**J**	0.100	0.00800	mg/L		09/21/20 11:26	09/22/20 11:13	1
Lead	0.0219	U	0.100	0.0219	mg/L		09/21/20 11:26	09/22/20 11:13	1
Antimony	0.0393	U	0.500	0.0393	mg/L		09/21/20 11:26	09/22/20 11:13	1
Selenium	0.0589	U	0.400	0.0589	mg/L		09/21/20 11:26	09/22/20 11:13	1

Client Sample ID: RS-2
Lab Sample ID: 600-211294-2
Date Collected: 09/16/20 13:00
Matrix: Solid
Date Received: 09/16/20 17:19

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vanadium Pentoxide	0.0303	U	0.180	0.0303	mg/L		09/21/20 11:26	09/22/20 11:13	1

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000103	U	0.000250	0.000103	mg/L		10/01/20 13:15	10/02/20 10:43	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Reactive	0.0799	U	0.234	0.0799	mg/Kg		09/28/20 10:40	09/28/20 19:05	1
Cyanide, Total	0.0171	U	0.114	0.0171	mg/Kg		09/28/20 14:30	09/28/20 18:30	1
Sulfide	5.68	U	10.1	5.68	mg/Kg		09/22/20 09:56	09/22/20 09:59	1
Sulfide, Reactive	13.1	U	46.7	13.1	mg/Kg		09/28/20 10:40	09/28/20 18:54	1
pH	**8.6**	**H**	0.01	0.01	SU			09/28/20 12:28	1
Flashpoint	**>160**		1.00	1.00	Degrees F			09/30/20 10:48	1

Client Sample ID: RS-3
Lab Sample ID: 600-211294-3
Date Collected: 09/16/20 16:00
Matrix: Solid
Date Received: 09/16/20 17:19

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorodifluoromethane	0.000760	U	0.00500	0.000760	mg/L			09/21/20 18:41	1
Vinyl chloride	0.000850	U	0.00500	0.000850	mg/L			09/21/20 18:41	1
Bromomethane	0.00215	U	0.0100	0.00215	mg/L			09/21/20 18:41	1
Trichlorofluoromethane	0.00123	U	0.0100	0.00123	mg/L			09/21/20 18:41	1
1,1-Dichlorethylene	0.000760	U	0.00500	0.000760	mg/L			09/21/20 18:41	1
Acetone	0.00227	U	0.0100	0.00227	mg/L			09/21/20 18:41	1
Carbon disulfide	**0.00188**	**J B**	0.0100	0.00170	mg/L			09/21/20 18:41	1
Acetonitrile	0.00197	U	0.0500	0.00197	mg/L			09/21/20 18:41	1
Methylene Chloride	**0.00224**	**J B**	0.0100	0.00143	mg/L			09/21/20 18:41	1
Acrylonitrile	0.00509	U	0.0500	0.00509	mg/L			09/21/20 18:41	1
Methyl Ethyl Ketone (2-Butanone)	0.00157	U	0.0100	0.00157	mg/L			09/21/20 18:41	1
Methacrylonitrile	0.00122	U	0.0500	0.00122	mg/L			09/21/20 18:41	1
Carbon tetrachloride	0.000920	U	0.00500	0.000920	mg/L			09/21/20 18:41	1
Benzene	0.000560	U	0.00500	0.000560	mg/L			09/21/20 18:41	1
1,2-Dichloroethane	0.00101	U	0.00500	0.00101	mg/L			09/21/20 18:41	1
Trichloroethylene	0.00158	U	0.00500	0.00158	mg/L			09/21/20 18:41	1
1,1,1-Trichloroethane	0.000980	U	0.00500	0.000980	mg/L			09/21/20 18:41	1
1,4-Dioxane	0.135	U	0.250	0.135	mg/L			09/21/20 18:41	1
Chloroform	0.000820	U	0.0100	0.000820	mg/L			09/21/20 18:41	1
Bromodichloromethane	0.000760	U	0.00500	0.000760	mg/L			09/21/20 18:41	1
cis-1,3-Dichloropropene	0.000970	U	0.00500	0.000970	mg/L			09/21/20 18:41	1
Methyl isobutyl ketone (MIBK)	0.00111	U	0.0100	0.00111	mg/L			09/21/20 18:41	1
Toluene	0.000550	U	0.00500	0.000550	mg/L			09/21/20 18:41	1
trans-1,3-Dichloropropene	0.000590	U	0.00500	0.000590	mg/L			09/21/20 18:41	1
1,1,2-Trichloroethane	0.000530	U	0.00500	0.000530	mg/L			09/21/20 18:41	1
Tetrachloroethylene	0.00124	U	0.00500	0.00124	mg/L			09/21/20 18:41	1
1,3-Dichloropropene, Total	0.000690	U	0.00500	0.000690	mg/L			09/21/20 18:41	1
Ethylene Dibromide	0.000850	U	0.00500	0.000850	mg/L			09/21/20 18:41	1
Chlorobenzene	0.000820	U	0.00500	0.000820	mg/L			09/21/20 18:41	1

Client Sample ID: RS-3
Date Collected: 09/16/20 16:00
Date Received: 09/16/20 17:19

Lab Sample ID: 600-211294-3
Matrix: Solid

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,1,1,2-Tetrachloroethane	0.000940	U	0.00500	0.000940	mg/L			09/21/20 18:41	1
Ethylbenzene	0.00129	U	0.00500	0.00129	mg/L			09/21/20 18:41	1
m-Xylene & p-Xylene	0.00126	U	0.00500	0.00126	mg/L			09/21/20 18:41	1
Xylenes, Total	0.00198	U	0.00500	0.00198	mg/L			09/21/20 18:41	1
o-Xylene	0.000930	U	0.00500	0.000930	mg/L			09/21/20 18:41	1
Styrene	0.000560	U	0.00500	0.000560	mg/L			09/21/20 18:41	1
Tribromomethane	0.000770	U	0.00500	0.000770	mg/L			09/21/20 18:41	1
1,2,3-Trichloropropane	0.00116	U	0.00500	0.00116	mg/L			09/21/20 18:41	1
1,1,2,2-Tetrachloroethane	0.000800	U	0.00500	0.000800	mg/L			09/21/20 18:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*69*		*50 - 134*		*09/21/20 18:41*	*1*
Dibromofluoromethane	*74*		*62 - 130*		*09/21/20 18:41*	*1*
Toluene-d8 (Surr)	*83*		*70 - 130*		*09/21/20 18:41*	*1*
4-Bromofluorobenzene	*85*		*67 - 139*		*09/21/20 18:41*	*1*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyridine	0.00520	U	0.0500	0.00520	mg/L		09/23/20 11:13	09/28/20 15:29	1
N-Nitrosomethylethylamine	0.0112	U	0.0500	0.0112	mg/L		09/23/20 11:13	09/28/20 15:29	1
Acrylamide	0.173	U	2.50	0.173	mg/L		09/23/20 11:13	09/28/20 15:29	1
Aniline	0.00810	U	0.0500	0.00810	mg/L		09/23/20 11:13	09/28/20 15:29	1
Phenol	0.00475	U	0.0500	0.00475	mg/L		09/23/20 11:13	09/28/20 15:29	1
Bis(2-chloroethyl)ether	0.00595	U	0.0500	0.00595	mg/L		09/23/20 11:13	09/28/20 15:29	1
2-Chlorophenol	0.00335	U	0.0500	0.00335	mg/L		09/23/20 11:13	09/28/20 15:29	1
1,4-Dichlorobenzene	0.00630	U	0.0500	0.00630	mg/L		09/23/20 11:13	09/28/20 15:29	1
o-Cresol	0.00505	U	0.0500	0.00505	mg/L		09/23/20 11:13	09/28/20 15:29	1
m & p - Cresol	0.00940	U	0.100	0.00940	mg/L		09/23/20 11:13	09/28/20 15:29	1
N-Nitrosodi-n-propylamine	0.00330	U	0.0500	0.00330	mg/L		09/23/20 11:13	09/28/20 15:29	1
Hexachloroethane	0.00580	U	0.0500	0.00580	mg/L		09/23/20 11:13	09/28/20 15:29	1
N-Nitrosopyrrolidine	0.00650	U *	0.0500	0.00650	mg/L		09/23/20 11:13	09/28/20 15:29	1
Acetophenone	0.00510	U	0.0500	0.00510	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,6-Dimethylphenol	0.00515	U *1	0.0500	0.00515	mg/L		09/23/20 11:13	09/28/20 15:29	1
Nitrobenzene	0.00590	U	0.0500	0.00590	mg/L		09/23/20 11:13	09/28/20 15:29	1
Isophorone	0.00365	U	0.0500	0.00365	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,4-Dimethylphenol	0.00670	U	0.0500	0.00670	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,4-Dichlorophenol	0.00770	U *1	0.0500	0.00770	mg/L		09/23/20 11:13	09/28/20 15:29	1
1,2,4-Trichlorobenzene	0.00570	U	0.0500	0.00570	mg/L		09/23/20 11:13	09/28/20 15:29	1
Hexachloro-1,3-butadiene	0.00555	U *1	0.0500	0.00555	mg/L		09/23/20 11:13	09/28/20 15:29	1
p-Phenylene diamine	0.0500	U *	0.500	0.0500	mg/L		09/23/20 11:13	09/28/20 15:29	1
N-Nitrosodi-n-butylamine	0.00775	U *	0.0500	0.00775	mg/L		09/23/20 11:13	09/28/20 15:29	1
p-Chloro-m-cresol	0.00410	U	0.0500	0.00410	mg/L		09/23/20 11:13	09/28/20 15:29	1
Hexachlorocyclopentadiene	0.00290	U	0.250	0.00290	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,4,6-Trichlorophenol	0.00460	U	0.0500	0.00460	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,4,5-Trichlorophenol	0.00630	U	0.0500	0.00630	mg/L		09/23/20 11:13	09/28/20 15:29	1
m-Dinitrobenzene	0.0174	U	0.100	0.0174	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,6-Dinitrotoluene	0.00320	U	0.0500	0.00320	mg/L		09/23/20 11:13	09/28/20 15:29	1
Acenaphthene	0.00265	U	0.0500	0.00265	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,4-Dinitrophenol	0.00445	U	0.250	0.00445	mg/L		09/23/20 11:13	09/28/20 15:29	1
Pentachlorobenzene	0.00340	U	0.0500	0.00340	mg/L		09/23/20 11:13	09/28/20 15:29	1

Client Sample ID: RS-3 **Lab Sample ID: 600-211294-3**
Date Collected: 09/16/20 16:00 **Matrix: Solid**
Date Received: 09/16/20 17:19

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dinitrotoluene	0.00475	U	0.0500	0.00475	mg/L		09/23/20 11:13	09/28/20 15:29	1
Diethyl phthalate	0.00570	U	0.0500	0.00570	mg/L		09/23/20 11:13	09/28/20 15:29	1
2,3,4,6-Tetrachlorophenol	0.00415	U	0.0500	0.00415	mg/L		09/23/20 11:13	09/28/20 15:29	1
Fluorene	0.00710	U	0.0500	0.00710	mg/L		09/23/20 11:13	09/28/20 15:29	1
Diphenylamine	0.00565	U *1	0.0500	0.00565	mg/L		09/23/20 11:13	09/28/20 15:29	1
N-Nitrosodiphenylamine	0.00515	U *1	0.100	0.00515	mg/L		09/23/20 11:13	09/28/20 15:29	1
1,2-Diphenylhydrazine (as Azobenzene)	0.0500	U	0.0500	0.0500	mg/L		09/23/20 11:13	09/28/20 15:29	1
Hexachlorobenzene	0.00450	U	0.0500	0.00450	mg/L		09/23/20 11:13	09/28/20 15:29	1
Pentachlorophenol	0.00445	U	0.250	0.00445	mg/L		09/23/20 11:13	09/28/20 15:29	1
Disulfoton	0.00375	U *	0.0500	0.00375	mg/L		09/23/20 11:13	09/28/20 15:29	1
Anthracene	0.00335	U	0.0500	0.00335	mg/L		09/23/20 11:13	09/28/20 15:29	1
Pronamide	0.00315	U	0.0500	0.00315	mg/L		09/23/20 11:13	09/28/20 15:29	1
Pentachloronitrobenzene	0.0129	U	0.0500	0.0129	mg/L		09/23/20 11:13	09/28/20 15:29	1
Dibutylphthalate	0.00520	U	0.0500	0.00520	mg/L		09/23/20 11:13	09/28/20 15:29	1
Fluoranthene	0.00260	U	0.0500	0.00260	mg/L		09/23/20 11:13	09/28/20 15:29	1
Benzidine	0.00305	U *1	0.250	0.00305	mg/L		09/23/20 11:13	09/28/20 15:29	1
Pyrene	0.00560	U	0.0500	0.00560	mg/L		09/23/20 11:13	09/28/20 15:29	1
Butyl benzyl phthalate	0.00305	U	0.0500	0.00305	mg/L		09/23/20 11:13	09/28/20 15:29	1
3,3'-Dichlorobenzidine	0.00290	U	0.250	0.00290	mg/L		09/23/20 11:13	09/28/20 15:29	1
Bis(2-ethylhexyl) phthalate	0.00260	U	0.0500	0.00260	mg/L		09/23/20 11:13	09/28/20 15:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol	*57*		*12 - 130*	*09/23/20 11:13*	*09/28/20 15:29*	*1*
Nitrobenzene-d5	*65*		*44 - 130*	*09/23/20 11:13*	*09/28/20 15:29*	*1*
2-Fluorobiphenyl	*73*		*37 - 130*	*09/23/20 11:13*	*09/28/20 15:29*	*1*
2,4,6-Tribromophenol	*72*		*14 - 130*	*09/23/20 11:13*	*09/28/20 15:29*	*1*
Terphenyl-d14	*79*		*10 - 149*	*09/23/20 11:13*	*09/28/20 15:29*	*1*
Phenol-d5 (Surr)	*64*		*12 - 130*	*09/23/20 11:13*	*09/28/20 15:29*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	0.537	U	5.00	0.537	mg/L			09/21/20 11:22	1
2-Methoxyethanol	0.766	U	5.00	0.766	mg/L			09/21/20 11:22	1
Ethylene glycol	3.49	U	5.00	3.49	mg/L			09/21/20 13:19	1
Isobutyl alcohol	0.180	U	5.00	0.180	mg/L			09/22/20 06:24	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,4'-DDD	0.0000770	U	0.000500	0.0000770	mg/L		09/22/20 17:52	09/26/20 07:47	1
4,4'-DDE	0.0000750	U	0.000500	0.0000750	mg/L		09/22/20 17:52	09/26/20 07:47	1
4,4'-DDT	0.000148	U	0.000500	0.000148	mg/L		09/22/20 17:52	09/26/20 07:47	1
Chlordane (technical)	0.00140	U	0.00500	0.00140	mg/L		09/22/20 17:52	09/26/20 07:47	1
Dieldrin	0.0000630	U	0.000500	0.0000630	mg/L		09/22/20 17:52	09/26/20 07:47	1
Endosulfan I	0.0000580	U	0.000500	0.0000580	mg/L		09/22/20 17:52	09/26/20 07:47	1
Endrin	0.0000790	U	0.000500	0.0000790	mg/L		09/22/20 17:52	09/26/20 07:47	1
Lindane	0.0000690	U	0.000500	0.0000690	mg/L		09/22/20 17:52	09/26/20 07:47	1
trans-Chlordane	0.0000910	U	0.000500	0.0000910	mg/L		09/22/20 17:52	09/26/20 07:47	1
Heptachlor	0.0000770	U	0.000500	0.0000770	mg/L		09/22/20 17:52	09/26/20 07:47	1
Heptachlor epoxide	0.0000750	U	0.000500	0.0000750	mg/L		09/22/20 17:52	09/26/20 07:47	1

Client Sample ID: RS-3
Date Collected: 09/16/20 16:00
Date Received: 09/16/20 17:19

Lab Sample ID: 600-211294-3
Matrix: Solid

Method: 8081A - Organochlorine Pesticides (GC) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Methoxychlor	0.000130	U	0.00100	0.000130	mg/L		09/22/20 17:52	09/26/20 07:47	1
Mirex	0.000121	U	0.000500	0.000121	mg/L		09/22/20 17:52	09/26/20 07:47	1
Toxaphene	0.00367	U	0.0200	0.00367	mg/L		09/22/20 17:52	09/26/20 07:47	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*110*		*34 - 122*	*09/22/20 17:52*	*09/26/20 07:47*	*1*
Tetrachloro-m-xylene	*95*		*28 - 115*	*09/22/20 17:52*	*09/26/20 07:47*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	0.00159	U *3	0.0166	0.00159	mg/Kg		09/17/20 14:00	09/21/20 17:52	1
PCB-1221	0.00857	U *3	0.0166	0.00857	mg/Kg		09/17/20 14:00	09/21/20 17:52	1
PCB-1232	0.00666	U *3	0.0166	0.00666	mg/Kg		09/17/20 14:00	09/21/20 17:52	1
PCB-1242	0.00123	U *3	0.0166	0.00123	mg/Kg		09/17/20 14:00	09/21/20 17:52	1
PCB-1248	0.00247	U *3	0.0166	0.00247	mg/Kg		09/17/20 14:00	09/21/20 17:52	1
PCB-1254	0.00220	U *3	0.0166	0.00220	mg/Kg		09/17/20 14:00	09/21/20 17:52	1
PCB-1260	0.0134	U *3	0.0166	0.0134	mg/Kg		09/17/20 14:00	09/21/20 17:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*77*	*3*	*10 - 150*	*09/17/20 14:00*	*09/21/20 17:52*	*1*
DCB Decachlorobiphenyl	*108*	*3*	*10 - 150*	*09/17/20 14:00*	*09/21/20 17:52*	*1*

Method: 8141A - Organophosphorous Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dimethoate	0.00449	U	0.0150	0.00449	mg/L		09/22/20 18:07	09/24/20 22:29	1
Methyl parathion	0.00141	U	0.0400	0.00141	mg/L		09/22/20 18:07	09/24/20 22:29	1
Parathion (ethyl parathion)	0.00144	U	0.0100	0.00144	mg/L		09/22/20 18:07	09/24/20 22:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Chlormefos	*83*		*49 - 171*	*09/22/20 18:07*	*09/24/20 22:29*	*1*
Triphenylphosphate	*83*		*60 - 154*	*09/22/20 18:07*	*09/24/20 22:29*	*1*

Method: 8151A - Herbicidas (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenoxyacetic acid	0.000200	U	0.00100	0.000200	mg/L		09/23/20 07:24	09/28/20 14:52	1
2,4,5-TP (Silvex)	0.000100	U *1	0.00100	0.000100	mg/L		09/23/20 07:24	09/28/20 14:52	1
Dinoseb	0.100	U	1.00	0.100	ug/L		09/23/20 07:24	09/28/20 14:52	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*81*		*10 - 130*	*09/23/20 07:24*	*09/28/20 14:52*	*1*

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	3.78	U	9.94	3.78	mg/Kg		09/22/20 08:56	09/22/20 18:01	1
>C12-C28	4.04	U	9.94	4.04	mg/Kg		09/22/20 08:56	09/22/20 18:01	1
>C28-C35	4.04	U	9.94	4.04	mg/Kg		09/22/20 08:56	09/22/20 18:01	1
C6-C35	3.78	U	9.94	3.78	mg/Kg		09/22/20 08:56	09/22/20 18:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*112*		*70 - 130*	*09/22/20 08:56*	*09/22/20 18:01*	*1*

Client: Tetra Tech, Inc.
Job ID: 600-211294-1
Project/Site: Closed Municipal Solid Waste Landfill 09-16-20

Client Sample ID: RS-3
Lab Sample ID: 600-211294-3
Date Collected: 09/16/20 16:00
Matrix: Solid
Date Received: 09/16/20 17:19

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	0.0129	U	0.100	0.0129	mg/L		09/21/20 11:26	09/22/20 11:15	1
Arsenic	0.0466	U	0.100	0.0466	mg/L		09/21/20 11:26	09/22/20 11:15	1
Barium	**2.27**		0.200	0.0162	mg/L		09/21/20 11:26	09/22/20 11:15	1
Beryllium	0.00420	U	0.0500	0.00420	mg/L		09/21/20 11:26	09/22/20 11:15	1
Cadmium	0.0111	U	0.0500	0.0111	mg/L		09/21/20 11:26	09/22/20 11:15	1
Chromium	0.0159	U	0.100	0.0159	mg/L		09/21/20 11:26	09/22/20 11:15	1
Nickel	**0.0250**	**J**	0.100	0.00800	mg/L		09/21/20 11:26	09/22/20 11:15	1
Lead	0.0219	U	0.100	0.0219	mg/L		09/21/20 11:26	09/22/20 11:15	1
Antimony	0.0393	U	0.500	0.0393	mg/L		09/21/20 11:26	09/22/20 11:15	1
Selenium	0.0589	U	0.400	0.0589	mg/L		09/21/20 11:26	09/22/20 11:15	1
Vanadium Pentoxide	0.0303	U	0.180	0.0303	mg/L		09/21/20 11:26	09/22/20 11:15	1

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000103	U	0.000250	0.000103	mg/L		10/01/20 13:15	10/02/20 10:45	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Reactive	0.0806	U	0.236	0.0806	mg/Kg		09/25/20 11:50	09/28/20 18:56	1
Cyanide, Total	**0.0444**	**J**	0.103	0.0154	mg/Kg		09/28/20 14:30	09/28/20 18:35	1
Sulfide	**87.9**		9.99	5.62	mg/Kg		09/22/20 09:56	09/22/20 09:59	1
Sulfide, Reactive	13.2	U	47.1	13.2	mg/Kg		09/25/20 11:50	09/28/20 18:54	1
pH	**8.8**	**H**	0.01	0.01	SU			09/28/20 12:28	1
Flashpoint	**>160**		1.00	1.00	Degrees F			09/30/20 10:48	1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

GC/MS Semi VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
*1	LCS/LCSD RPD exceeds control limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

GC VOA

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

GC Semi VOA

Qualifier	Qualifier Description
*1	LCS/LCSD RPD exceeds control limits.
*3	ISTD response or retention time outside acceptable limits.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

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ANALYTICAL REPORT

Eurofins TestAmerica, Houston
6310 Rothway Street
Houston, TX 77040
Tel: (713)690-4444

Laboratory Job ID: 600-211292-1
Client Project/Site: Landfill Leachate 09-15-20

For:
Tetra Tech, Inc.
1500 CityWest Boulevard
Houston, Texas 77042

Attn: Jim Norstrom

Dean A. Joiner

Authorized for release by:
10/7/2020 5:26:41 PM

Dean Joiner, Project Manager II
(713)690-4444
[redacted]

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Case Narrative

Client: Tetra Tech, Inc.
Project/Site: Landfill Leachate 09-15-20

Job ID: 600-211292-1

Job ID: 600-211292-1

Laboratory: Eurofins TestAmerica, Houston

Narrative

Job Narrative
600-211292-1

Comments
No additional comments.

Receipt
The samples were received on 9/16/2020 5:19 PM; the samples arrived in good condition, and where required, properly preserved and on ice. The temperatures of the 2 coolers at receipt time were 0.7º C and 1.0º C.

Metals
Method 3010A: The following sample was received with insufficient preservation: SB-1 (600-211292-1). 2mL of Nitric acid preservative was added by the laboratory, and the sample pH was adjusted to <2 pH SU.

Method 6010B: The following sample was diluted due to the abundance of non-target interfering analytes over range: SB-1 (600-211292-1). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
Method Distill/Phenol: Sample matrix required initial dilution.

SB-1 (600-211292-1)

Method OIA-1677: The following sample was diluted due to the nature of the sample matrix: SB-1 (600-211292-1). An elevated reporting limit (RL) is provided. The sample matrix made it impossible to obtain sufficient volume of filtered sample for undiluted analysis.

Method OIA-1677: LCS/LCSD were analyzed instead of MS/MSD due to difficulty in obtaining sufficient sample volume for MS/MSD spiking.

Method OIA-1677: The following samples were re-analyzed because the sample probe tube became detached during the initial analysis. They were re-analyzed immediately after the initial analyses; however a CCV/CCB pair was not analyzed prior to the re-analyzed samples. There are 9 client samples plus 8 QC samples analyzed in between compliant CCV/CCB pairs; however, this analysis sequence began with a compliant MB/LCS; therefore, the results are reported for these analyses.

(LCS 180-331566/172) and (MB 180-331566/173)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Methods 1664A, 1664B: 211583-5/211583-5MS, see LCS/LCSD for TPH

(600-211583-A-5-A) and (600-211583-A-5-B MS)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: Tetra Tech, Inc.
Job ID: 600-211292-1
Project/Site: Landfill Leachate 09-15-20

Method	Method Description	Protocol	Laboratory
6010B	Inductively Coupled Plasma - Atomic Emission Spectrometry	SW846	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)	SW846	TAL HOU
160.4	Solids, Volatile Suspended (VSS)	EPA	TAL HOU
1664A	HEM and SGT-HEM by Extraction and Gravimetry	EPA	TAL HOU
2320B-1997	Alkalinity, Total - SM Online, 2011	SM-Online	TAL HOU
2540 C-1997	Total Dissolved Solids (Dried at 180 °C)	SM	TAL HOU
2540 D-1997	Solids, Total Suspended (TSS) - SM Online, 2011	SM-Online	TAL HOU
335.4	Cyanide, Total (Semi-Automated Colorimetry)	MCAWW	TAL HOU
350.1	Nitrogen, Ammonia	MCAWW	TAL HOU
420.4	Phenolics (Total Recoverable, Colorimetric, Semi-Automated, with Distillation)	MCAWW	TAL HOU
9040B	pH	SW846	TAL HOU
OIA - 1677	Available Cyanide by Flow Injection, Lig	EPA	TAL PIT
SM4500 P E-1999	Phosphorus	SM	TAL HOU
1664A	HEM and SGT-HEM by Extraction and Gravimetry/Aqueous Preparation	EPA	TAL HOU
3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals	SW846	TAL HOU
350.1	Distillation, Ammonia	EPA	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)/Preparation	SW846	TAL HOU
Distill/CN	Distillation, Cyanide	None	TAL HOU
Distill/Phenol	Distillation, Phenolics	None	TAL HOU
SM 4500 P B	Sample Preparation for Total and Ortho Phosphorus	SM	TAL HOU

Protocol References:

EPA = US Environmental Protection Agency

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

None = None

SM = "Standard Methods For The Examination Of Water And Wastewater"

SM-Online = Standard Methods Online

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL HOU = Eurofins TestAmerica, Houston, 6310 Rothway Street, Houston, TX 77040, TEL (713)690-4444

TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Sample Summary

Client: Tetra Tech, Inc.
Job ID: 600-211292-1
Project/Site: Landfill Leachate 09-15-20

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
600-211292-1	SB-1	Water	09/15/20 11:00	09/16/20 17:19	

Client: Tetra Tech, Inc.
Job ID: 600-211292-1
Project/Site: Landfill Leachate 09-15-20

Client Sample ID: SB-1
Lab Sample ID: 600-211292-1
Date Collected: 09/15/20 11:00
Matrix: Water
Date Received: 09/16/20 17:19

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.117		0.0100	0.00466	mg/L		09/29/20 07:29	09/30/20 11:02	1
Boron	0.395		0.200	0.0191	mg/L		09/29/20 07:29	09/30/20 11:02	1
Cadmium	0.00270	J	0.00500	0.00111	mg/L		09/29/20 07:29	09/30/20 11:02	1
Chromium	0.310		0.0100	0.00159	mg/L		09/29/20 07:29	09/30/20 11:02	1
Copper	0.246		0.0100	0.00813	mg/L		09/29/20 07:29	09/30/20 11:02	1
Lead	0.419		0.0500	0.0110	mg/L		09/29/20 07:29	09/30/20 11:37	5
Molybdenum	0.0154		0.0100	0.00158	mg/L		09/29/20 07:29	09/30/20 11:02	1
Nickel	0.272		0.0100	0.000800	mg/L		09/29/20 07:29	09/30/20 11:02	1
Selenium	0.00990	J	0.0400	0.00589	mg/L		09/29/20 07:29	09/30/20 11:02	1
Silver	0.00129	U	0.0100	0.00129	mg/L		09/29/20 07:29	09/30/20 11:02	1
Zinc	2.86		0.150	0.0200	mg/L		09/29/20 07:29	09/30/20 11:37	5

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.103	U	0.250	0.103	ug/L		09/25/20 08:15	09/25/20 13:28	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Volatile Suspended Solids	7280		100	100	mg/L			09/18/20 08:31	1
HEM (Oil and Grease)	2.7	J	3.2	1.1	mg/L		09/30/20 14:04	09/30/20 14:05	1
SGT-HEM (Oil and Grease - Nonpolar)	1.2	J	3.2	1.1	mg/L		09/30/20 14:04	09/30/20 14:05	1
Alkalinity	980		20.0	20.0	mg/L			09/25/20 10:09	1
Bicarbonate Alkalinity as CaCO3	980		20.0	20.0	mg/L			09/25/20 10:09	1
Carbonate Alkalinity as CaCO3	20.0	U	20.0	20.0	mg/L			09/25/20 10:09	1
Total Dissolved Solids	1340		20.0	20.0	mg/L			09/18/20 11:01	1
Total Suspended Solids	78700		100	100	mg/L			09/18/20 08:30	1
Cyanide, Total	218		10.0	3.08	ug/L		09/28/20 14:24	09/28/20 18:07	1
Ammonia	26.0		0.400	0.135	mg/L		09/28/20 12:40	09/29/20 12:37	2
Phenols, Total	166		50.0	27.6	ug/L		09/30/20 13:22	09/30/20 17:08	1
pH	7.1	HF	0.01	0.01	SU			09/21/20 14:02	1
Cyanide, Available	0.0149	U	0.0200	0.0149	mg/L			09/28/20 16:52	10
Phosphorus as P	142		25.0	10.5	mg/L		09/25/20 12:00	09/25/20 17:45	500
Phosphorus as PO4	435		77.0	32.3	mg/L		09/25/20 12:00	09/25/20 17:45	500

Definitions/Glossary

Client: Tetra Tech, Inc. Job ID: 600-211292-1
Project/Site: Landfill Leachate 09-15-20

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

SPECIAL WASTE PROFILE

Requested Disposal Facility: ~~Ft. Bend Regional Landfill~~ Ruffino Hills Transfer

Waste Profile #
Sales Rep #. Sandra Carpenter

Saveable fill in form. Restricted printing until all required (yellow) fields are completed.

I. Generator Information

Generator Name: Tetra Tech			
Generator Site Address: 9610 & 9800 Ruffino Road			
City: Houston	County: Harris	State: TX	Zip: 77031
State ID/Reg No:	State Approval/Waste Code: MSW (if applicable)		NAICS # :
Generator Mailing Address (if different): 1500 CityWest Boulevard, Suite 1000			
City: Houston	County: Harris	State: TX	Zip: 77042
Generator Contact Name: Jim Norstrom		Email [redacted]	
Phone Number: (936) 202-0746	Ext:	Fax Number:	

IIa. Transporter Information

Transporter Name: Envirotech Drilling		Contact Name: David Draybuck	
Transporter Address: P.O. Box 19064			
City: Houston	County: Harris	State: TX	Zip: 77224
Phone Number: (832) 493-8063	Fax Number:	State Transportation Number:	

IIb. Billing Information

Bill To: Tetra Tech		Contact Name: Jim Norstrom	
Billing Address: 1500 CityWest Boulevard		Email [redacted]	
City: Houston	State: TX	Zip: 77042	Phone: (936) 202-0746

III. Waste Stream Information

Name of Waste: Municipal Solid Waste

Process Generating Waste: investigative drilling in vicinity of

Drill Cuttings from closed MSW landfills (City of West University Landfill MSW Permit No. 1250 and City of Bellaire Landfill MSW Permit No. 1238).

Physical State: ☑ SOLID ☐ SEMI-SOLID ☐ POWDER ☐ LIQUID

Method of Shipment: ☑ BULK ☐ DRUM ☐ BAGGED ☐ OTHER

Estimated Annual Volume: 3 Cubic Yards

Frequency: ☑ ONE TIME ☐ ANNUAL

Disposal Consideration: ☑ LANDFILL ☐ SOLIDIFICATION

IV. Representative Sample Certification

☐ NO SAMPLE TAKEN

Is the representative sample collected to prepare this profile and laboratory analysis, collected in accordance with U.S. EPA 40 CFR 261.20(c) guidelines or equivalent rules?	☐ YES or ☑ NO
Sample Date:	Type of Sample: ☐ COMPOSITE SAMPLE ☐ GRAB SAMPLE
Sample ID Numbers:	
Samplers Name:	Samplers Signature:

8/25/20

SPECIAL WASTE PROFILE (continued)

Waste Profile #

V. Physical Characteristics of Waste

Characteristic Components	% by Weight (range)
1. Municipal Solid Waste	100.000
2.	
3.	
4.	
5.	

Color	Odor (describe)	Does Waste Contain Free Liquids?	% Solids	pH:	Flash Point
		☐ Yes or ☑ No	100.00		°F

Attach Laboratory Analytical Report (and/or Material Safety Data Sheet) Including Chain of Custody and Required Parameters Provided for this Profile

Does this waste or generating process contain regulated concentrations of the following Pesticides and/or Herbicides: Chlordane, Endrin, Heptachlor (and it epoxides), Lindane, Methoxychlor, Toxaphene, 2,4-D, or 2,4,5-TP Silvex as defined in 40 CFR 261.33?	☐ Yes or ☑ No
Does this waste contain reactive sulfides (greater than 500 ppm) or reactive cyanide (greater than 250 ppm) [reference 40 CFR 261.23(a)(5)]?	☐ Yes or ☑ No
Does this waste contain regulated concentrations of Polychlorinated Biphenyls (PCBs) as defined in 40 CFR Part 761?	☐ Yes or ☑ No
Does this waste contain concentrations of listed hazardous wastes defined in 40 CFR 261.31, 261.32, 261.33, including RCRA F-Listed Solvents?	☐ Yes or ☑ No
Does this waste exhibit a Hazardous Characteristic as defined by Federal and/or State regulations?	☐ Yes or ☑ No
Does this waste contain regulated concentrations of 2,3,7,8-Tetrachlorodibenzodioxin (2,3,7,8-TCCD), or any other dioxin as defined in 40 CFR 261.31?	☐ Yes or ☑ No
Is this a regulated Radioactive Waste as defined by Federal and/or State regulations?	☐ Yes or ☑ No
Is this a regulated Medical or Infectious Waste as defined by Federal and/or State regulations?	☐ Yes or ☑ No
Is this waste a reactive or heat generating waste?	☐ Yes or ☑ No
Does the waste contain sulfur or sulfur by-products?	☐ Yes or ☑ No
Is this waste generated at a Federal Superfund Clean Up Site?	☐ Yes or ☑ No
Is this waste from a TSD facility, TSD-like facility or waste consolidator?	☐ Yes or ☑ No

VI. Certification

I hereby certify that to the best of my knowledge and belief, the information contained herein is a true, complete and accurate description of the waste material being offered for disposal and all known or suspected hazards have been disclosed. All Analytical Results/Material Safety Data Sheets submitted are truthful and complete and are representative of the waste.

I further certify that by utilizing this profile, neither I nor any other employee of the company will deliver for disposal or attempt to deliver for disposal any waste which is classified as toxic waste, hazardous waste or infectious waste, or any other waste material this facility is prohibited from accepting by law. I shall immediately give written notice of any change or condition pertaining to the waste not provided herein. Our company hereby agrees to fully indemnify this disposal facility against any damages resulting from this certification being inaccurate or untrue.

I further certify that the company has not altered the form or content of this profile sheet as provided by WCA Waste.

James M Nordrum — Tetra Tech

Authorized Representative Name/Title: James M. Nordrum, St. Proj. Mgr — Company Name

Date: 8/25/20

VII. Waste Approval Decision

☐ Approved ☐ Rejected Expiration: _____

Conditions:

Name, Title — Signature — Date

APPENDIX D BELLAIRE LANDFILL FIELD INVESTIGATION BORINGS (2020)

TETRA TECH

Report

To:	Paresh Lad (City of Houston), Martin Murdock (Jones-Carter)
From:	Jim Norstrom
Date:	December 18, 2020
Subject:	Ruffino Road Landfill Project – Task 2 Report – Bellaire Landfill Field Investigation

Contents

1. Introduction
2. Field Investigation
3. Waste Limits and Volume
4. Waste Characteristics and Classification
5. Liquids
6. Landfill Gas
7. Hazardous Materials and Asbestos
8. Changes to Future Tasks Scope and Fee
9. Updated Estimate of Waste Relocation Project Cost and Schedule
10. Conclusions and Recommendations

Appendices

A. Boring Location Map
B. Boring Logs
C. Photos
D. Laboratory Report – Solids
E. Laboratory Report – Liquids
F. Estimated Waste Relocation Project Cost
G. WCA Waste Profile for Drill Cuttings

Tetra Tech
http://www.tetratech.com/en/waste-management
1500 CityWest Boulevard, Suite 1000, Houston, TX 77042
Cell 936-202-0746 Tel 832-251-5165 [redacted]

1 Introduction

Tetra Tech's scope of work presented in our proposal to Jones–Carter dated February 13, 2020 includes the following Tasks:

1. Data Review
2. Field Investigation
3. Evaluation of Alternatives
4. Regulatory Agency Liason and Community Outreach
5. Waste Relocation Work Plan Preparation
6. TCEQ MSW Type IX Registration (Landfill Mining)

The Task 2 Scope is:

> TT will conduct a field investigation to augment data reviewed in Task 1. The field investigation will include obtaining data on the refuse limits and quantity through test pits, soil borings, and geophysical methods. Additional methods may include surface emissions monitoring, soil gas surveys and/or gas monitoring probe installation, laboratory testing of collected samples, and ground water quality evaluation. This Task 2 Report includes the following:

- Report of findings
- Updated estimate of total waste relocation project cost and schedule

2 Field Investigation

Tech Tech conducted a Field Investigation to augment data obtained and reviewed in Task 1. The field investigation included obtaining data on the refuse limits, volume, and characteristics through borings. Investigative methods in addition to visual observations and photo documentation included field classification and laboratory testing of collected samples, surface air measurements for combustible gas, and leachate depth measurements and sampling where present.

The locations of borings are shown in Appendix A. Our investigations were conducted as follows:

- Review and discuss our Health and Safety Plan with field personnel
- Mobilize exploration equipment, including pickup truck, track-mounted hollow stem auger drilling rig, support flatbed truck, Bobcat, and all-terrian vehicle
- Identify boring locations and record GPS coordinates. Based on current surface elevations and estimated landfill excavation depths, the terminal depth of each boring was estimated and recorded for the drill crew. Boring B-1 could not be advanced to full depth because of a subsurface obstruction and the boring was relocated and Boring B-1A drilled (see Appendix A).
- Borings (Appendices A and B) – To determine the limits and characteristics of buried waste, six borings were drilled through the cover soils and waste materials using hollow-stem auger equipment that provided continuous core samples every five feet. Boreholes were eight inches in diameter to the depths shown in the boring logs (Appendix B). Subsurface conditions were logged by a Tetra Tech Environmental Scientist according to the Unified Soil Classification System (ASTM D2488). Samples of each of the material types encountered were collected and packaged for shipment to the laboratory. Sample depths and elevations are shown on the boring logs.
- Terminal Depth - When approaching the estimated terminal depth, the boring proceeded slowly and care was taken to prevent penetration of the clay liner.
- Leachate – Liquid and saturated conditions were encountered in four borings (B-1A, B2, B-4, and W-1) at Elevation 59 feet to 61 feet MSL. A liquid sample was collected from Boring W-1 and tested for parameters required by the City of Houston Public Works Industrial Wastewater Service. Borings encountering liquids were advanced through the saturated zone. Following completion of each

boring, the boreholes were backfilled with bentonite chips to the ground surface and were mounded to promote positive drainage (see Appendix C photos).

