THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

TECH NOD #1 RESPONSE - FEBRUARY 2019

REDLINE STRIKEOUT

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

For Permitting Purposes Only

Prepared by

HANSON
Engineering | Planning | Allied Services

TBPE F-417

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED
PROFESSIONAL ENGINEER

02/13/19

TBPE Firm No. 417

HANSON PROJECT NO. 16L0438-0003

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Volume 1 of 6

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018
Revision 1 – November 2018
Revision 2 – February 2019

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VOLUME 1 of 6

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THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Part I

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

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ATTACHMENTS

Facility Name: City of Kingsville Landfill
Permittee/Registrant Name: City of Kingsville
MSW Authorization #:235C
Initial Submittal Date: September/2018
Revision Date: February/2019

Texas Commission on Environmental Quality

Part I Form for New Permit/Registration and Amendment Applications for an MSW Facility

1. Reason for Submittal

☐ Initial Submittal ☒ Notice of Deficiency (NOD) Response

2. Authorization Type

☒ Permit ☐ Registration

3. Application Type

☐ New ☒ Major Amendment
☐ Major Amendment (Limited Scope)

4. Application Fees

☐ Pay by Check ☒ Online Payment

If paid online, e-Pay Confirmation Number: **Trace Number: 582EA000315158, Voucher Number: 385823, Voucher Number: 385824**

5. Application URL

Is the application submitted for Type I Arid Exempt (AE) and/or Type IV AE facility?

☐ Yes ☒ No

If the answer is "No", provide the URL address of a publicly accessible internet web site where the application and all revisions to that application will be posted.
http://**www.cityofkingsville.com/departments/public-works/landfill/landfill-amendment-application/**

6. Application Publishing

Party Responsible for Publishing Notice:

☐ Applicant ☐ Agent in Service ☒ Consultant

Contact Name: **Scot Collins, P.G.** Title: **Project Manager**

Permit or Approval	Received	Pending	Not Applicable
Dredge or Fill Permits under the CWA	☐	☐	☐
Licenses under the Texas Radiation Control Act	☐	☐	☒
Other (describe) Air Operating Permit (#3337)	☒	☐	☐
Other (describe) Air New Source Registrations (#91376 & #54070L001)	☒	☐	☐
Other (describe) Stormwater Permit (#TXR05L074)	☒	☐	☐
Other (describe)	☐	☐	☐

12. General Facility Information

Facility Name: **City of Kingsville Landfill**

Contact Name: ~~Pete Pina~~ **Gary Fuselier** Title: **Landfill Supervisor**

MSW Authorization No. (if available): **235C**

Regulated Entity Reference No. (if issued)*: RN**102334570**

Physical or Street Address (if available): **348 COUNTY ROAD E 2130**

City: **Kingsville** County: **Kleberg** State: **Texas** Zip Code: **78363 9653**

(Area Code) Telephone Number: **(361) 595-0092**

Latitude (Degrees, Minutes Seconds): NAD 27: **N 27°26′ 41.95″** NAD 83: N 27° 26' 43.08"

Longitude (Degrees, Minutes Seconds): NAD 27: **W 97°48′ 55.89″** NAD 83: W 97° 48' 56.88"

Benchmark Elevation (above mean sea level): **52.61** ft.

Provide a description of the location of the facility with respect to known or easily identifiable landmarks: **1.7 Miles SE of the City of Kingsville at the NE corner of the intersection of FM 2619 and CR E 2130**

Detail access routes from the nearest United States or state highway to the facility: **2.57 miles east on CR E 2130 from US 77**

**If this number has not been issued for the facility, complete a TCEQ Core Data Form (TCEQ-10400) and submit it with this application. List the Facility as the Regulated Entity.*

13. Facility Type(s)

☒ Type I ☒ Type IV ☐ Type V

☐ Type I AE ☐ Type IV AE ☐ Type VI

14. Activities Conducted at the Facility

☒ Storage ☒ Processing ☒ Disposal

Signature Page

I, _______________________, _______________,
(Site Operator (Permittee/Registrant)'s Authorized Signatory) (Title)

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.

Signature: ______________ Date: __________

- -

TO BE COMPLETED BY THE OPERATOR IF THE APPLICATION IS SIGNED BY AN AUTHORIZED REPRESENTATIVE FOR THE OPERATOR

I, ____________________, hereby designate _______________________
(Print or Type Operator Name) (Print or Type Representative Name)

as my representative and hereby authorize said representative to sign any application, submit additional information as may be requested by the Commission; and/or appear for me at any hearing or before the Texas Commission on Environmental Quality 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.

____
Printed or Typed Name of Operator or Principal Executive Officer

____
Signature

-- -

SUBSCRIBED AND SWORN to before me by the said_____________________

On this ______ day of ______, ______

My commission expires on the ______ day of ______, ______

____
Notary Public in and for

____________________ County, Texas
(Note: Application Must Bear Signature & Seal of Notary Public)

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Part I

Attachment 1
Supplementary Technical Report

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 - February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

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I:\16jobs\16L0438\8514-City of Kingsville\8514-03\Permit Amendment\Part I\Part I -Att1 Supplementary Technical Report.docx

4 CHARACTER OF THE ADJACENT LAND §305.45(a)(6)

The following sections provide an overview of the various land use conditions of the surrounding area.

1) Wind Direction. The nearest reporting station is Corpus Christi, located to the northeast of the landfill site. A wind rose is included as part of Part I, Attachment 2, Figure I.2-1 The wind is predominantly from the southeast.

2) Water Wells. A well search was performed using the Texas Department of Licensing and Regulation's (TDLR) State of Texas Well Report Submission and Retrieval System, developed by the Texas Water Development Board in cooperation with the TDLR and the Texas Water Information Network. Based on this search, one well (Tracking Number 178262) is identified within 500 feet of the City of Kingsville Landfill site. During a site reconnaissance visit, this well was not confirmed to be located at the identified location (near the intersection of CR 2130 and CR 2619) and is believed to be plotted incorrectly based on available data, shown on Part II, Attachment 1, Figure II.1-4.

3) Existing Structures. The number of structures located within 500 feet of the landfill were determined through a visual reconnaissance and review of aerial photography. Approximately four (4) non-habitable structures are located within the 500-foot boundary of the City of Kingsville Landfill. These structures are associated with agricultural activities within the surrounding areas. Within the permitted boundary of the site, there is a scale house, an office building, and a maintenance shop, (see Part I, Attachment 2, Figure I.2-5and Part III, Attachment 1, Figures III.1-2and III.1-14).

4) Special Use areas. A visual reconnaissance and available records search revealed that other than the City of Kingsville Landfill, there are no active disposal facilities located within one mile of the landfill. Surrounding land uses include agriculture (crop land and pasture) with a few remote residences interspaced within the agricultural areas. There are no known licensed day care facilities, hospitals, cemeteries, ponds, or lakes within one mile of the permitted boundary of the landfill.

5) Area Streams. The nearest stream to the City of Kingsville Landfill is the Santa Gertrudis Creek. Santa Gertrudis Creek is located about 3,000 feet to the northeast of the northeast corner of the current site and about 2,000 feet to the northeast of the northeast corner of the proposed easterly expansion. No perennial or intermittent streams are located within 500 feet of the location of the proposed expansion

7 EVIDENCE OF COMPETENCY §330.59(f)

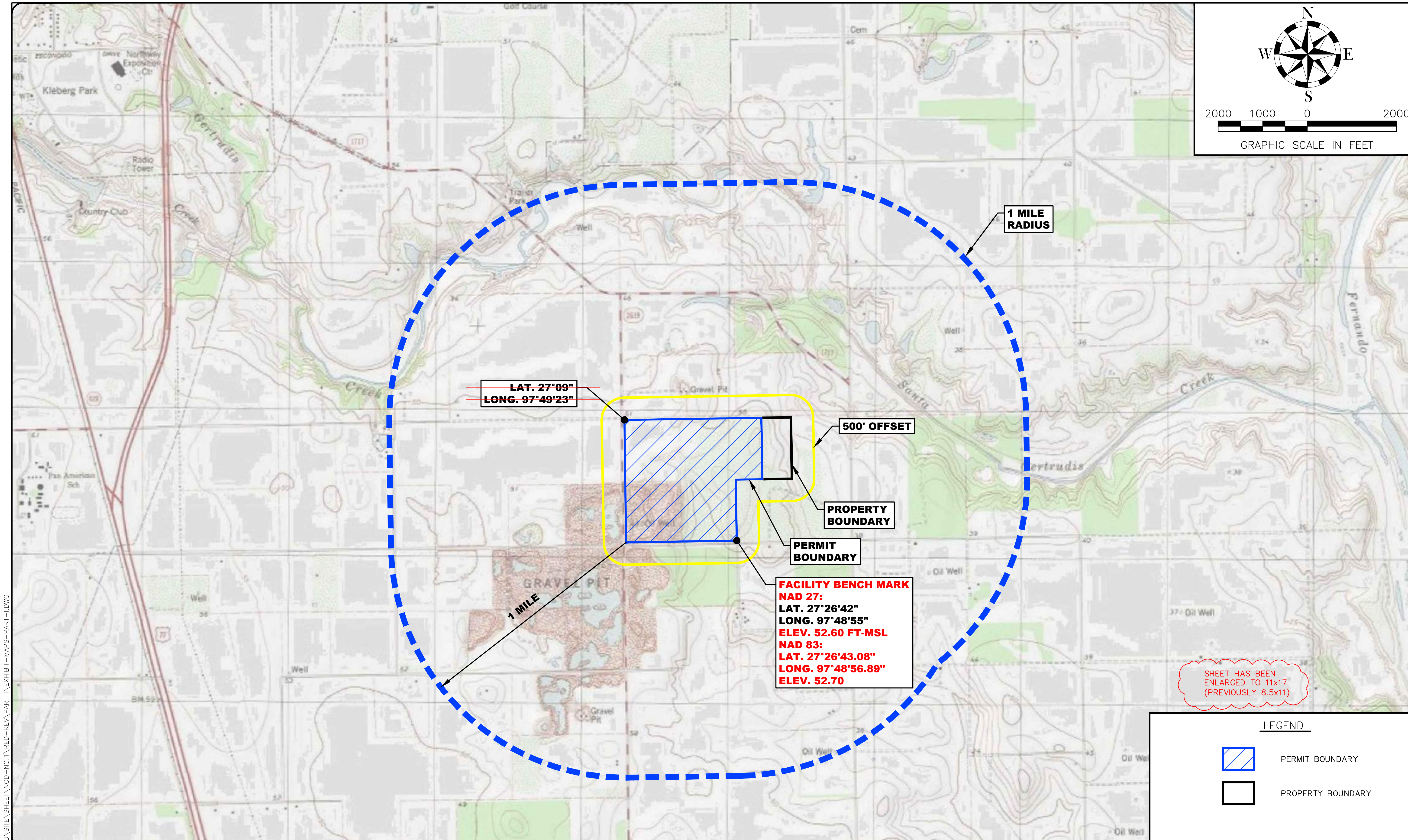
Kingsville Landfill is owned and operated by the City of Kingsville (City). The landfill serves residences and businesses within Kleberg County and portions of surrounding Texas counties. The City has been providing waste disposal since the 1970's and has successfully operated the municipal landfill operation. The City owns and operates the City of Kingsville Citizens Collection Station MSW Registration # 120081, since June 2012. The City does not own and has not operated any other solid waste sites in the last 10 years, in Texas or any other state. It has, to this date, complied with all regulations and requirements set forth by the regulatory agency and most currently, Texas Commission on Environmental Quality (TCEQ). Evidence of Competency for the City of Kingsville Landfill is provided in Part I, Attachment 7.

CITY OF KINGSVILLE LANDFILL

PART I

ATTACHMENT 2

GENERAL LOCATION MAPS



NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED PROFESSIONAL ENGINEER
02/12/19

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 02/12/2019

LAYOUT	DT	02/12/2019
DRAWN	DT	02/12/2019
REVIEWED	JMR	02/12/2019

HANSON

Hanson Professional Services Inc.
4501 Gollihar Rd.
Corpus Chrisiti, Texas 78411

TBPE F-417
TBPLS F-10039500
TBPG F-50556
TBAE F-BR 2458

Phone: (361) 814-9900
(800) 677-2831
www.hanson-inc.com
Offices Nationwide

PART I-ATTACHMENT 2
GENERAL TOPOGRAPHIC MAP
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
I.2-3

FEB 12, 2019 8:15 AM TORRE01809
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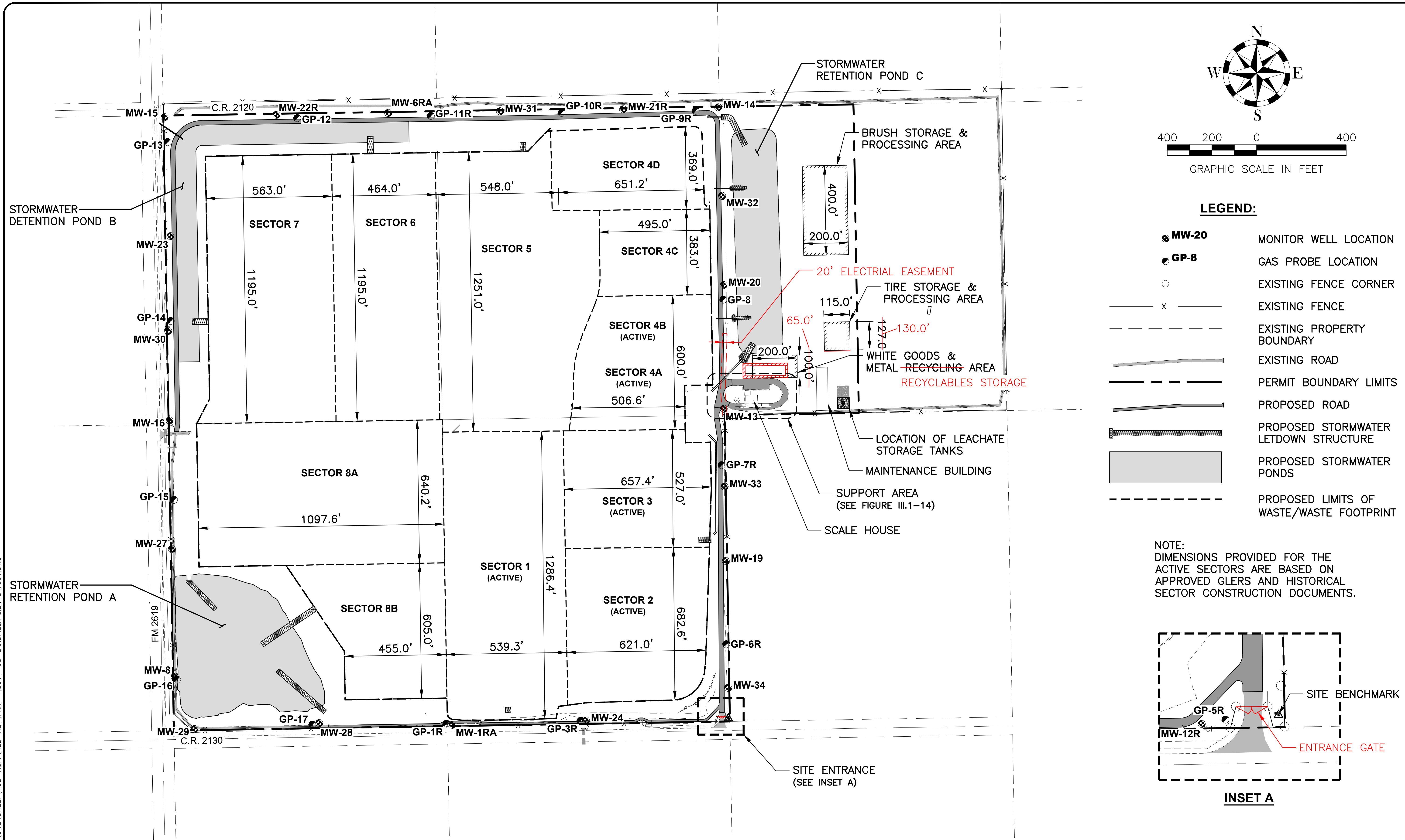

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
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PART I, ATTACHMENT 2
FACILITY LAYOUT PLAN
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
I.-2-5

FEB 12, 2019 8:09 AM TORRE01809
I:\16JOBS\16L0438B\CAD\SITE\SHEET\NOD-NO.1\RED-REV\PART I\8514-03-LANDFILLFACILITYLAYOUT.DWG

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Part I

Attachment 7
Evidence of Competency

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 - February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

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1 EVIDENCE OF COMPETENCY §330.59(f)

The City of Kingsville Landfill is owned and operated by the City of Kingsville (City). The landfill serves residences and businesses within Kleberg County and portions of surrounding Texas counties. The City has been providing waste disposal since the 1970's and has successfully operated the municipal landfill operation. The City owns and operates the City of Kingsville Citizens Collection Station MSW Registration # ~~120051~~120081, since June 2012. The City does not own and has not operated any other municipal solid waste sites in the last 10 years, in Texas or any other state. It has, to this date, complied with all regulations and requirements set forth by the regulatory agency and most currently, Texas Commission on Environmental Quality (TCEQ).

1.1 Experience of Principals, Supervisors and Key Personnel

The City of Kingsville Landfill currently has approximately eight (8) employees involved in its solid waste system. Consistent with §330.59(f)(4), the names of the City of Kingsville Landfill principals and supervisors are provided below along with previous affiliations with other organizations engaged in solid waste activities.

Applicant

The City of Kingsville has operated the existing Municipal Landfill for more than 30 years in accordance with the rules and regulations set forth by the state of Texas.

William A. Donnell, Public Works Director

Mr. Donnell has been with the City of Kingsville since 1997 and has been in charge of Wastewater Treatment and Collections, Water Production, Water Construction, Streets, Garage, Sanitation & Recycling, and Landfill Departments for the last 12 years. Mr. Donnell directs and oversees all aspects of the Public Work Department. Mr. Donnell administers all quality control and regulatory compliance aspects of the system, permit development and implementation functions of both the disposal and processing system, and administers all aspects of capital construction projects and expenditures.

Pete Pina, Landfill Supervisor

Mr. Pina is responsible for the daily operations of the City of Kingsville Landfill. He has worked for the City of Kingsville for 26 years and has held various positions during that time. His work includes oversight of hourly workers, equipment maintenance, construction management, and operations compliance. Mr. Pina has a Texas Class A License for MSW Landfill Management and Operations. He is also a member of the Solid Waste Association of North America (SWANA).

THE CITY OF KINGSVILLE LANDFILL
TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION
PART II

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018
Revision 1 – November 2018
Revision 2 - February 2019

Prepared by

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

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ATTACHMENT 2 – NAVAL AIR STATION KINGSVILLE COORDINATION CORRESPONDENCE

ATTACHMENT 3 – TCEQ TRANSPORTATION DATA AND REPORT (FORM NO. 20719)TEXAS DEPARTMENT OF TRANSPORTATION CORRESPONDENCE

ATTACHMENT 4 – FEDERAL AVIATION ADMINISTRATION CORRESPONDENCE

ATTACHMENT 5 – WETLANDS CORRESPONDENCE

ATTACHMENT 6 – ENDANGERED OR THREATENED SPECIES CORRESPONDENCE

ATTACHMENT 7 – CULTURAL RESOURCES CORRESPONDENCE

ATTACHMENT 8 – COUNCIL OF GOVERNMENTS CORRESPONDENCE

I:\16jobs\16L0438\8514-City of Kingsville\8514-03\Permit Amendment\NODs\Technical NOD #1\Part II\Part II Rdln.docxZ:\8514-City of Kingsville\8514-03\Permit Amendment\Part II\Part II.docx as indicated in Part III, Attachment 1, Figure III.1-3. The total permitted disposal capacity will be increased from approximately 5,813,000 cubic yards to an estimated 17,994,286 cubic yards.

This Permit Amendment Application presents several supporting site studies, including geological, geotechnical, groundwater, land use, slope stability, settlement, as well as a new wetlands delineation by the U.S. Army Corps of Engineers.

1.3 Other Authorizations Required

A review of the proposed project for permit requirements and any adverse potential impacts to environmental and cultural resources has been performed. No additional federal rulings or permits regarding wetlands, or floodplains are necessary for this amendment. Based on this review, no impacts to historical sites or to endangered species or critical habitat for endangered and or threatened species will occur.

1.4 Easements and Buffer Zones

The TCEQ regulations [30 TAC §330.543 (b) (A)] require that new landfills and vertical and lateral expansions of existing landfills have a 125-foot buffer zone between the property line and the outermost edge of the new airspace waste disposal footprint. This requirement does not apply to previously permitted airspace, only to newly permitted airspace. The City of Kingsville Landfill is considered a previously permitted airspace and has a buffer zone of 50 feet. The 50-foot buffer zone will be maintained ~~in~~ for previously permitted airspace, while a 125-foot buffer zone will be maintained from the outermost edge of new airspace for ~~in~~ the vertical and lateral expansion areas. The buffer distances from the property boundary to the outermost edge of previously permitted airspace and new airspace for the vertical and lateral expansion areas are shown on Part III, Attachment 2, Figure III.2-1 - Figure III.2-5. The buffer distances from the property boundary to each storage or processing facility are shown on Part I, Attachment 2, Figure I.2-5 and Part III, Attachment 1, Figure III.1-2.

30 TAC §330.543 (a) requires that no solid waste unloading, storage, disposal, and processing operations occur within any easement, buffer zone, or right-of-way that crosses the site. The City of Kingsville Landfill site does not have pipeline or utility easements in locations that will affect solid waste unloading, storage, disposal or processing operations.

1.5 Site Specific Conditions

Part II, Sections 2 Through 15 document a detailed discussion of site-specific conditions that potentially require special design considerations as set forth in 30 TAC §330.61 (a), including impact on surrounding areas, transportation, general geology, soils, groundwater, surface water, abandoned oil and water wells, floodplains, wetlands, endangered or threatened species, and Texas Historical Commission review. Based on this discussion, there are no existing site-specific conditions that require special design considerations or possible mitigation conditions.

2 WASTE ACCEPTANCE PLAN §330.61(b)

2.1 Sources and Characteristics of Waste

The operational procedures and redesign described in the Permit Amendment Application, once approved, will allow the facility to accept and dispose of municipal solid waste, construction and/or demolition waste, and some special wastes as defined by 30 TAC §330.3.

The facility will accept for disposal the following special waste allowable under 30 TAC §330.171: special wastes from health care related facilities, dead animals and/or slaughterhouse waste, non-regulated asbestos-containing materials (non-RACM), empty containers which have been used for pesticides, herbicides, fungicides, or rodenticides, Municipal hazardous waste from a conditionally exempt small quantity generator (CESQG), sludge, grease trap waste, grit trap waste, ~~septage that contains free liquids,~~ soil contaminated by petroleum products, crude oils, or chemicals and liquid waste from oilfield activities. Procedures for accepting and processing all special waste are detailed in the Site Operating Plan (Part IV). In the event that the City of Kingsville Landfill elects to accept other special wastes in the future, TCEQ authorization will be sought and procedures for acceptance and processing will be provided. Other materials that will be received for processing and potentially beneficial reuse include scrap tires and unsorted mixed recyclables.

Consistent with 30 TAC §330.15, the City of Kingsville Landfill will not accept for disposal lead acid storage batteries, used motor vehicle oil, used oil filters, refrigerators, freezers, air conditioners or other items containing chlorinated fluorocarbons (CFC), regulated hazardous waste, polychlorinated biphenyls (PCB) waste, radioactive materials, or other wastes prohibited by TCEQ. Friable asbestos-containing materials, and empty containers, as well as industrial hazardous waste, and Non-hazardous Class 1, Class 2, and Class 3 industrial waste will not be accepted for disposal.

The Site Operating Plan in Part IV of the application contains a detailed description of the restrictions pertaining to waste acceptance procedures. The Applicant (City of Kingsville) reserves the right to reject any waste material, including those mentioned above, that contributes a constituent or characteristic that may impact or influence the design or operation of the facility.

2.2 Volume and Rate of Disposal

Kingsville Landfill received approximately 31,444 tons of incoming solid waste in 2017. The maximum annual waste acceptance rate is anticipated to increase at approximately one (1) percent per year which corresponds to the anticipated yearly population growth rate for Kleberg County (based on population projections from the Texas State Data Center).

8 IMPACT ON SURROUNDING AREA §330.61(h)

8.1 Site Land Use

The site is currently being utilized as a Type I and Type IV municipal solid waste landfill operating under TCEQ Permit No. 235-B.

8.2 Zoning

The current City of Kingsville Landfill permit boundaries and the proposed expansion is not located within the city limits. It is however located within the City of Kingsville extraterritorial jurisdiction which extends two miles from the city's corporate boundaries. The City of Kingsville does not have zoning ordinances that control land use within their corporate limits, consequently, there are no zoning maps that define land use districts at the site.

However, the City of Kingsville entered a Joint Land Use Study (JLUS) with Kingsville Naval Air Station (NAS-Kingsville) in 2010. The purpose of the study was to establish regulations that guide land use within the vicinity of the airport. The envelope includes lands generally within five (5) miles from the runway ends with a width extending one and half (1.5) miles on either side of the centerline.

The City of Kingsville Landfill is within the land use envelope of NAS-Kingsville as seen on Part II, Attachment 1, Figures II.1-6 – NAS Kingsville Compatible Land Use Zoning Map. The landfill site is classified as C1, Neighborhood Service Area in the Kingsville-Kleberg Joint Airport Zoning Board (JAZB) – Land Use Compatibility Guide. Part of the proposed easterly expansion falls in Accident Potential Zone II (APZ II) which requires compliance with FAA Part 77. Further information on compliance with airport restrictions is provided in Part II, Section 9.5.

8.3 Surrounding Land Use

The character of surrounding land uses within a one-mile radius of the proposed permit boundary was investigated through site visits and aerials. The Joint Airport Zoning Board (JAZB) – Land Use Compatibility Guide was also utilized. The primary land use within a one-mile radius of the site was found to be agricultural consisting of cropland and pasture. Other surrounding land uses include single-family residential and neighborhood service properties (caliche mines) owned by Kleberg County. There do not appear to be any schools, licensed day care facilities, churches, hospitals, cemeteries, lakes, and commercial or industrial areas. The Texas Historic Sites Atlas of the Texas Historical Commission does not identify any historic sites, archaeological sites or sites with exceptional aesthetic qualities.

There are several small ponds within the one mile of the landfill site. These ponds are private stock ponds that hold water during the seasonal wet periods of the year.

Land use within one mile of the proposed permit boundary can be summarized as follows:

TABLE 2: SURROUNDING LAND USE – ONE MILE RADIUS

Land Use	Acres	Percent
~~Cultivated~~Agricultural	~~1,802~~2188	~~51.5~~62.5
Undeveloped~~/Pasture~~	~~1,136~~677	~~32.5~~19.4
~~Abandoned Caliche Mines~~Commercial	263	7.5
Residential	~~299~~372	~~8.5~~10.6
Total	3,500	100

The expanded site will extend the one mile radius in a north-easterly and south-westerly direction, most of which is agricultural.

8.4 Growth Trends and Directions of Major Development

The City of Kingsville Landfill site is in Kleberg County. The county's population was 31,549 in 2000, and 32,061 in 2010. According to the Texas State Data Center, the population of Kleberg County is projected to increase to 46,244 in 2050. For the 40-year period, the population is projected to increase by 44.24%.

The nearest community is the City of Kingsville, whose city limits are approximately 1.45 miles from the northeast corner of the proposed landfill boundary. The primary growth in the vicinity of Kingsville, though slow and confined within the city limits is projected in the south and southeast areas. Ricardo is a small town located 2.33 miles to the southwest of the landfill site. Ricardo's population increased from 1,019 in 2000 to 1,048 in 2010. As can be noted, the population growth in Ricardo is stunted and confined to areas near State Highway 77.

The nearest residence to the north of the landfill site is approximately 600 feet from the proposed boundary. Just inside the five mile radius is the same direction is the Kingsville Naval Air Station (NAS-Kingsville). Growth trends in this area are expected to be slow due to the influences of the current uses. The area immediately to the southwest (within one-half mile) is owned by Kleberg County and has several abandoned caliche mines. This area and the remaining surrounding areas (mostly agricultural) within the one-mile radius of the landfill site are also expected to have very little to no growth. Therefore, the proposed vertical and lateral expansion should not adversely affect area development.

8.5 Proximity to Residences and Other Uses

Surrounding land use within one mile of the landfill can be seen on Part II, Attachment 1, Figures II.1-2 and II.1-4. The surrounding area does contain some low density rural residential development interspersed within the primarily agricultural cropland and pasture. The number of structures located within 500 feet and one mile of the site was determined through a visual reconnaissance and review of aerial photography. There are four (4) non-habitable and no habitable structures located within 500 feet from the proposed boundary of the City of Kingsville

Landfill. Within one mile of the site and outside the 500-foot limit, there are approximately seventy-three non-habitable, and fifty-four (54) habitable structures. The nearest residences to the facility are located approximately 600 feet north of the northwest comer of the current landfill property boundary.

The nearest airfield is the Kingsville Naval Air Station (NAS-Kingsville) located approximately two (2) miles northeast of the landfill. NAS-Kingsville as well as the Federal Aviation Administration (FAA) are aware of the location of the City of Kingsville Landfill and its operations. Other than NAS-Kingsville, the nearest airport is the Bishop Municipal Airport. This airport is located about 11 miles to the northeast and is not within the jurisdictional limits of the regulatory airport restrictions.

Santa Gertrudis Creek is located about 3,000 feet to the northeast of the northeast corner of the current site and about 2,000 feet to the northeast of the northeast corner of the proposed easterly expansion.

8.6 Water Wells/ Oil and Gas Wells

A water/oil and gas well search was conducted to identify known wells within a 500-foot radius of the proposed facility boundary. The well search included a review of the Texas Water Development Board, the Texas Commission on Environmental Quality (TCEQ), and the Railroad Commission records. The U.S. Geological Society databasevwas also checked for groundwater sites on which it collects data.

Based on this review, one well (Tracking Number 178262) is identified within 500 feet of the City of Kingsville Landfill site. During a site reconnaissance visit, this well was not confirmed to be located at the identified location (near the intersection of CR 2130 and CR 2619) and is believed to be plotted incorrectly based on available data. ~~there do not appear to be any known active water wells located within 500 feet of the landfill boundary.~~

There is an active oil well located approximately 250 feet east and 1,200 feet north of the current southeast corner of the landfill boundary. There is an active gas well located approximately 300 feet west and 1,270 feet south of the current northwest corner of the landfill boundary. Other oil and gas wells on or near the facility are inactive or were dry holes and have been properly capped, closed, and plugged in accordance with Railroad Commission regulations.

Information relating to the locations and descriptions of all known wells within 500-feet of the City of Kingsville Landfill is presented in Part II, Attachment1, Figures II.1-3 and Figures II.1-4. This map includes the locations of all oil and gas, and water wells located within 500-feet of the facility.

10 GENERAL GEOLOGY AND SOILS §330.61(j)

10.1 Regional Geology

The Texas Coastal Zone is composed of several active, natural systems of environments: Fluvial deltaic, barrier-strandplain-chenier and bay-estuary-lagoon systems. as well as an eolian (wind) system in South Texas and marsh-swamp systems in more humid middle and upper coastal regions (Part III, Attachment 4). Sedimentary deposits that originated in ancient but similar. Coastal systems also underlie the Coastal Zone. (Brown, 1977[1]) The classic sediments composing the geologic formations grade from fluviatile and deltaic sand, silt and clay in inland areas to predominantly finer sediments that interfinger with brackish and marine sediments near the Gulf Coast and offshore. Geologic structure in the area is relatively simple. The water bearing formations underlying the report area form a monocline which dips gently toward the coast. Although faults are fairly common in many of the deeply buried formations, none of the geologic formations within the scope of this report are known to be displaced by significant faults (Shafer. 1973[2]).

10.2 Site Geology and Soils

The primary geologic formations exposed at the site are Holocene & Pleistocene Alluvium. Barrier Island Deposits and South Texas Eolian Plain Deposits. Sediments encountered at the site consist of clays, silts, sands, and some caliche. Cross-sections have been prepared and are included in the report (Part III Attachment 4). The subsurface geological structure at the Kingsville landfill site is shown to be fairly uniform down to approximately 10 feet above MSL in these elevations. Light olive green marine clay underlies the site that is more than 38-feet thick. The maximum explored depth for which soil samples were collected was 86-feet below ground surface. This layer forms the aquiclude at the site. The top of this clay varies from 5-feet to 17-feet above mean sea level below the landfill site.

The primary geologic formations exposed at the surface of the site are recent Holocene South Texas Eolian Plain Deposits. The topsoil (approximately 0-feet to 20-feet) consists of clay, which is black silty and contains humic material. This soil is overlain in the extreme northeast corner with a veneer of loess. Sediments encountered in borings at the site are Holocene to Pleistocene in age and consists of clays, silts, sands and caliches deposited in two (2) separate and distinct environments of deposition. Attachment 4 illustrates these environments of deposition. Four (4) deep borings at the MSW landfill site penetrate, a minimum thickness of 38-feet of, a massive low

[1]Brown, L. F., Jr., McGowen, J. H., Evans, T. J., Groat, C. G., and Fisher, W. L., Environmental Geologic Atlas of the Texas Coastal Zone - Kingsville Area: Bureau of Economic Geology, University of Texas at Austin, (1977).
[2] Shafer, G.H., and Baker, E. T., Jr., Ground-water Resources of Kleberg, Kenedy, and Southern Jim Wells Counties, Texas: Texas Water Development Board Report #173, (1973).

permeability, light olive green clay ("Light Olive Green Clay") believed to have been deposited in a marine (estuarian) environment.

The "Light Olive Green Clay" is the aquiclude for the MSW landfill facility. In turn, the "Light Olive Green Clay" is capped by a sheet of sand ("Orange Sand") possibly 2-feet to 10-feet thick across the site of the MSW landfill. Stratigraphically above the "Orange Sand", the environment of deposition Changes to fluvial-deltaic for the remaining 40-feet to 50-feet of section, measured back to the surface. These beds are comprised of sands, silts, caliches, and clays deposited as superimposed channels sands and clayey dunes or bars. Bodies I and II are superimposed, caliche or sand filled channels with Body I having the larger areal extent. Bodies II and IV a reinterpreted as dunes or bars of limited extent and are comprised of clayey sand. All of the above sand bodies are incised into, or embedded within, a tan, silty clay containing abundant mottles of organic matter. Taken together, the marine clay section, ("Light Olive Green Clay") overlain by fluvial-deltaics section represents a single regressive cycle, with respect to sea level at the top of the Pleistocene Beaumont formation. It is believed that the entire fluvial-deltaic section is comprised of Holocene sediments with the Holocene-Pleistocene boundary represented by the top of the "light Olive Green Clay" or "Orange Sand". The “Light Olive Green Clay" has a monoclinal dip to the northeast at approximately 20-feet per mile. Deposition of the above sediments postdates uplift of the Kingsville Dome. Pre-uplift formations are Miocene and older and exhibit west dip at depth in the vicinity of the MSW landfill site (See Part III, Attachment 4).

A thorough soils study was made from available literature sources (Environmental Geologic Atlas, Texas Coastal Basins Survey, Kleberg County Soil Conservation Service Map, USDA Kleberg County SCS Aerial Photos of MSWLF site, and Iowa State National Cooperative Soil Survey Database). The best description of the site is a Group IX Soil type of stabilized dunes with surface soils around the caliche pit of Hidalgo, Racombes, Willacy and Runges series.

10.3 Fault Areas

The property on which the City of Kingsville Landfill is located was examined for the presence of faulting according to 30 TAC §330.555 criteria. A fault study was conducted that included reviewing aerial photographs of the site, reviewing the available geologic literature and maps of the area, field observations, and examining subsurface boring data from the site. The site and surrounding area (within 200 feet) were investigated for: structural damage to constructed facilities, scarps in natural ground, presence of surface depressions, lineations (noted on aerial maps), vegetation changes, crude oil and natural gas accumulations, changes in elevations of established benchmarks and structural control of natural streams.

Based upon field observations at the site, there are no unusual scarps or topographic breaks within 200 feet of the site. In addition, there is no envidence to suspect mass movement of natural formations of earthen material on or in the vicinity of the site. No structural damage to constructed facilities (roadways, railways, and buildings) and no changes in drainage or vegetation patterns which are also associated with faulting were observed.

The literature review did not indicate the presence of any fault areas at the landfill facility or proposed expansion areas. This site is in full compliance with the regulatory restrictions regarding fault areas.

10.4 Seismic Impact Zones

TCEQ regulations (30 TAC §330.557) stipulate that landfill units shall not be located in a seismic impact zone (defined as an area with a 10% or greater probability that the maximum horizontal accelaration will exceed 0.10 g in 250 years) unless designed to resist the seismic forces. Based upon a review of U.S. Geological Survey Seismic-Hazard Map for the Conterminous United States, 2014 (Scientific Investigation Map 3325, Sheet 2 of 6), which can be seen as Figure III.4-4-1, the Kingsville landfill facility is located in an area having a maximum horizontal acceleration of approximately 0.02-0.04 g not being exceeded in 250 years.Based upon a review of U.S. Geological Survey Open File Report 82-1033 (entitled "Probabilistic Estimates of Maximum Acceleration and Velocity in Rock in the Contiguous United States" (1982)), the Kingsville landfill facility is located in an area having a maximum horizontal acceleration of approximately 0.04 g not being exceeded in 250 years. Based on this data, this area will not experience any significant seismic activity. Therefore, the landfill is not in a predictive earthquake zone, and is in full compliance wth seismic impact zone regulatory restrictions.

10.5 Unstable Areas

The existing landfill site and the proposed expansion areas were evaluated for susceptibility to unstable areas. An unstable area is defined by the TCEQ as a location that is susceptible to natural or human-induced events or forces capable of impairing the integrity of some or all of a landfill's structural components responsible for preventing releases from the landfill. An unstable area can include poor foundation conditions, areas susceptible to mass movement, and karst terrains.

The determination of potential unstable areas at the landfill was based on site observations and a review of existing documentation for the site. Site specific soil conditions which might result in differential compaction were not evident. A 2-foot to 2.5-foot topsoil and loess cover is present in the current agricultural area and the unmined areas. Below, the topsoil is a firm to very hard clay. This clay is described as silty, calcified, with caliche, and is uniform in character throughout the site.

No foundation problems or evidence of mass movement of natural formations of earthen material were identified in any of the constructed structures or soil borrow areas to indicate the presence of any unstable conditions. The site is not located in a Karst area. The integrity of the landfill is therefore not expected to become impared by natural or human-made features or events.

11.3 Stormwater Permitting

The facility will be designed to prevent the discharge of pollutants into waters of the State of Texas or Waters of the United States, as defined by the Texas Water Code and the Federal Clean Water Act, respectively. The City of Kingsville has an approved TPDES General Permit relating to stormwater discharge #TXR05L074.

12 ABANDONED OIL AND WATER WELLS §330.61(l)

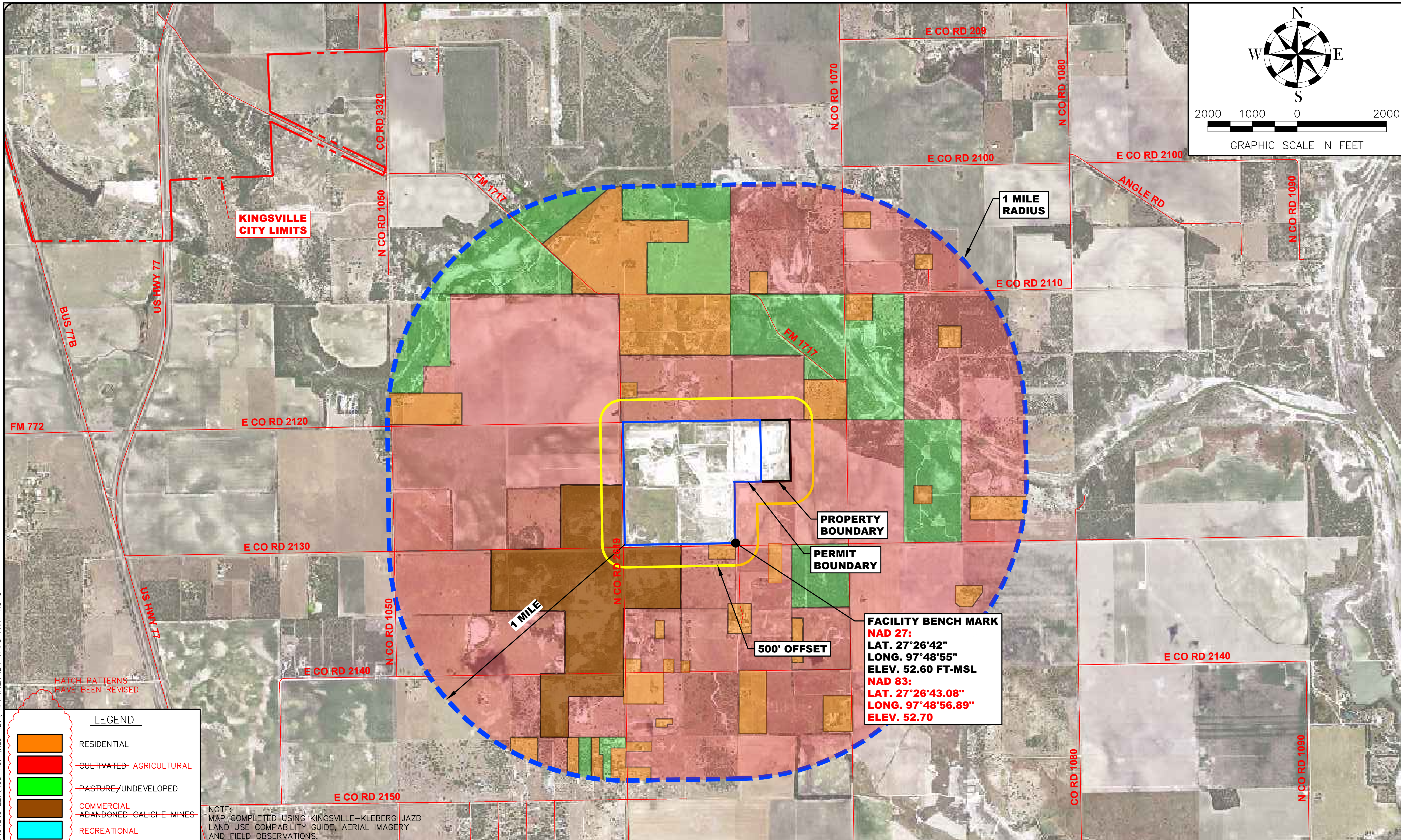
As described in Part II, Section 8.6, there are no known abandoned water wells within the proposed City of Kingsville Landfill boundary. Based on an online search of the Texas Water Development Board Groundwater Data Viewer, one well (Tracking Number 178262) was identified within 500 feet of the City of Kingsville Landfill site. During a site reconnaissance visit, this well was not confirmed to be located at the identified location (near the intersection of CR 2130 and CR 2619) and is believed to be plotted incorrectly based on available data, shown on Part II, Attachment 1, Figure II.1-4. There are however, three inactive oil/gas wells and two dry holes that have been properly capped, closed, and plugged in accordance with Railroad Commission regulations, shown on Part II, Attachment 1, Figure II.1-3. Should any unknown abandoned water and oil/gas wells be discovered during the landfill expansion project, the City of Kingsville will provide written notification to the TCEQ executive director of their location. A copy of the well plugging report for any found well will be submitted to the appropriate state agency and executive director prior to construction.

CITY OF KINGSVILLE LANDFILL

PART II

ATTACHMENT 1

MAPS AND DRAWINGS



NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED PROFESSIONAL ENGINEER
02/12/19

Hanson No. 16L0438
Filename EXHIBIT-MAPS-PART-II
Scale AS SHOWN
Date 02/12/2019

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PART II-ATTACHMENT 1
LAND USE MAP
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE: II.1-2

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CITY OF KINGSVILLE LANDFILL

PART II

ATTACHMENT 3

TCEQ TRANSPORTATION DATA AND REPORT (FORM NO. 20719) ~~TEXAS DEPARTMENT OF TRANSPORTATION (TXDOT)~~

~~CORRESPONDENCE~~

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION
PART III
SITE DEVELOPMENT PLAN

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 - February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-000

CONTENTS

ATTACHMENTS

LIST OF TABLES

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1 SITE DEVELOPMENT PLAN §330.63(a)

This Site Development Plan (SDP) for the City of Kingsville Landfill (Kingsville Landfill) has been prepared in accordance with 30 TAC §330.63. This plan includes the criteria used in the selection and design of the landfill to provide for the safeguarding of the health, welfare, and physical property of the people and the environment. The SDP includes a discussion of the geology, soil conditions, drainage, land use, zoning, adequacy of access roads, and other considerations specific to this facility. It also contains the following attachments:

Attachments

Attachment 1	Site Layout Plans
Attachment 2	Fill Cross-Sections
Attachment 3	Waste Management Unit Design Drawings
Attachment 4	Geology Report
Attachment 5	Alternative Liner and Overliner Point of Compliance Demonstrations
Attachment 6	Facility Surface Water Drainage Report
Attachment 7	Landfill Completion Plan
Attachment 8	Cost Estimates for Closure and Post Closure
Attachment 9	Financial Assurance
Attachment 10	Liner Quality Control Plan
Attachment 11	Groundwater Sampling and Analysis Plan
Attachment 12	Final Closure Plan
Attachment 13	Post-Closure Care Plan
Attachment 14	Landfill Gas Management Plan
Attachment 15	Leachate and Contaminated Water Management Plan
Attachment 16	Sector 4C Liner Construction Correspondence

3.2.2 Ventilation and Odor Control Measures

Potential odor sources associated with a landfill can vary considerably and may include the wastes being delivered to the landfill, waste in the open working face, landfill gas, the leachate collection system, or ponded water. Some wastes such as sludge and dead animals are a source of odor upon receipt, while other wastes have the potential for becoming a source of odor by their biodegradable nature. Leachate, liquid that has passed through or emerged from solid waste, may also be a source of odor if not properly handled in a timely manner.

Landfill operation at the site will occur in open areas within the permitted waste disposal footprint, therefore adequate ventilation will be provided. Landfill operators will ensure that odors are kept to a minimum by keeping the size of the working face area to a minimum, identifying any waste streams that require special attention to control odor, proper handling and disposal of leachate in a timely manner, and preventing ponded water. These and other odor control measures are discussed in detail in Part IV – Site Operating Plan.

The site will comply with all the applicable air quality rules and regulations. Accidental fires will be controlled, and open burning of waste will not be permitted.

3.2.3 Generalized Construction

Generalized construction details for the landfill are included in Part III, Attachments 1 through 3. Storage and Processing Area Plans, Figure III.1-16 in Part III, Attachment 1, provides details for the White Goods and Metal Recyclables Storage Area and the Tire Storage and Processing Area. Design and operation requirements for the Liquid Waste Solidification Facility are included in Part IV- SOP. Details of the leachate management system are included in Part III, Attachment 15.

3.3 Sanitation and Water Pollution Control §330.63(b)(3) – (4)

The white goods and metal recyclables storage ~~ing~~ area and the tire storage and processing area contains waste handling and storage operations but there is no process wastewater produced at these areas or other operations of the landfill. The areas will be built up with an all-weather surface that is graded and bermed to ~~minimize~~ prevent surface water from running into the storage area. In addition to preventing surface water runon into the areas, the berms enclosing the areas will also serve to contain runoff. The areas will be graded to a stormwater collection sump that wil collect and hold runoff from within the area. ~~The areas will be bermed to contain runoff.~~ If runoff is determined to be contaminated it will be collected and transported to the contaminated water evaporation pond or the contaminated water management area.

3.4 Endangered Species Protection §330.63(b)(5)

A literature review of threatened or endangered species in Kleberg County was conducted as discussed in Part II, Section 14. The review included both US Fish and Wildlife (USFWS) and Texas Parks and Wildlife Department documentation and their requirements for endangered species assessment and compliance. No potential habitat for federally listed threatened or endangered species or designated critical habitat occurs within the permit area, or the property. And no federally listed threatened or endangered species have been observed on the property. Neither the facility nor its operations will result in the destruction or adverse modification of the critical habitat of threatened or endangered species. If endangered species are encountered during site operations, USFWS and TPWD will be notified.

2017 annual report. This Permit Amendment Application proposes revisions to the facility design, resulting in a disposal facility with a total permitted disposal capacity of approximately 17,994,286 cubic yards that includes solid waste and daily cover material, not to exceed the maximum waste disposal elevations shown in Part III, Attachment 1, Figure III.1-4. Upon the approval of the Permit Amendment the total remaining disposal capacity is approximately 15,225,000 cubic yards or 6,295,538 tons.

Landfill life is sensitive to fluctuations in waste types and volumes received and operational factors which influence the refuse-to-cover ratio and compaction factors actually achieved. The following site life calculated beginning with a 2017 waste deposit rate of 31,444 tons per year, which increases 1.00% with the population as reflected in the traffic projections. These projections result in an annualized growth in waste deposited at the facility of approximately 1.00% and an annual rate of 54,547 tons/year, averaged over the life of the site. Based on an estimated daily cover volume of 15%, the site life is estimated to be 98 years as shown in Table 1.

TABLE 1: SITE LIFE CALCULATIONS

Total Remaining Disposal Capacity (tons)	Estimated Daily Cover Volume (15%) (tons)	Estimated Waste Disposal Capacity (tons)	Average Annual Waste Disposal Volume (tons)	Estimated Site Life
6,295,538	944,331	5,351,207	54,547	98.10

5.4 Liner Quality Control Plan

A Liner Quality Control Plan (LQCP) has been prepared in accordance with Subchapter H of the TCEQ regulations. The LQCP describes the procedures and methodology for assuring compliance with TCEQ rules and regulations regarding liner construction and is applicable to the construction of all landfill liner systems at the City of Kingsville Landfill as designed and specified in this permit. The LQCP shall govern the material characteristics, installation and testing for the various construction components for the landfill liners at the facility including the leachate collection system components. Qualifications for quality control personnel are also identified in this LQCP. The complete details for the LQCP are presented in Part III, Attachment 10.

5.5 Sector 4D Liner System

Permit 235B included a separate Type IV waste disposal unit as part of the facility along the northern portion of the permitted waste footprint. A portion of the Type IV area was developed as Type IV, Sector 1 in 2002. The area that was developed encompassed approximately 5.4 acres and was constructed with the same alternative liner system as specified for Type I sectors. The liner system that was constructed included, from bottom to top, a geosynthetic clay liner (GCL), a 60 mil HDPE geomembrane, a geosynthetic drainage layer and leachate collection system, and a protective soil cover layer. A Liner Evaluation Report consisting of a GCLER and GLER was submitted to the TCEQ on February 20, 2002 and was approved by TCEQ on March 4, 2002. Copies of the February 20, 2002 LER transmittal and the March 4, 2002 TCEQ approval are included in Part III, Appendix 16 – Sector 4D Liner System Correspondence.

This permit amendment does not include any separate Type IV waste disposal areas. The undeveloped portion of the Type IV waste sector from Permit 235B has been converted to and made a part of the Type I disposal areas of Sectors 5, 6 and 7 as shown in the Site Layout Plans included in Part III, Attachment 1. Type IV, Sector 1 is being designated as Sector 4D in this amendment and will be utilized as a Type I sector upon authorization of the permit amendment. The sector has only been utilized as a Type IV disposal area since being approved in 2002. No Type I disposal has taken place within the sector. Sector 4D has two leachate sumps which will have pumps and control systems installed and put into operation upon approval of the permit amendment and utilization of the sector for Type I disposal. Liner connection details between Sector 4D and Sectors 4C and 5 are included in Part III, Attachment 3, Figure III.3-2.

6 GEOLOGY REPORT §330.63(e)

A geology report has been prepared in accordance with Subchapter J, Parts §330.401 through §330.421 of the TCEQ regulations. The geology report describes the regional geology, geologic processes active in the vicinity of the facility, regional aquifers, results of investigations of subsurface conditions and geotechnical data that describes the geotechnical properties of the subsurface soil materials. The geology report includes previous geological data, investigations and reports from previous permits and permit amendments that is relative the current permit amendment. The Geology Report is presented in Part III, Attachment 4.

7 GROUNDWATER SAMPLING AND ANALYSIS PLAN §330.63(f)

A Groundwater Sampling and Analysis Plan (GWSAP) has been prepared in accordance with Subchapter J, Parts 330.401 through 330.421 of the TCEQ regulations. The GWSAP describes the procedures and methodology to monitor and collect ground water samples. The GWSAP also includes the testing frequency, establishment of background data, and statistical method to evaluate analytical results. The GWSAP details information regarding the plugging and abandonment of certain existing groundwater monitoring wells and the installation of certain new wells. The referenced P&A and new installation activities will be completed within six months of approval of the permit. The complete details for the GWSAP are presented in Part III, Attachment 11.

8 LANDFILL GAS MANAGEMENT PLAN §330.63(g)

A Landfill Gas Management Plan (LGMP) has been prepared in accordance with Subchapter I, Parts 330.371 of the TCEQ regulations. The LGMP describes the procedures and methodology to monitor and control landfill gas. The LGMP details information regarding the plugging and abandonment of certain existing landfill gas monitoring probes and the installation of certain new probes. The referenced P&A and new installation activities will be completed within six months of approval of the permit. The complete details for the LGMP are presented in Part III, Attachment 14.

9 CLOSURE PLAN §330.63(h)

Part III, Attachment 12 - Final Closure Plan contains the details of the final cover design, which has been developed to comply with Subchapter K, §330.501 through 330.505 of the TCEQ regulations. A composite cover will be constructed over the entire landfill. The composite cover will overlay a 12-inch thick intermediate cover layer immediately above the top of waste. The composite cover will consist of, from bottom to top, a geosynthetic clay liner (GCL), a 40-mil flexible membrane cover, a drainage geocomposite, and a 25-inch thick protective soil erosion layer. The Alternative Liner and Overliner Point of Compliance Demonstrations found in Part III, Attachment 5 includes a demonstration that the GCL material proposed in the final cover design is acceptable.

The initial and primary vegetative cover for the site will include appropriate native grasses. Typical types of grasses include Coastal Bermuda, Buffalo Grass, Texas Grama, Bluestem and Johnson Grass. Winter Rye and Fescue may be used in the cool seasons. The Kleberg County Extension Agent may also be consulted on the use of appropriate grasses and the appropriate planting seasons as cover projects are initiated. The maintenance of grass cover over completed areas is an essential component of erosion control in post closure care.

A demonstration that this specified final cover design will provide effective long term erosional stability is included in Part III, Attachment 6 - FSWDR.

10 POST-CLOSURE CARE PLAN §330.63(i)

Part III, Attachment 13 - Post Closure Care Plan contains the details of the post closure care, which has been developed to comply with Subchapter K, §330.501 and §330.507 of the TCEQ regulations.

11 CLOSURE AND POST-CLOSURE CARE COST ESTIMATE §330.63(j)

Part III, Attachment 8 – Cost Estimate for Closure and Post Closure contains the cost estimates for closure and post closure care, which has been developed to comply with Subchapter L, §330.501 through 330.507 of the TCEQ regulations.

12 FINANCIAL ASSURANCE §330.63(j)

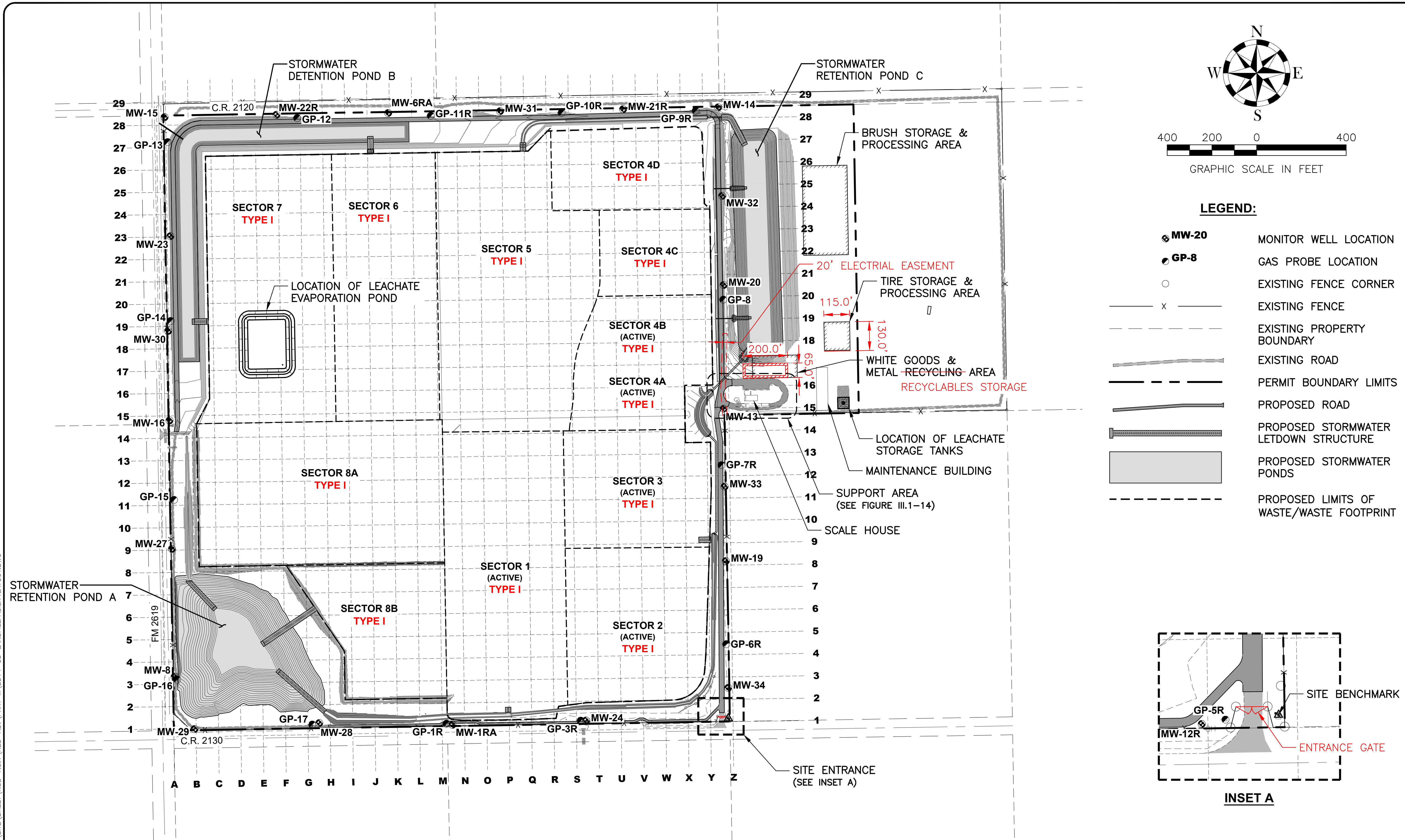
Part III, Attachment 9 – Financial Assurance contains a copy of the documentation demonstrating financial assurance for the existing Kingsville Landfill authorized under TCEQ Permit No. 235-B, to comply with Chapter 37, Subchapter R, §37.8001 through §37.8071 of the TCEQ regulations.

CITY OF KINGSVILLE LANDFILL

PART III

ATTACHMENT 1

SITE LAYOUT PLANS



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STATE OF TEXAS
JON M. REINHARD
64541
LICENSED PROFESSIONAL ENGINEER
02/12/19

Hanson No. 16L0438
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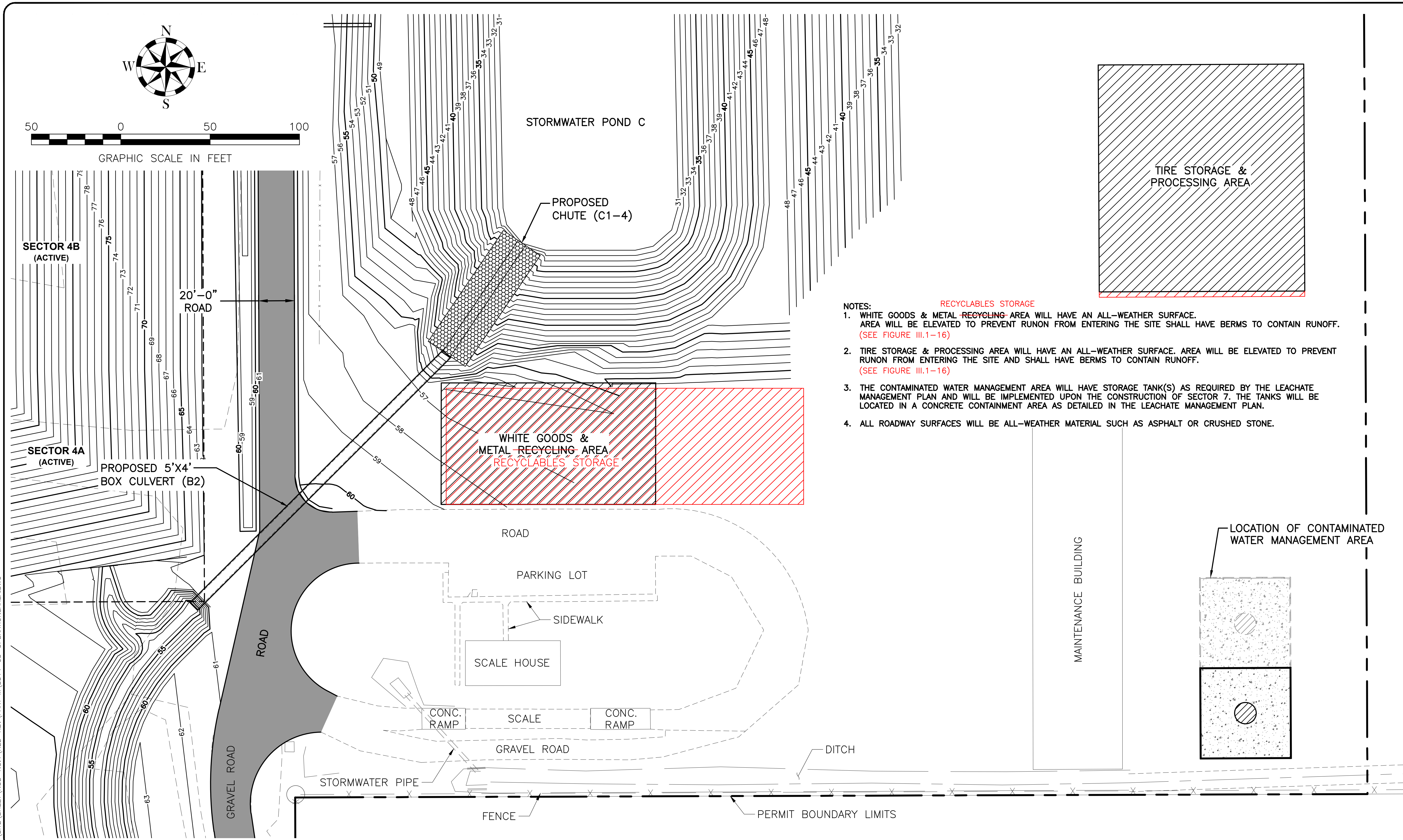
PART III, ATTACHMENT 1
FACILITY LAYOUT
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.1-2



NOTES:

1. WHITE GOODS & METAL ~~RECYCLING~~ RECYCLABLES STORAGE AREA WILL HAVE AN ALL-WEATHER SURFACE. AREA WILL BE ELEVATED TO PREVENT RUNON FROM ENTERING THE SITE SHALL HAVE BERMS TO CONTAIN RUNOFF. (SEE FIGURE III.1-16)
2. TIRE STORAGE & PROCESSING AREA WILL HAVE AN ALL-WEATHER SURFACE. AREA WILL BE ELEVATED TO PREVENT RUNON FROM ENTERING THE SITE AND SHALL HAVE BERMS TO CONTAIN RUNOFF. (SEE FIGURE III.1-16)
3. THE CONTAMINATED WATER MANAGEMENT AREA WILL HAVE STORAGE TANK(S) AS REQUIRED BY THE LEACHATE MANAGEMENT PLAN AND WILL BE IMPLEMENTED UPON THE CONSTRUCTION OF SECTOR 7. THE TANKS WILL BE LOCATED IN A CONCRETE CONTAINMENT AREA AS DETAILED IN THE LEACHATE MANAGEMENT PLAN.
4. ALL ROADWAY SURFACES WILL BE ALL-WEATHER MATERIAL SUCH AS ASPHALT OR CRUSHED STONE.