- Landfill Gas – The technician was equipped with a GEM-2000 landfill gas monitor capable of detecting levels as low at one percent methane in air. The technician took periodic measurements during drilling. Landfill gas odor was not detected in any of the borings and the GEM-2000 never registered a value above zero.
- Asbestos – The technician observed drill cuttings and samples for potential asbestos containing materials (ACM). There were no indications of ACM in any of the borings.
- Hazardous Materials – There were no visual or olfactory indications of hazardous materials in any borings
- Completion – After drilling and sampling was completed, all boreholes were backfilled with granular bentonite to ground level and mounded to promote positive drainage. Cuttings from the borehole were collected and transported to the Ruffino Road Transfer Station onsite (pre-arranged with the operator, Waste Corporation of America). The WCA waste profile is included in Appendix G.
- Data Collection and Recordkeeping – Field activities were documented in field notes and boring logs
- After completion of the borings:
    - The work site was inspected and cleaned of drill cuttings and debris
    - No borings were left open and no waste materials were exposed over night
    - Wastes from boreholes were either containerized for lab testing of transported to the Ruffino Road Transfer station for transport and disposal
    - There was no damage to the site

3 Waste Limits and Volume

In five borings, the bottom liner was encountered and the depth to liner measured. Based on our Bellaire Landfill borings, the average clay liner elevation is 56.5 feet, compared to an average liner elevation of 59.6 feet found at the West University Landfill. Knowing surface elevations, we converted liner depths to elevations as shown on the boring logs and in the table below.

Boring Number	Surface Elevation, ft MSL	Depth to Clay Liner, ft	Top of Clay Liner Elevation, ft MSL
B-1	86.71	Not Encountered	NA
B-1A	85.98	30.0	56.0
B-2	83.01	26.0	57.0
B-3	70.48	14.0	56.5
B-4	80.00	23.0	57.0
W-1	86.06	30.0	56.1

4 Waste Characteristics and Classification

Samples of excavated solid materials were collected, preserved, and shipped to a laboratory qualified to test contaminated materials and to determine concentrations of various compounds necessary to classify the wastes. Samples were tested for the following parameters: 40 CFR 261.24 Table 1 Contaminants for the Toxicity Characteristic (plus TCLP antimony, beryllium, nickel), Total Petroleum Hydrocarbons, total sulfates and cyanides, reactive sulfates and cyanides, pH, PAH, herbicides, pesticides, dioxins, furans, PCBs, and asbestos.

On the basis of the TCEQ regulations and the lab reports, the solid samples are classified as Class II Industrial Solid Waste which is suitable for disposal at Type I MSW Landfills.

5 Liquids

Liquids were encountered in four borings, but in three borings there was not enough liquid to produce a sufficient volume for lab testing. A sample of the leachate was collected from Boring W-1 and the laboratory report is presented in Appendix E. Based on the depths and volumes of liquid encountered, it is difficult to estimate the total volume of liquid that will be produced by removal of the buried waste and the variability of the characteristics of the liquid. However, according to the City of Houston GIMS Portal, a COH wastewater collector runs along Ruffino Road and should be considered a possible wastewater disposal option.

Liquid disposal options include:

- City of Houston sanitary sewer located at the Ruffino Hills Transfer Station (if specifically approved by the COH Public Works Department)
- Onsite use for dust control (requires TCEQ and COH approval)
- Disposal at an industrial wastewater treatment plant
- Solidification at the Republic Services Blue Ridge Landfill

Liquids encountered in Borings 1A, 2, 4, and W1 were absorbed during backfilling with bentonite chips. No liquids reached the landfill surface (except for the sample collected from W-1).

6 Landfill Gas

Landfill gas was not detected during drilling by personnel or the GEM-2000 Landfill Gas Monitor. Because these landfills closed more than 30 years ago, the organic fraction of waste has decomposed and no longer produces methane or carbon dioxide. The absence of odorous gas will be a benefit during waste excavation and relocation.

7 Hazardous Materials and Asbestos

No hazardous materials nor asbestos were detected in any of the borings.

8 Changes to Future Task Scope and Fee

Based on the findings of this Task 2 Field Investigation of the Bellaire Landfill, we believe that the Tetra Tech scope and fee estimates for remaining Tasks 3 through 6 remain appropriate.

9 Updated Estimate of Waste Relocation Project Cost and Schedule

Bellaire Landill borings encountered the clay liner (base of waste) at a slightly lower elevation than expected based on our literature search and the West University Landfill borings which caused us to change the cost estimate presented in our West University Landfill Field Investigation Report dated October 23, 2020.

Our estimate of average liner (base of waste) elevation for the Bellaire Landfill changed from 62 feet to 57 feet MSL and we reduced our estimate of the West University Landill average liner elevation from 62 feet to 60 feet.

We recalculated below grade waste volumes for both landfills using a lower liner elevation as summarized in the table below:

Below Grade Elevation Range, Feet MSL	Bellaire Volume to Excavate Below El 70', cy	Bellaire Volume to Excavate Above El 70', cy	West U Volume to Excavate Below El 70' cy	West U Volume to Excavate Above El 70', cy	Total Volume to Excavate, cy
Bellaire & West U 70' to 62'	411,430	524,555	565,850	523,807	2,025,642
Bellaire 70' to 57' West U 70' to 60'	627,370	524,555	698,930	523,807	2,374,662

A breakdown of our cost and schedule estimates are presented in Appendix F. These estimates are preliminary and based on rough volume estimates and initial prices that have not been negotiated.

Our estimates include assumptions such as: excavating by two CAT 235 or equivalent excavators, a construction manager / engineer will be onsite full time, wastes will be disposed of at the Blue Ridge Landfill (14 miles southeast of Ruffino Hills), and that soil comprises 50 percent of the excavated material matrix.

Actual costs can be affected by factors such as:

- Types of wastes encountered (at this stage, we have assumed only MSW and soil)
- Oversize materials within the buried wastes
- The need for more and different equipment to separate soil from MSW
- Changes in truck payload, availability of trucks, hauling prices, disposal prices, and demand for soil
- Local permit and ordinance requirements

10 Conclusions and Recommendations

The six borings drilled on the closed Bellaire Landfill confirmed our understanding of subsurface conditions developed during Task 1 and the West University Landfill field investigation, with the exception of liner (base of waste) elevation. Our estimate of total waste relocation project costs is presented in Appendix F.

Information obtained or confirmed by the Bellaire Landfill boring program includes the following:

- Our understanding of the horizontal limits of the closed landfill is unchanged
- Borings encountered the top of clay liner at an average Elevation of 57 feet MSL. Our original calculations of the subsurface volume of waste assumed a liner elevation of 62 feet MSL. Therefore, our calculation of below grade waste volume and associated excavation, transport, and disposal cost increased.
- As expected, the proportion of soil in all borings was significant. Therefore, we estimate that 50 percent of excavated material will be soil.
- Liquid was encountered in four borings. Based on this finding, it is difficult to estimate total subsurface liquid volume or characteristics.
- There were no indications of landfill gas. Because these landfills closed more than 30 years ago, the organic fraction of waste has decomposed and no longer produces methane or carbon dioxide. The absence of odorous gas will be a benefit during waste excavation and relocation.
- There were no indications of asbestos or hazardous materials. This is good news, but the borings provide a small view of subsurface conditions and plans to safely handle, transport, and dispose of these materials will be necessary before waste excavation and relocation begins.
- According to laboratory testing of three composite solid waste samples, the waste samples can be classified as Class II Industrial Waste, which is acceptable for disposal at any Type I MSW Landill.

The nearest Type I landfill is the Republic Services Blue Ridge Landfill which is 14 miles to the southeast.

We recommend proceeding with Task 3 Evaluation of Alternatives afterwhich we will report our findings, recommendations, and an updated project cost estimate.

Appendices

A. Boring Location Map
B. Boring Logs
C. Photos
D. Laboratory Report – Solids
E. Laboratory Report – Liquids
F. Estimated Waste Relocation Project Cost
G. WCA Waste Profile for Drill Cuttings

LEGEND

- Bellaire Borings
- Landfill Parcels
- 2018 2ft contours

NO.	REVISION DESCRIPTION	DATE

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

0 250 500
Feet

N
W E
S

1 inch equals 500 feet

TETRA TECH

CITY OF BELLAIRE LANDFILL

SAMPLE BORINGS
DRILLED NOVEMBER 17, 18, & 19

FIGURE 1

K:\00050\00050-0083-06 Ruffino Hills Landfill – Task 1B\2 Design Phase\Analysis\City of Bellaire Landfill 20201201.mxd

BORING NUMBER B-1

Tetra Tech
1500 CityWest Boulevard, Suite 1000
Houston, TX 77042

CLIENT City of Houston
PROJECT NAME Bellaire Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 11/17/20 **COMPLETED** 11/17/20
GROUND ELEVATION 86.71 ft MSL **HOLE SIZE** 8
DRILLING CONTRACTOR EnviroTech
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE
0			Brown to light brown clayey fill material with grass, roots, and small rocks throughout.		Vapor = 0
5			5.0	81.7	
			Very stiff reddish brown to brown clay with light brown mottling.		Vapor = 0
10			10.0	76.7	
			Soft, dark grey sandy clay.		
			12.5	74.2	
			Stiff, dark grey clay transitioning to grey-brown sandy clay as depth increases.		
15			15.0	71.7	
			No Recovery (NR) - Small bits of plastic and paper debris were recovered on the auger bit.		Vapor = 0
			17.0	69.7	
			Stiff, grey fine grained sandy clay.		
20			20.0	66.7	
			No Recovery (NR)		Vapor = 0
			22.0	64.7	
			23.0 Firm, grey sandy clay with scattererd small debris of wood, paper, and plastic.	63.7	

Bottom of borehole at 23.0 feet.

NOTES
1.) No liquid was encountered during drilling.
2.) No dust was produced during drilling.
3.) The boring was terminated at 23' bgs due to buried metal wire that prevented the auger bit from advancing further.
4.) Boring was filled with bentonite chips to surface at completion of drilling.

BORING NUMBER B-1A

Tetra Tech
1500 CityWest Boulevard, Suite 1000
Houston, TX 77042

CLIENT City of Houston
PROJECT NAME Bellaire Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 11/17/20 **COMPLETED** 11/17/20
GROUND ELEVATION 85.997 ft MSL **HOLE SIZE** 8
DRILLING CONTRACTOR EnviroTech
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING 33.00 ft / Elev 53.00 ft
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE
0					Brown to light brown clayey fill material with grass, roots, and small rocks throughout.		
2.0						84.0	
					Very stiff, moist, dark brown clay with high plasticity and light brown mottling.		
5							Vapor = 0
10							Vapor = 0
12.0						74.0	
15	SS R-1	100	R-1 is a composite sample of B1-A, B-2, and B-4 collected from the indicated intervals, respectively.		Brown clay with reddish mottling, medium plasticity, pebbles, and pockets of organic material.		
18.0						68.0	
19.0					Soft greyish-brown, moist, fine grained sand.	67.0	
20					NR - Small bits of plastic and paper debris were recovered on the auger bit.		Vapor = 0
25.0						61.0	
25					Soft, brown, moist sandy clay		Vapor = 0
27.0						59.0	
					NR - The auger bit was dripping wet.		
30							
30.0						56.0	
	SS R-3	100	R-3 is a composite sample of B1-A, B-2, B-3, and B-4 collected from the indicated intervals, respectively.		Very stiff, wet, clay layer consisting of reddish brown fat clay with yellow mottling.		Vapor = 0
35							
35.0					Bottom of borehole at 35.0 feet.	51.0	

NOTES 1.) Liquid encountered during drilling was free of odor, and not of sufficient quantity to collect a water sample. 2.) No dust was produced during drilling. 3.) No indication of hazardous subsurface materials were encountered. 4.) Boring was filled with bentonite chips to surface at completion of drilling.

BORING NUMBER B-2

Tetra Tech
1500 CityWest Boulevard, Suite 1000
Houston, TX 77042

CLIENT City of Houston
PROJECT NAME Bellaire Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 11/17/20 **COMPLETED** 11/17/20
GROUND ELEVATION 83.01 ft MSL **HOLE SIZE** 8
DRILLING CONTRACTOR EnviroTech
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
0hrs AFTER DRILLING 16.50 ft / Elev 66.51 ft

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE
0					Stiff, light brown, moist clay with black mottling, pebbles, and pockets of organic material.		
5					5.0	78.0	
					NR		Vapor = 0
					7.0	76.0	
					Very stiff, light brown, moist, clay with reddish mottling and small rocks.		
10					10.0	73.0	
					NR		Vapor = 0
					11.0	72.0	
	SS R-1	100	R-1 is a composite sample of B1-A, B-2, and B-4 collected from the indicated intervals, respectively.		Stiff, dark brown, sandy clay with light brown mottling, clay nodules, and organic matter throughout.		
15					15.0	68.0	
					NR		Vapor = 0
					17.0 ▼	66.0	
					Reddish-brown clay with grey and white mottling with dry chalky deposits.		
	SS R-2	100	R-2 is a composite sample of B-2, B-3, and B-4 collected from the indicated intervals, respectively.				
20					20.0	63.0	
					NR		
					21.0	62.0	
	SS R-3	100			Reddish-brown moist clay with grey and white mottling and small plastic and glass debris.		
25			R-3 is a composite sample of B1-A, B-2, B-3, and B-4 collected from the indicated intervals, respectively.		25.0	58.0	
					Very soft, brown to dark brown, wet, fine grained sand.		Vapor = 0
					26.0	57.0	
					Very stiff reddish-brown fat clay.		
					28.5	54.5	

Bottom of borehole at 28.5 feet.

NOTES
1.) Liquid encountered during drilling was free of odor, and not of sufficient quantity to collect a water sample.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.
4.) Boring was filled with bentonite chips to surface at completion of drilling.

BORING NUMBER B-3

Tetra Tech
1500 CityWest Boulevard, Suite 1000
Houston, TX 77042

CLIENT City of Houston
PROJECT NAME Bellaire Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 11/18/20 **COMPLETED** 11/18/20
GROUND ELEVATION 70.477 ft MSL **HOLE SIZE** 8
DRILLING CONTRACTOR EnviroTech
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING ---
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
AFTER DRILLING ---

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE
0					NR		
					2.0	68.5	
					Loose, brown, large grain top-soil with some organic matter.		
5					5.0	65.5	
					NR		Vapor = 0
					7.5	63.0	
	SS R-2	100	R-2 is a composite sample of B-2, B-3, and B-4 collected from the indicated intervals, respectively.		Brown to dark brown, coarse grained sandy clay, with high moisture content and glass and plastic debris.		
10					10.0	60.5	
					NR		Vapor = 0
					12.0	58.5	
					Firm, brown, moist, sandy clay with scattered plastic debris.		
					14.0	56.5	
15	SS R-3	100	R-3 is a composite sample of B1-A, B-2, B-3, and B-4 collected from the indicated intervals, respectively.		'Stiff, reddish-brown, fat clay with grey mottling.		
					15.0	55.5	
					Bottom of borehole at 15.0 feet.		Vapor = 0

NOTES
1.) No liquid was encountered during drilling.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.
4.) Boring was filled with bentonite chips to surface at completion of drilling.

BORING NUMBER B-4

Tetra Tech
1500 CityWest Boulevard, Suite 1000
Houston, TX 77042

CLIENT City of Houston
PROJECT NAME Bellaire Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 11/18/20 **COMPLETED** 11/19/20
GROUND ELEVATION 79.99 ft MSL **HOLE SIZE** 8
DRILLING CONTRACTOR EnviroTech
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING 24.50 ft / Elev 55.49 ft
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
19hrs AFTER DRILLING 23.50 ft / Elev 56.49 ft The boring did not produc

DEPTH (ft)	CHEMICAL TEST SAMPLE	RECOVERY %	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE
0					Stiff, dark brown sandy clay with light brown mottling, clay nodules, and organic matter.		
2.0						78.0	
					Same as above, except there is minimal organic matter.		
5							
	SS R-1	100	R-1 is a composite sample of B1-A, B-2, and B-4 collected from the indicated intervals, respectively.				Vapor = 0
10							
10.0						70.0	
					Stiff, brown, fat clay with grey, red, and dark brown mottling.		Vapor = 0
15							
15.0						65.0	
					NR		Vapor = 0
17.0						63.0	
	SS R-2	100	R-2 is a composite sample of B-2, B-3, and B-4 collected from the indicated intervals, respectively.		Stiff, light-brown to grey fat clay with high moisture content.		
20							
20.0						60.0	
					NR		
22.0						58.0	
23.0					Soft, saturated, fine grained clayey sand.	57.0	
					Stiff, reddish-brown fat clay with grey mottling.		
25	SS R-3	100	R-3 is a composite sample of B1-A, B-2, B-3, and B-4 collected from the indicated intervals, respectively.				
25.0						55.0	
					Bottom of borehole at 25.0 feet.		Vapor = 0

NOTES
1.) Liquid encountered during drilling was free of odor, and not of sufficient quantity to collect a water sample.
2.) No dust was produced during drilling.
3.) No indication of hazardous subsurface materials were encountered.
4.) Boring was filled with bentonite chips to surface at completion of drilling.

BORING NUMBER W-1

Tetra Tech
1500 CityWest Boulevard, Suite 1000
Houston, TX 77042

CLIENT City of Houston
PROJECT NAME Bellaire Landfill
PROJECT NUMBER 197-2020-0072
PROJECT LOCATION Houston TX
DATE STARTED 11/19/20 **COMPLETED** 11/19/20
GROUND ELEVATION 86.06 ft MSL **HOLE SIZE** 8
DRILLING CONTRACTOR EnviroTech
GROUND WATER LEVELS:
DRILLING METHOD HSA
AT TIME OF DRILLING 31.50 ft / Elev 54.56 ft
LOGGED BY Dylon Breyman **CHECKED BY** Jim Norstrom
AT END OF DRILLING ---
0.5hrs AFTER DRILLING 33.00 ft / Elev 53.06 ft

DEPTH (ft)	CHEMICAL TEST SAMPLE	REMARKS	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	% METHANE
0				Brown to light brown clayey fill material with grass, roots, and small rocks throughout.		
				2.0	84.1	
				Very stiff, moist, dark brown clay with high plasticity and light brown mottling.		
5						
10						Vapor = 0
				12.0	74.1	
				Brown clay with reddish mottling, medium plasticity, pebbles, and pockets of organic material.		
15						
				18.0	68.1	
				19.0 Soft, greyish-brown, moist, fine grained sand.	67.1	
20				NR - Small bits of plastic and paper debris were recovered on the auger bit.		Vapor = 0
25				25.0	61.1	
				Soft, brown, moist sandy clay.		
				27.0	59.1	
				NR - The auger bit was dripping wet.		
30				30.0	56.1	
	W-1	Leachate sample was collected using a bailer that produced approximately 3.5 gallons of water.		Very stiff, wet, clay layer consisting of reddish brown fat clay with yellow mottling.		Vapor = 0
35				35.0 Bottom of borehole at 35.0 feet.	51.1	

NOTES 1.) There were no odors associated with the liquid encountered while drilling. 2.) No dust was produced during drilling. 3.) No indication of hazardous subsurface materials were encountered. 4.) Boring was filled with bentonite chips to surface at completion of drilling.

Appendix C Photos of Bellaire Landfill Drilling and Sampling

Hollow Stem Auger on Closed City of Bellaire Landfill

Trees and Brush on Closed City of Bellaire Landfill

GEM-2000 Combustible Gas Meter

Sample Boring B-1

Sample Boring B-2

Sample Boring B-2 Deeper Tab and Light Gray Clay

Sampling Boring B-3

Sample Boring B-4

Backfilling Borehole With Granular Bentonite

Bentonite Backfilled Borehole and Cuttings Drum

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Houston
6310 Rothway Street
Houston, TX 77040
Tel: (713)690-4444

Laboratory Job ID: 600-213937-1
Client Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

For:
Tetra Tech, Inc.
1500 CityWest Boulevard
Houston, Texas 77042

Attn: Jim Norstrom

Dean A. Joiner

Authorized for release by:
12/9/2020 5:59:08 PM

Dean Joiner, Project Manager II
(713)690-4444
[redacted]

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Method Summary

Client: Tetra Tech, Inc.
Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Method	Method Description	Protocol	Laboratory
8260B	Volatile Organic Compounds (GC/MS)	SW846	TAL HOU
8270C	Semivolatile Organic Compounds (GC/MS)	SW846	TAL HOU
8015B	Nonhalogenated Organic Compounds - Direct Injection (GC)	SW846	TAL HOU
8081A	Organochlorine Pesticides (GC)	SW846	TAL DEN
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	SW846	TAL HOU
8151A	Herbicidas (GC)	SW846	TAL HOU
TX 1005	Texas - Total Petroleum Hydrocarbon (GC)	TCEQ	TAL HOU
6010B	Inductively Coupled Plasma - Atomic Emission Spectrometry	SW846	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)	SW846	TAL HOU
9012	Cyanide, Reactive	SW846	TAL HOU
9034	Sulfide, Acid Soluble and Insoluble (Titrimetric)	SW846	TAL DEN
9034	Sulfide, Acid Soluble and Insoluble (Titrimetric)	SW846	TAL HOU
9045C	Corrosivity as pH	SW846	TAL HOU
1311	Toxicity Characteristic Leaching Procedure	SW846	TAL DEN
1311	Toxicity Characteristic Leachate Procedure	SW846	TAL HOU
1311	Toxicity Characteristic Leaching Procedure	SW846	TAL HOU
1311	Toxicity Characteristic Leaching Procedure (ZHE)	SW846	TAL HOU
3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals/Leachates	SW846	TAL HOU
3510C	Liquid-Liquid Extraction (Separatory Funnel)	SW846	TAL DEN
3520C	Liquid-Liquid Extraction (Continuous)	SW846	TAL HOU
3546	Microwave Extraction	SW846	TAL HOU
5030B	Purge and Trap on Leachates	SW846	TAL HOU
7.3.3	Cyanide, Reactive	SW846	TAL HOU
7.3.4	Sulfide, Reactive	SW846	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)/Preparation/Leachate	SW846	TAL HOU
8151A	Chlorinated Herbicides by GC - Aqueous Prep	SW846	TAL HOU
9030B	Sulfide, Distillation (Acid Soluble and Insoluble)	SW846	TAL DEN
Frozen Preserve	Freezing Samples	None	TAL HOU
TX_1005_S_Prep	Extraction - Texas Total petroleum Hyrdocarbons	TCEQ	TAL HOU

Protocol References:

None = None
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.
TCEQ = Texas Commission of Environmental Quality

Laboratory References:

TAL DEN = Eurofins TestAmerica, Denver, 4955 Yarrow Street, Arvada, CO 80002, TEL (303)736-0100
TAL HOU = Eurofins TestAmerica, Houston, 6310 Rothway Street, Houston, TX 77040, TEL (713)690-4444

Sample Summary

Client: Tetra Tech, Inc.
Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
600-213937-1	R1	Solid	11/19/20 09:45	11/19/20 14:43	
600-213937-2	R2	Solid	11/19/20 09:55	11/19/20 14:43	
600-213937-3	R3	Solid	11/19/20 10:00	11/19/20 14:43	

Client: Tetra Tech, Inc.
Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Client Sample ID: R1
Lab Sample ID: 600-213937-1
Date Collected: 11/19/20 09:45
Matrix: Solid
Date Received: 11/19/20 14:43

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorodifluoromethane	0.00380	U	0.0250	0.00380	mg/L			11/24/20 15:07	5
Vinyl chloride	0.00425	U *	0.0250	0.00425	mg/L			11/24/20 15:07	5
Bromomethane	0.0108	U * F1	0.0500	0.0108	mg/L			11/24/20 15:07	5
Trichlorofluoromethane	0.00615	U * F1	0.0500	0.00615	mg/L			11/24/20 15:07	5
1,1-Dichlorethylene	0.00380	U	0.0250	0.00380	mg/L			11/24/20 15:07	5
Carbon disulfide	0.00850	U	0.0500	0.00850	mg/L			11/24/20 15:07	5
Acetonitrile	0.00985	U *1	0.250	0.00985	mg/L			11/24/20 15:07	5
Methylene Chloride	0.00715	U	0.0500	0.00715	mg/L			11/24/20 15:07	5
Acrylonitrile	0.0255	U	0.250	0.0255	mg/L			11/24/20 15:07	5
Methyl Ethyl Ketone (2-Butanone)	0.00785	U	0.0500	0.00785	mg/L			11/24/20 15:07	5
Methacrylonitrile	0.00610	U	0.250	0.00610	mg/L			11/24/20 15:07	5
Carbon tetrachloride	0.00460	U *	0.0250	0.00460	mg/L			11/24/20 15:07	5
Benzene	0.00280	U	0.0250	0.00280	mg/L			11/24/20 15:07	5
1,2-Dichloroethane	0.00505	U	0.0250	0.00505	mg/L			11/24/20 15:07	5
Trichloroethylene	0.00790	U	0.0250	0.00790	mg/L			11/24/20 15:07	5
1,1,1-Trichloroethane	0.00490	U	0.0250	0.00490	mg/L			11/24/20 15:07	5
1,4-Dioxane	0.675	U	1.25	0.675	mg/L			11/24/20 15:07	5
Chloroform	0.00410	U	0.0500	0.00410	mg/L			11/24/20 15:07	5
Bromodichloromethane	0.00380	U	0.0250	0.00380	mg/L			11/24/20 15:07	5
cis-1,3-Dichloropropene	0.00485	U	0.0250	0.00485	mg/L			11/24/20 15:07	5
Methyl isobutyl ketone (MIBK)	0.00555	U	0.0500	0.00555	mg/L			11/24/20 15:07	5
Toluene	0.00275	U	0.0250	0.00275	mg/L			11/24/20 15:07	5
trans-1,3-Dichloropropene	0.00295	U	0.0250	0.00295	mg/L			11/24/20 15:07	5
1,1,2-Trichloroethane	0.00265	U	0.0250	0.00265	mg/L			11/24/20 15:07	5
Tetrachloroethylene	0.00620	U	0.0250	0.00620	mg/L			11/24/20 15:07	5
1,3-Dichloropropene, Total	0.00345	U	0.0250	0.00345	mg/L			11/24/20 15:07	5
Ethylene Dibromide	0.00425	U	0.0250	0.00425	mg/L			11/24/20 15:07	5
Chlorobenzene	0.00410	U	0.0250	0.00410	mg/L			11/24/20 15:07	5
1,1,1,2-Tetrachloroethane	0.00470	U	0.0250	0.00470	mg/L			11/24/20 15:07	5
Ethylbenzene	0.00645	U	0.0250	0.00645	mg/L			11/24/20 15:07	5
m-Xylene & p-Xylene	0.00630	U	0.0250	0.00630	mg/L			11/24/20 15:07	5
Xylenes, Total	0.00990	U	0.0250	0.00990	mg/L			11/24/20 15:07	5
o-Xylene	0.00465	U	0.0250	0.00465	mg/L			11/24/20 15:07	5
Styrene	0.00280	U	0.0250	0.00280	mg/L			11/24/20 15:07	5
Tribromomethane	0.00385	U *	0.0250	0.00385	mg/L			11/24/20 15:07	5
1,2,3-Trichloropropane	0.00580	U	0.0250	0.00580	mg/L			11/24/20 15:07	5
1,1,2,2-Tetrachloroethane	0.00400	U	0.0250	0.00400	mg/L			11/24/20 15:07	5
Isobutyl alcohol	0.0842	U	0.625	0.0842	mg/L			11/24/20 15:07	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*103*		*50 - 134*		*11/24/20 15:07*	*5*
Dibromofluoromethane	*103*		*62 - 130*		*11/24/20 15:07*	*5*
Toluene-d8 (Surr)	*102*		*70 - 130*		*11/24/20 15:07*	*5*
4-Bromofluorobenzene	*104*		*67 - 139*		*11/24/20 15:07*	*5*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	10.5		0.500	0.114	mg/L			11/27/20 17:13	50

Client: Tetra Tech, Inc.
Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Client Sample ID: R1
Lab Sample ID: 600-213937-1
Date Collected: 11/19/20 09:45
Matrix: Solid
Date Received: 11/19/20 14:43

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
1,2-Dichloroethane-d4 (Surr)	108		50 - 134		11/27/20 17:13	50
Dibromofluoromethane	105		62 - 130		11/27/20 17:13	50
Toluene-d8 (Surr)	96		70 - 130		11/27/20 17:13	50
4-Bromofluorobenzene	93		67 - 139		11/27/20 17:13	50

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyridine	0.00520	U	0.0500	0.00520	mg/L		11/23/20 13:32	11/27/20 18:05	1
N-Nitrosomethylethylamine	0.0112	U *	0.0500	0.0112	mg/L		11/23/20 13:32	11/27/20 18:05	1
Acrylamide	0.173	U *	2.50	0.173	mg/L		11/23/20 13:32	11/27/20 18:05	1
Aniline	0.00810	U *	0.0500	0.00810	mg/L		11/23/20 13:32	11/27/20 18:05	1
Phenol	0.00475	U *	0.0500	0.00475	mg/L		11/23/20 13:32	11/27/20 18:05	1
Bis(2-chloroethyl)ether	0.00595	U *	0.0500	0.00595	mg/L		11/23/20 13:32	11/27/20 18:05	1
2-Chlorophenol	0.00335	U *	0.0500	0.00335	mg/L		11/23/20 13:32	11/27/20 18:05	1
1,4-Dichlorobenzene	0.00630	U *	0.0500	0.00630	mg/L		11/23/20 13:32	11/27/20 18:05	1
o-Cresol	0.00505	U *	0.0500	0.00505	mg/L		11/23/20 13:32	11/27/20 18:05	1
m & p - Cresol	0.00940	U *	0.100	0.00940	mg/L		11/23/20 13:32	11/27/20 18:05	1
N-Nitrosodi-n-propylamine	0.00330	U *	0.0500	0.00330	mg/L		11/23/20 13:32	11/27/20 18:05	1
Hexachloroethane	0.00580	U *	0.0500	0.00580	mg/L		11/23/20 13:32	11/27/20 18:05	1
N-Nitrosopyrrolidine	0.00650	U *	0.0500	0.00650	mg/L		11/23/20 13:32	11/27/20 18:05	1
Acetophenone	0.00510	U *	0.0500	0.00510	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,6-Dimethylphenol	0.00515	U	0.0500	0.00515	mg/L		11/23/20 13:32	11/27/20 18:05	1
Nitrobenzene	0.00590	U *	0.0500	0.00590	mg/L		11/23/20 13:32	11/27/20 18:05	1
Isophorone	0.00365	U *	0.0500	0.00365	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,4-Dimethylphenol	0.00670	U *	0.0500	0.00670	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,4-Dichlorophenol	0.00770	U *	0.0500	0.00770	mg/L		11/23/20 13:32	11/27/20 18:05	1
1,2,4-Trichlorobenzene	0.00570	U *	0.0500	0.00570	mg/L		11/23/20 13:32	11/27/20 18:05	1
Hexachloro-1,3-butadiene	0.00555	U *	0.0500	0.00555	mg/L		11/23/20 13:32	11/27/20 18:05	1
p-Phenylene diamine	0.0500	U *	0.500	0.0500	mg/L		11/23/20 13:32	11/27/20 18:05	1
N-Nitrosodi-n-butylamine	0.00775	U *	0.0500	0.00775	mg/L		11/23/20 13:32	11/27/20 18:05	1
p-Chloro-m-cresol	0.00410	U *	0.0500	0.00410	mg/L		11/23/20 13:32	11/27/20 18:05	1
Hexachlorocyclopentadiene	0.00290	U	0.250	0.00290	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,4,6-Trichlorophenol	0.00460	U *	0.0500	0.00460	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,4,5-Trichlorophenol	0.00630	U *	0.0500	0.00630	mg/L		11/23/20 13:32	11/27/20 18:05	1
m-Dinitrobenzene	0.0174	U *	0.100	0.0174	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,6-Dinitrotoluene	0.00320	U *	0.0500	0.00320	mg/L		11/23/20 13:32	11/27/20 18:05	1
Acenaphthene	0.00265	U *	0.0500	0.00265	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,4-Dinitrophenol	0.00445	U *	0.250	0.00445	mg/L		11/23/20 13:32	11/27/20 18:05	1
Pentachlorobenzene	0.00340	U *	0.0500	0.00340	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,4-Dinitrotoluene	0.00475	U *	0.0500	0.00475	mg/L		11/23/20 13:32	11/27/20 18:05	1
Diethyl phthalate	0.00570	U *	0.0500	0.00570	mg/L		11/23/20 13:32	11/27/20 18:05	1
2,3,4,6-Tetrachlorophenol	0.00415	U *	0.0500	0.00415	mg/L		11/23/20 13:32	11/27/20 18:05	1
Fluorene	0.00710	U	0.0500	0.00710	mg/L		11/23/20 13:32	11/27/20 18:05	1
Diphenylamine	0.00565	U *	0.0500	0.00565	mg/L		11/23/20 13:32	11/27/20 18:05	1
N-Nitrosodiphenylamine	0.00515	U *	0.100	0.00515	mg/L		11/23/20 13:32	11/27/20 18:05	1
1,2-Diphenylhydrazine (as Azobenzene)	0.0500	U *	0.0500	0.0500	mg/L		11/23/20 13:32	11/27/20 18:05	1
Hexachlorobenzene	0.00450	U *	0.0500	0.00450	mg/L		11/23/20 13:32	11/27/20 18:05	1
Pentachlorophenol	0.00445	U *	0.250	0.00445	mg/L		11/23/20 13:32	11/27/20 18:05	1
Disulfoton	0.00375	U *	0.0500	0.00375	mg/L		11/23/20 13:32	11/27/20 18:05	1

Client: Tetra Tech, Inc.
Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Client Sample ID: R1
Lab Sample ID: 600-213937-1
Date Collected: 11/19/20 09:45
Matrix: Solid
Date Received: 11/19/20 14:43

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Anthracene	0.00335	U *	0.0500	0.00335	mg/L		11/23/20 13:32	11/27/20 18:05	1
Pronamide	0.00315	U *	0.0500	0.00315	mg/L		11/23/20 13:32	11/27/20 18:05	1
Pentachloronitrobenzene	0.0129	U	0.0500	0.0129	mg/L		11/23/20 13:32	11/27/20 18:05	1
Dibutylphthalate	0.00520	U *	0.0500	0.00520	mg/L		11/23/20 13:32	11/27/20 18:05	1
Fluoranthene	0.00260	U	0.0500	0.00260	mg/L		11/23/20 13:32	11/27/20 18:05	1
Benzidine	0.00305	U	0.250	0.00305	mg/L		11/23/20 13:32	11/27/20 18:05	1
Pyrene	0.00560	U *	0.0500	0.00560	mg/L		11/23/20 13:32	11/27/20 18:05	1
Butyl benzyl phthalate	0.00305	U	0.0500	0.00305	mg/L		11/23/20 13:32	11/27/20 18:05	1
3,3'-Dichlorobenzidine	0.00290	U	0.250	0.00290	mg/L		11/23/20 13:32	11/27/20 18:05	1
Bis(2-ethylhexyl) phthalate	0.00260	U	0.0500	0.00260	mg/L		11/23/20 13:32	11/27/20 18:05	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol	*37*		*12 - 130*	*11/23/20 13:32*	*11/27/20 18:05*	*1*
Nitrobenzene-d5	*47*		*44 - 130*	*11/23/20 13:32*	*11/27/20 18:05*	*1*
2-Fluorobiphenyl	*44*		*37 - 130*	*11/23/20 13:32*	*11/27/20 18:05*	*1*
2,4,6-Tribromophenol	*49*		*14 - 130*	*11/23/20 13:32*	*11/27/20 18:05*	*1*
Terphenyl-d14	*55*		*10 - 149*	*11/23/20 13:32*	*11/27/20 18:05*	*1*
Phenol-d5 (Surr)	*38*		*12 - 130*	*11/23/20 13:32*	*11/27/20 18:05*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	0.537	U	5.00	0.537	mg/L			11/23/20 13:06	1
2-Methoxyethanol	0.766	U	5.00	0.766	mg/L			11/23/20 13:06	1
Ethylene glycol	3.49	U	5.00	3.49	mg/L			11/23/20 12:54	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,4'-DDD	0.0000770	U	0.000500	0.0000770	mg/L		11/26/20 15:35	12/02/20 14:43	1
4,4'-DDE	0.0000750	U	0.000500	0.0000750	mg/L		11/26/20 15:35	12/02/20 14:43	1
4,4'-DDT	0.000148	U	0.000500	0.000148	mg/L		11/26/20 15:35	12/02/20 14:43	1
Chlordane (technical)	0.00140	U	0.00500	0.00140	mg/L		11/26/20 15:35	12/02/20 14:43	1
Dieldrin	0.0000630	U	0.000500	0.0000630	mg/L		11/26/20 15:35	12/02/20 14:43	1
Endosulfan I	0.0000580	U	0.000500	0.0000580	mg/L		11/26/20 15:35	12/02/20 14:43	1
Endrin	0.0000790	U	0.000500	0.0000790	mg/L		11/26/20 15:35	12/02/20 14:43	1
Lindane	0.0000690	U	0.000500	0.0000690	mg/L		11/26/20 15:35	12/02/20 14:43	1
trans-Chlordane	**0.000814**		0.000500	0.0000910	mg/L		11/26/20 15:35	12/02/20 14:43	1
Heptachlor	0.0000770	U	0.000500	0.0000770	mg/L		11/26/20 15:35	12/02/20 14:43	1
Heptachlor epoxide	0.0000750	U	0.000500	0.0000750	mg/L		11/26/20 15:35	12/02/20 14:43	1
Methoxychlor	0.000130	U	0.00100	0.000130	mg/L		11/26/20 15:35	12/02/20 14:43	1
Mirex	0.000121	U	0.000500	0.000121	mg/L		11/26/20 15:35	12/02/20 14:43	1
Toxaphene	0.00367	U	0.0200	0.00367	mg/L		11/26/20 15:35	12/02/20 14:43	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*70*		*34 - 122*	*11/26/20 15:35*	*12/02/20 14:43*	*1*
Tetrachloro-m-xylene	*69*		*28 - 115*	*11/26/20 15:35*	*12/02/20 14:43*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	0.00160	U *3 F1 F2	0.0167	0.00160	mg/Kg		12/04/20 07:53	12/04/20 13:58	1
PCB-1221	0.00861	U *3	0.0167	0.00861	mg/Kg		12/04/20 07:53	12/04/20 13:58	1
PCB-1232	0.00669	U *3	0.0167	0.00669	mg/Kg		12/04/20 07:53	12/04/20 13:58	1

Client Sample ID: R1
Date Collected: 11/19/20 09:45
Date Received: 11/19/20 14:43

Lab Sample ID: 600-213937-1
Matrix: Solid

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1242	0.00124	U *3	0.0167	0.00124	mg/Kg		12/04/20 07:53	12/04/20 13:58	1
PCB-1248	0.00249	U *3	0.0167	0.00249	mg/Kg		12/04/20 07:53	12/04/20 13:58	1
PCB-1254	0.00221	U *3	0.0167	0.00221	mg/Kg		12/04/20 07:53	12/04/20 13:58	1
PCB-1260	0.0135	U *3 F1 F2	0.0167	0.0135	mg/Kg		12/04/20 07:53	12/04/20 13:58	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*112*	**3*	*10 - 150*	*12/04/20 07:53*	*12/04/20 13:58*	*1*
DCB Decachlorobiphenyl	*164*	*X *3*	*10 - 150*	*12/04/20 07:53*	*12/04/20 13:58*	*1*

Method: 8151A - Herbicidas (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenoxyacetic acid	0.000200	U	0.00100	0.000200	mg/L		11/24/20 09:13	12/03/20 14:01	1
2,4,5-TP (Silvex)	0.000100	U *1	0.00100	0.000100	mg/L		11/24/20 09:13	12/03/20 14:01	1
Dinoseb	0.100	U	1.00	0.100	ug/L		11/24/20 09:13	12/03/20 14:01	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*41*		*10 - 130*	*11/24/20 09:13*	*12/03/20 14:01*	*1*

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	3.79	U	9.98	3.79	mg/Kg		11/20/20 07:50	11/20/20 11:41	1
>C12-C28	4.05	U	9.98	4.05	mg/Kg		11/20/20 07:50	11/20/20 11:41	1
>C28-C35	4.05	U	9.98	4.05	mg/Kg		11/20/20 07:50	11/20/20 11:41	1
C6-C35	3.79	U	9.98	3.79	mg/Kg		11/20/20 07:50	11/20/20 11:41	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*93*		*70 - 130*	*11/20/20 07:50*	*11/20/20 11:41*	*1*