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PART III, ATTACHMENT 1
SUPPORT AREA LAYOUT
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.1-14

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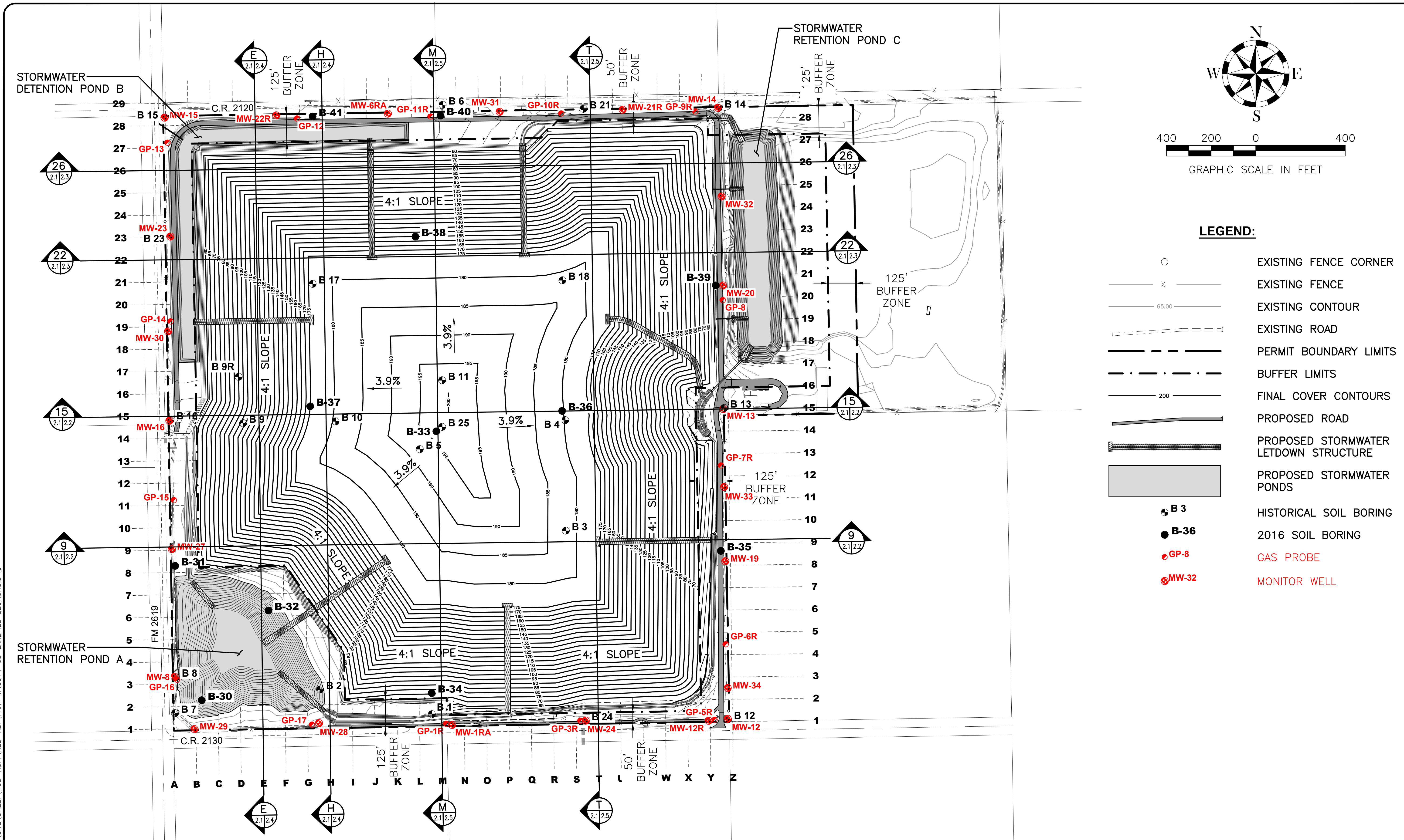
CITY OF KINGSVILLE LANDFILL

PART III

ATTACHMENT 2

CROSS-SECTIONS



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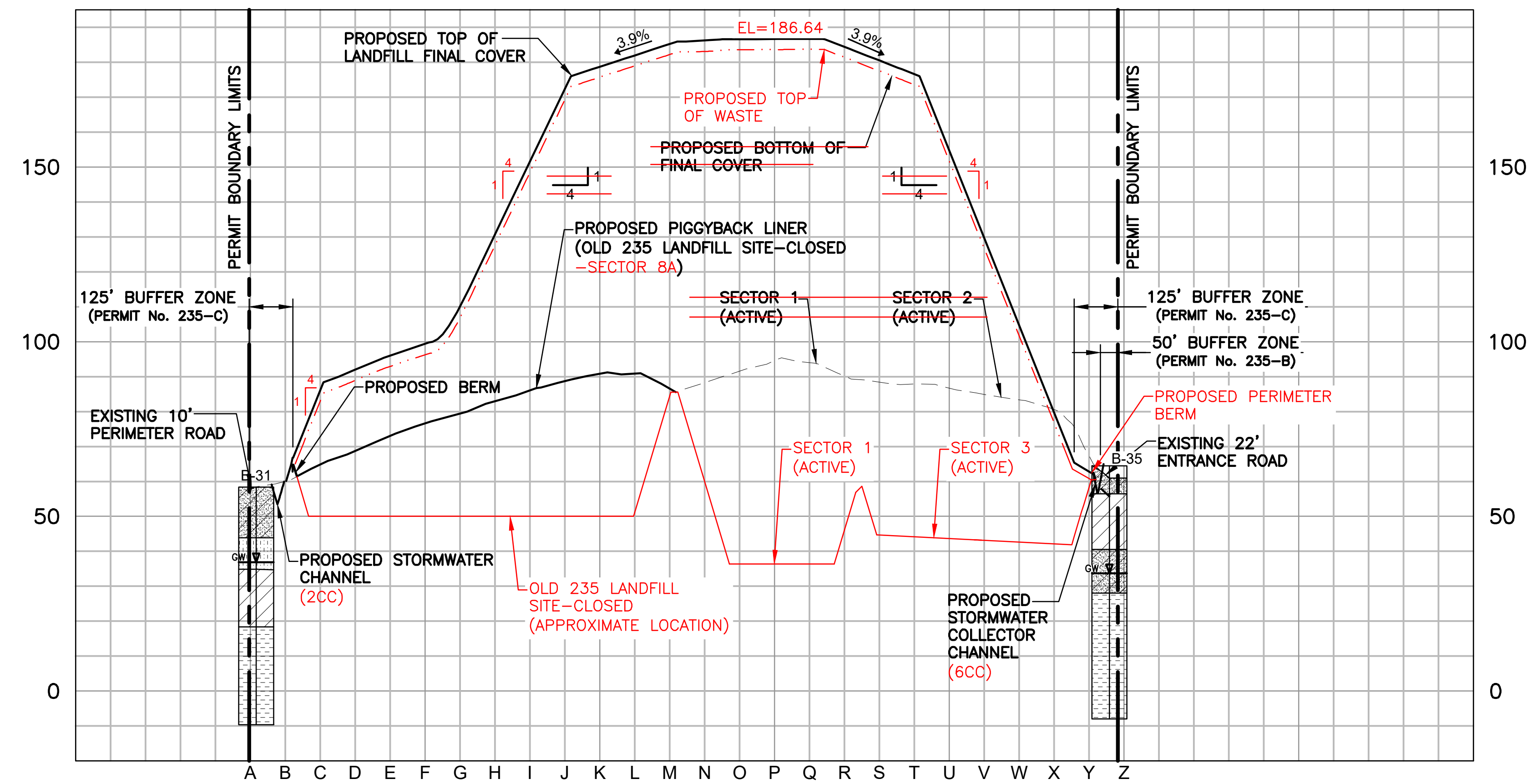
PART III, ATTACHMENT 2
LANDFILL CROSS - SECTION
LOCATION PLAN
CITY OF KINGSVILLE LANDFILL
PA. MSW 235-C
KINGSVILLE, TEXAS, KLEBERG COUNTY, TEXAS

FIGURE:
III.2-1



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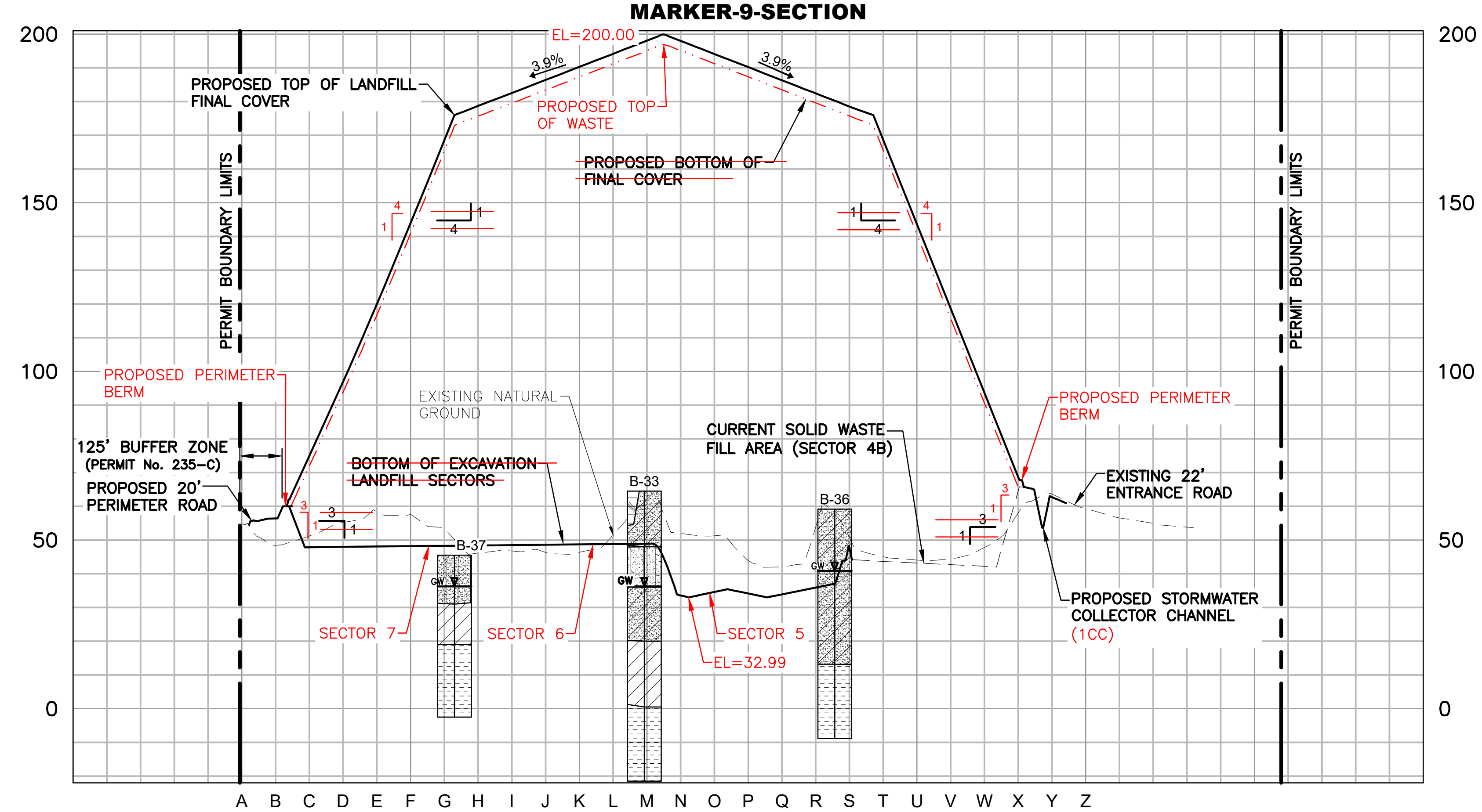
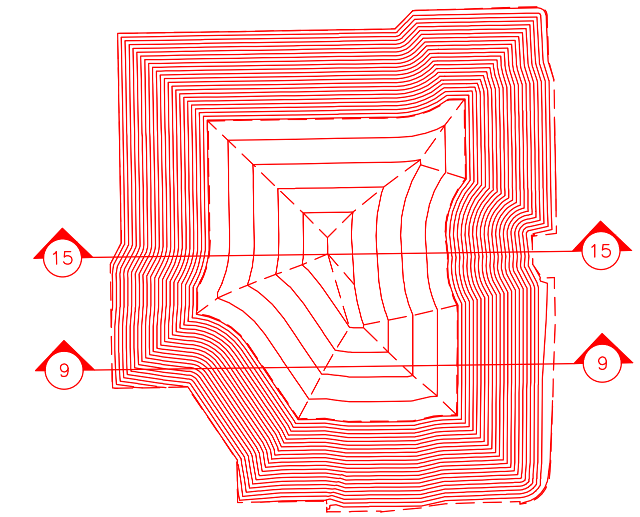


MARKER-15-SECTION



KEY MAP

LEGEND

(hatched)	LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
(hatched)	CLAYEY SAND (SC)
(hatched)	SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
(hatched)	FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
(hatched)	POORLY GRADED SAND WITH CLAY (SP–SC)
∇	GROUND WATER (GW)

50 0

500 250 0 500 1000

GRAPHIC SCALE IN FEET

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Hanson No. 16L0438
Filename
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Date 02/12/2019

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PART III, ATTACHMENT 2
LANDFILL CROSS - SECTIONS 9 & 15
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.2-2

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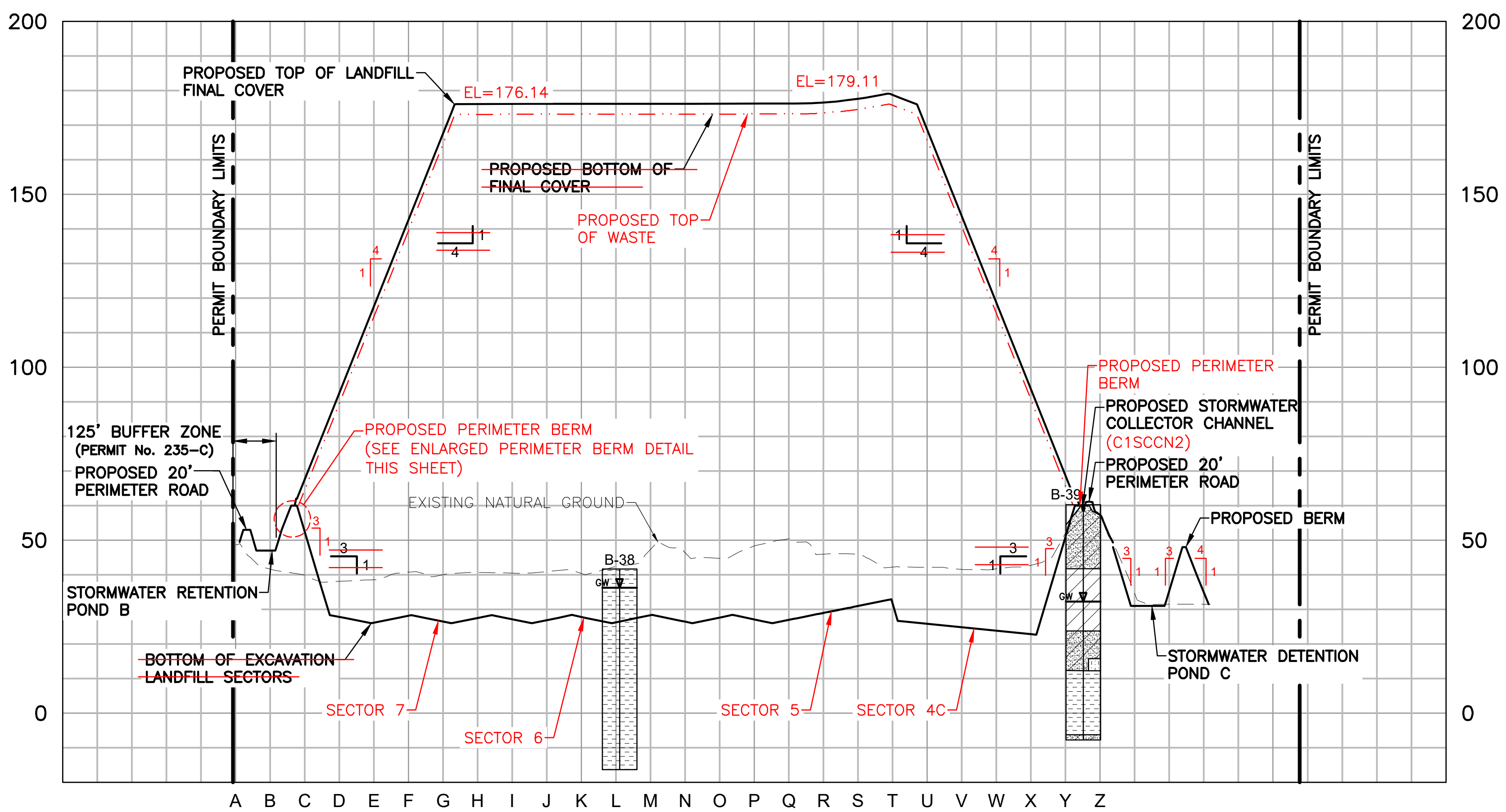

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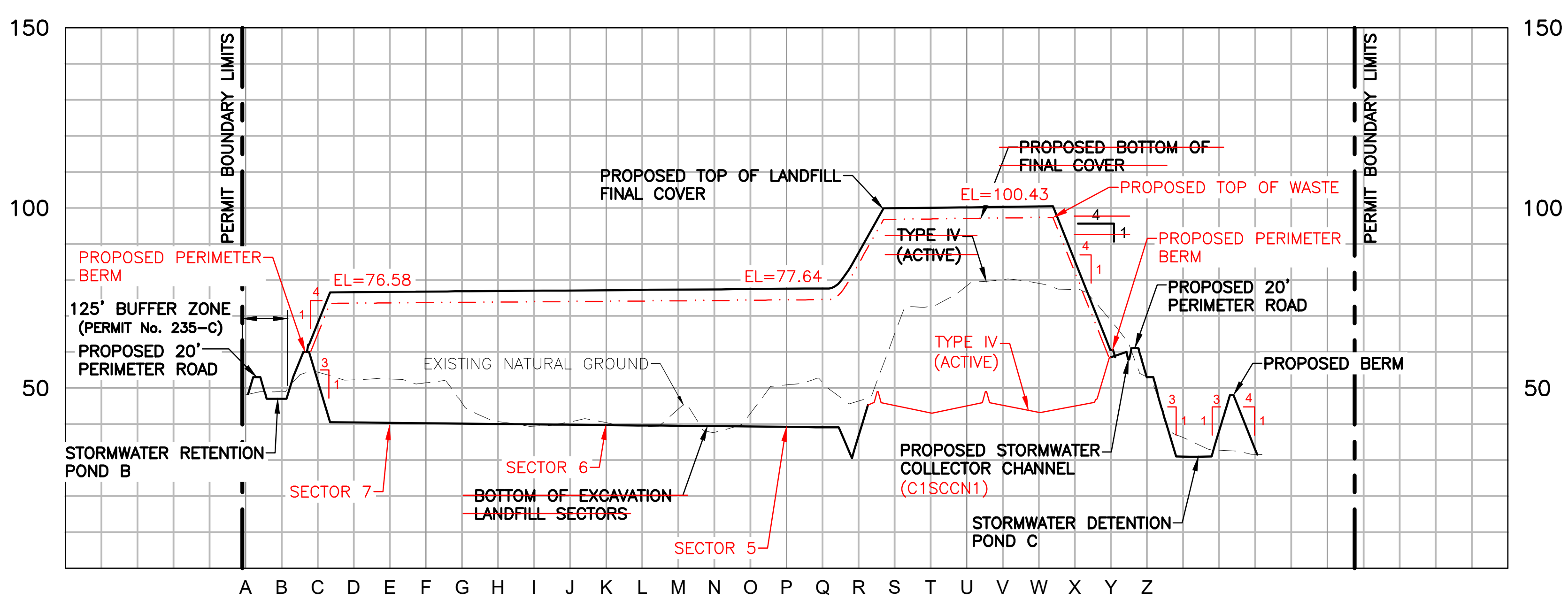

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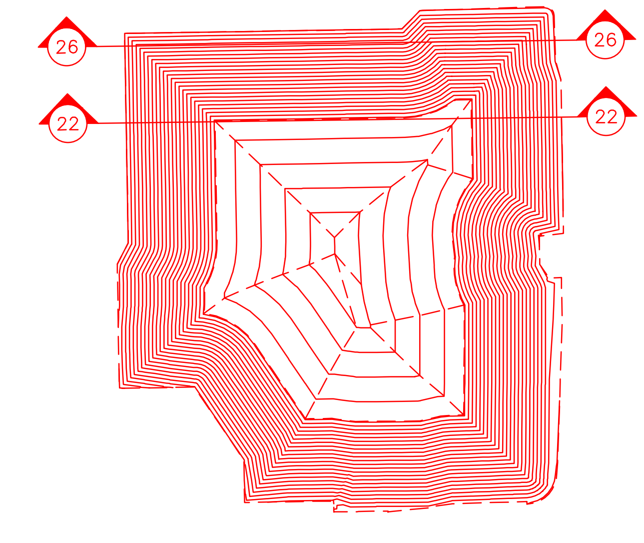
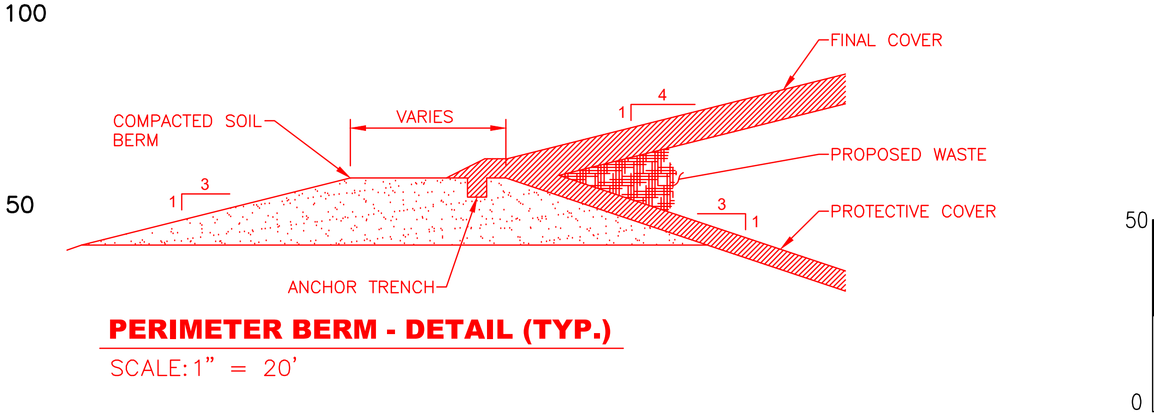


KEY MAP

LEGEND

- LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
- CLAYEY SAND (SC)
- SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
- FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
- POORLY GRADED SAND WITH CLAY (SP–SC)
- GROUND WATER (GW)



PERIMETER BERM - DETAIL (TYP.)

SCALE: 1" = 20'

GRAPHIC SCALE IN FEET

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

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PART III, ATTACHMENT 2
LANDFILL CROSS - SECTIONS 22 & 26
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FIGURE:
III.2-3

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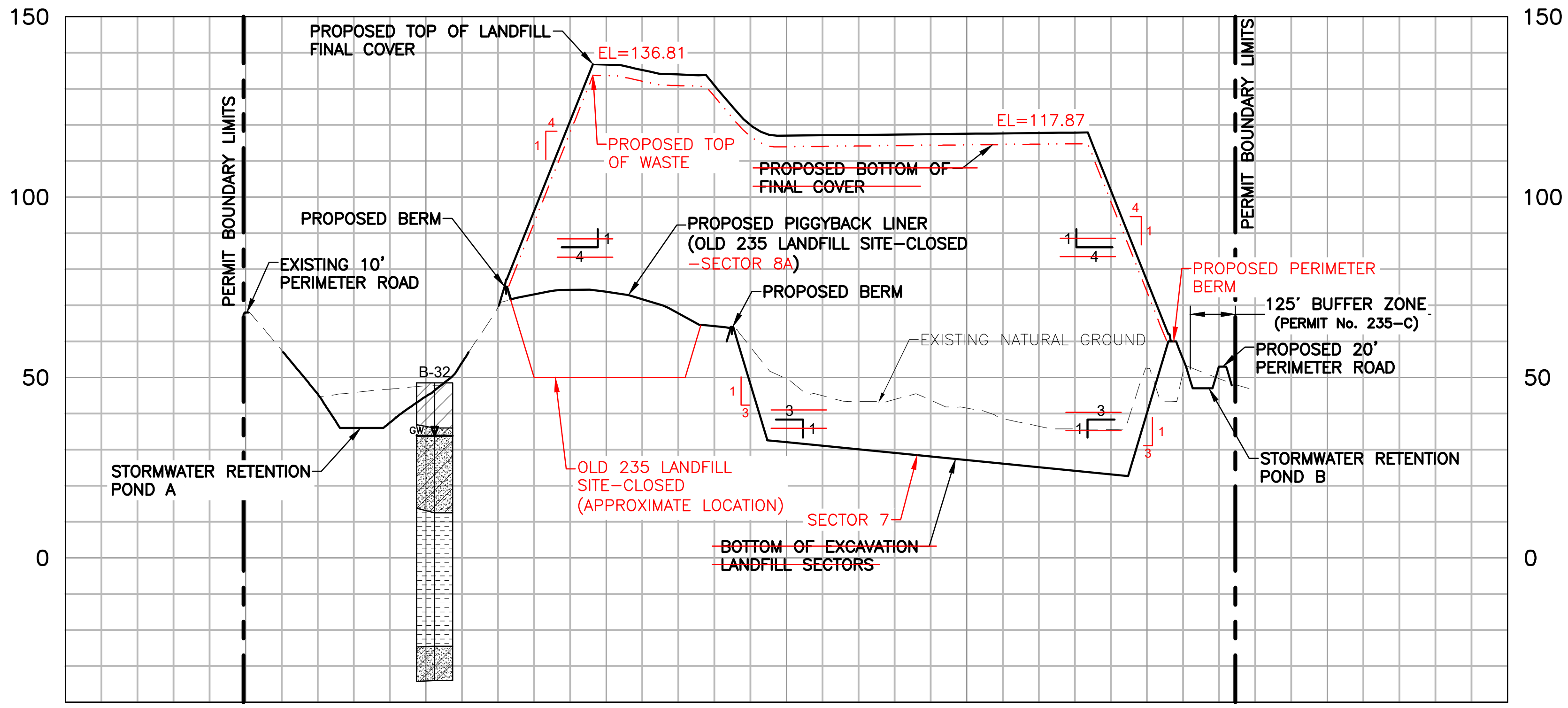

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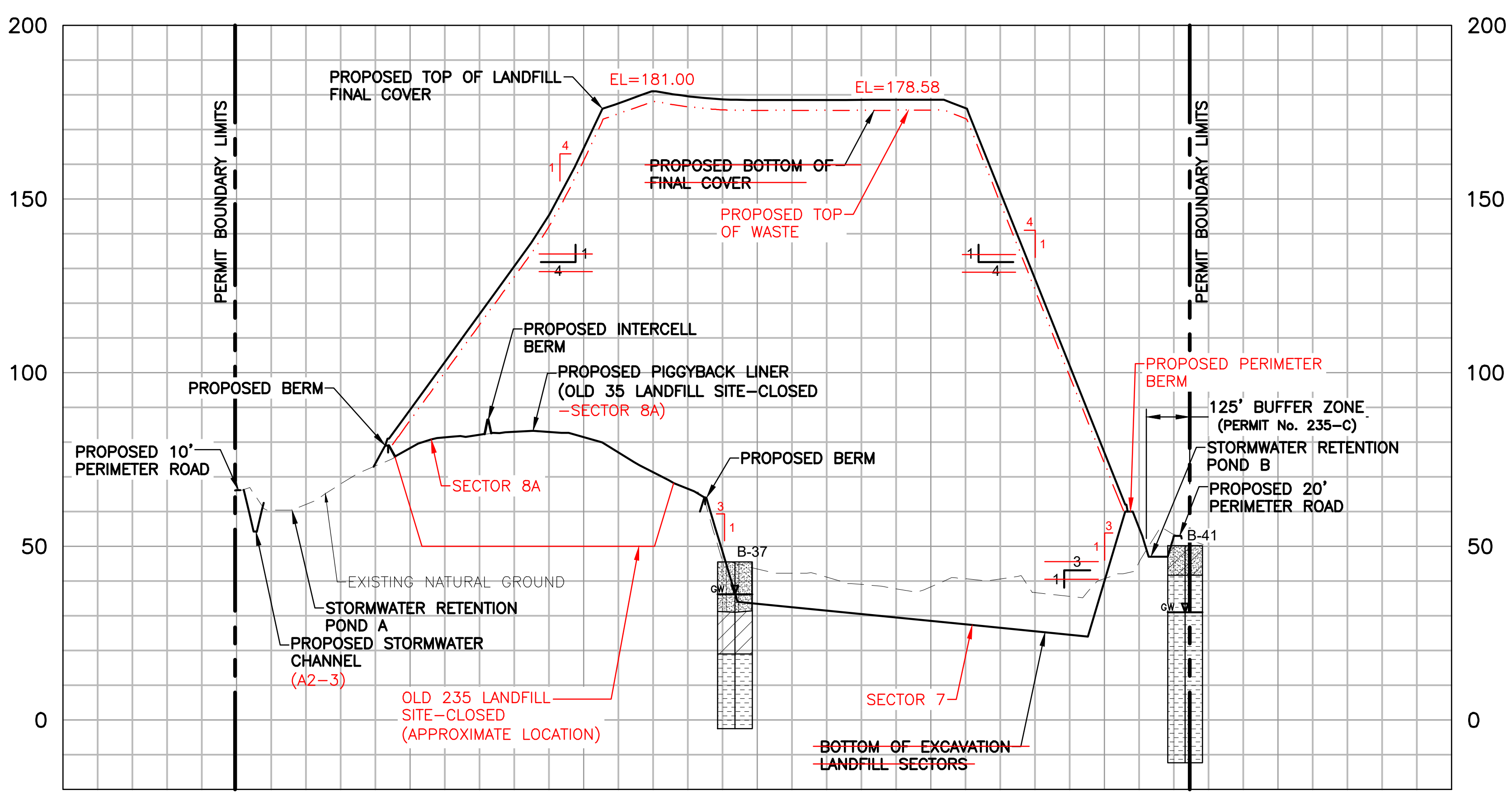
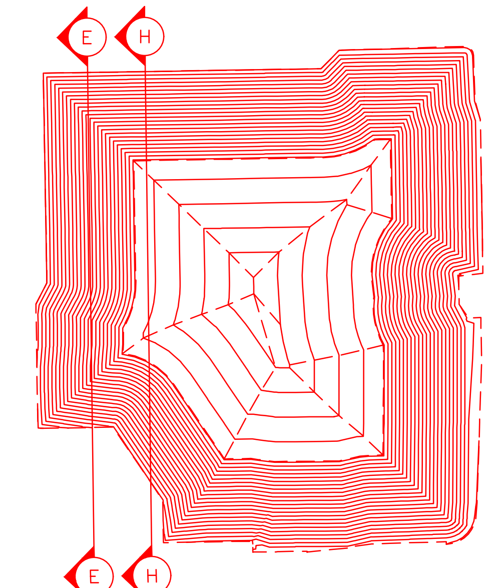


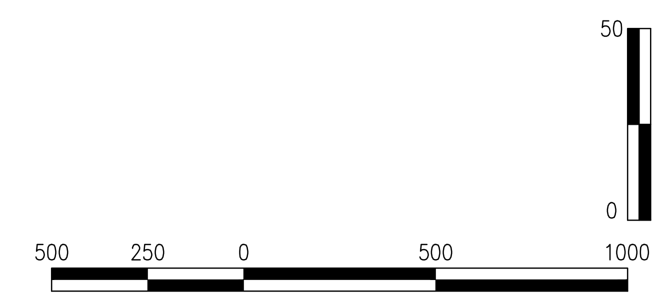
MARKER-H-SECTION



KEY MAP

LEGEND

- LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
- CLAYEY SAND (SC)
- SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
- FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
- POORLY GRADED SAND WITH CLAY (SP–SC)
- GROUND WATER (GW)



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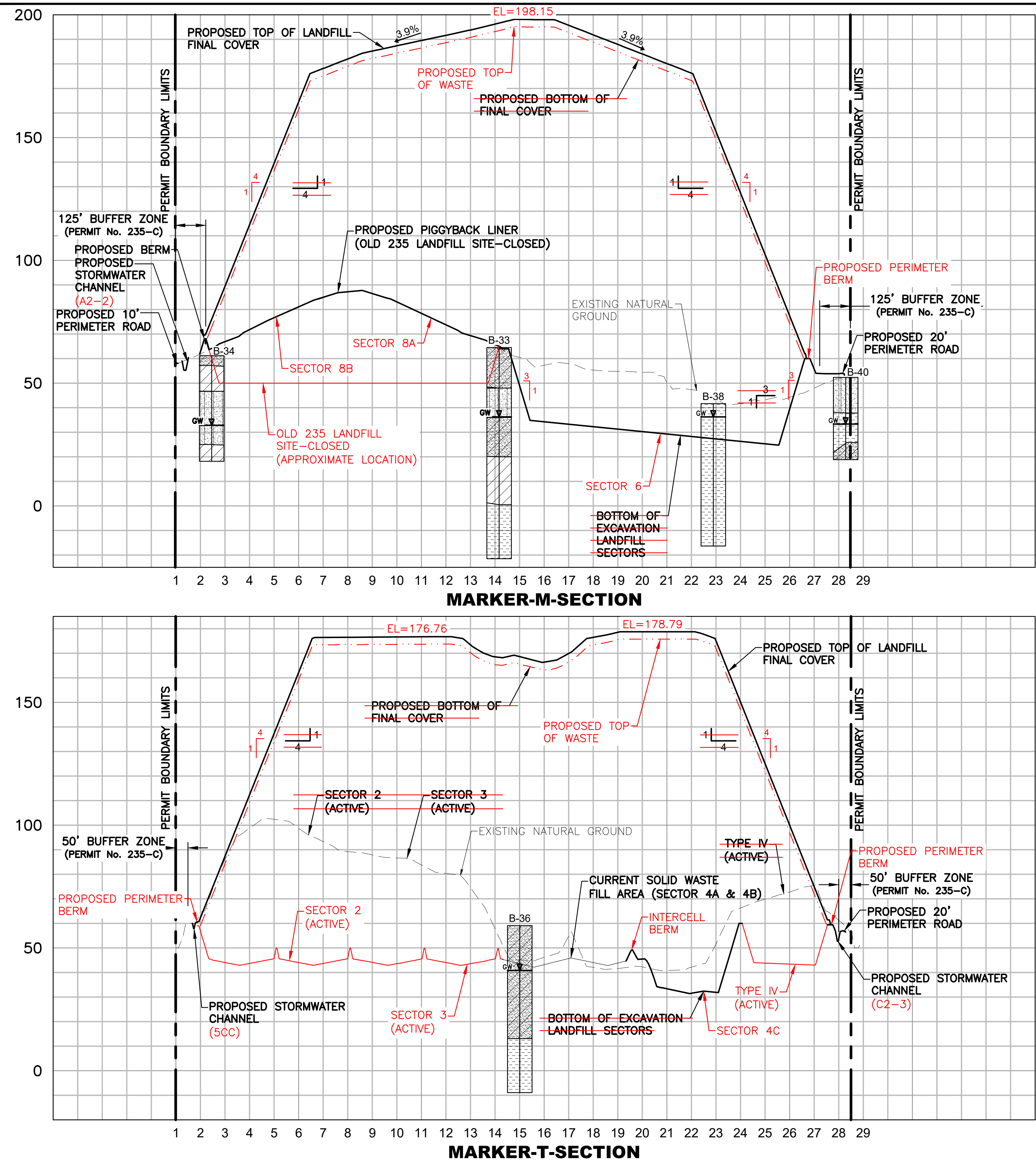
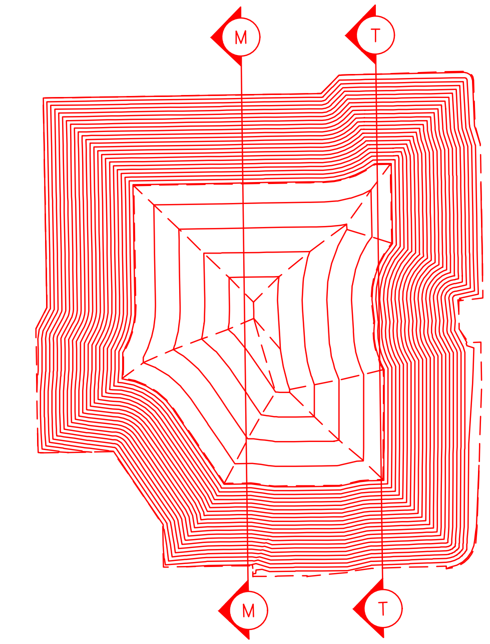
PART III, ATTACHMENT 2
LANDFILL CROSS - SECTIONS E & H
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.2-4





KEY MAP

LEGEND

- LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL–ML)
- CLAYEY SAND (SC)
- SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP–SM)
- FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
- POORLY GRADED SAND WITH CLAY (SP–SC)
- GROUND WATER (GW)

500 250 0 500 1000

GRAPHIC SCALE IN FEET

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PART III, ATTACHMENT 2
LANDFILL CROSS - SECTIONS M & T
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KLEBERG COUNTY, TEXAS

FIGURE: III.2-5

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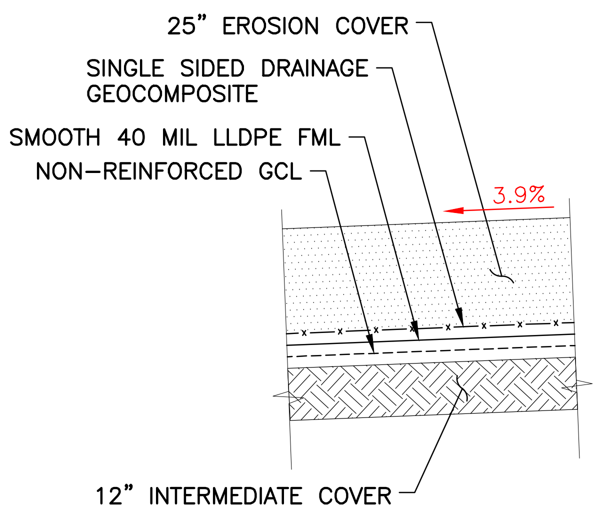
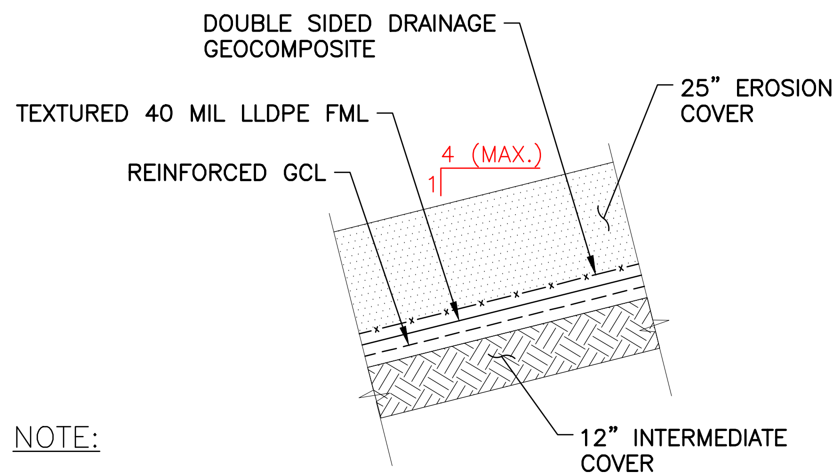
CITY OF KINGSVILLE LANDFILL

PART III

ATTACHMENT 3

WASTE MANAGEMENT UNIT DESIGN DRAWINGS



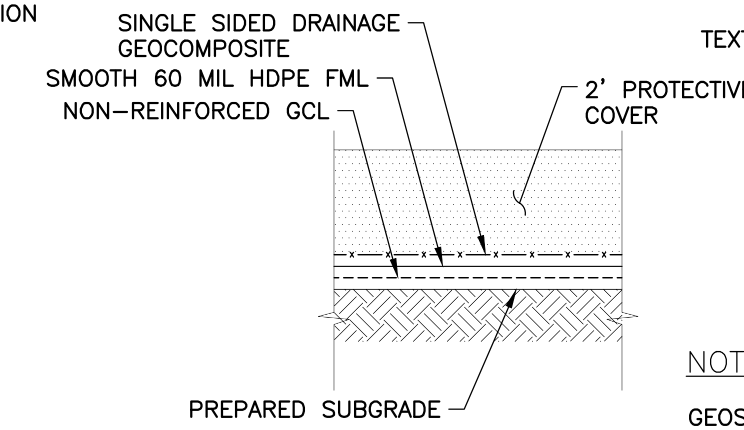


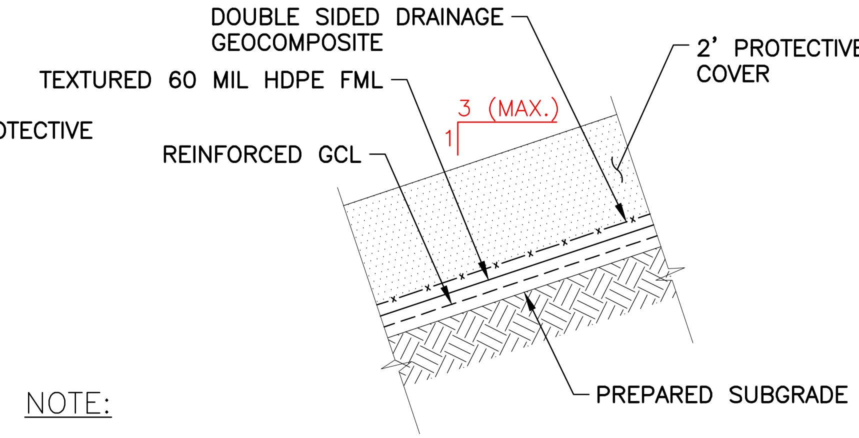
NOTE:

GEOSYNTHETIC COMPONENT THICKNESSES HAVE BEEN ENLARGED FOR CLARITY

SIDE SLOPE FINAL COVER

8 FINAL COVER LINING DETAIL
1 | 1
SCALE: N.T.S.



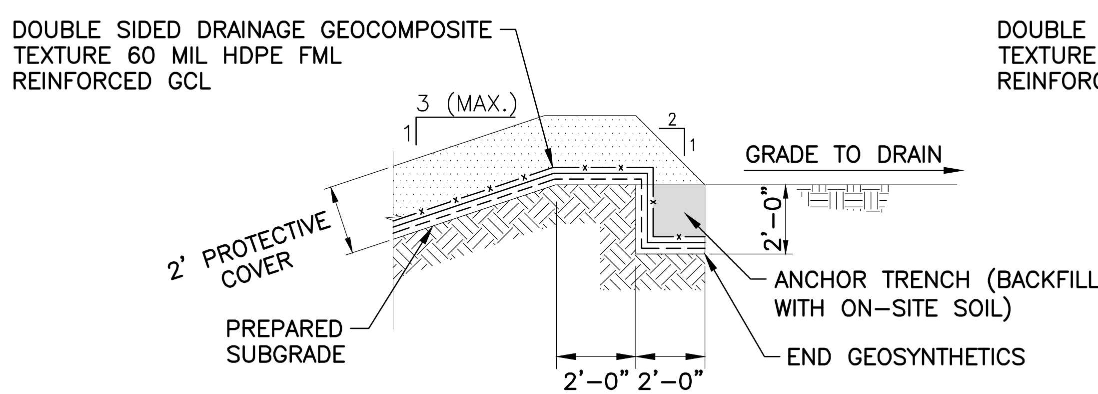


NOTE:

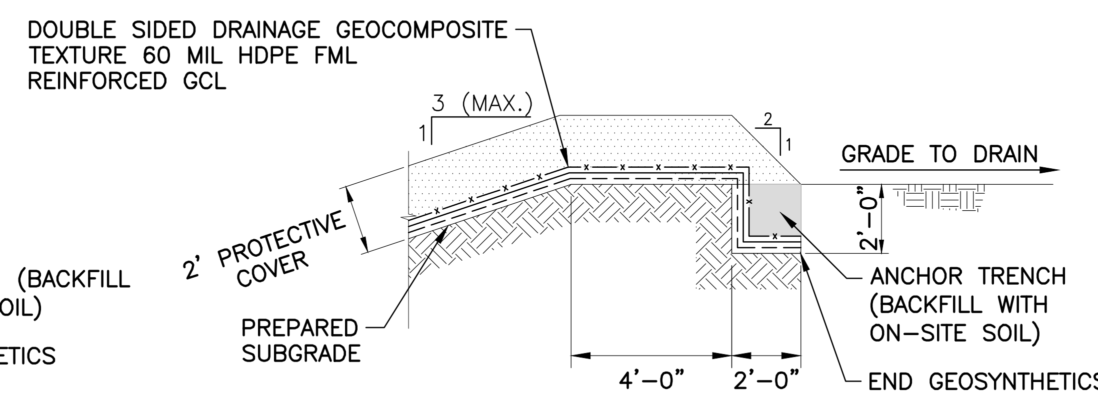
GEOSYNTHETIC COMPONENT THICKNESSES HAVE BEEN ENLARGED FOR CLARITY

LANDFILL SIDE SLOPE LINING

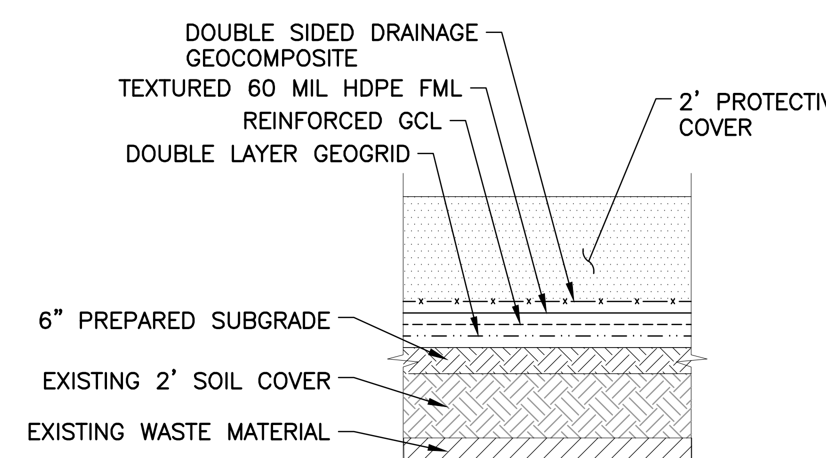
9 LANDFILL LINING DETAILS
1 | 1
SCALE: N.T.S.



10 ANCHOR TRENCH
1 | 1
SCALE: N.T.S.



11 ANCHOR TRENCH
1 | 1
SCALE: N.T.S.



NOTE:

GEOSYNTHETIC COMPONENT THICKNESSES HAVE BEEN ENLARGED FOR CLARITY

12 PIGGY BACK LINER DETAIL
1 | 1
SCALE: N.T.S.

NOTE:

1. ALL LINER SYSTEMS DEPICTED ARE ALTERNATIVE LINER SYSTEMS. ALTERNATIVE LINER DEMONSTRATIONS CAN BE FOUND IN PART III, ATTACHMENT 5.

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02/12/19

Hanson No. 16L0438
Filename 8514-03-FLOODPLAIN-MAP
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PART III, ATTACHMENT 3
LINER DETAILS
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KLEBERG COUNTY, TEXAS

FIGURE:
III.3-1

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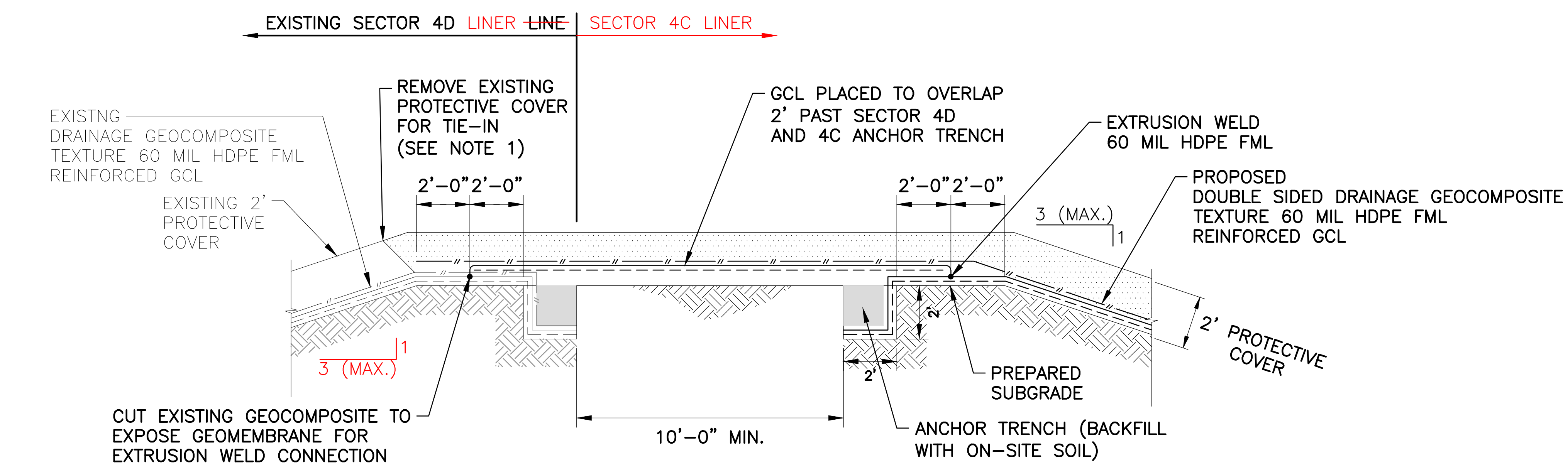
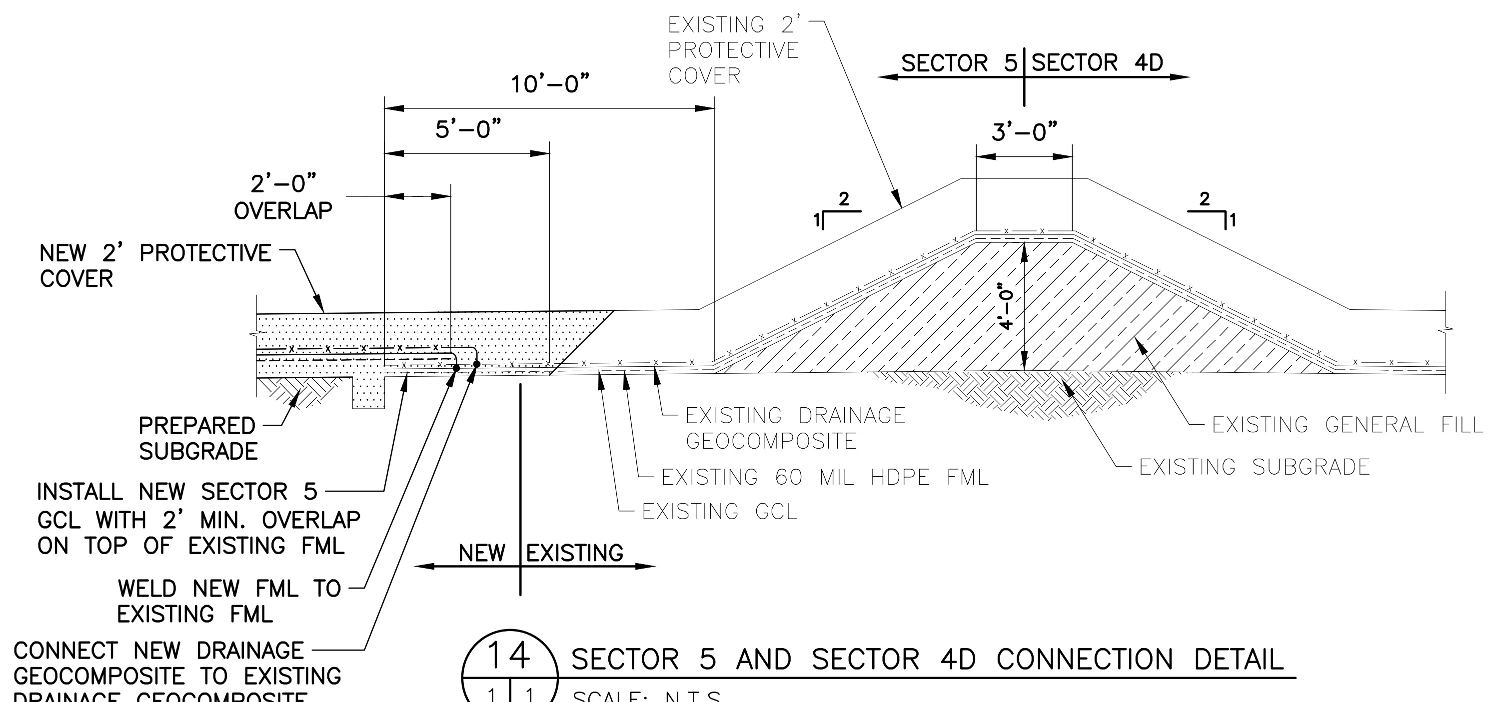


NOTE:
1. REQUIRE LAST 6" OF PROTECTIVE COVER OVER LINER TIE-IN LOCATION TO BE REMOVED BY HAND W/SHOVELS AND/OR BROOMS.

13 | 1 | 1 SECTOR 4D/4C LINER CONNECTION DETAIL
SCALE: N.T.S.



14 | 1 | 1 SECTOR 5 AND SECTOR 4D CONNECTION DETAIL
SCALE: N.T.S.

NOTE:
REMOVE EXISTING PROTECTIVE COVER AND CUT FML AND DRAINAGE GEOCOMPOSITE AT ANCHOR TRENCH. FOLD BACK FML AND DRAINAGE GEOCOMPOSITE TO ALLOW INSTALLATION OF NEW SECTOR 5 GCL WITH A MINIMUM OF 2' OVERLAP ON TOP OF EXISTING GCL. REPLACE FML AND WELD NEW SECTOR 5 FML TO EXISTING. REPLACE DRAINAGE GEOCOMPOSITE AND TIE NEW SECTOR 5 DRAINAGE GEOCOMPOSITE TO EXISTING.

NOTE:
1. ALL LINER SYSTEMS DEPICTED ARE ALTERNATIVE LINER SYSTEMS. ALTERNATIVE LINER DEMONSTRATIONS CAN BE FOUND IN PART III, ATTACHMENT 5.

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
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64541
LICENSED PROFESSIONAL ENGINEER
02/12/19

Hanson No. 16L0438
Filename 8514-03-FLOODPLAIN-MAP
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Date 02/12/2019

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PART III, ATTACHMENT 3
SECTOR 4D CONNECTION DETAILS
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.3-2

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THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Volume 2 of 6

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 – February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

THE CITY OF KINGSVILLE LANDFILL
TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION
PART III, ATTACHMENT 4
GEOLOGY REPORT

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018
Revision 1 – November 2018
Revision 2 - February 2019

Prepared by

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

Geology Report Qualified Groundwater Scientist Certification
City of Kingsville Landfill
TCEQ Permit No. MSW 235-C
Kleberg County, Texas

I, Tad A. Gass, a licensed professional geoscientist in the State of Texas and a qualified groundwater scientist as defined in 30 TAC §330.3, certify that the geology report for the above referenced facility has been prepared in accordance with the requirements outlined in 30 TAC §330.63 Contents of Part III of the Application.

____

Tad A. Gass, P.G.
Hanson Professional Services Inc.

____

Date

Contents

APPENDICES

APPENDIX 1 – FEE GEOLOGY REPORT DATED MAY 29, 1998 AND JUNE 29, 1998, AND REVISED SEPTEMBER 30, 1998, WITH APPENDICES FEE GROUNDWATER CHARACTERIZATION REPORT DATED NOVEMBER 1997, REVISED JUNE 1998 AND SEPTEMBER 1998, WITH APPENDICES

Appendix 1 Contents

Finch Energy and Environmental Services, Inc.
Geology Report

Appendices

Finch Energy and Environmental Services, Inc.

Groundwater Characterization Report

TABLES

FIGURES

APPENDICES

APPENDIX 2 – TOLUNAY-WONG ENGINEERS, INC. GEOTECHNICAL ENGINEERING STUDY

Appendix 2 Contents

TABLES

APPENDICES

APPENDIX 3 – HANSON PROFESSIONAL SERVICES, INC. SOIL BORING REPORT

Appendix 3 Contents

EXHIBITS

ATTACHMENTS

LIST OF TABLES

I:\16jobs\16L0438\8514-City of Kingsville\8514-03\Permit Amendment\Part III\Part III_att4 - Geology Report.docx

Finch Energy and Environmental Services, Inc. conducted an investigation of subsurface materials at the Landfill location. Twelve (12) soil borings were installed and sampled. Laboratory tests were performed to determine the engineering properties of the subsurface materials. The report discussed the soils, sediments, and geologic and groundwater conditions encountered by FEE, Inc. during the hydrogeological/geotechnical investigations at the City of Kingsville Landfill. The report also discussed the characteristics of the soil samples collected and tested during the investigation.

As requested by the Texas Natural Resource Conservation Commission (TNRCC) in an NOD letter, Professional Service Industries, Inc. also conducted a subsurface investigation for FEE, Inc. and the City of Kingsville to evaluate the soil and groundwater conditions present at the site and to better define the aquiclude below the landfill site. A total of eleven (11) soil test borings were drilled and laboratory tests were performed to determine the engineering properties of the subsurface materials. This additional study discussed the types of subsurface materials encountered in the test borings and the results of the field and other laboratory tests performed for this site.

1.4 Current Subsurface Investigation

As previously identified, the proposed permit boundary for this facility will incorporate 176 acres of land with 128 acres being utilized for waste disposal. In accordance with 30 TAC 330.63 (e)(4)(B), a facility of this size requires 23-26 borings with 13-15 of these borings being installed at least 30 feet below the elevation of deepest excavation (EDE) and the remainder of the borings being installed at least 5 feet below the EDE. Before this subsurface investigation, there were fifteen (15) borings that were installed at least 5 feet below the EDE and four (4) of those borings were installed at least 30 feet below the EDE.

For this investigation, nine (9) soil borings were advanced to a minimum depth of 30 feet below the elevation of the deepest excavation of 22.5 ft and one (1) additional soil boring was advanced to 5 feet below the elevation of the deepest excavation to supplement the existing facility data. The borings were drilled in the locations identified on Attachment 2- Soil Boring Location Map (Figure III.4-2-1). Attachment 2 also identifies the locations of the previously installed soil borings. Attachment 3- Groundwater Contour Map (Figure III.4-3-1) identifies groundwater elevations in addition to the current groundwater monitoring system.

The soil borings for the current subsurface investigation were installed by Tolunay-Wong Engineers, Inc. Representative samples were collected with split-barrel sampling procedures in general accordance with the procedures for "Penetration Test and Split-Barrel Sampling of Soils" (ASTM Designation D-1586) and Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes (ASTM Designation D-1587). Borings were dry-augered using hollow stem augers to advance the boreholes until groundwater was encountered or until the boreholes became unstable and/or collapsed. Wash rotary drilling techniques were used as necessary in order to continue advancing the borings to their required completion depths. No borings collapsed during this investigation. Samples were identified according to boring number and depth, protected against moisture loss, and transported to the laboratory for analysis. After obtaining all required soil samples and groundwater level readings, the soil borings were properly plugged and abandoned in accordance with 16 TAC Chapter 76, Texas Department of Licensing and Regulation (TDLR)-Water Well Drillers and Pump Installers rules. Table 1-1 below identifies specific details for both existing and newly installed soil borings. For this investigation, borings B30 through B41 were installed. These borings were advanced to depths ranging from 33.5 to 86 feet beneath the existing ground surface. Tolunay-Wong Engineers, Inc. prepared a Geotechnical Engineering Study Report that is provided in Appendix 2. Hanson Professional Services also prepared a soil boring report that has been included as Appendix 3.

Table 1-1
Soil Borings

Boring Identification	Surface Elevation (ft. AMSL)	Boring Depth (ft. bgs)	Bottom Elevation (ft. AMSL)	≥5 Feet Below E.D.E?	≥30 Feet Below E.D.E?
Finch Energy and Environmental Services, Inc. Borings					
B-1	59.25	42	17.25	YES	NO
B-2	52.64	27	25.64	NO	NO
B-3	56.1	37	19.1	NO	NO
B-4	58.01	39	19.01	NO	NO
B-5	60.54	48	12.54	YES	NO
B-6	55.46	38	17.46	YES	NO
B-7	61.05	36	25.05	NO	NO
B-8	59.79	43	16.79	YES	NO
B-9	62.51	44	18.51	NO	NO
B-9R	41.41	17	24.41	NO	NO
B-10	49.78	29	20.78	NO	NO
B-11	60.2	33	27.2	NO	NO
Professional Service Industries, Inc. Borings					
B-12	52.38	48	4.38	YES	NO
B-13	59.13	50	9.13	YES	NO
B-14	49.94	42	7.94	YES	NO
B-15	48.39	37	11.39	YES	NO
B-16	55.96	47	8.96	YES	NO
B-17	41.35	33	8.35	YES	NO
B-18	50.04	42	8.04	YES	NO
B-21	52.41	84	-31.59	YES	YES
B-23	49.5	86	-36.5	YES	YES
B-24	47.38	72	-24.62	YES	YES
B-25	61.12	88	-26.88	YES	YES
Tolunay-Wong Engineers, Inc. Borings					
B-30	45.99	82.5	-36.51	YES	YES
B-31	58.37	68	-9.63	YES	YES
B-32	48.46	82.5	-34.04	YES	YES
B-33	64.51	86	-21.49	YES	YES

Boring Identification	Surface Elevation (ft. AMSL)	Boring Depth (ft. bgs)	Bottom Elevation (ft. AMSL)	≥5 Feet Below E.D.E?	≥30 Feet Below E.D.E?
B-34	61.14	43	18.14	NO	NO
B-35	64.5	72.5	-8	YES	YES
B-36	59.13	68	-8.87	YES	YES
B-37	45.52	48	-2.48	YES	NO
B-38	41.64	58	-16.36	YES	YES
B-39	60.26	68	-7.74	YES	YES
B-40	52.31	33.5	18.81	NO	NO
B-41	50.2	62.5	-12.3	YES	YES

E.D.E.-Elevation of Deepest Excavation (22.5' Above Mean Sea Level (AMSL))

2.0 REGIONAL INFORMATION

2.1 Regional Physiography

As discussed in Finch Energy and Environmental Services' Report (Appendix 1, Section 2.0, Page 11-12), the site of the landfill is located in the part of the Gulf Coastal Plain that has been defined as the Coastal Bend of Texas. The coastal plain is gently, but irregularly, inclined gulfward at about 5 feet or less per mile. In many areas, coastal plain slopes range from 1 to 3 feet per mile, and on the lagoonal wind-tidal flats, slopes are usually less than 1 foot per mile. Elevations within the county range from 0 feet (Gulf of Mexico) to 125 feet above Mean Seal Level (MSL) in the extreme northwestern part. It is characterized as an arid, desert like region where wind (Eolian) erosion and wind transported sediment have determined much of the area's character and distinctiveness. The surface features of the county are broad, dune covered mainland prairies and extensive coastal wind-tidal flats.

Eolian transport of silts and sands has produced the South Texas Eolian System (Sand Sheet). Extensive, hummocky prairies within the South Texas sand sheet are underlain by relic sand dunes and wind-deflated depressions which extend inland from broad wind-tidal flats along the landward margin of Laguna Madre and parts of Baffin Bay.

2.2 Regional Stratigraphy

Table 2-1 presents the geologic formations that characterize the regional stratigraphy of Kleberg County.

Table 2-1
Geologic Formations for Kleberg County

Period	Epoch	Geologic Formation	Approximate Maximum Thickness (FT)	Litholgy	Water-Bearing Properties
Quaternary		Alluvium	?	Mostly very fine to fine sand, silt, and calcareous clay	Not significant as an aquifer. Not known to be tapped by wells.
		Barrier Island Deposits	50	Tan to gray, fossiliferous, medium sand containing wood fragments; interbedded tan sand and gray clay, locally gypseous; and gray, fossiliferous sandy clay	Capable of yielding small quantities of fresh water to shallow wells on Padre Island.
	Holocene and Pleistocene (?)	South Texas Eolian Plain Deposits	60+	Tan to white, unfossiliferous, massive, fine to very fine sand, greenish gray sandy clay, highly calcareous clay or marl, and thin-bedded clayey sand.	Yields small quantities of sl ightly saline water to a few stock wells in Kenedy County. in sofne areas in Kenedy County the sand contains brine
	Pleistocene	Barrier Island and Beach Deposits	1,400	Barrier island and beach deposits mostly light gray, massive, crossbedded fine sand about 60 feet thick; contains some shell fragments.	Barrier island and beach deposits yield small quantities of fresh to probably moderately saline water to a few stock wells in eastern Kleberg County near Laguna Madre.
		Beaumont Clay and Lissie Formation, Undifferentiated		Beaumont Clay and Lissie Formation mostly very calcareous, slightly carbonaceous, blue and yellow clay and a few lenticular beds of sand.	Beaumont Clay and Lissie Formation yield small quantities of slightly to moderately saline water to a few mostly stock wells in eastern part of Kleberg and Kenedy Counties.
Tertiary	Pliocene	Goliad Sand	1,100	Fine to coarse, mostly gray calcareous sand interbedded with sandstone and varicolored calcareous clay. Sand beds or sandstone compose from 40 to 60 percent of the formation.	Principal aquifer. Yields small to large quantities of fresh to slightly saline water to public supply, industrial, and irrigation wells as well as to numerous rural domestic and stock wells. Many of the wells tapping the Goliad in Kleberg and Kenedy Counties flow.
	Miocene	Lagarto Clay	1,200+	Mostly stiff, compact, gray, calcareous clay and some thin lenticular beds of gray sand.	Not known to be tapped by wells, but capable of yielding small quantities of slightly saline water in Kenedy and Jim Wells Counties.
		Oakville Sandstone	600	Very fine to coarse, brown to gray sand and sandstone interbedded with silt and a considerable amount of clay.	Yields small to moderate quantities of sl ightly saline water to industrial and stock wells in southern Jim Wells County.

*(Source) Texas Water Development Board, Report 173, Ground-Water Resources of Kleberg, Kenedy, and Southern Jim Wells Counties, Texas, July 1973. (Shafer, 1973)
The site overlies the South Texas Eolian Plain Deposits. The hydrogeologic units below the site consist of the Chicot Aquifer within the Lissie Formation followed by the Evangeline Aquifer within the Goliad Sand (Principal Aquifer of the site).

2.3 Regional Hydrogeology

As discussed in Finch Energy and Environmental Services' Report (Appendix 1, Section 4.0, Page 34-35), The Evangeline Aquifer is the principal aquifer in the region and is considered one of the most prolific aquifers in the Texas Coastal Plain. The aquifer is composed of at least the Goliad Sand and includes sections of sand in the Fleming Formation. Also discussed in Finch Energy and Environmental Services' Report (Appendix 1, Section 3.2, Page 17-18), the Goliad Sand of Pliocene age occurs in the subsurface of the site area. It is the principal aquifer in the site area with wells producing small to large quantities of fresh to slightly saline water to public supply, industrial, irrigation, rural-domestic, and stock wells. The aquifer is considered a large, leaky artesian aquifer. A stratigraphic column of geologic formations including a brief discussion of lithology and water-bearing properties found in the area of Kingsville is presented in Table 2-1.

The Pleistocene formations exposed in the region are the Beaumont Clay and Lissie Formation. The Beaumont Clay is recognized as lying to the east of U.S. Highway 77. The Beaumont Clay is a series of delta-plain deposits composed principally of mud with localized elongate sand and silt bodies. The Lissie Formation is composed of meanderbelt sands and muds which underlie thin loess (Eolian silt) deposits and Eolian sand deposits west of U.S. Highway 77. These two formations are generally discussed as one unit; Beaumont Clay and Lissie Formation, undifferentiated (Chicot Aquifer – uppermost aquifer beneath the facility). Regional hydrogeology for the site is discussed further in Appendix 1 beginning on page 16.

2.4 Water Quality

As stated in Appendix 1 (Section 4.1, Page 23), water quality of the Goliad is highly variable. The quality of water from wells in the Goliad Sand deteriorates at depths greater than 1,000 feet, and the salinity of the water increases eastward. Generally, water from wells in the Goliad Sand in southern Jim Wells County and about the western one-half of Kleberg County meets the quality standards of the U.S. Public Health Service. Shallow, moderately saline to very saline water overlies the fresh to slightly saline water at most places (Shafer, 1973).

The Beaumont Clay and Lissie Formation (Chicot Aquifer) yield small quantities of slightly to moderately saline water to a few shallow wells used mostly for stock needs in eastern Kleberg and Kenedy Counties. Test wells drilled for observation purposes 1.25 miles west of Riviera (approximately 15 miles south of Kingsville), show that shallow sands of the Beaumont and Lissie usually contain very saline water in this area. The casings of many wells are cemented through the Beaumont and Lissie due to highly mineralized water associated with these formations (Shafer, 1973).

A groundwater contour map has been included in Attachment 3 (Figure III.4-3-1). A monitoring well groundwater elevation table has been included as Exhibit 1 of Attachment 3 and an analytical data summary table has been included as Exhibit 2 of Attachment 3. Detailed analytical data and groundwater elevations from historic ground water monitoring of monitor wells at the site can be found in the Groundwater Characterization Report which is included in Appendix 1 beginning on page 752 and in Attachment 5 – Monitor Well Water Levels and Analytical Information. On-site groundwater monitoring well installation information has also been included in Appendix 1 beginning on page 962, and additional on-site monitor well installation information shall be provided as wells are installed.

FEE completed a water well survey within one mile of the site and is discussed in Appendix 1 (Section 4.4, Page 37). Hanson also completed a water well survey within one mile of the site and a summary of the information gathered during both surveys has been provided as Attachment 6 – Water Well Survey Data Table.

2.5 Groundwater Recharge

As discussed in Appendix 1 (Section 4.3, Page 37), Recharge within a 5 mile radius is from downward percolation of surface water, infiltration from streams, impoundments, and water retained in abandoned caliche pits. A map of the recharge area can be seen in Figure 4.14 on page 44 of Appendix 1.

3.0 SITE CHARACTERIZATION

3.1 Site Topography

The natural topography in the vicinity of the landfill is relatively flat to slightly depressed. The general direction of drainage is to the east-southeast and east-northeast. The natural ground elevation at the City of Kingsville Landfill is approximately 52 feet above mean sea level (MSL). The proposed elevation of the deepest excavation at the site is approximately 22.5 feet above MSL, and the highest permitted elevation for the site is approximately 200 feet above MSL. Lines displaying site topography for the City of Kingsville Landfill have been included on Attachment 2- Soil Boring Location Map (Figure III.4-2-1). The site vicinity is surrounded by extensive areas of agriculture. There are also abandoned caliche mines to the west and southwest. The Santa Gertrudis Creek, located 0.7 miles to the north, trends to the east-southeast 3.25 miles to it's confluence with the San Fernando Creek which then flows southeast to the Cayo del Grullo of Baffin Bay. Jaboncillos Creek, Ebanito Creek and several small unnamed ephemeral streams, are located several miles south of the site.

3.2 Subsurface Investigation Report

3.2.1 Site Exploration

Three subsurface studies have been performed to evaluate the stratigraphy of the landfill site. A total of thirty-five (35) borings have been drilled to depths ranging from 17 to 88 feet below the natural ground surface.

Finch Energy and Environmental Services, Inc. installed twelve (12) borings ranging in depth from 17 to 48 feet below the existing ground surface. Professional Service Industries, Inc. installed eleven (11) borings ranging from 33 to 88 feet below the existing ground surface. Tolunay-Wong Engineers, Inc. installed twelve (12) borings ranging in depth from 33.5 to 86 feet below the existing ground surface.

3.2.2 Field Drilling, Sampling, and Logging

For the three investigations, the soil test borings were installed using a drilling rig capable of sampling cohesive and cohesionless materials. Samples of cohesive materials were obtained by hydraulically pushing a thin walled tube in accordance with ASTM D 1587. Non-cohesive soils were obtained by performing a standard penetration test (SPT) using a split barrel sampler in accordance with ASTM D 1586-D. The samples were extruded in the field, wrapped in foil, placed in moisture sealed containers, and protected from disturbance prior to transport to the laboratory. All samples were transported to the laboratory for testing and were identified according to boring number and depth at a minimum. Soil test borings were visually logged in the field and boring logs have been provided in Appendices 1, 2, and 3.

3.3 Site Stratigraphy

As seen on Figure 4.4 and 4.4a (Page 19-20), the primary geologic formations exposed at the surface of the site are silt sheet deposits, clay dune, and clay-sand dune deposits. The topsoil consists of clay which is black, silty, and contains humic material. Sediments encountered in borings at the site are Holocene and Pleistocene in age and consist of clays, silts, sands, and caliche deposited in two (2) separate and distinct environments of deposition. The subsurface geology is presented on cross sections A–A' through I–I' included in Appendix 1 beginning on page 67. Additional cross sections (A–A' through E–E') developed from soil borings installed during Tolunay-Wong Engineers, Inc.'s investigation have been provided in Appendix 3 (Soil Boring Report) Exhibit IV.

The site is underlain by sediments that can be divided into five discontinuous units and one continuous unit. The discontinuous units are caliche bearing channel unit (I), sand filled channel unit (II), clayey sand unit (clay dune, III), clayey sand unit (clay dune IV), and sandy silty clay unit ~~(V)~~. The continuous unit consists of the light olive green to gray clay unit which is an aquiclude present below the site. The water bearing zone is made up of the five discontinuous units which are all in communication. The average ground water level is at approximately 35 feet ~~below~~ National Geodetic Vertical Datum (NGVD).

3.3.1 Body I- Caliche Bearing Channel

As stated in Appendix 1 (Page 59), this is the youngest, most extensive, sand containing body that can be correlated across the site. This body consists of interbeds of caliche, clays, and sands which, in themselves, are noncorrelative. The individual beds within this body appear to be of limited extent and probably represent braided deposits within a single channel approximately ½ mile in width. The base of this channel is placed at the base of the lowest caliche encountered in the borings at the site. When grouped together, it can be shown via cross section and isopach mapping that the body can obtain a maximum thickness of 40 feet and, as a whole, cuts downward into underlying beds. This body was deposited as a channel system which trends in a down dip direction, southwest to northeast, across the City of Kingsville Landfill site. Much of the caliche contained within this body has been previously removed from the site by mining operations. The Caliche Bearing Channel can be seen in Tolunay-Wong borings B-31, B-37, B-33, B-36, and B-39 as seen on cross section B-B' of Exhibit IV of the Soil Boring Report. The Clayey Sand (SC) layer of this cross section has mention of calcareous nodules, trace gravel, and trace caliche in the respective boring logs.

3.3.2 Body II- Sand Filled Channel

As stated in Appendix 1 (Page 59), Body II was deposited as a channel filled with a homogeneous, well sorted, very fine grained to fine grained, clean, unconsolidated sand. The fill sediment in Body II is much simpler than the fill sediment in Body I. The preserved length and width of this channel sand is less than one half mile due to truncation and incisement by the overlying Body I channel. Body II is interpreted as being a channel due to down cutting evident on the cross sections. This channel sand is apparent in borings 10 and 17. Body II (seen as SM on Cross Sections A–A', B–B', C–C', and D–D' on Exhibit IV of the Soil Boring Report in B-34, B-37, and B-40) was also evident in borings 37, 34, and 40 which were~~as~~ installed in the most recent geotechnical investigation by Tolunay-Wong Engineers, Inc.~~,~~ ~~approximately 14.5 feet below ground elevation~~

~~45.52.~~ B-37 penetrated approximately 14.5 feet of the silty sand (SM), B-34 penetrated approximately 21.5 feet of the silty sand (SM), and B-40 penetrated approximately 14.5 feet of the silty sand (SM). Deposition of the Body II channel sand was oriented in a dip direction, southwest to northeast across the site.

3.3.3 Body III- Clayey Sand (Clay Dune)

As stated in Appendix 1 (Page 59-60), the Clayey Sand (Clay Dune) Body III lies under the eastern edge of the City of Kingsville Landfill site and is composed of a homogeneous, very fine grained, well sorted, clayey sand. Well 13 was previously the only known penetration of the sand encountering a thickness of 17'. Borings 35 and 39, installed by Tolunay-Wong Engineers, Inc., also penetrated Body III (seen as SC on Cross Sections B–B' and C–C' on Exhibit IV of the Soil Boring Report in B-35 and B-39) at approximately 24 feet and 36.5 feet below ground elevations of 64.5 and 60.26 feet respectively. At it's base, the sand appears to be conformable with the underlying "orange" sand which is interpreted as a near shore or beach sand. Body III is interpreted as a clay dune based on clay content, sorting, and stratigraphic position within an overall regression section.

3.3.4 Body IV- Clayey Sand (Clay Dune)

As stated in Appendix 1 (Page 60), the Clayey Sand (Clay Dune) Body IV is believed to be a time and stratigraphic equivalent of Body III, described above, and underlies a portion of the western edge of the City of Kingsville Landfill site. Borings 16 and 23 penetrated 18 feet and 12 feet respectively, immediately above the underlying "orange" sand. Boring 31 installed by Tolunay-Wong Engineers, Inc., also penetrated Body IV (seen as SP-SC on Cross Section B–B' of Exhibit IV of the Soil Boring Report in B-31) at approximately 14.5 feet below surface elevation of 58.37 feet. Body IV sand is similar in all respects to the homogeneous, very fine grained, well sorted, clayey sand which comprises Body III above. Cross section G-G' included in Appendix 1 (wells 16 and 23) illustrates the top of Body IV as being concave downward with a flat base, indicating deposition as a "buildup" or clay dune. Again, Body IV appears conformable with the underlying "orange" which is interpreted as a near shore or beach sand. Bodies III and IV are typical of the QCD deposits seen on the Geologic Atlas of Texas Corpus Christi Sheet. QCD is comprised of clay due and clay-sand dune deposits and possess physical properties similar to those of the sandy and silty Beaumont Formation as indicated in the Geologic Atlas of Texas.

3.3.5 Sandy Silty Clay Bed

As stated in Appendix 1 (Page 60), the sandy clay bed was deposited in conjunction with Bodies I through IV and is composed of a homogeneous, tan, sandy clay containing abundant decomposed organic material. Thickness of this clay ranged from 40 to 60 feet under the City of Kingsville Landfill site with the above described Sand Bodies deposited within or adjacent to this clayey interval. The basal contact is abrupt with the underlying "orange" Sand. Several borings installed by Tolunay-Wong Engineers, Inc., penetrated the Sandy Silty Clay bed unit seen as CL-ML and CL on Cross Sections A–A', B–B', C–C', and D–D' of Exhibit IV of the Soil Boring Report in B-31, B-32, B-33, B-34 and B-37.

3.3.6 "Orange" Sand

As stated in Appendix 1 (Page 60), the "orange" sand appears to have been deposited in a near shore or beach environment. The sand is extremely well sorted and clean and the grains are well rounded and composed of approximately 90% fine quartz grains and 10% fine multicolored shell fragments giving the overall sand color an orange cast. The thin (<5 feet), sheet-like nature of the sand represents a beach environment of short duration developed at the top of the Beaumont clay (Light Olive Green to Gray Clay). It is present in all wells of sufficient depth.

3.3.7 Light Olive Green to Gray Clay

As stated in Appendix 1 (Page 61), tops of the Light Olive Green to Gray Clay are necessary to make the above interpretations of shallower beds in that it is the most definitive, planar marker bed under the City of Kingsville Landfill site. This clay is pure and therefore exhibits characteristic low permeabilites with a proven thickness of at least 38 feet as seen in Boring 21 (boring log included in Appendix 1). The light olive green clay layer begins at approximately 46 feet below the ground surface elevation of 52.41 feet in boring 21, and the boring was terminated at approximately 84 feet below the surface elevation (bottom elevation of -36.5 feet). The clay layer is also evidenced in boring B-23 with an approximate thickness of 50 feet. The layer begins at approximately 36 feet below the surface elevation of 49.50 feet, and the boring terminates at approximately 86 feet below the surface elevation (bottom elevation of -36.5 feet). All borings of sufficient depth installed by Tolunay-Wong Engineers, Inc., penetrated the Light Olive Green to Gray Caly unit seen as CH on Cross Sections A–A', B–B', C–C', D–D', and E–E' of Exhibit IV of the Soil Boring Report.

3.4 Geologic Fault and Seismicity Assessment

A geologic fault and seismicity assessment was performed by FEE. Sections 3.3.1 (Page 26-27) and 3.3.4 (Page 28) in Appendix 1 discusses faults and faulting, and seismic impact zones at the City of Kingsville Landfill. Conclusions from FEE are as follows:

"An evaluation of potential faults or fault zones does not indicate the presence of *active* faults. Topographic Maps, literature searches, aerial photographs, Petroleum Industry maps and a field survey were used in this evaluation. The field survey combined with topographic maps did not *reveal* structural damage to buildings, ground scarps, or unusual surface depressions. Changes in drainage or vegetation patterns which are also associated with faulting were not present. Data presented by Algermissen, et al, 1990 suggests a low probability of major seismic activity in the vicinity of the site." FEE also stated that, "An updip projection of the regional Frio growth fault passes below the landfill site at approximate depths of 6,000 to 7,000 feet, but the fault is buried below the Miocene age Oakville formation and therefore does not influence shallower beds."

Based upon review of U.S. Geological Survey (USGS) Open-File Report 82-1033, the Geologic Atlas of Texas Corpus Christi Sheet, and the USGS Quaternary Fault and Fold Database of the United States Interactive Fault Map, no faults within 200 feet of the site have had displacement in Holocene time.

A Seismic Impact Zone Map from the USGS from 1990 has been provided by FEE in Figure 4.9 of Appendix 1 (Page 30). A Seismic-Hazard Map for the Conterminous United States from 2014 from the USGS has also been included as Attachment 4 (Figure III.4-4-1). Both maps show the City of Kingsville Landfill site to be clear of any potential seismic impact zones.

3.5 Geologic Processes

Active Geologic Processes are discussed in Section 3.3 of Appendix 1 (Page 26-28). The primary geologic process occurring in this area of Texas is erosion. Based on soil types and character, and topography, erosion does not appear to be a significant factor under "normal conditions" or if design criteria are met and maintained. The construction of silt fences, wind screens, diversion berms, and routine maintenance should keep erosion at the City of Kingsville Landfill manageable.

4.0 GEOTECHNICAL REPORT

4.1 Laboratory Results

Laboratory tests were performed by Finch Energy and Environmental Services, Inc., Professional Service Industries, Inc., and Tolunay-Wong Engineers, Inc. on recovered soil samples to determine the engineering properties of the strata during the previous and most recent geotechnical engineering studies. Laboratory tests were performed in general accordance with ASTM International standards to measure physical and engineering properties of the recovered samples. Laboratory testing descriptions and methods used in the most recent Tolunay-Wong Engineers, Inc. study can be viewed in table 4-1. Laboratory results gathered from previous subsurface investigations performed by FEE and PSI are located in section 8.0 of Appendix 1 beginning on page 87. A summary of Tolunay-Wong's laboratory results has been included below.

Table 4-1
Laboratory Testing Program

Test Description	Test Method
Amount of Material in Soils Finer than No. 200 Sieve	ASTM D 1140
Unconfined Compressive Strength of Cohesive Soil (UC)	ASTM D 2166
Water (Moisture) Content of Soil	ASTM D 2216
Liquid Limit, Plastic Limit and Plasticity Index of Soils	ASTM D 4318
Density (Unit Weight) of Soil Specimens	ASTM D 2937
One-Dimensional, Incremental Loading Consolidation	ASTM D 2435
Consolidated-Undrained Triaxial Compression w/ Pore Water Pressure	ASTM D 4767

Standard geotechnical laboratory test results and soil properties encountered in the project borings are presented on the logs of borings in Appendix B of Appendix 2 beginning on page 31. Results of completed one-dimensional consolidation and consolidated-undrained triaixial shear tests performed on the selected cohesive soil samples obtained for this study are included in Appendix D (Page 64) and E (Page 68) of Appendix 2.

In-situ moisture contents of selected cohesive clay samples ranged from 18% to 34%. Results of Atterberg Limits tests on selected clay samples indicated liquid limits (LL) ranging from 31 to 81 with plasticity indices (PI) ranging from 18 to 58. The amount of materials finer than the No. 200 sieve on the selected samples ranged from 55% to 100%. In-situ moisture contents of selected silty sand samples ranged from 23% to 24%. The amount of materials finer than the No. 200 sieve on the selected samples tested for grain size distribution ranged from 14% to 38%.

Undrained shear strengths derived from field pocket penetrometer readings ranged from 0.25-tsf to 4.50-tsf. Undrained shear strengths derived from laboratory unconfined compressive (UC) strength testing ranged from 0.16-tsf to 3.41-tsf with corresponding total unit weights of 86-pcf to 105-pcf. Shear strength of cohesive soils inferred from SPT blow counts generally were similar. Based on this undrained shear strength data, the consistency of the cohesive soils encountered in the project borings is considered to be very soft to very stiff. Tabulated laboratory test results at the recovered sample depths are presented on the boring logs in Appendix B of Appendix 2 beginning on page 31.

4.2 Geotechnical Analysis

4.2.1 Settlement Analysis

One-dimensional consolidation tests were performed by Tolunay-Wong Engineers, Inc. using select samples from the soil borings to evaluate the compressibility characteristics of the foundation soils. The results of the consolidation tests are presented in Appendix D of Appendix 2 (Page 65-67). The predicted settlements resulting from consolidation settlement of the foundation soils due to the weight of the overlying landfill material are on the order of 1 foot.

Mr. Ralph N. Lewis of PSI also performed a settlement analysis during PSI's previous geotechnical analysis, and his calculations are shown in Appendix H.2 of Appendix 1 (Page 539). His calculations show that conservatively the final landfill cover will settle 3.0 inches at the center and 1.5 inches at the edges of the landfill. These calculations were based on previous landfill designs and capacities.

4.2.2 Slope Stability

A slope stability analysis was conducted by FEE. The objective of the analysis was to determine the local sliding stability of the liner system and cover as well as the overall stability of the embankment slope. The proposed embankments have a 4 (horizontal) to 1 (vertical) slope. FEE determined that a maximum allowable landfill height to satisfy a minimum factor of safety of 2.0 under static loading conditions was approximately 125 NGVD. Further discussion of the results from these analyses can be seen in Appendix 1 Section 8.3- Engineering Analyses beginning on page 120. Tolunay-Wong Engineers, Inc. also performed a waste mass stability analysis during their geotechnical engineering study. Tolunay determined that the calculated factor of safety for peak shear strength conditions exceeded 1.5 for their assumed strength and unit weight parameters, the analyzed cross sections, and assumed failure geometry. The calculated factor of safety for large displacement condition exceeds 1.5, which in their judgement, and based on published information, is acceptable. Further discussion of the results of this study have been included in Appendix 2 Section 7- Waste Mass Stability (Page 24-26).

5.0 CONCLUSIONS

As discussed in Finch Energy and Environmental Services, Professional Service Industries, Inc., and Tolunay-Wong Engineers Inc. reports and based upon the results of field and laboratory investigations performed during these studies, the following conclusions have been developed:

The site is located in the Gulf Coastal Plain of Texas with the Beaumont Clay and Lissie Formation undifferentiated near the surface. This formation underlies silt sheet deposits, clay dune, and clay-sand dune deposits on the surface at the site.

The site is underlain by sediments that can be divided into five discontinuous units [Caliche Bearing Channel Unit (I), Sand Filled Channel Unit (II), Clayey Sand (Clay Dune)(III), Clayey Sand (Clay Dune)(IV), Sandy (Silty) Clay] and one continuous unit [Light Olive Green to Gray Clay Aquiclude]. The water bearing zone is made up of the five discontinuous units which are all in communication. The normal ground water level is at approximately 35 ft NGVD.

The uppermost aquifer beneath the base grade of the existing site can be defined as a discontinuous fluvial-deltaic environment in which all units are in hydraulic communication with each other and bounded by the 38 foot thick plus Light Olive Green to Gray Clay aquiclude at depths of 5 ft to 17 ft above mean sea level. Groundwater movement is to all sides of the landfill except to the northwest.

The Landfill site has a Light Olive Green to Gray Clay layer of more than 38 feet thickness which forms an aquiclude between the uppermost local aquifer and the Chicot aquifer which is the uppermost regional aquifer. The Chicot aquifer is located between 200 and 300 feet below mean seal level (MSL) and generally contains slightly-saline to saline water in Kleberg County.

Tolunay determined that the calculated factor of safety for peak shear strength conditions exceeded 1.5 for their assumed strength and unit weight parameters, the analyzed cross sections, and assumed failure geometry. The calculated factor of safety for large displacement condition exceeds 1.5, which based on published information, is acceptable. Based on Tolunay-Wong's Geotechnical Engineering Study results, and in their opinion, it is anticipated that the planned landfill configuration should be stable, provided excess pore pressures are not generated within the waste mass or that there is no increase in piezometric head above 1 foot within the underlying liner cover material or leachate collection system. The generation of pore pressures and increase in piezometric head within the materials could substantially reduce the factor of safety and increase the risk for stability problems. Also, the predicted settlements resulting from consolidation settlement of the foundation soils due to the weight of the overlying landfill material are on the order of 1 foot.

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~~6~~7. Shafrer, G.H., and Baker, E. T., Jr., Ground-water Resources of Kleberg, Kenedy, and Southern Jim Wells Counties, Texas: Texas Water Development Board Report #173, (1973).

8. U.S. Geological Survey Quaternary Fault and Fold Database of the United States Interactive Fault Map (https://earthquake.usgs.gov/hazards/qfaults/).

ATTACHMENT 4

Geology Report

For Permitting Purposes Only. Applies to pages of Attachment 4 – Finch Energy & Environmental Services, Inc. Geology Report, sealed by Ray N. Finch, P.E. on 6-26-98 and 9-30-98 altered to provide a clean and legible copy and includes pages: 3, 3.0 Cover Page, 8, 9, 15 - 17,22 - 25, 29 – 30, 33 - 35, 39 - 46, 48 – 60, 60a, 62 - 98, 100 - 101, 104, 108 – 109 and D-32 - D-46. No information or data was altered or changed from the original 6-26-98 and 9-30-98 Geology Report other than text scale corrections on pages 48-60. Bar scales were also added to pages 48-60.

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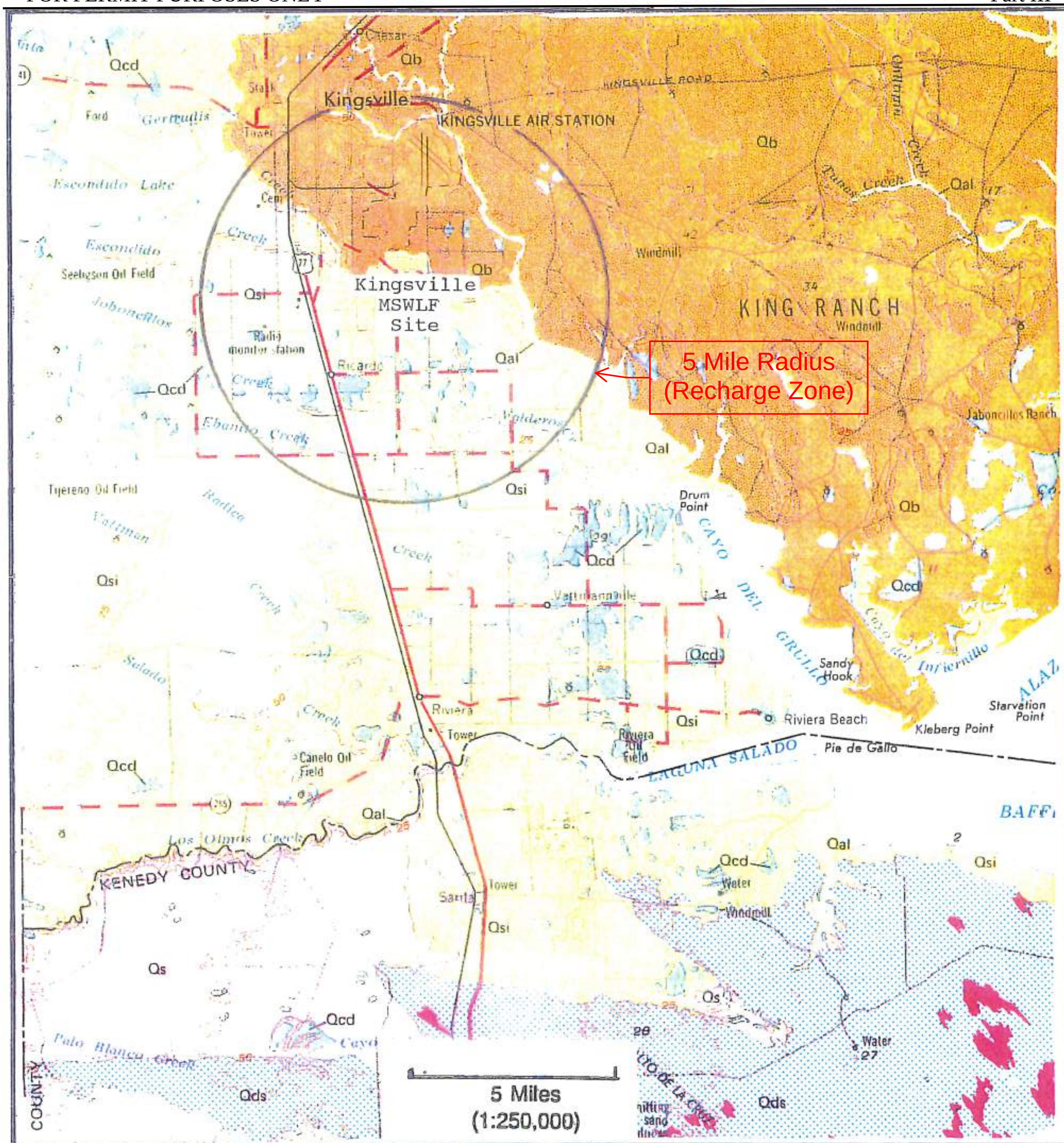


Figure 4.14
Regional Map showing
Recharge Area
Geologic Atlas of Texas
Corpus Christi Sheet - 1975

FINCH ENERGY &
ENVIRONMENTAL
SERVICES, Inc.

EXPLANATION

QUATERNARY

F S

Fill and Spoil

Fill, F, material dredged for raising land surface above alluvium and barrier island deposits and for creating land. Spoil, S, dredged material forming islands along waterways. Properties highly variable, mixed mud, silt, sand, and shell; mud and silt winnowed when reworked

Qal

Alluvium

Clay, silt, sand, and gravel, organic material abundant locally; includes point bar, natural levee, stream channel, backswamp, coastal marsh, mud flat, clay dune, sand dune, and oyster reef deposits. Includes some terrace deposits along streams other than the Nueces

Qbi

Barrier island deposit

Sand, silt, and clay; mostly sand, well sorted, fine grained, abundant shells and shell fragments; interfingers with silt and clay in landward direction; includes beach ridge, spit, tidal channel, tidal delta, washover fan, and sand dune deposits; "high to very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, high shear strength, low plasticity"

Qcd Qsd Qds Qs Qsi

Windblown deposits

Includes clay dune and clay-sand dune deposits, Qcd; active dunes and dune complexes; Qsd; stabilized sand dune deposits, Qds; sand sheet deposits, Qs; and silt sheet deposits, Qsi. Small areas of Pleistocene deposits within these various units not separately mapped

Clay dune and clay-sand dune deposits, Qcd, clay, silt, and sand ranging from mostly clay and silt in coastal areas to a mixture of clay, silt, and sand inland; light gray, calcareous; forms elongate deposits mostly on downwind side of intermittently wet basins, relief 5-30 feet; physical properties similar to those of the sandy and silty Beaumont

Active dunes and dune complexes on mainland, Qsd, banner dunes common, local barchan dunes; relief up to 30 feet; "very high permeability, low water-holding capacity, low compressibility, low shrink-swell potential, good drainage, high shear strength, low plasticity, unstable because of migration"

Stabilized sand dune deposits, Qds, strong relict eolian grain, sparse grass; includes active blowout areas with depressed relief, hummocky, locally becomes fresh-water marsh in wet season, and well-stabilized sand dunes with dense live-oak mottes and scrub; "moderate to very high permeability, low to moderate water-holding capacity, low compressibility, low shrink-swell potential, good to fair drainage, high shear strength, low plasticity, shallow water table"

Sand sheet deposits, Qs, no relict grain, sparse grass; physical properties similar to those of "Stabilized sand dune deposits," Qds

Silt sheet deposits, Qsi, silt and fine sand in thin, locally discontinuous sheet winnowed from other "Windblown deposits," brush and grass covered, rests on various Pleistocene deposits; has physical properties similar to those of other "Windblown deposits," but because of its thinness engineering plans should consider the nature of the underlying materials

Recent or Late (?) Pleistocene

Qd

Deweyville Formation

Sand, silt, clay, and gravel, includes point bar, natural levee, and stream channel deposits, surface characterized by relict meanders of much larger radius of curvature than those of present streams; occurs along Nueces River at three levels: 5-20, 20-30, and 40-55 feet above level of Recent floodplain

Pleistocene

QUATERNARY

Qbb Qb Qb

Beaumont Formation

Beaumont Formation, Qb, with barrier island and beach deposits, Qbb, mapped separately. Beaumont Formation, Qb, mostly clay, silt, sand, and gravel; includes mainly stream channel, point bar, natural levee, and backswamp deposits, and to a lesser extent coastal marsh, mud flat, lagoonal, Recent and older lake, clay dune, and sand dune deposits; concretions and massive accumulations of calcium carbonate (caliche) and concretions of iron oxide and iron-manganese oxides in zone of weathering; surface pitted by shallow lakes or dry lake beds with associated clay dunes which in places align along meanderbelt ridges; pimple mounds only in vicinity of Qbb unit; thickness 100± feet

The stippled overprint (source shown in Index to Geologic Mapping) shows areas that are "Dominantly clay and mud of low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity; geologic units include interdistributary muds, abandoned channel-fill muds, and fluvial overbank muds." The nonstippled areas are "Dominantly clayey sand and silt of low-moderate permeability, moderate drainage, level relief with local mounds and ridges, and high shear strength; geologic units include meanderbelt, levee, crevasse splay, and distributary sands"

Barrier island and beach deposits, Qbb, mostly fine-grained sand, shells scarce; surface slightly higher than that of surrounding deposits, characterized by numerous pimple mounds and poorly defined relict beach ridges; includes many Recent, locally active sand dunes; probably part of "Ingleside" barrier island system; thickness less than 60 feet

Ql

Lissie Formation undivided

Sand, silt, clay, and minor amount of gravel; iron oxide and iron-manganese nodules common in zone of weathering, in upper part locally calcareous, some concretions of calcium carbonate; surface fairly flat and featureless except for numerous rounded shallow depressions and pimple mounds, lower part very gently rolling; characterized by "moderate permeability, moderate drainage, and high shear strength; geologic units include meanderbelt, levee, crevasse splay, and distributary sands and floodbasin mud over meanderbelt sand;" thickness 200± feet

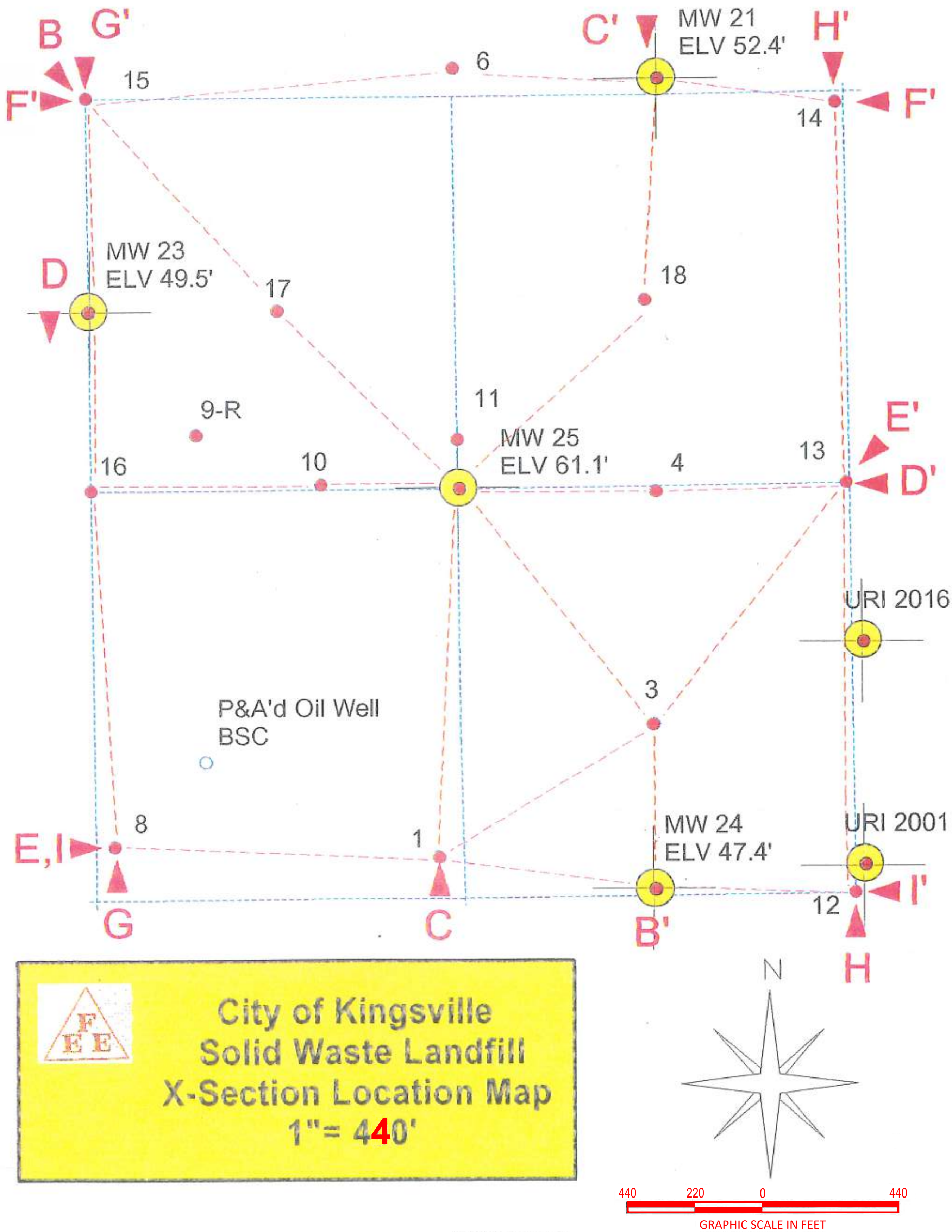
Fault

U
D

U, upthrown side; D, downthrown side; dashed where inferred

Figure 4.14a
Map Explanation
Geologic Atlas of Texas
Corpus Christi Sheet - 1975

FINCH ENERGY & ENVIRONMENTAL SERVICES, Inc.



REVISION 1
48

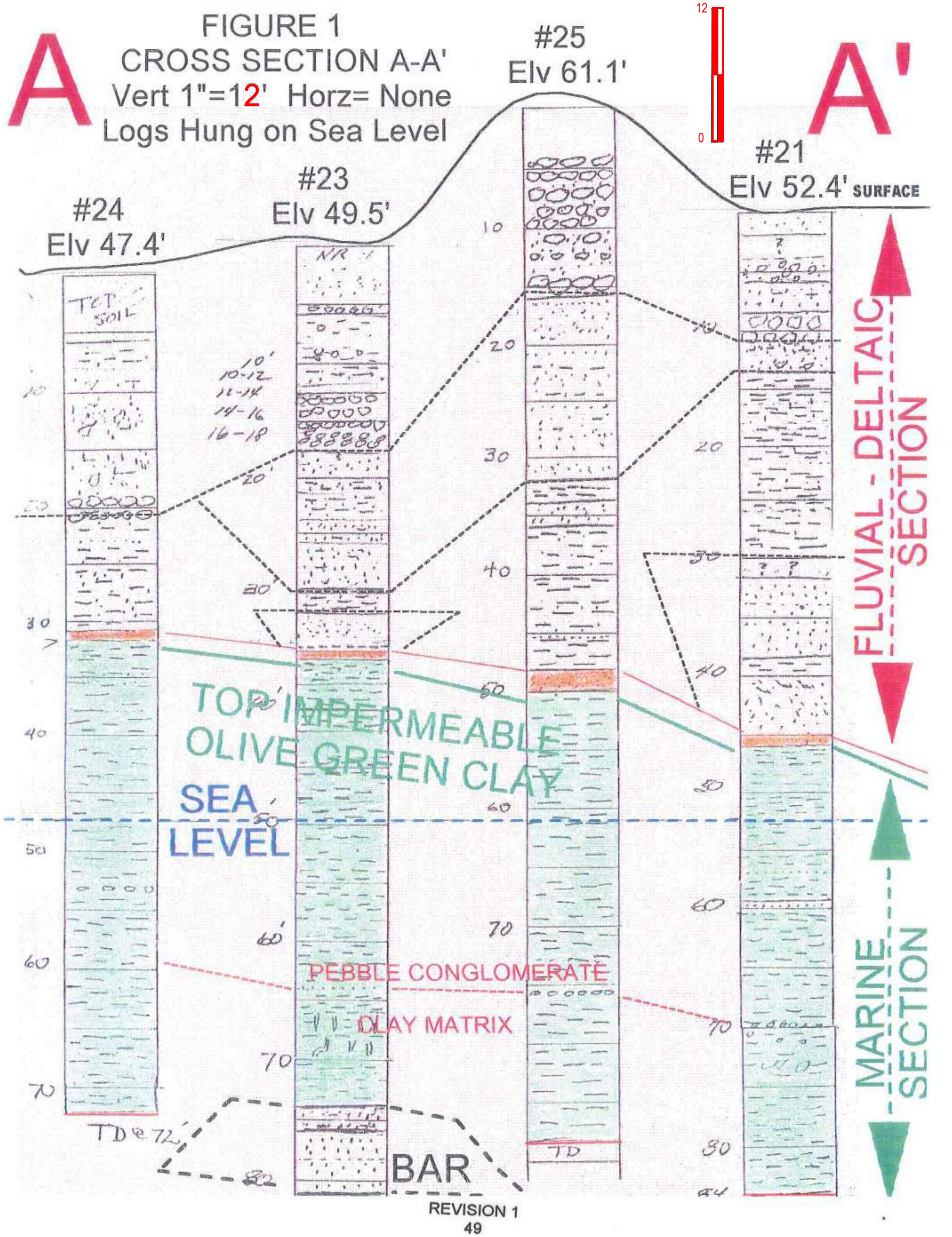
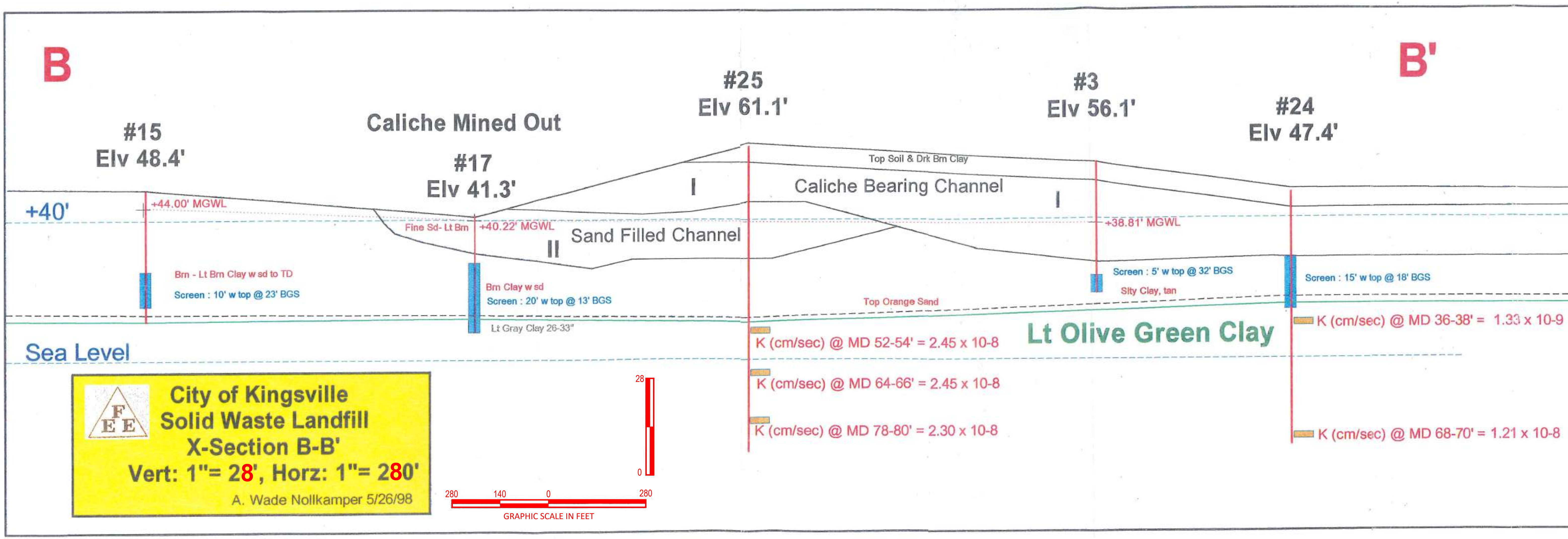
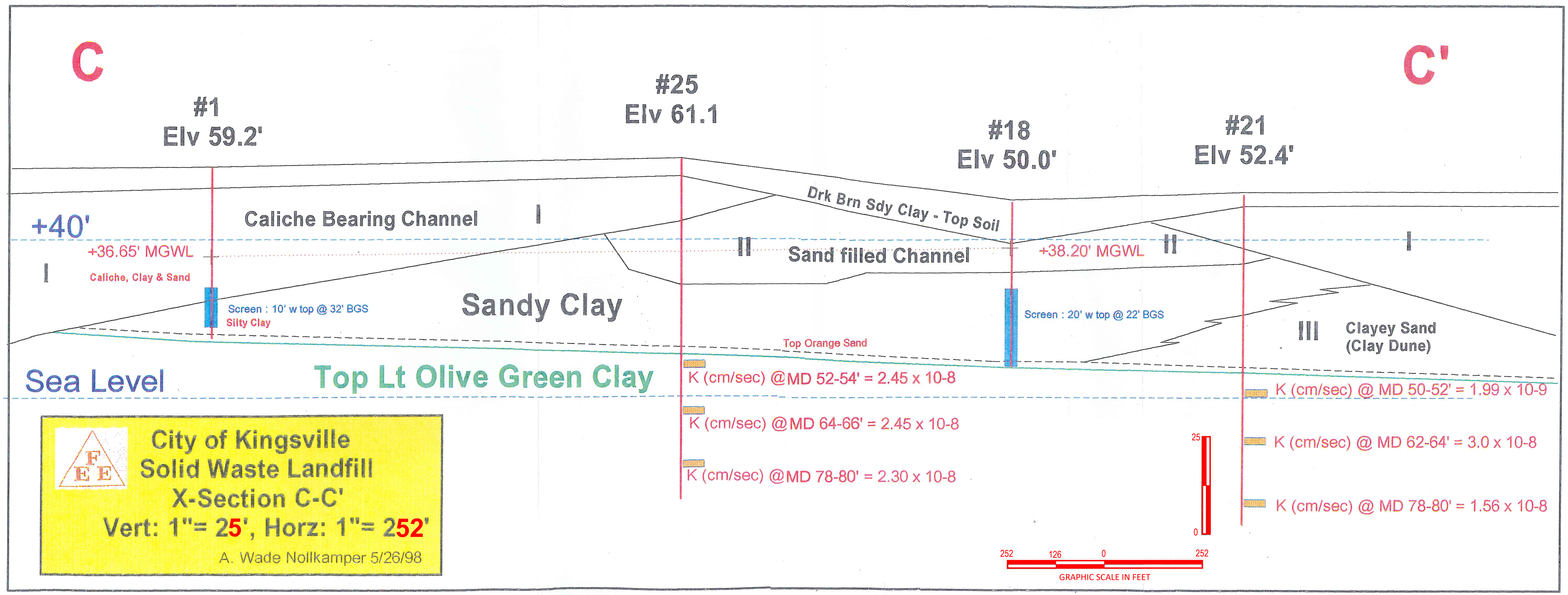


FIGURE 1
CROSS SECTION A-A'
Vert 1"=12' Horz= None
Logs Hung on Sea Level
A
A'
#24
Elv 47.4'
#23
Elv 49.5'
#25
Elv 61.1'
#21
Elv 52.4' SURFACE
TOP IMPERMEABLE
OLIVE GREEN CLAY
SEA
LEVEL
PEBBLE CONGLOMERATE
CLAY MATRIX
BAR
FLUVIAL - DELTAIC SECTION
MARINE SECTION
TD @ 72
REVISION 1
49

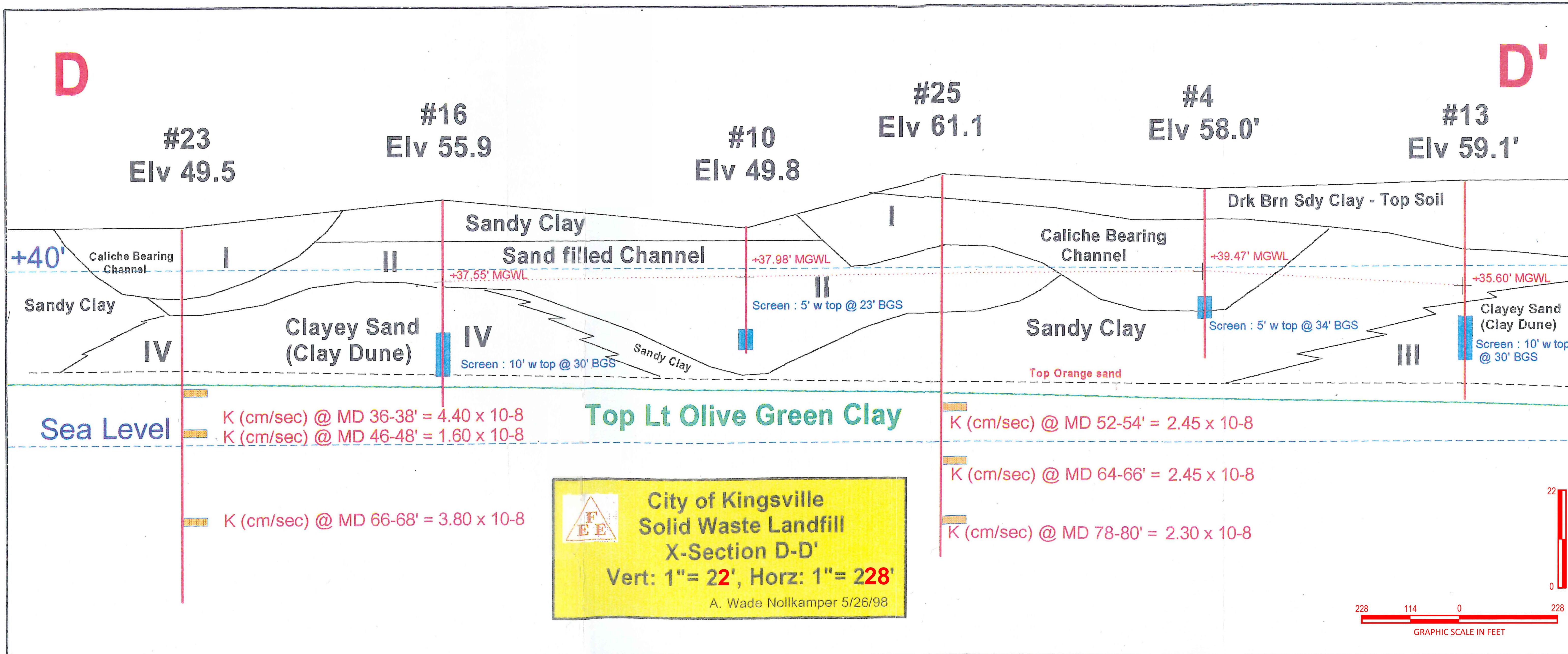
FOR PERMIT PURPOSES ONLY



Hanson Professional Services Inc.
Submittal Date: September 2018
Revision: 2 - February 2019~~Revision: 0~~

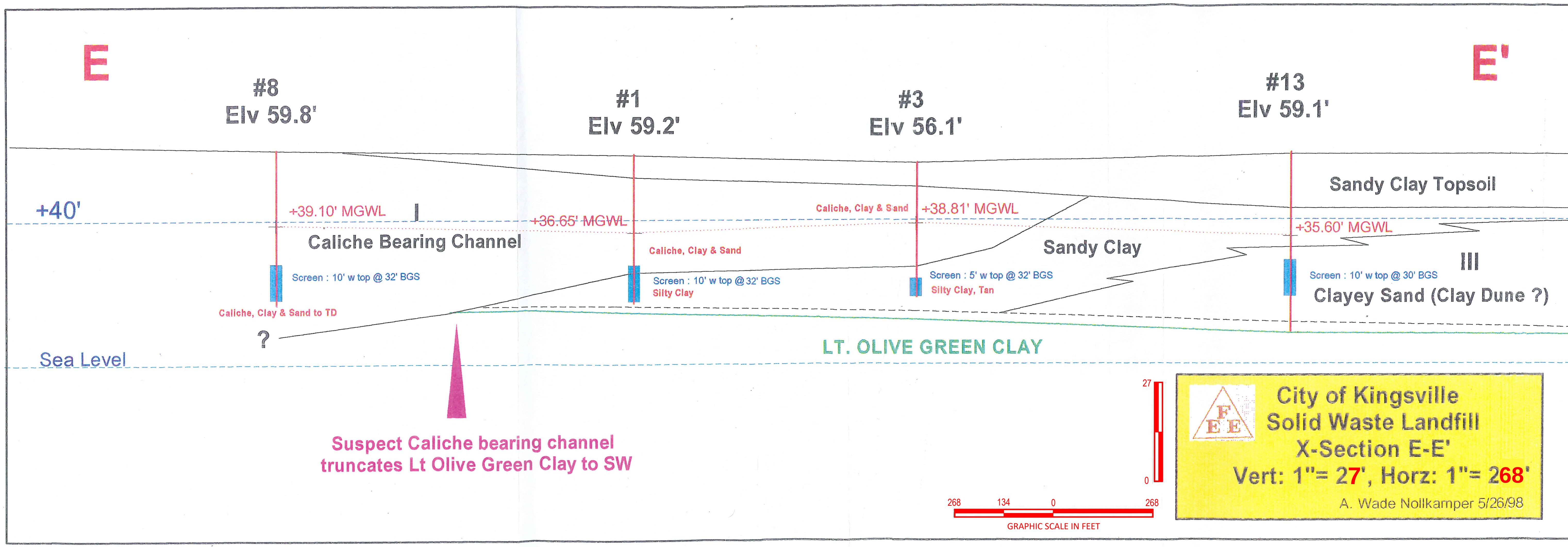

C
C'
#1
Elv 59.2'
#25
Elv 61.1
#18
Elv 50.0'
#21
Elv 52.4'
+40'
Caliche Bearing Channel
Drk Brn Sdy Clay - Top Soil
+36.65' MGWL
+38.20' MGWL
Sand filled Channel
Caliche, Clay & Sand
Sandy Clay
Screen : 10' w top @ 32' BGS
Silty Clay
Screen : 20' w top @ 22' BGS
Top Orange Sand
Clayey Sand
(Clay Dune)
Sea Level
Top Lt Olive Green Clay
K (cm/sec) @MD 52-54' = 2.45 x 10-8
K (cm/sec) @MD 64-66' = 2.45 x 10-8
K (cm/sec) @MD 78-80' = 2.30 x 10-8
K (cm/sec) @ MD 50-52' = 1.99 x 10-9
K (cm/sec) @ MD 62-64' = 3.0 x 10-8
K (cm/sec) @ MD 78-80' = 1.56 x 10-8
City of Kingsville
Solid Waste Landfill
X-Section C-C'
Vert: 1"= 25', Horz: 1"= 252'
A. Wade Nollkamper 5/26/98
GRAPHIC SCALE IN FEET