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0393	U	0.500	0.0393	mg/L		11/23/20 10:56	11/24/20 10:48	1
Arsenic	0.0466	U	0.100	0.0466	mg/L		11/23/20 10:56	11/24/20 10:48	1
Barium	**4.04**		0.200	0.0162	mg/L		11/23/20 10:56	11/24/20 10:48	1
Beryllium	**0.00800**	**J**	0.0500	0.00420	mg/L		11/23/20 10:56	11/24/20 10:48	1
Cadmium	0.0111	U	0.0500	0.0111	mg/L		11/23/20 10:56	11/24/20 10:48	1
Chromium	**0.0160**	**J**	0.100	0.0159	mg/L		11/23/20 10:56	11/24/20 10:48	1
Lead	0.0219	U	0.100	0.0219	mg/L		11/23/20 10:56	11/24/20 10:48	1
Nickel	**0.0420**	**J**	0.100	0.00800	mg/L		11/23/20 10:56	11/24/20 10:48	1
Selenium	0.0589	U	0.400	0.0589	mg/L		11/23/20 10:56	11/24/20 10:48	1
Silver	0.0129	U	0.100	0.0129	mg/L		11/23/20 10:56	11/24/20 10:48	1
Vanadium Pentoxide	0.0303	U	0.180	0.0303	mg/L		11/23/20 10:56	11/24/20 10:48	1

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000103	U	0.000250	0.000103	mg/L		11/25/20 08:29	11/25/20 11:50	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Reactive	0.0791	U	0.231	0.0791	mg/Kg		11/30/20 09:56	11/30/20 20:02	1
Sulfide	5.62	U	9.98	5.62	mg/Kg		11/23/20 14:45	11/23/20 14:48	1
Sulfide, Reactive	12.9	U	46.3	12.9	mg/Kg		11/30/20 09:56	12/01/20 18:35	1

Client: Tetra Tech, Inc. Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Client Sample ID: R1
Lab Sample ID: 600-213937-1
Date Collected: 11/19/20 09:45 **Matrix: Solid**
Date Received: 11/19/20 14:43

General Chemistry (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
pH	**8.3**		0.01	0.01	SU			11/25/20 13:00	1

Client Sample ID: R2
Lab Sample ID: 600-213937-2
Date Collected: 11/19/20 09:55 **Matrix: Solid**
Date Received: 11/19/20 14:43

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorodifluoromethane	0.000760	U	0.00500	0.000760	mg/L			11/24/20 15:32	1
Vinyl chloride	0.000850	U *	0.00500	0.000850	mg/L			11/24/20 15:32	1
Bromomethane	0.00215	U *	0.0100	0.00215	mg/L			11/24/20 15:32	1
Trichlorofluoromethane	0.00123	U *	0.0100	0.00123	mg/L			11/24/20 15:32	1
1,1-Dichlorethylene	0.000760	U	0.00500	0.000760	mg/L			11/24/20 15:32	1
Carbon disulfide	0.00170	U	0.0100	0.00170	mg/L			11/24/20 15:32	1
Acetonitrile	0.00197	U *1	0.0500	0.00197	mg/L			11/24/20 15:32	1
Methylene Chloride	0.00143	U	0.0100	0.00143	mg/L			11/24/20 15:32	1
Acrylonitrile	0.00509	U	0.0500	0.00509	mg/L			11/24/20 15:32	1
Methyl Ethyl Ketone (2-Butanone)	**0.00530**	**J**	0.0100	0.00157	mg/L			11/24/20 15:32	1
Methacrylonitrile	0.00122	U	0.0500	0.00122	mg/L			11/24/20 15:32	1
Carbon tetrachloride	0.000920	U *	0.00500	0.000920	mg/L			11/24/20 15:32	1
Benzene	0.000560	U	0.00500	0.000560	mg/L			11/24/20 15:32	1
1,2-Dichloroethane	0.00101	U	0.00500	0.00101	mg/L			11/24/20 15:32	1
Trichloroethylene	0.00158	U	0.00500	0.00158	mg/L			11/24/20 15:32	1
1,1,1-Trichloroethane	0.000980	U	0.00500	0.000980	mg/L			11/24/20 15:32	1
1,4-Dioxane	0.135	U	0.250	0.135	mg/L			11/24/20 15:32	1
Chloroform	0.000820	U	0.0100	0.000820	mg/L			11/24/20 15:32	1
Bromodichloromethane	0.000760	U	0.00500	0.000760	mg/L			11/24/20 15:32	1
cis-1,3-Dichloropropene	0.000970	U	0.00500	0.000970	mg/L			11/24/20 15:32	1
Methyl isobutyl ketone (MIBK)	0.00111	U	0.0100	0.00111	mg/L			11/24/20 15:32	1
Toluene	0.000550	U	0.00500	0.000550	mg/L			11/24/20 15:32	1
trans-1,3-Dichloropropene	0.000590	U	0.00500	0.000590	mg/L			11/24/20 15:32	1
1,1,2-Trichloroethane	0.000530	U	0.00500	0.000530	mg/L			11/24/20 15:32	1
Tetrachloroethylene	0.00124	U	0.00500	0.00124	mg/L			11/24/20 15:32	1
1,3-Dichloropropene, Total	0.000690	U	0.00500	0.000690	mg/L			11/24/20 15:32	1
Ethylene Dibromide	0.000850	U	0.00500	0.000850	mg/L			11/24/20 15:32	1
Chlorobenzene	**0.00687**		0.00500	0.000820	mg/L			11/24/20 15:32	1
1,1,1,2-Tetrachloroethane	0.000940	U	0.00500	0.000940	mg/L			11/24/20 15:32	1
Ethylbenzene	0.00129	U	0.00500	0.00129	mg/L			11/24/20 15:32	1
m-Xylene & p-Xylene	0.00126	U	0.00500	0.00126	mg/L			11/24/20 15:32	1
Xylenes, Total	0.00198	U	0.00500	0.00198	mg/L			11/24/20 15:32	1
o-Xylene	0.000930	U	0.00500	0.000930	mg/L			11/24/20 15:32	1
Styrene	0.000560	U	0.00500	0.000560	mg/L			11/24/20 15:32	1
Tribromomethane	0.000770	U *	0.00500	0.000770	mg/L			11/24/20 15:32	1
1,2,3-Trichloropropane	0.00116	U	0.00500	0.00116	mg/L			11/24/20 15:32	1
1,1,2,2-Tetrachloroethane	0.000800	U	0.00500	0.000800	mg/L			11/24/20 15:32	1
Isobutyl alcohol	0.0168	U	0.125	0.0168	mg/L			11/24/20 15:32	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*97*		*50 - 134*		*11/24/20 15:32*	*1*
Dibromofluoromethane	*95*		*62 - 130*		*11/24/20 15:32*	*1*

Client Sample ID: R2
Date Collected: 11/19/20 09:55
Date Received: 11/19/20 14:43

Lab Sample ID: 600-213937-2
Matrix: Solid

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP (Continued)

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Toluene-d8 (Surr)	*91*		*70 - 130*		*11/24/20 15:32*	*1*
4-Bromofluorobenzene	*95*		*67 - 139*		*11/24/20 15:32*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	4.55		0.500	0.114	mg/L			11/27/20 17:37	50

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*107*		*50 - 134*		*11/27/20 17:37*	*50*
Dibromofluoromethane	*106*		*62 - 130*		*11/27/20 17:37*	*50*
Toluene-d8 (Surr)	*94*		*70 - 130*		*11/27/20 17:37*	*50*
4-Bromofluorobenzene	*92*		*67 - 139*		*11/27/20 17:37*	*50*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyridine	0.00520	U	0.0500	0.00520	mg/L		11/23/20 13:32	11/27/20 18:29	1
N-Nitrosomethylethylamine	0.0112	U *	0.0500	0.0112	mg/L		11/23/20 13:32	11/27/20 18:29	1
Acrylamide	0.173	U *	2.50	0.173	mg/L		11/23/20 13:32	11/27/20 18:29	1
Aniline	0.00810	U *	0.0500	0.00810	mg/L		11/23/20 13:32	11/27/20 18:29	1
Phenol	0.00475	U *	0.0500	0.00475	mg/L		11/23/20 13:32	11/27/20 18:29	1
Bis(2-chloroethyl)ether	0.00595	U *	0.0500	0.00595	mg/L		11/23/20 13:32	11/27/20 18:29	1
2-Chlorophenol	0.00335	U *	0.0500	0.00335	mg/L		11/23/20 13:32	11/27/20 18:29	1
1,4-Dichlorobenzene	0.00630	U *	0.0500	0.00630	mg/L		11/23/20 13:32	11/27/20 18:29	1
o-Cresol	0.00505	U *	0.0500	0.00505	mg/L		11/23/20 13:32	11/27/20 18:29	1
m & p - Cresol	0.00940	U *	0.100	0.00940	mg/L		11/23/20 13:32	11/27/20 18:29	1
N-Nitrosodi-n-propylamine	0.00330	U *	0.0500	0.00330	mg/L		11/23/20 13:32	11/27/20 18:29	1
Hexachloroethane	0.00580	U *	0.0500	0.00580	mg/L		11/23/20 13:32	11/27/20 18:29	1
N-Nitrosopyrrolidine	0.00650	U *	0.0500	0.00650	mg/L		11/23/20 13:32	11/27/20 18:29	1
Acetophenone	0.00510	U *	0.0500	0.00510	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,6-Dimethylphenol	0.00515	U	0.0500	0.00515	mg/L		11/23/20 13:32	11/27/20 18:29	1
Nitrobenzene	0.00590	U *	0.0500	0.00590	mg/L		11/23/20 13:32	11/27/20 18:29	1
Isophorone	0.00365	U *	0.0500	0.00365	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,4-Dimethylphenol	0.00670	U *	0.0500	0.00670	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,4-Dichlorophenol	0.00770	U *	0.0500	0.00770	mg/L		11/23/20 13:32	11/27/20 18:29	1
1,2,4-Trichlorobenzene	0.00570	U *	0.0500	0.00570	mg/L		11/23/20 13:32	11/27/20 18:29	1
Hexachloro-1,3-butadiene	0.00555	U *	0.0500	0.00555	mg/L		11/23/20 13:32	11/27/20 18:29	1
p-Phenylene diamine	0.0500	U *	0.500	0.0500	mg/L		11/23/20 13:32	11/27/20 18:29	1
N-Nitrosodi-n-butylamine	0.00775	U *	0.0500	0.00775	mg/L		11/23/20 13:32	11/27/20 18:29	1
p-Chloro-m-cresol	0.00410	U *	0.0500	0.00410	mg/L		11/23/20 13:32	11/27/20 18:29	1
Hexachlorocyclopentadiene	0.00290	U	0.250	0.00290	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,4,6-Trichlorophenol	0.00460	U *	0.0500	0.00460	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,4,5-Trichlorophenol	0.00630	U *	0.0500	0.00630	mg/L		11/23/20 13:32	11/27/20 18:29	1
m-Dinitrobenzene	0.0174	U *	0.100	0.0174	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,6-Dinitrotoluene	0.00320	U *	0.0500	0.00320	mg/L		11/23/20 13:32	11/27/20 18:29	1
Acenaphthene	0.00265	U *	0.0500	0.00265	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,4-Dinitrophenol	0.00445	U *	0.250	0.00445	mg/L		11/23/20 13:32	11/27/20 18:29	1
Pentachlorobenzene	0.00340	U *	0.0500	0.00340	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,4-Dinitrotoluene	0.00475	U *	0.0500	0.00475	mg/L		11/23/20 13:32	11/27/20 18:29	1
Diethyl phthalate	0.00570	U *	0.0500	0.00570	mg/L		11/23/20 13:32	11/27/20 18:29	1
2,3,4,6-Tetrachlorophenol	0.00415	U *	0.0500	0.00415	mg/L		11/23/20 13:32	11/27/20 18:29	1

Client Sample ID: R2 **Lab Sample ID: 600-213937-2**
Date Collected: 11/19/20 09:55 **Matrix: Solid**
Date Received: 11/19/20 14:43

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Fluorene	0.00710	U	0.0500	0.00710	mg/L		11/23/20 13:32	11/27/20 18:29	1
Diphenylamine	0.00565	U *	0.0500	0.00565	mg/L		11/23/20 13:32	11/27/20 18:29	1
N-Nitrosodiphenylamine	0.00515	U *	0.100	0.00515	mg/L		11/23/20 13:32	11/27/20 18:29	1
1,2-Diphenylhydrazine (as Azobenzene)	0.0500	U *	0.0500	0.0500	mg/L		11/23/20 13:32	11/27/20 18:29	1
Hexachlorobenzene	0.00450	U *	0.0500	0.00450	mg/L		11/23/20 13:32	11/27/20 18:29	1
Pentachlorophenol	0.00445	U *	0.250	0.00445	mg/L		11/23/20 13:32	11/27/20 18:29	1
Disulfoton	0.00375	U *	0.0500	0.00375	mg/L		11/23/20 13:32	11/27/20 18:29	1
Anthracene	0.00335	U *	0.0500	0.00335	mg/L		11/23/20 13:32	11/27/20 18:29	1
Pronamide	0.00315	U *	0.0500	0.00315	mg/L		11/23/20 13:32	11/27/20 18:29	1
Pentachloronitrobenzene	0.0129	U	0.0500	0.0129	mg/L		11/23/20 13:32	11/27/20 18:29	1
Dibutylphthalate	0.00520	U *	0.0500	0.00520	mg/L		11/23/20 13:32	11/27/20 18:29	1
Fluoranthene	0.00260	U	0.0500	0.00260	mg/L		11/23/20 13:32	11/27/20 18:29	1
Benzidine	0.00305	U	0.250	0.00305	mg/L		11/23/20 13:32	11/27/20 18:29	1
Pyrene	0.00560	U *	0.0500	0.00560	mg/L		11/23/20 13:32	11/27/20 18:29	1
Butyl benzyl phthalate	0.00305	U	0.0500	0.00305	mg/L		11/23/20 13:32	11/27/20 18:29	1
3,3'-Dichlorobenzidine	0.00290	U	0.250	0.00290	mg/L		11/23/20 13:32	11/27/20 18:29	1
Bis(2-ethylhexyl) phthalate	0.00260	U	0.0500	0.00260	mg/L		11/23/20 13:32	11/27/20 18:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol	*36*		*12 - 130*	*11/23/20 13:32*	*11/27/20 18:29*	*1*
Nitrobenzene-d5	*46*		*44 - 130*	*11/23/20 13:32*	*11/27/20 18:29*	*1*
2-Fluorobiphenyl	*41*		*37 - 130*	*11/23/20 13:32*	*11/27/20 18:29*	*1*
2,4,6-Tribromophenol	*52*		*14 - 130*	*11/23/20 13:32*	*11/27/20 18:29*	*1*
Terphenyl-d14	*53*		*10 - 149*	*11/23/20 13:32*	*11/27/20 18:29*	*1*
Phenol-d5 (Surr)	*37*		*12 - 130*	*11/23/20 13:32*	*11/27/20 18:29*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	0.537	U	5.00	0.537	mg/L			11/23/20 13:38	1
2-Methoxyethanol	0.766	U	5.00	0.766	mg/L			11/23/20 13:38	1
Ethylene glycol	3.49	U	5.00	3.49	mg/L			11/23/20 13:44	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,4'-DDD	0.000308	U	0.00200	0.000308	mg/L		11/26/20 15:35	12/02/20 15:38	4
4,4'-DDE	0.000300	U	0.00200	0.000300	mg/L		11/26/20 15:35	12/02/20 15:38	4
4,4'-DDT	0.000592	U	0.00200	0.000592	mg/L		11/26/20 15:35	12/02/20 15:38	4
Chlordane (technical)	0.00560	U	0.0200	0.00560	mg/L		11/26/20 15:35	12/02/20 15:38	4
Dieldrin	0.000252	U	0.00200	0.000252	mg/L		11/26/20 15:35	12/02/20 15:38	4
Endosulfan I	0.000232	U	0.00200	0.000232	mg/L		11/26/20 15:35	12/02/20 15:38	4
Endrin	0.000316	U	0.00200	0.000316	mg/L		11/26/20 15:35	12/02/20 15:38	4
Lindane	0.000276	U	0.00200	0.000276	mg/L		11/26/20 15:35	12/02/20 15:38	4
trans-Chlordane	0.000364	U	0.00200	0.000364	mg/L		11/26/20 15:35	12/02/20 15:38	4
Heptachlor	0.000308	U	0.00200	0.000308	mg/L		11/26/20 15:35	12/02/20 15:38	4
Heptachlor epoxide	0.000300	U	0.00200	0.000300	mg/L		11/26/20 15:35	12/02/20 15:38	4
Methoxychlor	0.000520	U	0.00400	0.000520	mg/L		11/26/20 15:35	12/02/20 15:38	4
Mirex	0.000484	U	0.00200	0.000484	mg/L		11/26/20 15:35	12/02/20 15:38	4
Toxaphene	0.0147	U	0.0800	0.0147	mg/L		11/26/20 15:35	12/02/20 15:38	4

Client Sample ID: R2
Date Collected: 11/19/20 09:55
Date Received: 11/19/20 14:43

Lab Sample ID: 600-213937-2
Matrix: Solid

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl	84		34 - 122	11/26/20 15:35	12/02/20 15:38	4
Tetrachloro-m-xylene	78		28 - 115	11/26/20 15:35	12/02/20 15:38	4

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	0.00160	U *3	0.0167	0.00160	mg/Kg		11/23/20 10:04	11/27/20 19:13	1
PCB-1221	0.00862	U *3	0.0167	0.00862	mg/Kg		11/23/20 10:04	11/27/20 19:13	1
PCB-1232	0.00669	U *3	0.0167	0.00669	mg/Kg		11/23/20 10:04	11/27/20 19:13	1
PCB-1242	0.00124	U *3	0.0167	0.00124	mg/Kg		11/23/20 10:04	11/27/20 19:13	1
PCB-1248	0.00249	U *3	0.0167	0.00249	mg/Kg		11/23/20 10:04	11/27/20 19:13	1
PCB-1254	0.00221	U *3	0.0167	0.00221	mg/Kg		11/23/20 10:04	11/27/20 19:13	1
PCB-1260	0.0135	U *3	0.0167	0.0135	mg/Kg		11/23/20 10:04	11/27/20 19:13	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
Tetrachloro-m-xylene	62	*3	10 - 150	11/23/20 10:04	11/27/20 19:13	1
DCB Decachlorobiphenyl	45	*3	10 - 150	11/23/20 10:04	11/27/20 19:13	1

Method: 8151A - Herbicidas (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenoxyacetic acid	0.000200	U	0.00100	0.000200	mg/L		11/24/20 09:13	12/03/20 14:25	1
2,4,5-TP (Silvex)	0.000100	U *1	0.00100	0.000100	mg/L		11/24/20 09:13	12/03/20 14:25	1
Dinoseb	0.100	U	1.00	0.100	ug/L		11/24/20 09:13	12/03/20 14:25	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenylacetic acid	55		10 - 130	11/24/20 09:13	12/03/20 14:25	1

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	**13.0**		10.0	3.80	mg/Kg		11/20/20 07:50	11/20/20 21:06	1
>C12-C28	**41.7**		10.0	4.06	mg/Kg		11/20/20 07:50	11/20/20 21:06	1
>C28-C35	**57.4**		10.0	4.06	mg/Kg		11/20/20 07:50	11/20/20 21:06	1
C6-C35	**112**		10.0	3.80	mg/Kg		11/20/20 07:50	11/20/20 21:06	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	98		70 - 130	11/20/20 07:50	11/20/20 21:06	1

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0393	U	0.500	0.0393	mg/L		11/23/20 10:56	11/24/20 10:50	1
Arsenic	**0.0470**	**J**	0.100	0.0466	mg/L		11/23/20 10:56	11/24/20 10:50	1
Barium	**2.07**		0.200	0.0162	mg/L		11/23/20 10:56	11/24/20 10:50	1
Beryllium	0.00420	U	0.0500	0.00420	mg/L		11/23/20 10:56	11/24/20 10:50	1
Cadmium	0.0111	U	0.0500	0.0111	mg/L		11/23/20 10:56	11/24/20 10:50	1
Chromium	0.0159	U	0.100	0.0159	mg/L		11/23/20 10:56	11/24/20 10:50	1
Lead	**0.0280**	**J**	0.100	0.0219	mg/L		11/23/20 10:56	11/24/20 10:50	1
Nickel	**0.0600**	**J**	0.100	0.00800	mg/L		11/23/20 10:56	11/24/20 10:50	1
Selenium	0.0589	U	0.400	0.0589	mg/L		11/23/20 10:56	11/24/20 10:50	1
Silver	0.0129	U	0.100	0.0129	mg/L		11/23/20 10:56	11/24/20 10:50	1
Vanadium Pentoxide	0.0303	U	0.180	0.0303	mg/L		11/23/20 10:56	11/24/20 10:50	1

Client: Tetra Tech, Inc. Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Client Sample ID: R2 — Lab Sample ID: 600-213937-2

Date Collected: 11/19/20 09:55 **Matrix: Solid**
Date Received: 11/19/20 14:43

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000103	U	0.000250	0.000103	mg/L		11/25/20 08:29	11/25/20 11:56	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Reactive	0.0826	U	0.242	0.0826	mg/Kg		11/30/20 09:56	11/30/20 20:06	1
Sulfide	**204**		10.0	5.64	mg/Kg		11/23/20 14:45	11/23/20 14:48	1
Sulfide, Reactive	13.5	U	48.3	13.5	mg/Kg		11/30/20 09:56	12/01/20 18:35	1
pH	**8.6**		0.01	0.01	SU			11/25/20 13:00	1

Client Sample ID: R3 — Lab Sample ID: 600-213937-3

Date Collected: 11/19/20 10:00 **Matrix: Solid**
Date Received: 11/19/20 14:43

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dichlorodifluoromethane	0.000760	U	0.00500	0.000760	mg/L			11/24/20 15:57	1
Vinyl chloride	0.000850	U *	0.00500	0.000850	mg/L			11/24/20 15:57	1
Bromomethane	0.00215	U *	0.0100	0.00215	mg/L			11/24/20 15:57	1
Trichlorofluoromethane	0.00123	U *	0.0100	0.00123	mg/L			11/24/20 15:57	1
1,1-Dichlorethylene	0.000760	U	0.00500	0.000760	mg/L			11/24/20 15:57	1
Carbon disulfide	0.00170	U	0.0100	0.00170	mg/L			11/24/20 15:57	1
Acetonitrile	0.00197	U *1	0.0500	0.00197	mg/L			11/24/20 15:57	1
Methylene Chloride	0.00143	U	0.0100	0.00143	mg/L			11/24/20 15:57	1
Acrylonitrile	0.00509	U	0.0500	0.00509	mg/L			11/24/20 15:57	1
Methyl Ethyl Ketone (2-Butanone)	0.00157	U	0.0100	0.00157	mg/L			11/24/20 15:57	1
Methacrylonitrile	0.00122	U	0.0500	0.00122	mg/L			11/24/20 15:57	1
Carbon tetrachloride	0.000920	U *	0.00500	0.000920	mg/L			11/24/20 15:57	1
Benzene	0.000560	U	0.00500	0.000560	mg/L			11/24/20 15:57	1
1,2-Dichloroethane	0.00101	U	0.00500	0.00101	mg/L			11/24/20 15:57	1
Trichloroethylene	0.00158	U	0.00500	0.00158	mg/L			11/24/20 15:57	1
1,1,1-Trichloroethane	0.000980	U	0.00500	0.000980	mg/L			11/24/20 15:57	1
1,4-Dioxane	0.135	U	0.250	0.135	mg/L			11/24/20 15:57	1
Chloroform	0.000820	U	0.0100	0.000820	mg/L			11/24/20 15:57	1
Bromodichloromethane	0.000760	U	0.00500	0.000760	mg/L			11/24/20 15:57	1
cis-1,3-Dichloropropene	0.000970	U	0.00500	0.000970	mg/L			11/24/20 15:57	1
Methyl isobutyl ketone (MIBK)	0.00111	U	0.0100	0.00111	mg/L			11/24/20 15:57	1
Toluene	0.000550	U	0.00500	0.000550	mg/L			11/24/20 15:57	1
trans-1,3-Dichloropropene	0.000590	U	0.00500	0.000590	mg/L			11/24/20 15:57	1
1,1,2-Trichloroethane	0.000530	U	0.00500	0.000530	mg/L			11/24/20 15:57	1
Tetrachloroethylene	0.00124	U	0.00500	0.00124	mg/L			11/24/20 15:57	1
1,3-Dichloropropene, Total	0.000690	U	0.00500	0.000690	mg/L			11/24/20 15:57	1
Ethylene Dibromide	0.000850	U	0.00500	0.000850	mg/L			11/24/20 15:57	1
Chlorobenzene	0.000820	U	0.00500	0.000820	mg/L			11/24/20 15:57	1
1,1,1,2-Tetrachloroethane	0.000940	U	0.00500	0.000940	mg/L			11/24/20 15:57	1
Ethylbenzene	0.00129	U	0.00500	0.00129	mg/L			11/24/20 15:57	1
m-Xylene & p-Xylene	0.00126	U	0.00500	0.00126	mg/L			11/24/20 15:57	1
Xylenes, Total	0.00198	U	0.00500	0.00198	mg/L			11/24/20 15:57	1
o-Xylene	0.000930	U	0.00500	0.000930	mg/L			11/24/20 15:57	1
Styrene	0.000560	U	0.00500	0.000560	mg/L			11/24/20 15:57	1
Tribromomethane	0.000770	U *	0.00500	0.000770	mg/L			11/24/20 15:57	1

Client Sample ID: R3 **Lab Sample ID: 600-213937-3**
Date Collected: 11/19/20 10:00 **Matrix: Solid**
Date Received: 11/19/20 14:43

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
1,2,3-Trichloropropane	0.00116	U	0.00500	0.00116	mg/L			11/24/20 15:57	1
1,1,2,2-Tetrachloroethane	0.000800	U	0.00500	0.000800	mg/L			11/24/20 15:57	1
Isobutyl alcohol	0.0168	U	0.125	0.0168	mg/L			11/24/20 15:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*105*		*50 - 134*		*11/24/20 15:57*	*1*
Dibromofluoromethane	*104*		*62 - 130*		*11/24/20 15:57*	*1*
Toluene-d8 (Surr)	*99*		*70 - 130*		*11/24/20 15:57*	*1*
4-Bromofluorobenzene	*103*		*67 - 139*		*11/24/20 15:57*	*1*

Method: 8260B - Volatile Organic Compounds (GC/MS) - TCLP - DL

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	**10.5**		1.00	0.227	mg/L			11/27/20 18:01	100

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
1,2-Dichloroethane-d4 (Surr)	*107*		*50 - 134*		*11/27/20 18:01*	*100*
Dibromofluoromethane	*106*		*62 - 130*		*11/27/20 18:01*	*100*
Toluene-d8 (Surr)	*96*		*70 - 130*		*11/27/20 18:01*	*100*
4-Bromofluorobenzene	*89*		*67 - 139*		*11/27/20 18:01*	*100*

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Pyridine	0.00520	U	0.0500	0.00520	mg/L		11/23/20 13:32	11/27/20 18:53	1
N-Nitrosomethylethylamine	0.0112	U *	0.0500	0.0112	mg/L		11/23/20 13:32	11/27/20 18:53	1
Acrylamide	0.173	U *	2.50	0.173	mg/L		11/23/20 13:32	11/27/20 18:53	1
Aniline	0.00810	U *	0.0500	0.00810	mg/L		11/23/20 13:32	11/27/20 18:53	1
Phenol	0.00475	U *	0.0500	0.00475	mg/L		11/23/20 13:32	11/27/20 18:53	1
Bis(2-chloroethyl)ether	0.00595	U *	0.0500	0.00595	mg/L		11/23/20 13:32	11/27/20 18:53	1
2-Chlorophenol	0.00335	U *	0.0500	0.00335	mg/L		11/23/20 13:32	11/27/20 18:53	1
1,4-Dichlorobenzene	0.00630	U *	0.0500	0.00630	mg/L		11/23/20 13:32	11/27/20 18:53	1
o-Cresol	0.00505	U *	0.0500	0.00505	mg/L		11/23/20 13:32	11/27/20 18:53	1
m & p - Cresol	0.00940	U *	0.100	0.00940	mg/L		11/23/20 13:32	11/27/20 18:53	1
N-Nitrosodi-n-propylamine	0.00330	U *	0.0500	0.00330	mg/L		11/23/20 13:32	11/27/20 18:53	1
Hexachloroethane	0.00580	U *	0.0500	0.00580	mg/L		11/23/20 13:32	11/27/20 18:53	1
N-Nitrosopyrrolidine	0.00650	U *	0.0500	0.00650	mg/L		11/23/20 13:32	11/27/20 18:53	1
Acetophenone	0.00510	U *	0.0500	0.00510	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,6-Dimethylphenol	0.00515	U	0.0500	0.00515	mg/L		11/23/20 13:32	11/27/20 18:53	1
Nitrobenzene	0.00590	U *	0.0500	0.00590	mg/L		11/23/20 13:32	11/27/20 18:53	1
Isophorone	0.00365	U *	0.0500	0.00365	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,4-Dimethylphenol	0.00670	U *	0.0500	0.00670	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,4-Dichlorophenol	0.00770	U *	0.0500	0.00770	mg/L		11/23/20 13:32	11/27/20 18:53	1
1,2,4-Trichlorobenzene	0.00570	U *	0.0500	0.00570	mg/L		11/23/20 13:32	11/27/20 18:53	1
Hexachloro-1,3-butadiene	0.00555	U *	0.0500	0.00555	mg/L		11/23/20 13:32	11/27/20 18:53	1
p-Phenylene diamine	0.0500	U *	0.500	0.0500	mg/L		11/23/20 13:32	11/27/20 18:53	1
N-Nitrosodi-n-butylamine	0.00775	U *	0.0500	0.00775	mg/L		11/23/20 13:32	11/27/20 18:53	1
p-Chloro-m-cresol	0.00410	U *	0.0500	0.00410	mg/L		11/23/20 13:32	11/27/20 18:53	1
Hexachlorocyclopentadiene	0.00290	U	0.250	0.00290	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,4,6-Trichlorophenol	0.00460	U *	0.0500	0.00460	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,4,5-Trichlorophenol	0.00630	U *	0.0500	0.00630	mg/L		11/23/20 13:32	11/27/20 18:53	1
m-Dinitrobenzene	0.0174	U *	0.100	0.0174	mg/L		11/23/20 13:32	11/27/20 18:53	1

Client Sample ID: R3 **Lab Sample ID: 600-213937-3**
Date Collected: 11/19/20 10:00 **Matrix: Solid**
Date Received: 11/19/20 14:43

Method: 8270C - Semivolatile Organic Compounds (GC/MS) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,6-Dinitrotoluene	0.00320	U *	0.0500	0.00320	mg/L		11/23/20 13:32	11/27/20 18:53	1
Acenaphthene	0.00265	U *	0.0500	0.00265	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,4-Dinitrophenol	0.00445	U *	0.250	0.00445	mg/L		11/23/20 13:32	11/27/20 18:53	1
Pentachlorobenzene	0.00340	U *	0.0500	0.00340	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,4-Dinitrotoluene	0.00475	U *	0.0500	0.00475	mg/L		11/23/20 13:32	11/27/20 18:53	1
Diethyl phthalate	0.00570	U *	0.0500	0.00570	mg/L		11/23/20 13:32	11/27/20 18:53	1
2,3,4,6-Tetrachlorophenol	0.00415	U *	0.0500	0.00415	mg/L		11/23/20 13:32	11/27/20 18:53	1
Fluorene	0.00710	U	0.0500	0.00710	mg/L		11/23/20 13:32	11/27/20 18:53	1
Diphenylamine	0.00565	U *	0.0500	0.00565	mg/L		11/23/20 13:32	11/27/20 18:53	1
N-Nitrosodiphenylamine	0.00515	U *	0.100	0.00515	mg/L		11/23/20 13:32	11/27/20 18:53	1
1,2-Diphenylhydrazine (as Azobenzene)	0.0500	U *	0.0500	0.0500	mg/L		11/23/20 13:32	11/27/20 18:53	1
Hexachlorobenzene	0.00450	U *	0.0500	0.00450	mg/L		11/23/20 13:32	11/27/20 18:53	1
Pentachlorophenol	0.00445	U *	0.250	0.00445	mg/L		11/23/20 13:32	11/27/20 18:53	1
Disulfoton	0.00375	U *	0.0500	0.00375	mg/L		11/23/20 13:32	11/27/20 18:53	1
Anthracene	0.00335	U *	0.0500	0.00335	mg/L		11/23/20 13:32	11/27/20 18:53	1
Pronamide	0.00315	U *	0.0500	0.00315	mg/L		11/23/20 13:32	11/27/20 18:53	1
Pentachloronitrobenzene	0.0129	U	0.0500	0.0129	mg/L		11/23/20 13:32	11/27/20 18:53	1
Dibutylphthalate	0.00520	U *	0.0500	0.00520	mg/L		11/23/20 13:32	11/27/20 18:53	1
Fluoranthene	0.00260	U	0.0500	0.00260	mg/L		11/23/20 13:32	11/27/20 18:53	1
Benzidine	0.00305	U	0.250	0.00305	mg/L		11/23/20 13:32	11/27/20 18:53	1
Pyrene	0.00560	U *	0.0500	0.00560	mg/L		11/23/20 13:32	11/27/20 18:53	1
Butyl benzyl phthalate	0.00305	U	0.0500	0.00305	mg/L		11/23/20 13:32	11/27/20 18:53	1
3,3'-Dichlorobenzidine	0.00290	U	0.250	0.00290	mg/L		11/23/20 13:32	11/27/20 18:53	1
Bis(2-ethylhexyl) phthalate	**0.0201**	**J B**	0.0500	0.00260	mg/L		11/23/20 13:32	11/27/20 18:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2-Fluorophenol	*37*		*12 - 130*	*11/23/20 13:32*	*11/27/20 18:53*	*1*
Nitrobenzene-d5	*49*		*44 - 130*	*11/23/20 13:32*	*11/27/20 18:53*	*1*
2-Fluorobiphenyl	*45*		*37 - 130*	*11/23/20 13:32*	*11/27/20 18:53*	*1*
2,4,6-Tribromophenol	*49*		*14 - 130*	*11/23/20 13:32*	*11/27/20 18:53*	*1*
Terphenyl-d14	*54*		*10 - 149*	*11/23/20 13:32*	*11/27/20 18:53*	*1*
Phenol-d5 (Surr)	*38*		*12 - 130*	*11/23/20 13:32*	*11/27/20 18:53*	*1*

Method: 8015B - Nonhalogenated Organic Compounds - Direct Injection (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2-Ethoxyethanol	0.537	U	5.00	0.537	mg/L			11/23/20 13:51	1
2-Methoxyethanol	0.766	U	5.00	0.766	mg/L			11/23/20 13:51	1
Ethylene glycol	3.49	U	5.00	3.49	mg/L			11/23/20 13:58	1

Method: 8081A - Organochlorine Pesticides (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
4,4'-DDD	0.0000770	U	0.000500	0.0000770	mg/L		11/26/20 15:35	12/02/20 15:56	1
4,4'-DDE	0.0000750	U	0.000500	0.0000750	mg/L		11/26/20 15:35	12/02/20 15:56	1
4,4'-DDT	0.000148	U	0.000500	0.000148	mg/L		11/26/20 15:35	12/02/20 15:56	1
Chlordane (technical)	0.00140	U	0.00500	0.00140	mg/L		11/26/20 15:35	12/02/20 15:56	1
Dieldrin	0.0000630	U	0.000500	0.0000630	mg/L		11/26/20 15:35	12/02/20 15:56	1
Endosulfan I	0.0000580	U	0.000500	0.0000580	mg/L		11/26/20 15:35	12/02/20 15:56	1
Endrin	0.0000790	U	0.000500	0.0000790	mg/L		11/26/20 15:35	12/02/20 15:56	1
Lindane	0.0000690	U	0.000500	0.0000690	mg/L		11/26/20 15:35	12/02/20 15:56	1

Client Sample ID: R3
Date Collected: 11/19/20 10:00
Date Received: 11/19/20 14:43

Lab Sample ID: 600-213937-3
Matrix: Solid

Method: 8081A - Organochlorine Pesticides (GC) - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
trans-Chlordane	0.0000910	U	0.000500	0.0000910	mg/L		11/26/20 15:35	12/02/20 15:56	1
Heptachlor	0.0000770	U	0.000500	0.0000770	mg/L		11/26/20 15:35	12/02/20 15:56	1
Heptachlor epoxide	0.0000750	U	0.000500	0.0000750	mg/L		11/26/20 15:35	12/02/20 15:56	1
Methoxychlor	0.000130	U	0.00100	0.000130	mg/L		11/26/20 15:35	12/02/20 15:56	1
Mirex	0.000121	U	0.000500	0.000121	mg/L		11/26/20 15:35	12/02/20 15:56	1
Toxaphene	0.00367	U	0.0200	0.00367	mg/L		11/26/20 15:35	12/02/20 15:56	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
DCB Decachlorobiphenyl	*63*		*34 - 122*	*11/26/20 15:35*	*12/02/20 15:56*	*1*
Tetrachloro-m-xylene	*63*		*28 - 115*	*11/26/20 15:35*	*12/02/20 15:56*	*1*

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

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	0.00160	U	0.0167	0.00160	mg/Kg		11/23/20 13:08	11/27/20 20:03	1
PCB-1221	0.00861	U	0.0167	0.00861	mg/Kg		11/23/20 13:08	11/27/20 20:03	1
PCB-1232	0.00669	U	0.0167	0.00669	mg/Kg		11/23/20 13:08	11/27/20 20:03	1
PCB-1242	0.00124	U	0.0167	0.00124	mg/Kg		11/23/20 13:08	11/27/20 20:03	1
PCB-1248	0.00249	U	0.0167	0.00249	mg/Kg		11/23/20 13:08	11/27/20 20:03	1
PCB-1254	0.00221	U	0.0167	0.00221	mg/Kg		11/23/20 13:08	11/27/20 20:03	1
PCB-1260	0.0135	U	0.0167	0.0135	mg/Kg		11/23/20 13:08	11/27/20 20:03	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Tetrachloro-m-xylene	*1044*	*X*	*10 - 150*	*11/23/20 13:08*	*11/27/20 20:03*	*1*
DCB Decachlorobiphenyl	*48*		*10 - 150*	*11/23/20 13:08*	*11/27/20 20:03*	*1*

Method: 8151A - Herbicidas (GC) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dichlorophenoxyacetic acid	0.000200	U	0.00100	0.000200	mg/L		11/24/20 09:13	12/03/20 14:50	1
2,4,5-TP (Silvex)	0.000100	U *1	0.00100	0.000100	mg/L		11/24/20 09:13	12/03/20 14:50	1
Dinoseb	0.100	U	1.00	0.100	ug/L		11/24/20 09:13	12/03/20 14:50	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4-Dichlorophenylacetic acid	*47*		*10 - 130*	*11/24/20 09:13*	*12/03/20 14:50*	*1*

Method: TX 1005 - Texas - Total Petroleum Hydrocarbon (GC)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
C6-C12	3.78	U	9.95	3.78	mg/Kg		11/20/20 07:50	11/20/20 16:44	1
>C12-C28	4.04	U	9.95	4.04	mg/Kg		11/20/20 07:50	11/20/20 16:44	1
>C28-C35	4.04	U	9.95	4.04	mg/Kg		11/20/20 07:50	11/20/20 16:44	1
C6-C35	3.78	U	9.95	3.78	mg/Kg		11/20/20 07:50	11/20/20 16:44	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
o-Terphenyl	*83*		*70 - 130*	*11/20/20 07:50*	*11/20/20 16:44*	*1*

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Antimony	0.0393	U	0.500	0.0393	mg/L		11/23/20 10:56	11/24/20 10:52	1
Arsenic	0.0466	U	0.100	0.0466	mg/L		11/23/20 10:56	11/24/20 10:52	1
Barium	**2.37**		0.200	0.0162	mg/L		11/23/20 10:56	11/24/20 10:52	1
Beryllium	0.00420	U	0.0500	0.00420	mg/L		11/23/20 10:56	11/24/20 10:52	1
Cadmium	0.0111	U	0.0500	0.0111	mg/L		11/23/20 10:56	11/24/20 10:52	1

Client: Tetra Tech, Inc.
Job ID: 600-213937-1
Project/Site: Closed Municipal Solid Waste Landfill 11-19-20

Client Sample ID: R3
Lab Sample ID: 600-213937-3
Date Collected: 11/19/20 10:00
Matrix: Solid
Date Received: 11/19/20 14:43

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry - TCLP (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	0.0159	U	0.100	0.0159	mg/L		11/23/20 10:56	11/24/20 10:52	1
Lead	0.0219	U	0.100	0.0219	mg/L		11/23/20 10:56	11/24/20 10:52	1
Nickel	0.00800	U	0.100	0.00800	mg/L		11/23/20 10:56	11/24/20 10:52	1
Selenium	0.0589	U	0.400	0.0589	mg/L		11/23/20 10:56	11/24/20 10:52	1
Silver	0.0129	U	0.100	0.0129	mg/L		11/23/20 10:56	11/24/20 10:52	1
Vanadium Pentoxide	0.0303	U	0.180	0.0303	mg/L		11/23/20 10:56	11/24/20 10:52	1

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.000103	U	0.000250	0.000103	mg/L		11/25/20 08:29	11/25/20 11:59	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Reactive	0.0846	U	0.247	0.0846	mg/Kg		11/30/20 09:56	11/30/20 20:07	1
Sulfide	5.62	U	9.98	5.62	mg/Kg		11/23/20 14:45	11/23/20 14:48	1
Sulfide, Reactive	13.8	U	49.5	13.8	mg/Kg		11/30/20 09:56	12/01/20 18:35	1
pH	9.2		0.01	0.01	SU			11/25/20 13:00	1

Qualifiers

GC/MS VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
*1	LCS/LCSD RPD exceeds control limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
E	Result exceeded calibration range.
F1	MS and/or MSD recovery exceeds control limits.
F2	MS/MSD RPD exceeds control limits
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

GC/MS Semi VOA

Qualifier	Qualifier Description
*	LCS or LCSD is outside acceptance limits.
*1	LCS/LCSD RPD exceeds control limits.
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.
X	Surrogate recovery exceeds control limits

GC VOA

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

GC Semi VOA

Qualifier	Qualifier Description
*1	LCS/LCSD RPD exceeds control limits.
*3	ISTD response or retention time outside acceptable limits.
E	Result exceeded calibration range.
F1	MS and/or MSD recovery exceeds control limits.
F2	MS/MSD RPD exceeds control limits
U	Indicates the analyte was analyzed for but not detected.
X	Surrogate recovery exceeds control limits

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)

Glossary (Continued)

Abbreviation	These commonly used abbreviations may or may not be present in this report.
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

eurofins | Environment Testing America

ANALYTICAL REPORT

Eurofins TestAmerica, Houston
6310 Rothway Street
Houston, TX 77040
Tel: (713)690-4444

Laboratory Job ID: 600-213939-1
Client Project/Site: Ruffino Landfill Leachate 11-19-20

For:
Tetra Tech, Inc.
1500 CityWest Boulevard
Houston, Texas 77042

Attn: Jim Norstrom

Dean A. Joiner

Authorized for release by:
12/7/2020 5:26:36 PM

Dean Joiner, Project Manager II
(713)690-4444
[redacted]

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Case Narrative

Client: Tetra Tech, Inc. Job ID: 600-213939-1
Project/Site: Ruffino Landfill Leachate 11-19-20

Job ID: 600-213939-1

Laboratory: Eurofins TestAmerica, Houston

Narrative

Job Narrative
600-213939-1

Comments
No additional comments.

Receipt
The sample was received on 11/19/2020 2:43 PM; the sample arrived in good condition, and where required, properly preserved and on ice. The temperature of the cooler at receipt was 5.9º C.

Receipt Exceptions

The following sample was received at the laboratory without a sample collection time documented on the chain of custody: W-1 (600-213939-1). The sample was logged in with information from the container label and the client was contacted for confirmation.

Metals
Methods 200.7, 3010A: The following samples for metals were received unpreserved and were preserved upon receipt to the laboratory: W-1 (600-213939-1). Regulatory documents require a 24-hour waiting period from the time of the addition of the acid preservative to the time of digestion.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

General Chemistry
Method 350.1: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 600-307848 and analytical batch 600-307849 were outside control limits. Sample matrix interference is suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method 350.1: The matrix spike / matrix spike duplicate (MS/MSD) precision for preparation batch 600-307848 and analytical batch 600-307849 was outside control limits. Sample matrix interference is suspected.

Method 350.1: The matrix spike / matrix spike duplicate (MS/MSD) precision for preparation batch 600-307848 and analytical batch 600-307849 was outside control limits. Sample matrix interference is suspected.

Method Distill/Phenol: Sample matrix required initial dilution

W-1 (600-213939-1)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method 1664B: The reference method requires samples to be preserved to a pH of <pH 2. The following sample was received with insufficient preservation at a pH of <pH_5: W-1 (600-213939-1). The sample was preserved to the appropriate pH in the laboratory.

Method 1664B: Aluminum pans have oil residue.

W-1 (600-213939-1)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Method Summary

Client: Tetra Tech, Inc.
Job ID: 600-213939-1
Project/Site: Ruffino Landfill Leachate 11-19-20

Method	Method Description	Protocol	Laboratory
6010B	Inductively Coupled Plasma - Atomic Emission Spectrometry	SW846	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)	SW846	TAL HOU
160.4	Solids, Volatile Suspended (VSS)	EPA	TAL HOU
1664B	HEM and SGT-HEM	1664B	TAL HOU
2320B-1997	Alkalinity, Total - SM Online, 2011	SM-Online	TAL HOU
2540 C-1997	Total Dissolved Solids (Dried at 180 °C)	SM	TAL HOU
2540 D-1997	Solids, Total Suspended (TSS) - SM Online, 2011	SM-Online	TAL HOU
335.4	Cyanide, Total (Semi-Automated Colorimetry)	MCAWW	TAL HOU
350.1	Nitrogen, Ammonia	MCAWW	TAL HOU
420.4	Phenolics (Total Recoverable, Colorimetric, Semi-Automated, with Distillation)	MCAWW	TAL HOU
8000	Chemical Oxygen Demand (COD) Colorimetric	Hach	TAL HOU
9040B	pH	SW846	TAL HOU
OIA - 1677	Available Cyanide by Flow Injection, Lig	EPA	TAL PIT
SM 5210B	BOD, 5-Day	SM	TAL HOU
SM4500 P E-1999	Phosphorus	SM	TAL HOU
1664B	HEM and SGT-HEM (Aqueous)	1664B	TAL HOU
3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals	SW846	TAL HOU
350.1	Distillation, Ammonia	EPA	TAL HOU
7470A	Mercury in Liquid Waste (Manual Cold Vapor Technique)/Preparation	SW846	TAL HOU
Distill/CN	Distillation, Cyanide	None	TAL HOU
Distill/Phenol	Distillation, Phenolics	None	TAL HOU
SM 4500 P B	Sample Preparation for Total and Ortho Phosphorus	SM	TAL HOU

Protocol References:

1664B = EPA-821-98-002
EPA = US Environmental Protection Agency
Hach = Hach Company
MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.
None = None
SM = "Standard Methods For The Examination Of Water And Wastewater"
SM-Online = Standard Methods Online
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL HOU = Eurofins TestAmerica, Houston, 6310 Rothway Street, Houston, TX 77040, TEL (713)690-4444
TAL PIT = Eurofins TestAmerica, Pittsburgh, 301 Alpha Drive, RIDC Park, Pittsburgh, PA 15238, TEL (412)963-7058

Sample Summary

Client: Tetra Tech, Inc.
Project/Site: Ruffino Landfill Leachate 11-19-20

Job ID: 600-213939-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
600-213939-1	W-1	Water	11/19/20 11:00	11/19/20 14:43	

Client Sample Results

Client: Tetra Tech, Inc.
Job ID: 600-213939-1
Project/Site: Ruffino Landfill Leachate 11-19-20

Client Sample ID: W-1
Lab Sample ID: 600-213939-1
Date Collected: 11/19/20 11:00
Matrix: Water
Date Received: 11/19/20 14:43

Method: 6010B - Inductively Coupled Plasma - Atomic Emission Spectrometry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	0.0821		0.0100	0.00466	mg/L		11/24/20 06:05	11/24/20 14:14	1
Boron	0.517		0.200	0.0191	mg/L		11/24/20 06:05	11/24/20 14:14	1
Cadmium	0.00111	U	0.00500	0.00111	mg/L		11/24/20 06:05	11/24/20 14:14	1
Chromium	0.125		0.0100	0.00159	mg/L		11/24/20 06:05	11/24/20 14:14	1
Copper	0.0930		0.0100	0.00813	mg/L		11/24/20 06:05	11/24/20 14:14	1
Lead	0.130		0.0100	0.00219	mg/L		11/24/20 06:05	11/24/20 14:14	1
Molybdenum	0.00710	J	0.0100	0.00158	mg/L		11/24/20 06:05	11/24/20 14:14	1
Nickel	0.183		0.0100	0.000800	mg/L		11/24/20 06:05	11/24/20 14:14	1
Selenium	0.00589	U	0.0400	0.00589	mg/L		11/24/20 06:05	11/24/20 14:14	1
Silver	0.00129	U	0.0100	0.00129	mg/L		11/24/20 06:05	11/24/20 14:14	1
Zinc	0.410		0.0300	0.00400	mg/L		11/24/20 06:05	11/24/20 14:14	1

Method: 7470A - Mercury in Liquid Waste (Manual Cold Vapor Technique)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.103	U	0.250	0.103	ug/L		11/25/20 08:29	11/25/20 12:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Volatile Suspended Solids	19300		1000	1000	mg/L			11/20/20 13:58	1
HEM (Oil & Grease)	2.1	J	3.1	1.0	mg/L		12/02/20 09:16	12/02/20 09:42	1
SGT-HEM (Oil and Grease - Nonpolar)	1.3	J	3.1	1.0	mg/L		12/02/20 09:16	12/02/20 09:42	1
Alkalinity	753		20.0	20.0	mg/L			11/30/20 18:25	1
Bicarbonate Alkalinity as CaCO3	753		20.0	20.0	mg/L			11/30/20 18:25	1
Carbonate Alkalinity as CaCO3	20.0	U	20.0	20.0	mg/L			11/30/20 18:25	1
Total Dissolved Solids	15100		1000	1000	mg/L			11/23/20 01:51	1
Total Suspended Solids	422000		1000	1000	mg/L			11/20/20 13:58	1
Cyanide, Total	30.8	U	100	30.8	ug/L		11/25/20 14:17	11/25/20 16:30	1
Ammonia	2.86		0.200	0.0675	mg/L		11/28/20 17:49	11/28/20 20:29	1
Phenols, Total	53.1		50.0	27.6	ug/L		12/01/20 14:44	12/01/20 19:24	1
Chemical Oxygen Demand	66.3		10.0	2.46	mg/L			11/20/20 14:12	1
pH	7.1	HF	0.01	0.01	SU			12/02/20 10:59	1
Cyanide, Available	0.00151	J	0.00200	0.00149	mg/L			11/27/20 09:21	1
Biochemical Oxygen Demand	50.0	U	50.0	50.0	mg/L			11/19/20 11:00	1
Phosphorus as P	604		50.0	21.0	mg/L		12/01/20 12:00	12/04/20 11:21	1000
Phosphorus as PO4	1850		154	64.6	mg/L		12/01/20 12:00	12/04/20 11:21	1000

Definitions/Glossary

Client: Tetra Tech, Inc. Job ID: 600-213939-1
Project/Site: Ruffino Landfill Leachate 11-19-20

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

General Chemistry

Qualifier	Qualifier Description
F3	Duplicate RPD exceeds the control limit
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
U	Indicates the analyte was analyzed for but not detected.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

APPENDIX E SAFETY PLAN FOR TEST PIT INVESTIGATIONS

Safety Plan

Field Investigations

City of West University Landfill – Permit 1250
City of Bellaire Landfill – Permit 1238

Tt Project No. 197-2020-0072

TETRA TECH

PRESENTED TO

TCEQ Waste Permits Division
MSW Permits Section MC-124
12100 Park 35 Circle, Austin, TX 78753

ON BEHALF OF

City of Houston
Jones | Carter

PRESENTED BY

Tetra Tech
1500 CityWest Boulevard, Houston, TX 77042
936-202-0746

July 2021

www.tetratech.com

TETRA TECH Safety Excellence	**GEOTECHNICAL INVESTIGATION – RECONNAISSANCE & GEOLOGIC MAPPING**	**GTG SWP#1** **Date: 10-14-14**

Tetra Tech BAS Geotechnical Group (GTG) workers and sub-contractors will conduct themselves in a professional manner and strive to work productively and safely. The following site safe work practices provides a basic structure for anticipated site activities. See also other safe work practices (SWPs) and activity hazard analyses (AHASs) developed for various site activities and anticipated potential site hazards.

SAFE WORK PROCEDURES

1. Employees must be instructed or trained on site health and Safety Plan (HASP), job hazards and safety measures.
2. Maintain good personal hygiene – wash hands before eating, drinking or smoking.
3. Only qualified employees should operate equipment.
4. New or inexperienced employees should be given operational and safety instructions before starting work and have periodic supervision to ensure proper safe work practices are followed.
5. Wear safety glasses to protect eyes when conducting operations which involve striking objects or exposure to projectiles.
6. Wear appropriate personal protective equipment for the operation being conducted.
7. Reflective safety vests should be worn on site if vehicle traffic hazards are anticipated.
8. No employee will be positioned in the path of a moving vehicle. The driver must maintain constant visual contact with the other worker. The driver will stop the vehicle if visual contact of the other worker is lost.
9. Make sure that everyone understands the work to be conducted and how to do it safely.
10. To the extent practicable, contact with contaminated or suspected contaminated soil should be avoided.
11. Tailgate Safety Meetings detailing specific hazards of the work to be performed and safety precautions and procedures specific for the job will be conducted by a qualified person on a regular basis, as determined by the nature of the work (weekly for routine operations, daily for potentially hazardous operations) or as determined by the Supervisor.
12. Workers are encouraged to report to Supervisor uncontrolled hazards, unusual conditions or other safety concerns.

ACTIVITY HAZARD ANALYSIS

Activity:	Geotechnical Investigation	Analyzed By:	Doug Bell
AHA GTG-1	Reconnaissance & Geologic Mapping	Date:	10-14-14

Principal Steps	Potential Safety and Health Hazards	Recommended Controls
Identify the principal steps involved and the sequence of work activities	*Analyze each principal step for potential hazards*	*Develop Specific Control for Potential Hazard*
1. Field Reconnaissance: Walking the proposed test pit locations to evaluate site access and equipment requirements 2. Geologic Mapping: Walking of the water transmission pipeline alignment in order to assess geologic and topographic conditions. Recording of geologic data into field books and maps, and photographing of geologic, hydrologic and topographic features 3. Geophysical Surveys: Set up geophone array. Run various survey equipment over land surface.	1. Slip, Trip, Fall 2. Heat Stress.	1. Wear Level D PPE 2. Carry cell phone 3. Carry plenty of water 4. Access to first aid kit

Equipment to be Used	Inspection Requirements	Training Requirements
List Equipment to be used in the work activity	*List inspection requirements for the work activity*	*List training requirements, including hazard communication*
1. Field maps, field book, GPS	1. None	1. General knowledge of safe geologic mapping procedures. 2. General PPE requirements. 3. Site Health & Safety Plan (HASP). 4. Selected workers are first aid and fire extinguisher trained.

TETRA TECH Safety Excellence	**GEOTECHNICAL INVESTIGATION – EXPLORATION TEST PITS**	**GTG SWP#2** **Date: 10-14-14**

After the geotechnical investigation reconnaissance and mapping phase has been completed, the test pit exploration phase can begin. The geologist or engineer will direct the contractor to the test pit location and describe parameters such as depth and soil sampling objectives. The following describes safe work practices to be followed during drilling operations. See also AHA GTG-2.

SAFE WORK PROCEDURES

1. Inspect equipment daily before operations begin.
2. Prepare area for test pit operations: position excavator, deploy outriggers. Maintain safety zone around drilling operation to keep unauthorized persons away.
3. Excavate into soil and bring cuttings to surface.
4. Note that soil may be contaminated (see SWP#3). Avoid contact with soil and conduct periodic air monitoring if contamination is suspected.
5. Collect samples and complete logs following standard geologic mapping procedures.

ACTIVITY HAZARD ANALYSIS

Activity:	Geotechnical Investigation	Analyzed By:	Doug Bell
AHA GTG-2	Exploration Test Pits	Date:	10-14-14

Principal Steps	**Potential Safety and Health Hazards**	**Recommended Controls**
Identify the principal steps involved and the sequence of work activities	*Analyze each principal step for potential hazards*	*Develop Specific Control for Potential Hazard*
1. Precision Sampling will excavate 8 test pits to 10 ft depth. 2. Test pits may be excavated at some locations in lieu of borings.	1. Slip, Trip Fall 2. Heat Stress 3. Moving parts of drill rig 4. Leaking oil from drilling rig 5. Potential Sub-surface Soil Contaminants: gasoline, diesel fuel, crude oil, creosote (see GTG SWP#3)	1. Carry cell phone 2. Carry Plenty of Water 3. Access to first aid kit 4. Wear Hard Hat and all Level-D PPE 5. Develop safety exclusion zone around equipment 6. If oil leak develops mitigate by repairing and/or laying visqueen under rig and oil pan to catch waste 7. Conduct periodic air monitoring near bore hole for potential soil contaminants using photoionization detector (PID).

Equipment to be Used	**Inspection Requirements**	**Training Requirements**
List Equipment to be used in the work activity	*List inspection requirements for the work activity*	*List training requirements, including hazard communication*
1. Excavator and support vehicles. 2. Field books, logs, GPS.	1. Inspect equipment daily for leaks and observe that safe practices are followed in vicinity. 2. Conduct periodic air monitoring using PID. Frequency is based on conditions observed (discolored soil or odors require more frequent monitoring). Move away from source if sustained concentration exceeds 5 ppm for unknown contaminants (see GTG SWP3 for more details).	1. General knowledge of safe geologic mapping procedures. 2. General PPE requirements. 3. Site Health & Safety Plan (HASP). 4. Selected workers are first aid and fire extinguisher trained.

TETRA TECH Safety Excellence	**POTENTIAL SITE CONTAMINANTS (INHALATION OR CONTACT) HEALTH EFFECTS & WORKER EXPOSURE MONITORING**	**GTG SWP#3** **Date: 10-14-14**

Residual sub-surface contaminants may be encountered during test pit operations. The concentrations are expected to be low and the amount of exposure (inhalation and skin contact) should also be low. Hazardous materials (contaminants) can be broadly classified as having the following properties or characteristics: Flammable – Toxic – Reactive – Corrosive. The degree of hazard the contaminant presents and the amount of exposure (inhalation, skin contact) encountered define the risk. Workers will monitor potential contaminants when they are suspected of causing a potential exposure and take steps to control exposures.

SAFE WORK PROCEDURES

1. Hazardous materials users will follow safe work practices:
   - Avoid inhalation — Make sure that work area is adequately ventilated.
   - Avoid inadvertent ingestion — Wash hands before eating or drinking. Keep food out of work area.
   - Avoid skin contact — Wash hands or affected area, if skin becomes exposed.
2. Have available calibrated air monitoring instrument such as a photo-ionization detector (PID) for conditions where worker exposure is anticipated or encountered. Allow sufficient time (generally about 30 seconds) for air to cycle through the instrument.
3. When encountering unknown contaminants use a sustained 5 ppm as an "Action Level" – i.e., initiate procedures to reduce exposures.
4. Use personal protective equipment (e.g., safety glasses, gloves) as necessary. Respirator use requires training, fit-testing and Supervisor approval.

Potential Chemical Hazards Anticipated

Material	Hazards	Exposure Routes	*Exposure Limit	Warning Property/Odor
Gasoline (Benzene, Toluene, Ethyl Benzene, Xylene)	Irritant, CNS Depression, Possible Liver & Kidney damage, dermatitis Benzene is a confirmed human carcinogen. High fire risk in high concentrations, LEL 1.4%	Inhalation, Skin, Ingestion	300 ppm 1 ppm 50 ppm 100 ppm 100 ppm	Sweet, solvent-like odor
Diesel Fuel	Irritant, headache Low fire risk, LEL is 1.3%	Inhalation, Skin, Ingestion	No Exposure Limit established	Petroleum, kerosene odor
Crude Oil	Irritation	Skin	No Exposure Limit established	Distinct tarry odor
**Creosote	Irritant, Neurologic disturbance Low fire risk, human carcinogen	Inhalation, Skin, Ingestion	0.2 mg/m3	Tarry, aromatic odor

*when encountering unknown contaminants use a sustained 5ppm as an "Action Level" to warrant further investigation to provide ventilation or additional work practices or additional PPE (including respiratory protection) to reduce worker exposures. If the contaminant is known and the response factor of the monitoring instrument is known, the Exposure Limit can be used as the concentration to warrant further investigation for additional controls.
**Creosote is also known as coal tar, and coal tar pitch volatiles

TETRA TECH Safety Excellence	**GENERAL PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS**	**GTG SWP#4** **Date: 10-14-14**

Personal protective equipment is used in conjunction with engineering controls (e.g., ventilation units) and administrative controls (e.g., safe work practices). PPE is not to be used without first considering if the hazard could be adequately controlled by using engineering or administrative controls. Voluntary use of PPE, i.e., using PPE when its use may not be absolutely necessary, is allowed and in some cases encouraged.

The following provides a general guideline for PPE use. Recognize that PPE use is based on the particular hazards and conditions of a given operation and may need to be modified to suit the situation. PPE to be worn should be discussed prior to starting the job, e.g., in the (Pre) Job Safety Meeting.

PERSONAL PROTECTIVE EQUIPMENT

PPE TYPE	RECOMMENDED WHEN
Stout Gloves (leather or cotton)	For mechanical or sharp hazards. Gloves are not to be worn around moving machinery.
Impervious Gloves (elastomeric or plastic)	Plastic or Rubber: For wet or chemical hazards or biologic hazards. Note some employees may be allergic to latex. Have alternate type of glove available for latex allergic employees.
Ear plugs or ear muffs	For extended periods in noisy environments. If you will be in an area for more than a few minutes where you have to shout to talk to someone standing at arm's length, you probably need to use hearing protectors.
Body Protection	Dust or splash suit. For incidental contact with contaminated soil a dust suit (e.g., Tyvek or equivalent) is suitable. For liquid splash hazards an impervious suit is appropriate (e.g., plastic or rubber suit such as yellow Tyvek or equivalent).
Foot protection	Sturdy foot wear is all that is typically needed. For wet environments rubber boots are indicated. For heavy demolition, steel toed shoes are indicated.
Hard Hat	When objects could strike head, such as overhead work or around heavy construction equipment.
Eye Protection	When using striking tools, tools that generate flying dust or projectiles, or any other time the eyes could be affected or injured.
Reflective Safety Vest	Reflective Safety vests are to be worn when working in and around traffic hazards.
N-95 Respirator (Dust Mask)	For exposure to dust. Dust masks do not provide protection against chemicals.
Air-purifying Respirator	See SWP#5.

TETRA TECH Safety Excellence	**RESPIRATORY PROTECTION**	**GTG SWP#5** **Date: 10-14-14**

Respiratory protection is used in conjunction with engineering controls (e.g., ventilation units) and administrative controls (e.g., safe work practices). PPE is not to be used without first considering if the hazard could be adequately controlled by using engineering or administrative controls. Voluntary use of PPE, i.e., using PPE when its use may not be absolutely necessary, is allowed and in some cases encouraged.

The following provides a general guideline for respirator use. Recognize that respirator use is based on the particular hazards and conditions of a given operation and may need to be modified to suit the situation. Respirators to be worn should be discussed prior to starting the job, e.g., in the (Pre) Job Safety Meeting.

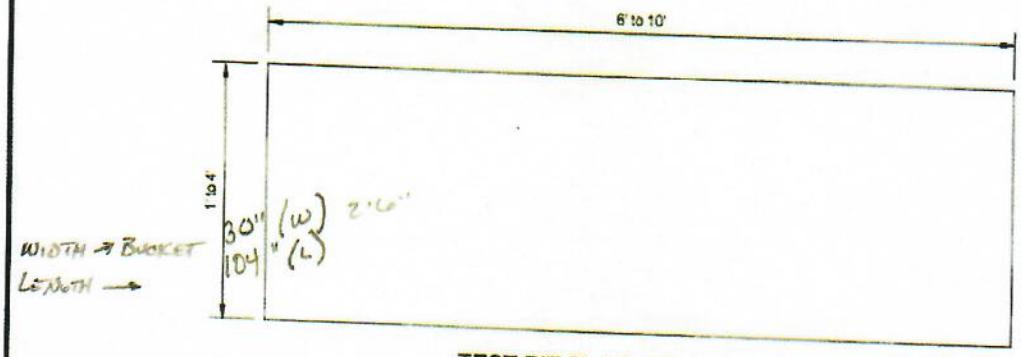
RESPIRATORY PROTECTION GUIDELINES

TYPE	RECOMMENDED WHEN
N-95 Respirator	For exposure to dust. If chemicals are being used or fuels may be present, it is probably more appropriate to use a ½ or full face respirator with particulate cartridges in conjunction with other filtering media, e.g., P-100 cartridges with nuisance acid gas or organic vapor cartridges.
½ or full face respirator with particulate & chemical cartridges	Determine what inhalation exposure could be and consult respiratory protection selection guide. Respirator use requires annual training, annual medical clearance, annual fit-testing and current Supervisor approval. Environmental Surveillance (air monitoring) is required to verify that level of respiratory protection is adequate. Written procedures must be implemented that address: a. Selection procedures b. Instruction and training • Why respirator is necessary and how bad fit, usage or maintenance can affect performance • Limitations of respiratory protection • How to inspect, don & doff respirator • How to properly fit respiratory protective equipment • How to use in emergency, e.g., failure situations • Maintenance and storage procedures c. Cleaning and sanitizing d. Inspection and maintenance e. Selection and issuance of respirators f. Correct respirator specified for each job g. Program surveillance and evaluation h. Environmental Surveillance i. Evaluation of program effectiveness

APPENDIX F FIELD LOGS

#1 29°39'26"N

95°32'54"W



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)

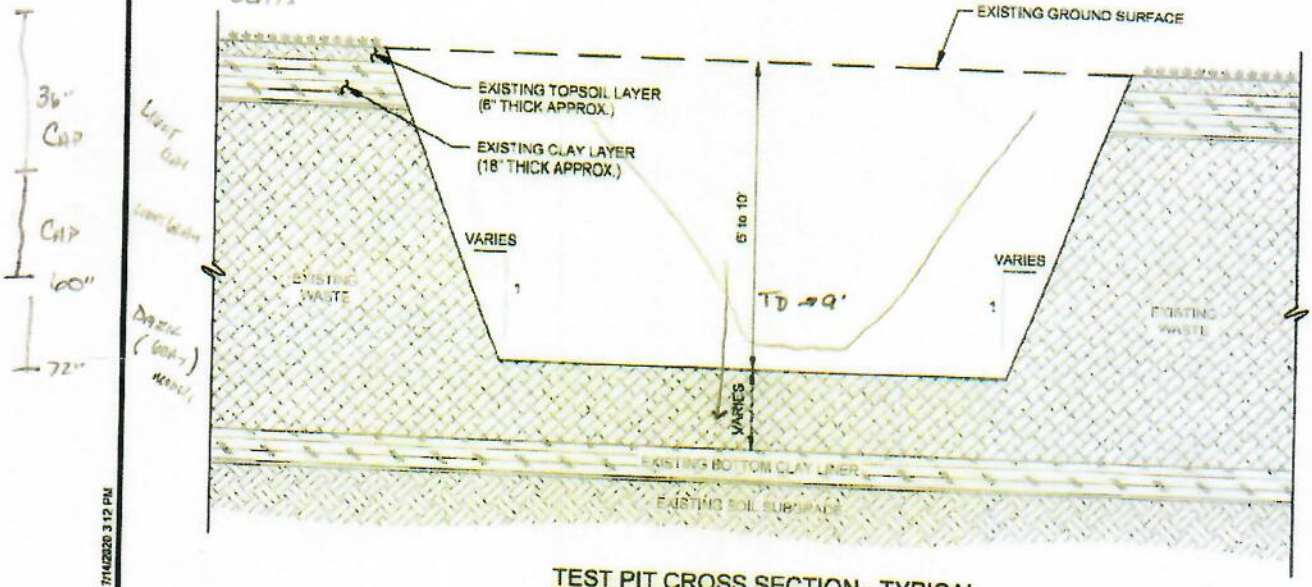
No Trash encountered

DAZIER

6'-7' - Dazier Sand green mottling

7'-8' Green Clays

8'-9' Clays



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

No Samples Soil 1022

0930-1000 Exempt

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 60 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

12/15/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
7/14/21
LICENSED PROFESSIONAL ENGINEER

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

TETRA TECH
1500 CityWest Blvd. Suite 1000
Houston, TX 77042
TEL 936.202.0746 FAX 713.784.2962

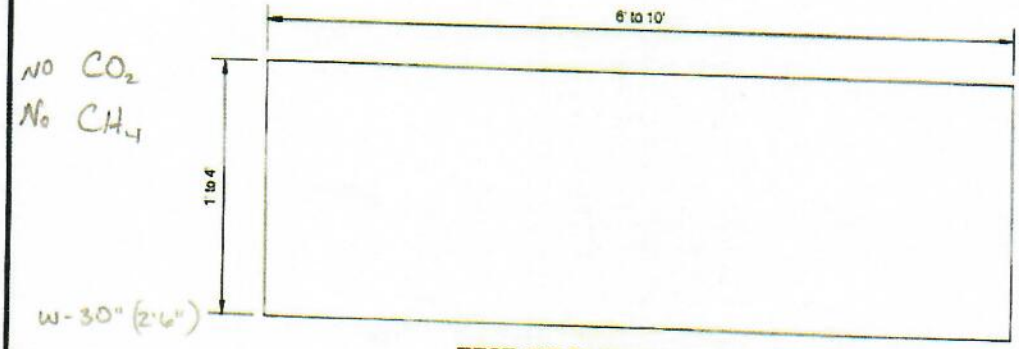
Ruffino Road Type IX Landfill Mining Registration Application

TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-804 Test Pit Plan And Cross Section.dwg, 7/14/2020 3:12 PM

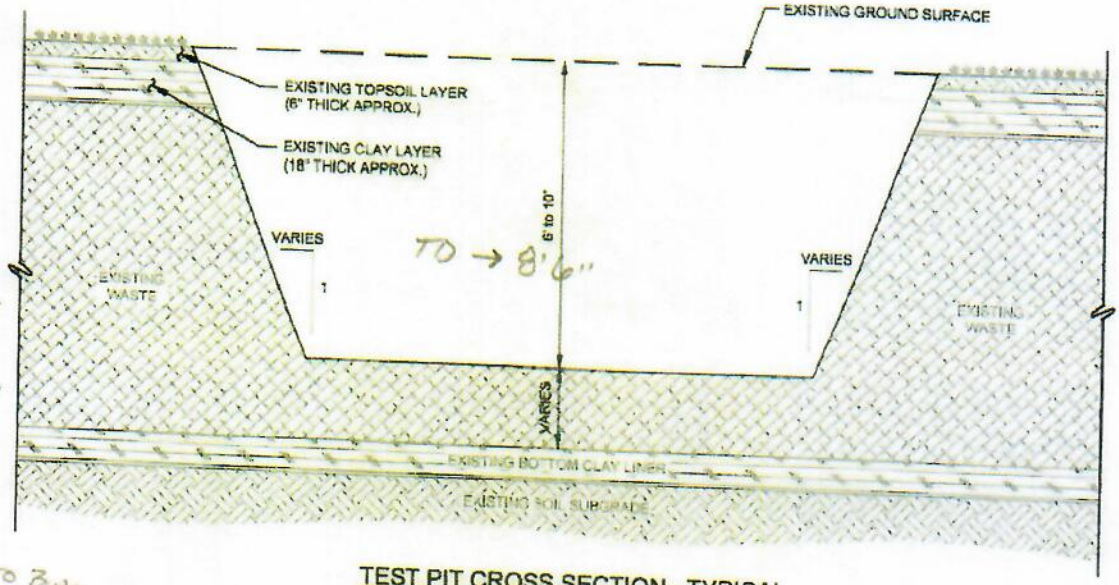
TEST #2 29° 39'31" N
95° 32'55" W



NO CO_2
No CH_4

W - 30" (2'6")
L - 82"

TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

TO BLACK CLAYS → NO OBVIOUS ODOR

NO TRASH
NO PLASTICS

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 50 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED
PROFESSIONAL ENGINEER
12/15/21
7/14/21

TETRA TECH, INC.
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1500 CityWest Blvd, Suite 1000
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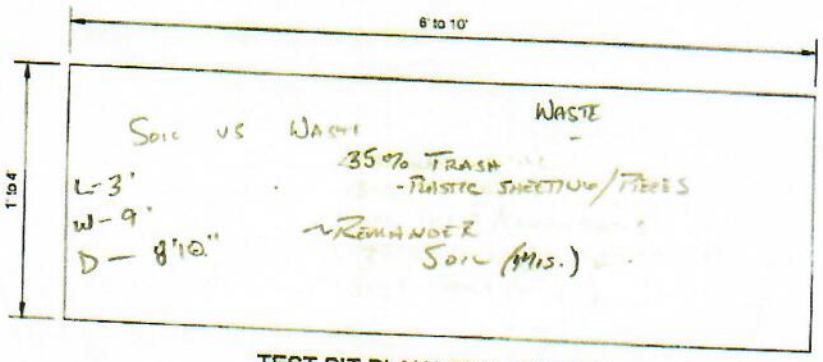
Ruffino Road Type IX Landfill Mining Registration Application

TEST PIT PLAN AND CROSS SECTION

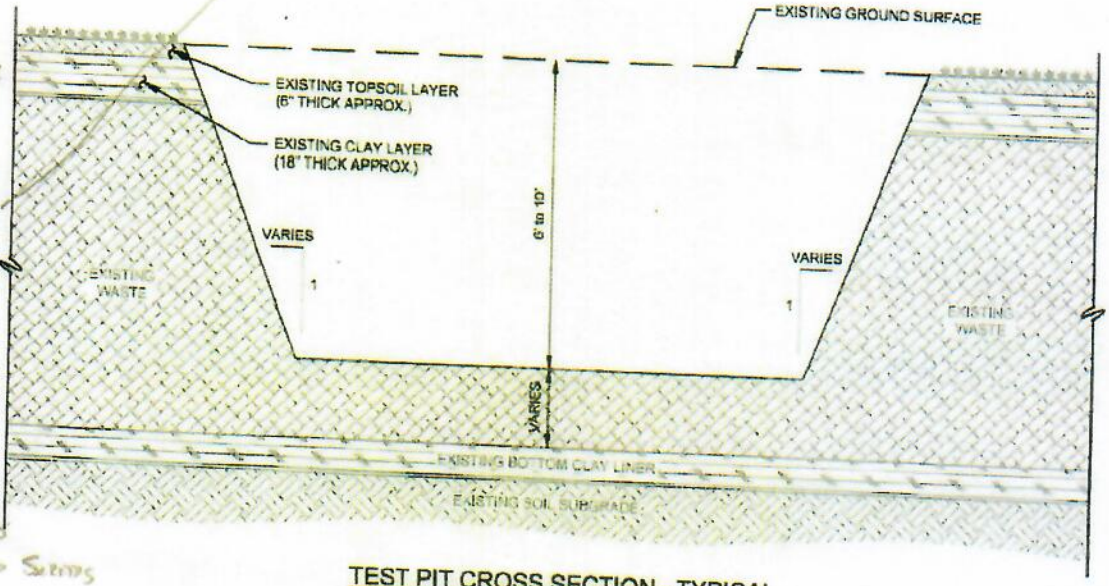
FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\Sheet Files\C-804 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

#3 29°39'31" N
95° 32'37" W



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

Soil Sample - 7' Down 1445

Waste Sample 1505

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 60 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

12/15/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
7/14/21
LICENSED PROFESSIONAL ENGINEER

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Houston, TX 77042
TEL 936.202.0746 FAX 713.784.2962

Ruffino Road Type IX Landfill Mining Registration Application

TEST PIT PLAN AND CROSS SECTION

FIGURE 4

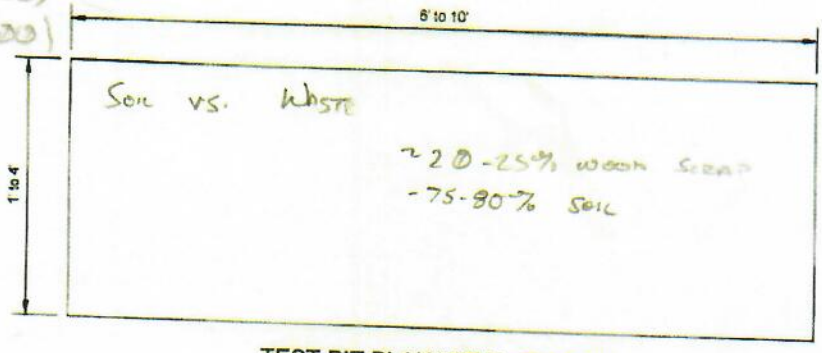
J:\HOUSTON Office Projects\Ruffino Hills Landfill\CADS\reedFiles\C-804 Test Pit Plan And Cross Section.dwg, 7/14/2020 3:12 PM

#4

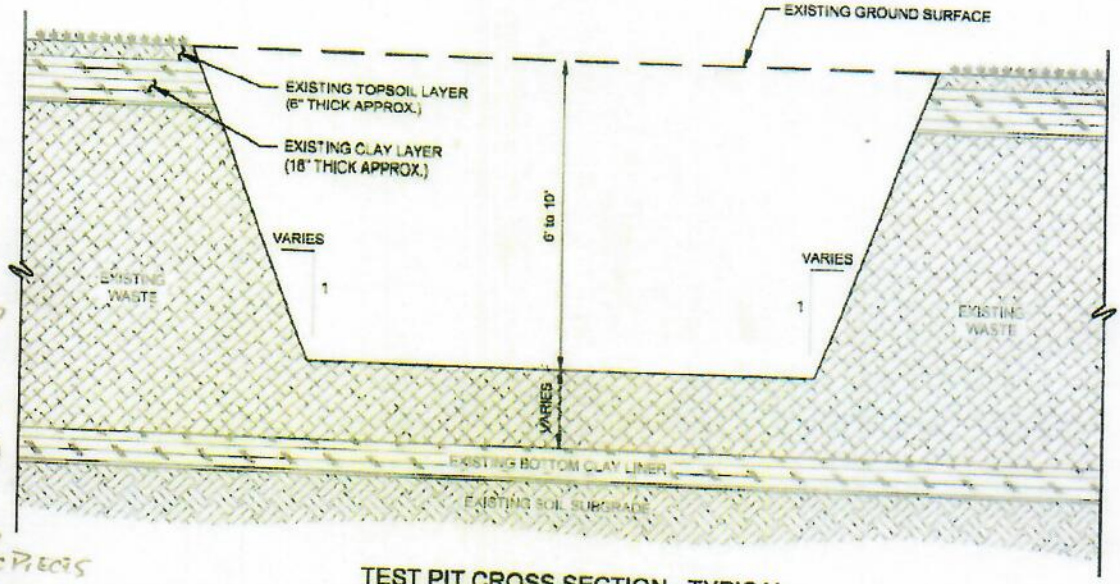
29°39'30" N 95°33'4" W

No CH4 (0.00)
No CH4 (0.00)

W→30"
L-9'
TD-8'



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 60 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

Test Pit W-1
Sample @ 8'↓
1630
Waste lays

12/15/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
7/19/21
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

TETRA TECH
1500 CityWest Blvd. Suite 1000
Houston, TX 77042
TEL 936.202.0746 FAX 713.784.2962