FOR PERMIT PURPOSES ONLY

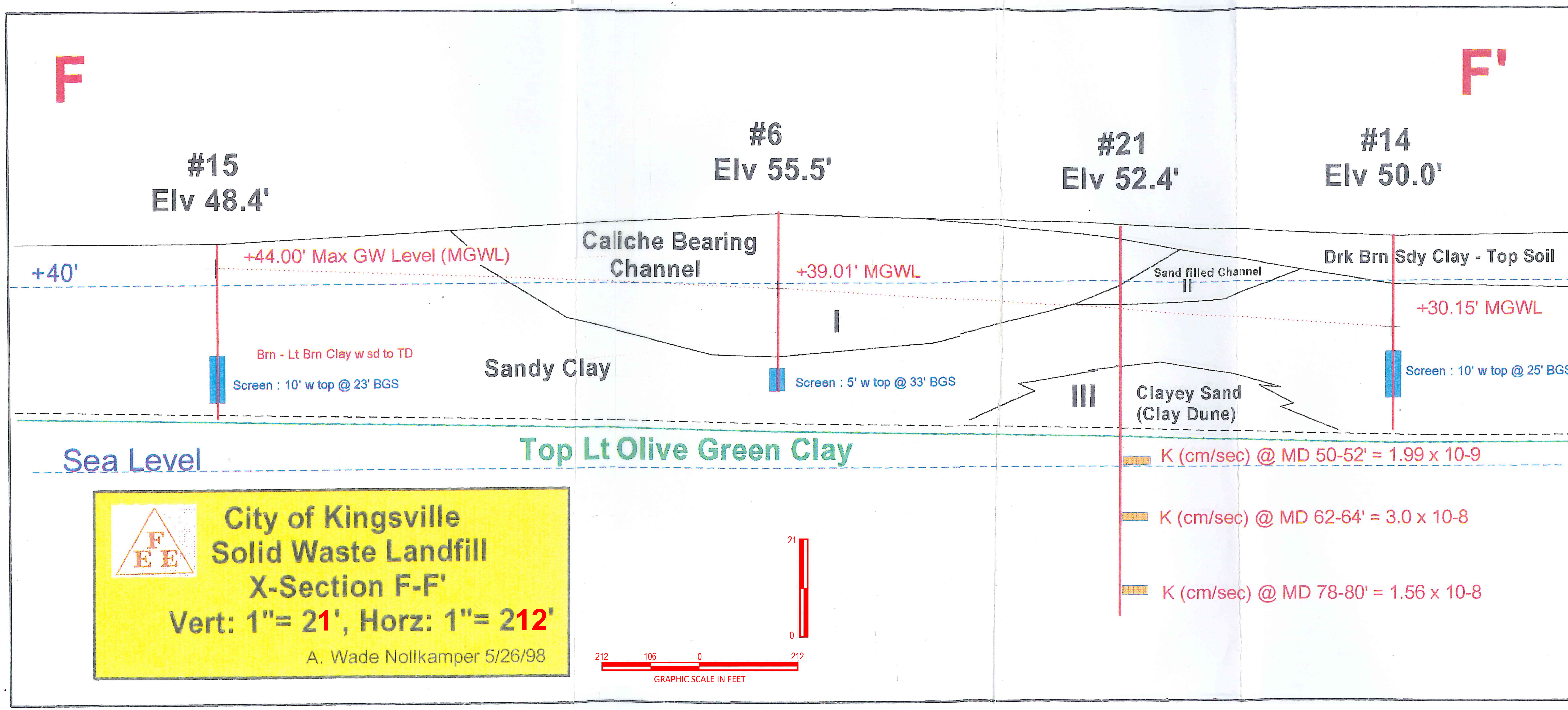


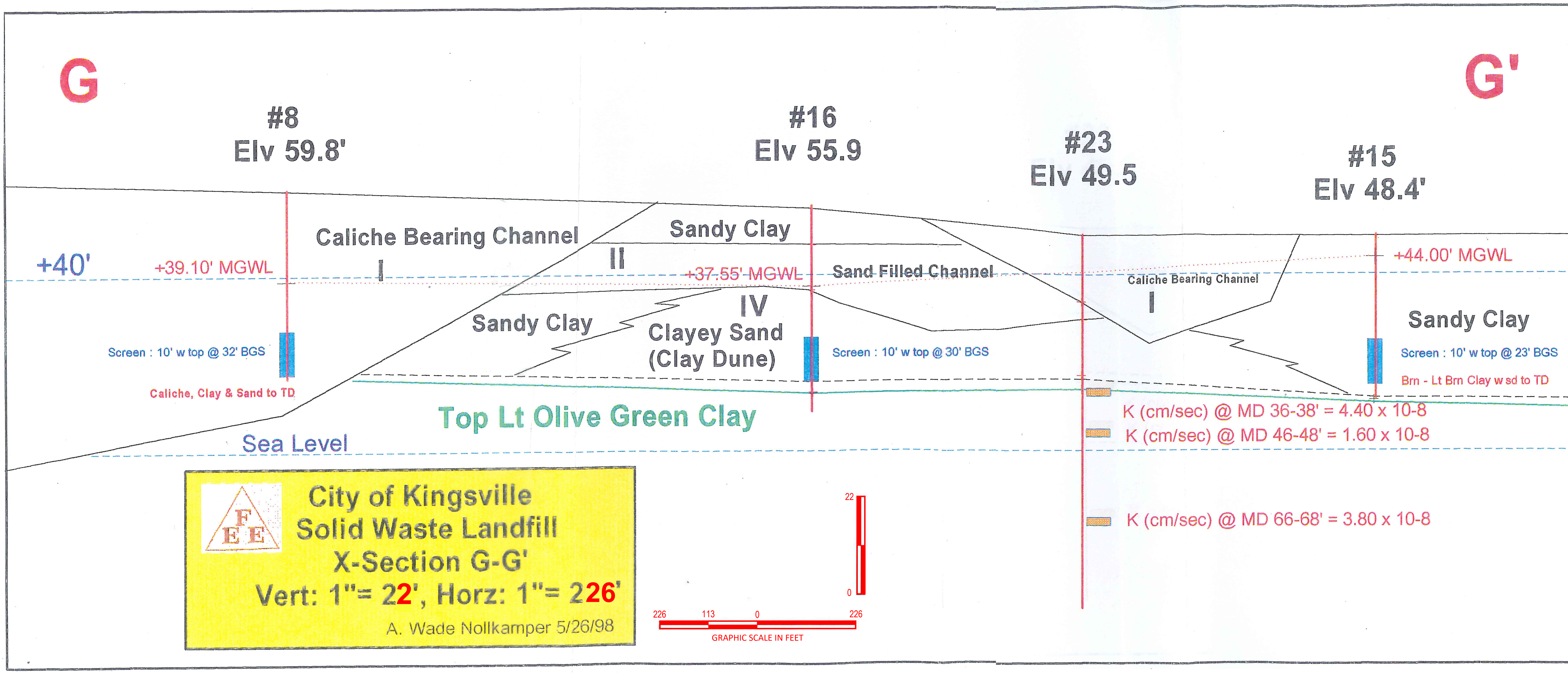
REVISION 1-52

FOR PERMIT PURPOSES ONLY

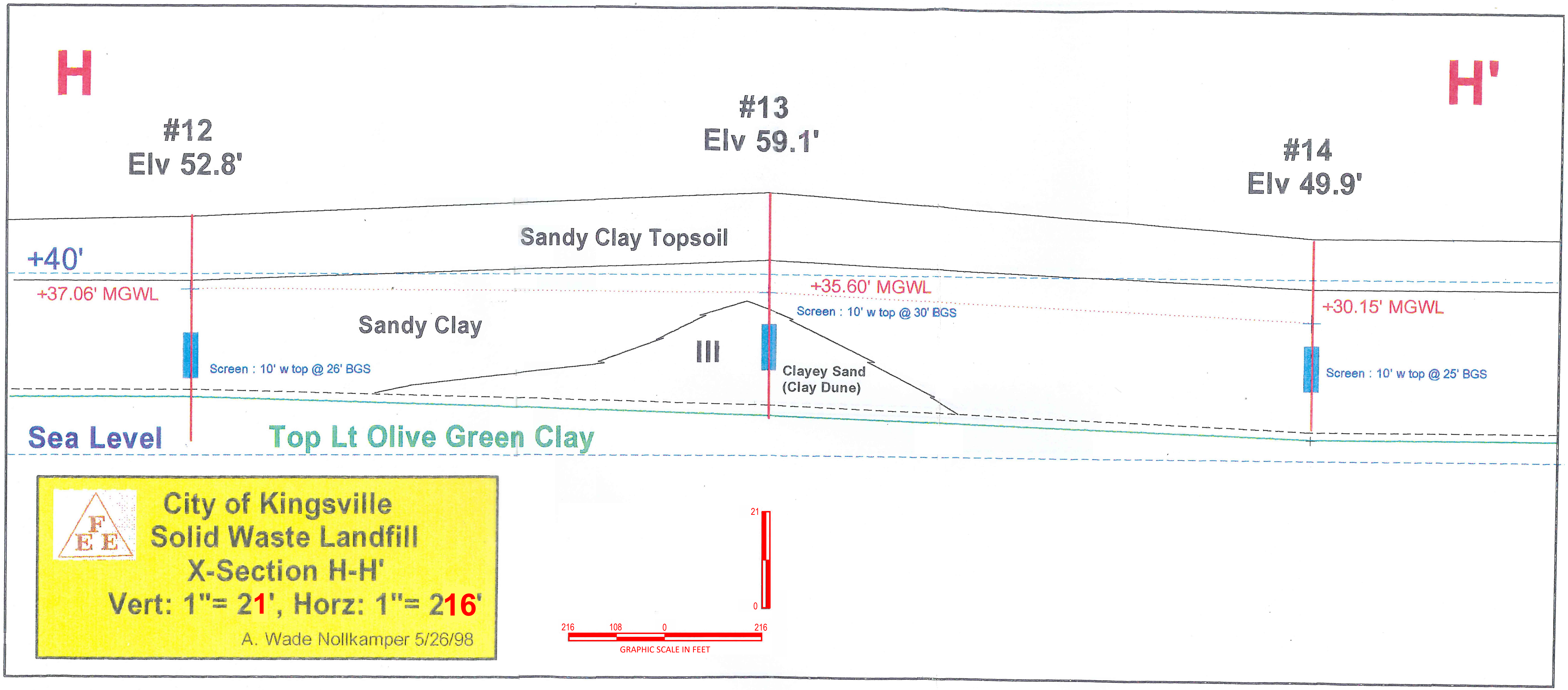


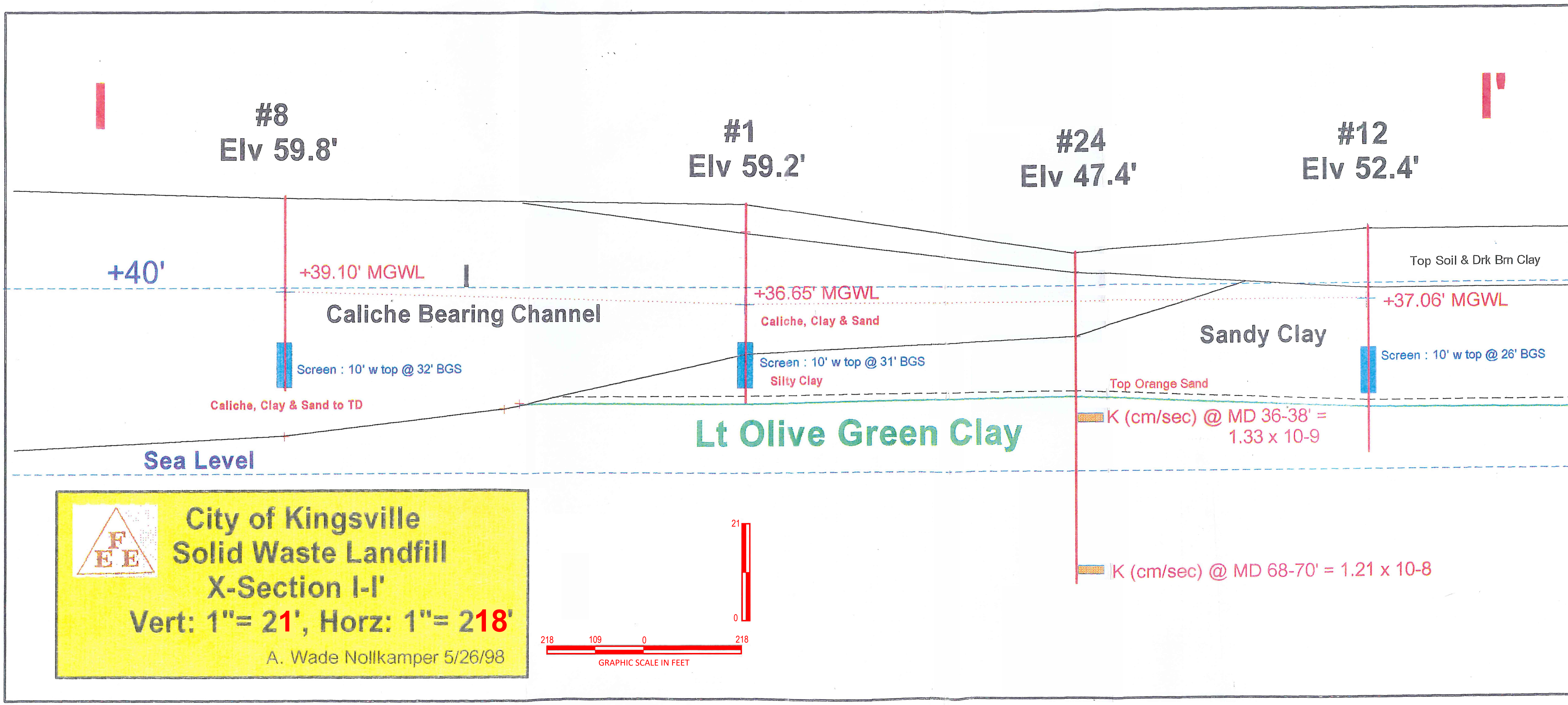
REVISION 1-51


F
F'
#15
Elv 48.4'
#6
Elv 55.5'
#21
Elv 52.4'
#14
Elv 50.0'
+44.00' Max GW Level (MGWL)
Caliche Bearing
Channel
+40'
+39.01' MGWL
Sand filled Channel
II
Drk Brn Sdy Clay - Top Soil
+30.15' MGWL
I
Brn - Lt Brn Clay w sd to TD
Sandy Clay
Screen : 10' w top @ 23' BGS
Screen : 5' w top @ 33' BGS
III
Clayey Sand
(Clay Dune)
Screen : 10' w top @ 25' BGS
Sea Level
Top Lt Olive Green Clay
K (cm/sec) @ MD 50-52' = 1.99 x 10-9
K (cm/sec) @ MD 62-64' = 3.0 x 10-8
K (cm/sec) @ MD 78-80' = 1.56 x 10-8
City of Kingsville
Solid Waste Landfill
X-Section F-F'
Vert: 1"= 21', Horz: 1"= 212'
A. Wade Nollkamper 5/26/98
21
0
212
106
0
212
GRAPHIC SCALE IN FEET



REVISION 1-55


H
H'
#12
Elv 52.8'
#13
Elv 59.1'
#14
Elv 49.9'
Sandy Clay Topsoil
+40'
+37.06' MGWL
+35.60' MGWL
+30.15' MGWL
Screen : 10' w top @ 30' BGS
Sandy Clay
III
Screen : 10' w top @ 26' BGS
Clayey Sand
(Clay Dune)
Screen : 10' w top @ 25' BGS
Sea Level
Top Lt Olive Green Clay
City of Kingsville
Solid Waste Landfill
X-Section H-H'
Vert: 1"= 21', Horz: 1"= 216'
A. Wade Nollkamper 5/26/98
21
0
216
108
0
216
GRAPHIC SCALE IN FEET



REVISION 1-57

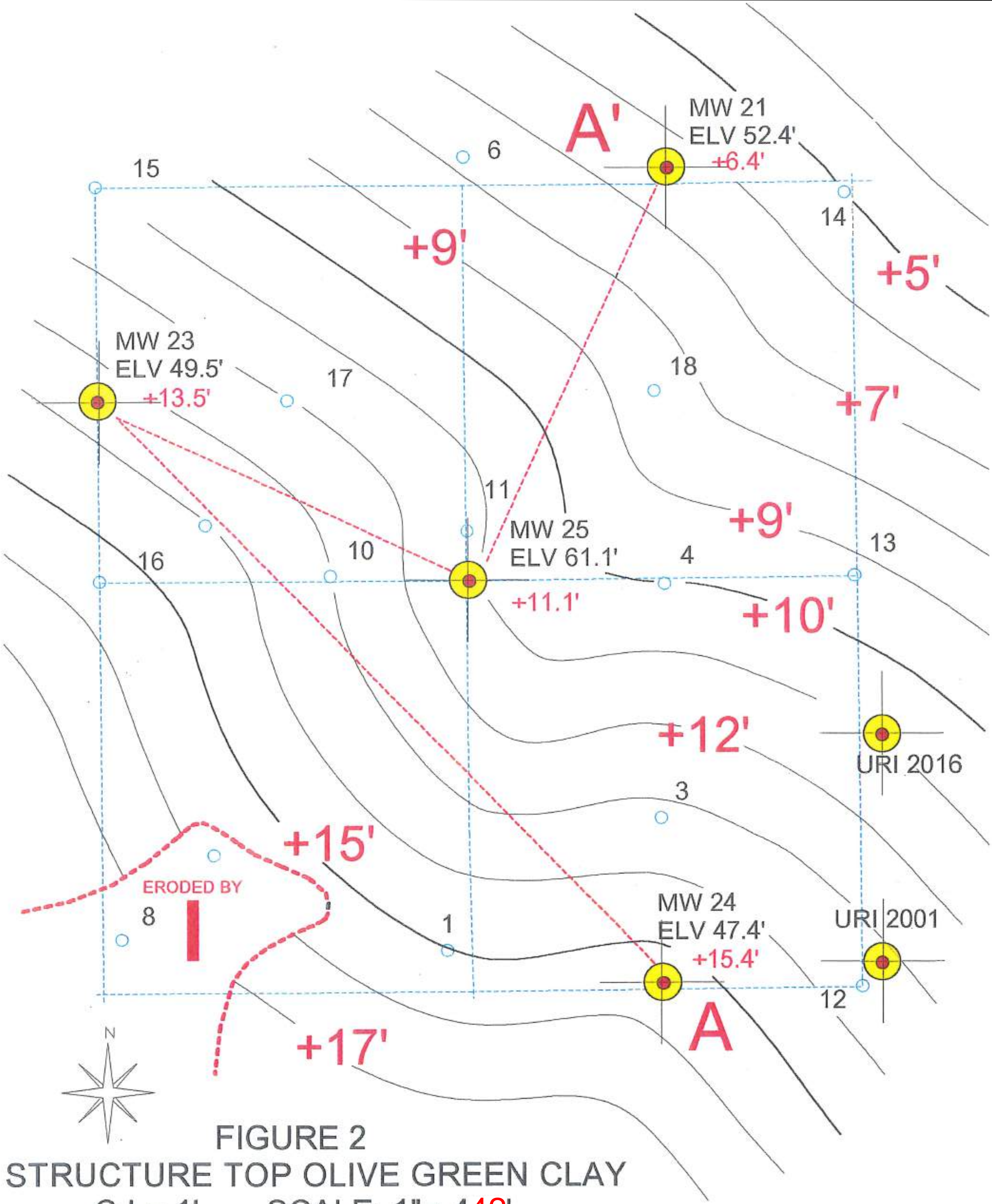
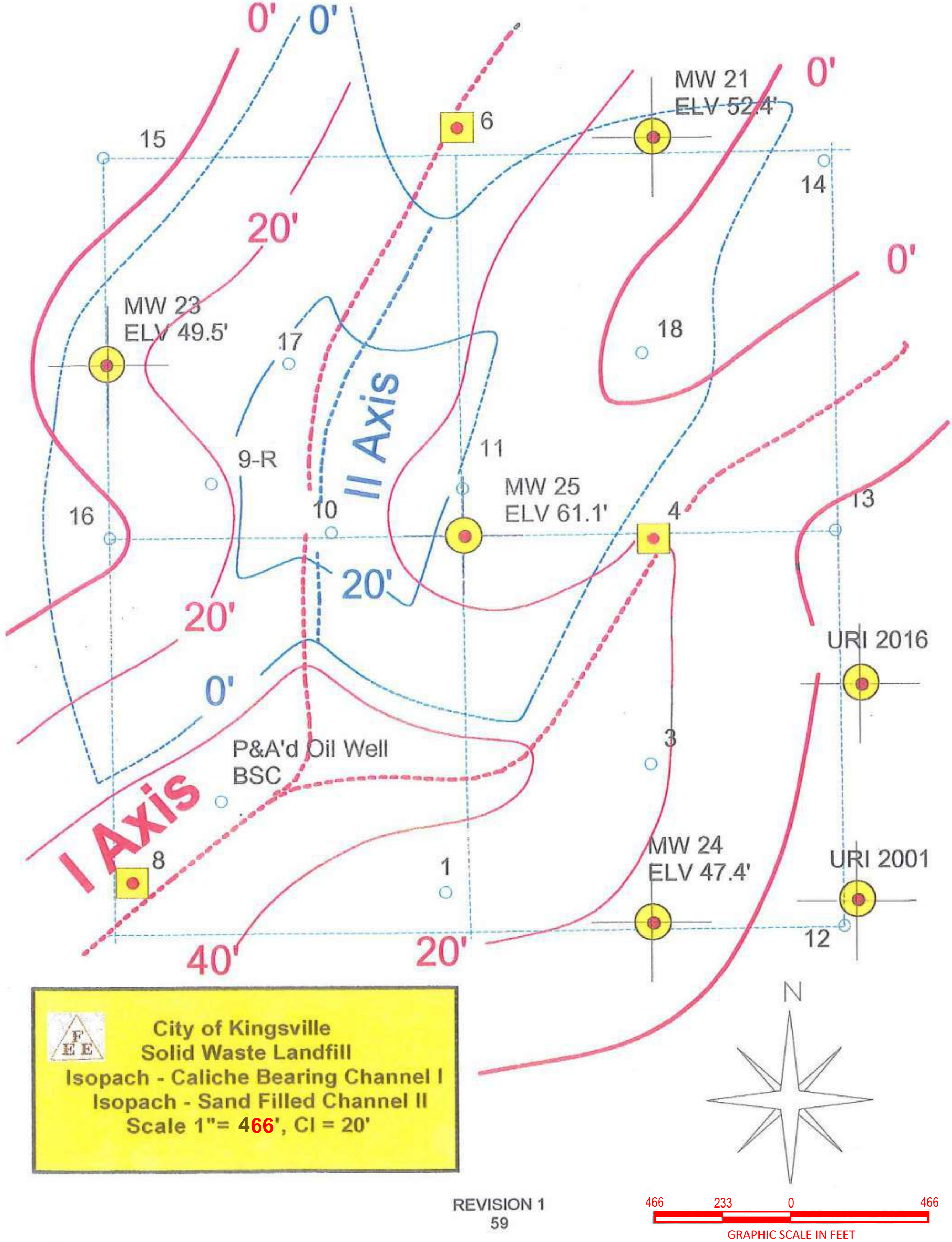
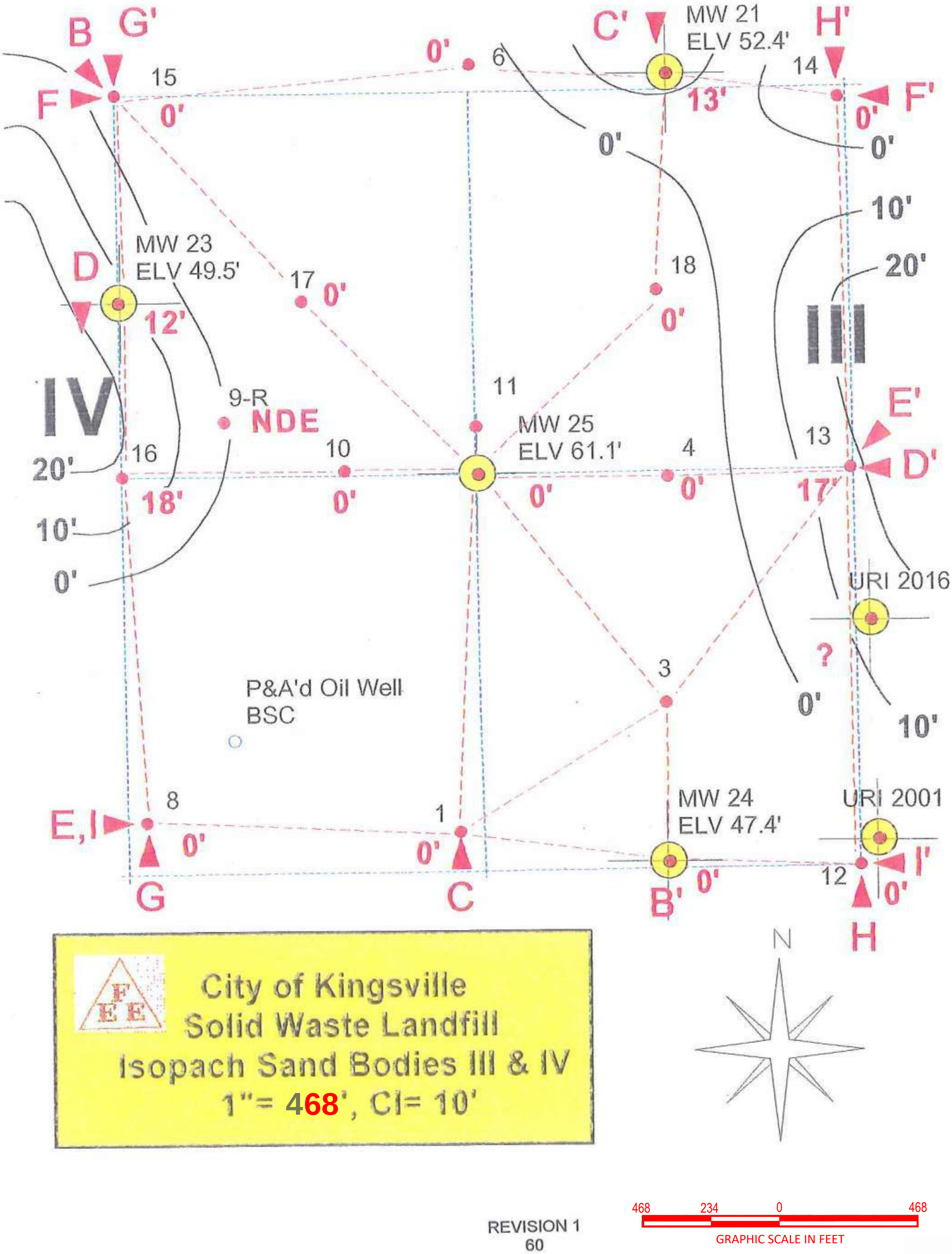


FIGURE 2
STRUCTURE TOP OLIVE GREEN CLAY
C.I.= 1' SCALE: 1"= 442'
A.W.N. 4/30/98
REVISION 1


0'
0'
0'
0'
20'
20'
20'
0'
40'
20'
15
6
MW 21
ELV 52.4'
14
MW 23
ELV 49.5'
17
18
II Axis
9-R
11
MW 25
ELV 61.1'
16
10
4
13
URI 2016
P&A'd Oil Well
BSC
3
I Axis
8
1
MW 24
ELV 47.4'
URI 2001
12
N
City of Kingsville
Solid Waste Landfill
Isopach - Caliche Bearing Channel I
Isopach - Sand Filled Channel II
Scale 1"= 466', CI = 20'
REVISION 1
59
466
233
0
466
GRAPHIC SCALE IN FEET


B G'
C'
MW 21
ELV 52.4'
H'
0'
6
14
15
F
0'
13'
0'
F'
0'
0'
10'
MW 23
ELV 49.5'
D
17
0'
18
20'
12'
0'
III
IV
11
E'
9-R
NDE
MW 25
ELV 61.1'
4
13
16
10
20'
D'
18'
0'
0'
0'
17'
10'
0'
URI 2016
?
3
P&A'd Oil Well
BSC
0'
10'
8
1
MW 24
ELV 47.4'
URI 2001
E,I
0'
0'
0'
I'
12
0'
G
C
B'
H
N
City of Kingsville
Solid Waste Landfill
Isopach Sand Bodies III & IV
1"= 468', CI= 10'
REVISION 1
60
468
234
0
468
GRAPHIC SCALE IN FEET

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Volume 3 of 6

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 – February 2019

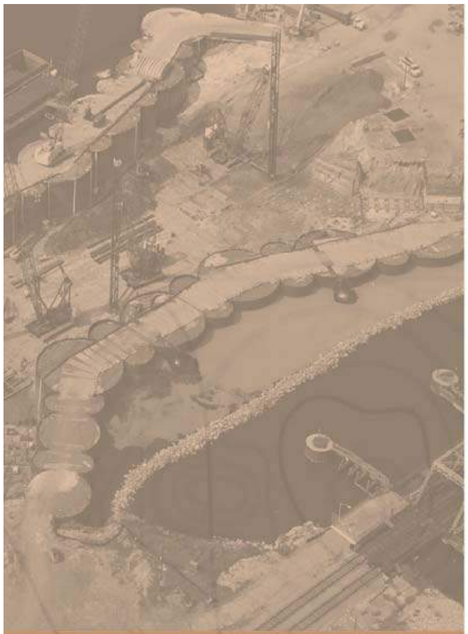
Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003



Tolunay-Wong Engineers, Inc.

**GEOTECHNICAL ENGINEERING STUDY
CITY OF KINGSVILLE MUNICIPAL SOLID
WASTE LANDFILL EXPANSION
KINGSVILLE, TEXAS**

For Permitting Purposes Only. Applies to boring logs in Appendix B of Tolunay-Wong Engineers, Inc. Geotechnical Engineering Study, City of Kingsville Municipal Solid Waste Landfill Expansion, Kingsville, Texas – Report No. 12788R1, sealed by Don R. Rokohl, P.E. on 8-30-18 altered to provide text showing surface elevations and the elevations of all contacts between soil and rock layers in the soil boring logs. No information or data was altered or changed from the original report other than the addition of text showing these elevations in Appendix B.

Prepared for:

**Naismith/Hanson
Corpus Christi, Texas**

Prepared by:

**Tolunay-Wong Engineers, Inc.
826 South Padre Island Drive
Corpus Christi, Texas 78416**

August 30, 2018

Project No. 16.53.042 / Report No. 12788R1

GEOTECHNICAL ENGINEERING, DEEP FOUNDATIONS TESTING, ENVIRONMENTAL SERVICES, CONSTRUCTION MATERIALS TESTING

1-888-887-9932
WWW.TWEINC.COM

LOG OF BORING B-30

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0" W 97° 49' 23.1"

SURFACE ELEVATION: 45.99' AMSL

DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Dense to very dense tan and gray CLAYEY SAND (SC) with gypsum crystals		11/6" 23/6" 50/5"	16		42	17				37	
5	-color changes to tan with ferrous staining		34/6" 50/3"									
	-with sand partings		13/6" 50/3"									
10												
			7/6" 12/6" 20/6"	35							33	
15	-color changes to reddish tan and light gray		6/6" 15/6" 20/6"									
20	25.49' AMSL											
	Very stiff to hard reddish tan and light gray FAT CLAY (CH) with gypsum crystals		10/6" 17/6" 26/6"									
25	-color changes to reddish tan and tan		10/6" 18/6" 30/6"	25		50	28				92	
	-color changes to tan and reddish brown		8/6" 11/6" 16/6"									
30												
	-color changes to tan and gray		8/6" 12/6" 18/6"									
35												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/22/2016
DATE BORING COMPLETED: 07/23/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 3

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION: 45.99' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Very stiff to hard reddish tan and tan FAT CLAY (CH) with gypsum crystals and ferrous stains		10/6" 17/6" 21/6"	30							90	
40	-color changes to tan and reddish brown		9/6" 14/6" 21/6"									
45			13/6" 19/6" 29/6"									
	-becomes sandy 48' to 52'		8/6" 11/6" 13/6"	30							70	
50	-color changes to tan and becomes slickensided	(P) 4.50+		23	100	71	51				87	
55		(P) 4.50+										
60		(P) 4.50+										
	-becomes sandy and color changes to tan and gray	(P) 4.50+		26	97	54	30	1.75	3		69	
65	-color changes to tan and reddish brown with trace calcareous nodules	(P) 3.00										
70												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/22/2016
DATE BORING COMPLETED: 07/23/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 3

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0" W 97° 49' 23.1"

SURFACE ELEVATION: 45.99' AMSL

DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	Very stiff to hard tan and reddish brown FAT CLAY (CH) with calcareous nodules -26.01' AMSL											
	Very dense tan CLAYEY SAND (SC) with calcareous nodules -30.01' AMSL		16/6" 43/6" 50/5"	17							17	
75	Very stiff to hard tan and gray FAT CLAY (CH) with ferrous staining		10/6" 11/6" 17/6"									
80	-becomes slickensided with ferrous staining -36.51' AMSL	(P) 4.50+										
	Bottom @ 82.5'											
85												
90												
95												
100												
105												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/22/2016
DATE BORING COMPLETED: 07/23/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 3 of 3

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: 58.37' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to very dense gray CLAYEY SAND (SC)		4/6" 5/6" 7/6"									
	-with calcareous nodules and sand pockets		10/6" 22/6" 18/6"									
5			4/6" 5/6" 6/6"	11							46	
			5/6" 6/6" 8/6"									
			6/6" 8/6" 12/6"									
10	-with cemented sand layers		8/6" 27/6" 29/6"	27							22	
	-color changes to tan		18/6" 32/6" 39/6"									
	43.87' AMSL											
15	Very dense tan POORLY GRADED SAND with CLAY (SP-SC) and sand partings		36/6" 50/5"									
			12/6" 50/5"	15							9	
			45/6" 50/5"									
20			35/6" 50/4"									
			17/6" 26/6" 50/5"									
	34.87' AMSL		17/6" 38/6" 38/6"									
25	Hard reddish tan and light gray SANDY LEAN SILTY CLAY (CL-ML) with sand partings		13/6" 20/6" 31/6"	26		29	7				66	
			23/6" 34/6" 50/4"									
			12/6" 17/6" 50/5"									
30	-color changes to reddish tan and tan with ferrous stains		13/6" 32/6" 50/5"									
			7/6" 36/6" 39/6"									
			10/6" 21/6" 36/6"	25							62	
35			10/6" 18/6" 35/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/21/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: 58.37' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Hard reddish tan and tan SANDY LEAN CLAY (CL) with ferrous stains and laminated sands		17/6" 25/6" 35/6" 17/6" 13/6" 19/6" 7/6" 16/6" 17/6"									
	18.87' AMSL											
40	Very stiff to hard reddish tan and tan FAT CLAY with SAND (CH) and ferrous stains		3/6" 7/6" 10/6"	37		59	36				76	
45			9/6" 20/6" 27/6" 5/6" 14/6" 17/6" 10/6" 18/6"									
	-with trace gypsum crystals and ferrous stains		21/6" 18/6" 23/6" 30/6" 6/6" 20/6" 21/6"	30							83	
50			9/6" 17/6" 19/6" 9/6" 18/6" 23/6" 11/6" 23/6" 26/6"									
	-with calcareous nodules and ferrous stains	(P) 4.50+		32	91	83	50	4.14	2		87	
55		(P) 4.50+										
		(P) 4.50+										
		(P) 4.50+		34	87			2.88	2		83	
60	-with trace gypsum crystals and ferrous stains	(P) 4.50+										
		(P) 4.50+										
65		(P) 4.50+										
	-9.63' AMSL	(P) 4.50+										
	Bottom @ 68'											
70												

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/21/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7" W 97° 49' 17.0"
SURFACE ELEVATION: 48.46' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Stiff to hard tan and gray SANDY LEAN CLAY (CL) with gypsum crystals and trace organics		3/6" 5/6" 6/6"	9		34	18				54	
5			6/6" 21/6" 23/6"									
10			11/6" 26/6" 50/3"									
	35.96' AMSL											
	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals		17/6" 50/6"	28							34	
15												
	-color changes to tan and gray with sand partings		10/6" 17/6" 22/6"									
20	-with ferrous stains		4/6" 8/6" 13/6"									
25	-color changes to reddish tan		10/6" 18/6" 21/6"	22		31	10				29	
30	-color changes to reddish brown and tan		6/6" 8/6" 12/6"									
			8/6" 8/6" 12/6"									
35												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/27/2016
DATE BORING COMPLETED: 07/28/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 3

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7"
W 97° 49' 17.0"
SURFACE ELEVATION: 48.46' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals 12.46' AMSL											
	Very stiff to hard tan FAT CLAY with SAND (CH), slickensided, with calcareous nodules	(P) 4.50+		29	89						79	
40												
	-color changes to tan and reddish brown with gypsum crystals and ferrous stains		8/6" 12/6" 15/6"									
45	-color changes to tan, gray, and reddish brown	(P) 4.50+										
50	-color changes to tan and reddish brown		4/6" 9/6" 10/6"	30		73	51				82	
		(P) 4.50+										
55												
	-color changes to tan and gray	(P) 4.50+										
60												
		(P) 4.50+		26	94			0.61	2		81	
65	-color changes to tan, red, and brown	(P) 4.00										
	-color changes to tan and gray	(P) 4.50+										
70												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/27/2016
DATE BORING COMPLETED: 07/28/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7" W 97° 49' 17.0"
SURFACE ELEVATION: 48.46' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	Very stiff to hard tan and gray FAT CLAY with SAND (CH), slickensided with gypsum crystals and calcareous nodules -24.54' AMSL											
	Medium dense to dense tan CLAYEY SAND (SC) with calcareous nodules	(P) 0.75		21		24	8				24	
75												
	-with gypsum crystals and ferrous stains		5/6" 10/6" 13/6"									
80			13/6" 20/6" 20/6"									
	-34.04' AMSL											
	Bottom @ 82.5'											
85												
90												
95												
100												
105												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/27/2016
DATE BORING COMPLETED: 07/28/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: 64.51' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to very dense tan CLAYEY SAND (SC) with gypsum crystals		2/6" 7/6" 9/6"									
5	-color changes to dark gray and gray with trace gravel		7/6" 11/6" 9/6"	16							47	
	-color changes to tan and light gray sand partings		27/6" 50/6"									
10												
	-color changes to tan and white with trace caliche		50/5"									
15	48.01' AMSL											
	Dense to very dense tan and white POORLY GRADED SAND with SILT (SP-SM), and trace caliche		17/6" 48/6" 50/3"	11		35	8				12	
20			17/6" 21/6" 27/6"									
25	-color changes to light gray and tan with gypsum crystals and ferrous stains		15/6" 17/6" 32/6"									
	36.01' AMSL											
	Medium dense to dense gray and white CLAYEY SAND (SC) with gypsum crystals		14/6" 22/6" 26/6"	42							20	
30												
	-color changes to tan		13/6" 21/6" 22/6"									
35												

COMPLETION DEPTH: 86 ft
DATE BORING STARTED: 08/05/2016
DATE BORING COMPLETED: 08/05/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: 64.51' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense to dense reddish tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains		6/6" 9/6" 12/6"									
40	-color changes to tan and reddish tan		8/6" 16/6" 18/6"									
	20.01' AMSL											
45	Stiff to very stiff reddish tan LEAN CLAY with SAND (CL), slickensided, with ferrous stains		9/6" 12/6" 18/6"	29		43	24				79	
	-color changes to reddish tan and tan with gypsum crystals		5/6" 6/6" 9/6"									
50	12.51' AMSL											
	Stiff to very stiff LEAN CLAY (CL), slickensided, with ferrous stains	(P) 2.00		40	79			1.06	3		96	
55	-color changes to reddish brown and tan with gypsum crystals	(P) 3.50										
60		(P) 4.00		34	87							
	-0.51' AMSL											
65	Very stiff to hard tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+		32	42	64	33	2.57	2		95	
70	-color changes to tan and reddish brown		7/6" 12/6" 14/6"									

COMPLETION DEPTH: 86 ft
DATE BORING STARTED: 08/05/2016
DATE BORING COMPLETED: 08/05/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9" W 97° 49' 11.3"
SURFACE ELEVATION: 64.51' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard tan and reddish brown FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+										
			-color changes to tan and light gray											
75			-with layers of calcareous nodules		9/6" 10/6" 21/6"									
			-15.49' AMSL											
80			Very stiff to hard tan FAT CLAY with SAND (CH) with gypsum crystals and ferrous stains	(P) 4.50+		18	106			3.57	3		77	
			-color changes to tan and white	(P) 4.50+										
85			-21.49' AMSL											
			Bottom @ 86'											
90														
95														
100														
105														

COMPLETION DEPTH: 86 ft
DATE BORING STARTED: 08/05/2016
DATE BORING COMPLETED: 08/05/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4"
W 97° 49' 11.4"
SURFACE ELEVATION: 61.14' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense dark gray, gray, and light gray CLAYEY SAND (SC) with trace of organics		2/6" 5/6" 6/6"									
		(P) 4.50+		15	112			2.53	6		42	
	57.14' AMSL											
5	Very stiff to hard gray and light gray SANDY LEAN SILTY CLAY (CL-ML) with calcareous nodules	(P) 4.50+		15	115	21	7				59	
		(P) 4.50+		14	114			6.13	4		62	
	-color changes to light gray											
	-color changes to light gray and tan		4/6" 12/6" 16/6"									
10	-color changes to white and light gray		11/6" 18/6" 16/6"									
	-becomes stiff		5/6" 6/6" 8/6"									
	46.64' AMSL											
15	Medium dense to dense white and light gray SILTY SAND (SM) with calcareous nodules		4/6" 6/6" 8/6"	17		38	7				31	
			4/6" 10/6" 19/6"									
	-color changes to light gray and tan with ferrous stains											
			23/6" 50/5"									
20												
			23/6" 50/4"									
	-color changes to light gray		27/6" 35/6" 50/4"	22							25	
25			5/6" 37/6" 45/6"									
			20/6" 39/6" 37/6"									
			8/6" 12/6" 9/6"	26		39	2				28	
	-becomes medium dense											
30												
			4/6" 12/6" 10/6"	33							39	
			5/6" 6/6" 10/6"									
	-color changes to tan and marine green		3/6"									
35												

COMPLETION DEPTH: 43 ft
DATE BORING STARTED: 06/22/2016
DATE BORING COMPLETED: 06/22/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4" W 97° 49' 11.4"
SURFACE ELEVATION: 61.14' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense tan and marine green SILTY SAND (SM) with sand lenses and trace organics 25.14' AMSL		8/6" 13/6"									
	Hard tan and light gray LEAN CLAY (CL)	(P) 4.50+										
		(P) 4.50+		30	91	40	17	0.93	1		91	
40		(P) 4.50+										
	18.14' AMSL	(P) 4.50+										
	Bottom @ 43'											
45												
50												
55												
60												
65												
70												

COMPLETION DEPTH: 43 ft
DATE BORING STARTED: 06/22/2016
DATE BORING COMPLETED: 06/22/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5" W 97° 48' 57.2"
SURFACE ELEVATION: 64.50' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense tan and brown CLAYEY SAND (SC) with trace caliche		5/6" 8/6" 7/6"									
5	-color changes to reddish brown with ferrous stains		5/6" 8/6" 5/6"	12		31	17				38	
	56.50' AMSL											
8	Very stiff to hard reddish tan SANDY LEAN CLAY (CL) with gypsum crystals	(P) 4.50+		14	117			2.22	3		52	
10												
13	-color changes to reddish tan and tan with ferrous stains		5/6" 10/6" 12/6"									
15	-color changes to reddish tan	(P) 4.50+		17	109	42	25					
20	-color changes to reddish tan and tan	(P) 4.50+										
	40.50' AMSL											
24	Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains	(P) 4.50+		17	104			1.29	3		40	
25												
28	-color changes to reddish tan		4/6" 7/6" 9/6"									
30												
33			8/6" 13/6" 20/6"									
35												

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: 64.50' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	28.00' AMSL Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains											
	Hard tan and light gray FAT CLAY with SAND (CH), gypsum crystals, and ferrous stains		17/6" 26/6" 30/6"	25		109	72				77	
40	-color changes to tan and reddish brown		8/6" 15/6" 24/6"									
45	-with sand partings		10/6" 16/6" 16/6"									
	16.00' AMSL Stiff to hard reddish brown and tan FAT CLAY (CH) with gypsum crystals and ferrous stains		4/6" 7/6" 10/6"	34							96	
50	-becomes slickensided with sand layers	(P) 2.00										
55	-color changes to tan		4/6" 7/6" 10/6"									
60		(P) 3.75		33	89	90	67	3.88	4		89	
65		(P) 4.25										
	-color changes to tan and reddish brown	(P) 4.50+										
70												

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5" W 97° 48' 57.2"
SURFACE ELEVATION: 64.50' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard reddish brown and tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains -8.00' AMSL	(P) 4.50+		32	89			2.68	1		95	
			Bottom @ 72.5'											
75														
80														
85														
90														
95														
100														
105														

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8" W 97° 49' 04.9"
SURFACE ELEVATION: 59.13' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Loose to medium dense dark gray and gray CLAYEY SAND (SC)											
	-with calcareous nodules		18/6" 20/6" 21/6"	10							36	
5	-color changes to light gray and tan		4/6" 5/6" 5/6"									
10	-color changes to tan		4/6" 5/6" 6/6"	12		47	28				44	
15			2/6" 4/6" 6/6"									
20	-color changes to light gray with ferrous stains		4/6" 10/6" 14/6"									
	-becomes very dense and color changes to light gray and tan		15/6" 24/6" 50/6"	25							32	
25			12/6" 14/6" 15/6"									
30	-becomes dense		5/6" 17/6" 27/6"									
35			4/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8"
W 97° 49' 04.9"
SURFACE ELEVATION: 59.13' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense light gray and tan CLAYEY SAND (SC)		7/6" 8/6"									
	-with sand seams, calcareous nodules, and ferrous staining		6/6" 10/6" 13/6"	21		47	30				35	
40												
	-color changes to reddish brown and light gray		4/6" 8/6" 10/6"									
45	13.13' AMSL											
	Stiff to very stiff reddish brown and light gray FAT CLAY (CH), slickensided, with ferrous staining	(P) 4.50+										
50												
	-with sand seams and calcareous nodules		4/6" 6/6" 8/6"	42							96	
55	-color changes to light gray with sand layers		11/6" 12/6" 14/6"									
	-becomes hard		11/6" 21/6" 26/6"	37		70	44				94	
60												
			7/6" 8/6" 9/6"									
65												
	-color changes to brown yellow, reddish brown, and light gray -8.87' AMSL		7/6" 10/6" 10/6"									
	Bottom @ 68'											
70												

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: 45.52' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Very dense light gray and tan SILTY SAND (SM)											
	-with ferrous staining		6/6" 16/6" 50/5"									
5			11/6" 50/5"	20		33	9				20	
10	-with calcareous nodules		23/6" 37/6" 50/6"									
	31.02' AMSL											
15	Very stiff to hard tan and light tan SANDY LEAN SILTY CLAY (CL-ML)		6/6" 7/6" 10/6"	31							52	
	-color changes to tan and light gray with ferrous staining		9/6" 17/6" 27/6"									
20			7/6" 12/6" 13/6"									
25	19.02' AMSL											
	Stiff to very stiff reddish brown and light gray FAT CLAY (CH) with calcareous nodules and ferrous staining		4/6" 5/6" 9/6"	33		56	39				99	
30	-color changes to light gray with sand layers		5/6" 7/6" 12/6"									
35			5/6"	34							86	

COMPLETION DEPTH: 48 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/25/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: 45.52' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Stiff to very stiff light gray and brownish tan FAT CLAY (CH) with sand seams, calcareous nodules, and ferrous staining		7/6" 12/6"									
40			4/6" 5/6" 7/6"									
	-color changes to light gray and reddish brown		6/6" 6/6" 9/6"									
45	-color changes to light gray		4/6" 5/6" 9/6"	35		80	51				86	
48	-2.48' AMSL Bottom @ 48'											

COMPLETION DEPTH: 48 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/25/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76"
W 97° 49' 12.19"
SURFACE ELEVATION: 41.64' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Very stiff to hard light gray SANDY FAT CLAY (CH) with ferrous stains and trace calcareous nodules		10/6" 18/6" 31/6"	17		50	19				55	
			20/6" 45/6" 50/4"									
5			3/6" 33/6" 50/5"									
			12/6" 27/6" 37/6"									
			17/6" 36/6" 50/3"	30							66	
10			18/6" 35/6" 50/3"									
			13/6" 33/6" 50/2"									
15	-color changes to light gray and tan		8/6" 14/6" 20/6"									
			7/6" 12/6" 19/6"									
			6/6" 10/6" 14/6"	28		60	40				57	
20			6/6" 11/6" 15/6"									
	-becomes stiff		5/6" 7/6" 8/6"									
25			6/6" 8/6" 13/6"									
			4/6" 9/6" 9/6"									
		(P) 4.50+		25	92	47	29					
30		(P) 4.50+										
	-color changes to brown and light gray and becomes stiff with sand layers		4/6" 5/6" 8/6"									
35			9/6"									

COMPLETION DEPTH: 58 ft
DATE BORING STARTED: 06/23/2016
DATE BORING COMPLETED: 06/23/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76" W 97° 49' 12.19"
SURFACE ELEVATION: 41.64' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Very stiff to hard reddish brown and light gray SANDY FAT CLAY (CH) with sand seams and layers	(P) 4.50+	8/6" 10/6"									
	3.64' AMSL											
	Stiff to hard light gray FAT CLAY (CH), slickensided, with calcareous nodules and ferrous stains	(P) 4.50+		42	78	100	72	2.95	2		93	
40	-color changes to reddish brown and light gray	(P) 4.50+										
		(P) 4.50+										
45	-color changes to tannish brown and light gray with trace organics	(P) 4.50+										
	-color changes to light gray		5/6" 6/6" 8/6"									
		(P) 4.50+		30	91			2.14	3		87	
50			6/6" 7/6" 7/6"									
			4/6" 5/6" 8/6"									
55	-color changes to tannish brown and light gray		5/6" 7/6" 9/6"									
	-color changes to light gray		6/6" 7/6" 9/6"									
	-16.36' AMSL											
	Bottom @ 58'											
60												
65												
70												

COMPLETION DEPTH: 58 ft
DATE BORING STARTED: 06/23/2016
DATE BORING COMPLETED: 06/23/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3"
W 97° 48' 57.3"
SURFACE ELEVATION: 60.26' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to dense tan and light gray CLAYEY SAND FILL with trace gravel		8/6" 9/6" 6/6"	18							33	
	-color changes to brown		40/6" 27/6" 19/6"									
	55.76' AMSL											
5	Medium dense to dense brown and reddish brown CLAYEY SAND (SC)		6/6" 7/6" 8/6"									
	-color changes to tan and gray with calcareous nodules		4/6" 5/6" 6/6"									
			5/6" 6/6" 8/6"	11		36	20				49	
10	-color changes to tan and light gray		4/6" 6/6" 7/6"									
	-color changes to light gray		7/6" 8/6" 11/6"									
15	-color changes to light gray and tan with ferrous stains		6/6" 12/6" 19/6"									
	-color changes to light gray		11/6" 19/6" 22/6"									
	41.76' AMSL											
20	Stiff to hard light gray SANDY LEAN CLAY (CL) with calcareous nodules and ferrous stains		3/6" 4/6" 5/6"	19							65	
			6/6" 9/6" 13/6"									
			8/6" 11/6" 20/6"									
25	-color changes to light tan and light gray	(P) 4.50+										
	-color changes to light gray	(P) 4.00										
			7/6" 11/6" 13/6"									
30	-color changes to light gray and tan	(P) 4.50+		19	102			1.14	7		50	
			12/6" 16/6" 20/6"									
35			8/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/20/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3" W 97° 48' 57.3"
SURFACE ELEVATION: 60.26' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Stiff to hard light gray and tan SANDY LEAN CLAY (CL) with ferrous stains 23.76' AMSL		12/6" 16/6"									
	Medium dense to dense light gray CLAYEY SAND (SC) with ferrous stains		7/6" 8/6" 11/6"									
			6/6" 11/6" 12/6"									
40			7/6" 10/6" 13/6"	25		69	51				45	
	15.76' AMSL		13/6" 19/6" 21/6"									
45	Dense light gray POORLY GRADED SAND with CLAY (SP- SC)		12/6" 21/6" 20/6"									
	12.26' AMSL		11/6" 16/6" 16/6"									
	Hard reddish brown and light gray FAT CLAY with SAND (CH)	(P) 4.50+										
50		(P) 4.50+		28	93			0.85	1		72	
	-becomes slickensided with calcareous nodules	(P) 4.50+										
	-with ferrous stains	(P) 4.50+										
55		(P) 4.50+										
		(P) 4.50+										
60		(P) 4.50+										
	-becomes stiff		7/6" 7/6" 7/6"									
65	-6.24' AMSL											
	Medium dense light gray CLAYEY SAND (SC) with calcareous nodules and ferrous stains -7.74' AMSL		6/6" 10/6" 13/6"	20	102	61	45	1.91	5		46	
	Bottom @ 68'											
70												

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/20/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-40

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.97"
W 97° 49' 11.18"
SURFACE ELEVATION: 52.31' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 22 ft.
Wash Bored: 22 ft. to 33.75 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Loose to very dense light gray and gray SILTY SAND (SM) with trace caliche		4/6" 4/6" 6/6"									
	-color changes to light gray and tan with ferrous stains		5/6" 7/6" 11/6"	16		35	10				31	
5			7/6" 17/6" 17/6"									
	-color changes to light gray with calcareous nodules		12/6" 21/6" 34/6"									
	-color changes to light gray and white		12/6" 27/6" 50/3"	18							34	
10	-color changes to white		15/6" 50/3"									
	-color changes to light gray and white		25/6" 50/4"									
	37.81' AMSL											
15	Hard light gray FAT CLAY with SAND (CH), calcareous nodules, and ferrous stains		7/6" 26/6" 50/5"	22		70	41				80	
			5/6" 17/6" 28/6"									
			10/6" 30/6" 35/6"									
20	31.81' AMSL											
	Hard light gray SANDY FAT CLAY (CH) with calcareous nodules and ferrous stains		9/6" 25/6" 35/6"	31							59	
			16/6" 32/6" 50/5"									
25			16/6" 31/6" 50/5"									
	25.81' AMSL											
	Dense to very dense light gray CLAYEY SAND (SC) with calcareous nodules		8/6" 18/6" 27/6"	30		53	32				49	
30			6/6" 18/6" 50/6"									
			6/6" 20/6" 50/5"									
	18.81' AMSL		3/6" 40/6" 50/3"	16							30	
	Bottom @ 33.5'											
35												

COMPLETION DEPTH: 33.5 ft
DATE BORING STARTED: 06/21/2016
DATE BORING COMPLETED: 06/22/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'. At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8"
W 97° 49' 17.4"
SURFACE ELEVATION: 50.20' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Loose to medium dense gray CLAYEY SAND (SC) with calcareous nodules		4/6" 5/6" 5/6"	8							35	
5	-color changes to light gray		4/6" 5/6" 6/6"									
	41.70' AMSL											
	Stiff to very stiff gray SANDY FAT CLAY (CH)		5/6" 8/6" 11/6"	20		78	52				64	
10												
	-becomes hard and color changes to brown with interbedded sand seams		9/6" 17/6" 25/6"									
15	-color changes to brown and tan		7/6" 12/6" 14/6"									
20	-color changes to tan with sand layers		3/6" 4/6" 6/6"	36							64	
25	-color changes to brown with sand partings		5/6" 4/6" 6/6"									
	-color changes to brown and tan		6/6" 7/6" 8/6"	31		52	30				51	
30												
			4/6" 6/6" 6/6"									
35												

COMPLETION DEPTH: 62.5 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/20/2016
LOGGER: M. Anderson
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8" W 97° 49' 17.4"

SURFACE ELEVATION: 50.20' AMSL

DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
14.20' AMSL Stiff to very stiff gray SANDY FAT CLAY (CH)											
Very stiff brown FAT CLAY with SAND (CH)	(P) 3.25		27	92						77	
-color changes to brown and tan		6/6" 13/6" 11/6"									
		4/6" 9/6" 14/6"									
		6/6" 8/6" 9/6"	35		97	75				84	
-color changes to brown and gray		7/6" 9/6" 12/6"									
-color changes to gray	(P) 4.50+										
	(P) 3.50										
-12.30' AMSL											
Bottom @ 62.5'											

COMPLETION DEPTH: 62.5 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/20/2016
LOGGER: M. Anderson
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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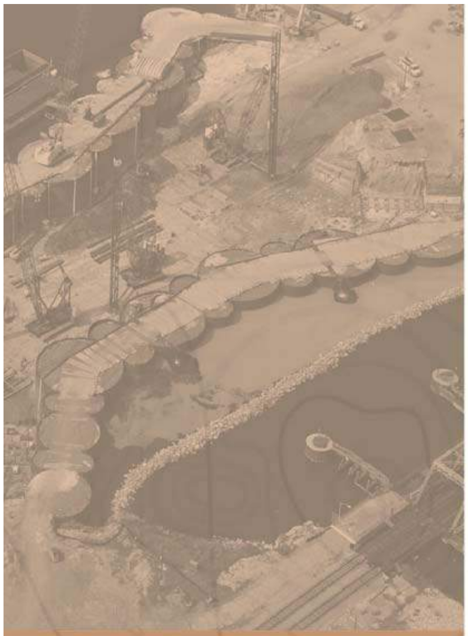
TOLUNAY-WONG ENGINEERS, INC.



For Permitting Purposes Only. Applies to boring logs in Appendix B of Tolunay-Wong Engineers, Inc. Geotechnical Engineering Study, City of Kingsville Municipal Solid Waste Landfill Expansion, Kingsville, Texas – Report No. 12788R1, sealed by Don R. Rokohl, P.E. on 8-30-18 altered to provide text showing surface elevations and the elevations of all contacts between soil and rock layers in the soil boring logs. No information or data was altered or changed from the original report other than the addition of text showing these elevations in Appendix B.

Tolunay-Wong Engineers, Inc.

GEOTECHNICAL ENGINEERING STUDY CITY OF KINGSVILLE MUNICIPAL SOLID WASTE LANDFILL EXPANSION KINGSVILLE, TEXAS

Prepared for:

Naismith/Hanson
Corpus Christi, Texas

Prepared by:

Tolunay-Wong Engineers, Inc.
826 South Padre Island Drive
Corpus Christi, Texas 78416

August 30, 2018

Project No. 16.53.042 / Report No. 12788R1

LOG OF BORING B-30

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion
CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0" W 97° 49' 23.1"
SURFACE ELEVATION: 45.99' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Dense to very dense tan and gray CLAYEY SAND (SC) with gypsum crystals		11/6" 23/6" 50/5"	16		42	17				37	
5	-color changes to tan with ferrous staining		34/6" 50/3"									
	-with sand partings		13/6" 50/3"									
10												
			7/6" 12/6" 20/6"	35							33	
15												
	-color changes to reddish tan and light gray		6/6" 15/6" 20/6"									
20	25.49' AMSL											
	Very stiff to hard reddish tan and light gray FAT CLAY (CH) with gypsum crystals		10/6" 17/6" 26/6"									
25	-color changes to reddish tan and tan		10/6" 18/6" 30/6"	25		50	28				92	
	-color changes to tan and reddish brown		8/6" 11/6" 16/6"									
30												
	-color changes to tan and gray		8/6" 12/6" 18/6"									
35												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/22/2016
DATE BORING COMPLETED: 07/23/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0"
W 97° 49' 23.1"
SURFACE ELEVATION: 45.99' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Very stiff to hard reddish tan and tan FAT CLAY (CH) with gypsum crystals and ferrous stains											
			10/6" 17/6" 21/6"	30							90	
40	-color changes to tan and reddish brown		9/6" 14/6" 21/6"									
45			13/6" 19/6" 29/6"									
	-becomes sandy 48' to 52'		8/6" 11/6" 13/6"	30							70	
50												
	-color changes to tan and becomes slickensided	(P) 4.50+		23	100	71	51				87	
55		(P) 4.50+										
60		(P) 4.50+										
	-becomes sandy and color changes to tan and gray	(P) 4.50+		26	97	54	30	1.75	3		69	
65												
	-color changes to tan and reddish brown with trace calcareous nodules	(P) 3.00										
70												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/22/2016
DATE BORING COMPLETED: 07/23/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-30

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 44.0" W 97° 49' 23.1"
SURFACE ELEVATION: 45.99' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	Very stiff to hard tan and reddish brown FAT CLAY (CH) with calcareous nodules -26.01' AMSL											
	Very dense tan CLAYEY SAND (SC) with calcareous nodules		16/6" 43/6" 50/5"	17							17	
75	-30.01' AMSL											
	Very stiff to hard tan and gray FAT CLAY (CH) with ferrous staining		10/6" 11/6" 17/6"									
80	-becomes slickensided with ferrous staining	(P) 4.50+										
	-36.51' AMSL											
	Bottom @ 82.5'											
85												
90												
95												
100												
105												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/22/2016
DATE BORING COMPLETED: 07/23/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 10'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: 58.37' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to very dense gray CLAYEY SAND (SC)		4/6" 5/6" 7/6"									
	-with calcareous nodules and sand pockets		10/6" 22/6" 18/6"									
5			4/6" 5/6" 6/6"	11							46	
			5/6" 6/6" 8/6"									
			6/6" 8/6" 12/6"									
10	-with cemented sand layers		8/6" 27/6" 29/6"	27							22	
	-color changes to tan 43.87' AMSL		18/6" 32/6" 39/6"									
15	Very dense tan POORLY GRADED SAND with CLAY (SP-SC) and sand partings		36/6" 50/5"									
			12/6" 50/5"	15							9	
			45/6" 50/5"									
20			35/6" 50/4"									
			17/6" 26/6" 50/5"									
	34.87' AMSL		17/6" 38/6" 38/6"									
25	Hard reddish tan and light gray SANDY LEAN SILTY CLAY (CL-ML) with sand partings		13/6" 20/6" 31/6"	26		29	7				66	
			23/6" 34/6" 50/4"									
			12/6" 17/6" 50/5"									
30	-color changes to reddish tan and tan with ferrous stains		13/6" 32/6" 50/5"									
			7/6" 36/6" 39/6"									
			10/6" 21/6" 36/6"	25							62	
35			10/6" 18/6" 35/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/21/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-31

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.1"
W 97° 49' 24.3"
SURFACE ELEVATION: 58.37' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 68-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35–39	Hard reddish tan and tan SANDY LEAN CLAY (CL) with ferrous stains and laminated sands		17/6" 25/6" 35/6" 17/6" 13/6" 19/6" 7/6" 16/6" 17/6"									
39	18.87' AMSL											
39–44	Very stiff to hard reddish tan and tan FAT CLAY with SAND (CH) and ferrous stains		3/6" 7/6" 10/6" 9/6" 20/6" 27/6" 5/6" 14/6" 17/6"	37		59	36				76	
44–48	-with trace gypsum crystals and ferrous stains		10/6" 18/6" 21/6" 18/6" 23/6" 30/6" 6/6" 20/6" 21/6"	30							83	
48–53			9/6" 17/6" 19/6" 9/6" 18/6" 23/6" 11/6" 23/6" 26/6"									
53	-with calcareous nodules and ferrous stains	(P) 4.50+		32	91	83	50	4.14	2		87	
55		(P) 4.50+										
57		(P) 4.50+										
59		(P) 4.50+		34	87			2.88	2		83	
61	-with trace gypsum crystals and ferrous stains	(P) 4.50+										
63		(P) 4.50+										
65		(P) 4.50+										
67	-9.63' AMSL	(P) 4.50+										
68	Bottom @ 68'											

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/21/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 21'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7" W 97° 49' 17.0"
SURFACE ELEVATION: 48.46' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Stiff to hard tan and gray SANDY LEAN CLAY (CL) with gypsum crystals and trace organics		3/6" 5/6" 6/6"	9		34	18				54	
5			6/6" 21/6" 23/6"									
10			11/6" 26/6" 50/3"									
	35.96' AMSL											
	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals		17/6" 50/6"	28							34	
15	-color changes to tan and gray with sand partings		10/6" 17/6" 22/6"									
20	-with ferrous stains		4/6" 8/6" 13/6"									
25	-color changes to reddish tan		10/6" 18/6" 21/6"	22		31	10				29	
30	-color changes to reddish brown and tan		6/6" 8/6" 12/6"									
35			8/6" 8/6" 12/6"									

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/27/2016
DATE BORING COMPLETED: 07/28/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7" W 97° 49' 17.0"
SURFACE ELEVATION: 48.46' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense to dense reddish tan and gray CLAYEY SAND (SC) with gypsum crystals 12.46' AMSL											
	Very stiff to hard tan FAT CLAY with SAND (CH), slickensided, with calcareous nodules	(P) 4.50+		29	89						79	
40												
	-color changes to tan and reddish brown with gypsum crystals and ferrous stains		8/6" 12/6" 15/6"									
45	-color changes to tan, gray, and reddish brown	(P) 4.50+										
50	-color changes to tan and reddish brown		4/6" 9/6" 10/6"	30		73	51				82	
		(P) 4.50+										
55												
	-color changes to tan and gray	(P) 4.50+										
60												
		(P) 4.50+		26	94			0.61	2		81	
65	-color changes to tan, red, and brown	(P) 4.00										
	-color changes to tan and gray	(P) 4.50+										
70												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/27/2016
DATE BORING COMPLETED: 07/28/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-32

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 49.7" W 97° 49' 17.0"
SURFACE ELEVATION: 48.46' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 82.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	Very stiff to hard tan and gray FAT CLAY with SAND (CH), slickensided with gypsum crystals and calcareous nodules -24.54' AMSL											
	Medium dense to dense tan CLAYEY SAND (SC) with calcareous nodules	(P) 0.75		21		24	8				24	
75												
	-with gypsum crystals and ferrous stains		5/6" 10/6" 13/6"									
80			13/6" 20/6" 20/6"									
	-34.04' AMSL											
	Bottom @ 82.5'											
85												
90												
95												
100												
105												

COMPLETION DEPTH: 82.5 ft
DATE BORING STARTED: 07/27/2016
DATE BORING COMPLETED: 07/28/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 18' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 14'-7". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: 64.51' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to very dense tan CLAYEY SAND (SC) with gypsum crystals		2/6" 7/6" 9/6"									
5	-color changes to dark gray and gray with trace gravel		7/6" 11/6" 9/6"	16							47	
	-color changes to tan and light gray sand partings		27/6" 50/6"									
10	-color changes to tan and white with trace caliche		50/5"									
15	48.01' AMSL											
	Dense to very dense tan and white POORLY GRADED SAND with SILT (SP-SM), and trace caliche		17/6" 48/6" 50/3"	11		35	8				12	
20			17/6" 21/6" 27/6"									
25	-color changes to light gray and tan with gypsum crystals and ferrous stains		15/6" 17/6" 32/6"									
	36.01' AMSL											
30	Medium dense to dense gray and white CLAYEY SAND (SC) with gypsum crystals		14/6" 22/6" 26/6"	42							20	
35	-color changes to tan		13/6" 21/6" 22/6"									

COMPLETION DEPTH: 86 ft
DATE BORING STARTED: 08/05/2016
DATE BORING COMPLETED: 08/05/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9"
W 97° 49' 11.3"
SURFACE ELEVATION: 64.51' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense to dense reddish tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains		6/6" 9/6" 12/6"									
40	-color changes to tan and reddish tan		8/6" 16/6" 18/6"									
	20.01' AMSL											
45	Stiff to very stiff reddish tan LEAN CLAY with SAND (CL), slickensided, with ferrous stains		9/6" 12/6" 18/6"	29		43	24				79	
50	-color changes to reddish tan and tan with gypsum crystals		5/6" 6/6" 9/6"									
	12.51' AMSL											
	Stiff to very stiff LEAN CLAY (CL), slickensided, with ferrous stains	(P) 2.00		40	79			1.06	3		96	
55	-color changes to reddish brown and tan with gypsum crystals	(P) 3.50										
60		(P) 4.00		34	87							
	-0.51' AMSL											
65	Very stiff to hard tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains	(P) 4.50+		32	42	64	33	2.57	2		95	
70	-color changes to tan and reddish brown		7/6" 12/6" 14/6"									

COMPLETION DEPTH: 86 ft
DATE BORING STARTED: 08/05/2016
DATE BORING COMPLETED: 08/05/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-33

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 55.9" W 97° 49' 11.3"
SURFACE ELEVATION: 64.51' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 86-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70	Very stiff to hard tan and reddish brown FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains											
	-color changes to tan and light gray	(P) 4.50+										
75	-with layers of calcareous nodules		9/6" 10/6" 21/6"									
	-15.49' AMSL											
80	Very stiff to hard tan FAT CLAY with SAND (CH) with gypsum crystals and ferrous stains	(P) 4.50+		18	106			3.57	3		77	
	-color changes to tan and white	(P) 4.50+										
85	-21.49' AMSL											
	Bottom @ 86'											

COMPLETION DEPTH: 86 ft
DATE BORING STARTED: 08/05/2016
DATE BORING COMPLETED: 08/05/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 32'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-2". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4"
W 97° 49' 11.4"
SURFACE ELEVATION: 61.14' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense dark gray, gray, and light gray CLAYEY SAND (SC) with trace of organics		2/6" 5/6" 6/6"									
		(P) 4.50+		15	112			2.53	6		42	
	57.14' AMSL											
5	Very stiff to hard gray and light gray SANDY LEAN SILTY CLAY (CL-ML) with calcareous nodules	(P) 4.50+		15	115	21	7				59	
		(P) 4.50+		14	114			6.13	4		62	
	-color changes to light gray											
	-color changes to light gray and tan		4/6" 12/6" 16/6"									
10	-color changes to white and light gray		11/6" 18/6" 16/6"									
	-becomes stiff		5/6" 6/6" 8/6"									
	46.64' AMSL											
15	Medium dense to dense white and light gray SILTY SAND (SM) with calcareous nodules		4/6" 6/6" 8/6"	17		38	7				31	
	-color changes to light gray and tan with ferrous stains		4/6" 10/6" 19/6"									
			23/6" 50/5"									
20			23/6" 50/4"									
	-color changes to light gray		27/6" 35/6" 50/4"	22							25	
25			5/6" 37/6" 45/6"									
			20/6" 39/6" 37/6"									
	-becomes medium dense		8/6" 12/6" 9/6"	26		39	2				28	
30			4/6" 12/6" 10/6"	33							39	
			5/6" 6/6" 10/6"									
35	-color changes to tan and marine green		3/6"									

COMPLETION DEPTH: 43 ft
DATE BORING STARTED: 06/22/2016
DATE BORING COMPLETED: 06/22/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-34

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 43.4" W 97° 49' 11.4"
SURFACE ELEVATION: 61.14' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 30 ft.
Wash Bored: 30 ft. to 43 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense tan and marine green SILTY SAND (SM) with sand lenses and trace organics 25.14' AMSL		8/6" 13/6"									
	Hard tan and light gray LEAN CLAY (CL)	(P) 4.50+										
		(P) 4.50+		30	91	40	17	0.93	1		91	
40		(P) 4.50+										
	18.14' AMSL	(P) 4.50+										
	Bottom @ 43'											

COMPLETION DEPTH: 43 ft
DATE BORING STARTED: 06/22/2016
DATE BORING COMPLETED: 06/22/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 31' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 28'-4". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5" W 97° 48' 57.2"
SURFACE ELEVATION: 64.50' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense tan and brown CLAYEY SAND (SC) with trace caliche		5/6" 8/6" 7/6"									
5	-color changes to reddish brown with ferrous stains		5/6" 8/6" 5/6"	12		31	17				38	
	56.50' AMSL											
	Very stiff to hard reddish tan SANDY LEAN CLAY (CL) with gypsum crystals	(P) 4.50+		14	117			2.22	3		52	
10												
	-color changes to reddish tan and tan with ferrous stains		5/6" 10/6" 12/6"									
15	-color changes to reddish tan	(P) 4.50+		17	109	42	25					
20	-color changes to reddish tan and tan	(P) 4.50+										
	40.50' AMSL											
25	Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains	(P) 4.50+		17	104			1.29	3		40	
	-color changes to reddish tan		4/6" 7/6" 9/6"									
30												
			8/6" 13/6" 20/6"									
35												

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5"
W 97° 48' 57.2"
SURFACE ELEVATION: 64.50' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	28.00' AMSL Medium dense to dense reddish tan and tan CLAYEY SAND (SC) with gypsum crystals and ferrous stains											
	Hard tan and light gray FAT CLAY with SAND (CH), gypsum crystals, and ferrous stains		17/6" 26/6" 30/6"	25		109	72				77	
40	-color changes to tan and reddish brown		8/6" 15/6" 24/6"									
45	-with sand partings		10/6" 16/6" 16/6"									
	16.00' AMSL Stiff to hard reddish brown and tan FAT CLAY (CH) with gypsum crystals and ferrous stains		4/6" 7/6" 10/6"	34							96	
50	-becomes slickensided with sand layers	(P) 2.00										
55	-color changes to tan		4/6" 7/6" 10/6"									
60		(P) 3.75		33	89	90	67	3.88	4		89	
65		(P) 4.25										
70	-color changes to tan and reddish brown	(P) 4.50+										

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-35

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 50.5" W 97° 48' 57.2"
SURFACE ELEVATION: 64.50' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 72.5-ft.
Wash Bored: -- to --

DEPTH (ft)	SAMPLE TYPE	SYMBOL/USCS	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
70			Very stiff to hard reddish brown and tan FAT CLAY (CH), slickensided, with gypsum crystals and ferrous stains -8.00' AMSL	(P) 4.50+		32	89			2.68	1		95	
			Bottom @ 72.5'											
75														
80														
85														
90														
95														
100														
105														

COMPLETION DEPTH: 72.5 ft
DATE BORING STARTED: 07/29/2016
DATE BORING COMPLETED: 07/29/2016
LOGGER: J. Gonzalez
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 34' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 30'-9". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8" W 97° 49' 04.9"
SURFACE ELEVATION: 59.13' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Loose to medium dense dark gray and gray CLAYEY SAND (SC)											
	-with calcareous nodules		18/6" 20/6" 21/6"	10							36	
5												
	-color changes to light gray and tan		4/6" 5/6" 5/6"									
10	-color changes to tan		4/6" 5/6" 6/6"	12		47	28				44	
15			2/6" 4/6" 6/6"									
	-color changes to light gray with ferrous stains		4/6" 10/6" 14/6"									
20												
	-becomes very dense and color changes to light gray and tan		15/6" 24/6" 50/6"	25							32	
25			12/6" 14/6" 15/6"									
30	-becomes dense		5/6" 17/6" 27/6"									
35			4/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-36

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 56.8" W 97° 49' 04.9"
SURFACE ELEVATION: 59.13' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 22-ft.
Wash Bored: 22-ft. to 68-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Medium dense light gray and tan CLAYEY SAND (SC)		7/6" 8/6"									
	-with sand seams, calcareous nodules, and ferrous staining		6/6" 10/6" 13/6"	21		47	30				35	
40												
	-color changes to reddish brown and light gray		4/6" 8/6" 10/6"									
45	13.13' AMSL											
	Stiff to very stiff reddish brown and light gray FAT CLAY (CH), slickensided, with ferrous staining	(P) 4.50+										
50	-with sand seams and calcareous nodules		4/6" 6/6" 8/6"	42							96	
55	-color changes to light gray with sand layers		11/6" 12/6" 14/6"									
	-becomes hard		11/6" 21/6" 26/6"	37		70	44				94	
60												
			7/6" 8/6" 9/6"									
65												
	-color changes to brown yellow, reddish brown, and light gray -8.87' AMSL		7/6" 10/6" 10/6"									
	Bottom @ 68'											
70												

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 23' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 18'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1"
W 97° 49' 17.6"
SURFACE ELEVATION: 45.52' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Very dense light gray and tan SILTY SAND (SM)											
	-with ferrous staining		6/6" 16/6" 50/5"									
5												
			11/6" 50/5"	20		33	9				20	
10	-with calcareous nodules		23/6" 37/6" 50/6"									
	31.02' AMSL											
15	Very stiff to hard tan and light tan SANDY LEAN SILTY CLAY (CL-ML)		6/6" 7/6" 10/6"	31							52	
	-color changes to tan and light gray with ferrous staining		9/6" 17/6" 27/6"									
20												
			7/6" 12/6" 13/6"									
25	19.02' AMSL											
	Stiff to very stiff reddish brown and light gray FAT CLAY (CH) with calcareous nodules and ferrous staining		4/6" 5/6" 9/6"	33		56	39				99	
30	-color changes to light gray with sand layers		5/6" 7/6" 12/6"									
35			5/6"	34							86	

COMPLETION DEPTH: 48 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/25/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-37

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 26' 57.1" W 97° 49' 17.6"
SURFACE ELEVATION: 45.52' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 12-ft.
Wash Bored: 12-ft. to 48-ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Stiff to very stiff light gray and brownish tan FAT CLAY (CH) with sand seams, calcareous nodules, and ferrous staining		7/6" 12/6"									
			4/6" 5/6" 7/6"									
	-color changes to light gray and reddish brown		6/6" 6/6" 9/6"									
	-color changes to light gray		4/6" 5/6" 9/6"	35		80	51				86	
48	-2.48' AMSL Bottom @ 48'											

COMPLETION DEPTH: 48 ft
DATE BORING STARTED: 06/24/2016
DATE BORING COMPLETED: 06/25/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 15' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 9'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76"
W 97° 49' 12.19"
SURFACE ELEVATION: 41.64' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Very stiff to hard light gray SANDY FAT CLAY (CH) with ferrous stains and trace calcareous nodules		10/6" 18/6" 31/6"	17		50	19				55	
			20/6" 45/6" 50/4"									
5			3/6" 33/6" 50/5"									
			12/6" 27/6" 37/6"									
			17/6" 36/6" 50/3"	30							66	
10			18/6" 35/6" 50/3"									
			13/6" 33/6" 50/2"									
15	-color changes to light gray and tan		8/6" 14/6" 20/6"									
			7/6" 12/6" 19/6"									
			6/6" 10/6" 14/6"	28		60	40				57	
20			6/6" 11/6" 15/6"									
	-becomes stiff		5/6" 7/6" 8/6"									
25			6/6" 8/6" 13/6"									
			4/6" 9/6" 9/6"									
		(P) 4.50+		25	92	47	29					
30		(P) 4.50+										
	-color changes to brown and light gray and becomes stiff with sand layers		4/6" 5/6" 8/6"									
35			9/6"									

COMPLETION DEPTH: 58 ft
DATE BORING STARTED: 06/23/2016
DATE BORING COMPLETED: 06/23/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

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TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-38

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 03.76" W 97° 49' 12.19"
SURFACE ELEVATION: 41.64' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 10 ft.
Wash Bored: 10 ft. to 58 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Very stiff to hard reddish brown and light gray SANDY FAT CLAY (CH) with sand seams and layers	(P) 4.50+	8/6" 10/6"									
	3.64' AMSL											
	Stiff to hard light gray FAT CLAY (CH), slickensided, with calcareous nodules and ferrous stains	(P) 4.50+		42	78	100	72	2.95	2		93	
40	-color changes to reddish brown and light gray	(P) 4.50+										
		(P) 4.50+										
45	-color changes to tannish brown and light gray with trace organics	(P) 4.50+										
	-color changes to light gray		5/6" 6/6" 8/6"									
		(P) 4.50+		30	91			2.14	3		87	
50			6/6" 7/6" 7/6"									
			4/6" 5/6" 8/6"									
55	-color changes to tannish brown and light gray		5/6" 7/6" 9/6"									
	-color changes to light gray		6/6" 7/6" 9/6"									
	-16.36' AMSL											
	Bottom @ 58'											
60												
65												
70												

COMPLETION DEPTH: 58 ft
DATE BORING STARTED: 06/23/2016
DATE BORING COMPLETED: 06/23/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 11' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 5'-5". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3"
W 97° 48' 57.3"
SURFACE ELEVATION: 60.26' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Medium dense to dense tan and light gray CLAYEY SAND FILL with trace gravel		8/6" 9/6" 6/6"	18							33	
	-color changes to brown		40/6" 27/6" 19/6"									
	55.76' AMSL											
5	Medium dense to dense brown and reddish brown CLAYEY SAND (SC)		6/6" 7/6" 8/6"									
	-color changes to tan and gray with calcareous nodules		4/6" 5/6" 6/6"									
			5/6" 6/6" 8/6"	11		36	20				49	
10	-color changes to tan and light gray		4/6" 6/6" 7/6"									
	-color changes to light gray		7/6" 8/6" 11/6"									
15	-color changes to light gray and tan with ferrous stains		6/6" 12/6" 19/6"									
	-color changes to light gray		11/6" 19/6" 22/6"									
	41.76' AMSL											
	Stiff to hard light gray SANDY LEAN CLAY (CL) with calcareous nodules and ferrous stains		3/6" 4/6" 5/6"	19							65	
20			6/6" 9/6" 13/6"									
			8/6" 11/6" 20/6"									
25	-color changes to light tan and light gray	(P) 4.50+										
	-color changes to light gray	(P) 4.00										
			7/6" 11/6" 13/6"									
30	-color changes to light gray and tan	(P) 4.50+		19	102			1.14	7		50	
			12/6" 16/6" 20/6"									
35			8/6"									

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/20/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-39

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 01.3" W 97° 48' 57.3"
SURFACE ELEVATION: 60.26' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 26 ft.
Wash Bored: 26 ft. to 68 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	Stiff to hard light gray and tan SANDY LEAN CLAY (CL) with ferrous stains 23.76' AMSL		12/6" 16/6"									
	Medium dense to dense light gray CLAYEY SAND (SC) with ferrous stains		7/6" 8/6" 11/6"									
			6/6" 11/6" 12/6"									
40			7/6" 10/6" 13/6"	25		69	51				45	
	15.76' AMSL		13/6" 19/6" 21/6"									
45	Dense light gray POORLY GRADED SAND with CLAY (SP- SC)		12/6" 21/6" 20/6"									
	12.26' AMSL		11/6" 16/6" 16/6"									
	Hard reddish brown and light gray FAT CLAY with SAND (CH)	(P) 4.50+										
50		(P) 4.50+		28	93			0.85	1		72	
	-becomes slickensided with calcareous nodules	(P) 4.50+										
	-with ferrous stains	(P) 4.50+										
55		(P) 4.50+										
		(P) 4.50+										
60		(P) 4.50+										
	-becomes stiff		7/6" 7/6" 7/6"									
65	-6.24' AMSL											
	Medium dense light gray CLAYEY SAND (SC) with calcareous nodules and ferrous stains -7.74' AMSL		6/6" 10/6" 13/6"	20	102	61	45	1.91	5		46	
	Bottom @ 68'											
70												

COMPLETION DEPTH: 68 ft
DATE BORING STARTED: 06/20/2016
DATE BORING COMPLETED: 06/24/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 27' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 26'-6". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-40

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.97"
W 97° 49' 11.18"
SURFACE ELEVATION: 52.31' AMSL
DRILLING METHOD:
Dry Augered: 0 ft. to 22 ft.
Wash Bored: 22 ft. to 33.75 ft.

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Loose to very dense light gray and gray SILTY SAND (SM) with trace caliche		4/6" 4/6" 6/6"									
	-color changes to light gray and tan with ferrous stains		5/6" 7/6" 11/6"	16		35	10				31	
5			7/6" 17/6" 17/6"									
	-color changes to light gray with calcareous nodules		12/6" 21/6" 34/6"									
	-color changes to light gray and white		12/6" 27/6" 50/3"	18							34	
10	-color changes to white		15/6" 50/3"									
	-color changes to light gray and white 37.81' AMSL		25/6" 50/4"									
15	Hard light gray FAT CLAY with SAND (CH), calcareous nodules, and ferrous stains		7/6" 26/6" 50/5"	22		70	41				80	
			5/6" 17/6" 28/6"									
20	31.81' AMSL		10/6" 30/6" 35/6"									
	Hard light gray SANDY FAT CLAY (CH) with calcareous nodules and ferrous stains		9/6" 25/6" 35/6"	31							59	
			16/6" 32/6" 50/5"									
25	25.81' AMSL		16/6" 31/6" 50/5"									
	Dense to very dense light gray CLAYEY SAND (SC) with calcareous nodules		8/6" 18/6" 27/6"	30		53	32				49	
30			6/6" 18/6" 50/6"									
			6/6" 20/6" 50/5"									
	18.81' AMSL		3/6" 40/6" 50/3"	16							30	
35	Bottom @ 33.5'											

COMPLETION DEPTH: 33.5 ft
DATE BORING STARTED: 06/21/2016
DATE BORING COMPLETED: 06/22/2016
LOGGER: J. Garcia
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 21' below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'. At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 1

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville
Municipal Solid Waste Landfill
Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8"
W 97° 49' 17.4"
SURFACE ELEVATION: 50.20' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
0	Loose to medium dense gray CLAYEY SAND (SC) with calcareous nodules		4/6" 5/6" 5/6"	8							35	
5	-color changes to light gray		4/6" 5/6" 6/6"									
	41.70' AMSL											
10	Stiff to very stiff gray SANDY FAT CLAY (CH)		5/6" 8/6" 11/6"	20		78	52				64	
	-becomes hard and color changes to brown with interbedded sand seams		9/6" 17/6" 25/6"									
15	-color changes to brown and tan		7/6" 12/6" 14/6"									
20	-color changes to tan with sand layers		3/6" 4/6" 6/6"	36							64	
25	-color changes to brown with sand partings		5/6" 4/6" 6/6"									
30	-color changes to brown and tan		6/6" 7/6" 8/6"	31		52	30				51	
35			4/6" 6/6" 6/6"									

COMPLETION DEPTH: 62.5 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/20/2016
LOGGER: M. Anderson
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 1 of 2

TOLUNAY-WONG ENGINEERS, INC.

LOG OF BORING B-41

PROJECT: City of Kingsville Municipal Solid Waste Landfill Aerial Expansion

CLIENT: Naismith Engineering, Inc.

COORDINATES: N 27° 27' 09.8" W 97° 49' 17.4"
SURFACE ELEVATION: 50.20' AMSL
DRILLING METHOD:
Dry Augered: 0-ft. to 62.5-ft.
Wash Bored: -- to --

DEPTH (ft)	MATERIAL DESCRIPTION	(P) POCKET PEN (tsf) (T) TORVANE (psf)	STD. PENETRATION TEST (blows/ft)	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	COMPRESSIVE STRENGTH (tsf)	FAILURE STRAIN (%)	CONFINING PRESSURE (psi)	PASSING #200 SIEVE (%)	OTHER TESTS PERFORMED
35	14.20' AMSL Stiff to very stiff gray SANDY FAT CLAY (CH)											
	Very stiff brown FAT CLAY with SAND (CH)	(P) 3.25		27	92						77	
40	-color changes to brown and tan		6/6" 13/6" 11/6"									
45			4/6" 9/6" 14/6"									
50			6/6" 8/6" 9/6"	35		97	75				84	
	-color changes to brown and gray		7/6" 9/6" 12/6"									
55	-color changes to gray	(P) 4.50+										
60		(P) 3.50										
	-12.30' AMSL Bottom @ 62.5'											
65												
70												

COMPLETION DEPTH: 62.5 ft
DATE BORING STARTED: 07/20/2016
DATE BORING COMPLETED: 07/20/2016
LOGGER: M. Anderson
PROJECT NO.: 16.53.042

REMARKS: Free water was encounterd at an approximate depth of 19'-6" below existing grade during drilling operations. After a 10 to 15-minute waiting period, water was at a depth of 19'-3". At the completion of the boring, the open bore-hole was backfilled with cement-bentonite grout.

Page 2 of 2

TOLUNAY-WONG ENGINEERS, INC.

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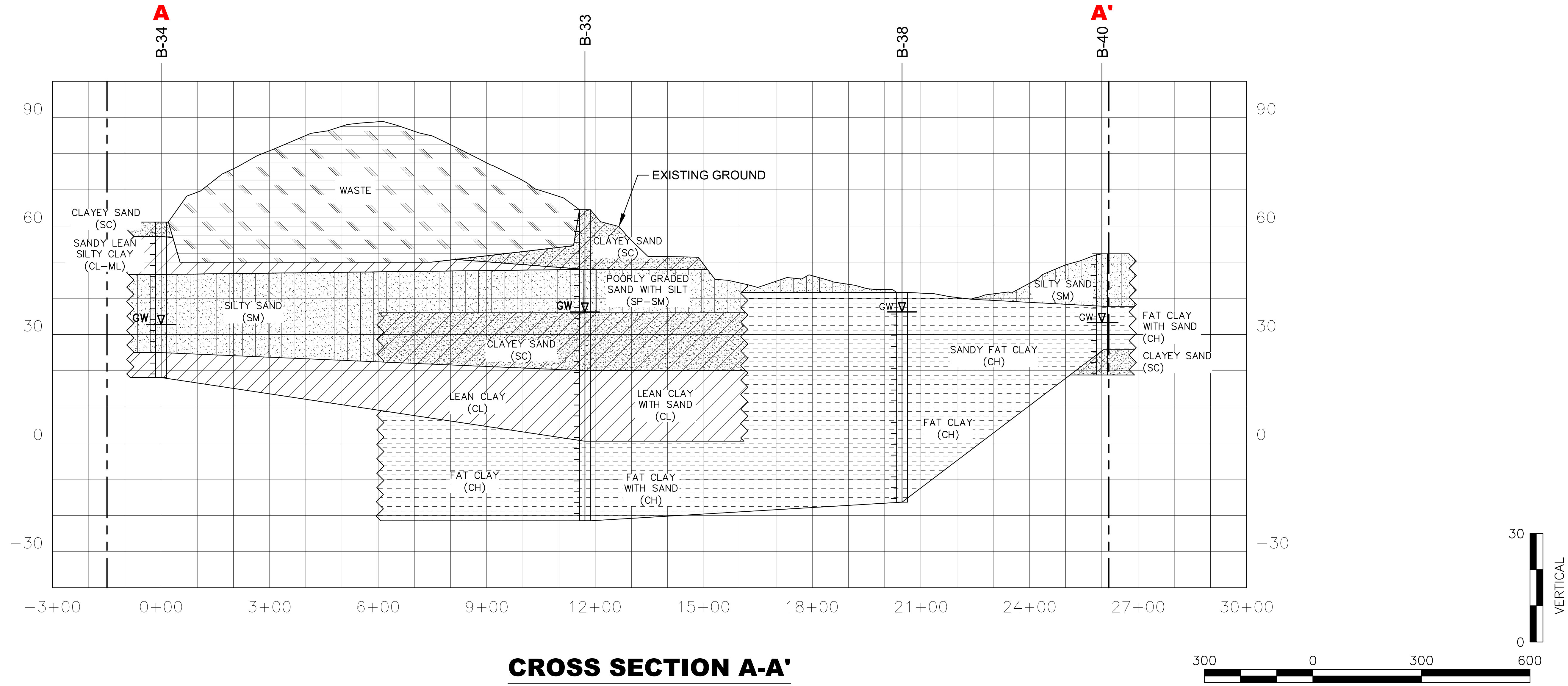

CROSS SECTION A-A'

LEGEND

WASTE	
LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL-ML)	
CLAYEY SAND (SC)	
SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP-SM)	
FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)	
GROUND WATER AFTER EQUILIBRIUM (GW)	
PERMIT BOUNDARY	

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION A-A'
KLEBERG COUNTY, TEXAS

16L0438 EXHIBIT IV

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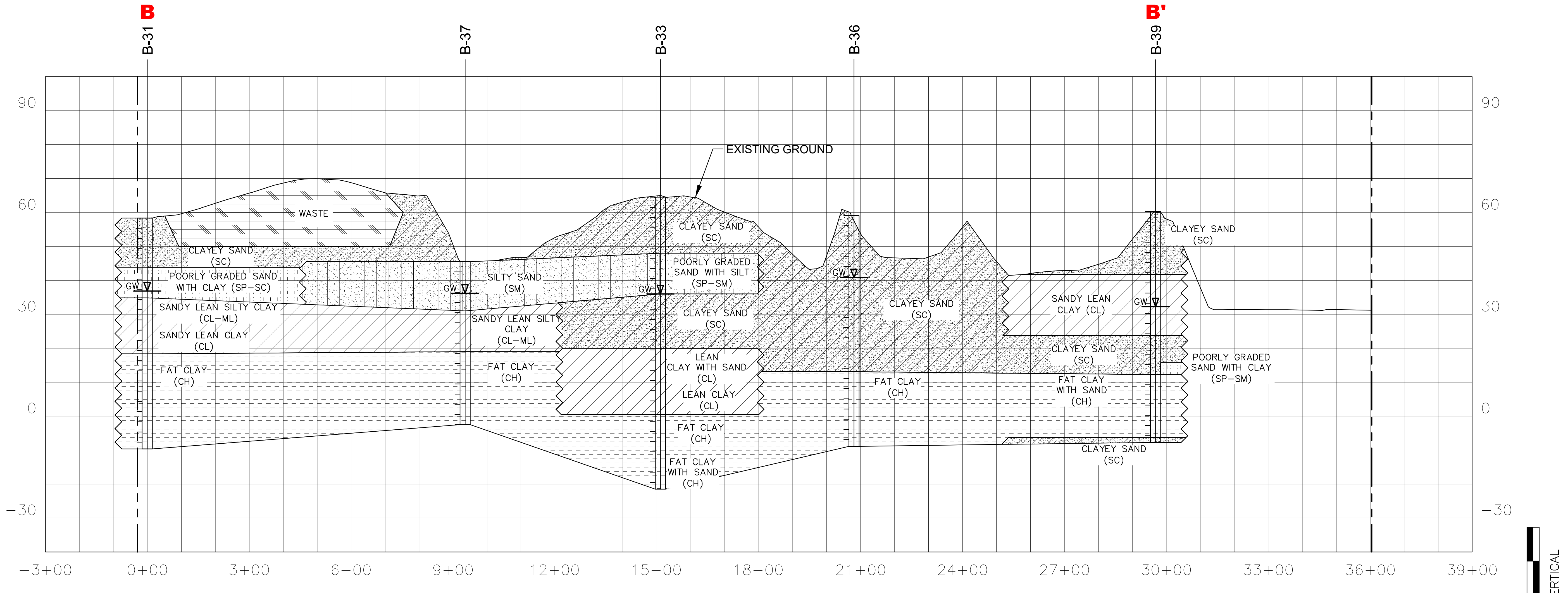

CROSS SECTION B-B'

LEGEND

- WASTE
- LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL-ML)
- CLAYEY SAND (SC)
- SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP-SM)
- FAT CLAY, SANDY FAT CLAY FAT CLAY WITH SAND (CH)
- POORLY GRADED SAND WITH CLAY (SP-SC)
- GROUND WATER AFTER EQUILIBRIUM (GW)
- PERMIT BOUNDARY

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION B-B'
KLEBERG COUNTY, TEXAS

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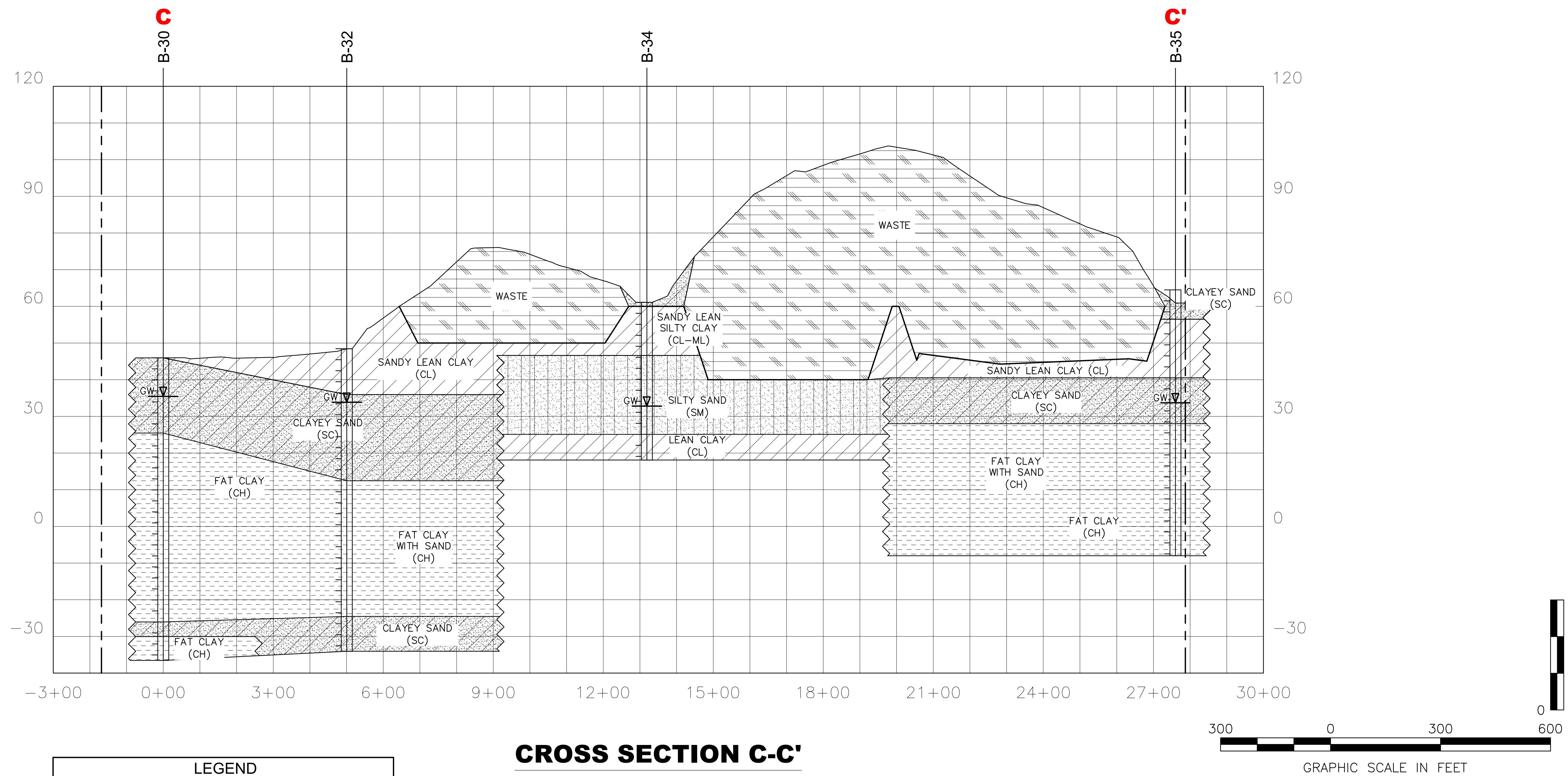

CROSS SECTION C-C'

LEGEND

- WASTE
- LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL-ML)
- CLAYEY SAND (SC)
- SILTY SAND, POORLY GRADED SAND WITH SILT (SM, SP-SM)
- FAT CLAY, SANDY FAT CLAY (CH)
- GROUND WATER AFTER EQUILIBRIUM (GW)
- PERMIT BOUNDARY

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION C-C'
KLEBERG COUNTY, TEXAS

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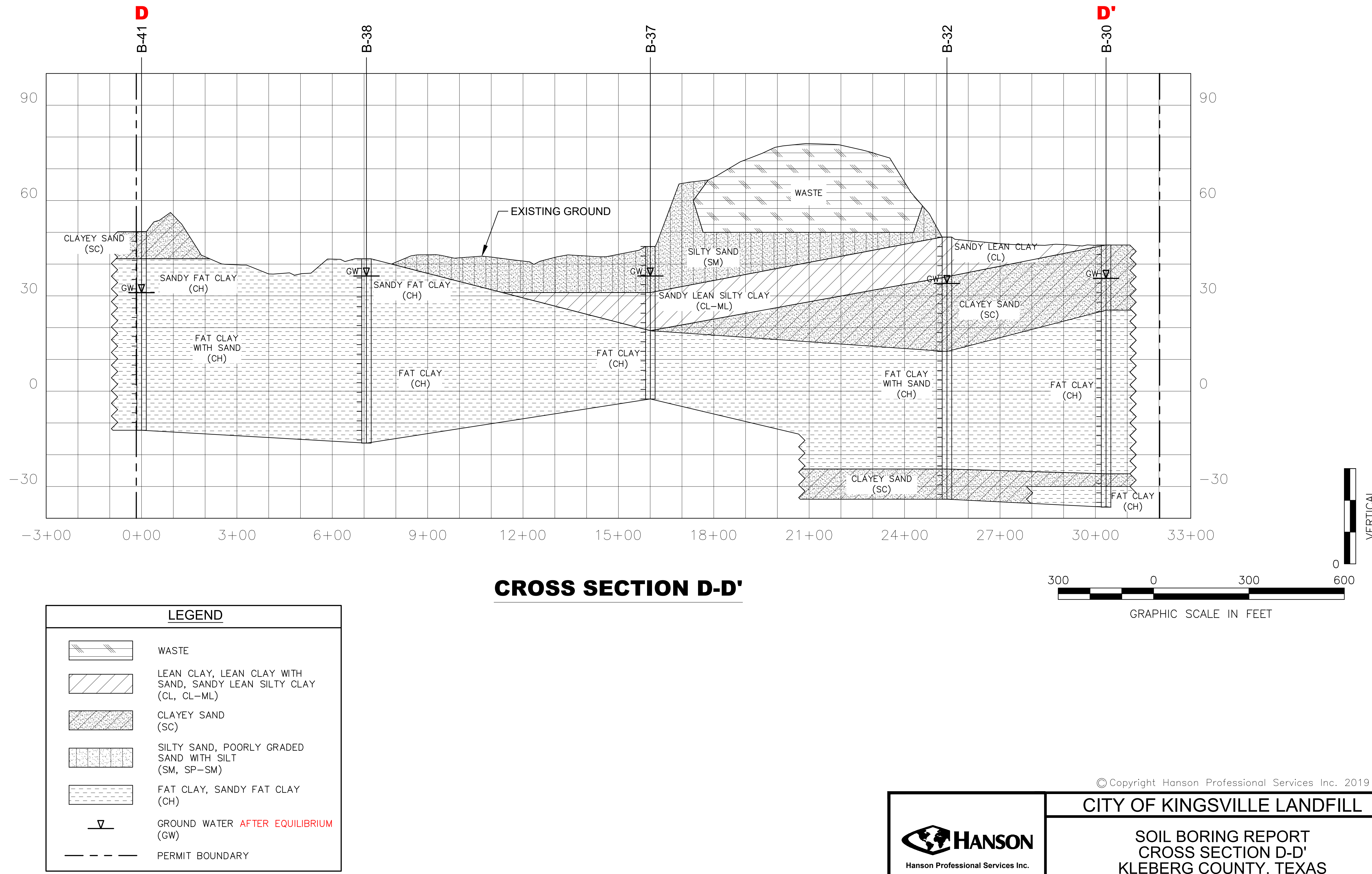

CROSS SECTION D-D'

HANSON Hanson Professional Services Inc. TBPE F-417 / TBPLS F-10039500 TBAE F-BR 2458 / TBPG F-50556	CITY OF KINGSVILLE LANDFILL SOIL BORING REPORT CROSS SECTION D-D' KLEBERG COUNTY, TEXAS
16L0438	EXHIBIT IV

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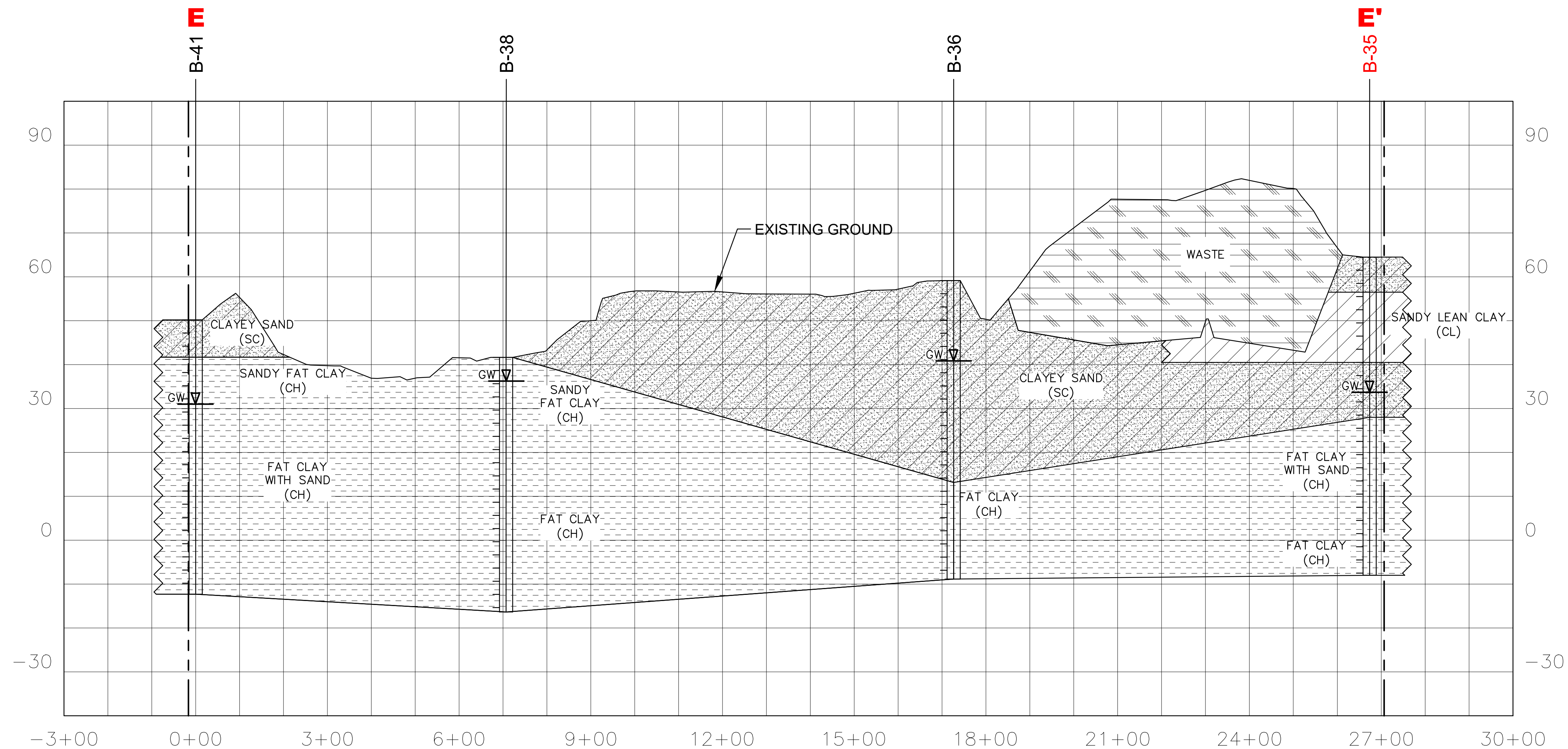
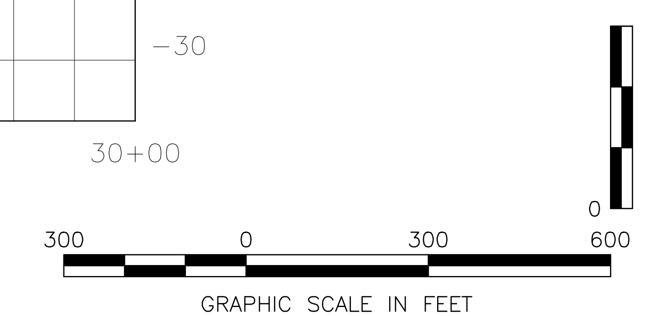


CROSS SECTION E-E'



LEGEND

(hatch)	WASTE
(hatch)	LEAN CLAY, LEAN CLAY WITH SAND, SANDY LEAN SILTY CLAY (CL, CL-ML)
(hatch)	CLAYEY SAND (SC)
(hatch)	FAT CLAY, SANDY FAT CLAY (CH)
▽	GROUND WATER AFTER EQUILIBRIUM (GW)
— — —	PERMIT BOUNDARY

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CITY OF KINGSVILLE LANDFILL

SOIL BORING REPORT
CROSS SECTION E-E'
KLEBERG COUNTY, TEXAS

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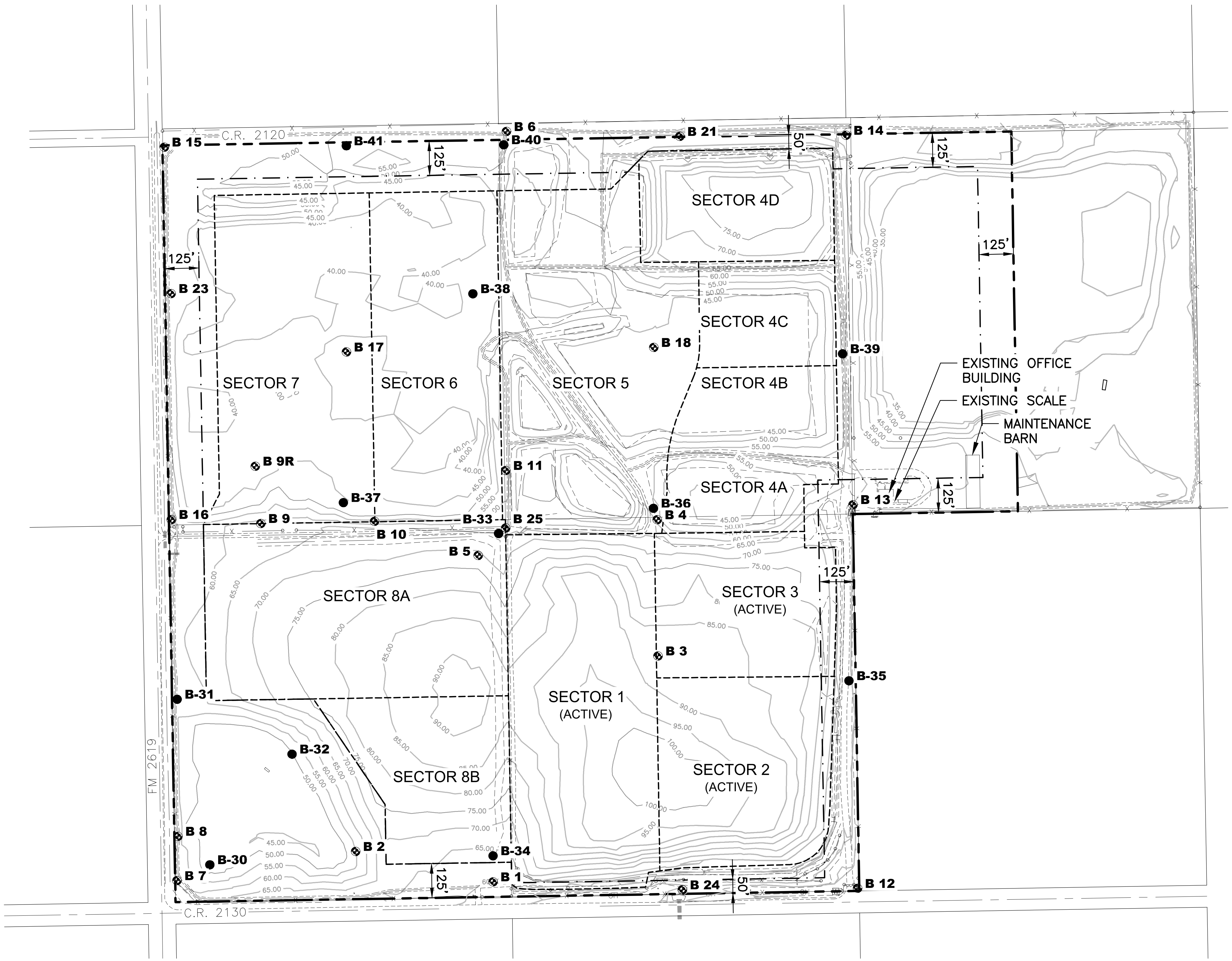

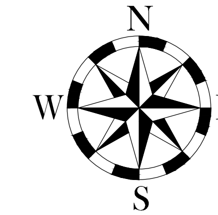

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GRAPHIC SCALE IN FEET

LEGEND:

- B 2 — PREVIOUS SOIL BORING LOCATION
- EXISTING FENCE
- 65.00 — EXISTING SURFACE CONTOUR
- SECTOR OUTLINE
- PERMIT BOUNDARY (175.89 ACRES)
- BUFFER ZONE
- B 32 — NEW SOIL BORING LOCATION

NOTE:

1. LOCATION OF EXISTING BORINGS #2,#5, ~~#7,#9 AND #25~~ AND ARE APPROXIMATED BASED UPON FIG. 5.16 BORING PLOT PLAN FROM PERMIT 235-B.

LOCATIONS OF PREVIOUS BORINGS & ELEVATIONS			
ID	LATITUDE	LONGITUDE	SURFACE ELEVATION
B-1	27.445056	-97.819611	59.25
B-2			52.64
B-3	27.447306	-97.817750	56.10
B-4	27.448667	-97.817750	58.01
B-5			60.54
B-6	27.452556	-97.819417	55.46
B-7	27.445528	-97.823139	61.05
B-8	27.445528	-97.823139	59.79
B-9	27.465000	-97.822250	62.51
B-9R	27.449222	-97.822250	41.41
B-10	27.448667	-97.820917	49.78
B-11	27.449167	-97.819444	60.20
B-12	27.444972	-97.815528	52.38
B-13	27.448806	-97.815556	59.13
B-14	27.452500	-97.815611	49.94
B-15	27.452417	-97.823250	48.39
B-16	27.448694	-97.823194	55.96
B-17	27.450361	-97.821222	41.35
B-18	27.450389	-97.817778	50.04
B-21	27.435833	-97.813222	52.41
B-23	27.450389	-97.807833	49.50
B-24	27.444972	-97.813583	47.38
B-25	27.448667	-97.811611	61.12

LOCATIONS OF NEW BORINGS & ELEVATIONS			
ID	LATITUDE	LONGITUDE	SURFACE ELEVATION
B-30	27.445558	-97.823058	45.99
B-31	27.447214	-97.823415	58.37
B-32	27.446659	-97.822130	48.46
B-33	27.448853	-97.819803	64.51
B-34	27.445632	-97.819885	61.14
B-35	27.447362	-97.815887	64.50
B-36	27.449097	-97.818067	59.13
B-37	27.449170	-97.821540	45.52
B-38	27.451251	-97.820077	41.64
B-39	27.450631	-97.815937	60.26
B-40	27.452738	-97.819722	52.31
B-41	27.452737	-97.821486	50.20

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

Hanson No. 16L0438
Filename
Scale 1"=400'
Date 02/12/2019

LAYOUT	DT	02/12/2019
DRAWN	DT	02/12/2019
REVIEWED	TAG	02/12/2019

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TBPE F-417
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TBAE F-BR 2458

Phone: (361) 814-9900
(800) 677-2831
www.hanson-inc.com
Offices Nationwide

PART III, ATTACHMENT 4
ATTACHMENT 2
SOIL BORING LOCATION MAP
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.4-2-1

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CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

ATTACHMENT 5

MONITOR WELL WATER LEVELS AND ANALYTICAL INFORMATION

FOR PERMIT PURPOSES ONLY

MW-1R Analytical Data

MW-1R	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	01/18	07/18
Groundwater elevation	33.09	33.15	33.24	32.62	32.05	31.68	30.50	29.87	30.93	32.23	34.24	35.19	37.28	35.37	35.70	33.85	36.00	34.30	36.41	36.35	35.10	32.84	31.62	29.93	28.65	28.14	27.94	27.67	27.73	27.65	27.97	31.17	31.09	32.98	33.38	32.51	31.04	30.39
Antimony	n/a	<0.003	0.0093	0.0096	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	n/a	0.0714	0.0404	0.0782	0.0508	0.0306	0.0579	0.0633	<0.010	0.0744	0.0757	0.075	0.0228	0.0885	0.0802	0.074	0.058	0.065	0.0504	n/a	0.0506	0.0526	0.0533	0.0521	0.0495	n/a	0.0427	n/a	0.0319	n/a	0.0434	0.0355	0.0378	0.038	0.0479	0.0423	0.051	0.0411
Barium	n/a	0.0439	0.0392	0.0483	0.0395	0.0382	0.0378	0.0392	0.0378	0.0355	0.0363	0.0492	0.11	0.002	0.0604	0.043	0.042	0.037	0.0315	n/a	0.0401	0.05	0.0527	0.0386	0.0523	n/a	0.0438	n/a	0.0393	n/a	0.0379	0.0402	0.0407	0.0409	0.0479	0.0454	0.0459	0.0484
Beryllium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0054	<0.005	<0.005	<0.005	0.002	<0.005	<0.005	<0.010	<0.010	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0052	<0.001	0.0027	<0.002	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	0.002	0.00384	0.003	<0.0045	<0.0045	<0.050	n/a	<0.050	<0.050	<0.050	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	n/a	<0.002	<0.002	<0.002	<0.002	0.0021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	0.00101	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.21	0.193	0.157	0.188	0.169	0.162	0.158	0.165	0.167	0.158	0.15	0.192	0.17	0.192	0.183
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																																						
pH	n/a	n/a	n/a	n/a	6.22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.95	6.81	7.26	7.43	8.21	7.29	7.14	7.23	6.94	7.06	7.06	7.07	7.17	7.11	7.27	7.33	6.92	7.21	7.16	7.19	7.12	7.61	7.04
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3130	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3040	3130	3310	3545	3504	3431	3595	3699	3574	3852	3673	3778	3692	3664	3692	3567	3789	3994	3825	4109	4103	4180	4115
Organic Constituents																																						
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050	0.0156	<0.050	<0.050	<0.050	<0.020	<0.050	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	n/a	<0.010	<0.010	<0.010	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.002	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	<0.020	<0.100	<0.020	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chlorid	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	n/a	<0.010	<0.010	<0.010	<0.005	<0.020	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	n/a	<0.040	<0.040	<0.040	<0.005	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.005	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.005	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	n/a	<0.010	<0.010	<0.010	<0.100	<0.010	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
All units mg/L unless otherwise noted																																						
n/a = Not Analyzed																																						

MW-6R Analytical Data

MW-6R	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10
Groundwater elevation	33.32	33.68	33.33	31.26	29.88	30.24	28.61	27.99	30.29	36.68	36.83	36.00	38.57	34.23	35.26	31.34	32.44	35.38
Antimony	n/a	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002
Arsenic	n/a	0.188	0.0791	0.143	0.0753	0.0761	0.0951	0.0904	<0.010	<0.010	0.214	0.195	0.186	0.176	0.205	0.16	0.17	0.18
Barium	n/a	0.0414	0.03	0.0419	0.0327	0.0297	0.0298	0.0306	0.0319	0.0263	0.042	0.052	0.323	0.0702	0.0753	0.037	0.033	0.033
Beryllium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Chromium	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	n/a	<0.002	<0.002	<0.002	<0.002	0.0021	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0045	<0.0045
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																		
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.7	7.82	8.21
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2085	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1760	4520	1550
Organic Constituents																		
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050	<0.050	<0.050	<0.050	<0.050
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane (ethyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
o-Dichlorobenzene (1,2-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
p-Dichlorobenzene (1,4-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1,1-Dichloroethane (ethylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane (ethylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane (Propylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone (methyl butyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040
Methyl iodide (iodomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane (methylchloroform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethylene (trichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-6R	1/11	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	38.25	38.09	33.89	30.20	28.41	26.16	24.72	25.26	25.16	24.36	23.84	27.02	27.38	33.00	32.07	36.02	34.08	32.18	30.05	29.59
Antimony	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.164	n/a	0.162	0.182	0.019	0.167	0.156	n/a	0.172	n/a	0.168	n/a	0.193	0.169	0.173	0.148	0.158	0.135	0.139	0.124
Barium	0.0306	n/a	0.0387	0.0462	0.0283	0.0273	0.0359	n/a	0.034	n/a	0.0363	n/a	0.021	0.0428	0.0425	0.0448	0.0476	0.0466	0.0685	0.0608
Beryllium	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.020	n/a	<0.020	<0.020	<0.02	<0.02	<0.02	n/a	<0.02	n/a	<0.02	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cobalt	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.050	n/a	<0.050	<0.050	<0.05	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.001	n/a	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	0.361	0.343	0.307	0.353	0.31	0.347	0.306	0.385	0.322	0.366	0.307	0.344	0.302	0.365	0.328
Zinc	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																				
pH	8.35	8.21	8.35	8.22	8.28	7.95	8.01	8.08	7.88	7.83	7.98	8.18	8.22	8.04	8.17	8.34	8.08	7.99	8.39	7.75
Specific Conductance umho/cm	1534	1504	1541	1562	1637	1922	1673	1727	1728	1669	1728	1871	1780	1865	1997	2067	2089	2315	2545	2730
Organic Constituents																				
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.100	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

All units mg/L unless otherwise noted
n/a = Not Analyzed

MW-8 Analytical Data

MW-8	5/01	8/01	11/01	3/02	5/02	10/02	1/03	4/03	7/03	2/04	5/04	7/04	10/04	1/05	4/05
Groundwater elevatior	31.00	29.78	30.59	30.78	30.38	31.43	33.43	27.95	31.49	33.08	33.68	33.62	31.62	31.19	31.07
Antimony	<0.001	<0.001	0.001	<0.001	<0.001	n/a	<0.003	<0.003	n/a	n/a	n/a	<0.003	n/a	n/a	n/a
Arsenic	0.023	0.019	0.022	0.025	0.017	n/a	0.0176	0.0241	0.0225	0.0187	n/a	0.0152	n/a	n/a	n/a
Barium	0.08	0.1	0.06	0.03	0.06	n/a	0.0792	0.0743	0.0858	0.0915	n/a	0.0933	n/a	n/a	n/a
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	n/a	n/a	n/a	<0.002	n/a	n/a	n/a
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a
Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	n/a	n/a
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	n/a	n/a
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	n/a	n/a	n/a	<0.002	n/a	n/a	n/a
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters															
pH	7.82	7.82	8.08	8.02	7.4	n/a	7.69	8.09	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Specific Conductance umho/cm	970	1080	1270	1130	1190	n/a	1114	885	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Organic Constituents															
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bromodichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Chlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Chloroethane (ethyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Chloroform (trichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dibromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2-Dibromo-3-Chloropropane (DBCP	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2-Dibromoethane (ethylene dibromide, EDE	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
o-Dichlorobenzene (1,2-dichlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
p-Dichlorobenzene (1,4-dichlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,1-Dichloroethane (ethylidene chloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2-Dichloroethane (ethylene dichloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2-Dichloropropane (Propylene dichloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Hexanone (methyl butyl ketone	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl ethyl ketone (MEK,2-butanone	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl iodide (iodomethane	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Styrene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,1,1-Trichloroethane (methylchloroform	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Trichloroethylene (trichloroethene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Trichlorofluoromethane (CFC-11	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vinyl acetate	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Vinyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a
All units mg/L unless otherwise noted															
n/a = Not Analyzed															

MW-8	7/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11	7/11	1/12	7/12
Groundwater elevatior	29.7	31.66	36.01	35.41	36.13	36.2	34	34.81	31.7	36.48	36.13	36.15	32.15	33.07	30.82	29.65
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	<0.005	<0.005
Arsenic	0.0225	<0.006	0.0287	0.0255	0.0271	0.0228	0.0211	0.0237	0.02	0.021	0.02	0.0179	n/a	0.0173	0.0209	0.169
Barium	0.105	0.0798	0.0723	0.094	0.111	0.11	0.152	0.0154	0.12	0.11	0.12	0.0942	n/a	0.105	0.115	0.0381
Beryllium	<0.001	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	<0.004	<0.004
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.020	n/a	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	0.0051	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015	<0.015	n/a	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0045	<0.0045	<0.0045	<0.050	n/a	<0.050	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																
pH	7.73	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.49	7.35	7.85	8.16	8.8	8.1	7.93	8.41
Specific Conductance umho/cm	938	n/a	n/a	n/a	n/a	n/a	n/a	n/a	850	990	3390	1025	1001	907	906.2	840.4
Organic Constituents																
Acetone	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDE	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	<0.100	<0.001
1,1-Dichloroethane (ethylidene chloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.001	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-8	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevatior	28.05	26.98	27.37	27.37	26.80	26.23	26.28	28.51	32.91	31.73	35.92	33.35	31.63	30.47	30.65
Antimony	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.0229	0.0209	n/a	0.0222	n/a	0.0165	n/a	0.0236	0.0187	0.0195	0.0158	0.0191	0.0146	0.0177	0.0177
Barium	0.0864	0.0896	n/a	0.0767	n/a	0.0825	n/a	0.0545	0.0926	0.105	0.112	0.144	0.14	0.147	0.131
Beryllium	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	0.143	0.133	0.0954	0.122	0.107	0.106	0.0982	0.124	0.125	0.142	0.127	0.139	0.146	0.149	0.15
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters															
pH	7.63	7.75	7.73	7.72	8.03	7.74	7.90	8.05	7.80	7.84	8.16	7.76	7.83	8.07	7.85
Specific Conductance umho/cm	1002	997.8	1087	1074	1040	1195	1246	1134	1083	1185	1025	1131	978.7	1262	1151
Organic Constituents															
Acetone	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDE	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-12 Analytical Data

MW-12	5/01	8/01	11/01	3/02	5/02	10/02	1/03	4/03	7/03	2/04	5/04	7/04	10/04	1/05	4/05	7/05
Groundwater elevation	31.03	29.99	29.97	31.18	30.5	29.58	31.95	33.77	31.98	32.85	33.28	33.28	32.35	31.74	31.42	30.35
Antimony	<0.001	0.00139	0.001	<0.001	<0.001	n/a	<0.003	<0.003	n/a	n/a	n/a	<0.003	n/a	n/a	n/a	<0.003
Arsenic	0.107	0.175	0.125	0.226	0.174	n/a	0.245	0.28	0.268	0.235	n/a	0.177	n/a	n/a	n/a	0.145
Barium	0.03	0.05	0.02	0.01	0.03	n/a	0.0819	0.0742	0.0711	0.0525	n/a	0.069	n/a	n/a	n/a	0.0799
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	n/a	n/a	n/a	<0.002	n/a	n/a	n/a	<0.001
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	<0.001
Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	n/a	n/a	<0.005
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	0.0025
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	0.003	0.002	0.003	0.001	0.002	n/a	<0.002	<0.002	<0.002	<0.002	n/a	0.0076	n/a	n/a	n/a	<0.002
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	<0.002	n/a	n/a	<0.002	n/a	n/a	n/a	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																
pH	7.00	7.08	7.3	7.23	7.13	n/a	7.98	7.35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.48
Specific Conductance umho/cm	8350	1080	6040	3940	4850	n/a	2872	3170	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3891
Organic Constituents																
Acetone	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050
Benzene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Bromochloromethane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Bromodichloromethane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Bromoform	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Chlorobenzene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Dibromochloromethane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
o-Dichlorobenzene (1,2-dichlorobenzene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
p-Dichlorobenzene (1,4-dichlorobenzene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020
1,1-Dichloroethane (ethylidene chloride	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,2-Dichloroethane (ethylene dichloride	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,2-Dichloropropane (Propylene dichloride	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
2-Hexanone (methyl butyl ketone	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050
Methyl ethyl ketone (MEK,2-butanone	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Methyl iodide (iodomethane	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010
Styrene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Toluene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Trichloroethylene (trichloroethene	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Vinyl acetate	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Vinyl chloride	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Xylenes	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005