Ruffino Road Type IX Landfill Mining Registration Application

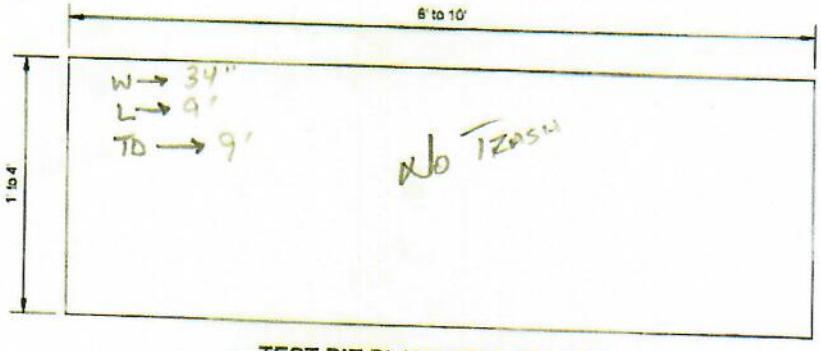
TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hds Landfill\CAD\Sheet\Test\C-804 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

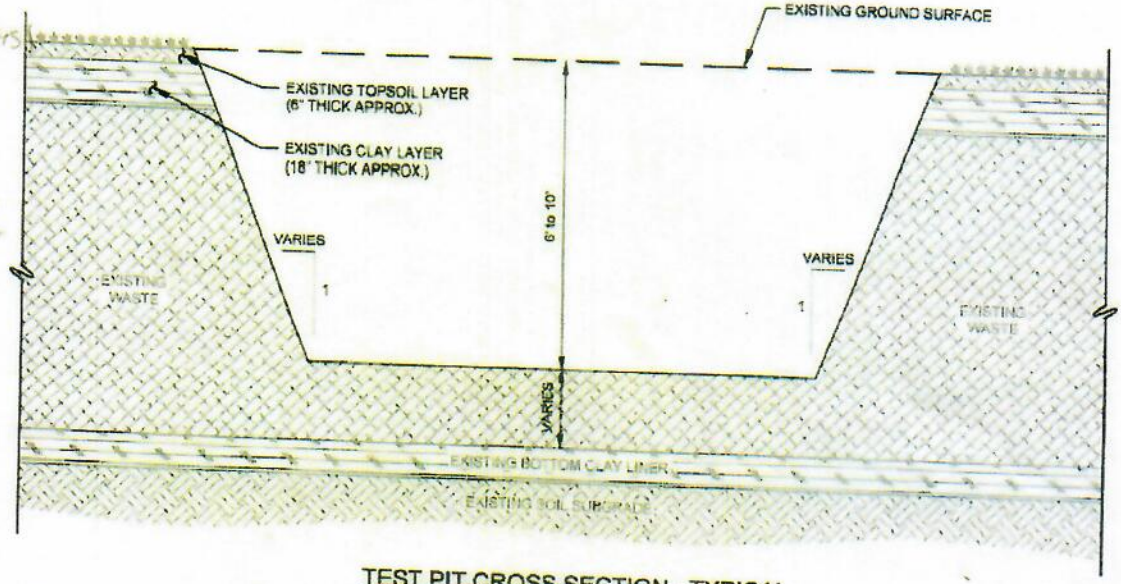
TEST PIT #5

29°39'35"N
95° 32'57"W



CO_2 → 0.0%
CH_4 → 0.0%

TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

SOIL SAMPLE - 0925
SOIL SAMPLE - 0940

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 50 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

12/15/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
7/14/21
LICENSED PROFESSIONAL ENGINEER

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

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Ruffino Road Type IX Landfill Mining Registration Application

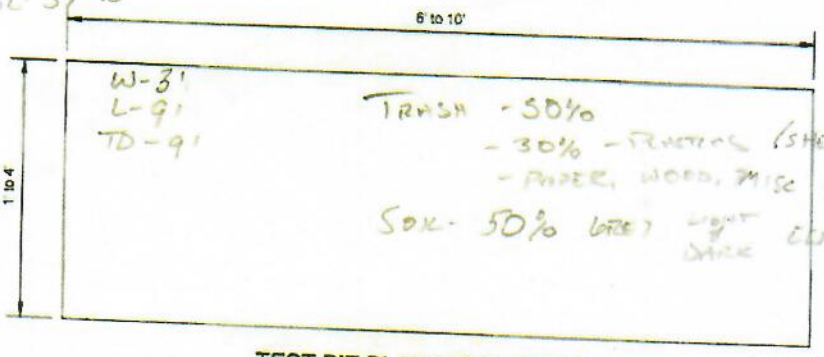
TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-804 Test Pit Plan And Cross Section.dwg 7/14/2021 3:12 PM

Test Pit #6

29°39'35"N
95°32'57"W

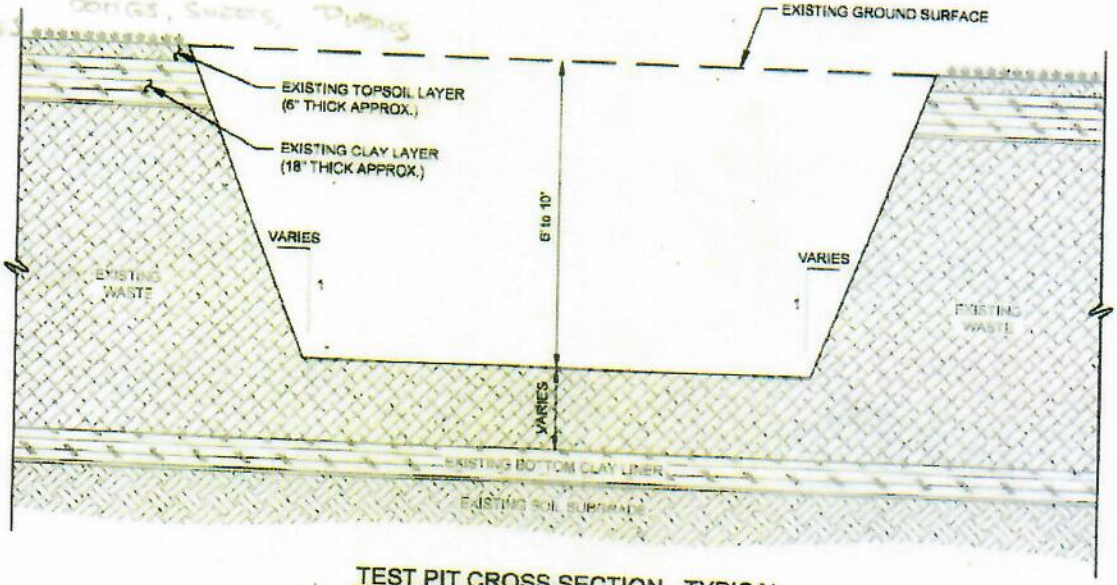


W-3'
L-9'
TD-9'

TRASH - 50%
- 30% - PLASTICS (SHEETING/PIECES)
- PAPER, WOOD, MISC METAL

SOIL - 50% LIGHT TO DARK GREY ELASTIC CLAYS

TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

WASTE SAMPLE - ID 15

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 80 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

12/15/21

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Ruffino Road Type IX Landfill Mining Registration Application

TEST PIT PLAN AND CROSS SECTION

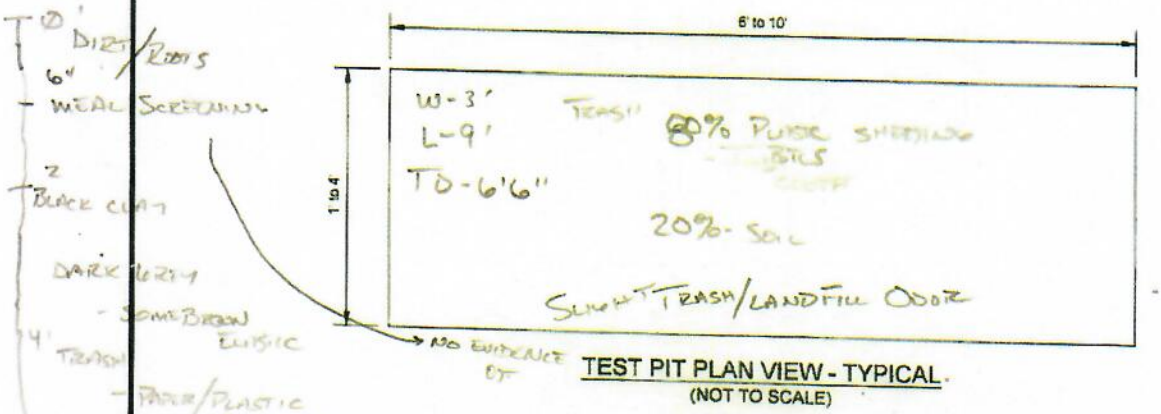
FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-804 Test Pit Plan And Cross Section.dwg, 7/14/2020 3:12 PM

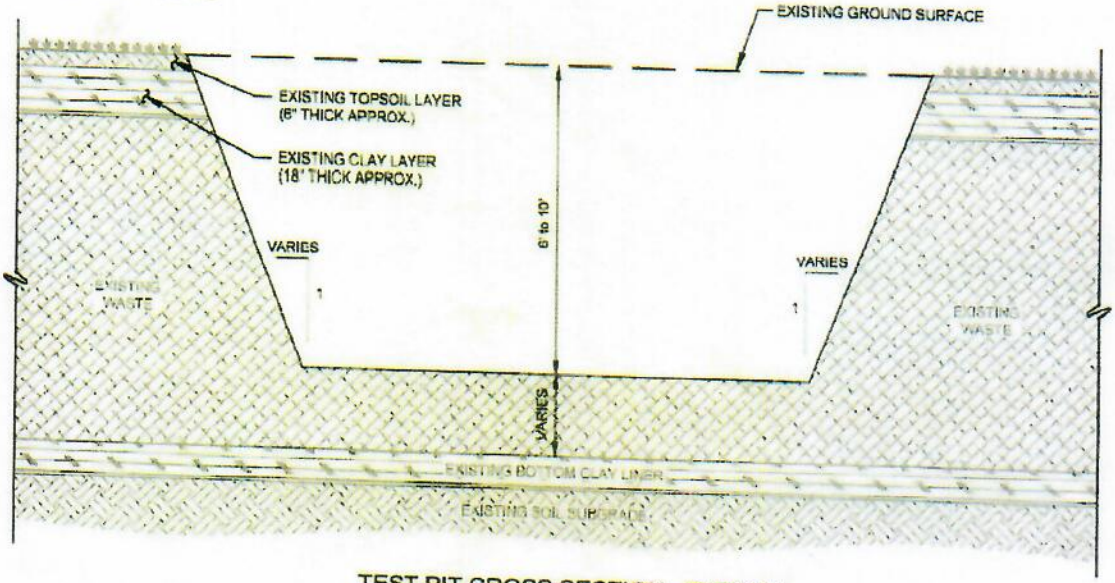
#7

29°39'42"N

95°32'51"W



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

WASTE #1 → 1115

EXTRA WASTE #2 → 1125

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 60 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

12/15/21

STATE OF TEXAS
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Ruffino Road Type IX Landfill Mining Registration Application

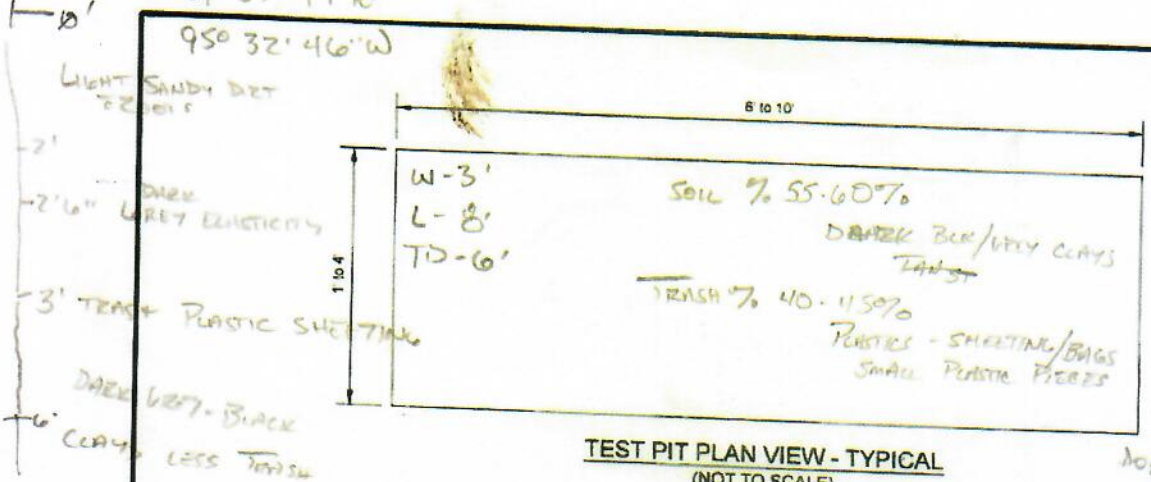
TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\Src Files\C-804 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

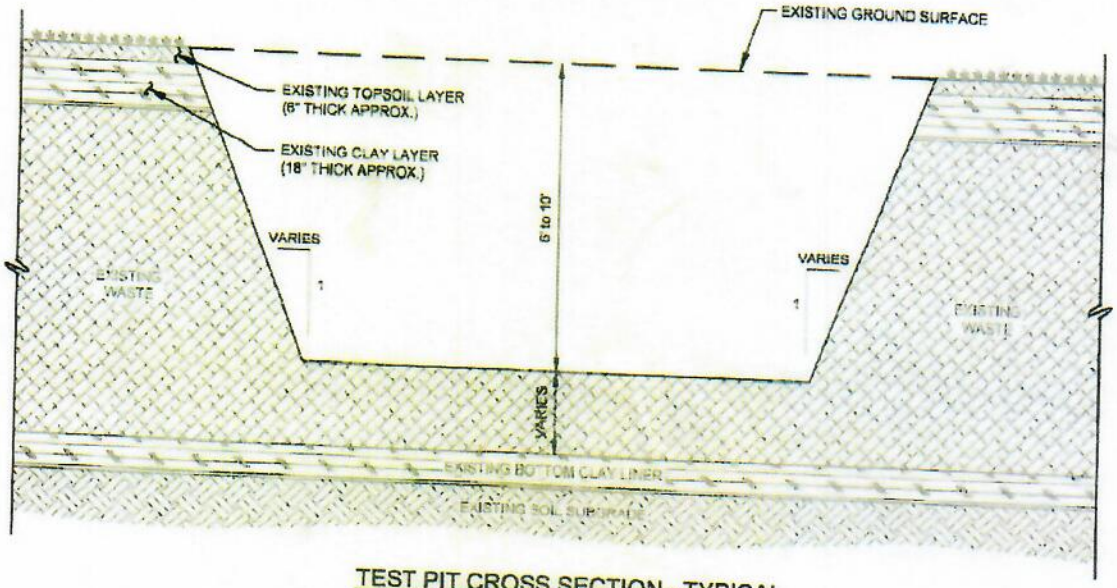
H8

29° 39' 49"N
95° 32' 46"W



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)

DOZER HAULING TO HELP BACK HOES



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

SOIL SAMPLE - 1230
EXTRA - 1240

TRASH SAMPLE - 1248

GENERAL NOTES:

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 80 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

12/15/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED
PROFESSIONAL ENGINEER
7/14/21

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

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0	ORIGINAL	07/2/21

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Ruffino Road Type IX Landfill Mining Registration Application

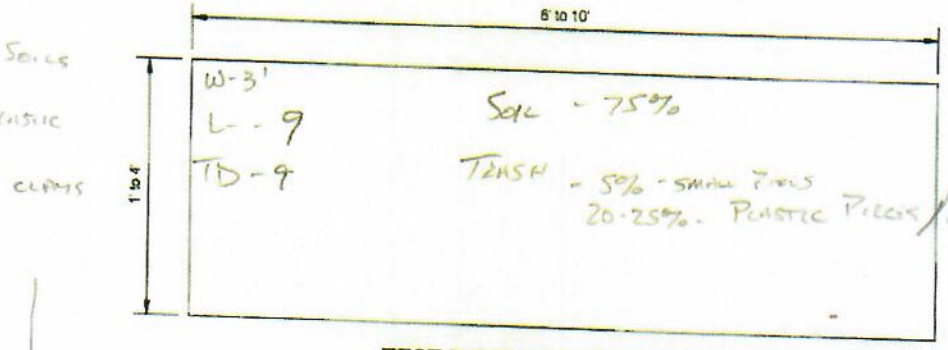
TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\C\D\SheetFiles\C-504 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

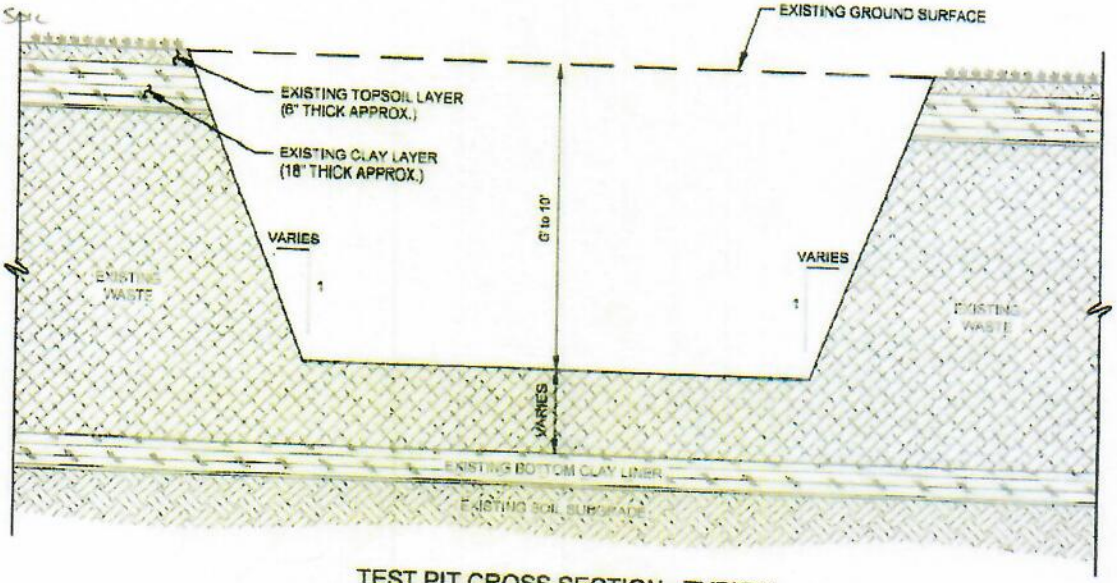
#9 29° 39' 37" N
95° 32' 44" W

12'
BROWN CRUMBLY SOILS
2' GREY CLAYS - ELASTIC
2' 8" LIGHT GREY CLAYS
4'
5'6"
6'
DARKENING ON SPLC
7' 4"
8' TRASH
9



TEST PIT PLAN VIEW - TYPICAL
(NOT TO SCALE)

* BIG CHUNK OF CONCRETE



TEST PIT CROSS SECTION - TYPICAL
(NOT TO SCALE)

GENERAL NOTES:

WASTE SAMPLE - 1340

EXTRA WASTE - 1350

1. TEST PITS SHALL NOT PENETRATE THE BOTTOM CLAY LINER.
2. TEST PITS SHALL BE NO DEEPER THAN ELEVATION 80 FT MSL.
3. PERSONNEL SHALL NOT BE ALLOWED TO ENTER TEST PITS.

12/15/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED PROFESSIONAL ENGINEER
7/19/21

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

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Ruffino Road Type IX Landfill Mining Registration Application

TEST PIT PLAN AND CROSS SECTION

FIGURE 4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-804 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

APPENDIX G LAB REPORTS

Laboratory Analysis Report

Total Number of Pages: 48

Job ID : 21120952

10100 East Freeway, Suite 100, Houston, TX 77029 tel: 713-453-6060, fax: 713-453-6091, http://www.ablabs.com

Client Project Name :
Landfill Closure / Landfill

Report To :	Client Name:	Tetra Tech	P.O.#.:
	Attn:	Jim Norstrom	Sample Collected By: Stu McBride
	Client Address:	1500 CityWest Boulevard, Suite 1000	Date Collected: 12/08/21
	City, State, Zip:	Houston, Texas, 77042	

A&B Labs has analyzed the following samples...

Client Sample ID	Matrix	A&B Sample ID
Test Pit #1 - Soil	Soil	21120952.01
Test Pit #3 - Soil	Soil	21120952.02
Test Pit #3 - Waste #1	Soil	21120952.03
Test Pit #4 - Soil	Soil	21120952.04
Test Pit #4 - Waste #1	Soil	21120952.05
Test Pit #3 - Waste #1 (Run#2)	Soil	21120952.06
Test Pit #4 - Waste #1 (Run#2)	Soil	21120952.07
Test Pit #1 - Soil (Run #2)	Soil	21120952.10

Released By: Shantall Carpenter
Title: Senior Project Manager
Date: 1/5/2022

This Laboratory is NELAP (T104704213) accredited. Effective: 04/01/2021; Expires: 3/31/2022
Scope: Non-Potable Water, Drinking Water, Air, Solid, Biological Tissue, Hazardous Waste

I am the laboratory manager, or his/her designee, and I am responsible for the release of this data package. This laboratory data package has been reviewed and is complete and technically compliant with the requirements of the methods used, except where noted in the attached exception reports. I affirm, to the best of my knowledge that all problems/anomalies observed by this laboratory (and if applicable, any and all laboratories subcontracted through this laboratory) that might affect the quality of the data, have been identified in the Laboratory Review Checklist, and that no information or data have been knowingly withheld that would affect the quality of the data.

ab-q210-0321

Date Received : 12/09/2021 14:48

LABORATORY TERM AND QUALIFIER DEFINITION REPORT

Job ID : 21120952

Date: 1/5/2022

General Term Definition

Back-Wt	Back Weight	Post-Wt	Post Weight
BRL	Below Reporting Limit	ppm	parts per million
cfu	colony-forming units	Pre-Wt	Previous Weight
Conc.	Concentration	Q	Qualifier
D.F.	Dilution Factor	RegLimit	Regulatory Limit
Front-Wt	Front Weight	RPD	Relative Percent Difference
LCS	Laboratory Check Standard	RptLimit	Reporting Limit
LCSD	Laboratory Check Standard Duplicate	SDL	Sample Detection Limit
MS	Matrix Spike	surr	Surrogate
MSD	Matrix Spike Duplicate	T	Time
MW	Molecular Weight	TNTC	Too numerous to count
J	Estimation. Below calibration range but above MDL		

Qualifier Definition

D1	Sample required dilution due to matrix effects.
M1	Matrix Spike and/or Matrix Spike Duplicate recovery is above laboratory control limits due to matrix interference. "The sample randomly selected as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
M2	Matrix Spike and/or Matrix Spike Duplicate recovery is below laboratory control limits due to matrix interference."The sample randomly selected as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
M6	Not calculated. Sample concentration high, more than 4X spike concentration. Control limits do not apply."The sample randomly selcted as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
R1	RPD exceeds control limits."The sample randomly selcted as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
S1	Surrogate recovery is above control limit. Results may be biased high.
S6	Surrogate recovery is outside control limits due to matrix effects.
V11	CCV recovery is below acceptance limits.

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #1 - Soil
Date Collected: 12/08/21
Time Collected: 10:22
Other Information:

Job Sample ID: 21120952.01
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
AOAC/RI-PT#080601	Salmonella								
	Salmonella[2]	Negative	/25g	1	1			12/09/21 18:15	PR
SM 9222D	Fecal Coliform								
	Coliform, Fecal	20	cfu/g	10	10			12/09/21 15:40	SB
SM 2520Bm									
	Salinity[2]	BRL	s.u.	1	2			12/21/21 12:00	AJ
SM 2540G	% Moisture								
	% Moisture[2]	29.5	%	1	0.1			12/13/21 16:10	RP
SM 2540G	% Solids								
	% Foreign matter[1]	79.6	%	1	0.1			12/16/21 16:10	RP
SW-846 9045D	Corrosivity, pH								
	pH	5.4	s.u.					12/13/21 10:00	RP
	Temperature when read, °C[2]	21.3	s.u.					12/13/21 10:00	RP
SW-846 6010D	Total Metals								
	Arsenic*	1.73	mg/Kg	1	0.5			12/14/21 18:58	JM
	Cadmium*	BRL	mg/Kg	1	0.5			12/14/21 18:58	JM
	Chromium*	7.48	mg/Kg	1	0.5			12/14/21 18:58	JM
	Copper*	6.67	mg/Kg	1	0.5			12/14/21 18:58	JM
	Lead*	6.89	mg/Kg	1	0.5			12/14/21 18:58	JM
	Molybdenum*	BRL	mg/Kg	1	0.5			12/14/21 18:58	JM
	Nickel*	4.23	mg/Kg	1	0.5			12/14/21 18:58	JM
	Selenium*	BRL	mg/Kg	1	0.5			12/14/21 18:58	JM
	Zinc*	11.1	mg/Kg	1	0.5			12/14/21 18:58	JM
SW-846 7470A	Total Metals - Mercury								
	Mercury*	0.018	mg/Kg	1	0.01			12/13/21 14:30	BDC
SW-846 8015D	TCLP Alcohols								
	2-Propanol	BRL	mg/Kg	1	2			12/21/21 13:42	AK
	Ethanol	BRL	mg/Kg	1	2			12/21/21 13:42	AK
	Methanol	BRL	mg/Kg	1	2			12/21/21 13:42	AK
	n-Butanol	BRL	mg/Kg	1	2			12/21/21 13:42	AK
	n-Propyl Alcohol	BRL	mg/Kg	1	2			12/21/21 13:42	AK
	t-Butyl alcohol	BRL	mg/Kg	1	2			12/21/21 13:42	AK
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech

Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #1 - Soil
Date Collected: 12/08/21
Time Collected: 10:22
Other Information:

Job Sample ID: 21120952.01
Sample Matrix Soil
% Moisture 29.5

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/15/21 23:51	VMN
	Tetrachloro-m-xylene(surr)	79.7	%	1.00	42-128			12/15/21 23:51	VMN
	Decachlorobiphenyl(surr)	61.2	%	1.00	42-130			12/15/21 23:51	VMN

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #3 - Soil
Date Collected: 12/08/21
Time Collected: 14:45
Other Information:

Job Sample ID: 21120952.02
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
AOAC/RI-PT#080601	Salmonella								
	Salmonella[2]	Negative	/25g	1	1			12/09/21 18:15	PR
SM 9222D	Fecal Coliform								
	Coliform, Fecal	50	cfu/g	10	10			12/09/21 15:40	SB
SM 2520Bm									
	Salinity[2]	BRL	s.u.	1	2			12/21/21 12:00	AJ
SM 2540G	% Moisture								
	% Moisture[2]	21.4	%	1	0.1			12/13/21 16:10	RP
SM 2540G	% Solids								
	% Foreign matter[1]	77.4	%	1	0.1			12/16/21 16:10	RP
SW-846 9045D	Corrosivity, pH								
	pH	6.1	s.u.					12/13/21 10:00	RP
	Temperature when read, °C[2]	21.3	s.u.					12/13/21 10:00	RP
SW-846 6010D	Total Metals								
	Arsenic*	2.42	mg/Kg	1	0.5			12/15/21 12:44	JM
	Cadmium*	BRL	mg/Kg	1	0.5			12/15/21 12:44	JM
	Chromium*	9.05	mg/Kg	1	0.5			12/15/21 12:44	JM
	Copper*	8.93	mg/Kg	1	0.5			12/15/21 12:44	JM
	Lead*	22.4	mg/Kg	20	10			12/15/21 12:49	JM
	Molybdenum*	BRL	mg/Kg	1	0.5			12/15/21 12:44	JM
	Nickel*	7.07	mg/Kg	1	0.5			12/15/21 12:44	JM
	Selenium*	BRL	mg/Kg	1	0.5			12/15/21 12:44	JM
	Zinc*	34	mg/Kg	20	10			12/15/21 12:49	JM
SW-846 7470A	Total Metals - Mercury								
	Mercury*	0.023	mg/Kg	1	0.01			12/13/21 14:33	BDC
SW-846 8015D	TCLP Alcohols								
	2-Propanol	BRL	mg/Kg	1	2			12/21/21 13:55	AK
	Ethanol	BRL	mg/Kg	1	2			12/21/21 13:55	AK
	Methanol	BRL	mg/Kg	1	2			12/21/21 13:55	AK
	n-Butanol	BRL	mg/Kg	1	2			12/21/21 13:55	AK
	n-Propyl Alcohol	BRL	mg/Kg	1	2			12/21/21 13:55	AK
	t-Butyl alcohol	BRL	mg/Kg	1	2			12/21/21 13:55	AK

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #3 - Waste #1
Date Collected: 12/08/21
Time Collected: 15:05
Other Information:

Job Sample ID: 21120952.03
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 1010A									
	Ignitability	>150	°F	1				12/20/21 11:19	YSK
SM 2540G	% Moisture								
	% Moisture²	18.2	%	1	0.1			12/15/21 16:10	RP
SW-846 7.3	Reactive Cyanide								
	Reactive Cyanide²	BRL	mg/Kg	1	25			12/20/21 15:50	RHasse
SW-846 7.3	Reactive Sulfide								
	Reactive Sulfide²	BRL	mg/Kg	1	25			12/20/21 15:50	RHasse
SW-846 9034									
	Sulfide	BRL	mg/Kg	1	50			12/15/21 13:30	LC
	Sulfide, as Hydrogen Sulfide²	BRL	mg/Kg	1	50			12/15/21 13:30	LC
SW-846 9045D	Corrosivity, pH								
	pH	6.8	s.u.					12/16/21 10:00	RP
	Temperature when read, °C²	21.4	s.u.					12/16/21 10:00	RP
SW-846 6010D	TCLP Metals								
	Antimony	BRL	mg/L	1	0.04	1		12/16/21 15:47	JM
	Arsenic	BRL	mg/L	1	0.04	5		12/16/21 15:47	JM
	Barium	1.53	mg/L	1	0.04	100.0		12/16/21 15:47	JM
	Beryllium	BRL	mg/L	1	0.04	0.08		12/16/21 15:47	JM
	Cadmium	BRL	mg/L	1	0.04	0.5		12/16/21 15:47	JM
	Chromium	BRL	mg/L	1	0.04	5.0		12/16/21 15:47	JM
	Lead	BRL	mg/L	1	0.04	1.5		12/16/21 15:47	JM
	Nickel	BRL	mg/L	1	0.04	70		12/16/21 15:47	JM
	Selenium	BRL	mg/L	1	0.04	1.0		12/16/21 15:47	JM
	Silver	BRL	mg/L	1	0.04	5.0		12/16/21 15:47	JM
	Vanadium	BRL	mg/L	1	0.04			12/16/21 15:47	JM
SW-846 7470A	TCLP Mercury								
	Mercury	BRL	mg/L	1	0.00050	0.2		12/16/21 22:27	BDC
TX 1005	Total Petroleum Hydrocarbons								
	C6-C12*	BRL	mg/Kg	1.00	25			12/20/21 23:13	AK
	>C12-C28*	BRL	mg/Kg	1.00	25			12/20/21 23:13	AK
	>C28-C35*	BRL	mg/Kg	1.00	25			12/20/21 23:13	AK
	Total C6-C35*	BRL	mg/Kg	1.00	25			12/20/21 23:13	AK
	Chlorooctadecane(surr)	89.5	%	1.00	60-150			12/20/21 23:13	AK
	1-Chlorooctane(surr)	81.9	%	1.00	60-143			12/20/21 23:13	AK
SW-846 8015M	TX335 TCLP Non Purgeable Organics								

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name:	Tetra Tech	Attn: Jim Norstrom	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #3 - Waste #1	Job Sample ID:	21120952.03
Date Collected:	12/08/21	Sample Matrix	Soil
Time Collected:	15:05	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8015M	TX335 TCLP Non Purgeable Organics								
	2-Ethoxyethanol²	BRL	mg/L	2	10	1400		12/21/21 12:24	AK
	2-Methoxyethanol²	BRL	mg/L	2	5	14		12/21/21 12:24	AK
	Ethylene glycol	BRL	mg/L	2	5	7000		12/21/21 12:24	AK
	Isobutyl Alcohol	BRL	mg/L	1	2	1000		12/21/21 14:09	AK
SW-846 8081B	TCLP Organochlorine Pesticides								
	Chlordane	BRL	ug/L	1.00	0.5	30		12/20/21 14:58	VMN
	Endrin	BRL	ug/L	1.00	0.05	20		12/20/21 14:58	VMN
	g-BHC	BRL	ug/L	1.00	0.05	400		12/20/21 14:58	VMN
	Heptachlor	BRL	ug/L	1.00	0.05	8		12/20/21 14:58	VMN
	Heptachlor epoxide	BRL	ug/L	1.00	0.05	40		12/20/21 14:58	VMN
	Methoxychlor	BRL	ug/L	1.00	0.05	10000		12/20/21 14:58	VMN
	Toxaphene	BRL	ug/L	1.00	0.5	300		12/20/21 14:58	VMN
	Decachlorobiphenyl(surr)	98.5	%	1.00	10-146			12/20/21 14:58	VMN
	Tetrachloro-m-xylene(surr)	80.8	%	1.00	12-116			12/20/21 14:58	VMN
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	10.00	16.7		D1	12/16/21 00:18	VMN
	Aroclor 1221*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Aroclor 1232*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Aroclor 1242*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Aroclor 1248*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Aroclor 1254*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Aroclor 1260*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Total PCBs*	BRL	ug/Kg	10.00	16.7			12/16/21 00:18	VMN
	Tetrachloro-m-xylene(surr)	73.8	%	10.00	42-128			12/16/21 00:18	VMN
	Decachlorobiphenyl(surr)	64	%	10.00	42-130			12/16/21 00:18	VMN
SW-846 8141B	TX335 TCLP Pesticide (NPD)								
	Dimethoate	BRL	mg/L	1	0.01	70		12/21/21 17:41	VMN
	Disulfoton	BRL	mg/L	1	0.01	0.1		12/21/21 17:41	VMN
	Methomyl²	BRL	mg/L	1	0.05	90		12/21/21 17:41	VMN
	Methyl Parathion	BRL	mg/L	1	0.01	0.9		12/21/21 17:41	VMN
	Parathion	BRL	mg/L	1	0.01	20		12/21/21 17:41	VMN
	Pronamide²	BRL	mg/L	1	0.01	300		12/21/21 17:41	VMN
	4-Chloro-3-Nitro-Benzene(surr)	69.8	%	1	50-130			12/21/21 17:41	VMN
SW-846 8151A	TCLP Herbicides								
	2,4,5-TP	BRL	ug/L	5.00	5	1000		12/20/21 17:15	VMN
	2,4-D	BRL	ug/L	5.00	5	10000		12/20/21 17:15	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #3 - Waste #1
Date Collected: 12/08/21
Time Collected: 15:05
Other Information:

Job Sample ID: 21120952.03
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8151A	TCLP Herbicides								
	DCPAA(surr)	10.5	%	5.00	34-124		S6	12/20/21 17:15	VMN
SW-846 8260C	TCLP VOC								
	1,1-Dichloroethylene	BRL	mg/L	1.00	0.13	0.6		12/16/21 12:42	SKM
	1,2-Dichloroethane	BRL	mg/L	1.00	0.13	0.5		12/16/21 12:42	SKM
	1,4-Dichlorobenzene	BRL	mg/L	1.00	0.15	7.5		12/16/21 12:42	SKM
	Benzene	BRL	mg/L	1.00	0.13	0.5		12/16/21 12:42	SKM
	Carbon tetrachloride	BRL	mg/L	1.00	0.13	0.5		12/16/21 12:42	SKM
	Chlorobenzene	BRL	mg/L	1.00	0.15	70		12/16/21 12:42	SKM
	Chloroform	BRL	mg/L	1.00	0.13	6		12/16/21 12:42	SKM
	MEK	BRL	mg/L	1.00	0.13	200		12/16/21 12:42	SKM
	Tetrachloroethylene	BRL	mg/L	1.00	0.13	0.7		12/16/21 12:42	SKM
	Trichloroethylene	BRL	mg/L	1.00	0.13	0.5		12/16/21 12:42	SKM
	Vinyl Chloride	BRL	mg/L	1.00	0.13	0.2		12/16/21 12:42	SKM
	1,2-Dichloroethane-d4(surr)	104	%	1.00	70-130			12/16/21 12:42	SKM
	Dibromofluoromethane(surr)	105	%	1.00	70-130			12/16/21 12:42	SKM
	p-Bromofluorobenzene(surr)	98	%	1.00	70-130			12/16/21 12:42	SKM
	Toluene-d8(surr)	98.2	%	1.00	70-130			12/16/21 12:42	SKM
SW-846 8270D	TCLP Semivolatiles								
	1,4-Dichlorobenzene	BRL	mg/L	1.00	0.05	7.5		12/17/21 14:25	MS
	2,4,5-Trichlorophenol	BRL	mg/L	1.00	0.05	400		12/17/21 14:25	MS
	2,4,6-Trichlorophenol	BRL	mg/L	1.00	0.05	2		12/17/21 14:25	MS
	2,4-Dinitrotoluene	BRL	mg/L	1.00	0.05	0.13		12/17/21 14:25	MS
	2-Methylphenol	BRL	mg/L	1.00	0.05	200		12/17/21 14:25	MS
	3- & 4-Methylphenols	BRL	mg/L	1.00	0.1	200		12/17/21 14:25	MS
	Hexachlorobenzene	BRL	mg/L	1.00	0.05	0.13		12/17/21 14:25	MS
	Hexachlorobutadiene	BRL	mg/L	1.00	0.05	0.5		12/17/21 14:25	MS
	Hexachloroethane	BRL	mg/L	1.00	0.05	3		12/17/21 14:25	MS
	Nitrobenzene	BRL	mg/L	1.00	0.05	2		12/17/21 14:25	MS
	Pentachlorophenol	BRL	mg/L	1.00	0.05	100	V11	12/17/21 14:25	MS
	Pyridine	BRL	mg/L	1.00	0.05	5		12/17/21 14:25	MS
	2-Fluorophenol(surr)	71.8	%	1.00	17-115			12/17/21 14:25	MS
	Phenol-d6(surr)	69	%	1.00	15-120			12/17/21 14:25	MS
	Nitrobenzene-d5(surr)	79.5	%	1.00	20-120			12/17/21 14:25	MS
	2-Fluorobiphenyl(surr)	72.4	%	1.00	30-115			12/17/21 14:25	MS
	2,4,6-Tribromophenol(surr)	76.1	%	1.00	10-120			12/17/21 14:25	MS
	p-Terphenyl-d14(surr)	77.1	%	1.00	30-140			12/17/21 14:25	MS

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #4 - Soil
Date Collected: 12/08/21
Time Collected: 16:30
Other Information:

Job Sample ID: 21120952.04
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
AOAC/RI-PT#080601	Salmonella								
	Salmonella[2]	Negative	/25g	1	1			12/09/21 18:15	PR
SM 9222D	Fecal Coliform								
	Coliform, Fecal	10	cfu/g	10	10			12/09/21 15:40	SB
SM 2520Bm									
	Salinity[2]	BRL	s.u.	1	2			12/21/21 12:00	AJ
SM 2540G	% Moisture								
	% Moisture[2]	20.7	%	1	0.1			12/13/21 16:10	RP
SM 2540G	% Solids								
	% Foreign matter[1]	73.6	%	1	0.1			12/16/21 16:10	RP
SW-846 9045D	Corrosivity, pH								
	pH	6.4	s.u.					12/13/21 10:00	RP
	Temperature when read, °C[2]	22	s.u.					12/13/21 10:00	RP
SW-846 6010D	Total Metals								
	Arsenic*	2.19	mg/Kg	1	0.5			12/14/21 19:23	JM
	Cadmium*	BRL	mg/Kg	1	0.5			12/14/21 19:23	JM
	Chromium*	17.3	mg/Kg	20	10			12/14/21 19:27	JM
	Copper*	7.59	mg/Kg	1	0.5			12/14/21 19:23	JM
	Lead*	9.17	mg/Kg	1	0.5			12/14/21 19:23	JM
	Molybdenum*	BRL	mg/Kg	1	0.5			12/14/21 19:23	JM
	Nickel*	8.01	mg/Kg	1	0.5			12/14/21 19:23	JM
	Selenium*	BRL	mg/Kg	1	0.5			12/14/21 19:23	JM
	Zinc*	30.3	mg/Kg	20	10			12/14/21 19:27	JM
SW-846 7470A	Total Metals - Mercury								
	Mercury*	BRL	mg/Kg	1	0.01			12/13/21 14:36	BDC
SW-846 8015D	TCLP Alcohols								
	2-Propanol	BRL	mg/Kg	1	2			12/21/21 14:22	AK
	Ethanol	BRL	mg/Kg	1	2			12/21/21 14:22	AK
	Methanol	BRL	mg/Kg	1	2			12/21/21 14:22	AK
	n-Butanol	BRL	mg/Kg	1	2			12/21/21 14:22	AK
	n-Propyl Alcohol	BRL	mg/Kg	1	2			12/21/21 14:22	AK
	t-Butyl alcohol	BRL	mg/Kg	1	2			12/21/21 14:22	AK