MW-12	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11	7/11	10/11	1/12	7/12
Groundwater elevation	29.57	30.34	31.52	33.41	34.82	36.61	34.67	35.12	32.93	33.08	34.98	37.02	36.80	34.95	33.49	32.30	30.72
Antimony	n/a	<0.003	<0.003	<0.003	<0.003	<0.003	0.002	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	n/a	<0.005	<0.005
Arsenic	n/a	<0.006	<0.006	0.225	0.22	0.223	0.184	0.156	0.12	0.12	0.09	0.0929	n/a	0.0903	n/a	0.134	0.125
Barium	n/a	0.0876	0.0908	0.0432	0.0919	0.101	0.129	0.161	0.2	0.28	0.36	0.0228	n/a	0.209	0.2	0.205	0.189
Beryllium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	n/a	<0.004	<0.004
Cadmium	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	n/a	<0.002	<0.002
Chromium	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00346	<0.010	<0.010	<0.010	<0.020	n/a	<0.020	n/a	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	n/a	<0.001	<0.001	<0.001	0.0012	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015	<0.015	n/a	<0.015	n/a	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	n/a	<0.002	<0.002	0.0043	<0.002	<0.002	<0.002	0.00213	0.005	0.007	<0.0045	<0.050	n/a	<0.050	n/a	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	n/a	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.893	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																	
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.13	6.94	7.23	7.29	7.7	7.76	7.71	7.37	7.16
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5900	6800	3450	9065	9697	7810	7844	6176	5600
Organic Constituents																	
Acetone	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	n/a	<0.020	<0.020
Acrylonitrile	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050
Benzene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Bromochloromethane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Bromodichloromethane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Bromoform	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Carbon Disulfide	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Carbon tetrachloride	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Chlorobenzene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Chloroethane (ethyl chloride)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Chloroform (trichloromethane)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Dibromochloromethane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
trans-1,4-Dichloro-2-butene	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	n/a	<0.100	<0.001
1,1-Dichloroethane (ethylidene chloride	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
cis-1,3-Dichloropropene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
trans-1,3-Dichloropropene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Ethylbenzene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
2-Hexanone (methyl butyl ketone	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	n/a	<0.010	<0.010
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Methylene chloride (dichloromethane	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methyl iodide (iodomethane	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Styrene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
1,1,1,2-Tetrachloroethane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.001	n/a	<0.002	<0.002
1,1,2,2-Tetrachloroethane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Toluene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,1,2-Trichloroethane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Trichloroethylene (trichloroethene	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	n/a	<0.010	<0.010
1,2,3-Trichloropropane	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Vinyl acetate	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	n/a	<0.100	<0.100
Vinyl chloride	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
Xylenes	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005

MW-12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	28.94	27.64	27.52	27.44	27.23	26.69	27.87	28.18	32.87	32.60	34.12	33.17	32.11	30.67	29.85
Antimony	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.144	0.165	n/a	0.161	n/a	0.151	n/a	0.178	0.159	0.166	0.157	0.166	0.154	0.164	0.145
Barium	0.128	0.137	n/a	0.15	n/a	0.0959	n/a	0.131	0.109	0.112	0.0839	0.108	0.103	0.179	0.138
Beryllium	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	0.863	0.806	0.654	0.769	0.67	0.629	0.695	0.776	0.959	0.992	0.844	0.853	0.811	1.01	0.904
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters															
pH	7.18	7.39	7.15	7.09	7.38	7.31	7.44	7.43	7.25	7.46	7.43	7.45	7.52	7.89	7.41
Specific Conductance umho/cm	6704	6336	6826	7114	7421	7585	7506	8362	5313	5595	4217	5183	5203	5760	5652
Organic Constituents															
Acetone	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

All units mg/L unless otherwise noted.
n/a = Not analyzed

FOR PERMIT PURPOSES ONLY

MW-13 Analytical Data

MW-13	5/01	8/01	11/01	3/02	5/02	1/03	4/03	7/03	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10
Groundwater elevation	31.43	30.38	32.04	32.55	21.43	34.97	34.67	33.38	34.84	35.08	35.15	34.01	32.74	32.3	31.08	30.65	32.98	36.68	37.14	36.81	38.18	35.86	36.47	33.55	34.25
Antimony	<0.001	<0.001	<0.001	n/a	n/a	<0.003	<0.003	n/a	n/a	n/a	0.0034	n/a	n/a	n/a	0.0146	n/a	0.0084	<0.003	<0.003	<0.003	<0.003	0.002	<0.003	<0.002	<0.002
Arsenic	0.078	0.092	0.096	0.089	0.087	0.0689	0.104	0.0885	0.0845	n/a	0.0815	n/a	n/a	n/a	0.0913	n/a	<0.006	<0.006	0.148	0.119	0.17	0.134	0.161	0.15	0.19
Barium	0.09	0.09	0.04	0.02	0.03	0.131	0.114	0.0825	0.0774	n/a	0.0737	n/a	n/a	n/a	0.0484	n/a	0.051	0.0608	0.0433	0.036	0.421	0.509	0.445	0.38	0.55
Beryllium	<0.001	<0.001	<0.001	n/a	<0.001	<0.002	<0.002	n/a	n/a	n/a	<0.002	n/a	n/a	n/a	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	0.0045	<0.002	<0.002	<0.002
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005
Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	n/a	n/a	<0.005	n/a	<0.005	<0.005	0.0058	0.0071	<0.005	<0.005	<0.005	<0.010	<0.010
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	0.0018	n/a	<0.001	<0.001	<0.001	0.0012	<0.001	<0.001	<0.001	<0.0015	<0.0015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	0.004	0.003	0.007	0.005	0.005	<0.002	<0.002	<0.002	<0.002	n/a	0.0049	n/a	n/a	n/a	<0.002	n/a	<0.002	<0.002	0.0055	0.0036	0.00708	0.0036	0.00463	0.005	<0.0045
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.001	<0.001	<0.001	n/a	n/a	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	n/a	n/a	<0.002	n/a	0.0023	n/a	0.0023	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																									
pH	7.05	7.11	7.34	7.11	7.07	7.00	7.24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.76	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.8	7.05
Specific Conductance umho/cm	5940	6200	7820	8140	7910	8621	8380	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7942	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4570	2260
Organic Constituents																									
Acetone	<0.020	<0.020	<0.020	n/a	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050
Acrylonitrile	<0.050	<0.050	<0.050	n/a	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromochloromethane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010
Carbon tetrachloride	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibromochloromethane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	n/a	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	<0.050	<0.050	<0.050	n/a	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040
Methyl iodide (iodomethane)	<0.010	<0.010	<0.010	n/a	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	n/a	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Styrene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-13	7/10	1/11	2/11	7/11	10/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18	8/18
Groundwater elevation	36.25	38.20	38.42	36.94	34.36	32.81	31.32	29.12	27.67	28.66	28.08	27.04	26.88	30.28	29.41	34.04	33.45	37.25	34.62	33.08	31.55	30.59	30.51
Antimony	<0.002	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Arsenic	0.2	0.151	n/a	0.156	0.157	0.184	0.188	0.16	0.131	n/a	0.172	n/a	0.167	n/a	0.205	0.155	0.217	0.167	0.16	0.15	0.181	0.159	n/a
Barium	0.55	0.0576	n/a	0.0583	0.0713	0.0753	0.073	0.0671	0.0873	n/a	0.0531	n/a	0.0643	n/a	0.0714	0.0758	0.0676	0.0685	0.0782	0.0772	0.0864	0.103	0.0903
Beryllium	<0.002	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	n/a
Cadmium	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
Chromium	<0.010	<0.020	n/a	<0.020	<0.005	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a
Lead	<0.0015	<0.015	n/a	<0.015	<0.005	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	n/a
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	n/a
Selenium	<0.0045	<0.050	n/a	<0.050	0.00531	<0.050	<0.050	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	n/a
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a
Thallium	<0.002	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Vanadium	n/a	n/a	n/a	n/a	n/a	0.561	n/a	0.481	0.413	0.535	0.538	0.506	0.509	0.463	0.633	0.559	0.762	0.56	0.526	0.492	0.617	0.557	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	n/a
Additional Parameters																							
pH	7.57	7.75	8.05	7.61	7.23	7.59	7.71	7.29	7.32	7.78	7.61	7.63	7.64	7.78	7.71	7.35	7.73	7.84	7.47	7.31	7.94	6.93	6.55
Specific Conductance umho/cm	1880	3143	3991	6089	3893	3332	2924	3703	4086	2305	2024	1971	2414	3692	2696	3491	1910	3051	3619	4111	4046	4595	5722
Organic Constituents																							
Acetone	<0.050	<0.020	<0.020	<0.020	<0.010	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a
Benzene	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Bromochloromethane	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Bromodichloromethane	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Carbon Disulfide	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Chlorobenzene	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Chloroform (trichloromethane)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
trans-1,4-Dichloro-2-butene	<0.020	<0.100	<0.100	<0.100	<0.005	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
cis-1,3-Dichloropropene	<0.005	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Ethylbenzene	<0.005	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
2-Hexanone (methyl butyl ketone)	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Methyl bromide (bromomethane)	n/a	<0.010	<0.010	<0.010	<0.005	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a
Methyl Chloride (chloromethane)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Methylene bromide (dibromomethane)	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Methylene chloride (dichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Methyl ethyl ketone (MEK,2-butanone)	<0.040	<0.005	<0.005	<0.005	<0.020	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Methyl iodide (iodomethane)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Styrene	<0.005	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
1,1,1,2-Tetrachloroethane	<0.005	<0.002	<0.002	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
1,1,2,2-Tetrachloroethane	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Toluene	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
1,1,2-Trichloroethane	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a
Trichlorofluoromethane (CFC-11)	<0.005	<0.010	<0.010	<0.010	<0.001	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a
1,2,3-Trichloropropane	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a
Vinyl acetate	<0.010	<0.100	<0.100	<0.100	<0.005	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a

All units mg/L unless otherwise noted.
n/a = Not analyzed

Hanson Professional Services Inc.
Submittal Date: September 2018
Revision: 2 - February 2019

MW-14 Analytical Data

MW-14	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11
Groundwater elevation	30.75	29.17	29.18	27.24	28.07	26.51	25.54	28.51	30.38	32.05	32.33	34.31	31.32	32.08	28.73	29.83	32.05	33.96	33.89
Antimony	<0.003	<0.003	0.005	0.0053	0.0031	<0.003	0.0053	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	n/a
Arsenic	0.159	0.0844	0.142	0.0603	0.067.8	0.104	0.0937	<0.010	0.0022	0.14	0.126	0.167	0.147	0.148	0.13	0.13	0.17	0.166	n/a
Barium	0.0291	0.0293	0.0187	0.0189	0.0151	0.0159	0.0214	0.0237	0.0296	0.0293	0.0275	0.0853	0.117	0.112	0.068	0.044	0.056	0.0548	n/a
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.00536	0.0036	0.00507	<0.010	<0.010	<0.010	<0.020	n/a
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0028	<0.001	0.002	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015	<0.015	n/a
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.002	<0.002	<0.002	<0.002	0.0021	<0.002	<0.002	<0.002	<0.002	0.0038	<0.002	0.00893	0.0036	0.00779	0.005	<0.0045	<0.0045	<0.050	n/a
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																			
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.94	6.85	7.25	7.54	8.2
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8460	8690	3400	6341	7523
Organic Constituents																			
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Chloroethane (ethyl chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.100	<0.100
1,1-Dichloroethane (ethylidene chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.001
Methylene chloride (dichloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005
Methyl iodide (iodomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Trichloroethylene (trichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-14	7/11	10/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	31.16	29.09	27.74	26.39	24.13	22.70	23.91	23.75	22.62	21.99	24.31	25.63	29.00	28.66	31.10	30.34	28.76	27.57	26.61
Antimony	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.159	0.139	0.129	0.139	0.142	0.13	n/a	0.145	n/a	0.137	n/a	0.141	0.214	0.207	0.241	0.206	0.187	0.188	0.183
Barium	0.0624	0.0542	0.0826	0.0429	0.0381	0.0448	n/a	0.0405	n/a	0.0459	n/a	0.0407	0.0688	0.0707	0.0694	0.0677	0.0689	0.0535	0.0485
Beryllium	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.020	<0.005	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.015	<0.005	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.050	<0.005	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	0.57	n/a	0.472	0.456	0.462	0.503	0.463	0.489	0.477	0.543	0.846	0.791	0.861	0.683	0.663	0.672	0.648
Zinc	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																			
pH	7.72	7.02	7.15	7.28	6.93	7.1	7.09	7.12	6.95	7.07	7.33	7.47	7.16	7.29	7.57	7.24	7.21	7.49	6.60
Specific Conductance umho/cm	5728	8666	8262	9610	9201	5395	10100	10030	9827	9663	10620	10760	7242	9121	4669	8761	9234	10210	9943
Organic Constituents																			
Acetone	<0.020	<0.010	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.100	<0.005	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	<0.010	<0.005	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.020	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane)	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.001	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.001	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.010	<0.001	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.005	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.003	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

All units mg/L unless otherwise noted.
n/a = Not Analyzed

MW-15 Analytical Data

MW-15	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10
Groundwater elevation	35.06	34.32	32.22	30.44	31.52	29.83	27.38	30.49	33.92	37	37.79	40.78	35.26	37.85	33.51	33.92	37.22
Antimony	<0.003	<0.003	<0.003	0.0032	<0.003	<0.003	0.0032	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002
Arsenic	0.0444	0.0286	0.0476	0.0322	0.032	0.032	0.0345	<0.010	0.00119	0.0272	0.032	0.0372	0.036	0.0379	0.038	0.038	0.033
Barium	0.0714	0.0563	0.0737	0.0796	0.0741	0.0803	0.0932	0.0974	0.106	0.0753	0.111	0.106	0.151	0.174	0.17	0.17	0.13
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0016	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0582	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0029	<0.001	0.0012	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0066	<0.002	0.00355	<0.002	0.00391	0.006	<0.0045	<0.0045
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																	
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.81	7.23	7.05
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3680	3920	4330
Organic Constituents																	
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050	<0.050	<0.050	<0.050	<0.050
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane (ethyl chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1,1-Dichloroethane (ethylidene chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane (ethylene dichloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane (Propylene dichloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone (methyl butyl ketone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040
Methyl iodide (iodomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane (methylchloroform)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethylene (trichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-15	1/11	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	40.42	40.61	36.18	31.47	29.49	27.05	25.38	25.19	24.94	24.48	24.03	26.84	27.53	36.89	34.75	38.09	36.31	33.91	30.75	29.57
Antimony	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.0317	n/a	0.0325	0.0343	0.0406	0.0382	0.0477	n/a	0.0436	n/a	0.0413	n/a	0.0542	0.0764	0.0699	0.0603	0.0721	0.0697	0.0785	0.0878
Barium	0.0924	n/a	0.0968	0.141	0.144	0.124	0.0902	n/a	0.113	n/a	0.0639	n/a	0.0532	0.0212	0.0196	0.0235	0.0273	0.0254	0.0334	0.0261
Beryllium	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	<0.001	n/a	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	0.105	0.114	0.0927	0.107	0.0961	0.109	0.111	0.139	0.177	0.161	0.138	0.162	0.16	0.2	0.207
Zinc	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																				
pH	7.3	7.91	7.59	7	7.4	6.85	7.01	6.92	6.76	6.81	6.88	7.09	7.14	6.92	7.15	7.37	7.12	7.12	7.47	7.1
Specific Conductance umho/cm	4565	4460	4171	3132	3623	4992	8681	6146	7120	7742	8706	8544	8982	9135	9682	8848	8644	8062	7858	7754
Organic Constituents																				
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.100	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

All units mg/L unless otherwise noted.
n/a = Not Analyzed

FOR PERMIT PURPOSES ONLY

MW-16 Analytical Data

MW-16	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11
Groundwater elevatior	35.21	34.95	32.88	32.45	32.32	29.99	30.12	31.6	34.55	36.06	37.03	38.79	35.99	36.74	33.34	34.08	36.69	38.75
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	0.0031	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005
Arsenic	0.0244	0.0167	0.0238	0.0209	0.023	0.0219	0.0267	<0.010	<0.010	0.0222	0.0243	0.0277	0.0273	0.025	0.028	0.028	0.029	0.0243
Barium	0.108	0.0917	0.106	0.0842	0.0814	0.0823	0.0876	0.0847	0.0806	0.109	0.088	0.0682	0.092	0.0972	0.063	0.066	0.056	0.0477
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0017	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0013	<0.001	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00555	0.0038	0.0101	0.009	0.009	<0.0045	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																		
pH	n/a	n/a	n/a	n/a	n/a	n/a	6.68	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.8	7.1	7.17	7.49
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	4460	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3620	3840	4180	4269
Organic Constituents																		
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Chloroethane (ethyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.100
1,1-Dichloroethane (ethylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
1,2-Dichloroethane (ethylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
1,2-Dichloropropane (Propylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
2-Hexanone (methyl butyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001
Methylene chloride (dichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040	<0.005
Methyl iodide (iodomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
1,1,1-Trichloroethane (methylchloroform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Trichloroethylene (trichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-16	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevatior	38.61	35.39	32.36	30.72	28.65	27.14	26.97	27.02	26.51	25.80	27.51	28.58	35.17	33.91	36.59	36.10	34.27	31.97	31.57
Antimony	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	n/a	0.0257	0.0296	0.026	0.0296	0.0279	n/a	0.0311	n/a	0.0238	n/a	0.0328	0.0335	0.0314	0.0298	0.0308	0.0294	0.0297	0.0343
Barium	n/a	0.0597	0.0605	0.0578	0.0521	0.0565	n/a	0.0642	n/a	0.0582	n/a	0.054	0.0546	0.0502	0.0443	0.0473	0.0461	0.0534	0.0501
Beryllium	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	n/a	<0.050	<0.050	<0.050	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	n/a	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	0.338	0.31	0.281	0.326	0.28	0.285	0.281	0.318	0.304	0.339	0.297	0.301	0.29	0.362	0.354
Zinc	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																			
pH	7.97	7.79	7.32	7.32	7.07	7.25	7.31	7.21	7.55	7.23	7.36	7.33	7.22	7.33	7.6	7.29	7.35	7.8	7.18
Specific Conductance umho/cm	4103	3910	3709	3675	3539	4185	4246	4316	4391	4143	4704	4677	4361	4020	3748	3895	3278	3629	3533
Organic Constituents																			
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

All units mg/L unless otherwise noted
n/a = Not Analyzed

FOR PERMIT PURPOSES ONLY

MW-19 Analytical Data

MW-19	5/01	8/01	11/01	3/02	5/02	10/02	1/03	4/03	7/03	2/04	5/04	7/04
Groundwater elevation	31.75	30.96	31.4	31.98	31.23	30.97	31.37	33.35	32.99	33.75	34.54	34.62
Antimony	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.003	<0.003	n/a	n/a	n/a	<0.003
Arsenic	0.053	0.084	0.098	0.092	0.095	n/a	0.0866	0.201	0.0721	0.107	n/a	0.15
Barium	0.04	0.04	0.03	<0.010	0.03	n/a	0.0576	0.0433	0.0433	0.112	n/a	0.0382
Beryllium	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.002	<0.002	n/a	n/a	n/a	<0.002
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.005	<0.005	<0.005	<0.005	n/a	0.0538
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	0.001	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	0.01	0.007	0.008	0.008	0.008	n/a	<0.002	<0.002	<0.002	<0.002	n/a	0.0055
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters												
pH	7.12	7.21	7.23	7.22	7.13	n/a	7.33	7.26	n/a	n/a	n/a	n/a
Specific Conductance umho/cm	6940	6600	8000	7970	7890	n/a	7840	7297	n/a	n/a	n/a	n/a
Organic Constituents												
Acetone	<0.020	<0.020	<0.020	n/a	n/a	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a
Acrylonitrile	<0.050	<0.050	<0.050	n/a	n/a	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a
Benzene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Bromochloromethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Bromodichloromethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Bromoform	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Carbon Disulfide	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Carbon tetrachloride	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Chlorobenzene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Dibromochloromethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	n/a	n/a	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Ethylbenzene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	<0.050	<0.050	<0.050	n/a	n/a	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Methyl iodide (iodomethane)	<0.010	<0.010	<0.010	n/a	n/a	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	n/a	n/a	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a
Styrene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Toluene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Vinyl acetate	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Vinyl chloride	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a
Xylenes	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a

MW-19	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09
Groundwater elevation	33.48	32.73	32.2	31.39	31.89	32.05	35.17	35.62	37.14	37.86	36.19	36.52
Antimony	n/a	n/a	n/a	0.0035	n/a	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	n/a	n/a	n/a	0.0864	n/a	<0.006	<0.006	0.214	0.167	0.224	0.201	0.175
Barium	n/a	n/a	n/a	0.0339	n/a	0.019	0.0359	0.0454	0.0523	0.0489	0.0555	0.0663
Beryllium	n/a	n/a	n/a	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium	n/a	n/a	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	n/a	n/a	n/a	0.005	n/a	<0.005	<0.005	<0.005	<0.005	0.0119	0.051	0.00217
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	n/a	n/a	n/a	0.002	n/a	<0.001	<0.001	<0.001	0.0035	<0.001	<0.001	<0.001
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	n/a	n/a	n/a	<0.002	n/a	<0.002	<0.002	0.0029	<0.002	0.00511	<0.002	0.004
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	n/a	n/a	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters												
pH	n/a	n/a	n/a	7.11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Specific Conductance umho/cm	n/a	n/a	n/a	6825	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Organic Constituents												
Acetone	n/a	n/a	n/a	<0.020	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050
Acrylonitrile	n/a	n/a	n/a	<0.050	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromochloromethane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010
Carbon tetrachloride	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane (ethyl chloride)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dibromochloromethane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	<0.020	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
1,1-Dichloroethane (ethylidene chloride)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane (ethylene dichloride)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane (Propylene dichloride)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone (methyl butyl ketone)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	n/a	n/a	n/a	<0.050	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040
Methyl iodide (iodomethane)	n/a	n/a	n/a	<0.010	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	n/a	n/a	n/a	<0.010	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Styrene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane (methylchloroform)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethylene (trichloroethene)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2,3-Trichloropropane	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010
Vinyl chloride	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002
Xylenes	n/a	n/a	n/a	<0.005	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-19	7/09	1/10	7/10	1/11	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14
Groundwater elevation	34.17	37.19	40.22	38.17	38.52	36.58	33.72	32.07	30.08	28.60	28.40	28.11
Antimony	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Arsenic	0.17	0.29	<0.010	0.106	n/a	0.106	0.129	0.145	0.137	0.152	n/a	0.16
Barium	0.043	0.049	0.38	0.0933	n/a	0.0835	0.105	0.0921	0.058	0.0781	n/a	0.0698
Beryllium	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004
Cadmium	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Chromium	<0.010	<0.010	0.1	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01
Lead	<0.0015	<0.0015	<0.0015	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02
Selenium	0.004	<0.0045	<0.0045	<0.050	n/a	<0.050	<0.050	<0.050	<0.05	<0.05	n/a	<0.05
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01
Thallium	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.464	0.476	0.458	0.497
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1
Additional Parameters												
pH	7.09	7.36	11.65	8.05	8.11	8.81	7.84	7.53	7.75	7.74	7.00	7.81
Specific Conductance umho/cm	4920	1230	2020	1215	1197	1363	1243	1404	1409	1549	1604	1647
Organic Constituents												
Acetone	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050
Benzene	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005
Bromochloromethane	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromodichloromethane	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Carbon Disulfide	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Chlorobenzene	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Dibromochloromethane	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
2-Hexanone (methyl butyl ketone)	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl bromide (bromomethane)	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010
Methyl Chloride (chloromethane)	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methylene bromide (dibromomethane)	n/a	n/a	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Methylene chloride (dichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl iodide (iodomethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Styrene	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Toluene	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Vinyl acetate	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005

MW-19	4/14	7/14	10/14	1/15	7/15	9/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	27.65	27.30	28.29	28.62	32.64	30.05	33.16	35.02	34.44	33.30	31.71	30.62
Antimony	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	n/a	0.159	n/a	0.214	0.169	n/a	0.195	0.129	0.161	0.16	0.181	0.188
Barium	n/a	0.0731	n/a	0.0526	0.0951	n/a	0.069	0.11	0.113	0.0902	0.0946	0.0867
Beryllium	n/a	<0.004	n/a	<0.004	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	n/a	<0.020	n/a	<0.020	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	n/a	<0.015	n/a	<0.015	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	n/a	<0.05	n/a	<0.05	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	0.465	0.5	0.469	0.569	0.81	n/a	0.528	0.432	0.471	0.477	0.578	0.522
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters												
pH	8.20	7.65	6.29	8.04	7.41	n/a	7.82	7.46	7.56	7.53	7.78	7.41
Specific Conductance umho/cm	1713	1717	1607	1526	1569	n/a	1599	1526	1627	1609	1652	1665
Organic Constituents												
Acetone	n/a	<0.020	n/a	<0.020	0.112	<0.010	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	n/a	<0.050	n/a	<0.050	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	n/a	<0.010	n/a	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene)	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	<0.010	n/a	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	n/a	<0.001	n/a	<0.001	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	n/a	<0.100	n/a	<0.100	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	n/a	<0.002	n/a	<0.002	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	<0.005	n/a	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

All units mg/L unless otherwise noted.
n/a = Not Analyzed

MW-20 Analytical Data

MW-20	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	34.19	35.43	35.47	33.32	32.18	31.79	29.95	31.06	33.74	36.41	36.44	35.77	37.33	34.67	35.15	31.38	34.43	36.73	36.68	36.60	33.04	30.43	29.52	27.05	26.63	28.39	27.11	25.55	25.73	30.62	29.83	32.93	31.91	35.47	32.69	31.34	30.42	30.00
Antimony	n/a	<0.003	0.004	0.0053	0.0068	<0.003	<0.003	0.0117	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	n/a	0.036	0.0231	0.0385	0.0266	0.0124	0.0368	0.0369	<0.010	<0.010	0.0555	0.0538	0.0666	0.064	0.0611	0.054	0.057	0.055	0.0514	n/a	0.0512	0.0598	0.0621	0.0642	0.0637	n/a	0.0673	n/a	0.0585	n/a	0.0692	0.0699	0.0639	0.0641	0.0675	0.0703	0.0731	0.0723
Barium	n/a	0.0531	0.0278	0.0278	0.0282	0.0236	0.0206	0.0207	0.0213	0.0186	0.0162	0.0169	0.0256	0.0209	0.0292	0.018	0.015	0.015	0.0123	n/a	0.0132	0.0167	0.0195	0.0101	0.0169	n/a	0.0166	n/a	0.0205	n/a	0.017	0.0271	0.0187	0.024	0.0255	0.0152	0.0199	0.0158
Beryllium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	n/a	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.020	n/a	<0.020	<0.020	<0.020	<0.02	<0.02	n/a	<0.02	n/a	<0.02	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0041	<0.001	0.0022	<0.001	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.092	<0.002	0.00769	0.0103	0.00961	0.011	0.008	<0.0045	<0.050	n/a	<0.050	<0.050	<0.050	<0.05	<0.05	n/a	<0.05	n/a	<0.05	n/a	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	n/a	<0.002	<0.002	<0.002	<0.002	0.0052	<0.002	<0.002	0.0031	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.271	0.308	0.298	0.343	0.3	0.32	0.34	0.384	0.345	0.325	0.314	0.31	0.308	0.343	0.332
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																																						
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.75	6.33	7	7.22	7.66	7.27	7.32	7.09	6.91	6.95	7.15	6.95	7.25	7.10	7.21	7.08	7.03	7.09	7.61	7.03	7.22	7.41	6.46
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1740	n/a	n/a	n/a	n/a	n/a	n/a	n/a	16270	14780	18800	18080	17280	18270	19550	20180	18770	18000	14960	14900	15720	15560	13500	13240	15060	16430	15370	16760	16190	17230	16790
Organic Constituents																																						
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chlorid	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
All units mg/L unless otherwise noted																																						
n/a = Not Analyzed																																						

FOR PERMIT PURPOSES ONLY

MW-24 Analytical Data

MW-24	5/01	8/01	11/01	3/02	5/02	10/02	1/03	4/03	7/03	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06
Groundwater elevation	31.7	30.78	31.00	31.56	30.93	30.33	32.44	32.97	32.25	33.35	33.62	33.75	32.59	32.15	31.79	30.28	30.3	31.02
Antimony	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.003	<0.003	n/a	n/a	n/a	<0.003	n/a	n/a	n/a	<0.003	n/a	<0.003
Arsenic	0.231	0.272	0.256	0.248	0.226	n/a	0.288	0.328	0.281	0.336	n/a	0.0528	n/a	n/a	n/a	0.164	n/a	<0.006
Barium	0.06	0.06	0.05	0.02	0.04	n/a	0.0713	0.0645	0.0868	0.0576	n/a	0.0528	n/a	n/a	n/a	0.0475	n/a	0.0465
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	n/a	n/a	n/a	<0.002	n/a	n/a	n/a	<0.001	n/a	<0.002
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	<0.001	n/a	<0.001
Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.005	<0.005	<0.005	0.0399	n/a	<0.005	n/a	n/a	n/a	<0.005	n/a	<0.005
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	0.0036	0.0036	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	0.0048	n/a	<0.001
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	0.001	<0.001	<0.001	<0.001	0.001	n/a	<0.002	<0.002	<0.002	<0.002	n/a	0.0052	n/a	n/a	n/a	<0.002	n/a	<0.002
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	n/a	n/a	<0.002	n/a	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																		
pH	7.66	7.75	7.56	7.73	7.54	n/a	8.01	8.36	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.71	n/a	n/a
Specific Conductance umho/cm	1300	1580	1980	1850	1831	n/a	1803	1845	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1831	n/a	n/a
Organic Constituents																		
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	n/a	n/a
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	n/a	n/a
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Bromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Bromodichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Chlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Dibromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	n/a	n/a
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	<0.050	<0.050	<0.050	n/a	n/a	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	n/a	n/a
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Methyl iodide (iodomethane)	<0.010	<0.010	<0.010	n/a	n/a	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	n/a	n/a
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	n/a	n/a	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	n/a	n/a
Styrene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Toluene	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Vinyl acetate	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Vinyl chloride	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
Xylenes	<0.005	<0.005	<0.005	n/a	n/a	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a	n/a
All units mg/L unless otherwise noted.																		
n/a = Not Analyzed																		

MW-24	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11	7/11	1/12	7/12	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	7/18
Groundwater elevation	32.38	34.14	35.94	37.45	35.04	35.81	33.42	33.66	35.24	37.15	36.96	34.92	32.73	31.23	29.56	28.22	28.21	28.01	27.56	26.94	28.37	28.21	32.91	32.87	33.76	33.50	32.42	31.03	30.63
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.354	0.327	0.253	0.267	0.26	0.222	0.27	0.27	0.18	0.207	n/a	0.181	0.288	0.307	0.284	0.293	n/a	0.391	n/a	0.344	n/a	0.367	0.163	0.276	0.199	0.268	0.22	0.3	0.241
Barium	0.0509	0.0495	0.0685	0.0756	0.0933	0.104	0.056	0.064	0.078	0.0513	n/a	0.0564	0.0742	0.0468	0.0322	0.0437	n/a	0.0479	n/a	0.0483	n/a	0.0461	0.047	0.0509	0.0531	0.0553	0.0538	0.0652	0.0606
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lead	<0.001	<0.001	0.0023	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.002	<0.002	<0.002	0.00275	<0.002	<0.002	0.001	<0.0045	<0.0045	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thallium	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	<0.001	<0.001	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.539	0.508	0.567	0.68	0.613	0.607	0.575	0.71	0.916	0.891	0.865	0.958	0.917	0.998	0.971
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Additional Parameters																													
pH	n/a	n/a	n/a	n/a	n/a	n/a	7.37	6.97	7.13	7.81	7.67	7.96	7.68	7.9	7.7	7.81	7.51	7.77	8.04	7.80	7.85	7.89	7.65	7.83	8.07	7.60	7.82	8.37	7.74
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	1980	3890	2540	2515	2436	2683	2108	1874	1682	1777	1851	1840	1763	1758	1805	1771	1859	2069	1707	1635	1682	1901	1864
Organic Constituents																													
Acetone	<0.020	<0.020	<0.020	<0.020	<0.050	0.0147	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.010	n/a	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.010	n/a	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane)	<0.050	<0.050	<0.050	<0.050	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	<0.005	<0.040	n/a	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane)	<0.010	<0.010	<0.010	<0.010	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.005	<0.005	<0.005	<0.005	<0.010	n/a	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.005	<0.005	<0.005	<0.005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

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MW-27 Analytical Data

MW-27	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05	1/06	7/06	12/06	7/07	1/08	7/08
Groundwater elevation	33.87	33.95	33.92	32.44	31.87	31.79	29.83	30.58	31.78	34.54	35.38	35.99	37.01	34.7
Antimony	<0.003	<0.003	0.0042	0.0035	<0.003	<0.003	0.0031	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	0.0184	0.0184	0.0125	0.0194	0.0144	0.0132	0.0139	0.0154	<0.010	<0.010	0.018	0.0134	0.0161	0.0188
Barium	0.174	0.174	0.144	0.144	0.143	0.132	0.127	0.13	0.118	0.125	0.13	0.127	0.108	0.156
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0012	<0.001	<0.001
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.002	<0.002	<0.002	0.0029	0.0064	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters														
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	6.58	n/a	n/a	n/a	n/a	n/a	n/a
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2638	n/a	n/a	n/a	n/a	n/a	n/a
Organic Constituents														
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.025	<0.025	<0.025	<0.025	<0.050
Acrylonitrile	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.050
Benzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Bromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Bromodichloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Bromoform	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010
Carbon tetrachloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroethane (ethyl chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Dibromochloromethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,4-Dichloro-2-butene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	<0.020	<0.020	<0.020	<0.020
1,1-Dichloroethane (ethylidene chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloroethane (ethylene dichloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dichloropropane (Propylene dichloride)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
cis-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
trans-1,3-Dichloropropene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
2-Hexanone (methyl butyl ketone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	<0.050	<0.050	<0.050	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.040
Methyl iodide (iodomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010
Styrene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2,2-Tetrachloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,1-Trichloroethane (methylchloroform)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,1,2-Trichloroethane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Trichloroethylene (trichloroethene)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
1,2,3-Trichloropropane	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Vinyl acetate	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.010
Vinyl chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.002
Xylenes	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005

MW-27	1/09	7/09	1/10	7/10	1/11	2/11	7/11	1/12	7/12	1/13	7/13
Groundwater elevation	35.42	32.66	33.53	35.48	36.83	36.81	34.28	31.73	30.23	28.55	27.23
Antimony	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic	0.0206	0.02	0.019	0.019	0.0197	n/a	0.0216	0.0246	0.0214	0.0246	0.0208
Barium	0.131	0.1	0.084	0.081	0.0723	n/a	0.0823	0.0796	0.0587	0.0438	0.056
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004
Cadmium	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002
Chromium	<0.005	<0.010	<0.010	<0.010	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01
Lead	<0.001	<0.001	<0.0015	<0.0015	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.02	<0.02
Selenium	<0.002	<0.0045	<0.0045	<0.0045	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.01	<0.01
Thallium	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	<0.001	<0.001	<0.001	<0.002	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.128	0.135
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.1	<0.1
Additional Parameters											
pH	n/a	6.86	6.34	7.12	7.49	8.27	7.69	7.27	7.65	7.12	7.26
Specific Conductance umho/cm	n/a	2450	2230	2350	2510	2394	2190	2191	2238	1905	1973
Organic Constituents											
Acetone	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Benzene	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.005	<0.005
Bromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromodichloromethane	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon Disulfide	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Dibromochloromethane	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	<0.100	<0.001	<0.001	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
2-Hexanone (methyl butyl ketone)	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Methylene chloride (dichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Methyl iodide (iodomethane)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Styrene	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.001	<0.002	<0.002	<0.002	<0.002
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Toluene	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vinyl acetate	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Vinyl chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

MW-27	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	3/18	7/18
Groundwater elevation	27.47	27.43	26.91	26.20	28.29	28.79	33.36	32.64	35.61	34.49	33.06	31.46	31.51	31.23
Antimony	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Arsenic	n/a	0.0233	n/a	0.0166	n/a	0.0273	0.0293	0.0267	0.022	0.0182	0.0276	0.0176	n/a	0.0171
Barium	n/a	0.0514	n/a	0.0518	n/a	0.0611	0.069	0.0613	0.0594	0.0758	0.105	0.125	0.096	0.103
Beryllium	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004
Cadmium	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Chromium	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020
Cobalt	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	<0.01
Lead	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	n/a	<0.02
Selenium	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	<0.01
Thallium	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Vanadium	0.144	0.224	0.153	0.115	0.15	0.165	0.163	0.0548	0.0568	0.0343	0.0476	0.0502	n/a	0.0511
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	n/a	<0.1
Additional Parameters														
pH	7.25	7.34	7.62	7.13	7.63	7.41	7.32	7.28	7.64	7.27	7.13	7.52	7.3	7.05
Specific Conductance umho/cm	1976	2011	1956	1939	2002	1976	1960	1895	1850	2072	2211	2240	2232	2261
Organic Constituents														
Acetone	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020
Acrylonitrile	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050
Benzene	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromochloromethane	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromodichloromethane	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromoform	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Carbon Disulfide	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Carbon tetrachloride	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Chlorobenzene	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Chloroethane (ethyl chloride)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Chloroform (trichloromethane)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Dibromochloromethane	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
trans-1,4-Dichloro-2-butene	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1-Dichloroethane (ethylidene chloride)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,2-Dichloroethane (ethylene dichloride)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1-Dichloroethylene (1,1-dichloroethene, vinylidene chloride)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,2-Dichloropropane (Propylene dichloride)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
cis-1,3-Dichloropropene	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
trans-1,3-Dichloropropene	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Ethylbenzene	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
2-Hexanone (methyl butyl ketone)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl bromide (bromomethane)	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010
Methyl Chloride (chloromethane)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methylene bromide (dibromomethane)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Methylene chloride (dichloromethane)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl iodide (iodomethane)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Styrene	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,1,1,2-Tetrachloroethane	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,1,2,2-Tetrachloroethane	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Toluene	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1,1-Trichloroethane (methylchloroform)	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1,2-Trichloroethane	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Trichloroethylene (trichloroethene)	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Trichlorofluoromethane (CFC-11)	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010
1,2,3-Trichloropropane	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Vinyl acetate	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100
Vinyl chloride	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Xylenes	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005

All units mg/L unless otherwise noted.
n/a = Not Analyzed

MW-28 Analytical Data

MW-28	5/01	8/01	11/01	3/02	5/02	10/02	1/03	4/03	7/03	2/04	5/04	7/04	10/04	1/05	4/05	7/05	10/05
Groundwater elevation	32.29	31.54	31.37	31.49	31.13	30.45	32.57	33	34.36	33.12	33.31	33.33	32.84	31.92	31.44	30.86	30.45
Antimony	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.003	<0.003	n/a	n/a	n/a	<0.003	n/a	n/a	n/a	<0.003	n/a
Arsenic	0.009	0.012	0.015	0.014	0.014	n/a	0.0188	0.0172	0.0157	0.0147	n/a	0.228	n/a	n/a	n/a	0.0155	n/a
Barium	1.2	1.1	0.63	0.23	0.25	n/a	0.32	0.348	0.356	0.444	n/a	0.228	n/a	n/a	n/a	0.355	n/a
Beryllium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	n/a	n/a	n/a	<0.002	n/a	n/a	n/a	<0.001	n/a
Cadmium	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	<0.001	n/a
Chromium	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	n/a	n/a	n/a	<0.005	n/a
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	<0.001	0.001	n/a	<0.001	<0.001	<0.001	<0.001	n/a	<0.001	n/a	n/a	n/a	0.0039	n/a
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	n/a	n/a	<0.002	n/a
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	n/a	n/a	n/a	<0.002	n/a
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																	
pH	7.04	7.25	7.48	7.61	7.5	n/a	7.48	7.43	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.44	n/a
Specific Conductance umho/cm	6750	6500	5770	4020	4090	n/a	5086	6099	n/a	n/a	n/a	n/a	n/a	n/a	n/a	5289	n/a
Organic Constituents																	
Acetone	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	n/a
Acrylonitrile	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	n/a
Benzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Bromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Bromodichloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Bromoform	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Carbon Disulfide	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Carbon tetrachloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Chlorobenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Chloroethane (ethyl chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Chloroform (trichloromethane)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Dibromochloromethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
trans-1,4-Dichloro-2-butene	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020	<0.020	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.020	n/a
1,1-Dichloroethane (ethylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,2-Dichloroethane (ethylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,1-Dichloroethylene (1,1-dichloroethylene, vinylidene chloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,2-Dichloropropane (Propylene dichloride)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
cis-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
trans-1,3-Dichloropropene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Ethylbenzene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride (dichloromethane)	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.050	n/a
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Methyl iodide (iodomethane)	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	n/a
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010	<0.010	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	n/a
Styrene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,1,1,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,1,2,2-Tetrachloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Toluene	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,1,1-Trichloroethane (methylchloroform)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,1,2-Trichloroethane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Trichloroethylene (trichloroethene)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Trichlorofluoromethane (CFC-11)	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
1,2,3-Trichloropropane	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Vinyl acetate	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Vinyl chloride	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a
Xylenes	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	n/a

MW-28	1/06	7/06	12/06	7/07	1/08	7/08	1/09	7/09	1/10	7/10	1/11	2/11	7/11	10/11	1/12	7/12
Groundwater elevation	31.28	34.08	34.9	35.33	37.1	35.26	35.5	33.68	33.08	34.63	36.41	36.38	34.79	33.57	32.43	31.31
Antimony	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.002	<0.002	<0.002	<0.005	n/a	<0.005	n/a	<0.005	<0.005
Arsenic	<0.006	0.0481	0.0347	0.05	0.0493	0.0474	0.057	0.058	0.042	0.039	0.039	n/a	0.0403	n/a	0.0321	0.0476
Barium	0.294	0.389	0.918	0.742	0.288	0.422	0.162	0.35	0.83	0.38	0.224	n/a	0.707	n/a	2.37	1.56
Beryllium	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	n/a	<0.004	n/a	<0.004	<0.004
Cadmium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.002	n/a	<0.002	n/a	<0.002	<0.002
Chromium	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.020	n/a	<0.020	n/a	<0.020	<0.020
Cobalt	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Copper	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Lead	<0.001	<0.001	<0.001	0.0024	<0.001	<0.001	<0.001	<0.0015	<0.0015	<0.0015	<0.015	n/a	<0.015	n/a	<0.015	<0.015
Nickel	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	<0.002	<0.002	0.0023	<0.002	<0.002	<0.002	<0.002	<0.0045	<0.0045	<0.0045	<0.050	n/a	<0.050	n/a	<0.050	<0.050
Silver	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	0.0023	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	n/a	0.00109	n/a	<0.001	<0.001
Vanadium	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Zinc	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Additional Parameters																
pH	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7.02	6.77	7.34	7.4	7.81	7.67	7.01	7.02	6.94
Specific Conductance umho/cm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3860	5630	5270	4197	4426	6323	9408	10740	9935
Organic Constituents																
Acetone	n/a	<0.020	0.0465	<0.020	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.020	<0.020	<0.020	n/a	<0.020	<0.020
Acrylonitrile	n/a	<0.050	<0.020	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050	<0.050
Benzene	n/a	<0.005	0.0239	<0.005	<0.005	<0.005	<0.005	0.0085	0.0064	<0.005	<0.001	<0.001	0.014	0.0384	0.00409	<0.001
Bromochloromethane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Bromodichloromethane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Bromoform	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Carbon Disulfide	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Carbon tetrachloride	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Chlorobenzene	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Chloroethane (ethyl chloride)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Chloroform (trichloromethane)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Dibromochloromethane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
trans-1,4-Dichloro-2-butene	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.100	<0.100	<0.100	n/a	<0.100	<0.001
1,1-Dichloroethane (ethylidene chloride)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,2-Dichloroethane (ethylene dichloride)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,1-Dichloroethylene (1,1-dichloroethylene, vinylidene chloride)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,2-Dichloropropane (Propylene dichloride)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
cis-1,3-Dichloropropene	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
trans-1,3-Dichloropropene	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Ethylbenzene	n/a	<0.005	0.00709	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	0.00511	0.0213	<0.002	0.00249
2-Hexanone (methyl butyl ketone)	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methyl bromide (bromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.010	<0.010	<0.010	n/a	<0.010	<0.010
Methyl Chloride (chloromethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methylene bromide (dibromomethane)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Methylene chloride (dichloromethane)	n/a	<0.050	<0.050	<0.050	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methyl ethyl ketone (MEK,2-butanone)	n/a	<0.005	<0.005	<0.005	<0.005	<0.040	<0.040	<0.040	<0.040	<0.040	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Methyl iodide (iodomethane)	n/a	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Styrene	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
1,1,1,2-Tetrachloroethane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.001	n/a	<0.002	<0.002
1,1,2,2-Tetrachloroethane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Toluene	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,1,1-Trichloroethane (methylchloroform)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
1,1,2-Trichloroethane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Trichloroethylene (trichloroethene)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005
Trichlorofluoromethane (CFC-11)	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	n/a	<0.010	<0.010
1,2,3-Trichloropropane	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.001	<0.001	<0.001	n/a	<0.001	<0.001
Vinyl acetate	n/a	<0.005	<0.005	<0.005	<0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.100	<0.100	<0.100	n/a	<0.100	<0.100
Vinyl chloride	n/a	<0.005	<0.005	<0.005	<0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002	<0.002
Xylenes	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005	<0.005

MW-28	1/13	7/13	10/13	1/14	4/14	7/14	10/14	1/15	7/15	1/16	7/16	1/17	7/17	1/18	3/18	7/18
Groundwater elevation	30.66	28.43	28.02	27.87	27.58	27.20	28.06	28.16	31.35	31.13	34.21	33.29	32.40	30.87	30.79	30.40
Antimony	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Arsenic	0.042	0.0529	n/a	0.0654	n/a	0.0549	n/a	0.0474	0.0466	0.0616	0.0525	0.0501	0.0527	0.0538	n/a	0.0645
Barium	1.6	0.898	n/a	0.746	n/a	0.612	n/a	0.794	0.851	0.755	0.811	1.03	1.33	1.16	n/a	0.702
Beryllium	<0.004	<0.004	n/a	<0.004	n/a	<0.004	n/a	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	n/a	<0.004
Cadmium	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Chromium	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020
Cobalt	0.00615	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Copper	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	<0.01
Lead	<0.015	<0.015	n/a	<0.015	n/a	<0.015	n/a	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	n/a	<0.015
Nickel	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	n/a	<0.02
Selenium	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	n/a	<0.01
Thallium	<0.002	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Vanadium	0.136	0.142	0.0245	0.0253	0.0193	0.0215	0.0375	0.0584	0.0534	0.0912	0.0454	0.0801	0.0808	0.24	0.0341	0.121
Zinc	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	n/a	<0.1
Additional Parameters																
pH	6.82	7.05	7.18	7.14	7.16	7.19	7.42	7.3	7.12	7.33	7.52	7.2	7.14	7.68	7.22	7.23
Specific Conductance umho/cm	8158	6815	6383	6385	6032	5859	6487	6704	7205	5949	6386	6356	6799	5302	4670	4272
Organic Constituents																
Acetone	<0.020	<0.020	n/a	<0.020	n/a	<0.020	n/a	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	<0.020	n/a	<0.020
Acrylonitrile	<0.050	<0.050	n/a	<0.050	n/a	<0.050	n/a	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	n/a	<0.050
Benzene	<0.005	<0.005	n/a	<0.005	n/a	<0.001	n/a	<0.001	<0.001	<0.001	0.00313	0.00207	<0.001	<0.001	n/a	<0.001
Bromochloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromodichloromethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Bromoform	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Carbon Disulfide	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Carbon tetrachloride	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Chlorobenzene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Chloroethane (ethyl chloride)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Chloroform (trichloromethane)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Dibromochloromethane	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,2-Dibromo-3-Chloropropane (DBCP)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
1,2-Dibromoethane (ethylene dibromide, EDB)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
o-Dichlorobenzene (1,2-dichlorobenzene)	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
p-Dichlorobenzene (1,4-dichlorobenzene)	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
trans-1,4-Dichloro-2-butene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1-Dichloroethane (ethylidene chloride)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,2-Dichloroethane (ethylene dichloride)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1-Dichloroethylene (1,1-dichloroethylene, vinylidene chloride)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
cis-1,2-Dichloroethylene (cis-1,2-dichloroethene)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
trans-1,2 Dichloroethylene (trans-1,2-dichloroethene)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,2-Dichloropropane (Propylene dichloride)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
cis-1,3-Dichloropropene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
trans-1,3-Dichloropropene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Ethylbenzene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	0.0025	<0.002	<0.002	<0.002	n/a	<0.002
2-Hexanone (methyl butyl ketone)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl bromide (bromomethane)	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010
Methyl Chloride (chloromethane)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methylene bromide (dibromomethane)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Methylene chloride (dichloromethane)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl ethyl ketone (MEK,2-butanone)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Methyl iodide (iodomethane)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
4-Methyl-2-pentanone (methyl isobutyl ketone)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Styrene	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,1,1,2-Tetrachloroethane	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
1,1,2,2-Tetrachloroethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Tetrachloroethylene (tetrachloroethene, perchloroethylene	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Toluene	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1,1-Trichloroethane (methylchloroform)	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
1,1,2-Trichloroethane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Trichloroethylene (trichloroethene)	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005
Trichlorofluoromethane (CFC-11)	<0.010	<0.010	n/a	<0.010	n/a	<0.010	n/a	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	n/a	<0.010
1,2,3-Trichloropropane	<0.001	<0.001	n/a	<0.001	n/a	<0.001	n/a	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	n/a	<0.001
Vinyl acetate	<0.100	<0.100	n/a	<0.100	n/a	<0.100	n/a	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	n/a	<0.100
Vinyl chloride	<0.002	<0.002	n/a	<0.002	n/a	<0.002	n/a	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	n/a	<0.002
Xylenes	<0.005	<0.005	n/a	<0.005	n/a	<0.005	n/a	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	n/a	<0.005

All units mg/L unless otherwise noted.
n/a = Not Analyzed

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 4

ATTACHMENT 6

WATER WELL SURVEY DATA TABLE

Water Well Survey Data Table

Well ID	Figure 4.15 ID	Well Use	Aquifer	Well Depth (Ft.)	Approximate Distance from Site
Wells Identified by FEE					
83-34-501	501	Domestic	Evangeline Aquifer (Goliad Sand)	631	~0.6 Miles South
83-34-502	N/A	Domestic	Evangeline Aquifer (Goliad Sand)	656	~1.8 Miles South
83-34-503	503	N/A	Aquifer Code Is Not Applicable to this Well	6131	~ 0.8 Miles Northeast
83-34-2C	2C	Domestic	*Evangeline Aquifer (Goliad Sand)	618	~0.9 Miles Northeast
83-34-2D	2D	Other	*Evangeline Aquifer (Goliad Sand)	556	~0.9 Miles Northeast
83-34-2H	2H	Domestic	*Evangeline Aquifer (Goliad Sand)	618	~0.9 Mile Northwest
83-34-2K	2K	Domestic	*Evangeline Aquifer (Goliad Sand)	591	~0.9 Miles Northwest
83-34-2K	2K	Domestic	*Evangeline Aquifer (Goliad Sand)	668	~0.9 Miles Northwest
83-34-4K	4K	Domestic	*Evangeline Aquifer (Goliad Sand)	692	~0.9 Miles Southwest
83-34-4S	4S	Domestic	*Evangeline Aquifer (Goliad Sand)	640	~0.8 Miles Southwest
83-34-5B	5B	Domestic	*Evangeline Aquifer (Goliad Sand)	631	~0.4 Miles Southeast
83-34-5D	5D	Domestic	*Evangeline Aquifer (Goliad Sand)	642	~0.7 Miles Northeast
83-34-5E	5E	Domestic	*Evangeline Aquifer (Goliad Sand)	612	~0.5 Miles Northwest
83-34-5F	5F	Domestic	*Evangeline Aquifer (Goliad Sand)	727	~0.5 Miles North
83-34-5G	5G	Domestic	*Evangeline Aquifer (Goliad Sand)	763	~0.9 Miles Southwest
83-34-5H	5H	Domestic	*Evangeline Aquifer (Goliad Sand)	687	~0.5 Miles South
83-34-5U	5J	Domestic	*Evangeline Aquifer (Goliad Sand)	640	~ 0.7 Miles Northeast
83-34-1	1(1)	Irrigation	*Evangeline Aquifer (Goliad Sand)	642	~0.5 Miles Northwest
83-34-2	2(1)	Domestic	*Evangeline Aquifer (Goliad Sand)	540	~1.0 Miles Northeast
83-34-4	4(1)	Domestic	*Evangeline Aquifer (Goliad Sand)	630	~0.7 Miles Northwest
83-34-5	5(1)	Domestic	*Evangeline Aquifer (Goliad Sand)	573	~0.3 Miles Southwest
83-34-5	5(2)	Domestic	*Evangeline Aquifer (Goliad Sand)	630	~0.4 Miles Northwest
83-34-5	5(3)	Domestic	*Evangeline Aquifer (Goliad Sand)	662	~0.3 Miles Southeast
83-34-5	5(4)	Domestic	*Evangeline Aquifer (Goliad Sand)	652	~0.5 Miles Southeast
83-34-5	5(5)	Domestic	*Evangeline Aquifer (Goliad Sand)	661	~0.7 Miles Southwest
83-34-5	5(6)	Domestic	*Evangeline Aquifer (Goliad Sand)	729	~0.3 Miles East
83-34-5	5(7)	Supply	*Evangeline Aquifer (Goliad Sand)	720	~0.9 Miles Southeast
83-34-5	5(8)	Industrial	*Evangeline Aquifer (Goliad Sand)	801	~0.5 Miles West
83-34-5	5(9)	Domestic	*Evangeline Aquifer (Goliad Sand)	645	~0.8 Miles Southwest
83-34-5	5(10)	Domestic	*Evangeline Aquifer (Goliad Sand)	656	~0.5 Miles Southeast
83-34-5	5(11)	Domestic	*Evangeline Aquifer (Goliad Sand)	663	~0.7 Miles Southwest
83-34-5	5(12)	Domestic	*Evangeline Aquifer (Goliad Sand)	612	~0.3 Miles Southeast
Additional Wells Identified by Hanson Professional Services					
Tracking #	**Owner Well #**	**Well Use**	**Aquifer**	**Well Depth (Ft.)**	**Approximate Distance from Site**
155775	No Data	Domestic	*Evangeline Aquifer (Goliad Sand)	600	~0.7 Miles Northeast
100867	NOLLKINPER #2	Rig Supply	*Evangeline Aquifer (Goliad Sand)	640	~0.6 Miles Northeast
425307	2	Stock	*Evangeline Aquifer (Goliad Sand)	650	~0.9 Miles Northeast
425295	1	Domestic	*Evangeline Aquifer (Goliad Sand)	650	~0.9 Miles Northeast
494827	FLAMINGO #1	Rig Supply	*Evangeline Aquifer (Goliad Sand)	600	~1.0 Miles Southeast
372796	1	Domestic	*Evangeline Aquifer (Goliad Sand)	660	~1.0 Miles Southwest
155888	No Data	Industrial	*Evangeline Aquifer (Goliad Sand)	580	~0.5 Miles Southwest
305970	No Data	Industrial	*Evangeline Aquifer (Goliad Sand)	608	~0.8 Miles Southwest
342528	No Data	Domestic	*Evangeline Aquifer (Goliad Sand)	645	~0.5 Miles Southwest
178262	No Data	Domestic	*Evangeline Aquifer (Goliad Sand)	595	~0.2 Miles Southwest
208460	No Data	Domestic	*Evangeline Aquifer (Goliad Sand)	596	~0.8 Milles Northwest
246291	No Data	Domestic	*Evangeline Aquifer (Goliad Sand)	560	~0.8 Milles Northwest
413217	No Data	Domestic	*Evangeline Aquifer (Goliad Sand)	622	~0.8 Milles Northwest
***Aquifer Based on Total Depth of Well and Screening Interval**					

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Volume 4 of 6

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 – February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

ATTACHMENT 5

ALTERNATIVE LINER AND OVERLINER DESIGN AND POINT OF COMPLIANCE DEMONSTRATIONS

CONTENTS

layer covered with a 2-foot-thick layer of protective soil cover. The components of the proposed alternative liner are shown in Appendix B.1 HELP Model/MULTIMED Model-Summary of Cases 1-8 for both interim and closed conditions. Details of the alternate liner are in Appendix D.1 and Appendix D.2.

1.3 Proposed Overliner System

The layout of the proposed overliner system is shown in Appendix A Point of Compliance Figures, A.1 Permit Amendment Application MSW-235C Landfill Completion Site Plan. The proposed alternative overliner system consists of a 60-mil high density polyethylene (HDPE) geomembrane placed over GCL overlain by a geocomposite leachate collection layer covered with a 2-foot thick layer of protective soil cover. The GCL will be placed over a 6-inch prepared subgrade. The overliner will be placed over pre-Subtitle D areas to separate the existing waste and the vertical expansion area. The overliner system areas include Sectors 8A and 8B. The existing Type IV Sector area (future Sector 4D) is lined with a GCL, 60-mil HDPE geomembrane, geocomposite, and a 2-foot thick layer of protective soil cover. The components of the proposed overliner system are shown in Appendix B.11 Help Model/MULTIMED Model-Summary of Cases 1OL-8OL for both interim and closed conditions. Details of the overliner system are in Appendix D.3 and Appendix D.4.

1.4 Site Geology and Hydrogeology

A geologic and hydrogeologic site exploration program was conducted for the proposed City of Kingsville Landfill. Details of these investigations are included in Attachment 4 Geology Report.

1.5 Liner Quality Control Plan (LQCP)

The specifications for the liner and final cover materials are referenced in Part III Attachment 10 Liner Quality Control Plan. This LQCP shall govern the material characteristics, installation and testing for the various construction components at the facility.

APPENDIX G

ALTERNATE COMPOSITE FINAL COVER DESIGN DEMONSTRATION

Table of Contents

List of Appendices

1.0 INTRODUCTION

This alternate composite final cover design demonstration will demonstrate that the use of a geosynthetic clay liner (GCL) will provide equivalent infiltration and protection from wind and water erosion as the conventional composite final cover defined in 30 TAC §330.457 (a).

1.1 Alternative Composite Liner System

The GCL Alternative Final Cover System is as follows from top to bottom:

24-inch thick erosion layer
Double-sided geocomposite drainage layer
40-mil LLDPE textured geomembrane
GCL

GCLs are frequently used in liner systems. GCLs are geocomposite materials of low hydraulic conductivity and are readily available by several manufacturers. The GCLs have varying characteristics. They are generally manufactured by placing powdered or granulated bentonite on a geotextile or geomembrane substrate. The bentonite layer is typically 6 to 10 mm thick (following hydration) and is placed at a unit weight of approximately 0.8 pounds per square feet (lb/ft^2). The GCLs with a geotextile substrate also have a covering geotextile, which is often needle-punched, connecting the underlying geotextile to increase the structural integrity. Non-woven and woven geotextiles of various weights are used.

Generally, the permeability of the bentonite component of GCLs ranges from less than 1×10^{-9} to 5×10^{-9} cm/sec.

2.0 EQUIVALENCY

2.1 Leakage Rate Estimates

The leakage through composite liners can be estimated using the “Giroud equation”, as illustrated in Appendix G.1. The method requires assumptions regarding the characteristics of the composite liner. It is assumed that permeation through the full area of the geomembrane is insignificant in comparison to rapid leakage through isolated defects or holes. Also, assumptions need to be made regarding the extent to which intimate contact has been made. A composite liner that has intimate contact has been constructed such that the geomembrane lies flush with the surface of the underlying clay component, with few or no gaps between two liners. When intimate contact has been achieved, the effective area of leakage is very small, and the total liner system leakage is minimized. This phenomenon is referred to as “composite action.”

The equation used in the analysis is derived both from theoretical models of fluid flow and from empirical analyses of actual composite liner systems. Flow through a circular defect in a composite liner is calculated as follows:

$$Q = C[1+0.1(h/t_s)^{0.95}]a^{0.1}h^{0.9}k_s^{0.74}$$ [Ref 1] in Appendix G.1

Where:

Q = rate of leakage through a defect (m^3/sec)

C = Dimensionless constant related to the quality of the intimate contact between the geomembrane and the underlying soil component

h = hydraulic head on the geomembrane (m)

t_s = thickness of the low-permeability soil component (compacted clay liner or GCL) (m)

a = area of geomembrane defect (m^2)

k_s= permeability of soil component (compacted clay liner or GCL) (m/s)

Using the above equation, the conventional composite final cover system was compared to the alternative composite final cover system for both "good' and "poor" intimate contact and for circular holes with an area of 0.1 and 1.0 cm^2.

As shown in Appendix G.1, Infiltration Rate Comparison-GCL Alternate Final Cover for each condition, the alternative composite final cover had calculated leakage rates approximately 1/405th that of the geomembrane/compacted clay liner system.

2.2 Wind and Water Erosion

The alternative composite final cover surface will be seeded.

3.0 SUMMARY

The analysis demonstrates that substituting a GCL for an 18-inch thick compacted clay rich earthen material with a hydraulic conductivity of 1 x 10^{-5} cm/sec provides a level of infiltration reduction and wind and water protection that is greater than or equal to the level of protection provided by the conventional composite final cover system.

APPENDIX G.1

INFILTRATION RATE COMPARISON-GCL ALTERNATE FINAL COVER

ALTERNATE COMPOSITE FINAL COVER DESIGN DEMONSTRATION

INFILTRATION RATE COMPARISON-GCL ALTERNATE FINAL COVER

OBJECTIVE:
Comparison between the infiltration rate through a conventional composite final cover system and the infiltration rate through the alternative composite final cover system.

GIVEN:
The conventional composite final cover system consists of a 40-mil geomembrane overlying an 18-inch thick compacted clay rich material with a maximum hydraulic conductivity of 1 x 10-5 cm/sec. In the alternative composite final cover system, the compacted clay rich infiltration layer material will be replaced with a geosynthetic clay liner (GCL). Both final covers include a geocomposite drainage layer above the geomembrane (GM).

Infiltration Layer Properties

k=	1.00E-05	cm/s
	1.00E-07	m/s
t=	1.5	ft
	0.4572	m
h=	0.2	inches
	0.005079752	m

(sized to prevent head > 0.2 inches when cover soil saturated)

GCL Properties

k=	3.00E-09	cm/s
	3.00E-11	m/s
t=	6	mm
h=	0.2	inches
	0.005079752	m

(geocomposite drainage layer sized to prevent head > 0.2 inches when cover soil saturated)

METHOD:
Estimate the infiltration rate through each final cover system using the Giroud Equation (Ref. 1). Compare the infiltration rate through composite final cover systems consisting of a geomembrane(GM)/clay rich material and a GM/GCL.