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #4 - Waste #1
Date Collected: 12/08/21
Time Collected: 16:45
Other Information:

Job Sample ID: 21120952.05
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 1010A									
	Ignitability	>150	°F	1				12/20/21 11:19	YSK
SM 2540G	% Moisture								
	% Moisture²	18.6	%	1	0.1			12/15/21 16:10	RP
SW-846 7.3	Reactive Cyanide								
	Reactive Cyanide²	BRL	mg/Kg	1	25			12/20/21 15:50	RHasse
SW-846 7.3	Reactive Sulfide								
	Reactive Sulfide²	BRL	mg/Kg	1	25			12/20/21 15:50	RHasse
SW-846 9034									
	Sulfide	BRL	mg/Kg	1	50			12/15/21 13:30	LC
	Sulfide, as Hydrogen Sulfide²	BRL	mg/Kg	1	50			12/15/21 13:30	LC
SW-846 9045D	Corrosivity, pH								
	pH	7	s.u.					12/16/21 10:00	RP
	Temperature when read, °C²	21.8	s.u.					12/16/21 10:00	RP
SW-846 6010D	TCLP Metals								
	Antimony	BRL	mg/L	1	0.04	1		12/16/21 15:51	JM
	Arsenic	BRL	mg/L	1	0.04	5		12/16/21 15:51	JM
	Barium	2.32	mg/L	1	0.04	100.0		12/16/21 15:51	JM
	Beryllium	BRL	mg/L	1	0.04	0.08		12/16/21 15:51	JM
	Cadmium	BRL	mg/L	1	0.04	0.5		12/16/21 15:51	JM
	Chromium	BRL	mg/L	1	0.04	5.0		12/16/21 15:51	JM
	Lead	BRL	mg/L	1	0.04	1.5		12/16/21 15:51	JM
	Nickel	BRL	mg/L	1	0.04	70		12/16/21 15:51	JM
	Selenium	BRL	mg/L	1	0.04	1.0		12/16/21 15:51	JM
	Silver	BRL	mg/L	1	0.04	5.0		12/16/21 15:51	JM
	Vanadium	BRL	mg/L	1	0.04			12/16/21 15:51	JM
SW-846 7470A	TCLP Mercury								
	Mercury	BRL	mg/L	1	0.00050	0.2		12/16/21 22:30	BDC
TX 1005	Total Petroleum Hydrocarbons								
	C6-C12*	BRL	mg/Kg	1.00	25			12/20/21 23:39	AK
	>C12-C28*	BRL	mg/Kg	1.00	25			12/20/21 23:39	AK
	>C28-C35*	BRL	mg/Kg	1.00	25			12/20/21 23:39	AK
	Total C6-C35*	BRL	mg/Kg	1.00	25			12/20/21 23:39	AK
	Chlorooctadecane(surr)	109	%	1.00	60-150			12/20/21 23:39	AK
	1-Chlorooctane(surr)	110	%	1.00	60-143			12/20/21 23:39	AK
SW-846 8015M	TX335 TCLP Non Purgeable Organics								

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name:	Tetra Tech	Attn: Jim Norstrom	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #4 - Waste #1	Job Sample ID:	21120952.05
Date Collected:	12/08/21	Sample Matrix	Soil
Time Collected:	16:45	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8015M	TX335 TCLP Non Purgeable Organics								
	2-Ethoxyethanol[2]	BRL	mg/L	2	5	1400		12/21/21 12:35	AK
	2-Methoxyethanol[2]	BRL	mg/L	2	5	14		12/21/21 12:35	AK
	Ethylene glycol	BRL	mg/L	2	5	7000		12/21/21 12:35	AK
	Isobutyl Alcohol	BRL	mg/L	1	2	1000		12/21/21 14:36	AK
SW-846 8081B	TCLP Organochlorine Pesticides								
	Chlordane	BRL	ug/L	1.00	0.5	30		12/20/21 15:25	VMN
	Endrin	BRL	ug/L	1.00	0.05	20		12/20/21 15:25	VMN
	g-BHC	BRL	ug/L	1.00	0.05	400		12/20/21 15:25	VMN
	Heptachlor	BRL	ug/L	1.00	0.05	8		12/20/21 15:25	VMN
	Heptachlor epoxide	BRL	ug/L	1.00	0.05	40		12/20/21 15:25	VMN
	Methoxychlor	BRL	ug/L	1.00	0.05	10000		12/20/21 15:25	VMN
	Toxaphene	BRL	ug/L	1.00	0.5	300		12/20/21 15:25	VMN
	Decachlorobiphenyl(surr)	106	%	1.00	10-146			12/20/21 15:25	VMN
	Tetrachloro-m-xylene(surr)	93.3	%	1.00	12-116			12/20/21 15:25	VMN
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 00:45	VMN
	Tetrachloro-m-xylene(surr)	83.2	%	1.00	42-128			12/16/21 00:45	VMN
	Decachlorobiphenyl(surr)	46.2	%	1.00	42-130			12/16/21 00:45	VMN
SW-846 8141B	TX335 TCLP Pesticide (NPD)								
	Dimethoate	BRL	mg/L	1	0.01	70		12/21/21 18:44	VMN
	Disulfoton	BRL	mg/L	1	0.01	0.1		12/21/21 18:44	VMN
	Methomyl[2]	BRL	mg/L	1	0.05	90		12/21/21 18:44	VMN
	Methyl Parathion	BRL	mg/L	1	0.01	0.9		12/21/21 18:44	VMN
	Parathion	BRL	mg/L	1	0.01	20		12/21/21 18:44	VMN
	Pronamide[2]	BRL	mg/L	1	0.01	300		12/21/21 18:44	VMN
	4-Chloro-3-Nitro-Benzene(surr)	76	%	1	50-130			12/21/21 18:44	VMN
SW-846 8151A	TCLP Herbicides								
	2,4,5-TP	BRL	ug/L	5.00	5	1000		12/20/21 17:47	VMN
	2,4-D	BRL	ug/L	5.00	5	10000		12/20/21 17:47	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #4 - Waste #1
Date Collected: 12/08/21
Time Collected: 16:45
Other Information:

Job Sample ID: 21120952.05
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8151A	TCLP Herbicides								
	DCPAA(surr)	18.3	%	5.00	34-124		S6	12/20/21 17:47	VMN
SW-846 8260C	TCLP VOC								
	1,1-Dichloroethylene	BRL	mg/L	1.00	0.13	0.6		12/16/21 19:48	SKM
	1,2-Dichloroethane	BRL	mg/L	1.00	0.13	0.5		12/16/21 19:48	SKM
	1,4-Dichlorobenzene	BRL	mg/L	1.00	0.15	7.5		12/16/21 19:48	SKM
	Benzene	BRL	mg/L	1.00	0.13	0.5		12/16/21 19:48	SKM
	Carbon tetrachloride	BRL	mg/L	1.00	0.13	0.5		12/16/21 19:48	SKM
	Chlorobenzene	BRL	mg/L	1.00	0.15	70		12/16/21 19:48	SKM
	Chloroform	BRL	mg/L	1.00	0.13	6		12/16/21 19:48	SKM
	MEK	BRL	mg/L	1.00	0.13	200		12/16/21 19:48	SKM
	Tetrachloroethylene	BRL	mg/L	1.00	0.13	0.7		12/16/21 19:48	SKM
	Trichloroethylene	BRL	mg/L	1.00	0.13	0.5		12/16/21 19:48	SKM
	Vinyl Chloride	BRL	mg/L	1.00	0.13	0.2		12/16/21 19:48	SKM
	1,2-Dichloroethane-d4(surr)	107	%	1.00	70-130			12/16/21 19:48	SKM
	Dibromofluoromethane(surr)	106	%	1.00	70-130			12/16/21 19:48	SKM
	p-Bromofluorobenzene(surr)	98.2	%	1.00	70-130			12/16/21 19:48	SKM
	Toluene-d8(surr)	97	%	1.00	70-130			12/16/21 19:48	SKM
SW-846 8270D	TCLP Semivolatiles								
	1,4-Dichlorobenzene	BRL	mg/L	1.00	0.05	7.5		12/17/21 16:28	MS
	2,4,5-Trichlorophenol	BRL	mg/L	1.00	0.05	400		12/17/21 16:28	MS
	2,4,6-Trichlorophenol	BRL	mg/L	1.00	0.05	2		12/17/21 16:28	MS
	2,4-Dinitrotoluene	BRL	mg/L	1.00	0.05	0.13		12/17/21 16:28	MS
	2-Methylphenol	BRL	mg/L	1.00	0.05	200		12/17/21 16:28	MS
	3- & 4-Methylphenols	BRL	mg/L	1.00	0.1	200		12/17/21 16:28	MS
	Hexachlorobenzene	BRL	mg/L	1.00	0.05	0.13		12/17/21 16:28	MS
	Hexachlorobutadiene	BRL	mg/L	1.00	0.05	0.5		12/17/21 16:28	MS
	Hexachloroethane	BRL	mg/L	1.00	0.05	3		12/17/21 16:28	MS
	Nitrobenzene	BRL	mg/L	1.00	0.05	2		12/17/21 16:28	MS
	Pentachlorophenol	BRL	mg/L	1.00	0.05	100		12/17/21 16:28	MS
	Pyridine	BRL	mg/L	1.00	0.05	5		12/17/21 16:28	MS
	2-Fluorophenol(surr)	75.2	%	1.00	17-115			12/17/21 16:28	MS
	Phenol-d6(surr)	71.2	%	1.00	15-120			12/17/21 16:28	MS
	Nitrobenzene-d5(surr)	76	%	1.00	20-120			12/17/21 16:28	MS
	2-Fluorobiphenyl(surr)	70.2	%	1.00	30-115			12/17/21 16:28	MS
	2,4,6-Tribromophenol(surr)	75	%	1.00	10-120			12/17/21 16:28	MS
	p-Terphenyl-d14(surr)	74.9	%	1.00	30-140			12/17/21 16:28	MS

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #3 - Waste #1 (Run#2)
Date Collected: 12/08/21
Time Collected: 15:05
Other Information:

Job Sample ID: 21120952.06
Sample Matrix Soil
% Moisture 18.2

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	10.00	16.7		D1	12/16/21 00:31	VMN
	Aroclor 1221*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Aroclor 1232*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Aroclor 1242*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Aroclor 1248*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Aroclor 1254*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Aroclor 1260*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Total PCBs*	BRL	ug/Kg	10.00	16.7			12/16/21 00:31	VMN
	Tetrachloro-m-xylene(surr)	92.5	%	10.00	42-128			12/16/21 00:31	VMN
	Decachlorobiphenyl(surr)	47.1	%	10.00	42-130			12/16/21 00:31	VMN

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech

Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #4 - Waste #1 (Run#2)
Date Collected: 12/08/21
Time Collected: 16:45
Other Information:

Job Sample ID: 21120952.07
Sample Matrix Soil
% Moisture 18.6

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 00:58	VMN
	Tetrachloro-m-xylene(surr)	83.5	%	1.00	42-128			12/16/21 00:58	VMN
	Decachlorobiphenyl(surr)	46	%	1.00	42-130			12/16/21 00:58	VMN

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21120952

Date 1/5/2022

Client Name: Tetra Tech

Attn: Jim Norstrom

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #1 - Soil (Run #2)
Date Collected: 12/08/21
Time Collected: 10:22
Other Information:

Job Sample ID: 21120952.10
Sample Matrix Soil
% Moisture 29.5

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 00:05	VMN
	Tetrachloro-m-xylene(surr)	75.9	%	1.00	42-128			12/16/21 00:05	VMN
	Decachlorobiphenyl(surr)	54.8	%	1.00	42-130			12/16/21 00:05	VMN

ab-q212-0321
Soil results reported on dry weight basis

[1]-Parameter is not accredited.
[2]-Parameter not available for accreditation.
*-Moisture Attached

Laboratory Analysis Report

Total Number of Pages: 49

Job ID : 21121092

10100 East Freeway, Suite 100, Houston, TX 77029 tel: 713-453-6060, fax: 713-453-6091, http://www.ablabs.com

Client Project Name :
Landfill Closure / Landfill

Report To :

Client Name: Tetra Tech
Attn:
Client Address: 1500 CityWest Boulevard, Suite 1000
City, State, Zip: Houston, Texas, 77042

P.O.#.:
Sample Collected By: Stu McBride
Date Collected: 12/09/21

A&B Labs has analyzed the following samples...

Client Sample ID	Matrix	A&B Sample ID
Test Pit #5 - Soil	Soil	21121092.01
Test Pit #6 - Waste	Soil	21121092.03
Test Pit #7 - Waste	Soil	21121092.04
Test Pit #8 - Soil	Soil	21121092.06
Test Pit #8 - Waste	Soil	21121092.08
Test Pit #9 - Waste	Soil	21121092.09
Test Pit #6 - Waste (Run #2)	Soil	21121092.11
Test Pit #7 - Waste (Run #2)	Soil	21121092.12
Test Pit #9 - Waste (Run #2)	Soil	21121092.13
Test Pit #5 - Soil (Run #2)	Soil	21121092.17
Test Pit #8 - Waste (Run #2)	Soil	21121092.18

Released By: Shantall Carpenter
Title: Senior Project Manager
Date: 1/5/2022

This Laboratory is NELAP (T104704213) accredited. Effective: 04/01/2021; Expires: 3/31/2022
Scope: Non-Potable Water, Drinking Water, Air, Solid, Biological Tissue, Hazardous Waste

I am the laboratory manager, or his/her designee, and I am responsible for the release of this data package. This laboratory data package has been reviewed and is complete and technically compliant with the requirements of the methods used, except where noted in the attached exception reports. I affirm, to the best of my knowledge that all problems/anomalies observed by this laboratory (and if applicable, any and all laboratories subcontracted through this laboratory) that might affect the quality of the data, have been identified in the Laboratory Review Checklist, and that no information or data have been knowingly withheld that would affect the quality of the data.

ab-q210-0321

Date Received : 12/10/2021 14:26

LABORATORY TERM AND QUALIFIER DEFINITION REPORT

Job ID : 21121092

Date: 1/5/2022

General Term Definition

Back-Wt	Back Weight	Post-Wt	Post Weight
BRL	Below Reporting Limit	ppm	parts per million
cfu	colony-forming units	Pre-Wt	Previous Weight
Conc.	Concentration	Q	Qualifier
D.F.	Dilution Factor	RegLimit	Regulatory Limit
Front-Wt	Front Weight	RPD	Relative Percent Difference
LCS	Laboratory Check Standard	RptLimit	Reporting Limit
LCSD	Laboratory Check Standard Duplicate	SDL	Sample Detection Limit
MS	Matrix Spike	surr	Surrogate
MSD	Matrix Spike Duplicate	T	Time
MW	Molecular Weight	TNTC	Too numerous to count
J	Estimation. Below calibration range but above MDL		

Qualifier Definition

D1	Sample required dilution due to matrix effects.
M1	Matrix Spike and/or Matrix Spike Duplicate recovery is above laboratory control limits due to matrix interference. "The sample randomly selected as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
M2	Matrix Spike and/or Matrix Spike Duplicate recovery is below laboratory control limits due to matrix interference."The sample randomly selected as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
M6	Not calculated. Sample concentration high, more than 4X spike concentration. Control limits do not apply."The sample randomly selcted as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
R1	RPD exceeds control limits."The sample randomly selcted as QC for this batch was not part of your project. Therefore, this sample matrix is not applicable to your project samples."
S1	Surrogate recovery is above control limit. Results may be biased high.
S6	Surrogate recovery is outside control limits due to matrix effects.

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #5 - Soil	Job Sample ID:	21121092.01
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	09:25	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SM 2540G	% Moisture								
	% Moisture[2]	24.4	%	1	0.1			12/13/21 16:10	RP
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.46			12/16/21 01:11	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 01:11	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 01:11	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 01:11	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 01:11	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 01:11	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.52			12/16/21 01:11	VMN
	Total PCBs*	BRL	ug/Kg	1.00				12/16/21 01:11	VMN
	Tetrachloro-m-xylene(surr)	80.5	%	1.00	42-128			12/16/21 01:11	VMN
	Decachlorobiphenyl(surr)	77.3	%	1.00	42-130			12/16/21 01:11	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #6 - Waste	Job Sample ID:	21121092.03
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	10:15	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SM 2540G	% Moisture								
	% Moisture[2]	13.8	%	1	0.1			12/16/21 16:10	RP
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 01:38	VMN
	Tetrachloro-m-xylene(surr)	84.2	%	1.00	42-128			12/16/21 01:38	VMN
	Decachlorobiphenyl(surr)	63.2	%	1.00	42-130			12/16/21 01:38	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #7 - Waste	Job Sample ID:	21121092.04
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	11:15	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SM 2540G	% Moisture								
	% Moisture[2]	20	%	1	0.1			12/16/21 16:10	RP
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 02:31	VMN
	Tetrachloro-m-xylene(surr)	82.1	%	1.00	42-128			12/16/21 02:31	VMN
	Decachlorobiphenyl(surr)	45.5	%	1.00	42-130			12/16/21 02:31	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name: Tetra Tech Attn:

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #8 - Soil
Date Collected: 12/09/21
Time Collected: 12:30
Other Information:

Job Sample ID: 21121092.06
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
AOAC/RI-PT#080601	Salmonella								
	Salmonella²	Negative	/25g	1	1			12/13/21 17:50	PR
SM 9222D	Fecal Coliform								
	Coliform, Fecal	BRL	cfu/g	10	10			12/13/21 12:00	SB
SM 2520Bm									
	Salinity²	BRL	s.u.	1	2			12/21/21 12:00	AJ
SM 2540G	% Moisture								
	% Moisture²	19.9	%	1	0.1			12/13/21 16:10	RP
SM 2540G	% Solids								
	% Foreign matter¹	81.5	%	1	0.1			12/20/21 16:10	RP
SW-846 9045D	Corrosivity, pH								
	pH	6.2	s.u.					12/13/21 11:00	RP
	Temperature when read, °C²	21.6	s.u.					12/13/21 11:00	RP
SW-846 6010D	Total Metals								
	Arsenic*	1.66	mg/Kg	1	0.5			12/14/21 20:04	JM
	Cadmium*	BRL	mg/Kg	1	0.5			12/14/21 20:04	JM
	Chromium*	9.5	mg/Kg	1	0.5			12/14/21 20:04	JM
	Copper*	6.99	mg/Kg	1	0.5			12/14/21 20:04	JM
	Lead*	8.43	mg/Kg	1	0.5			12/14/21 20:04	JM
	Molybdenum*	BRL	mg/Kg	1	0.5			12/14/21 20:04	JM
	Nickel*	8.86	mg/Kg	1	0.5			12/14/21 20:04	JM
	Selenium*	BRL	mg/Kg	1	0.5			12/14/21 20:04	JM
	Zinc*	24.7	mg/Kg	20	10			12/14/21 20:08	JM
SW-846 7470A	Total Metals - Mercury								
	Mercury*	BRL	mg/Kg	2	0.02		D1	12/13/21 14:55	BDC
SW-846 8015D	TCLP Alcohols								
	2-Propanol	BRL	mg/Kg	1	2			12/21/21 14:49	AK
	Ethanol	BRL	mg/Kg	1	2			12/21/21 14:49	AK
	Methanol	BRL	mg/Kg	1	2			12/21/21 14:49	AK
	n-Butanol	BRL	mg/Kg	1	2			12/21/21 14:49	AK
	n-Propyl Alcohol	BRL	mg/Kg	1	2			12/21/21 14:49	AK
	t-Butyl alcohol	BRL	mg/Kg	1	2			12/21/21 14:49	AK

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #8 - Waste	Job Sample ID:	21121092.08
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	12:48	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 1010A									
	Ignitability	>150	°F	1				12/21/21 11:19	YSK
SM 2540G	% Moisture								
	% Moisture²	25.5	%	1	0.1			12/15/21 16:10	RP
SW-846 7.3	Reactive Cyanide								
	Reactive Cyanide²	BRL	mg/Kg	1	25			12/21/21 17:00	RHasse
SW-846 7.3	Reactive Sulfide								
	Reactive Sulfide²	BRL	mg/Kg	1	25			12/21/21 16:30	RHasse
SW-846 9034									
	Sulfide	BRL	mg/Kg	1	50			12/15/21 13:30	LC
	Sulfide, as Hydrogen Sulfide²	BRL	mg/Kg	1	50			12/15/21 13:30	LC
SW-846 9045D	Corrosivity, pH								
	pH	8	s.u.					12/16/21 10:00	RP
	Temperature when read, °C²	21.4	s.u.					12/16/21 10:00	RP
SW-846 6010D	TCLP Metals								
	Antimony	BRL	mg/L	1	0.04	1		12/17/21 15:14	JM
	Arsenic	BRL	mg/L	1	0.04	5		12/17/21 15:14	JM
	Barium	1.96	mg/L	1	0.04	100.0		12/17/21 15:14	JM
	Beryllium	BRL	mg/L	1	0.04	0.08		12/17/21 15:14	JM
	Cadmium	BRL	mg/L	1	0.04	0.5		12/17/21 15:14	JM
	Chromium	BRL	mg/L	1	0.04	5.0		12/17/21 15:14	JM
	Lead	BRL	mg/L	1	0.04	1.5		12/17/21 15:14	JM
	Nickel	BRL	mg/L	1	0.04	70		12/17/21 15:14	JM
	Selenium	BRL	mg/L	1	0.04	1.0		12/17/21 15:14	JM
	Silver	BRL	mg/L	1	0.04	5.0		12/17/21 15:14	JM
	Vanadium	BRL	mg/L	1	0.04			12/17/21 15:14	JM
SW-846 7470A	TCLP Mercury								
	Mercury	BRL	mg/L	1	0.00050	0.2		12/17/21 14:05	BDC
TX 1005	Total Petroleum Hydrocarbons								
	C6-C12*	BRL	mg/Kg	1.00	25			12/13/21 14:27	AK
	>C12-C28*	BRL	mg/Kg	1.00	25			12/13/21 14:27	AK
	>C28-C35*	BRL	mg/Kg	1.00	25			12/13/21 14:27	AK
	Total C6-C35*	BRL	mg/Kg	1.00	25			12/13/21 14:27	AK
	Chlorooctadecane(surr)	97.7	%	1.00	60-150			12/13/21 14:27	AK
	1-Chlorooctane(surr)	99.1	%	1.00	60-143			12/13/21 14:27	AK
SW-846 8015M	TX335 TCLP Non Purgeable Organics								

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name: Tetra Tech Attn:

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #8 - Waste
Date Collected: 12/09/21
Time Collected: 12:48
Other Information:

Job Sample ID: 21121092.08
Sample Matrix Soil
% Moisture

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8015M	TX335 TCLP Non Purgeable Organics								
	2-Ethoxyethanol²	BRL	mg/L	2	5	1400		12/21/21 12:46	AK
	2-Methoxyethanol²	BRL	mg/L	2	5	14		12/21/21 12:46	AK
	Ethylene glycol	BRL	mg/L	2	5	7000		12/21/21 12:46	AK
	Isobutyl Alcohol	BRL	mg/L	1	2	1000		12/21/21 15:03	AK
SW-846 8081B	TCLP Organochlorine Pesticides								
	Chlordane	BRL	ug/L	1.00	0.5	30		12/20/21 15:38	VMN
	Endrin	BRL	ug/L	1.00	0.05	20		12/20/21 15:38	VMN
	g-BHC	BRL	ug/L	1.00	0.05	400		12/20/21 15:38	VMN
	Heptachlor	BRL	ug/L	1.00	0.05	8		12/20/21 15:38	VMN
	Heptachlor epoxide	BRL	ug/L	1.00	0.05	40		12/20/21 15:38	VMN
	Methoxychlor	BRL	ug/L	1.00	0.05	10000		12/20/21 15:38	VMN
	Toxaphene	BRL	ug/L	1.00	0.5	300		12/20/21 15:38	VMN
	Decachlorobiphenyl(surr)	101	%	1.00	10-146			12/20/21 15:38	VMN
	Tetrachloro-m-xylene(surr)	95.8	%	1.00	12-116			12/20/21 15:38	VMN
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 02:58	VMN
	Tetrachloro-m-xylene(surr)	67.1	%	1.00	42-128			12/16/21 02:58	VMN
	Decachlorobiphenyl(surr)	41.1	%	1.00	42-130		S6	12/16/21 02:58	VMN
SW-846 8151A	TCLP Herbicides								
	2,4,5-TP	BRL	ug/L	5.00	5	1000		12/20/21 18:04	VMN
	2,4-D	BRL	ug/L	5.00	5	10000		12/20/21 18:04	VMN
	DCPAA(surr)	16.8	%	5.00	34-124		S6	12/20/21 18:04	VMN
SW-846 8260C	TCLP VOC								
	1,1-Dichloroethylene	BRL	mg/L	1.00	0.13	0.6		12/16/21 20:21	SKM
	1,2-Dichloroethane	BRL	mg/L	1.00	0.13	0.5		12/16/21 20:21	SKM
	1,4-Dichlorobenzene	BRL	mg/L	1.00	0.15	7.5		12/16/21 20:21	SKM
	Benzene	BRL	mg/L	1.00	0.13	0.5		12/16/21 20:21	SKM
	Carbon tetrachloride	BRL	mg/L	1.00	0.13	0.5		12/16/21 20:21	SKM
	Chlorobenzene	BRL	mg/L	1.00	0.15	70		12/16/21 20:21	SKM

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #8 - Waste	Job Sample ID:	21121092.08
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	12:48	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8260C	TCLP VOC								
	Chloroform	BRL	mg/L	1.00	0.13	6		12/16/21 20:21	SKM
	MEK	BRL	mg/L	1.00	0.13	200		12/16/21 20:21	SKM
	Tetrachloroethylene	BRL	mg/L	1.00	0.13	0.7		12/16/21 20:21	SKM
	Trichloroethylene	BRL	mg/L	1.00	0.13	0.5		12/16/21 20:21	SKM
	Vinyl Chloride	BRL	mg/L	1.00	0.13	0.2		12/16/21 20:21	SKM
	p-Bromofluorobenzene(surr)	93.8	%	1.00	70-130			12/16/21 20:21	SKM
	Toluene-d8(surr)	97	%	1.00	70-130			12/16/21 20:21	SKM
	1,2-Dichloroethane-d4(surr)	107	%	1.00	70-130			12/16/21 20:21	SKM
	Dibromofluoromethane(surr)	107	%	1.00	70-130			12/16/21 20:21	SKM
SW-846 8270D	TCLP Semivolatiles								
	1,4-Dichlorobenzene	BRL	mg/L	1.00	0.05	7.5		12/19/21 22:58	MS
	2,4,5-Trichlorophenol	BRL	mg/L	1.00	0.05	400		12/19/21 22:58	MS
	2,4,6-Trichlorophenol	BRL	mg/L	1.00	0.05	2		12/19/21 22:58	MS
	2,4-Dinitrotoluene	BRL	mg/L	1.00	0.05	0.13		12/19/21 22:58	MS
	2-Methylphenol	BRL	mg/L	1.00	0.05	200		12/19/21 22:58	MS
	3- & 4-Methylphenols	BRL	mg/L	1.00	0.1	200		12/19/21 22:58	MS
	Hexachlorobenzene	BRL	mg/L	1.00	0.05	0.13		12/19/21 22:58	MS
	Hexachlorobutadiene	BRL	mg/L	1.00	0.05	0.5		12/19/21 22:58	MS
	Hexachloroethane	BRL	mg/L	1.00	0.05	3		12/19/21 22:58	MS
	Nitrobenzene	BRL	mg/L	1.00	0.05	2		12/19/21 22:58	MS
	Pentachlorophenol	BRL	mg/L	1.00	0.05	100		12/19/21 22:58	MS
	Pyridine	BRL	mg/L	1.00	0.05	5		12/19/21 22:58	MS
	2-Fluorophenol(surr)	86.3	%	1.00	17-115			12/19/21 22:58	MS
	Phenol-d6(surr)	77.6	%	1.00	15-120			12/19/21 22:58	MS
	Nitrobenzene-d5(surr)	81.2	%	1.00	20-120			12/19/21 22:58	MS
	2-Fluorobiphenyl(surr)	70.3	%	1.00	30-115			12/19/21 22:58	MS
	2,4,6-Tribromophenol(surr)	90	%	1.00	10-120			12/19/21 22:58	MS
	p-Terphenyl-d14(surr)	68.9	%	1.00	30-140			12/19/21 22:58	MS

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #9 - Waste	Job Sample ID:	21121092.09
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	13:40	% Moisture	
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SM 2540G	% Moisture								
	% Moisture²	10.7	%	1	0.1			12/16/21 16:10	RP
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	10.00	16.7		D1	12/16/21 03:11	VMN
	Aroclor 1221*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Aroclor 1232*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Aroclor 1242*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Aroclor 1248*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Aroclor 1254*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Aroclor 1260*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Total PCBs*	BRL	ug/Kg	10.00	16.7			12/16/21 03:11	VMN
	Tetrachloro-m-xylene(surr)	81	%	10.00	42-128			12/16/21 03:11	VMN
	Decachlorobiphenyl(surr)	59.9	%	10.00	42-130			12/16/21 03:11	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #6 - Waste (Run #2)	Job Sample ID:	21121092.11
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	10:15	% Moisture	13.8
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 01:51	VMN
	Tetrachloro-m-xylene(surr)	85.8	%	1.00	42-128			12/16/21 01:51	VMN
	Decachlorobiphenyl(surr)	68.2	%	1.00	42-130			12/16/21 01:51	VMN

ab-q212-0321

Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name: Tetra Tech Attn:

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #7 - Waste (Run #2)
Date Collected: 12/09/21
Time Collected: 11:15
Other Information:

Job Sample ID: 21121092.12
Sample Matrix Soil
% Moisture 20

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/16/21 02:45	VMN
	Tetrachloro-m-xylene(surr)	80.4	%	1.00	42-128			12/16/21 02:45	VMN
	Decachlorobiphenyl(surr)	45.7	%	1.00	42-130			12/16/21 02:45	VMN

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name: Tetra Tech Attn:

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #9 - Waste (Run #2)
Date Collected: 12/09/21
Time Collected: 13:40
Other Information:

Job Sample ID: 21121092.13
Sample Matrix Soil
% Moisture 10.7

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	10.00	16.7		D1	12/16/21 03:25	VMN
	Aroclor 1221*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Aroclor 1232*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Aroclor 1242*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Aroclor 1248*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Aroclor 1254*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Aroclor 1260*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Total PCBs*	BRL	ug/Kg	10.00	16.7			12/16/21 03:25	VMN
	Tetrachloro-m-xylene(surr)	90.5	%	10.00	42-128			12/16/21 03:25	VMN
	Decachlorobiphenyl(surr)	76.3	%	10.00	42-130			12/16/21 03:25	VMN

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name: Tetra Tech Attn:

Project Name: Landfill Closure / Landfill

Client Sample ID: Test Pit #5 - Soil (Run #2)
Date Collected: 12/09/21
Time Collected: 09:25
Other Information:

Job Sample ID: 21121092.17
Sample Matrix Soil
% Moisture 24.4

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.46			12/16/21 01:25	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/16/21 01:25	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/16/21 01:25	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/16/21 01:25	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/16/21 01:25	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/16/21 01:25	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.52			12/16/21 01:25	VMN
	Total PCBs*	BRL	ug/Kg	1.00				12/16/21 01:25	VMN
	Tetrachloro-m-xylene(surr)	83.8	%	1.00	42-128			12/16/21 01:25	VMN
	Decachlorobiphenyl(surr)	78.2	%	1.00	42-130			12/16/21 01:25	VMN

ab-q212-0321
Soil results reported on dry weight basis

LABORATORY TEST RESULTS

Job ID : 21121092

Date 1/5/2022

Client Name:	Tetra Tech	Attn:	
Project Name:	Landfill Closure / Landfill		

Client Sample ID:	Test Pit #8 - Waste (Run #2)	Job Sample ID:	21121092.18
Date Collected:	12/09/21	Sample Matrix	Soil
Time Collected:	12:48	% Moisture	25.5
Other Information:			

Test Method	Parameter/Test Description	Result	Units	DF	Rpt Limit	Reg Limit	Q	Date Time	Analyst
SW-846 8082A	Polychlorinated Biphenyls								
	Aroclor 1016*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Aroclor 1221*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Aroclor 1232*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Aroclor 1242*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Aroclor 1248*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Aroclor 1254*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Aroclor 1260*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Total PCBs*	BRL	ug/Kg	1.00	1.67			12/22/21 13:39	VMN
	Tetrachloro-m-xylene(surr)	51.3	%	1.00	42-128			12/22/21 13:39	VMN
	Decachlorobiphenyl(surr)	33.9	%	1.00	42-130		S6	12/22/21 13:39	VMN

ab-q212-0321

Soil results reported on dry weight basis

[1]-Parameter is not accredited.

[2]-Parameter not available for accreditation.

*-Moisture Attached

Laboratory Analysis Report

Total Number of Pages: 7

Job ID : 21120952

10100 East Freeway, Suite 100, Houston, TX 77029 tel: 713-453-6060, fax: 713-453-6091, http://www.ablabs.com

Client Project Name :
Landfill Closure / Landfill

Report To :	Client Name:	Tetra Tech	P.O.#.:	
	Attn:	Jim Norstrom	Sample Collected By:	Stu McBride
	Client Address:	1500 CityWest Boulevard, Suite 100	Date Collected:	12/08/21
	City, State, Zip:	Houston, Texas, 77042		

Client Sample ID	Matrix	A&B Sample ID
Test Pit #1 - Soil	Soil	21120952.01
Test Pit #3 - Soil	Soil	21120952.02
Test Pit #3 - Waste #1	Soil	21120952.03
Test Pit #4 - Soil	Soil	21120952.04
Test Pit #4 - Waste #1	Soil	21120952.05
Test Pit #3 - Waste #1 (Run#2)	Soil	21120952.06
Test Pit #4 - Waste #1 (Run#2)	Soil	21120952.07
Test Pit #3 - Waste #1 (Run #3)	Soil	21120952.08
Test Pit #4 - Waste #1 (Run #3)	Soil	21120952.09

This analysis was subcontracted to :
J3 Resources, Inc., 6110 W. 34th Street
Houston, Texas, 77092

Released By: Shantall Carpenter
Title: Senior Project Manager

Date: 01/04/2022

I am the laboratory manager, or his/her designee, and I am responsible for the release of this data package. This laboratory data package has been reviewed and is complete and technically compliant with the requirements of the methods used, except where noted in the attached exception reports. I affirm, to the best of my knowledge that all problems/anomalies observed by this laboratory (and if applicable, any and all laboratories subcontracted through this laboratory) that might affect the quality of the data, have been identified in the Laboratory Review Checklist, and that no information or data have been knowingly withheld that would affect the quality of the data.

ab-q210-0321

Date Received : 12/09/2021 14:48

Eurofins J3 Resources, Inc.
6110 W. 34th Street, Houston, Texas 77092
Phone: (713) 290-0221 - Fax: (713) 290-0248
J3Resources.com

Bulk Asbestos Fiber Analysis by Polarized Light Microscopy (PLM)

Appx E Sub E 40 CFR 763 / EPA 600/R-93/116

Shantall Carpenter
A&B Labs
10100 East Frwy, Suite 100
Houston TX 77029

Order #: JH21133804
Project #: 46478/2110952
Date Received: 21-Dec-2021
Date Analyzed: 23-Dec-2021
Date Reported: 27-Dec-2021

46478/2110952

Sample ID #	Sample Description	Asbestos Constituents	Non-Asbestos Constituents	
Test Pit #1-Soil	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #3-Soil	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #3-Waste #1 (Run#1)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #4-Soil	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #4-Waste #1 (Run#1)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #3-Waste #1 (Run#2)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #4-Waste #1 (Run#2)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #4-Waste #1 (Run#3)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #4-Waste #1 (Run#3)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%

Juliann Johnson Analyst

Scott Ward, Ph.D. Lab Director

NVLAP Lab Code: 200525-0 **TDSHS License: 30-0273**

Laboratory Analysis Report

Total Number of Pages: 9

Job ID : 21121092

10100 East Freeway, Suite 100, Houston, TX 77029 tel: 713-453-6060, fax: 713-453-6091, http://www.ablabs.com

Client Project Name :
Landfill Closure / Landfill

Report To :

Client Name: Tetra Tech
Attn:
Client Address: 1500 CityWest Boulevard, Suite 100
City, State, Zip: Houston, Texas, 77042

P.O.#.:
Sample Collected By: Stu McBride
Date Collected: 12/09/21

Client Sample ID	Matrix	A&B Sample ID
Test Pit #6 - Waste	Soil	21121092.03
Test Pit #7 - Waste	Soil	21121092.04
Test Pit #8 - Soil	Soil	21121092.06
Test Pit #8 - Waste	Soil	21121092.08
Test Pit #9 - Waste	Soil	21121092.09
Test Pit #6 - Waste (Run #2)	Soil	21121092.11
Test Pit #7 - Waste (Run #2)	Soil	21121092.12
Test Pit #9 - Waste (Run #2)	Soil	21121092.13
Test Pit #6 - Waste (Run #3)	Soil	21121092.14
Test Pit #7 - Waste (Run #3)	Soil	21121092.15
Test Pit #9 - Waste (Run #3)	Soil	21121092.16
Test Pit #8 - Waste (Run #2)	Soil	21121092.18
Test Pit #8 - Waste (Run #3)	Soil	21121092.19

This analysis was subcontracted to :
J3 Resources, Inc., 6110 W. 34th Street
Houston, Texas, 77092

Released By: Shantall Carpenter
Title: Senior Project Manager

Date: 01/04/2022

I am the laboratory manager, or his/her designee, and I am responsible for the release of this data package. This laboratory data package has been reviewed and is complete and technically compliant with the requirements of the methods used, except where noted in the attached exception reports. I affirm, to the best of my knowledge that all problems/anomalies observed by this laboratory (and if applicable, any and all laboratories subcontracted through this laboratory) that might affect the quality of the data, have been identified in the Laboratory Review Checklist, and that no information or data have been knowingly withheld that would affect the quality of the data.

ab-q210-0321

Date Received : 12/10/2021 14:26

Eurofins J3 Resources, Inc.
6110 W. 34th Street, Houston, Texas 77092
Phone: (713) 290-0221 - Fax: (713) 290-0248
J3Resources.com

Bulk Asbestos Fiber Analysis by Polarized Light Microscopy (PLM)

Appx E Sub E 40 CFR 763 / EPA 600/R-93/116

Shantall Carpenter
A&B Labs
10100 East Frwy, Suite 100
Houston TX 77029

Order #: JH21133803
Project #: 46478/21121092
Date Received: 21-Dec-2021
Date Analyzed: 23-Dec-2021
Date Reported: 27-Dec-2021

46478/21121092

Sample ID #	Sample Description	Asbestos Constituents	Non-Asbestos Constituents	
Test Pit #6-Waste	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	5% 95%
Test Pit #7-Waste	Soil, Brown, Homogeneous	None Detected	Synthetic Fiber Non-Fibrous Material	2% 98%
Test Pit #8-Soil	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	2% 98%
Test Pit #8-Waste	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	2% 98%
Test Pit #9-Waste	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Synthetic Fiber Non-Fibrous Material	2% <1 98%
Test Pit #6-Waste (Run#2)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	5% 95%
Test Pit #7-Waste (Run#2)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Synthetic Fiber Non-Fibrous Material	2% <1 98%
Test Pit #9-Waste (Run#2)	Soil, Brown, Homogeneous	None Detected	Cellulose Fiber Synthetic Fiber Non-Fibrous Material	2% <1 98%

Juliann Johnson Analyst

Scott Ward, Ph.D. Lab Director

NVLAP Lab Code: 200525-0 **TDSHS License: 30-0273**

Eurofins J3 Resources, Inc.
6110 W. 34th Street, Houston, Texas 77092
Phone: (713) 290-0221 - Fax: (713) 290-0248
J3Resources.com

Bulk Asbestos Fiber Analysis by Polarized Light Microscopy (PLM)

Appx E Sub E 40 CFR 763 / EPA 600/R-93/116

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Order #: JH21133803
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Date Analyzed: 23-Dec-2021
Date Reported: 27-Dec-2021

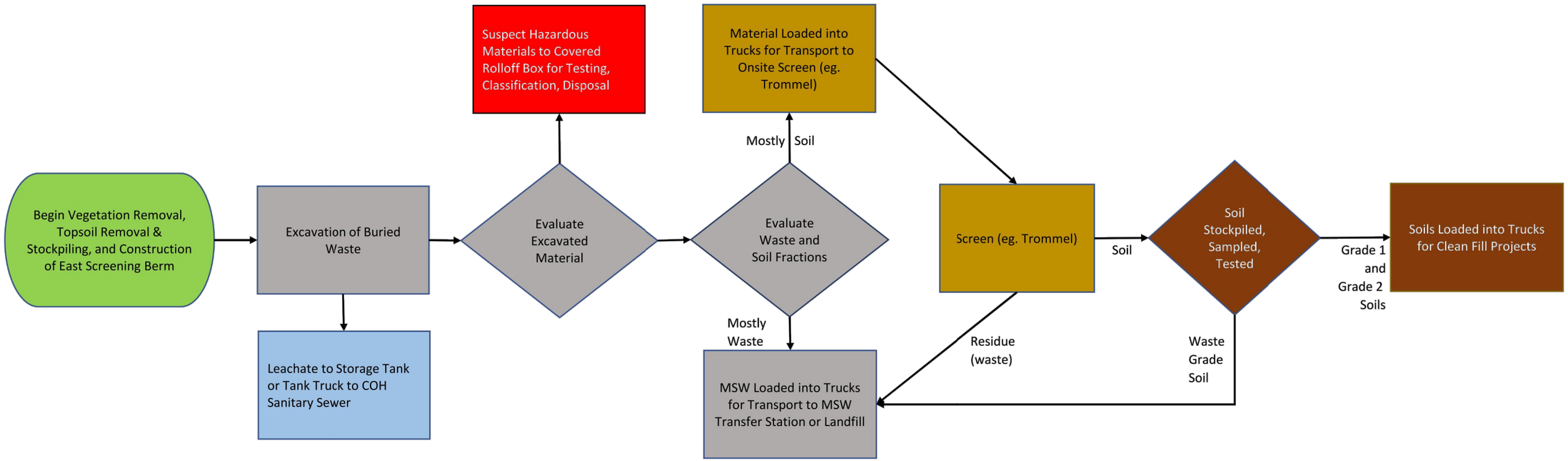
46478/21121092

Sample ID #	Sample Description	Asbestos Constituents	Non-Asbestos Constituents	
Test Pit #6- Waste (Run#3)	Soil, Brown/ Black, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	8% 92%
Test Pit #7- Waste (Run#3)	Soil, Brown/ Black, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	2% 98%
Test Pit #9 - Waste (Run #3)	Soil, Brown/ Black, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #8 - Waste (Run #2)	Soil, Brown/ Black, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%
Test Pit #8 - Waste (Run #3)	Soil, Brown/ Black, Homogeneous	None Detected	Cellulose Fiber Non-Fibrous Material	<1% 100%

Juliann Johnson Analyst

Scott Ward, Ph.D. Lab Director

NVLAP Lab Code: 200525-0 **TDSHS License: 30-0273**



TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 & 832.251.5160

AGENCY NAME

DESIGNED BY :	-
DRAWN BY :	A.K. / D.B.
CHECKED BY :	V.Y.
APPROVED BY :	J.N.
DATE:	08-2021
PROJ. NO.:	2020-0072

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

FLOW DIAGRAM

Attach III-2

STATE OF TEXAS
JAMES M. NORSTROM
57016
LICENSED
PROFESSIONAL ENGINEER
3/1/23
TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-813 Flow Diagram

N

0 150 300

SCALE:1"= 300'

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

MAIN SITE HAUL ROAD

PROPERTY BOUNDARY

MAIN SITE HAUL ROAD

MAIN SITE HAUL ROAD

MAIN SITE HAUL ROAD

MAIN SITE HAUL ROAD ENTRANCE

10' HIGH VISUAL SCREENING BERM

10' HIGH VISUAL SCREENING BERM

10' HIGH VISUAL SCREENING BERM

DIRECTION OF EXCAVATION

DIRECTION OF EXCAVATION

DIRECTION OF EXCAVATION

DIRECTION OF EXCAVATION

DIRECTION OF EXCAVATION

DIRECTION OF EXCAVATION

LINER ELEV.: 56.5'

LINER ELEV.: 56.5'

LINER ELEV.: 56.5'

LINER ELEV.: 56.5'

LINER ELEV.: 56.5'

LINER ELEV.: 59.6'

30.00'

50.00'

2:1

60 70 80

LEGEND

- APPROXIMATE LIMIT OF PROPERTY LINE
- LIMIT OF GRADING / DAYLIGHT
- 50 MAJOR CONTOUR
- 50 MINOR CONTOUR
- 50 PROPOSED MAJOR CONTOUR
- 50 PROPOSED MINOR CONTOUR
- UNPAVED ROAD / BENCH
- PROPOSED HAUL ROAD

DATE OF TOPOGRAPHY: 2018

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-814 Excavation-Schematic View

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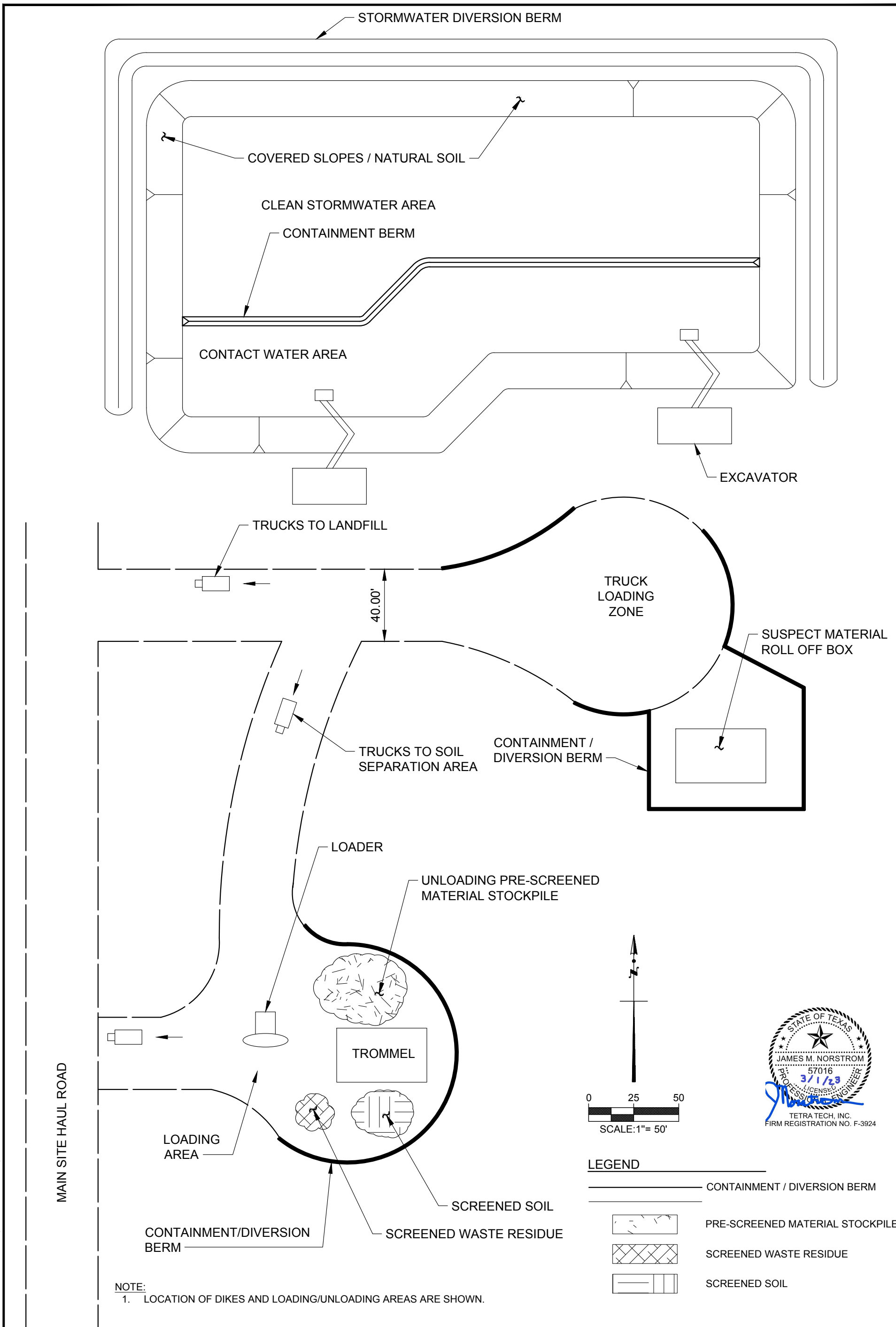
Houston, TX 77042
TEL 936.202.0746 & 832.251.5160

AGENCY		
DESIGNED BY :	J.N.	DATE: 08-2021
DRAWN BY :	A.K. / D.B.	PROJ. NO.: 2020-0072
CHECKED BY :	V.Y.	
APPROVED BY :	J.N.	

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

EXCAVATION-SCHEMATIC VIEW

Attach III-3



NOTE:

1. LOCATION OF DIKES AND LOADING/UNLOADING AREAS ARE SHOWN.

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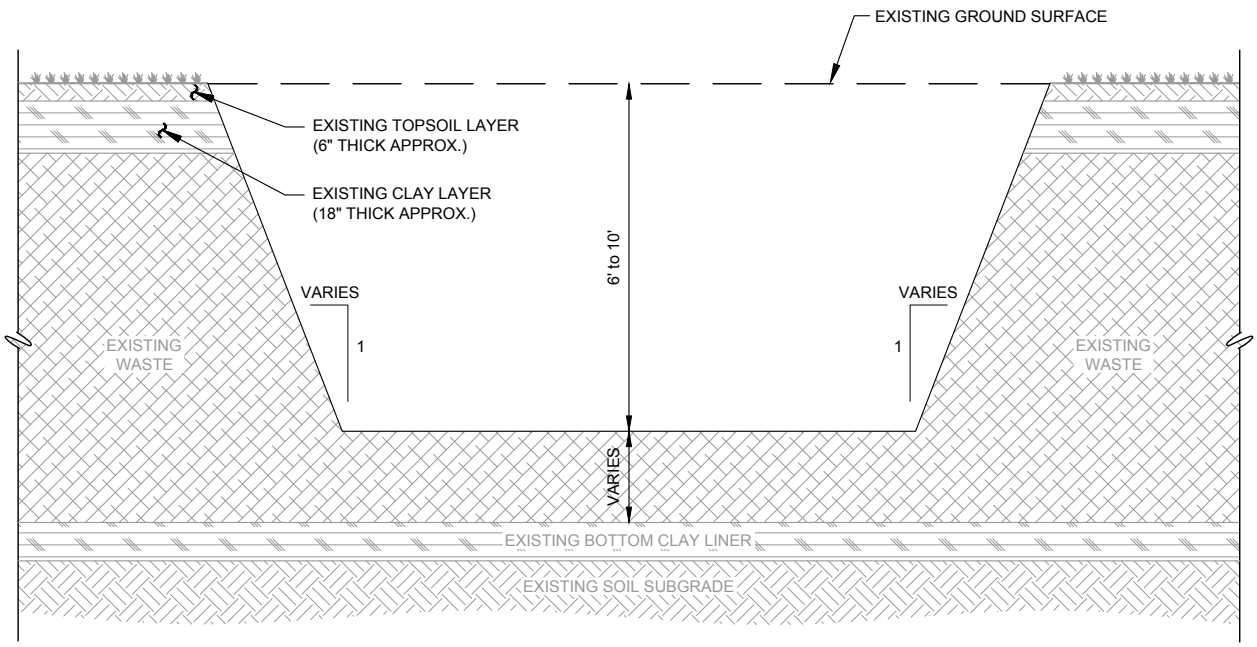
AGENCY			
DESIGNED BY :	J.N.	DATE:	08-2021
DRAWN BY :	A.K. / D.B.	PROJ. NO.:	2020-0072
CHECKED BY :	V.Y.		
APPROVED BY :	J.N.		

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

PROCESS DIAGRAM

Attach III-4

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-815 Process Diagram



LINER SYSTEM PROXIMITY TO LANDFILL CROSS SECTION - TYPICAL

(NOT TO SCALE)

GENERAL NOTES:

1. West University and Bellaire Landfill records indicate that a three-foot thick compacted or in-situ clay liner is present
2. TCEQ approved voluntary permit revocation at the end of post-closure monitoring
3. There were no reports or indications of groundwater contamination

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL	07/2/21

STATE OF TEXAS
JAMES M. NORSTROM
57016
3/1/23
LICENSED PROFESSIONAL ENGINEER

TETRA TECH, INC.
FIRM REGISTRATION NO. F-3924

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Ruffino Road Type IX Landfill Mining Registration Application

Liner System Design

Attachment III-5

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\C-804 Test Pit Plan And Cross Section.dwg 7/14/2020 3:12 PM

Attachment III–6 Air Quality Requirements

At the direction of the TCEQ Air Quality Division, the applicant will submit a Standard Air Permit Application after the Type IX Landfill Mining Registration is issued.

Attachment III-7 to Part III

Drainage Calculations

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

936-202-0746

April 2023

Drainage Calculations

TABLE OF CONTENTS

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2.0 DRAINAGE PARAMETERS 1
3.0 DRAINAGE SUB-AREA FLOW RATE, VOLUME, AND VELOCITY 4
4.0 DIVERSION BERM GEOMETRIES (AT EXCAVATION RIM) 6
5.0 CONTAINMENT BERM GEOMETRIES (CONTAMINATED WATER IN EXCAVATIONS) 7
6.0 CONTAINMENT BERM GEOMETRIES (CLEAN WATER IN EXCAVATIONS) 8

1.0 INTRODUCTION

The facility was designed and constructed, and will be operated, to comply with the requirements of §330.303. The design of the facility will manage run-on and runoff during the peak discharge of a 25- year rainfall event and will prevent the off-site discharge of waste and feedstock material, including, but not limited to, in-process and/or processed materials. Surface water drainage in and around the facility will be controlled to minimize surface water running onto, into, and off of the treatment area.

The drainage design is discussed in the Part III Supplement, Section 3.2. The pre-development drainage subareas drawings is Attachment III-8. Calculations are presented in this report. Using the following parameters:

- Design precipitation depth for the 25-year, 24-hour storm event
- Time of concentration
- Rainfall intensity
- Measurements of six drainage sub-areas onsite
- For each sub-area and the design storm:
    - Peak flows
    - Runoff volume
    - Drainage velocity

Post-development drainage parameters were not calculated because excavations to remove waste will detain stormwater and be pumped as necessary by the excavation contractor. Earthen berms will be necessary to:

1. Contain water in the bottom of excavations that has been in contact with waste (contaminated water) for proper collection, storage, and disposal
2. Divert stormwater from entering excavations

Required berm heights for various configurations of upslope runoff areas and waste excavation geometries are presented below.

2.0 DRAINAGE PARAMETERS

NOAA's Hydrometeorological Design Studies Center Precipitation Frequency Data Center (PFDC) (PF Map: Contiguous US (noaa.gov)) is the source of the 25-year, 24-hour design storm water depth for the proposed landfill mining project site.

As shown in the following table, the 25-year, 24-hour design storm water depth for the Ruffino Road site is 11.2 inches.

NOAA Atlas 14, Volume 11, Version 2
Location name: Houston, Texas, USA*
Latitude: 29.656°, Longitude: -95.5457°
Elevation: 69.4 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.504 (0.381-0.665)	0.588 (0.449-0.768)	0.725 (0.552-0.953)	0.840 (0.630-1.12)	0.999 (0.726-1.37)	1.12 (0.793-1.58)	1.25 (0.860-1.81)	1.38 (0.927-2.05)	1.56 (1.01-2.40)	1.70 (1.08-2.69)
10-min	0.797 (0.603-1.05)	0.933 (0.711-1.22)	1.15 (0.877-1.51)	1.34 (1.00-1.78)	1.59 (1.16-2.19)	1.79 (1.27-2.53)	1.99 (1.37-2.89)	2.19 (1.47-3.26)	2.45 (1.59-3.78)	2.65 (1.68-4.18)
15-min	1.02 (0.770-1.34)	1.18 (0.904-1.55)	1.46 (1.11-1.91)	1.68 (1.26-2.24)	1.99 (1.45-2.74)	2.23 (1.58-3.15)	2.48 (1.71-3.59)	2.74 (1.84-4.07)	3.09 (2.01-4.76)	3.36 (2.13-5.31)
30-min	1.46 (1.11-1.93)	1.69 (1.30-2.22)	2.07 (1.58-2.72)	2.38 (1.79-3.18)	2.81 (2.04-3.85)	3.13 (2.21-4.41)	3.47 (2.39-5.03)	3.85 (2.59-5.73)	4.38 (2.85-6.76)	4.82 (3.05-7.62)
60-min	1.93 (1.46-2.54)	2.25 (1.72-2.94)	2.77 (2.11-3.64)	3.21 (2.41-4.28)	3.82 (2.76-5.22)	4.27 (3.02-6.01)	4.76 (3.29-6.91)	5.33 (3.59-7.95)	6.18 (4.02-9.54)	6.89 (4.36-10.9)
2-hr	2.33 (1.77-3.06)	2.81 (2.13-3.60)	3.55 (2.70-4.62)	4.21 (3.17-5.58)	5.17 (3.77-7.07)	5.96 (4.23-8.38)	6.84 (4.74-9.88)	7.88 (5.32-11.7)	9.46 (6.16-14.5)	10.8 (6.86-17.0)
3-hr	2.54 (1.94-3.33)	3.15 (2.37-3.97)	4.03 (3.07-5.23)	4.86 (3.67-6.43)	6.11 (4.48-8.35)	7.17 (5.12-10.1)	8.40 (5.83-12.1)	9.83 (6.64-14.5)	12.0 (7.84-18.4)	13.9 (8.84-21.8)
6-hr	2.92 (2.24-3.82)	3.75 (2.79-4.64)	4.90 (3.75-6.31)	6.03 (4.57-7.94)	7.78 (5.74-10.6)	9.32 (6.70-13.1)	11.1 (7.75-16.0)	13.2 (8.95-19.4)	16.4 (10.7-25.1)	19.1 (12.2-29.9)
12-hr	3.33 (2.56-4.33)	4.37 (3.25-5.34)	5.80 (4.45-7.43)	7.22 (5.50-9.48)	9.44 (7.01-12.9)	11.4 (8.24-16.0)	13.7 (9.61-19.6)	16.4 (11.2-24.1)	20.5 (13.5-31.2)	24.0 (15.4-37.4)
24-hr	3.77 (2.91-4.88)	5.04 (3.76-6.11)	6.78 (5.23-8.64)	8.52 (6.52-11.1)	11.2 (8.39-15.3)	13.7 (9.93-19.1)	16.5 (11.6-23.5)	19.7 (13.4-28.7)	24.5 (16.1-37.0)	28.4 (18.3-44.2)
2-day	4.27 (3.31-5.51)	5.82 (4.34-6.98)	7.92 (6.13-10.0)	10.0 (7.71-13.1)	13.3 (10.1-18.2)	16.4 (12.0-22.9)	19.8 (14.0-28.1)	23.4 (16.0-33.9)	28.2 (18.7-42.5)	32.1 (20.7-49.6)
3-day	4.66 (3.62-5.99)	6.34 (4.75-7.61)	8.65 (6.71-10.9)	10.9 (8.43-14.2)	14.5 (11.0-19.8)	17.8 (13.1-24.9)	21.5 (15.2-30.4)	25.1 (17.2-36.3)	30.0 (19.8-44.9)	33.7 (21.8-52.0)
4-day	4.98 (3.88-6.39)	6.73 (5.07-8.10)	9.15 (7.12-11.6)	11.5 (8.90-14.9)	15.2 (11.5-20.6)	18.6 (13.7-25.8)	22.2 (15.7-31.4)	25.9 (17.8-37.4)	30.8 (20.4-46.1)	34.5 (22.4-53.2)
7-day	5.74 (4.49-7.35)	7.56 (5.77-9.17)	10.1 (7.93-12.8)	12.6 (9.77-16.3)	16.4 (12.4-22.1)	19.8 (14.5-27.3)	23.4 (16.6-32.9)	27.1 (18.7-39.0)	32.0 (21.3-47.7)	35.8 (23.3-54.9)
10-day	6.39 (5.01-8.16)	8.26 (6.36-10.1)	11.0 (8.59-13.8)	13.5 (10.5-17.4)	17.3 (13.2-23.2)	20.7 (15.2-28.5)	24.3 (17.3-34.1)	27.9 (19.3-40.1)	32.8 (21.9-48.9)	36.6 (23.8-56.1)
20-day	8.47 (6.67-10.8)	10.4 (8.17-12.9)	13.4 (10.6-16.9)	16.1 (12.5-20.6)	19.9 (15.1-26.5)	23.2 (17.1-31.7)	26.6 (19.0-37.2)	30.1 (20.9-43.1)	34.7 (23.3-51.6)	38.3 (25.1-58.5)
30-day	10.2 (8.07-13.0)	12.3 (9.70-15.3)	15.5 (12.2-19.4)	18.2 (14.2-23.3)	22.1 (16.8-29.3)	25.3 (18.7-34.4)	28.5 (20.4-39.8)	31.8 (22.2-45.6)	36.3 (24.4-53.8)	39.6 (26.0-60.4)
45-day	12.8 (10.1-16.2)	15.0 (12.0-18.8)	18.6 (14.8-23.4)	21.5 (16.9-27.5)	25.6 (19.4-33.7)	28.7 (21.2-38.8)	31.8 (22.8-44.2)	34.8 (24.3-49.8)	38.8 (26.2-57.5)	41.8 (27.5-63.5)
60-day	15.1 (11.9-19.0)	17.4 (14.0-21.9)	21.4 (17.1-26.9)	24.6 (19.3-31.3)	28.8 (21.9-37.8)	31.9 (23.5-43.0)	34.8 (25.0-48.3)	37.6 (26.4-53.7)	41.2 (27.9-60.9)	43.8 (28.8-66.5)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

The minimum (most conservative) Time of Concentration (t_c) from TXDOT guidance is 10 minutes. Using a 10-minute time of concentration and the following table, Rainfall Intensity is determined.

Rainfall Intensity-Duration-Frequency Coefficients for Texas

Based on United States Geological Survey (USGS) Scientific Investigations Report 2004–5041
"Atlas of Depth-Duration Frequency of Precipitation Annual Maxima for Texas"

1. Select English or SI Units: English

2. Select or Enter a County: Harris

3. Enter a Time of Conc. Select Units: 10 min

Coefficient	50% (2-year)	20% (5-year)	10% (10-year)	4% (25-year)	2% (50-year)	1% (100-year)
e	0.7939	0.7855	0.7829	0.7774	0.7727	0.772
b (in.)	57.73	73.87	86.47	102.23	116.88	136.33
d (min)	9.48	10.46	11.27	12.32	12.95	14.08
Intensity (in./hr)	5.47	6.90	7.90	9.14	10.38	11.69

(Spreadsheet Release Date: August 31, 2015; data table reshuffle by Asquith July 14, 2016)

Peak Flow for existing conditions is obtained from the following formula:

$$Q = CIA$$

Where

- Q = flow in cubic feet per second (cfs)
- C = runoff coefficient $C = C_r + C_i + C_v + C_s = 0.10 + 0.10 + 0.05 + 0.08 = 0.33$
- I = rainfall intensity = 9.14 inches / hour
- A = area contributing runoff to the discharge point (or sheet flow)

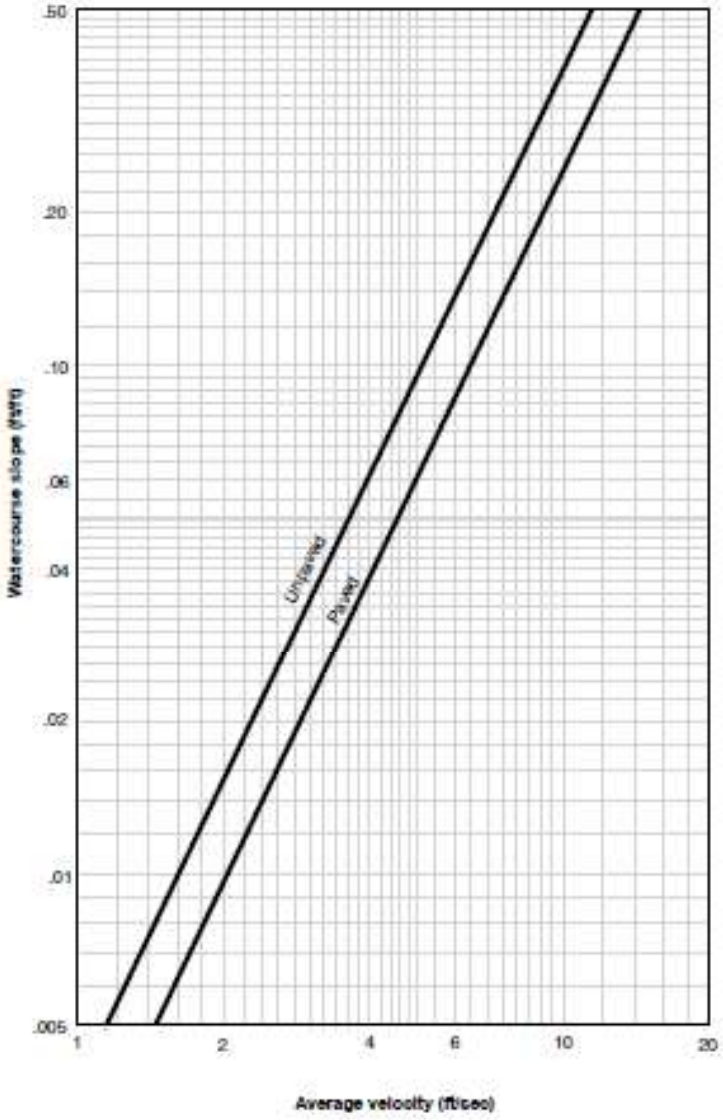
3.0 DRAINAGE SUB-AREA FLOW RATE, VOLUME, AND VELOCITY

Drainage sub-area acres, flow rate, runoff volume, and velocity are presented in the following table.

Drainage Sub-Area Flow, Volume, Velocity					
Drainage Area	Drainage Sub-Area Area, acres	Typical Surface Slope	Flow, ft^3/sec (Q)	Water Volume from Design Storm, acre-ft	Runoff Velocity, feet/sec (from TR-55 graph)
1	6.5	0.020	19.61	2.00	2.18
2	19.4	0.009	58.51	5.98	1.47
3	31.6	0.012	95.31	9.73	1.78
4	41.9	0.020	126.38	12.91	2.18
5	24.6	0.007	74.20	7.58	1.35
6	19.7	0.026	59.42	6.07	2.60
Notes:					
C =	0.33				
I =	9.14	in/hr			
Design Storm					
Rainfall Depth	11.2	in			

Discharge velocity is obtained from the following graph when knowing the typical drainage area slope.

Average velocities for estimating travel time for shallow concentrated flow



(210-VI-TR-55, Second Ed., June 1986)

4.0 DIVERSION BERM GEOMETRIES (AT EXCAVATION RIM)

Stormwater Diversion Berm Summary Sheet

Surface Slope (outside excavations) = 2 Percent

Area Sloping Toward Excavation Width, Ft (W)	Area Sloping Toward Excavation Length, Ft (L)	Area Sloping Toward Excavation, Ft^2 ($A_{drainage}$)	Area Sloping Toward Excavation, Acres ($A_{drainage}$)	Diverted Stormwater Storage Volume Required, Ft^3 ($V_{required}$)	Average Depth of Water in Diverted Stormwater Storage Area, Ft (D_{avg})	Diverted Stormwater Storage Area Slope, ft/ft (S)	Diversion Berm Height Required, Ft (H_{berm})
200	150	30,000	0.69	28,250	0.9	0.02	2.94
400	150	60,000	1.38	56,500	0.9	0.02	2.94
600	150	90,000	2.07	84,750	0.9	0.02	2.94
800	150	120,000	2.75	113,000	0.9	0.02	2.94

Notes:

R = 25-year, 24-hour storm depth = 11.3 in.

$A_{drainage}$ = Drainage Area flowing toward top of excavation

$V_{required}$ = Volume of stormwater required to be stored behind berm = $A_{drainage}$ x R

D_{avg} = Average depth of diverted stormwater stored behind berm at top of excavation = $V_{required}$ / (L x W)

H_{berm} = Required height of berm = ((L/2) x S) + D_{avg} + H_{FB}

where: H_{FB} = freeboard = 0.5 ft, S = slope of area sloping toward top of excavation = 0.02 ft/ft

5.0 CONTAINMENT BERM GEOMETRIES (CONTAMINATED WATER IN EXCAVATIONS)

Containment Berm Summary Sheet

Bottom of Excavation has 1 Percent Slope

Waste Excavation Working Face Area (exposed waste), **Ft^2** **($A_{working\ face}$)**	**Waste Excavation Working Face Area, acres** **($A_{working\ face}$)**	**Storage Area Width, Ft (W)**	**Storage Area Length, Ft (L)**	**Contact Water Storage Area** (working face to containment berm), **Ft^2** **($A_{storage}$)**	**Drainage Area, Ft^2** **($A_{drainage}$)**	**Contact Water Storage Volume Required, Ft^3** **($V_{required}$)**	**Average Depth of Liquid in Storage Area, Ft** **(D_{avg})**	**Storage Area Bottom Slope, ft/ft (S)**	**Containment Berm Height Required, Ft** **(H_{berm})**
5,600	0.13	100	100	10,000	12,800	12,053	1.2	0.01	2.21
8,400	0.19	150	150	22,500	26,700	25,143	1.1	0.01	2.37
11,200	0.26	200	200	40,000	45,600	42,940	1.1	0.01	2.57
16,800	0.39	300	300	90,000	98,400	92,660	1.0	0.01	3.03

Notes:

R = 25-year, 24-hour storm depth = 11.3 in.

$A_{drainage}$ = Drainage Area = C x $A_{working\ face}$ + $A_{storage}$

where: C = infiltration / abstraction reduction factor = 0.5

$V_{required}$ = Volume of contact water storage required = $A_{drainage}$ x R

D_{avg} = Average depth of liquid in storage area = $V_{required}$ / (L x W)

H_{berm} = Required height of Berm = ((L/2) x S) + D_{avg} + H_{FB}

where: H_{FB} = freeboard = 0.5 ft, S = slope of storage area bottom = 0.01 ft/ft

6.0 CONTAINMENT BERM GEOMETRIES (CLEAN WATER IN EXCAVATIONS)

Containment Berm Summary Sheet (Clean Water Containment in Excavations)

Bottom of Excavation has 1 Percent Slope

Soil Excavation Working Face Area (exposed waste), Ft^2 ($A_{working\ face}$)	Soil Excavation Working Face Area, acres ($A_{working\ face}$)	Storage Area Width, Ft (W)	Storage Area Length, Ft (L)	Clean Water Storage Area (working face to containment berm), Ft^2 ($A_{storage}$)	Drainage Area, Ft^2 ($A_{drainage}$)	Clean Water Storage Volume Required, Ft^3 ($V_{required}$)	Average Depth of Liquid in Storage Area, Ft (D_{avg})	Storage Area Bottom Slope, ft/ft (S)	Containment Berm Height Required, Ft (H_{berm})
28,000	0.64	100	200	20,000	34,000	32,017	1.6	0.01	3.10
33,600	0.77	200	200	40,000	56,800	53,487	1.3	0.01	2.84
50,400	1.16	300	300	90,000	115,200	108,480	1.2	0.01	3.21
72,800	1.67	300	500	150,000	186,400	175,527	1.2	0.01	4.17

Notes:

R = 25-year, 24-hour storm depth = 11.3 in.

$A_{drainage}$ = Drainage Area = C x $A_{working\ face}$ + $A_{storage}$

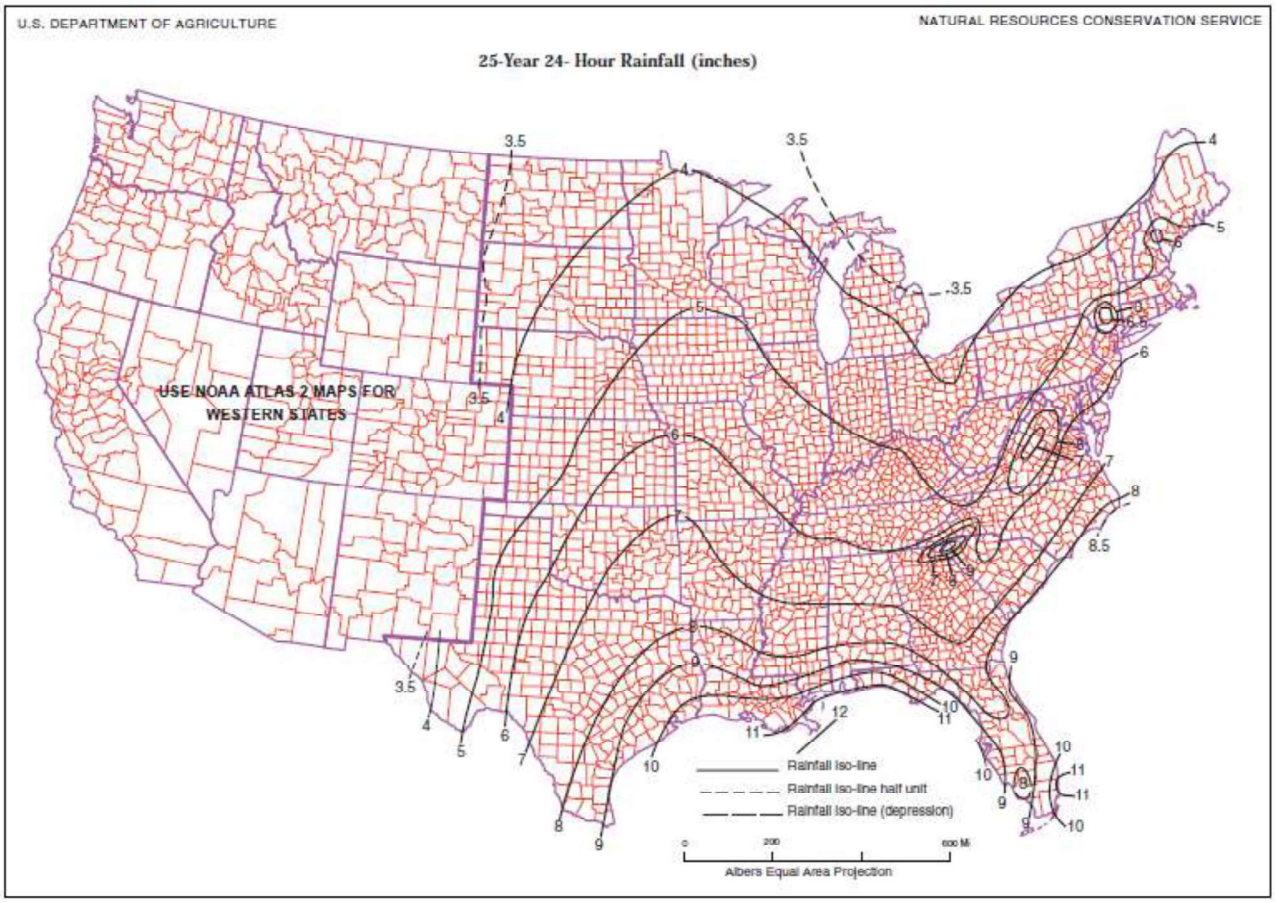
where: C = infiltration / abstraction reduction factor = 0.5

$V_{required}$ = Volume of clean water storage required = $A_{drainage}$ x R

D_{avg} = Average depth of liquid in storage area = $V_{required}$ / (L x W)

H_{berm} = Required height of Berm = ((L/2) x S) + D_{avg} + H_{FB}

where: H_{FB} = freeboard = 0.5 ft, S = slope of storage area bottom = 0.01 ft/ft



(210-VI-TR-55, Second Ed., June 1986)

N

0 150 300

SCALE:1"= 300'

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3/1/23
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Q = 59.4 cfs
VOL = 6.1 ac-ft
VEL = 2.6 fps

Q = 126.4 cfs
VOL = 12.9 ac-ft
VEL = 2.2 fps

PROPERTY BOUNDARY

Q = 95.3 cfs
VOL = 9.7 ac-ft
VEL = 1.8 fps

PROPERTY BOUNDARY

Q = 19.6 cfs
VOL = 2.0 ac-ft
VEL = 2.2 fps

Q = 58.5 cfs
VOL = 6.0 ac-ft
VEL = 1.5 fps

Q = 74.2 cfs
VOL = 7.6 ac-ft
VEL = 1.4 fps

LEGEND

- APPROXIMATE LIMIT OF PROPERTY LINE
- 50 MAJOR CONTOUR
- 50 MINOR CONTOUR
- SUB-AREA BOUNDARY
- (1) SUB-AREA NUMBER

DATE OF TOPOGRAPHY: 2018

J:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-816 Predevelopment Drainage Sub-Areas

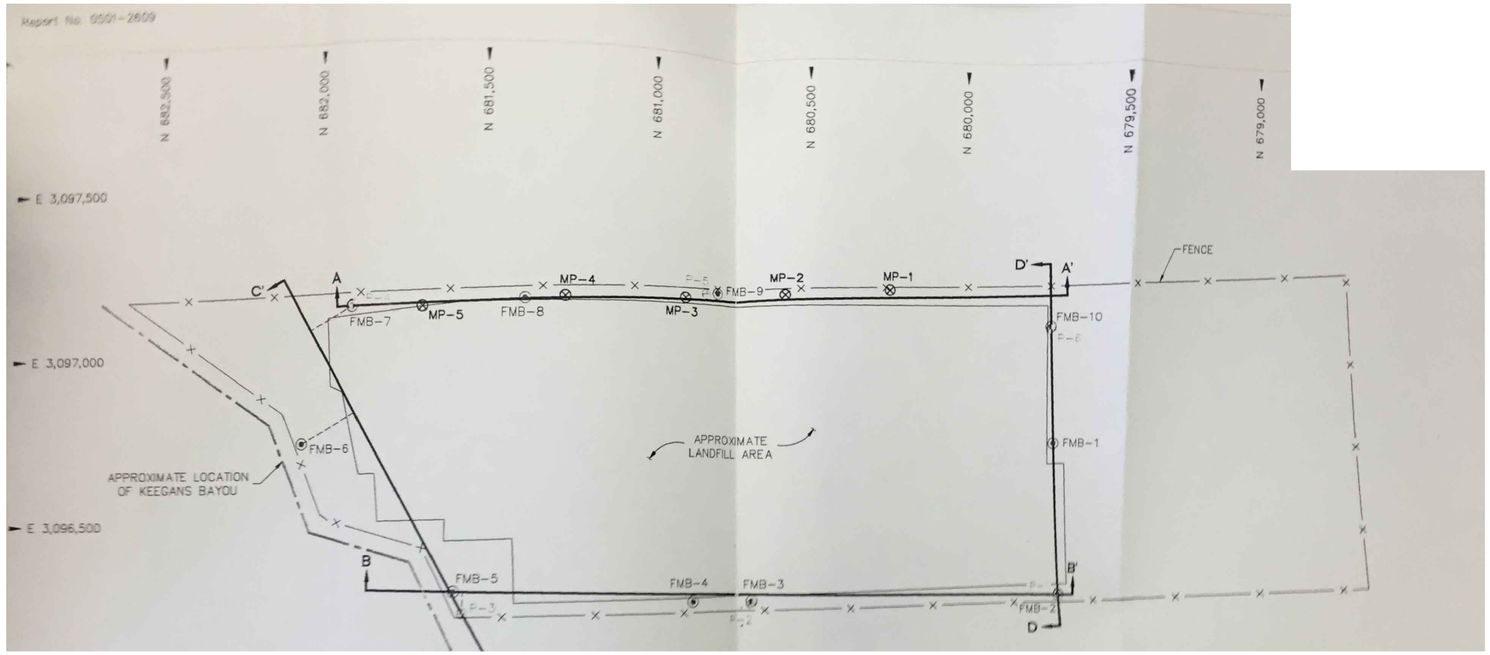
TETRA TECH
1500 CityWest Blvd, Suite 1000
Houston, TX 77042
TEL 936.202.0746 & 832.251.5160

AGENCY			
DESIGNED BY :	J.N.	DATE:	08-2021
DRAWN BY :	A.K. / D.B.	PROJ. NO.:	2020-0072
CHECKED BY :	V.Y.		
APPROVED BY :	J.N.		

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

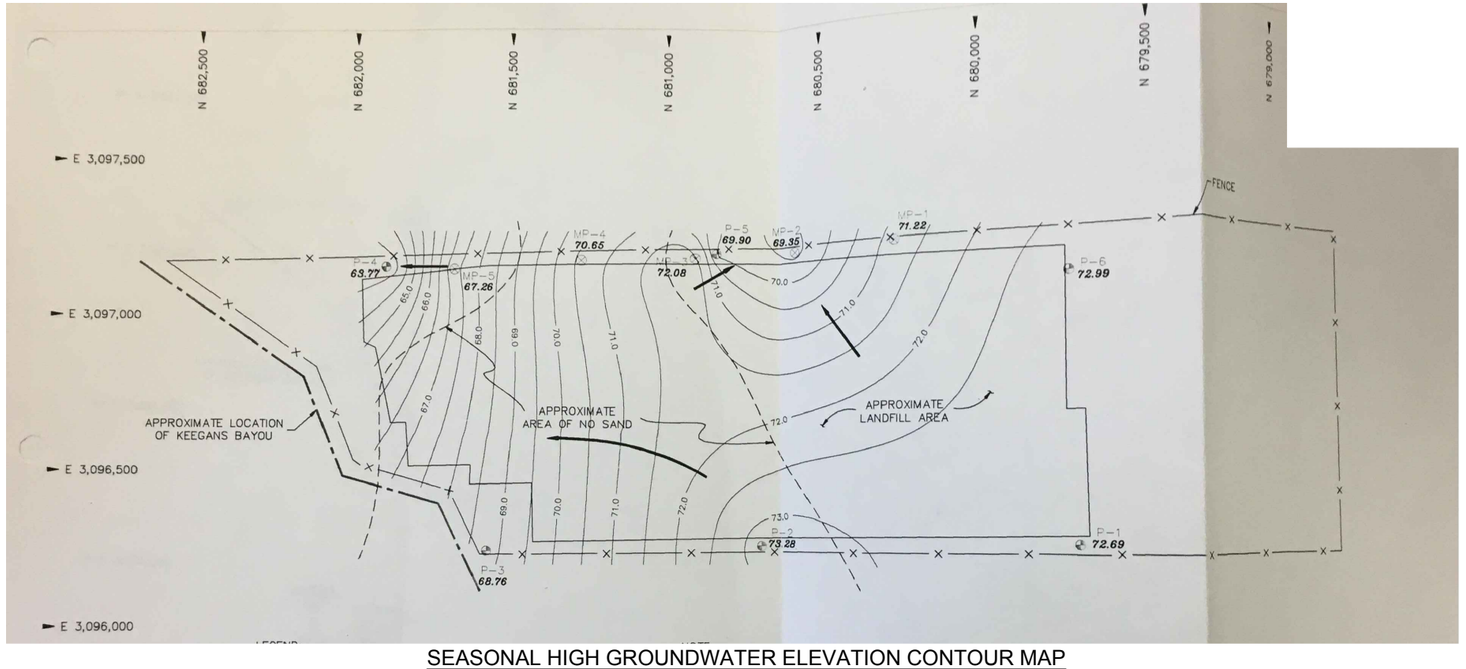
PREDEVELOPMENT DRAINAGE SUB-AREAS

Attach III-8



STRATIORAPHY PROFILE LOCATION MAP

SCALE: AS SHOWN



SEASONAL HIGH GROUNDWATER ELEVATION CONTOUR MAP

SCALE: AS SHOWN

LEGEND:
- PIEZOMETER LOCATION
- METHANE PROBE LOCATION
- 72.69 GROUNDWATER ELEVATION (FT)
- —70.0— GROUNDWATER ELEVATION CONTOUR (FT)
- GENERAL FLOW DIRECTION

CONTOUR INTERVAL: 0.5 FT

REFERENCE: PHOTOGRAPHS OF DRAWINGS FROM TCEQ REGION 12 RECORDS

0 250' 500'

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AGENCY NAME

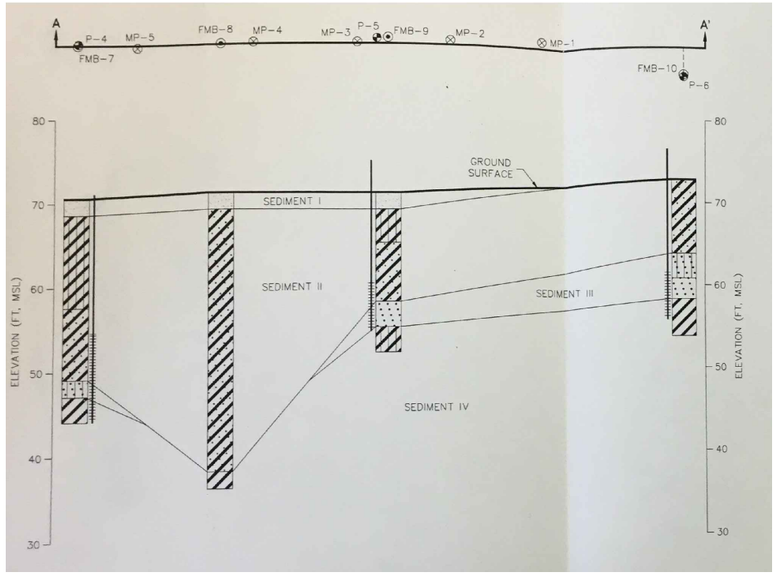
DESIGNED BY:	-	DATE:	08-2021
DRAWN BY:	A.K. / D.B.	PROJ. NO.:	2020-0072
CHECKED BY:	V.Y.		
APPROVED BY:	J.N.		

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

PLAN OF BORINGS AND GROUND WATER CONTOURS

Attach III-9

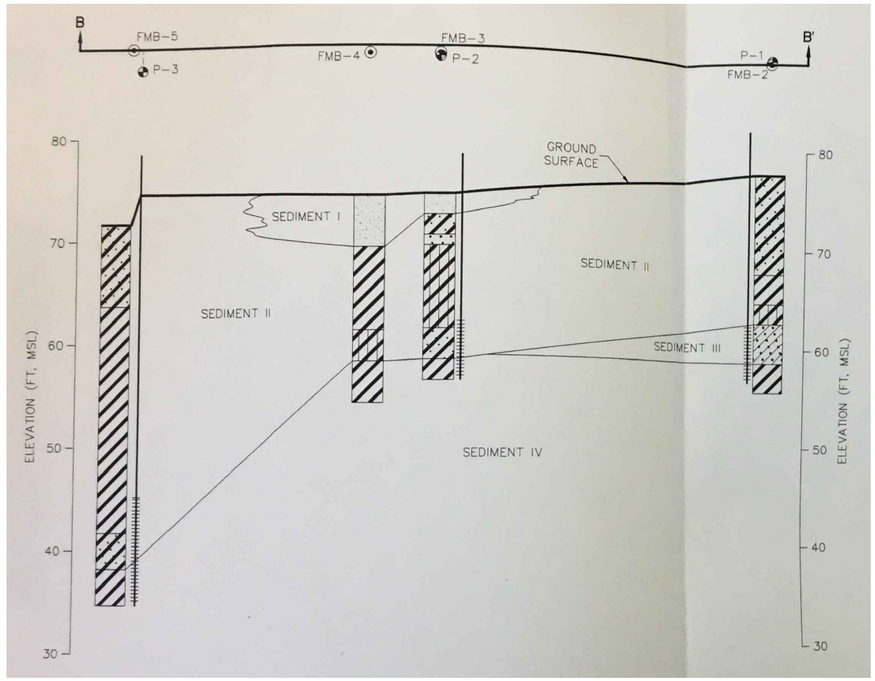
L:\HOUSTON Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-817 Plan Of Borings And Ground Water Contours



GENERALIZED CROSS SECTION A-A'

SCALE: AS SHOWN

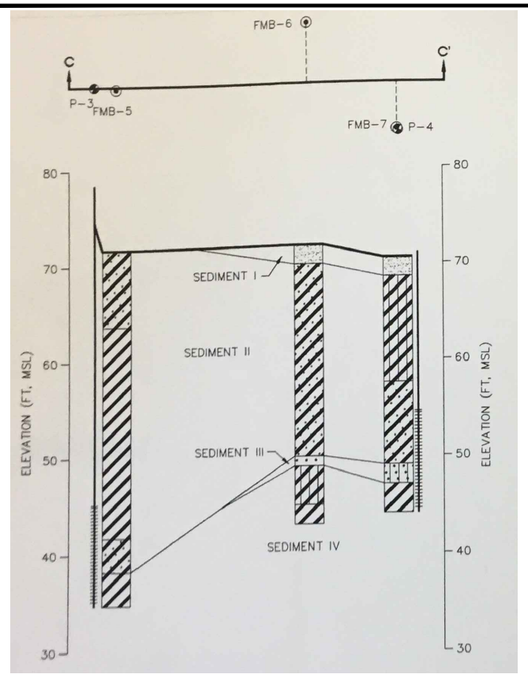
0 300' 600'



GENERALIZED CROSS SECTION B-B'

SCALE: AS SHOWN

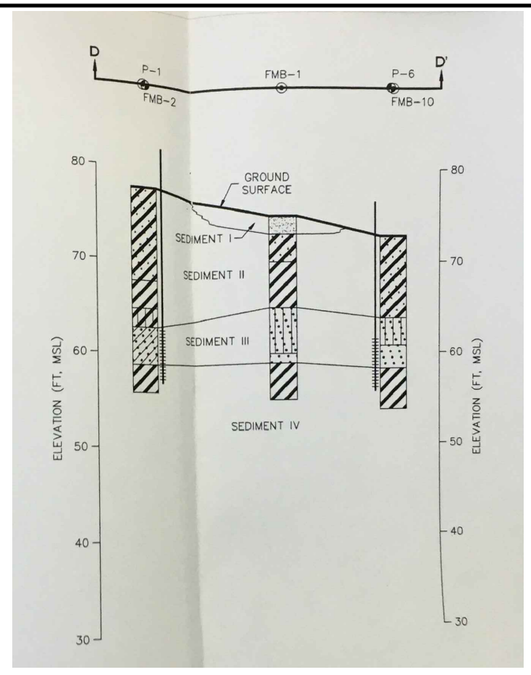
0 250' 500'



GENERALIZED CROSS SECTION C-C'

SCALE: AS SHOWN

0 250' 500'



GENERALIZED CROSS SECTION D-D'

SCALE: AS SHOWN

0 250' 500'

REFERENCE: PHOTOGRAPHS OF DRAWINGS FROM TCEQ REGION 12 RECORDS

LEGEND:
- FILL
- CLAY
- SANDY CLAY
- SILTY CLAY
- SAND
- CLAYEY SAND
- SILTY SAND
- PIEZOMETER LOCATION
- BORING LOCATION
- PIEZOMETER SCREENED INTERVAL

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AGENCY NAME

DESIGNED BY: -
DRAWN BY: A.K./D.B.
CHECKED BY: V.Y.
APPROVED BY: J.N.
DATE: 08-2021
PROJ. NO.: 2020-0072

RUFFINO ROAD TYPE IX LANDFILL MINING REGISTRATION APPLICATION

GEOLOGIC CROSS SECTIONS

Attach III-10

J:\HOUSTON\Office Projects\Ruffino Hills Landfill\CAD\SheetFiles\Figures\C-818 Geologic Cross Sections

Attachment III-11 to Part III

Closure Plan

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

936-202-0746

March 2023

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4.0 POST-CLOSURE CARE REQUIREMENTS 2
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1.0 INTRODUCTION

In accordance with 30 TAC §330.459 and 30 TAC §330.461, Section 2.0 of this plan describes the steps necessary to close the facility at any point during its active life. Section 3.0 discusses Post-Closure Land Use of the site. Post-closure maintenance of the site is not required because all wastes will be removed during excavation and landfill mining of the two closed landfills.

2.0 CLOSURE REQUIREMENTS

The landfill mining operation will include temporary roads, waste excavation, loading, and processing areas, a gatehouse, an optional office/break room trailer, contaminated water holding tank(s), drainage features, and a perimeter fence with locking gates.

The City of Houston (COH) intends to excavate and relocate all buried waste from the closed City of West University and City of Bellaire Landfills. Soil will be separated from the excavated material. When all wastes have been removed, the COH will plans to begin construction of a detention and associated drainage structures to mitigate future flooding in the area.

Upon completion of waste excavation and landfill mining, the gate house and any trailers will be removed. The contaminated water storage tank will be emptied and transported offsite. The stormwater drainage features may remain intact or may be removed as part of the detention pond excavation and construction.

If, because of unforeseen conditions, closure of the landfill mining project is necessary before all waste has been removed, the COH will ensure that all exposed waste is covered by six inches of topsoil over 1.5 feet of compacted clay (CL or CH). The topsoil will be seeded and watered to establish a vegetative cover. To prevent the development of ponds, any excavations that terminate in natural soil will be backfilled with compacted clay with the surface above surrounding ground surface and graded to drain.

If there is evidence of a release from a municipal solid waste unit, the executive director of the TCEQ may require an investigation into the nature and extent of the release and an assessment of measures necessary to correct an impact to groundwater.

In accordance with 30 TAC §330.461(a), no later than 90 days prior to the initiation of a completion of the landfill mining project, the COH shall, through a public notice in the newspaper(s) of largest circulation in the vicinity of the facility, provide public notice for project completion. This notice will include the name, address, and physical location of the facility, the registration number, and the last day of intended waste excavation and landfill mining. The COH will also make available an adequate number of copies of the approved Closure Plan for public access. The owner or operator will also provide written notification to the TCEQ of the intent to complete the project and construct a stormwater detention pond on the former landfill property.

Start-up of the closure activities for the site will begin after all buried waste has been removed. The closure activities are as follows:

- Notify the TCEQ;
- Post a minimum of one sign at the main entrance and all other frequently used points of access for the facility notifying all persons that the landfill mining project has been completed

- Ensure that suitable barriers at all gates or access points and a fence around the entire property is in place to prevent the unauthorized access and/or dumping
- Remove the gate house, office trailers, and scales
- Empty and remove the contaminated water holding tank
- Ensure that all soils and surface areas that have been in contact with waste are removed from the property for appropriate disposal
- Disinfect tipping areas, processing areas and post-processing area, including tunnel floors, contaminated water trenches and/or box drains, and related piping;
- Conduct vector control procedures if necessaryt
- Perform site inspection and prepare certification of closure in accordance with §330.461.

3.0 CERTIFICATION OF FINAL FACILITY CLOSURE

Following completion of all closure activities the COH will submit, within 10 days, to the executive director for review and approval, a documented certification, signed by an independent registered professional engineer, verifying that closure has been completed in accordance with the approved Closure Plan and the applicable rule provisions of 30 TAC Chapter 330, Subchapter K. The submittal to the executive director shall include all applicable documentation necessary for certification of final closure.

Within 10 days after completing final closure activities for the facility, the owner or operator will submit to the executive director by registered mail a certified copy of an "affidavit to the public" in accordance with the requirements of 30 TAC §330.19 and 30 TAC §330.457(g) and place a copy of the affidavit in the facility's operating record.

Following receipt of the required final closure documents, as applicable, the commissions' regional office will conduct an inspection and provide a report verifying proper closure of the facility according to the approved Closure Plan and acknowledge that the landfill mining operation has been properly closed and all wastes have been removed.

In accordance with §330.461©(3), the COH will submit a request to the TCEQ for voluntary revocation of the landfill mining registration.

For approval to construct a detention pond on the property of the former landfills, according to §330.461(d), the COH will request the Executive Director’s approval to remove the notation from the deed, thereby indicating that all wastes have been removed from the property.

4.0 POST-CLOSURE CARE REQUIREMENTS

Post-closure maintenance of the site will not be required (30 TAC §330.463(a)(l)) because all wastes will be removed during the excavation and landfill mining project.

The COH will request permission from the executive director of the TCEQ to remove the certified deed notation from the property deed when all wastes have been removed from the facility, in accordance with §330.7(a).

5.0 CLOSURE COST ESTIMATE

The landfill mining operation will excavate waste and soil material from the closed City of Bellaire and City of West University Landfills. Excavation will begin with stripping cover soil from the area to be mined. Excavation of waste material shall be accomplished with a track excavator, track loader, rubber tire loader or other excavation equipment. Excavated waste may be fed directly into processing equipment to separate soil from waste or stockpiled for transportation to the soil sorting equipment. The stockpile area shall be over a lined landfill cell and shall be protected from stormwater run-on and run-off by a berm equal to that required to protect the working face. Large material, such as white goods, tree stumps, or metals, shall be segregated at the excavation area for recovery, separate processing, or disposal in a Type I Landfill.

A detailed estimate in current dollars of the cost of hiring a third party that is not affiliated (as defined in 30 TAC 328.2) with the owner or operator to close the facility at any time during the landfill mining project, when the extent and manner of its operation would make closure most expensive is included in Form 20876, Section 3.6.C, Table III-2.

Type IX Landfill Mining Registration Application
Ruffino Road Landfills
Houston, Texas

Part IV Supplement
Site Operating Plan

Prepared for:

City of Houston Public Works - Transportation and Drainage Operations

611 Walker Street, Houston, Texas 77002

Prepared by:

TETRA TECH

TBPELS Registration No. F-3924

1500 CityWest Boulevard, Suite 1000, Houston, TX 77042

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STATE OF TEXAS
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LICENSED PROFESSIONAL ENGINEER
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FIRM REGISTRATION NO. F-3924

April 2023

Part IV Supplement Site Operating Plan
Type IX Landfill Mining Registration Application
City of West University Landfill
Houston, TX

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4.0 PART IV – SITE OPERATING PLAN

General Requirements

The requirement that landfill-mining activities be conducted in such a manner that they do not disrupt landfill operations does not apply because the landfills are closed and past the post-closure period. Leachate found while uncovering buried waste shall be properly disposed of in accordance with TCEQ and City of Houston sanitary sewer requirements. Leachate shall not be used as a dust suppressant.

Mining Operation Plan

Excavation Plan

The landfill mining operation will excavate waste and soil from the closed City of Bellaire and City of West University Landfills. Excavation will begin with stripping cover soil from the area to be mined. Excavation of waste material shall be accomplished with a track excavator, track loader, rubber tire loader or other excavation equipment. Excavated waste may be:

- Fed into processing equipment to separate soil from waste
- Stockpiled for transportation to the soil sorting equipment.
- Loaded directly into trucks destined for an approved landfill
- Stockpiled for later loading into trucks destined for an approved landfill

Soils that the applicant intends to test to determine re-use potential (eg. Grade 1 or Grade 2), either before or after separation by equipment, will be stockpiled in 5,000 cubic yard increments. The stockpile area shall be over a lined landfill cell and shall be protected from stormwater run-on and run-off by a berm equal to that required to protect the working face. Materials such as white goods, tree stumps, tires, or metals, shall be segregated at the excavation area for recovery, separate processing, or disposal in a Type I Landfill.

Segregation of Suspicious Material

Should the excavation uncover any items which present characteristics that are indicators of a currently prohibited waste, or that may require special handling, these items shall be isolated as necessary in a designated area for further evaluation. Although encountering suspicious material is not anticipated, suitable equipment and procedures or third-party contractors shall be available to remove and properly dispose of such waste. Suspicious material may include items such as sealed drums, electrical transformers, and asbestos containing materials.

Transportation of Material

If waste material is not fed directly into the soil sorting equipment, it will be transported from the stockpile to the processing and sorting equipment. Should the processing area be within 300-feet of the stockpile, mined material may be transported using a rubber tire loader, or other suitable equipment. Should the processing area be located more than 300-feet from the stockpile, mined material shall be transported in covered trucks or covered conveyors, to minimize loss of windblown material.

Soil Sorting Equipment

Mined material may be sorted to separate soil from waste at the processing area. All processing shall occur over a lined area that may include the landfill's clay liner. Processing and sorting equipment may include, but is not limited to:

- Excavation equipment
- Screening equipment
- Waste sorting equipment
- Roll-off containers

Mined material may be screened to remove soil, unless it is determined that the majority of excavated material is municipal solid waste or construction and demolition debris. Soil will be stockpiled until it is tested in accordance with Section 4.1.6 of this Plan.

The waste fraction of the mined materials shall be collected and transported to a Type I Landfill, or Type IV Landfill is approved by the TCEQ. If waste material is transported offsite, it shall be transported in covered trucks in accordance with 30 TAC §330.605(b)(7).

Storage see below

Disposal

Mined materials which have not been processed during the working day shall be covered with daily cover, transported to the Ruffino Road Transfer Station, or transported to a Type I landfill.

4.1 Operational Requirements 30TAC330.609

The operation of the facility shall comply with the following operational requirements.

4.1.1 Protection of Groundwater §330.609(1)

All operations of excavation shall be conducted over an existing clay-lined area. All processing and stockpiling of recovered materials shall be conducted on a previously filled waste area over a previously constructed clay liner. Transport of waste or recyclable materials will occur over lined and unlined areas.

It is requested that the TCEQ Executive Director approve the processing and sorting of the mined materials over the existing clay liner as an alternative design that is protective of groundwater in accordance with §330.609(1)(B). The compacted or in-situ clay liner systems of both landfills have been in place since the late 1980's and there have been no documented cases of groundwater contamination from leachate.

By processing and sorting the mined material adjacent to the excavation area, the handling and transportation of the materials will be limited to the smallest amount practical. Elimination of transportation of materials within the site to other processing areas decreases the number of times staff are required to handle the material, decreasing the risk of spillage or generation of windborne material.

4.1.2 Prohibited Materials §330.609(2)

The recovery process shall be operated in a manner that will preclude the entry of hazardous constituents. Should the mining operation unearth materials that are not acceptable for processing (soil separation) or disposal at a Type I Landfill, the material will be properly contained, characterized, loaded, transported and disposed at an authorized facility.

4.1.3 Waste Slopes §330.609(3)

Side slopes of excavations into buried waste shall be benched, or if sloped, no steeper than 34 degrees (1.5:1) if higher than five feet (per Occupational Safety and Health Administration 1926.652) unless an excavation plan prepared and sealed by a licensed professional engineer is prepared for the mining operation.

4.1.4 Authorization of Changes §330.609(4)

The operator shall obtain written permission from the Executive Director before changing the processing method or other significant changes to this authorized process.

4.1.5 Existing Systems §330.609(5)

The closed West University and Bellaire Landfills did not include leachate collection systems or landfill gas collection. Groundwater monitoring wells and landfill gas probes in place during operation and post-closure at the West University Landfill have been removed. During the landfill mining project, care will be taken to preserve the existing surface drainage system. Perimeter fences, barricades, trees, and brush will be left in place or replaced for security and visual screening purposes.

4.1.6 Soil End-Product Standards §330.609(6)

The operator shall meet processing testing requirements set forth in Section 4.1.6, Final Soil Product Grades and Allowable Uses.

4.1.7. Certified Operator §330.609(7)

The City shall employ at least one TCEQ-certified landfill operator who shall routinely be available on-site during the hours of operation.

4.1.8. Health and Safety Coordinator §330.609(8)

The City shall employ at least one health and safety coordinator on a full-time basis to be on-site at least 70 percent of the time during excavation and waste processing. The health and safety coordinator shall be trained in hazardous waste and emergency response operations. The Landfill Mining Manager may serve as this Coordinator.

4.1.9. Personal Protection Equipment §330.609(9)

The City shall specify personal protection equipment and its operational characteristics. The equipment must be located on-site.

4.1.10. Health and Safety Plan §330.609(10)

Operations will be conducted in accordance with the Health and Safety Plan presented in Section 4.14 below.

4.1.11. Covered Trucks §330.609(11)

Haul trucks shall be covered when transporting excavated material off-site.

4.2 Facility-Generated Waste 30TAC330.205 & 30TAC330.207

The landfill mining project will generate municipal solid waste, construction and demolition debris, soil, and possibly contaminated water from excavation of the closed landfills. Excavated materials and liquids will be managed as described in Section 4.0 above.

4.3 Storage Requirements 30TAC330.209

Mined materials, other than excavated soils, may be stored at the excavation or processing area for no longer than the operating day, unless they are stored in containers or trailers or covered with daily cover.

Daily cover will be applied to the excavation face and stockpiled waste materials and will consist of 6 inches of clean soil or an alternative daily cover such as spray-on cover typically approved for use at active Type I Landfills (eg. Posi-Shell). Only soil will be used to cover surfaces traversed by vehicles.

Mined soil may be stockpiled for up to 30 days to allow for sampling and laboratory testing in accordance with Sections 8 and 9 of this Plan. Mined soil that has not been tested within 30 days shall be transported offsite for disposal. Soil that has been tested and determined to be Class 1 soil may be used for any purpose, on or off-site. Class 2 soil shall not be used at a residence, recreational area, licensed child-care facility or for food chain crops . Soil classified as waste soil shall be disposed of at a Type I Landfill.

Besides soil, materials such as concrete and tires may be separated for transport to recycling facilities.

4.4 Access Control 30TAC330.223

The landfill mining project will be located at the site of the closed City of Bellaire and City of West University Landfills. A perimeter fence encompassing the entire landfill mining project will be constructed to control public access. Access will be provided by the single entrance / exit on Ruffino Road. This site entrance will be secured by a gate that is monitored during normal operating hours. Outside of operating hours, the gate will be locked.

4.4.1 Site Security

Site security measures are designed to prevent unauthorized persons from entering the site to protect the facility and its equipment from possible damage caused by trespassers, and to prevent disruption of facility operations caused by unauthorized site entry. Unauthorized entry will be minimized by controlling access with the perimeter fence and locking gate. The perimeter fence will consist of a 6-foot-high chain-link fence and/or a barbed wire fence (at least three-strand) or a mesh wire fence. The perimeter fence and entrance gate will be inspected weekly for integrity. Maintenance will be performed as needed to correct normal wear and tear.

The existing trees and brush along Ruffino Road will be maintained to provide visual screening from the road.

Entry to the active portion of the landfill mining project will be restricted to designated personnel, approved waste haulers, and properly identified persons whose entry is authorized by site management. The general public will not have access to the facility.

4.5 Spill Prevention and Control 30TAC330.227

The waste excavation, material storage, material processing, and loading areas will be constructed and operated to control and contain waste spills and contaminated water. Contaminated water generation will be minimized by diversion berms that prevent rainwater from running onto the excavation face or material storage areas. Water that has contacted waste will be contained with toe berms, then directed to a portable holding tank (eg. Frac tank). The holding tank will be pumped, as necessary, and hauled to an approved waste water treatment plant by a registered hauler.

Based on the depths and volumes of liquid encountered during our field investigations, it is difficult to estimate the total volume of liquid that will be produced by removal of the buried waste and the variability of contaminant concentrations.

The stormwater management plan will include methods to minimize the volume of water that contacts waste during the excavation process, but some contaminated water will probably be generated. This type of

"contact water" typically has low concentrations of contaminants and should be acceptable by the COH sanitary sewer.

The City of Houston sanitary sewer line running along Ruffino Road with an inlet at the Ruffino Hills Transfer Station should be considered the best wastewater disposal option. Allison Osborne, Supervising Engineer with Houston Public Works has been provided lab reports on liquids collected from borings at both landfills and we will work with Allison to determine the acceptability of the liquids for the COH sanitary sewer system.

Liquid disposal options include:

- City of Houston sanitary sewer located at the Ruffino Hills Transfer Station (if approved by the COH Public Works Department)
- Transport to a POTW or industrial wastewater treatment plant
- Transport to the Republic Services Blue Ridge Landfill for solidification and disposal

4.6 Operating Hours 30TAC330.229

Operating hours for heavy equipment and transportation vehicles are planned to be from 5:00 am to 9:00 pm, Monday through Saturday.

4.7 Facility Sign 30TAC330.231

A conspicuous and readable sign will be displayed at the site entrance on Ruffino Road. The sign will measure at least 4 feet by 4 feet, with letters at least 3 inches in height stating:

- Ruffino Road Landfill Mining Project
- TCEQ MSW Type IX Registration Number _____
- Hours and days of operation
- Emergency 24-hour contact phone numbers
- Fire department phone number
- Facility Rules

Within the site, speed limit, warning, and directional signs will be placed along haul roads at regular intervals. NO SMOKING signs will be posted near the facility entrance. A sign at the facility entrance / exit will instruct drivers that all loads will be properly covered or otherwise secured.

4.8 Control of Windblown Materials and Litter 30TAC330.233

Excavation and processing of municipal solid waste will occur within the smallest area practicable to minimize the potential for litter. A perimeter fence surrounding the site will capture any incidental windblown trash. Litter along fence lines, access roads, or surrounding the site will be collected and brought to roll-off boxes or the Ruffino Road Transfer Station at least once per day when the facility is operating. Vehicles transporting waste or soil will be completely enclosed or covered as they exit the facility to minimize windblown trash.

4.9 Facility Access Roads 30TAC330.237

The site entrance and haul roads will be constructed to be accessible in all weather conditions. Roads will be surfaced with concrete, gravel, crushed rock, or a similar material. The surface condition of these roads will be maintained and repaired regularly to eliminate potholes or low spots that may impound water. The surfacing of all site roadways will minimize the tracking of mud and trash onto public roads. Any tracked mud and associated debris which may be deposited on facility roads will be cleaned by washing down, sweeping, or

scraping, as necessary, to minimize tracking those materials onto the public streets. Litter and other debris will be picked up at least daily and taken to the transfer station or roll-off boxes onsite for disposal.

Fugitive dust emissions will be minimized by the surface types of site roads and regular cleaning procedures.

4.10 Odor Management Plan 30TAC330.149

4.10.1 Air Quality §330.607

The Landfill Mining Project qualifies for a TCEQ Standard Air Permit. The following application documents have been submitted to the TCEQ Air Permits Section:

- Standard Permit Certification for MSW Landfills TCEQ Form 20296
- Standard Permit Checklist TCEQ Form 20304
- Standard Permit Checklist Attachment with Project Description and Certification Requirements
- LandGEM Landfill Gas Emissions Model, Version 3.03
- NMOC and VOC Emissions Conversion to lbs/hour and tons/year

The Air Permits Section commented on our application and requested that we re-submit following issuance of the MSW Type IX Registration.

The applicant will send he Air Quality Authorization to the MSW Permits Section following issuance.

4.10.3 Odor Management

The landfill mining operations shall manage odor emissions on-site using best management practices and be conducted in a manner that does not create nuisance conditions.

4.10.3 Dust Suppression

- All mined material shall be transported to the processing area in a manner to minimize fugitive dust.
- Processing equipment shall be equipped with low-velocity fog nozzles, that are spaced to create a continuous fog curtain. Alternatively, the City shall have portable watering equipment available during the processing operation. These controls shall be utilized as necessary for maximum control of dust when loading vehicles and stockpiling reusable soil or waste material. Excavation equipment is not considered processing equipment. Leachate from excavations is prohibited from use as dust-suppressant.
- All conveyors that carry materials from processing equipment will have available watering or mechanical dust suppression systems.

4.11 Disease Vector Control 30TAC330.151

Disease vectors such as flies and rodents will be controlled by minimizing the volume and surface area of exposed waste or wastewater. If vectors become a nuisance, an exterminator will be contracted to spray and/or place traps.

4.12 Ponded Water 30TAC330.167

Ponding of water over the closed landfills will be prevented by maintaining surface grades that promote positive drainage, filling with clean soil, and re-grading toward existing drainage structures. The site manager or designee will inspect the site daily for potential ponding sites, initiate corrective actions to remove ponded water as needed, and properly manage contaminated water.

4.13 Employee Sanitation Facilities 30TAC330.249

Potable water and sanitary facilities will be provided for all employees, contractors, consultants, and visitors.

4.14 Health and Safety Plan (H&S Plan)

This Landfill Mining Health and Safety Plan establishes the requirements for the safety of site personnel and the public during landfill mining activities. The plan is designed to minimize exposure to hazardous contaminants.

H&S Personnel Responsibilities

Landfill Mining Manager or Health & Safety Coordinator - Responsibilities

- Make final decisions on all H&S matters and provide equipment to implement the plan
- Provide adequate personnel and time resources to conduct activities safely
- Provide appropriate corrective action when unsafe acts or practices occur
- Provide H&S training of all on-site personnel

Health & Safety Coordinator - Responsibilities

- Monitor implementation of H&S Plan
- Coordinate H&S Plan orientation of all site personnel
- Coordinate and implement air monitoring and site inspections
- Ensure compliance with safe work procedures
- Maintain an up-to-date emergency contact list

Landfill Mining Operation Site Personnel - Responsibilities

- Take precautions to prevent injury to themselves and other employees
- Comply with the H&S Plan and all safety procedures
- Perform only the tasks they are qualified to do safely, and report any accidents and/or unsafe conditions to a supervisor

Medical Personnel - Responsibilities

- Provide emergency treatment for the exposures and hazards that may occur at the site

Hazard Potential

There is the potential for the following contaminants to be found during excavation: Polychlorinated biphenyls (PCBs), Volatile organic compounds (VOCs), Heavy Metals (Cd, Hg, Pb, etc.), Ammonia, Combustible gases, Medical Waste, Asbestos, Lead Acid Batteries, Reactive Materials

The contaminants listed above may not be encountered, but for the purpose of the Landfill Mining H&S Plan, workers should assume that the contaminants listed above may be present at the landfill mining working face.

Site Health and Safety Meetings

The Health and Safety Coordinator will ensure that periodic health and safety meetings are conducted with site personnel. Topics of discussion will include, but not be limited to: potential hazardous contaminants, physical hazards, review of recent accident reports plus their causes and means of prevention, remedial

actions taken or required by the reports of investigations and inspections, and any other health and safety issues.

For each safety meeting, the topics of discussion and attendees will be recorded.

Site Inspections

The H&S Coordinator will conduct periodic inspections of site conditions, facilities and equipment, and activities to ensure that the H&S Plan is being followed. Deficiencies identified by H&S Coordinator will be corrected as soon as practical and follow-up actions will be recorded.

Training

The Landfill Mining Project Manager shall ensure all landfill mining personnel are adequately trained to safely perform their assigned duties.

General

All landfill mining personnel are to be trained in the policies and procedures outlined in this H&S Plan and job specific safe work procedures prior to beginning work. The training shall cover:

- Potential hazards that might be encountered
- Safe work practices that must be followed
- PPE use, maintenance, and limitations
- Emergency action plans
- Fire prevention training

The Health and Safety Coordinator will observe workers to ensure that they are following H&S Plan procedures.

Record of Training

Documentation of training will be maintained onsite (electronic or paper).

6.6. Personal Protection Equipment (PPE)

Anyone entering the landfill mining area must be protected against potential hazards. The purpose of PPE is to shield or isolate individuals from potential hazards. The H&S Coordinator shall determine the level of worker protection required based on job responsibilities.

A re-evaluation of the type and level of worker protection will be conducted by the H&S Coordinator periodically. The level of worker protection will be upgraded or downgraded as tasks and material characteristics change.

The following PPE shall be kept in good condition and worn at all times by workers: Safety glasses or goggles, steel toed boots, hard hat, high visibility vest, hearing protection, and gloves.

Decontamination

The process of removing or neutralizing contaminants that have accumulated on personnel and equipment is important to the health and safety of workers.

Decontamination:

- Protects workers from hazardous substances that may contaminate PPE, tools, vehicles, and equipment

- Protects all site personnel by minimizing the transfer of harmful materials into clean area
- Helps to prevent mixing of incompatible chemicals
- Prevents the uncontrolled transport of contaminants offsite

Prevention of Contamination

The first step in decontamination is to establish procedures that minimize contact with contaminants and thus the potential for spreading contamination. These procedures include:

- Work practices that minimize contact with hazardous substances
- The use of disposable outer garments and use of disposable equipment, where appropriate

Decontamination Methods

All personnel, clothing, equipment, and samples leaving the contaminated area of the site must be decontaminated to remove any harmful contaminants that may have adhered to them. Decontamination methods include:

- All personnel must thoroughly wash their hands and face with soap and water before eating, drinking, smoking or using the restroom. Meals must not be eaten in the landfill mining area and PPE must be removed before entering the lunch area.
- At the end of each shift, all workers will wash any areas of skin which may have contacted contaminants
- It is recommended that work clothes (worn beneath protective equipment) be frequently laundered

Emergency Decontamination Procedures

In the event of an emergency, the decontamination and disposal procedures outlined above will be followed to the greatest extent possible. The primary concern is to prevent loss of life or severe injury. If immediate medical treatment is required to save a life, decontamination should be delayed until the victim is stabilized. If decontamination can be performed without interfering with essential life-saving procedures or first aid, decontamination should be performed immediately.

During emergency treatment, the Landfill Mining Manager or H&S Coordinator shall ensure that responding personnel (first aid, paramedics, fire department, etc.) are aware of site hazards and are protected from exposure to potential contaminants.

4.15 Fire Protection

No burning of waste materials will be permitted at the site, unless specifically authorized by the TCEQ Executive Director. Accidental fires will be promptly extinguished. All employees will be instructed in the potential sources of fires and their appropriate control. All buildings and machinery at the site will be equipped with fire extinguishers which will be kept fully charged, have a current inspection, and be ready for use.

Flammable and combustible liquids will be stored in labeled, flammable-materials storage containers. Smoking, open flames, temporary heaters, and spark-producing containers, devices, or tools will not be permitted in areas where flammable materials are stored or handled.

Landfill mining personnel will observe waste transport vehicles to detect evidence of smoke or fire in the vehicle. Suspect vehicles will be directed to an area where waste can be safely discharged and the fire extinguished.

If ignited materials are observed in a stockpile, the water truck will extinguish the burning material. The extinguished waste materials will be moved to an area away from combustible material for subsequent inspection, and ultimately transport offsite for disposal.

Any additional fire protection procedures required by the fire marshal to comply with the local fire codes will be incorporated into this Fire Protection Plan by a registration modification in accordance with 30 TAC 305.70.

Any fires managed at the site will be done so with the employees' safety in mind. Site personnel will initiate the following procedures upon detecting a fire:

1. Call the fire department
2. Notify and request assistance from other operating personnel
3. Stop all site operations
4. Push the fire to a safe location if possible
5. Use the water truck or portable fire extinguishers as appropriate
6. Confine fire to a small area
7. Approach the fire from any upwind position to minimize exposure to combustible products

The nearest fire station, Station 82, is located at 11250 Braesridge Dr, Houston, TX 77071, approximately 2.5 miles east of the site. The emergency number is 911 and the non- emergency number is (832) 394-6700.

If a fire occurs that is not extinguished within ten minutes of detection, the TCEQ's regional office will be contacted immediately after detection, but no later than four hours by telephone, and in writing within 14 days with a description of the fire and the resulting response.

The following firefighting equipment will be readily available in the event of fire:

- Fire extinguishers located in the waste processing and heavy equipment
- Water truck with water cannon
- Fire hydrants located along Ruffino Road
- Water storage in ponds onsite

Fire Protection Training

Fire-fighting professionals will train on-site personnel in firefighting techniques, fire prevention, response, and the fire safety. Records of training will be included in the site operating record.

4.16 Attachments to Part IV of the Application

None