Infiltration through composite geomembrane/GCL liner:

$$Q= C[1+0.1(h/t_s)^{0.95}]a^{0.1}h^{0.9}K_s^{0.74}$$ Ref 1

where: C = 0.21 good contact
1.15 poor contact
h = head (m)
t_s = thickness of low permeability soil component (clay material or GCL) (m)
a = area of hole (m^2)
0.1 cm^2
0.00001 m^2
1 cm^2
0.0001 m^2
k_s = hydraulic conductivity of clay material or GCL (m/s)

RESULTS:

Leakage Rate Per Defect

Intimate Contact		Good		Poor	
Composite Cover System		GM/Clay	GM/GCL	GM/Clay	GM/GCL
Leakage (m^3/sec)	0.1 cm^2 hole	3.79E-09	9.35E-12	2.07E-08	5.12E-11
	1 cm^2 hole	4.77E-09	1.18E-11	2.61E-08	6.44E-11

Comparison

Intimate Contact	$Q_{GM/Clay}/Q_{GM/GCL}$	
	0.1 cm^2 hole	1 cm^2 hole
Good	405	405
Poor	405	405

CONCLUSION:

Based on this analysis, the infiltration rate through an alternative composite final cover system with a GCL will be approximately 1/405th that of the conventional composite final system with a clay rich infiltration layer.

REFERENCE:

1. Giroud, J.P., "Equations for Calculating the Rate of Liquid Migration Through Composite Liners Due to Geomembrane Defects", Geosynthetics International, Vol. 4, Nos. 3-4, pp. 335-348, 1997.

ATTACHMENT 6

FACILITY SURFACE WATER DRAINAGE REPORT

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OVERALL WEST DRAINAGE PLAN

THE CITY OF KINGSVILLE LANDFILL
TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION
Volume 5 of 6

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018
Revision 1 – November 2018
Revision 2 – February 2019

Prepared by

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Part III

Attachment 10
Liner Quality Control Plan

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018
Revision 1 – November 2018
Revision 2 - February 2019

Prepared by

HANSON
Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438- 0003

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1. GENERAL

1.1. Scope and Purpose

This Liner Quality Control Plan (LQCP) is applicable to the construction of all landfill liner systems at the City of Kingsville Landfill, a Municipal Solid Waste (MSW) disposal facility in Kleberg County, Texas. This LQCP shall govern the material characteristics, installation and testing for the various construction components for the landfill liners at the facility. Qualifications for quality control personnel are also identified in this LQCP. The provisions of this LCQP were developed based on the latest technical guidelines of the TCEQ, including quality control of construction, testing frequencies and procedures, and quality assurance of sampling and testing procedures.

1.2. Lining and Cover Systems Used for the Landfill

The lining and cover systems that will be used at this facility will be alternative liner designs. Alternative liner design demonstrations can be found in Part III, Attachment 5. The following lining and/or cover systems will be used at the facility:

1.2.1. ~~Standard~~ Landfill Lining System

The ~~standard~~ landfill lining system to be used in Sectors 4C, 5, 6 and 7 will consist of (from bottom to top):

- A prepared subgrade;
- A geosynthetic clay liner (GCL);
- A geomembrane liner consisting of sixty mil (0.06 inch) thick HDPE;
- A leachate collection layer consisting of a drainage geocomposite (a synthetic drainage net with geotextile fabric on one or both sides), gravel, collection piping, and geotextile separation fabric;
- A two (2) foot protective cover soil layer.

1.2.2. Landfill Cover System

The landfill cover system will consist of (from bottom to top):

- A six (6) inch thick (minimum) prepared soil subgrade layer;
- A geosynthetic clay liner (GCL) layer;
- A forty mil (0.04 inch) thick LLDPE geomembrane layer;
- A geocomposite drainage layer consisting of a synthetic drainage net and geotextile fabric;
- A twenty five (25) inch thick protective cover soil layer, the top seven (7) inches of which must be capable of supporting vegetation.

1.2.3. Piggyback Liner System

This liner system will be used in areas of the landfill where disposal development will occur over existing unlined MSW fill locations and will include components that will provide additional geotechnical stability. The piggyback lining system will consist of (from bottom to top):

APPENDIX D

Temporary Dewatering System Design

TEMPORARY DEWATERING SYSTEM DESIGN

The liner system for future Sectors 4C, 5, 6 and 7 may be constructed below the historic high groundwater elevations and will therefore require the installation of a temporary dewatering system beneath the liner. The dewatering system will consist of a dewatering drainage geocomposite that will be installed along the floor and sideslopes as these sectors are constructed. The dewatering drainage geocomposite will capture groundwater and convey it to collection trenches located at the centerline of the sector and also along the toe of the sideslopes. The collection trenches will drain to sumps from which the groundwater will be pumped to the perimeter stormwater drainage system.

The dewatering system shall be kept in operation as described in Section 10A until the executive director determines it is no longer required.

This appendix includes the design information and supporting calculations for the various components of the temporary dewatering system.

APPENDIX E

Ballast Thickness Calculations

Ballast Thickness Calculations

Provide example calculations for ballast above the liner for long-term hydrostatic pressure controls against liner system uplift.

The actual thickness of ballast required must be calculated and submitted with the Ballast Evaluation Report (BER), which has as-built documentation of the hydrostatic pressure controls (as applicable) and placement of the waste ballast above the protective cover.

For each lined area below the groundwater table, the lined area may be divided into smaller subareas to determine the ballast requirements. In summary, the anticipated thickness of ballast required will be calculated using the following methodology:

a.) Adjust the highest measured groundwater surface upward if necessary, across the area being lined using the highest measured water levels derived from the most recent water level readings. Include this information in the BER for the area.

b.) Using the highest measured water levels determined in step a.), determine the long-term hydrostatic uplift pressure on the sidewall and bottom liner systems including normal, vertical, and horizontal components of the uplift pressure as follows:

i. Determine the point within the cell where the maximum hydrostatic pressure may occur. This point will occur at the lowest top-of-liner point within the area to be lined.

ii. Subtract the elevation of this point from the maximum highest measured water level elevation for the cell area (determined in step a.) to calculate the design hydrostatic head, H, acting on the liner. The lined area may be subdivided into more than one area as appropriate for changes in water-level elevations and/or subgrade elevations across the lined area.

c.) Determine the hydrostatic uplift pressure on the base of the bottom and sidewall liner system geomembrane including normal, vertical, and horizontal components of the uplift pressure as follows:

i. Bottom Liner: Determine the maximum hydrostatic uplift pressures acting normal to the bottom liner system geomembrane using the unit weight of water, γ_w times the vertical distance from the geomembrane to the highest measured groundwater surface, H, as determined in step b.)ii. above.

$$P_N = \gamma_w \bullet H$$

ii. Sidewall Liner: Determine the maximum hydrostatic uplift pressures acting normal, vertical, and horizontal to the base of the sidewall liner system geomembrane using the following steps.

(a) Determine the normal uplift pressure on the base of the sidewall liner geomembrane using the unit weight of water times the vertical distance from the critical location on the sidewall geomembrane to the highest measured groundwater surface, H, as determined in step b.)ii above.

$$P_N = \gamma_w \bullet H$$

(b) Determine the vertical uplift pressure on the base of the sidewall liner geomembrane using the normal uplift pressure times the cosine of the slope angle.

$$P_V = P_N \bullet \cos\beta$$

(c) Determine the horizontal uplift pressure on the base of the sidewall liner geomembrane using the normal uplift pressure times the cosine of the slope angle.

$$P_H = P_N \bullet \sin\beta$$

d.) Determine the resisting pressure against uplift of the bottom and sidewall liner system geomembrane including normal, vertical, and horizontal components of the resisting pressure as follows:

i. Bottom Liner: Determine the normal resisting pressure at the bottom of the geomembrane using the unit weight of the protective cover material times the thickness of the protective cover layer.

Note that the weight of the soil liner system is not included in the calculations of required ballast thickness, because with a very low permeability component (i.e. a geomembrane) as part of the liner system, the soil liner will become saturated over the long term and transfer the hydrostatic pressure to the geomembrane. Therefore, on a long-term basis, the critical uplift point will occur at the base of the geomembrane.

Also, since the leachate collection system will consist of a geocomposite drainage layer, the weight of a geocomposite drainage layer is negligible. The normal pressure is the only pressure applicable for the bottom liner system.

$$R_N = \gamma_{pc} \bullet T_{pc}$$

where: γ_{pc} = Total unit weight of the protective cover

T_{pc} = Thickness of the protective cover

The unit weight of the protective cover should be determined from field measured unit weight.

ii. Sidewall Liner:

(a) Determine the vertical resisting pressure of the sidewall liner geomembrane using the unit weight of the protective cover times the vertical thickness of the protective cover.

$$R_V = \gamma_{pc} \bullet T_{pc}$$

(b) Determine the horizontal resisting pressure at the bottom of the sidewall liner geomembrane using the coefficient of at-rest earth pressure of the liner system components times the vertical resisting pressure.

$$R_H = K_O \bullet R_V$$

(c) Determine the normal resisting pressure of the sidewall liner geomembrane using the normal components of the horizontal and vertical resisting pressures calculated in step (a) and (b) above.

$$R_N = R_H \sin\beta + R_V \cos\beta$$

e.) Evaluate the factor of safety against uplift of the bottom and sidewall liner system geomembrane due to hydrostatic pressures.

i. Bottom Liner:

Determine the factor of safety against uplift of the bottom liner system geomembrane due to hydrostatic forces acting normal to the base of the bottom liner system.

The factor of safety is calculated as the resisting gravity pressure determined in Step d.) i. divided by the maximum hydrostatic uplift pressure determined in Step c.) i.

$$FS = R_N / P_N$$

If the factor of safety is greater than or equal to 1.2, the protective cover layer provides sufficient ballast to offset the hydrostatic uplift forces.

If the factor of safety is less than 1.2 additional ballast in for form of solid waste or additional soil will be necessary to offset the hydrostatic forces. See Step f.) for determining the thickness of additional ballast if necessary.

ii. Sidewall Liner:

Determine the factor of safety against uplift of the sidewall liner geomembrane system due to hydrostatic pressures acting normal, vertical, and horizontal to the base of the sidewall liner system.

(a) The factor of safety against uplift of the sidewall liner system geomembrane due to hydrostatic pressures acting normal to the sidewall liner system is calculated as the resisting pressure determined in Step d.) ii.(c) divided by the uplift pressure determine in Step c.) ii.(a).

$$FS = R_N / P_N$$

(b) The factor of safety against uplift of the sidewall liner system geomembrane due to hydrostatic pressures acting vertical to the sidewall liner system is calculated as the resisting pressure determined in Step d.ii (b) divided by the uplift pressure determined in Step c.ii (b).

$$FS = R_V / P_V$$

(c) The factor of safety against uplift of the sidewall liner system geomembrane due to hydrostatic pressures acting horizontal to the sidewall liner system is calculated as the resisting at-rest pressure determined in Step d.) ii.(b) divided by the uplift pressure determined in Step c.) ii.(c).

$$FS = R_H / P_H$$

If the factors of safety are greater than or equal to 1.2 the leachate collection and protective cover layers provide sufficient ballast to offset the hydrostatic forces.

If the factor of safety is less than 1.2 for any of the components (normal, vertical, or horizontal), additional ballast in for form of solid waste or additional soil will be necessary to offset the hydrostatic forces. See Section f.) for determining the thickness of additional ballast if necessary.

f.) Determine the additional ballast necessary to offset hydrostatic pressures on the bottom and sidewall liner system geomembrane.

i. Bottom Liner:

If the factor of safety calculated in Section e.) is less than 1.2, determine the height of additional ballast (*Hballast),* in for form of waste or additional protective cover soil above the liner system necessary to offset the potential hydrostatic uplift pressure at the base of the bottom liner system geomembrane.

The factor of safety against uplift of the liner and ballast system is calculated as follows:

$$FS = (R_N + B_N) / P_N$$

Where:

B_N = Normal Ballast Pressure

and $B_N = \gamma ballast \bullet H_{ballast}$

Solving the above equation for the height of ballast:

$$H_{ballast} = [(FS \bullet P_N)-R_N]/ \gamma ballast$$

For Waste as Ballast: Use a factor of safety of 1.5 against uplift of the liner and ballast system. Use a unit weight of 44 pcf for municipal solid waste.

For Soil as Ballast: Use a factor of safety of 1.2 against uplift of the liner and ballast system. Use a unit weight of the protective cover from Step d.) calculations for soil as ballast.

ii. Sidewall Liner:

If the factor of safety calculated in Section e.) is less than 1.2 for normal and/or vertical loading, determine the height of additional ballast (*Hballast),* in the form of waste or additional protective cover soil necessary to offset the potential hydrostatic uplift pressure below the sidewall liner system geomembrane.

The factor of safety against uplift of the sidewall liner and ballast is calculated as follows:

$$FS = (R_N + B_N) /P_N$$

where:

B_N = Normal Ballast Pressure

and $B_N = \gamma ballast \bullet H_{ballast} \bullet \cos \beta$

Solving the above equation for the height of the ballast:

$$H_{ballast} =[(FS \bullet P_N)-R_N]) (\gamma ballast \bullet \cos \beta)$$

For Waste as Ballast: Use a factor of safety of 1.5 against uplift of the liner and ballast system. Use a unit weight of 44.4 pcf for municipal solid waste.

For Soil as Ballast: Use a factor of safety of 1.2 against uplift of the liner and ballast system. Use a unit weight of the protective cover from Step d.) calculations as soil for ballast.

EXAMPLE BALLAST THICKNESS CALCULATIONS

Material Unit Weights:
Water = 62.4 pcf
Protective Cover = 120 pcf
Waste = 44.4 pcf

Location of Ballast Evaluation	Top of Liner Elevation	Historic High Groundwater Elevation	Uplift Force due to Groundwater Head	Top of Protective Cover Elevation	Protective Cover Resisting Force	Uplift FS from Protective Cover Only	Waste as Ballast Req'd?	Depth of Waste Ballast Required	Top of Waste as Ballast Elevation
-	-	-	-	-	-	-	-	-	-
Sump 7B	22.5	40.55	1126.3	24.5	240.0	0.2	Y	32.6	57.1
Sump 7A	22.5	40	1092.0	24.5	240.0	0.2	Y	31.5	56.0
Sump 6B	22.5	39.35	1051.4	24.5	240.0	0.2	Y	30.1	54.6
Sump 6A	22.5	38.9	1023.4	24.5	240.0	0.2	Y	29.2	53.7
Sump 5B	22.5	38.7	1010.9	24.5	240.0	0.2	Y	28.7	53.2
Sump 5A	22.5	38.5	998.4	24.5	240.0	0.2	Y	28.3	52.8
Sump 4C	22.5	37.4	929.8	24.5	240.0	0.3	Y	26.0	50.5

See Figure III.10D-2 in Part III, Attachment 10, Appendix D for elevations of liner and historic high groundwater contours

THE CITY OF KINGSVILLE LANDFILL
TCEQ PERMIT MSW 235-C

PERMIT AMENDMENT APPLICATION
PART III, ATTACHMENT 11
GROUNDWATER SAMPLING AND ANALYSIS PLAN

CITY OF KINGSVILLE, TEXAS

September 2018
Revision 1 – November 2018
Revision 2 - February 2019

Prepared by

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

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APPENDICES

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1.0 INTRODUCTION

The State of Texas promulgated regulations governing all aspects of municipal solid waste (MSW) management in Title 30 of the Texas Administrative Code (TAC), Chapter 330. Subchapter J, Section 330.405 (b) requires that the owners or operators of Municipal Solid Waste Landfills (MSWLFs) prepare and submit a Groundwater Sampling and Analysis Plan (GWSAP) to the Texas Commission on Environmental Quality (TCEQ). The purpose of this document is to satisfy the requirements of the above-referenced regulations as they pertain to the City of Kingsville Landfill (hereafter referred to as the Kingsville Landfill) and provide groundwater sampling procedures, frequencies, analytical parameters, monitoring data evaluation, and reporting requirements.

In accordance with TCEQ regulations, this GWSAP contains the procedures and techniques to be used to conduct Background Monitoring Statistical Evaluations, Detection Monitoring, Assessment Monitoring, and Corrective Action implementation should a significant groundwater impact be determined.

1.1 Facility Description

The Kingsville Landfill is located 1.7 miles southeast of the City of Kingsville at the intersection of County Road (CR) 2130 and Farm to Market (FM) 2619 in Kleberg County, Texas. The primary land use within a one-mile radius of the site is agricultural consisting of cropland and pasture co-existing with some oil and gas production. Adjacent to the landfill on the east of the property are a series of borrow pits that have been used for the purpose of daily cover and other site soil needs. Low-density residential development is scattered throughout the one-mile radius area of the facility, with most development located to the southeast and northeast. Immediately to the east and west of the permitted facility boundary, the land use is agricultural with some oil and gas production. To the north, south, and southeast, residences are widely scattered throughout brush and agricultural areas.

1.2 Groundwater Monitoring System

Based upon an understanding of the local ground water flow regime and site stratigraphy, the groundwater monitoring system will monitor the uppermost aquifer identified in the site Geology and Groundwater Characterization Reports. Analysis of the ground water level data over the life of the facility indicate that the ground water flow tends to leave the site in all directions except the northwest. Construction at the landfill should have minimal impact on ground water flow. The most likely pollutant pathway for pollutant migration in the event that the primary barrier liner system is penetrated would follow the groundwater flow away from the site. Further discussion and detail can be seen in the provided Groundwater Characterization Report (Part III, Attachment 4, Appendix 1, Section 2.0 beginning on page 762).

The completed groundwater monitoring system will be comprised of a total of twenty-two (22) monitoring wells. Monitor Wells 6RA, 15, 22R, 23, and 30 shall be considered upgradient wells until further development of waste sectors occur. The remaining 17 monitor wells shall be considered downgradient wells. All monitoring wells will be installed and monitored throughout the active life and post-closure care period of this site. The design will provide for monitoring well spacing of not more than 600 feet at the closest practicable distance to the point of compliance (when physical obstacles preclude installation of the groundwater monitoring wells at the point of compliance), as defined in 30 TAC §330.3, that will ensure detection of groundwater contamination of the uppermost aquifer. All parts of the groundwater monitoring system shall be operated and maintained so that they perform at least to design specifications. The design of the monitoring system is based on site specific technical information gathered during multiple site investigations and further discussed in the site Geology Report included as Part III Attachment 4 of this permit, Part III Attachment 4 Appendix 1, and the Groundwater Characterization Report included as Part III Attachment 4, Appendix 1 beginning on page 752. The City of Kingsville Landfill will promptly notify the executive director, and any local pollution agency with jurisdiction that has requested to be notified, in writing of changes in facility construction or operation or changes in adjacent property that affect or are likely to affect the direction and rate of groundwater flow and the potential for detecting groundwater contamination from a solid waste management unit and that may require the installation of additional monitoring wells or sampling points and that such additional wells or sampling points require a modification of the site development plan.

A topographic and Groundwater Contour map identifying the existing and proposed monitor well locations, installed depths, property boundary, a delineation of the waste management area, and the point of compliance line has been included in Appendix A-Item 1A and B Site Layout Maps. All monitoring wells will be constructed in accordance with 30 TAC §330.421. The Groundwater Monitoring System Design Certification has been included as Appendix A-Item 2.

2.0 HEALTH AND SAFETY

Personnel performing water level measurements, well purging, or sampling will, at a minimum, wear latex or other equivalent non-powdered gloves. The gloves will be changed when they become damaged and when activities begin at a different well location. All personnel that are associated with the purging and sample collections from monitor wells will wear other appropriate Personal Protective Equipment (PPE) such as eye protection, safety vests, chemical resistant clothing and/or aprons, and air purifying respirators, as necessary.

3.0 GROUNDWATER SAMPLING FREQUENCY

3.1 Background Monitoring

At least eight (8) statistically independent background groundwater samples will be obtained on a quarterly basis prior to commencing with Detection Monitoring for each groundwater monitor well at the facility (see Appendix A, Table 1, for parameters). Background monitoring events should allow approximately 90 days between each monitoring event to allow the collection of groundwater data over the different seasons of the year.

3.2 Detection Monitoring

After establishment of background groundwater quality, detection monitoring will be performed on a semi-annual basis at approximately 6-month intervals during the remaining operational life and post-closure care period for this facility. Detection monitoring will begin on the first semi-annual monitoring event following the completion of the background monitoring establishment period.

4.0 GROUNDWATER ANALYTICAL PARAMETERS

The constituents to be analyzed for both background monitoring and detection monitoring are listed in Appendix A-Table 1. The respective Practical Quantitation Limits (PQLs), analytical methods, and Chemical Abstracts Service number (CAS) are also located in Appendix A-Table1 and Table-2.

At the conclusion of the background monitoring period, all the detection monitoring constituents will be thoroughly reviewed. As a result of this review, the City may request that the Executive Director eliminate subsequent monitoring for those constituents that were consistently below the method detection limits (MDL) throughout this period and are not expected to originate from the MSWLF unit.

5.0 GROUNDWATER PURGING AND SAMPLING

The following subsections will summarize tasks involved in the purging and sampling of the groundwater monitoring wells at the facility.

5.1 Well Inspection

Prior to performing any purging or sampling, each monitoring well will be inspected to assess its integrity. The visual inspection will include the lock, protective casing or collar, concrete pad, and casing for signs of damage by vandalism, animals, heavy equipment, or other causes. All necessary repairs or maintenance needed will be documented on the Monitor Well Field Data Sheet for each respective well. If it is determined that the integrity of the well has been compromised, the necessary information will be documented and the TCEQ will be notified. No additional actions will be taken without prior approval of the TCEQ.

5.2 Well Headspace Screening

Upon the opening of each monitoring well, an appropriately calibrated gas meter capable of measuring methane concentrations in percent volume and combustible gases in a percentage of the Lower Explosive Limit (LEL) will be utilized to screen the well headspace for hazardous concentrations of gasses that the sampling personnel could be exposed to during the well gauging and sampling procedures. The gas meter will contain a methane specific sensor and be able to measure the percent volume of methane in air. The concentration of methane, or percentage of the LEL, will dictate what precautions will be necessary during sampling activities. If methane is detected in excess of 5.0% by volume (100% LEL), the well will be left open and allowed to vent. No work will be performed at the well until methane concentrations fall below 5.0% by volume.

5.3 Equipment Decontamination

All non-dedicated equipment used for water level measurement, purging, and/or the collection of groundwater samples will be decontaminated prior to use at each well location. An appropriate decontamination procedure consists of washing the non-dedicated equipment in a solution of Alconox, or equivalent laboratory-grade detergent, and distilled water followed by a distilled or deionized water rinse. Containers for the collection of rinsates will be utilized, as appropriate,

9. Water quality measurements (temperature, pH, and specific conductivity)

10. Duplicates for quality control or any split samples.

5.8 Groundwater Static Depth Stabilization

After purging and prior to sample collection, the water surface should be allowed to stabilize to within a minimum of ninety percent (90%) of the initial static groundwater depth. This provides for a representative and adequate volume of water from the aquifer to enter the well casing for sampling. The well must be allowed to sufficiently recharge and allow for the suspended solids to settle prior to sampling, which generally takes up to 24 hours. If clear groundwater can be retrieved in less than 24 hours, then samples can be collected as appropriate. Samples must be taken within a maximum of seven (7) days of the purge. If after seven days a slowly recharging well has not recovered sufficiently for a complete set of samples, a partial set of samples will be collected in the order specified in section 5.10, or in another order if warranted by conditions and data needs, until no more samples for the set can be collected. ~~If after seven days there is still insufficient water for sampling,~~ Tthe situation should be recorded on the Monitor Well Field Data Sheet for that well.

5.9 Low-Flow Purging and Sampling Techniques

Low-flow purging and sampling techniques may be utilized at this facility in lieu of the procedures outlined in Sections 5.7 and 5.8 of this plan and will be performed in accordance with EPA approved low-flow purging and sampling methods. Sampling instrumentation should include a water quality multi-parameter system capable of measuring temperature, pH, conductivity, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity, and an appropriate pump capable of managing flow rates for low-flow purging and sampling. The static water level should be monitored to ensure minimal drawdown from the water column. Typically, a flow rate below 1 liter per minute is ideal; however, this is dependent on the site specific hydrogeology.

While purging groundwater, water quality parameters will be monitored and readings recorded in three to five minute intervals. Groundwater will be purged until stabilization occurs. This is achieved when three consecutive readings for each monitored parameter are within the following ranges: ± 0.1 Standard Units for pH, ± 3% for specific conductivity, ± 10 mV for ORP, and ± 10% for DO. Turbidity should be below 10 nephelometric turbidity units (NTUs) before sampling. Once groundwater stability is achieved, laboratory provided sample containers are to be filled from the discharge side of the pump.

5.10 Well Sampling

Sampling personnel will wear, at a minimum, new latex or nitrile gloves during sampling to minimize the chance of cross contamination of the sample. Wells should be sampled within 24 hours of purging or when the well has recovered to within 90% of the initial static water level. Sampling of wells will proceed from the least contaminated well to the most contaminated well if the degree of contamination is known. If the degree of contamination is unknown, the sampling will proceed from the most upgradient to the most downgradient wells. Precautions for avoidance of dust and exhaust generated by vehicles and sampling equipment should be taken. All sampling equipment and containers will be protected to prevent damage or cross-contamination of the samples.

Samples may be collected using disposable polyethylene bailers or dedicated PVC, stainless steel or Teflon bailers. Additionally, electric or air-operated pumps can be utilized if the flow rate can be adjusted to less than 1 liter per minute to minimize turbulence and aeration of the sample during the collection of volatile organic compounds (VOCs).

If a new disposable bailer, not previously utilized for purging, is used for sample collection, then the new bailer will be rinsed once with well water prior to collecting the sample (first bailer volume is discarded into the purged water container). The bailer will be slowly lowered into the water to minimize turbulence and aeration of the sample. The bailer will then be slowly withdrawn and removed from the well and the sample containers filled from the bottom of the bailer using an appropriate bailer-discharging device. VOC samples will be obtained from a single bailer volume. Additional bailer volumes can be collected as sample container volumes require.

If low-flow purging and sampling procedures are utilized, each well will be sampled with the same device used for purging immediately following verification of an adequate purge as described in section 5.9. If an in-line device is used to monitor water quality parameters, it will be disconnected or bypassed during the time of sample collection. Sampling flow rate will remain at the stabilized purge rate or may be adjusted slightly to minimize aeration, bubble formation, turbulent filling of sample bottles, or the loss of volatiles due to extended residence time in the tubing.

The following parameter samples are to be collected from each monitor well in the exact order specified.

- **VOCs** are to be collected in 40-milliliter (ml) glass vials that utilize Teflon-lined lids (septa), preserved with HCI, and immediately chilled to four degrees Celsius (4°C). The sampling personnel will minimize the introduction of air bubbles by allowing the water to flow down the inside of the container until a positive meniscus forms. VOC samples will be collected with zero headspace. For the collection of the VOCs, the pump flow rate will be adjusted to less than 1L per minute. Samples will not be field filtered.

- **Metals** are to be collected in a high-density polyethylene (HDPE) or glass containers that are preserved with nitric acid (HNO3) to a pH<2 and immediately chilled to four degrees Celsius (4°C). Samples will not be field filtered.

- **Other constituents** as required are to be collected in polyethylene or glass containers, and immediately chilled to four degrees Celsius (4°C) as specified in Appendix B-Item 2, which details preservation, container type, and hold time requirements. Samples will not be field filtered.

The sampling date and time will be recorded on the Monitor Well Field Data Sheet and the container will be labeled with the following information as appropriate:

- **Facility name and/or owner (i.e. City of Kingsville Landfill)**
- **Monitoring well number (i.e., MW-1)**
- **Sample date and time**
- **Preservatives utilized**
- **Sampler's signature or initials**
- **Analysis requested**

5.11 Field Sampling Quality Assurance/Quality Control

To document that sample collection and handling or site conditions have not affected the quality of the groundwater samples, Quality Assurance/Quality Control (QA/QC) samples shall be prepared and analyzed as detailed below.

- **Equipment Blank:** Following decontamination of all non-dedicated sampling equipment and prior to sample collection, laboratory provided reagent-grade water will be run over the sampling equipment and the rinsate collected in a clean container labeled as an Equipment Blank. One equipment blank will be collected for each day of sampling. This sample will be analyzed for all detection monitoring constituents, to measure the effectiveness of the decontamination procedure in removing contaminants from one sample collection point to another.

- **Field Blank:** A field blank will be prepared in the field by pouring laboratory provided reagent-grade water into empty sample containers. This procedure shall be conducted on the downwind side of the facility or in another appropriate location that is the most representative of site sampling conditions. A minimum of one (1) field blank will be

The Chain-of-Custody Form includes:

1. The unique sample number as obtained from the sample label
2. Source of the sample
3. Date and time of sample collection
4. Name of person taking samples
5. Analysis name and analytical method requested (i.e., Detection Monitoring List Metals)
6. Signature of persons involved in the chain-of-custody; and
7. Inclusive dates of possession

7.0 SAMPLE SHIPMENT AND HANDLING PROCEDURES

Subsequent to field activities, all samples collected shall be preserved as appropriate and immediately transported to the laboratory within the required holding times dictated by the specific analytical methods. To maintain sample integrity, the samples shall be kept in appropriate portable coolers that have a constant interior temperature of 4ºC, protect samples from sunlight, and minimize the risk of sample container breakage. Under no circumstances shall dry ice be used as the chilling agent for sample preservation; dry ice has the potential to freeze samples, which can result in container breakage (i.e., glass containers may shatter). Custody seals will be placed on the coolers and will not be broken until the samples arrive in the analytical laboratory and checked in by laboratory personnel.

If samples are shipped by common carrier, the COC will be completed with the signature of the relinquisher and the date and time relinquished. The COC is then placed in a sealable plastic storage bag and placed in the sample cooler. The sample coolers will be sealed in a manner to ensure that the samples remain secure, and so any tampering would be evident. At the time and place of receipt of the samples, the receiving party will attach a copy of the bill of lading to the COC document.

8.0 LABORATORY PROTOCOL

8.1 Introduction

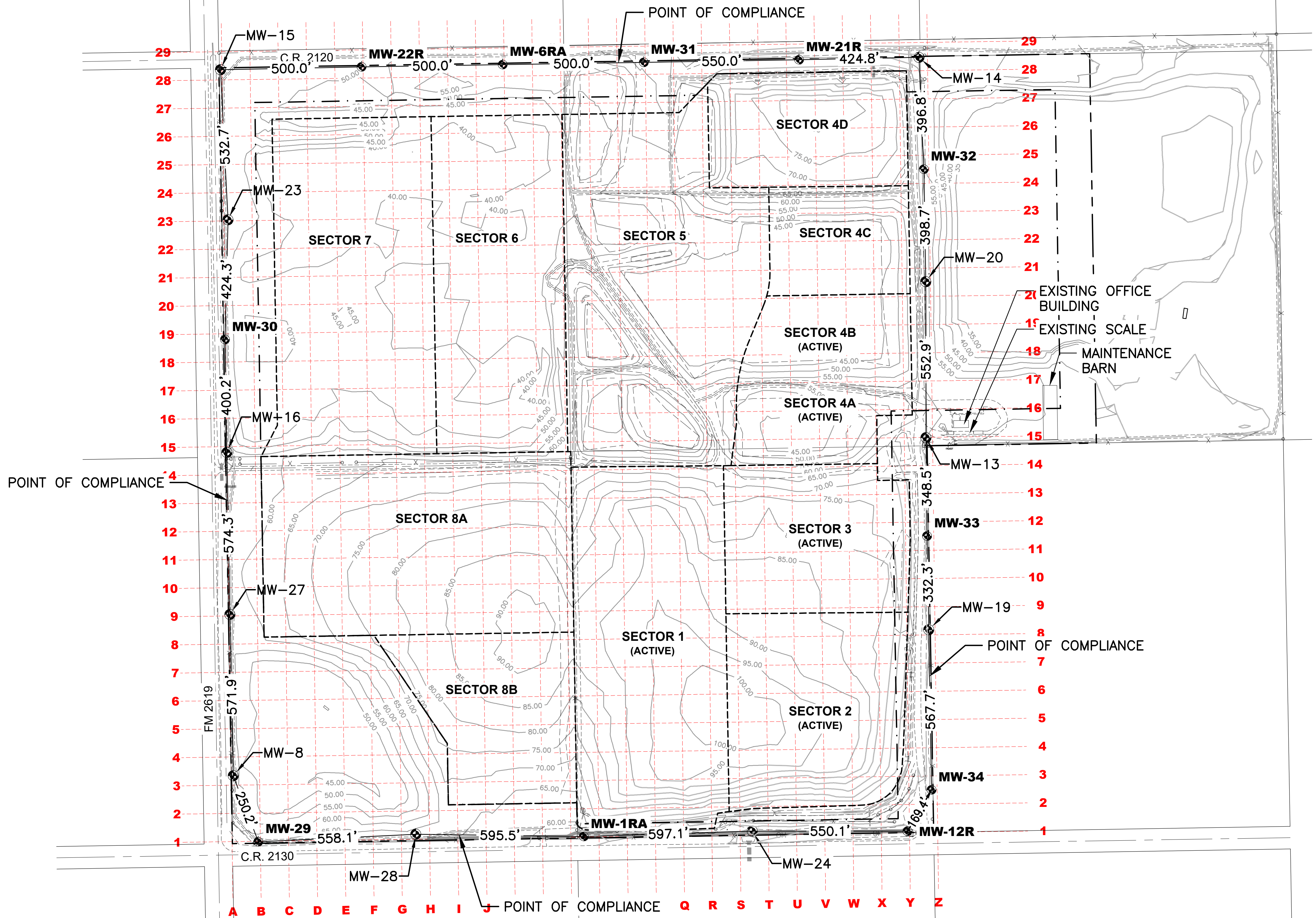
The goal of this quality assurance (QA) and quality control (QC) program is to establish appropriate field and laboratory sampling and analysis procedures for all tested analytes to ensure proper collection, preparation, and analysis of representative samples of waste, soil, water, and other media. In addition, the goal of this QA/QC program is to evaluate completeness, correctness, and conformance or compliance of a specific data set against method, procedural, or contractual requirements. To achieve accuracy (correctness) and completeness, The City of

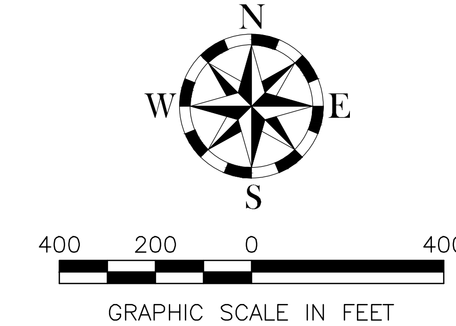
CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 11

APPENDIX A

ITEM 1A-SITE LAYOUT MAP (TOPO)
ITEM 1B-SITE LAYOUT MAP (GW CONTOUR)





LEGEND:

- MW-20 — MONITOR WELL LOCATION
- EXISTING FENCE
- 65.00 — EXISTING SURFACE CONTOUR (2015)
- SECTOR OUTLINE
- PERMIT BOUNDARY (175.89 ACRES)
- BUFFER ZONE
- 400.2' — POINT OF COMPLIANCE

SITE COORDINATES				
MONITOR WELL LOCATIONS				
MW	Northing	Easting	DEPTH (FT BGS)	STATUS
MW-8	17051473.78	1203673.74	43	EXISTING
MW-13	17052672.16	1206127.95	40	EXISTING
MW-14	17054020.04	1206103.02	35	EXISTING
MW-15	17053976.10	1203628.61	33	EXISTING
MW-16	17052619.76	1203651.21	40	EXISTING
MW-19	17051991.35	1206137.50	43	EXISTING
MW-20	17053225.01	1206127.20	39	EXISTING
MW-23	17053444.05	1203654.88	35	EXISTING
MW-24	17051277.99	1205512.42	33	EXISTING
MW-27	17052045.52	1203661.75	40	EXISTING
MW-28	17051266.46	1204320.24	43	EXISTING
MW-1RA	17051258.70	1204915.66	35	PROPOSED
MW-32	17053623.64	1206120.29	31	PROPOSED
MW-6RA	17053994.38	1204628.44	30	PROPOSED
MW-12RA	17051277.38	1206062.51	35	PROPOSED
MW-21R	17054011.48	1205678.30	32	PROPOSED
MW-22R	17053986.24	1204128.51	30	PROPOSED
MW-29	17051239.92	1203762.81	40	PROPOSED
MW-30	17053019.90	1203644.60	30	PROPOSED
MW-31	17054002.53	1205128.38	31	PROPOSED
MW-33	17052323.65	1206132.04	35	PROPOSED
MW-34	17051423.79	1206147.64	35	PROPOSED

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

Hanson No. 16L0438
Filename 8514-03-APPENDIX-SITE-LAYOUT
Scale AS SHOWN
Date 02/12/2019

LAYOUT	DT	02/12/2019
DRAWN	DT	02/12/2019
REVIEWED	TAG	02/12/2019

HANSON

Hanson Professional Services Inc.
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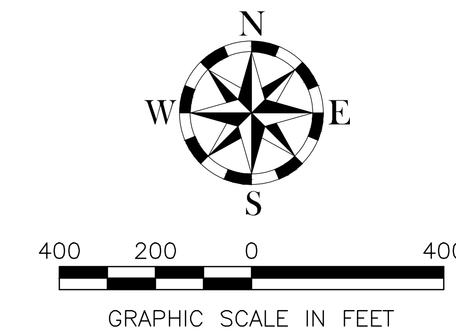
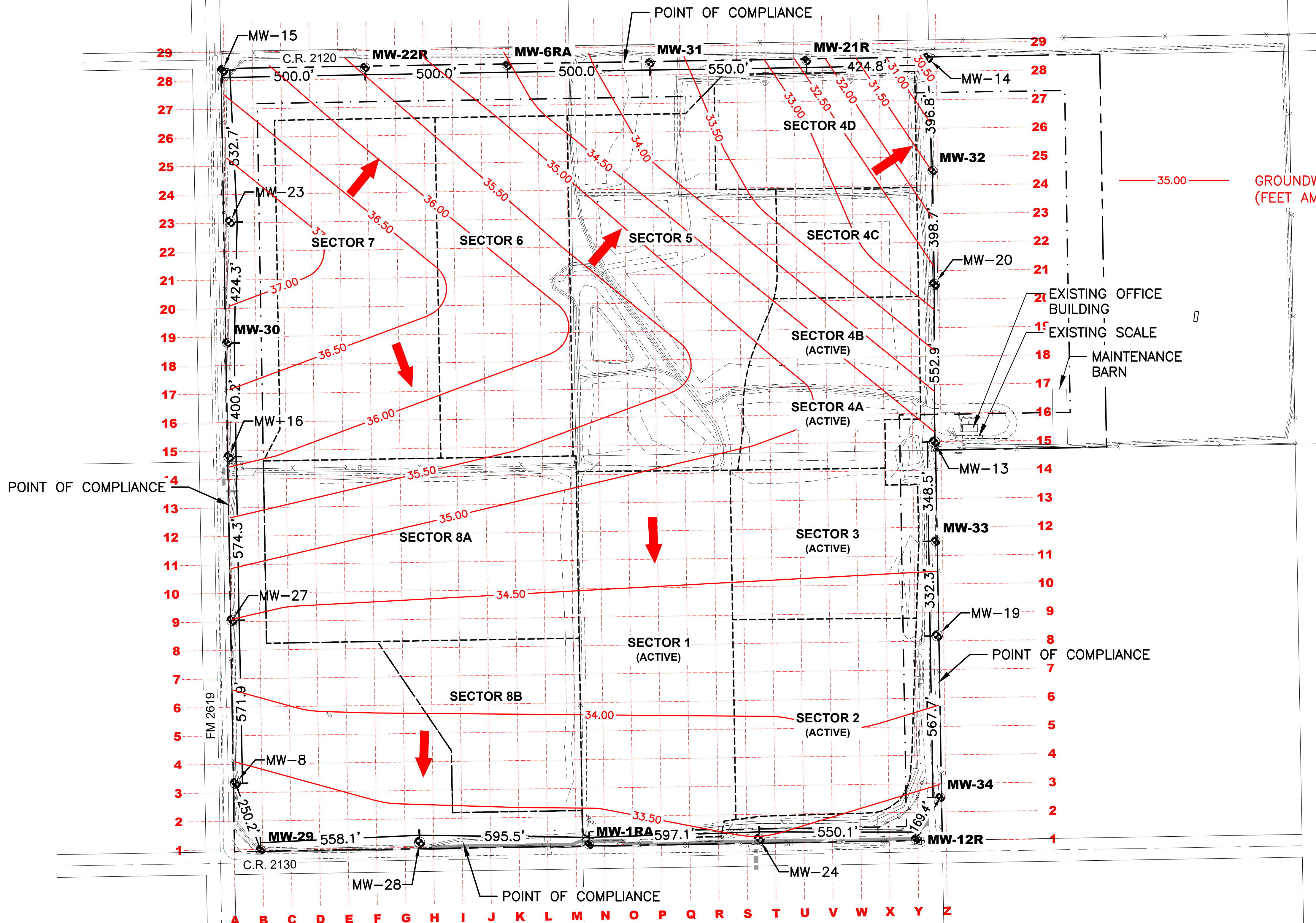
PART III, ATTACHMENT 11
APPENDIX A
ITEM - 1A
SITE LAYOUT MAP
GROUNDWATER SAMPLING AND ANALYSIS PLAN
CITY OF KINGSVILLE LANDFILL
PA. MSW 235-C
KINGSVILLE, TEXAS, KLEBERG COUNTY, TEXAS

FIGURE:
III.11-A-1A





GROUNDWATER CONTOURS (FEET AMSL)

LEGEND:

- MW-20 — MONITOR WELL LOCATION
- EXISTING FENCE
- ~~EXISTING SURFACE CONTOUR (2015)~~
- SECTOR OUTLINE
- PERMIT BOUNDARY (175.89 ACRES)
- BUFFER ZONE
- 400.2' — POINT OF COMPLIANCE
- GROUNDWATER DIRECTIONAL FLOW ARROW

SITE COORDINATES				
MONITOR WELL LOCATIONS				
MW	Northing	Easting	DEPTH (FT BGS)	STATUS
MW-8	17051473.78	1203673.74	43	EXISTING
MW-13	17052672.16	1206127.95	40	EXISTING
MW-14	17054020.04	1206103.02	35	EXISTING
MW-15	17053976.10	1203628.61	33	EXISTING
MW-16	17052619.76	1203651.21	40	EXISTING
MW-19	17051991.35	1206137.50	43	EXISTING
MW-20	17053225.01	1206127.20	39	EXISTING
MW-23	17053444.05	1203654.88	35	EXISTING
MW-24	17051277.99	1205512.42	33	EXISTING
MW-27	17052045.52	1203661.75	40	EXISTING
MW-28	17051266.46	1204320.24	43	EXISTING
MW-1RA	17051258.70	1204915.66	35	PROPOSED
MW-32	17053623.64	1206120.29	31	PROPOSED
MW-6RA	17053994.38	1204628.44	30	PROPOSED
MW-12RA	17051277.38	1206062.51	35	PROPOSED
MW-21R	17054011.48	1205678.30	32	PROPOSED
MW-22R	17053986.24	1204128.51	30	PROPOSED
MW-29	17051239.92	1203762.81	40	PROPOSED
MW-30	17053019.90	1203644.60	30	PROPOSED
MW-31	17054002.53	1205128.38	31	PROPOSED
MW-33	17052323.65	1206132.04	35	PROPOSED
MW-34	17051423.79	1206147.64	35	PROPOSED

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

Hanson No. 16L0438
Filename 8514-03-APPENDIX-SITE-LAYOUT-2
Scale AS SHOWN
Date 02/12/2019

LAYOUT	DT	02/12/2019
DRAWN	DT	02/12/2019
REVIEWED	TAG	02/12/2019

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PART III, ATTACHMENT 11
APPENDIX A
ITEM - 1B
SITE LAYOUT MAP
GROUNDWATER SAMPLING AND ANALYSIS PLAN
CITY OF KINGSVILLE LANDFILL
PA. MSW 235-C
KINGSVILLE, TEXAS, KLEBERG COUNTY, TEXAS

FIGURE:
III.11-A-1B

FEB 12, 2019 1:55 PM TORRE01809
I:\16JOBS\16L0438B\CAD\SITE\SHEET\NOD-NO.1\RED-REV\PART III\8514-03-APPENDIX-SITE-LAYOUT-2.DWG

Special Evaluation Process for Organic Constituents

Organic constituents will be evaluated using the laboratory reporting limit. A detection of an organic constituent (above the approved laboratory reporting limit) will be considered an apparent SSI with no further statistical evaluation performed.

Determine If Background Data is Normally Distributed

The first statistical procedure is to determine if the data for each inorganic constituent conformed to some type of normal distribution. This evaluation is performed using the "Coefficient of Skewness". In accordance with an EPA guidance document[1], data sets with an absolute value of the Coefficient of Skewness less than 1 were considered to conform to a normal distribution. Those data sets with a Coefficient of Skewness greater than 1 were evaluated to determine if they conformed to a log-normal distribution. This evaluation is performed by determining the Coefficient of Skewness using the natural logarithms of the data. Logged data sets with a Coefficient of Skewness less than 1 are considered to conform to a log-normal distribution.

In accordance with ~~an~~ the EPA guidance document, data sets with greater than fifty percent (50%) "non-detects" were assumed to not be normally distributed. Data sets with less than twenty five percent (25%) "non-detects" are evaluated by replacing the "non-detects" with one-half of the laboratory reporting limit. Data sets with greater than twenty five percent (25%) but less than fifty percent (50%) "non-detects" are evaluated using only the "detects".

Determining Parametric Prediction Limits

For those background data sets that are determined to conform to either the normal or log-normal distribution, a parametric prediction limit is determined. As identified in the previously referenced~~on Page 60 of the~~ EPA guidance document ~~(previously referenced)~~, the equation for calculating a one-sided (upper) Prediction Limit is:

$$PL = \overline{X} + St\sqrt{1/m + 1/n}$$

where: $\overline{X}$ is the sample mean
S is the sample standard deviation
t is the t-statistic from the standardized t distribution
m is the number of future samples to be evaluated
n is the number of measurements in the background data set

For this evaluation, the results of the current monitoring event are the only data to be evaluated. There are eight (8) original measurements in the background data set for each well. To determine the "t statistic", a confidence level of 99.0% is used along with "n-1" (7 or 1ess) degrees of freedom for the wells as appropriate. The "t statistic" used for this evaluation is 2.998 for n-1=7. This value is substituted into the equation above to calculate the PL.

[1] "Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance", U.S. Environmental Protection Agency, Office of Resource Conservation and Recovery, March, 2009.~~"Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities – Addendum to Interim Final Guidance", U.S. Environmental Protection Agency, Office of Solid Waste, July, 1992.~~

If the current value exceeded this prediction limit, the value is considered an SSI.

Determining Parametric Prediction Limits from Pooled Upgradient Background Data

For those data sets that do not conform to either the normal or log-normal distribution, parametric prediction limits are determined from the pooled background data of all upgradient monitoring wells. Prior to establishing prediction limits from the pooled background data, the background data is evaluated to determine if it conformed to a normal or log-normal distribution. This is done using the Coefficient of Skewness, as outlined above.

For those background data sets that are determined to conform to either the normal or log-normal distribution, a parametric prediction limit is determined. The equation for calculating a one-sided (upper) Prediction Limit is:

$$PL = \overline{X} + St\sqrt{1/m + 1/n}$$

where: $\overline{X}$ is the sample mean
S is the sample standard deviation
t is the t-statistic from the standardized t distribution
m is the number of future samples to be evaluated
n is the number of measurements in the background data set

~~For this evaluation, the results of the current monitoring event are the only data to be evaluated. With the removal of outliers, there are fifty six (56) measurements in the background data set.~~ To determine the "t statistic", a confidence level of 95% (more conservative) is used along with "n-1" ~~(55)~~ degrees of freedom. The "t statistic" used for this evaluation is 1.~~674~~ 753 for n-1=~~55~~ 15 as appropriate[2].

~~The equation used in the spreadsheet to determine the upper Prediction Limit is:~~

~~$PL = \overline{X} + tS$~~

If the current value ~~exceeded~~ exceeds this pooled background dataset prediction limit, the value is considered an apparent SSI.

For ~~those~~ pooled background data sets that do not conform to either the normal or log-normal distribution, non-parametric prediction limits are determined. The mean and standard deviation are determined for each of these sets for comparison purposes only. If the current value exceeds the historic high from the pooled background dataset or Municipal Soild Waste-Practical Quantitation Limit (MSW-PQL), whichever is higher, then~~,~~ the value is considered an SSI.

[2] Alfredo H.S. Ang, and Wilson H. Tang, "Probability Concepts in Engineering Planning and Design", John Wiley & Sons, 1975. Table A.2, Page 383.

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 11

APPENDIX C

ITEM 1-FIELD ~~SAMPLING~~ CONDITIONS REPORT

FIELD ~~SAMPLING~~ CONDITIONS REPORT

FACILITY NAME: ______________________________

LOCATION: ______________________________

OWNER: ______________________________

Date: ____________________ Temperature: ____________________

Weather: ____________________ Time: ____________________

Sampling Team: ______________________________

____

Purpose of Sampling: ___ Background ___ Semi-annual ___ Annual ___ Quarterly

Phase: ___ Detection Monitoring ___ Assessment Monitoring ___

Other____________________

Site Observations: ______________________________

____

____

____

____

____

____

____

____

____

Reported By: ______________________________

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 11

APPENDIX C

ITEM 2-~~Monitor~~ MONITOR WELL~~ell~~ FIELD~~ield~~ ~~Sample Log~~DATA SHEET

MONITOR WELL FIELD ~~SAMPLE LOG~~DATA SHEET

SITE NAME:	CITY OF KINGSVILLE MUNICIPAL SOLID WASTE LANDFILL	
PROJECT #:		
DATE:		

MONITOR WELL NO.	CASING DIAMETER (IN.)	DEPTH TO WATER (FT. BTOC)	TOTAL DEPTH (FT. BTOC)	PURGE VOLUME (GAL.)	%Vol. CH_4	TEMP (C°)	CONDUCTIVITY (µS/cm)	pH	TIME	COMMENTS
COMMENTS:										
COMMENTS:										
COMMENTS:										
COMMENTS:										

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION
PART III – ATTACHMENT 14
LANDFILL GAS MANAGEMENT PLAN

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 – February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

CONTENTS

APPENDICES

Appendix 1: Gas Monitor Probe Installation Sequence

Appendix 2: Gas Monitoring Site Plan

Appendix 3: Gas Probe Installation Details

Appendix 4: Gas Monitoring Probe Detail

Appendix 5: Utility Trench Vent Detail

Appendix 6: Gas Monitoring Field Data Report

Appendix 7: Gas Monitoring and Control System Installation Report

Appendix 8: As-Builts for Passive Gas Vents

Appendix 9: Vent Trench Detail

Appendix 10: Passive/Active Gas Vent Detail

Appendix 11: Flare/Blower Assembly System Details

I:\16jobs\16L0438\8514-City of Kingsville\8514-03\Permit Amendment\Part III\Part III_att14 - LFGMP.docx sides of the cell and will be directed upward. The amount of gas migrating past this liner system, if any, would be minimal.

The predominant gas generated in the initial stages of decomposition is carbon dioxide. As time passes, methane generation increases while carbon dioxide generation decreases. Methanogenesis (methane generation) continues until accessible moisture or organic material within the solid waste disposal area is consumed. According to Supplement E of the US EPA AP-42, Compilation of Air Pollution Emission Factors, typical landfill gas at steady state generation consists of:

Table 2: Typical Landfill Gas Composition

Gas Constituent	Estimated Concentration
Methane	55%
Carbon Dioxide	40%
Nitrogen (and other gases)	5%
Non-methane Organic Carbon (NMOCs)	trace

4.1 Permit Boundary Monitoring

Permit boundary monitoring will consist of quarterly monitoring of permanently installed gas monitoring probes. The gas monitoring probe network will be installed in phases such that there is at least one (1) permanent perimeter probe within 1,000 feet of any newly constructed sector prior to acceptance of waste. The use of the Gas Monitoring Probe Installation Sequence, provided as Appendix 1, will ensure that gas monitoring probes are present within 1,000 feet of new disposal areas. Based on the geologic and hydrogeological information available and the engineering design of the facility, the likelihood of offsite subsurface gas migration is minimized. Due to these conditions, along with adjacent land use and the proximity of offsite receptors, a maximum spacing of 800 feet between permanent gas monitoring probes should be considered protective of human health and the environment for this facility, however; gas probe spacing may be adjusted on a case by case basis.

4.1.1 Gas Monitoring Probe Placement

Currently, there are ~~nine~~ ten (~~9~~10) permanent gas monitoring probes (GPs) installed at this facility to detect the presence of landfill gas at the permit boundary. The existing gas monitoring probes were referred to as "monitoring gas wells" (MGWs), but will herein be referred to as GPs. Due to the planned depth of waste placement in the new sectors yet to be constructed, the existing GPs, other than GP-8, are not installed to an adequate depth to ensure that gas migrating within the subsurface and in the direction of the existing gas probes would be detected. Due to these conditions, all existing GPs, except GP-8, will be plugged and abandoned and new GPs will be installed. As the site develops fifteen (15) GPs will be required to effectively monitor for the migration of methane from this facility. The perimeter probes are located as close as practical to the permit boundary as indicated on the Gas Monitoring Site Plan included as Appendix 2. Following the installation of each GP, its location will be surveyed to determine actual site coordinates.

The spacing of the permanent GPs is a function of site geology/hydrogeology, adjacent land use, and landfill design. The presence of the synthetic liner system used in the construction of sectors 1 through ~~8~~ 7 greatly decreases the potential for landfill gas migration from these areas. The existing pre-Subtitle D waste cells in sector 8 do not have a synthetic liner system, however; a synthetic liner system will be installed over the existing pre-Subtitle D waste cells during the construction of sector 8. Lateral spacing of permanent GPs shall be approximately 800 feet on the east and west sides of the disposal facility. Due to the higher concentration of residences on the north and south sides of the facility, the lateral spacing shall be approximately 600 feet along these boundaries. The locations of the permanent GPs are indicated on the Gas Monitoring Site Plan located in Appendix 2.

GPs will be designed to monitor the unsaturated subsurface zone of the facility. The installation depth of the probes will be equal to the lowest waste placement elevation. The planned gas ~~prove~~ probe elevations are listed in Appendix 3 – Gas Probe Installation Details.

4.1.2 Gas Monitoring Probe Construction

Gas probes will be installed by a Texas licensed driller and will be supervised by a licensed professional geoscientist or a licensed professional engineer. Soils will be described using the Unified Soil Classification System. The holes will be drilled with a hollow-stem or solid flight auger and will be sampled continuously during installation. All GPs will consist of one (1) inch diameter schedule 40 polyvinyl chloride (PVC) riser and machine slotted well screen. Screened intervals will be from the bottom of the bore hole to within five (5) feet of the surface. The riser will consist of solid PVC pipe and extend to approximately three (3) feet above ground surface. A clean filter pack gravel will be installed to pack the annulus one (1) to two (2) foot above the top of the well screen. The gas probe will be installed to the depth described in the above section. A bentonite seal at least one (1) foot thick will be installed above the filter pack. The gas monitoring probe will extend above grade with a concrete pad and a locking steel protective cover. The top of the riser pipe will be completed with a brass ball valve and ¼" barb fitting to allow attachment of gas sampling equipment. Protective steel pipes (bollards), set in concrete, will be installed separate from the well pad. The construction details for a typical gas monitoring probe are shown in Appendix 4 – Typical Gas Monitoring Probe Detail.

4.1.3 Utility Vents

For all underground utility trenches within the permit boundary, utility vents will be installed and monitored. Presently, there is a utility trench that enters/exits the site near the southeast corner of the facility and contains water, phone, and electrical service lines. These utilities service the scale house, maintenance shop, and the landfills leachate pumps. One (1) vent for each trench will be installed where the trench leaves the site. The utility vent locations are indicated on the waste. A vertical vent is typically constructed by installing a four (4) inch perforated pipe into a boring that is then backfilled with gravel, and plugged with bentonite. The perforated pipe is attached to a solid riser pipe that extends above ground and is typically terminated with a turbine or a U-shaped downward facing opening. A vent trench is typically constructed by excavating a narrow trench, lining the outermost wall of the trench with a flexible membrane liner (FML), installing perforated pipe with a solid riser in the excavation and backfilling with gravel. The vents within a vent trench are typically terminated similar to the vertical vent method above. Vents placed within the waste are similar to a vertical vent but are bored through the FML in place over the waste and a boot is used to seal the pipe around the FML. Due to the design capacity of this facility, passive venting complies with TCEQ air emissions requirements in 30 TAC § 115 and 30 TAC § 330 at this time.

The methane gas control system currently in place at this facility includes a passive vertical vent system along the southern and eastern permit boundaries adjacent to Sector 1 and Sector 2. At present, there are a total of forty nine (49) gas vents at the facility. Twenty (20) gas vents are located along the eastern permit boundary and twenty nine (29) along the southern boundary. These vertical gas vents were constructed of four (4) inch perforated PVC pipe in a thirty six (36) inch diameter bore hole. The area around the pipe was backfilled with gravel and sealed with bentonite. The gas vents on the southern boundary are set to twenty (20) feet deep and the vents on the eastern boundary are set to twenty five (25) feet deep. This control system was installed to prevent the migration of methane beyond these boundaries. A Site Map showing the locations of the existing gas vents may be found in Appendix 2. The As-Builts for the passive gas vents can be found in Appendix 8. Other alternative passive control systems include the installation of vent trenches along the permit boundaries and the installation of vents within the waste to relieve the gas build-up. These passive gas control systems may be pursued or implemented in the future, if necessary. Construction details for the landfill gas vent trenches can be found in Appendix 9 and design details for vents placed in the waste are provided in Appendix 10.

The number and type of vents installed will depend on the extent of the methane migration problem. If an excessive methane concentration is detected in a gas probe, appropriate gas vents will be installed in the area of the affected gas probe. Additional vents will be installed if gas continues to be detected in individual probes. Prior to the installation of the final landfill cover, installation of passive vents will be limited to the perimeter of the facility and those portions of the landfill that are filled to permitted waste elevations.

This facility is subject to the Federal New Source Performance Standards (NSPS) for Municipal Solid Waste Landfills (40 CFR Part 60) based on the design capacity of the landfill. Due to the current size of the landfill and site specific Tier II Non Methane Organic Chemical (NMOC) Emissions, these types of passive systems can be pursued but are dependent on current New Source Performance Standards (NSPS) regulations and landfill development. An active gas control system will be the only type of system pursued if this facility exceeds current NMOC emissions limits.

CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 14

APPENDIX 1

GAS MONITORING PROBE INSTALLAION SEQUENCE

Gas Probe Installation Sequence

MSW Permit Number	235-A	235-B	235-B	235-C	235-C	235-C	235-C	235-C
Probe No.	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5	Sector 6	Sector 7	Sector 8
GP-1	X	X	X	PA	PA	PA	PA	PA
GP-1R	ND	ND	ND	X	X	X	X	X
GP-2	X	X	X	PA	PA	PA	PA	PA
GP-3	X	X	X	PA	PA	PA	PA	PA
GP-3R	ND	ND	ND	X	X	X	X	X
GP-4	X	PA	PA	PA	PA	PA	PA	PA
GP-5	ND	X	X	PA	PA	PA	PA	PA
GP-5R	ND	ND	ND	X	X	X	X	X
GP-6	ND	X	X	PA	PA	PA	PA	PA
GP-6R	ND	ND	ND	X	X	X	X	X
GP-7	ND	X	X	PA	PA	PA	PA	PA
GP-7R	ND	ND	ND	X	X	X	X	X
GP-8	ND	ND	X	X	X	X	X	X
GP-9	ND	X	X	PA	PA	PA	PA	PA
GP-9R	ND	ND	ND	X	X	X	X	X
GP-10	ND	X	X	PA	PA	PA	PA	PA
GP-10R	ND	ND	ND	X	X	X	X	X
GP-11	ND	X	X	PA	PA	PA	PA	PA
GP-11R	ND	ND	ND	X	X	X	X	X
GP-12	ND	ND	ND	ND	ND	X	X	X
GP-13	ND	ND	ND	ND	ND	ND	X	X
GP-14	ND	ND	ND	ND	ND	ND	X	X
GP-15	ND	ND	ND	~~ND~~X	~~ND~~X	~~ND~~X	X	X
GP-16	ND	ND	ND	~~ND~~X	~~ND~~X	~~ND~~X	~~ND~~X	X
GP-17	ND	ND	ND	~~ND~~X	~~ND~~X	~~ND~~X	~~ND~~X	X

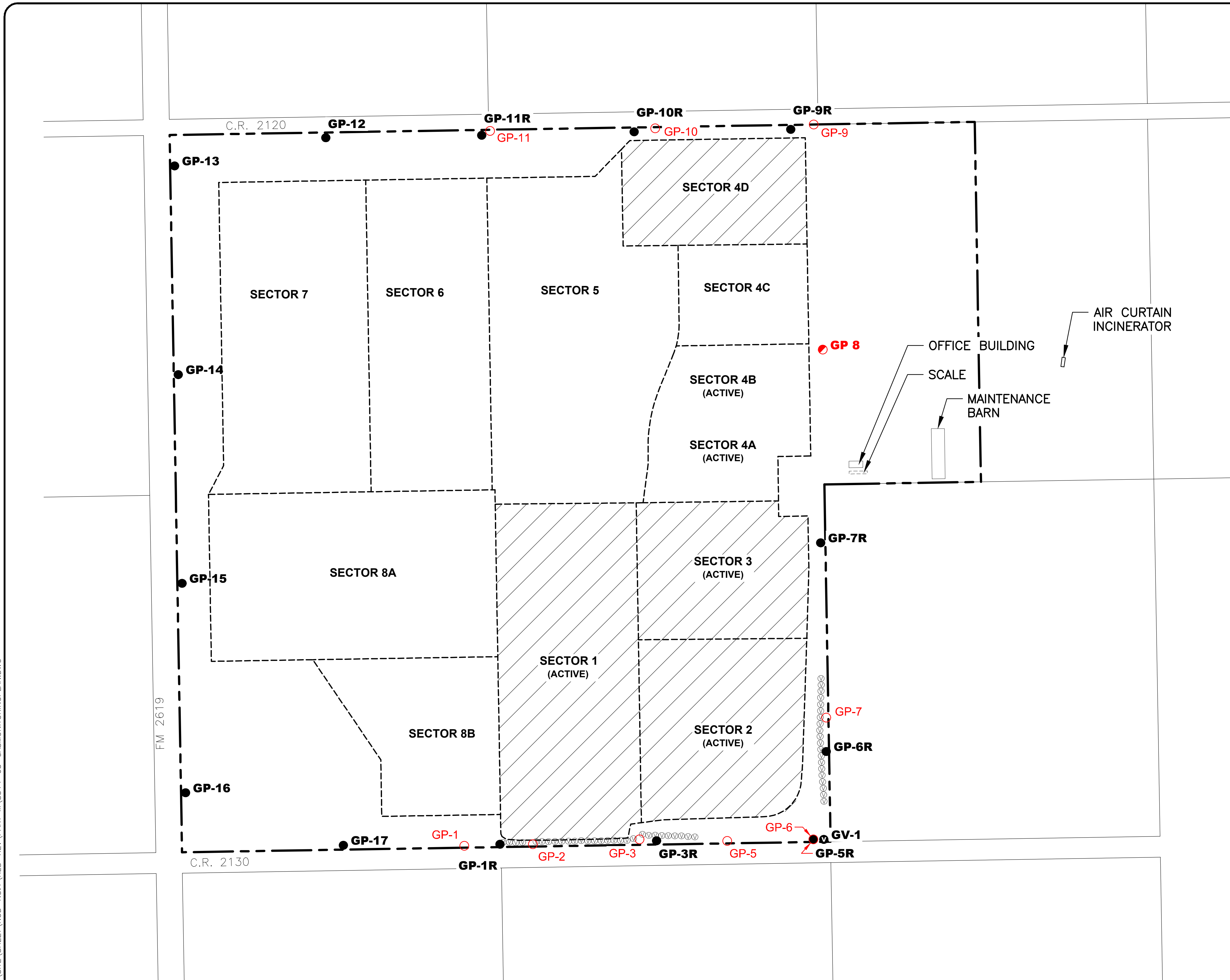
X = An operating gas probe in the current gas monitoring system
ND = A gas monitoring probe which has not been drilled yet
PA = A well that has been Plugged and Abandoned

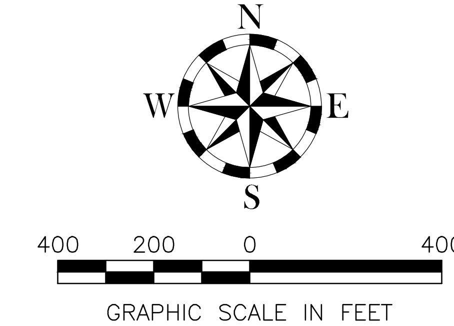
CITY OF KINGSVILLE LANDFILL

PART III, ATTACHMENT 14

APPENDIX 2

GAS MONITORING SITE PLAN





LEGEND:

Symbol	Description
GP 10	EXISTING MSW PERMIT 235-B GAS PROBE TO BE PLUGGED & ABANDONED
GP 8	EXISTING MSW PERMIT 235-B GAS PROBE TO REMAIN IN FUTURE MSW PERMIT 235-C
GP 15	FUTURE MSW PERMIT 235-C GAS PROBE TO BE INSTALLED
x	EXISTING FENCE
	SECTOR OUTLINE
	PERMIT BOUNDARY (175.89 ACRES)
	EXISTING GAS VENT
	UTILITY VENT
	ACTIVE CELLS

EXISTING GAS PROBE LOCATIONS			GAS PROBE DEPTH (FEET) BGS
SITE COORDINATES			
GP	NORTHING	EASTING	
GP-1	17051258.1290	1204752.2190	10.00
GP-2	17051263.8190	1205014.7380	10.00
GP-3	17051282.8690	1205423.9840	15.00
GP-5	17051276.7030	1205759.6460	15.00
GP-6	17051282.2620	1206089.3790	15.00
GP-7	17051749.2390	1206139.2150	20.00
GP-9	17054023.3360	1206090.7800	20.00
GP-10	17054008.7150	1205483.7840	15.00
GP-11	17053998.5040	1204850.9240	15.00

FUTURE GAS PROBE LOCATIONS			GAS PROBE DEPTH (FEET) BGS
SITE COORDINATES			
GP	NORTHING	EASTING	
GP-1R	17051263.8190	1204888.9816	35.90
GP-3R	17051277.3811	1205488.9816	27.21
GP-5R	17051282.2620	1206088.9816	30.64
GP-6R	17051619.6274	1206139.2150	34.73
GP-7R	17052419.6274	1206117.8621	39.50
GP-8	17053159.9300	1206125.7800	37.39
GP-9R	17054004.2022	1206002.7210	34.86
GP-10R	17053995.2004	1205403.1645	35.38
GP-11R	17053981.8903	1204818.8997	30.12
GP-12	17053972.1570	1204221.4253	27.04
GP-13	17053864.3664	1203642.2362	25.32
GP-14	17053064.3664	1203656.2724	25.88
GP-15	17052264.3664	1203670.6988	35.27
GP-16	17051461.5924	1203684.6171	35.87
GP-17	17051260.0121	1204288.9816	45.23
PROPOSED UTILITY VENT			
GV-1	17051282.2620	1206129.3790	--

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JON M. REINHARD
64541
LICENSED
PROFESSIONAL ENGINEER
02/12/19

Hanson No.	16L0438
Filename	8514-03-GASMONITORINGPLAN
Scale	AS SHOWN
Date	02/12/2019
LAYOUT	DT	02/12/2019
DRAWN	DT	02/12/2019
REVIEWED	JMR	02/12/2019

HANSON

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PART III-ATTACHMENT 14
APPENDIX 2
GAS MONITORING SITE PLAN
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.14-2-1

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THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

Volume 6 of 6

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 – February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

ATTACHMENT 15
LEACHATE AND CONTAMINATED WATER MANAGEMENT PLAN

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APPENDICES

all Sectors will consists of geosynthetic clay liner (GCL), a 60-mil HDPE geomembrane liner (FML), high permeability drainage layer (geocomposite), geotextile fabrics for liner protection and fines filtration, perforated collection pipes installed in gravel filled trenches, and leachate collection sumps. The liners are constructed on slopes designed to promote positive drainage along herring-bone contoured sectors. Leachate flows across the graded sector floor to a perforated pipe which directs leachate to sumps or cleanout pipes.

The leachate collection systems will be sloped to drain to a collector pipe running through the center of each section. The leachate collection system used on the sidewalls will consist of a double-sided geocomposite (synthetic drainage net between two layers of geotextile fabric). This will act as a filter to minimize the potential for clogging the drainage net, provide a high friction angle, and maintain the stability of the slope. The leachate collection system used on the bottom or floor will be a single-sided geocomposite (synthetic drainage net with one layer of geotextile fabric on top). The underlying lining system will be sloped at a minimum two percent (2%) slope to the collector pipe. The collector pipe will have a minimum slope of one percent (1%) toward the sump. The sump will have an additional riser pipe for the removal of leachate. Each sump will have nominal dimensions of thirty-four (34) feet square at the floor level and twenty-two (22) feet square at the sump base and will be two (2) feet deep. The sumps will have a gross volume of approximately 1,592 ft^3 and a net or available volume of 478 ft^3.

The entire leachate collection system will be protected by a two (2) foot thick soil cover layer and will have the following characteristics:.

- be constructed of industry standard materials that are chemically resistant to the leachate expected to be generated;
- be of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying wastes, waste cover materials, and by any equipment used at the landfill facility; and
- designed to function through the scheduled closure and post-closure period of the landfill facility.

Design calculations are in Appendix B: Hydraulic Calculations, Appendix C: Leachate Collection System Structural Calculations, Appendix D: Leachate Collection System Pipe & Sump Design Calculations, and Appendix E: Filter Calculations. Design details are in Appendix G: Leachate Storage Facility Design and Appendix H: Collection System Design Details.

The location of the leachate collection system for each section has been shown on Attachment 1, Site Layout Plan. Detail drawings of the leachate collection system have been included in Appendix H.

3.3 Leachate Generation

A computer program was used to estimate the amount of leachate generated from each landfill section. The particular program used was the "Hydrologic Evaluation of Landfill Performance (HELP) Model- Version 3.07". [Ref. 3] This model was developed by the U.S. Army Corps of Engineers Waterways Experiment Station under contract to the U.S. Environmental Protection Agency (EPA) Hazardous Waste Engineering Research Laboratory. The HELP model is an unsaturated flow, water balance model that uses site specific climate, soil, and design data to simulate landfill conditions over a specified time period. This program was used to predict the amount of runoff, evapotranspiration, drainage, leachate collection, and percolation through the liner. A sensitivity analysis of HELP model parameters is included in Appendix I: EPA Seminar Publication Design and Construction of RCRA/CERCLA Final Covers (Chapter 9 Sensitivity Analysis of HELP Model Parameters).

The active stage was modeled for 1 year. The interim stages with intermediate cover were modeled for various lengths of time selected based on the projected duration each condition is likely to occur. The closed landfill condition was modeled for 30 years. The following cases were modeled for the proposed conditions:

- Open (Daily Cover) Conditions-modeled a drainage layer with 10 feet of waste material (1-year); and
- Intermediate Conditions-modeled a drainage layer with 25 feet of waste material (5-years); and
- Intermediate Conditions-modeled a drainage layer with 80 feet of waste material (10-years); and
- Intermediate Conditions-modeled a drainage layer with 168 feet, 141.5 feet, and 120 feet of waste, respectively (5-years); and
- Closed Conditions-modeled a landfill that had achieved final grades (approximately 200 feet) with 2 feet of cover soil (30-years).

3.3.1 Model Input

The HELP program provides a default of five (5) years of rainfall records for most major cities in the U.S. The rainfall records for Kingsville, Texas were used since it is located more than three (3) miles southwest of Corpus Christi, Texas, the closest city with available rainfall data. The normal mean monthly rainfall records were obtained from the National Oceanic and Atmospheric Administration (NOAA) for years 1902 through 2016. This rainfall data was used by the HELP program to synthetically generate rainfall data for the City of Kingsville.

Default average monthly temperature data for Corpus Christi was used since the Kingsville site is not more than 100 miles and difference in elevation is less than 500 feet. Default Solar Radiation Data for Corpus Christi was used since the latitude of the Kingsville site is less than 50 miles. See table below:

HELP Model Weather Input Parameters		
Month	Avg. Precip. (in.)	Avg. Temp (°F)
January	1.63	56.30
February	1.69	59.30
March	1.20	65.90
April	1.57	73.00
May	3.29	78.10
June	3.12	82.70
July	2.26	84.90
August	2.78	85.00
September	5.31	81.50

October	2.92	74.00
November	1.61	65.00
December	1.17	59.10

Default evapotranspiration data for Corpus Christi, Texas was used in the model. The default evaporative zone depth of 12 inches and maximum leaf area index value of 0 for bare ground was selected for the active cases (Case A-1 (1 YR), Case B-1 (1 YR), and Case C-1 (1 YR)). The default evaporative zone depth of 12 inches and maximum leaf area index value of 2 for fair ground was selected for the intermediate cases (Case A-2 (5 YR), Case A-3 (10 YR), Case A-4 (5 YR), Case B-2 (5 YR), Case B-3 (10 YR), Case B-4 (5 YR), Case C-2 (5 YR), Case C-3 (10 YR), and Case C-4 (5 YR)). The default evaporative zone depth of 12 inches and maximum leaf area index of 3.5 for good cover was selected for final cases (Case A-5 (30 YR), Case B-5 (30 YR), and Case C-5 (30 YR)).

For demonstration purposes, the following cases were selected as representative of the worst case leachate collection system and evaluated using the HELP model:

SECTOR 5
Case A-1 (1 YR)-Daily Cover, 10 feet of waste
Case A-2 (5 YR)-Intermediate cover, 25 feet of waste
Case A-3 (10 YR)-Intermediate cover, 80 feet of waste
Case A-4 (5 YR)-Intermediate cover, 168 feet of waste
Case A-5 (30 YR)-Final cover, 168 feet of waste
SECTOR 4C
Case B-1 (1 YR)-Daily Cover, 10 feet of waste
Case B-2 (5 YR)-Intermediate cover, 25 feet of waste
Case B-3 (10 YR)-Intermediate cover, 80 feet of waste
Case B-4 (5 YR)-Intermediate cover, 141.5 feet of waste
Case B-5 (30 YR)-Final cover, 141.5 feet of waste
SECTOR 8 OVERLINER
Case C-1 (1 YR)-Daily Cover, 10 feet of waste
Case C-2 (5 YR)-Intermediate cover, 25 feet of waste
Case C-3 (10 YR)-Intermediate cover, 80 feet of waste
Case C-4 (5 YR)-Intermediate cover, 120 feet of waste
Case C-5 (30 YR)-Final cover, 120 feet of waste

Default properties from the model were used to describe the waste layer and the composite liner. For the protective soil layer and the leachate collection system, parameters from the model were supplemented with data from the geotechnical report and design assumptions. All active scenarios were modeled with a 0% recirculation rate as shown in Appendix A.

A summary of surface area and maximum travel distance to a collector pipe for each section of the landfill is shown below:

Section	Surface Area (AC.)	Model Surface Area (AC.)	Drain Length (FT.)	Depth of MSW at Closure (IN.)
A	19.2	1	500	2,016
B	4.7	1	150	1,698
C	26.9	1	400	1,440

Groundwater Inflow – It is assumed that there will be no groundwater inflow into the landfill. See Part III Attachment 10 Liner Quality Control Plan (LQCP), Appendix D Temporary Dewatering System Design and Appendix J Groundwater Inflow in this Attachment.

Runoff Potential – Runoff potential for the open condition was conservatively assumed to be zero, although operational daily cover will allow runoff on graded portions of the operational areas. Runoff potential for operational conditions was assumed to be 80%, as cover will be rough graded to drain. The closed conditions model assumes a runoff potential for 100% of the surface area, since the vegetative cover and final grading will be constructed and maintained to effectively control stormwater runoff and minimize ponding on top of the final cover.

Runoff Curve Number – Default curve numbers were chosen based on the soil data, ground cover, surface slope, and slope length of the selected case. SCS runoff curve numbers ranged from approximately 84 to 95 for the HELP modeling.

Daily and Intermediate Cover Soil Layers – The open conditions model assumes that 6 inches of daily cover is in place and the intermediate conditions model assumes that 12 inches of intermediate soil cover is in place. Geotechnical information provided indicates that sandy clay soils will be available onsite for use as daily and intermediate cover soil layers and therefore default values for soil texture 13 were used in the model.

Final Cover Soil Layers – The closed conditions were modeled with a 24-inch erosion layer of onsite soil with the top 6 inches that is capable of sustaining growth of vegetation. Geotechnical information provided indicates that sandy clay soils will be available for use as erosion layer and therefore default values for soil texture 13 were used in the model.

Leachate Collection Layer – The leachate collection layer will consist of a drainage geocomposite. It will be comprised of a 300-mil geonet with an 8-ounce non-woven geotextile heat-bonded to top (at bottom of cell) or the top and bottom of the geonet (at sideslopes). Soil texture 20 was used in the model.

Flexible Membrane Cover – The flexible membrane cover consists of a 40-mil LLDPE geomembrane. Default values for soil texture 36 were used to model the flexible membrane cover. The cover will be installed and tested in accordance with the requirements of *Final Cover Quality Control Plan* and therefore was modeled for good installation quality, two defects per acre, and a pinhole density of one hole per acre.

Barrier Liner – The barrier liner consists of a geosynthetic clay liner (GCL). Default values for soil texture 17 were used to model the GCL.

The capacity of the leachate collection pump was selected to both comply with the maximum allowable liquid level and provide a reasonable pump cycle time. Minimum pump capacities for the individual landfill sections are shown in the following table. See Appendix B for hydraulic calculations and Appendix D for leachate collection system pipe and sump design calculations.

Section	Design Flow (gpm)	Design Volume (gal/week)	Leachate Collector Line Size (inches)
A	92.0	46,000	6
B	22.5	~~45,210~~11,180	6
C	66.2	32,700	6

Piping used to convey leachate will be smooth walled high density polyethylene (HDPE) piping. This piping will be run above ground, where it can be inspected for leakage. If it is necessary to provide a crossing for equipment, the line will be buried and/or cased, and an earthen ramp constructed over the casing. A high level shut-off switch will be provided at the Contaminated Water Storage Area to prevent over-filling of the leachate storage unit.

4.1.2 Collector Pipe Cleaning

The City of Kingsville currently has sewer cleaning capabilities which can be used to clean the leachate lines if necessary. The maximum pipe length will not exceed approximately 1,100 feet. This should be adequate to hydroflush lines in each Sector with no obstructions in the event the pipes become clogged.

4.2 Management and Disposal of Leachate and First Degree Contaminated Stormwater

Leachate may be managed in several ways. Leachate may be pumped to and stored onsite in a lined evaporation pond, as discussed in Section 5.3. It may also be collected and transported or pumped and disposed of directly at the Kingsville Wastewater Treatment Plant in accordance with the City of Kingsville, TX Code of Ordinances. A copy of the Kingsville, TX Code of Ordinances is attached in Appendix F. A copy of the Kingsville, TX Code of Ordinances will be placed in the Site Operating Record (SOR). The City of Kingsville may also elect to transport the leachate to an alternate disposal facility, authorized by the TCEQ to accept MSW landfill leachate. Leachate and first degree contaminated stormwater will be pumped into the existing lined contaminated water evaporation pond located in Sector 5 during active waste filling operations until Sector 5 is completely developed. The existing contaminated water evaporation pond is adequately sized to contain the combined leachate volumes from Sectors 1-4D plus the rainfall from a 25-year, 24-hour storm, first degree contaminated stormwater, and at least 1 foot of freeboard. The existing pond is 11 feet deep or 9 feet deep with 2 feet of protective cover over the liner. The existing pond is lined with a GCL, a 60-mil HDPE geomembrane, and 2 feet of protective cover. The Alternate Pond Liner Design Report (Permit Amendment Application MSW 235-B) has been included in Appendix B. Calculations for Sector 5 pond are included in Appendix B. Upon development of Sector 5 and the decommissioning of the existing contaminated water evaporation pond, a new contaminated water evaporation pond will be constructed in Sector 7. Leachate and first degree contaminated stormwater will then be pumped to the lined evaporation pond located in Sector 7 during active waste filling operations up until Sector 7 is completely developed. At which time, due to space limitations, the leachate will be pumped to an onsite Contaminated Water Storage Area (leachate tanks) as described in Section 7. The leachate will either be collected and transported or pumped directly to the Kingsville Wastewater Treatment Plant and/or transported to an alternate TCEQ authorized disposal facility.

4.3 Storage of Leachate

Leachate may be stored in the Contaminated Water Storage Area, described in Section 7, Design of Contaminated Water Storage Area. The Contaminated Water Storage Area will provide for proper storage and containment for contaminated water. If necessary, gas condensate may also be stored in the contaminated water storage area.

5 LEACHATE MANAGEMENT DURING POST-CLOSURE

During the post-closure care period, the City will monitor the leachate removal risers for the presence of leachate at least weekly. The computer modeling described below indicates that the leachate will be maintained at a depth of less than thirty (30) centimeters (cm) if it is removed weekly.

5.1 Post-Closure Leachate Generation

The HELP Program was used to estimate leachate generation during the thirty (30) year post-closure period. Program input was the same as described previously, except that the MSW layer was increased to reflect depth at closure, and four (4) layers were added to simulate the final cover of the landfill. The final depth of MSW used as input is shown in Appendix A. The following is a summary of leachate generation rates output by the HELP model:

Section	Peak Daily (CF.)	Annual Average (CF.)
A	0.1701	0.078
B	0.00021	0.008
C	0.151	0.062

5.2 Leachate Monitoring and Removal

As mentioned previously, leachate risers will initially be monitored weekly for the presence of leachate. Any section which has been monitored for eight (8) consecutive weeks, and has produced no leachate, will have the monitoring frequency reduced to monthly after final cap placement. Any section which has been monitored for six (6) consecutive months, and has produced no leachate, will have the monitoring frequency reduced to quarterly. Quarterly monitoring shall continue for all sections after closure. Leachate removal pumps will be maintained in those sections of the landfill which are still producing leachate on a weekly basis.

5.3 Management and Disposal of Leachate

Leachate generated during the post-closure period may be managed in several ways. During the active period the leachate and contaminated stormwater will pumped into a lined evaporation pond. The leachate generation modeling performed indicates that this is a cost effective way of handing the leachate. The future pond will be constructed in an unused portion of the west side of the landfill located in future Sector 7; once Sector 5 is completely developed and the pond is Sector 5 is no longer utilized. This pond will be sized to contain the combined leachate volumes from Sectors 1-6, plus the rainfall from a 25 year, 24 hour storm first degree contaminated stormwater, and one foot of freeboard. The pond will be lined with a 60 mil flexible membrane liner (HDPE geomembrane) and geosynthetic clay liner (GCL). A typical cross section of the evaporation pond is shown in Appendix G.

The pond will require a surface area of approximately one acre. Calculations and design details demonstrating the adequacy of the evaporation ponds have been in included in Appendix B and Appendix G. The ponds will be monitored during the periodic leachate monitoring activities. If the leachate generation rates exceed the capacity of the ponds, the excess leachate will be disposed of at an authorized offsite facility.

Once Sector 7 is fully developed, the leachate may be pumped to an onsite Contaminated Water Storage Area (leachate tanks). The leachate storage facility design is shown in Appendix G. The leachate may be disposed of at the City of Kingsville Wastewater Treatment Plant by either pumping or transporting it in accordance with the City of City of Kingsville, TX Code of Ordinances (Appendix F). The City of Kingsville may also elect to transport the leachate to an alternate disposal facility, authorized by the TCEQ to accept MSW landfill leachate.

6 CONTROL OF CONTAMINATED STORM WATER

6.1 First Degree Contaminated Storm Water

First degree contaminated storm water will be evacuated utilizing a portable pump which will be moved about the cell depending on where the working face and ponded water are located. A twenty five (25) year, twenty four (24) hour storm event of eight and ~~one-half~~seven tenths (~~8 ½~~8.7) inches can be expected to generate approximately ~~30,000~~30,500 gallons of contaminated storm water on a seventy five (75) feet square working face. This contaminated storm water will either be pumped to either the contaminated water evaporation pond in Sector 5 or Sector 7; the Contaminated Water Storage Area or removed and transported off- site. Piping used to convey first degree contaminated water will be smooth walled high density polyethylene piping. This piping will be run above ground, where it can be inspected for leakage. If it is necessary to provide a crossing for equipment, the line will be cased, and an earthen ramp constructed over the casing. This storm water will be disposed of at either the Kingsville Wastewater Treatment Plant (in accordance with the City of Kingsville, TX Code of Ordinances) or at an authorized off-site facility.

6.2 Second Degree Contaminated Storm Water

The City of Kingsville has a current Stormwater Pollution Prevention Plan (SWPPP) prepared according to the requirements of the *Texas Commission on Environmental Quality (TCEQ) Permit Number TXR050000-General Permit to Discharge Under the Texas Pollutant Discharge Elimination System (TPDES)-Multi-Sector General Permit (MSGP)*, effective on August 14, 2016. Prior to being discharged, second degree contaminated storm water will be inspected for exhibits excessive suspended solid will be discharged through a sediment control structure. Acceptable sediment control structures include silt fences, hay bales, wattles, and similar technologies. All discharges will be made in a manner that minimizes erosion at the discharge point. Second degree contaminated storm water which exhibits an oil sheen will be managed as first degree contaminated storm water.

7 DESIGN OF CONTAMINATED WATER STORAGE AREA

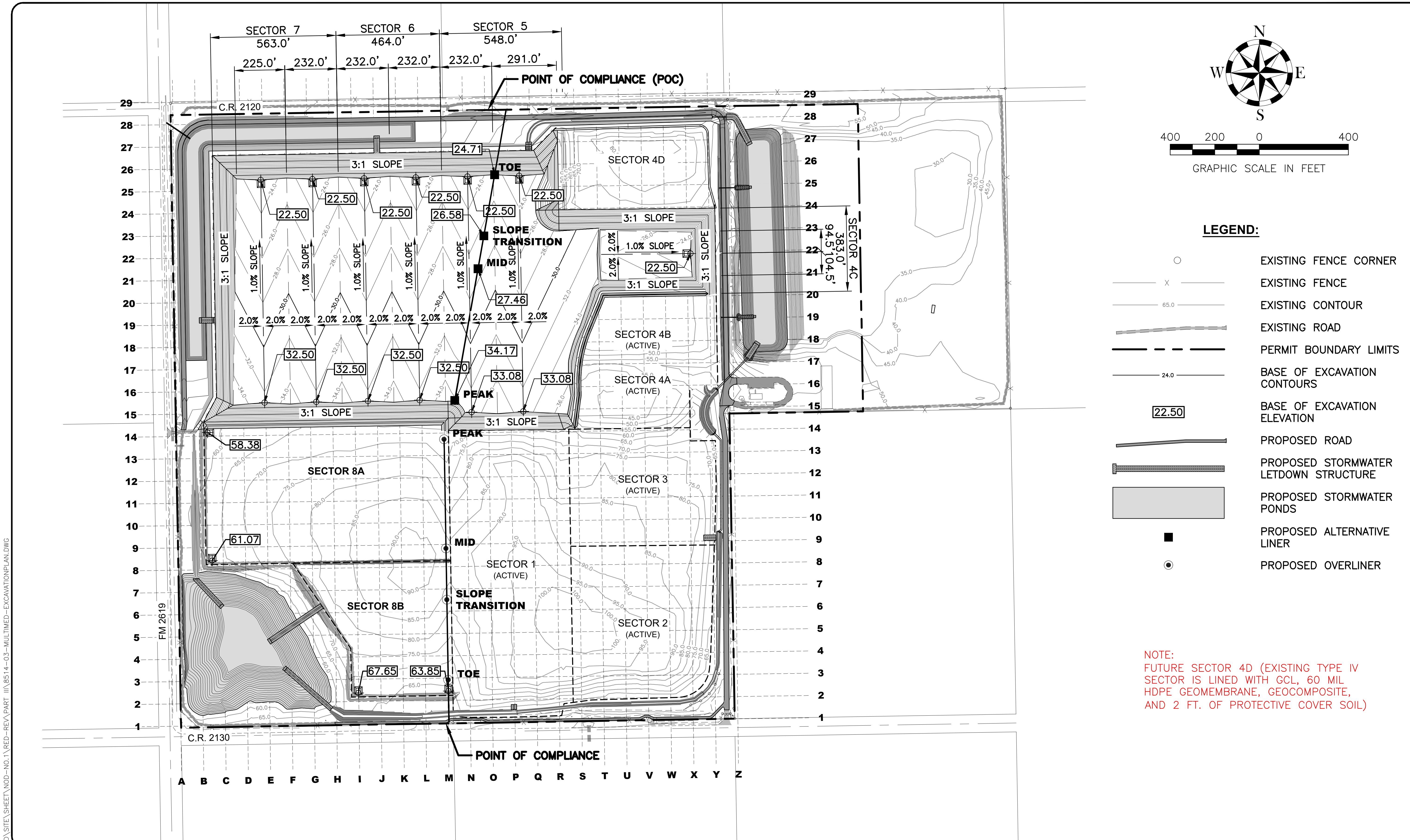
The Contaminated Water Storage Area will provide tanks to contain leachate, contaminated water, and gas condensate, if produced. These tanks will be placed inside a secondary concrete containment unit. Secondary containment will be designed to hold a spill of the largest tank plus the rainfall volume of the twenty-five (25) year, twenty-four (24) hour storm. Approximately 30,000 gallons of tankage will be maintained on-site with the option of adding a future 30,000 gallon tank; and based on actual leachate volumes and characteristics, the storage capacities of the tanks and disposal frequencies may be revised. Details for the contaminated water storage area have been included in Appendix G.

8 REFERENCES

1. Texas Natural Resource Conservation Commission Municipal Solid Waste Division, Leachate Collection System Handbook, October 1993.
2. City of Kingsville Municipal Solid Waste Disposal Facility Permit Amendment Application MSW 235-5 (Attachment 4-Geology Report), September 1998.
3. The Hydrologic Evaluation of Landfill Performance (HELP) Model, User's Guide Version 3, Paul R. Schroeder, Cheryl M. Lloyd, Paul A. Zappi, and Nadim M. Aziz, September 1994.
4. ASCE, "Design and Construction of Sanitary and Storm Sewers", Manual and Report on Engineering Practice No. 37, American Society of Civil Engineers, New York, NY, Printed 1969, Reprinted 1979, 332 p.
5. Koerner, Robert M., (1994). "Designing with Geosynthetics"; 3rd Edition; Prentice Hall; Englewood-Cliffs, New Jersey 07632.
6. Uni-Bell PVC Pipe Association (1993), "Handbook of PVC Pipe Design and Construction"; 3rd Edition; Uni-Bell PVC Pipe Association; Dallas, Texas 75234
7. "TNRCC Municipal Solid Waste Permits Section Subtitle D Training Manual"; May 10, 1994.

APPENDIX A

HELP MODEL DATA



LEGEND:

○	EXISTING FENCE CORNER
—x—	EXISTING FENCE
—65.0—	EXISTING CONTOUR
	EXISTING ROAD
— — —	PERMIT BOUNDARY LIMITS
—24.0—	BASE OF EXCAVATION CONTOURS
22.50	BASE OF EXCAVATION ELEVATION
	PROPOSED ROAD
	PROPOSED STORMWATER LETDOWN STRUCTURE
	PROPOSED STORMWATER PONDS
■	PROPOSED ALTERNATIVE LINER
⊙	PROPOSED OVERLINER

NOTE:
FUTURE SECTOR 4D (EXISTING TYPE IV SECTOR IS LINED WITH GCL, 60 MIL HDPE GEOMEMBRANE, GEOCOMPOSITE, AND 2 FT. OF PROTECTIVE COVER SOIL)

FEB 11, 2019 1:33 PM TORRE01809
I:\16JOBS\16L0438B\CAD\SITE\SHEET\NOD-NO.1\RED-REV\PART III\8514-03-MULTIMED-EXCAVATIONPLAN.DWG

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JOSE C. GARZA
91790
LICENSED PROFESSIONAL ENGINEER
02/11/19

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 02/11/2019

LAYOUT	DT	02/11/2019
DRAWN	DT	02/11/2019
REVIEWED	JCG	02/11/2019

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4501 Gollihar Rd.
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TBPLS F-10039500
TBPG F-50556
TBAE F-BR 2458

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(800) 677-2831
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Offices Nationwide

PART III, ATTACHMENT 5, APPENDIX A
LANDFILL COMPLETION
EXCAVATION PLAN
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.5-A.2

APPENDIX B

HYDRAULIC CALCULATIONS

JOB NO. 8514-3 **HANSON PROFESSIONAL SERVICES INC.** SHEET NO. 1
DESCRIPTION: SAMPLE CALCULATIONS – City of Kingsville Landfill DATE: ~~08/13/2018~~01/08/19
Leachate Collection System - Hydrologic

OBJECTIVES:
- Compute the design leachate flow rates/volumes for the leachate collection facilities.
- Compute the maximum depth of leachate in the collection system.
- Compute the size of the sump pump and the storage time in the sump.
- Compute the capacity required for the facility's future contaminated water ~~leachate~~ evaporation pond in Sector 7.
- Compute the capacity required for the facility's existing contaminated water evaporation pond in future Sector 5.

I. OBJECTIVE: Compute the design leachate flow rates/volumes for the various leachate collection facilities.

A. Approach:

1. Calculations are shown for one acre disposal area.
2. Review the leachate generation rates computed using the HELP model to determine the largest, to use in the design of the leachate system hydraulics.
3. Multiply the selected leachate generation rate by the required safety factor to compute the design flow rates.
4. Review the leachate generation rates computed using the HELP model to determine the long term average, to use in the design of the leachate evaporation pond.

B. Assumptions: The rainfall data used to run the HELP model (Kingsville, Texas) is applicable to this site.

C. Calculations:

1. The output from the HELP models indicate that the Peak Daily generation rate is 622 cubic feet (ft^3).

$$Q = 622 \text{ ft}^3\text{/day-acre} \times 1 \text{ day/24 hrs.} \times 1 \text{ hr./60 min} \times 1 \text{ min/60 sec}$$
$$= \mathbf{0.007\ ft^3/sec\text{-}acre}$$

2. Multiply the selected leachate generation rates by the required safety factor to compute the design flow rates.

As required by the TNRCC Leachate Collection System Handbook, the design flow rates must be increased by fifty percent (50%).

$$Q = 0.007 \text{ ft}^3\text{/sec-acre} \times 1.5 = \mathbf{0.01080\ ft^3/sec\text{-}acre}$$

JOB NO. 8514-3 **HANSON PROFESSIONAL SERVICES INC.** SHEET NO. 4
DESCRIPTION: SAMPLE CALCULATIONS – City of Kingsville Landfill DATE: ~~08/13/2018~~01/08/19
Leachate Collection System - Hydrologic

C. Calculations:

Q = 0.01080 ft^3/sec –acre x 60 sec/min x 7.48 gal/ft^3 = 4.847 gal/min-acre;
Q = 4.847 gal/min-acre x 19 acre = 92.08 gal/min
Q = 0.01080 ft^3/sec –acre x 19 acre = 0.2052 ft^3/sec

Time = 478 ft^3 (sump volume) x 1 sec/0.2052 ft^3 x 1 min/60 sec = 38.82 min
Time = 0.65 hrs.
Time = 0.027 days

(Calculations Continued in Part III. C. Calculations Existing Sump Pump Capacities)

APPENDIX D

SUMP & PUMP CAPACITIES

City of Kingsville
Municipal Solid Waste Disposal Facility
Permit Amendment Application MSW 235-B

STATE OF TEXAS
RAY N. FINCH
30926
REGISTERED
PROFESSIONAL ENGINEER
11-25-97

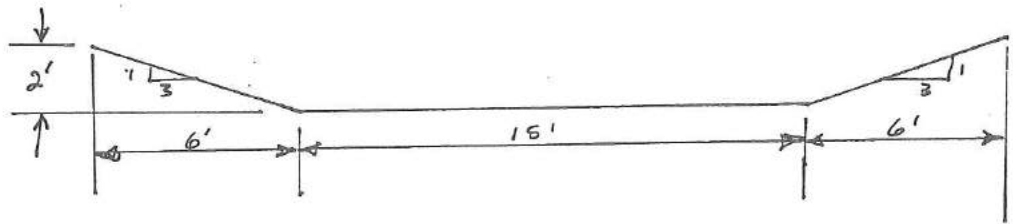
THIS CERTIFICATION IS INTENDED FOR PERMITTING PURPOSES ONLY AND INCLUDES PAGES 1 THROUGH 11.

November 1997

PAGE 455 FROM PERMIT 235-B VOLUME V OF V

6-97	R.N. Finch	Leachate Collection Sump Volume	COK-MSWLF ATTACHMENT 15	1/1

The Leachate Collection Sump(s) are to be 2 foot deep with a 15 foot square bottom and 3H:1V side slopes:



The volume for the frustrum of a pyramid is

$$V = \frac{1}{3}\left[A_1 + A_2 + \sqrt{A_1 A_2}\right] h$$

where V = volume, $(\ell)^3$

A_1 = area of base, $(\ell)^2$

A_2 = area of top, $(\ell)^2$

h = height between base & top, ℓ

$\therefore A_1 = (6' + 15' + 6')^2 = (27')^2 = 729\ ft^2$

& $A_2 = (15')^2 = (15')^2 = 225\ ft^2$

$h = 2'$

$\therefore V = \frac{1}{3}\left[729\ ft^2 + 225\ ft^2 + \sqrt{(729\ ft^2)(225\ ft^2)}\right] \cdot 2\ ft$

$V = \boxed{906\ ft^3} \times \frac{7.481\ gal}{ft^3} = \boxed{6{,}778\ gals}$ ←

V @ 50% Porosity = $(6{,}778)(0.50) = \boxed{3{,}389\ gallons}$ when full gravel ←

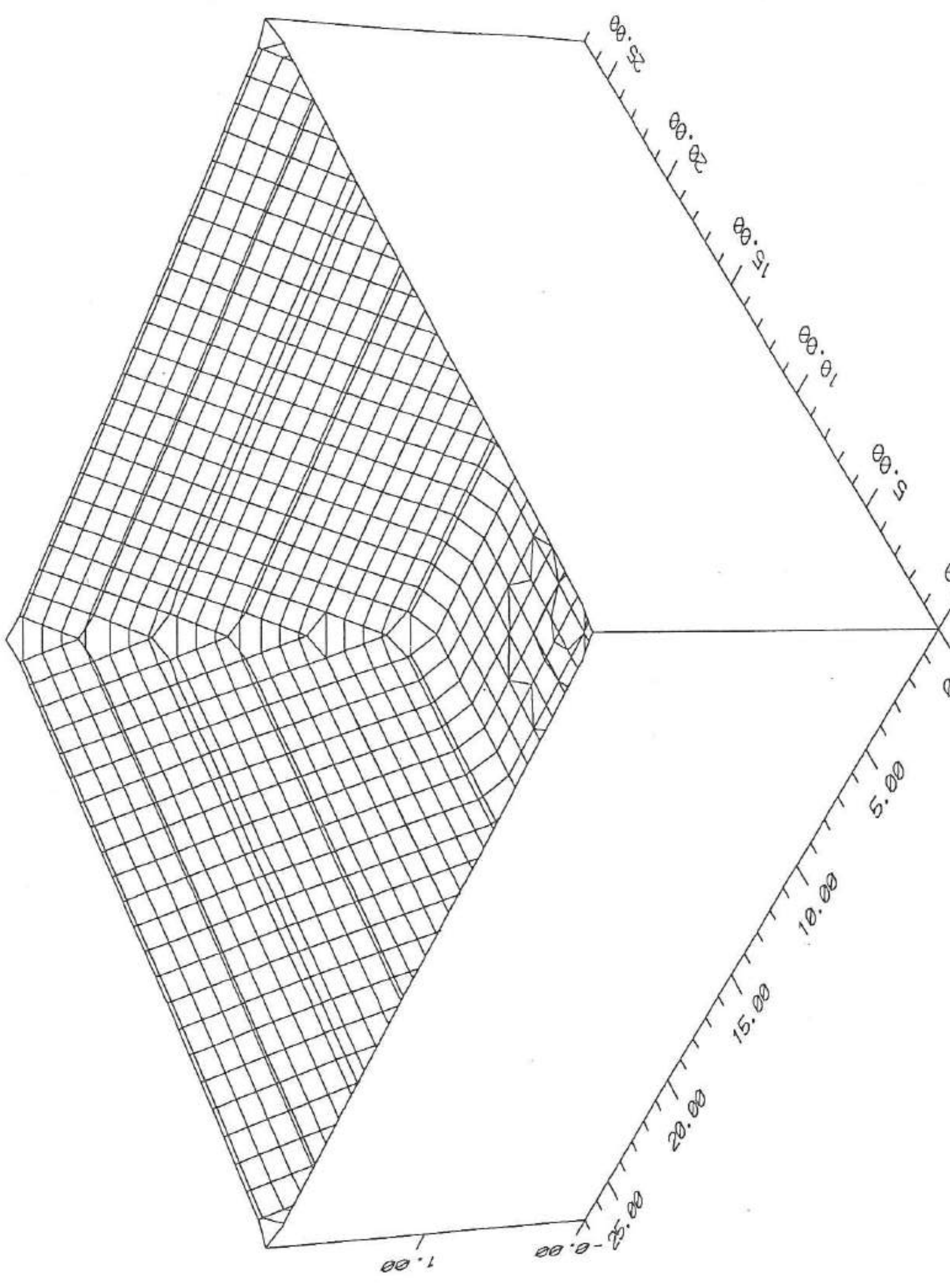


FIGURE 15.D.1 - Leachate Collection Sump

PAGE 459 FROM PERMIT 235-B VOLUME V OF V

For piping - use portable 6" diameter aluminum irrigation pipe or PVC Sched 40 pipe. This will actually have a smoother surface & less friction than 6" Schd 40 steel pipe.

The maximum distance from the farthest leachate sump to the existing leachate collection pond. (Beginning w/ Cell 2 and going around outside of cells is 2,400 ft. ∴ Use 2,500 ft of pipe.)

This must be 6" diameter pipe.

Recheck pump size for leachate removal from sump, if sump full w/ gravel case, volume is 3,389 gallons. ∴ to pump out would take only

$\frac{3,389 \text{ gallons}}{300 \text{ gpm}} = 11.3$ minutes - this might be too fast & cause problems w/ operations or erosion in sump.

TRY 1 hour pump out time.

$\therefore \frac{3,389 \text{ gallons}}{60 \text{ min}} = 56.48$ gpm say 50 gpm

Since normally not pump whole contents @ once

$$H.H.P. = \left(\frac{50\,gal}{min}\right)\left(\frac{ft^3}{7.481\,gal}\right)\left(\frac{40\,ft\text{-}lbf}{lbm}\right)\left(\frac{62.4\,lbm}{ft^3}\right)\left(\frac{min\cdot HP}{33,000\,ft\text{-}lbf}\right)$$

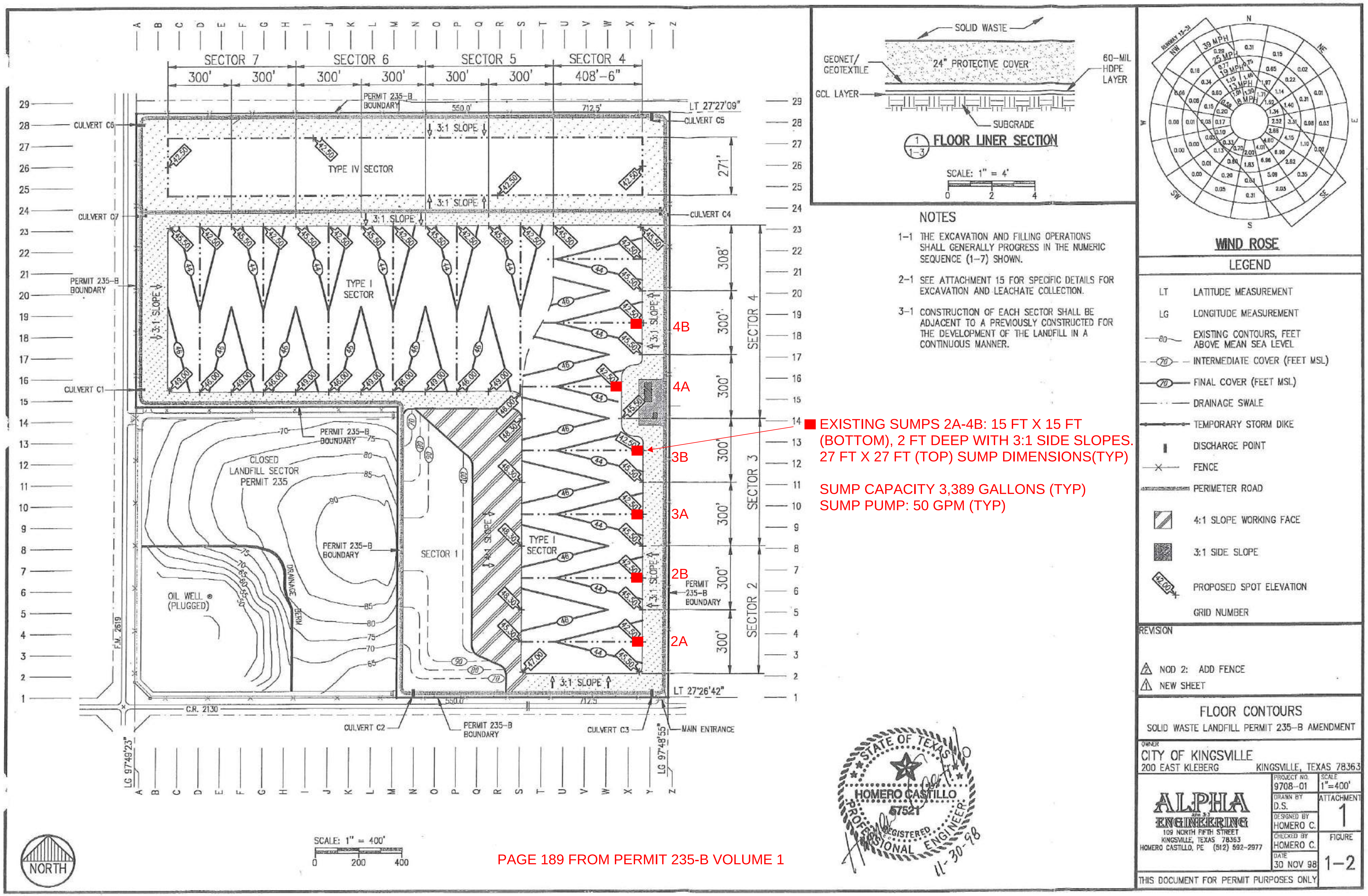
H.H.P = 0.50 HHP

∴ try 1 BHP

$\therefore Effcy = \frac{0.50}{1.00} \times 100 = 50\%$ (OK)

∴ **Use a 50 gpm, 40 ft lbf/lbm head, 1 BHP submersible pump** ←

Need a min of 1, 2 if dist change sumps (2,3,4) & 4 cells (5,6,7)



SECTOR 7
SECTOR 6
SECTOR 5
SECTOR 4
TYPE IV SECTOR
TYPE I SECTOR
CLOSED LANDFILL SECTOR PERMIT 235
SECTOR 1
SECTOR 2
SECTOR 3
4B
4A
3B
3A
2B
2A
EXISTING SUMPS 2A-4B: 15 FT X 15 FT (BOTTOM), 2 FT DEEP WITH 3:1 SIDE SLOPES. 27 FT X 27 FT (TOP) SUMP DIMENSIONS(TYP)
SUMP CAPACITY 3,389 GALLONS (TYP)
SUMP PUMP: 50 GPM (TYP)
FLOOR LINER SECTION
SCALE: 1" = 4'
NOTES
1-1 THE EXCAVATION AND FILLING OPERATIONS SHALL GENERALLY PROGRESS IN THE NUMERIC SEQUENCE (1-7) SHOWN.
2-1 SEE ATTACHMENT 15 FOR SPECIFIC DETAILS FOR EXCAVATION AND LEACHATE COLLECTION.
3-1 CONSTRUCTION OF EACH SECTOR SHALL BE ADJACENT TO A PREVIOUSLY CONSTRUCTED FOR THE DEVELOPMENT OF THE LANDFILL IN A CONTINUOUS MANNER.
WIND ROSE
LEGEND
LT LATITUDE MEASUREMENT
LG LONGITUDE MEASUREMENT
EXISTING CONTOURS, FEET ABOVE MEAN SEA LEVEL
INTERMEDIATE COVER (FEET MSL)
FINAL COVER (FEET MSL)
DRAINAGE SWALE
TEMPORARY STORM DIKE
DISCHARGE POINT
FENCE
PERIMETER ROAD
4:1 SLOPE WORKING FACE
3:1 SIDE SLOPE
PROPOSED SPOT ELEVATION
GRID NUMBER
REVISION
NOD 2: ADD FENCE
NEW SHEET
FLOOR CONTOURS
SOLID WASTE LANDFILL PERMIT 235-B AMENDMENT
CITY OF KINGSVILLE
200 EAST KLEBERG KINGSVILLE, TEXAS 78363
ALPHA ENGINEERING
109 NORTH FIFTH STREET KINGSVILLE, TEXAS 78363
HOMERO CASTILLO, PE (512) 592-2977
PROJECT NO. 9708-01
SCALE 1"=400'
ATTACHMENT 1
FIGURE 1-2
DATE 30 NOV 98
THIS DOCUMENT FOR PERMIT PURPOSES ONLY
SCALE: 1" = 400'
PAGE 189 FROM PERMIT 235-B VOLUME 1

JOB NO. 8514-3 **HANSON PROFESSIONAL SERVICES INC.** SHEET NO. 10
DESCRIPTION: SAMPLE CALCULATIONS – City of Kingsville Landfill DATE: ~~08/13/2018~~01/08/19
Leachate Collection System - Hydrologic

IV. OBJECTIVE: Compute the capacity required for the facility's future contaminated water~~leachate~~ evaporation pond in Sector 7. Compute the capacity required for the facility's existing contaminated water evaporation pond in future Sector 5.

A. Approach: Compute the onsite contaminated water~~leachate~~ evaporation pond capacity using the design flow rate.

B. Assumptions:

1. None of the leachate is re-circulated back onto the working face of the landfill.
2. The landfill leachate will be pumped directly into an onsite contaminated water~~leachate~~ evaporation pond.

C. Calculations:

V = 28,366 gal/day x 7 days = **198,562 gallons**
V = 28,366 gal/day x 14 days = **397,124 gallons**
V = 28,366 gal/day x 21 days = **595,686 gallons**
V = 28,366 gal/day x 28 days = **794,248 gallons**
V = 28,366 gal/day x 30 days = **850,980 gallons**

(Calculations Continued in Part IV. C. Calculations Contaminated Water Evaporation Pond in Future Sector 7 and Part IV. C. Calculations Existing Contaminated Evaporation Pond in Future Sector 5)

Part IV. C. Calculations (continued):
Contaminated Water Evaporation Pond in Future Sector 7

Determine the required capacity of a 5-foot deep pond to accommodate the average yearly flow rate and the 25-yr/24-hr rainfall produced during operating conditions from Sectors 1-6 for 30 days.

Convert the max average yearly flow rate of leachate from (ft^3/yr-acre) to (ft^3/sec-acre): 16,880 ft^3/yr-acre
16,880 ft^3/year-acre x (1 yr/365 days) x (1 day/24 hrs) x (1 hr/60 min) x (1min/60 sec): 0.0005353 ft^3/sec-acre

multiply by 82 acres:
Where: Q = flow rate for Sectors 1-6 (82 acres): 0.043891 ft^3/sec

^{V}required = Q (ft^3) x (30 days) x (24 hrs/1 day) x (60 min/1 hr) x (60 sec/1 min) 113,767 ft^3
^{V}required = Q (ft^3) x 7.48 gallons/ft^3 850,974 gallons
^{V}required = Round to nearest 10 850,980 gallons

Calculate the volume of a pond that is 170 ft wide by 220 ft long at the bottom and 200 ft wide by 250 ft long at the top with a depth of 5 feet and sideslope of 3H:1V.

Bottom W=	170	ft
Bottom L=	220	ft
Top W=	200	ft

JOB NO. 8514-3 **HANSON PROFESSIONAL SERVICES INC.** SHEET NO. 11
DESCRIPTION: SAMPLE CALCULATIONS – City of Kingsville Landfill DATE: ~~08/13/2018~~01/08/19
Leachate Collection System - Hydrologic

Top L= 250 ft
Side Slope (S)= 3 (3 to 1)

Perimeter (ft) at each foot of depth:

Depth (D)	Perimeter (P)
0	762.65
1	781.45
2	800.24
3	819.24
4	837.84
5	856.63

Vpond = Vrectangle + Vtriangle perimeter (Pond Volume at Each Foot of Depth)
Vpond = (W x L x Depth)+(1/2 x (S x D) x D x P)

		ft^3	gallons
Where:	Vpond (at 0 depth) =	0	0.00
	Vpond (at 1 depth) =	38,572	288,520
	Vpond (at 2 depth) =	79,601	595,419
	Vpond (at 3 depth) =	123,260	921,983
	Vpond (at 4 depth) =	169,708	1,269,417
	Vpond (at 5 depth) =	219,124	1,639,045

Determine the required capacity for precipitation from a 25-yr, 24-hr Storm (8.7"); top area of pond.
25-yr/24-hr= 8.7 inches

^{V}required = Rain (in) x (1 ft/12 in) x Top W x Top L 36,250 ft^3
^{V}required = Q (ft^3) x 7.48 gallons/ft^3 **271,150 gallons**

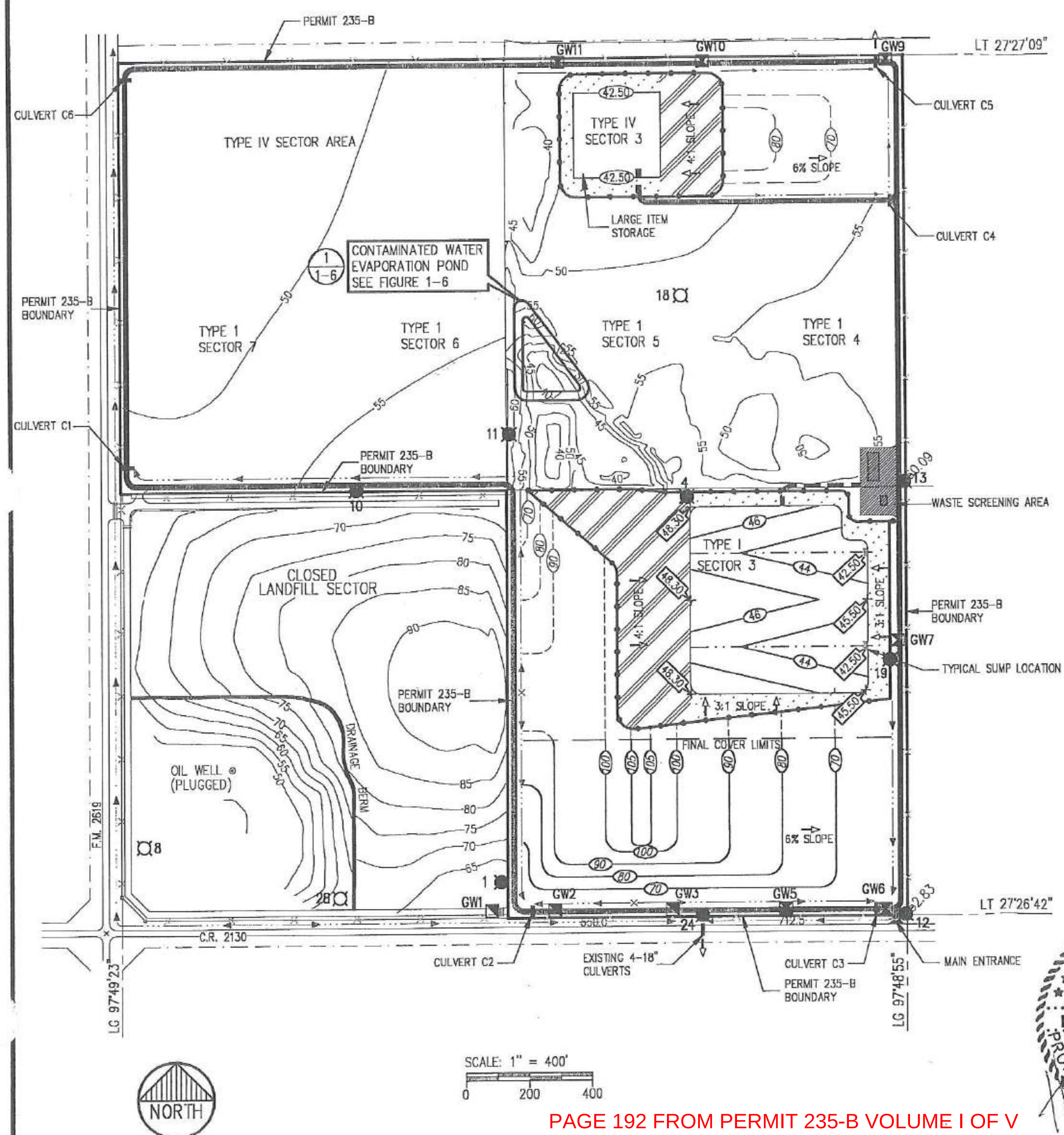
Determine the required capacity for first degree contaminated stormwater for precipitation from a 25-yr, 24-hr Storm (8.7"); 75' x 75' working face.
25-yr/24-hr= 8.7 inches

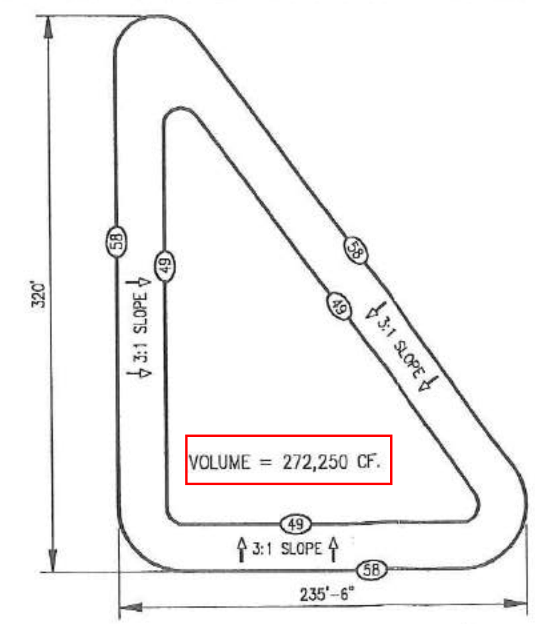
^{V}required = (Rain (in) x (1 ft/12 in) x 75 ft x 75 ft) x 7.48 gallons/ft^3 **30,504 gallons**

The required volume (leachate plus 25-yr/24-hr precipitation) is: 1,152,634 gallons which is less than the available volume of 1,269,417 gallons at 4 ft depth.

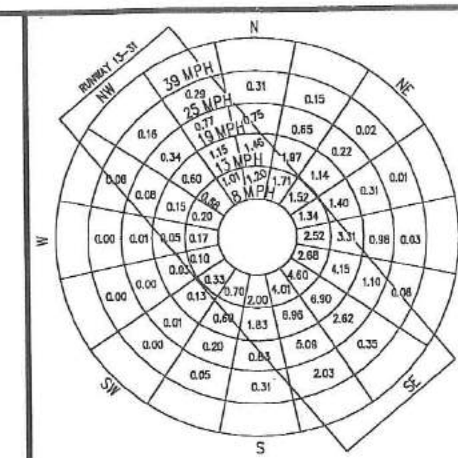
The available volume of the contaminated water evaporation pond is approximately 219,124 ft^3 or 1,639,045 gallons.

RESULTS:
The leachate storage pond is designed to adequately handle the maximum leachate production and the 25-yr/24-hr precipitation from Sectors 1-6 during operational conditions; including 1 ft. of freeboard.





CONTAMINATED WATER EVAPORATION POND
REFER TO FIG. 1-5, 1-6, 1-7, AND APPENDIX 6B FIG. 6B-3
SCALE: 1" = 100'
0 50 100



WIND ROSE

LEGEND

- LT — LATITUDE MEASUREMENT
- LG — LONGITUDE MEASUREMENT
- EXISTING CONTOURS, FEET ABOVE MEAN SEA LEVEL
- INTERMEDIATE COVER CONTOUR (FEET MSL)
- FINAL COVER CONTOUR (FEET MSL)
- DRAINAGE SWALE
- TEMPORARY STORM DIKE
- DISCHARGE POINT
- PERIMETER ROAD
- TEMPORARY ACCESS ROAD TO SECTOR
- 4:1 SLOPE WORKING FACE
- 3:1 SIDE SLOPE
- FENCE
- GW10 MONITORING GAS WELLS

GROUNDWATER MONITORING WELLS

- 1 POINT OF COMPLIANCE WELLS
- 18 NETWORK WELLS

TYPES OF AREAS

	TYPE	AREA (SF)	AREA (AC.)
	WORKING FACE/SIDE SLOPE	437,040	10
	FLOOR BOTTOM	325,997	7.5
TYPE I	INTERMEDIATE COVER	313,632	7.2
TYPE I	FINAL COVER	701,316	16.1
TYPE IV	INTERMEDIATE COVER	222,156	5.1
TYPE IV	FINAL COVER	0	0

NOTES

1. THIS MAP COMPILED FROM AN ACTUAL FIELD SURVEY BASED OFF THE U.S.G.S. DATUM.
2. REFER TO ATTACHMENT 6 FOR DRAINAGE SYSTEM.
3. OPERATIONAL FILL SEQUENCES SHOWN REPRESENTS MAXIMUM GRADES AND WASTE HEIGHTS.
4. LOCATIONS OF ROAD, ELEVATIONS, CONTOURS, AND FINAL COVER ARE APPROXIMATE.
5. ADDITIONAL HAUL ROADS MAY BE PROVIDED AS NEEDED FOR OPERATIONAL REQUIREMENTS.
6. THE SEQUENCE SLOPES SHOULD NOT BE INCREASED NOR THE BENCH WIDTHS DECREASED WITHOUT APPROVAL OF DESIGN ENGINEER.

REVISION
- 3 NOD 3: REVISED LEACHATE COLLETION POND TO CONTAMINATED WATER EVAPORATION POND
- 2 NOD 2: ADD COMPLIANCE AND NETWORK WELLS
- 1 NEW SHEET

FINAL COVER PHASE 5
SOLID WASTE LANDFILL PERMIT 235-B AMENDMENT

OWNER
CITY OF KINGSVILLE
200 EAST KLEBERG KINGSVILLE, TEXAS 78363

ALPHA ENGINEERING
109 NORTH FIFTH STREET
KINGSVILLE, TEXAS 78363
HOMERO CASTILLO, PE (512) 592-2977

PROJECT NO. 9708-01 | SCALE 1"=400'
DRAWN BY D.S. | ATTACHMENT 1
DESIGNED BY HOMERO C.
CHECKED BY HOMERO C. | FIGURE
DATE 29 SEP 98 | 1-6

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JOB NO. 8514-3 **HANSON PROFESSIONAL SERVICES INC.** SHEET NO. 13
DESCRIPTION: SAMPLE CALCULATIONS – City of Kingsville Landfill DATE: ~~08/13/2018~~01/08/19
Leachate Collection System - Hydrologic

Part IV. C. Calculations (continued):
Contaminated Water Evaporation Pond in Future Sector 5

Determine the required capacity of a 9-foot deep pond to accommodate the average yearly flow rate and the 25-yr/24-hr rainfall produced during operating conditions from Sectors 1-4D for 30 days.

Convert the max average yearly flow rate of leachate from (ft^3/yr-acre) to (ft^3/sec-acre): 16,880 ft^3/yr-acre
16,880 ft^3/year-acre x (1 yr/365 days) x (1 day/24 hrs) x (1 hr/60 min) x (1min/60 sec): 0.0005353 ft^3/sec-acre

multiply by 52 acres:
Where: Q = flow rate for Sectors 1-4D (52 acres): 0.027834 ft^3/sec

^{V}required =	Q (ft^3) x (30 days) x (24 hrs/1 day) x (60 min/1 hr) x (60 sec/1 min)	72,145 ft^3
^{V}required =	Q (ft^3) x 7.48 gallons/ft^3	539,642 gallons
^{V}required =	Round to nearest 10	**540,000 gallons**

Existing pond is irregular/triangular shaped. Refer to Attached Page 192 from Permit 235-B Volume I of V for pond capacity of 272,250 ft^3.
^{V}required = 272,250 ft^3 x 7.48 gallons/ft^3 2,036,430 gallons

Determine the required capacity for precipitation from a 25-yr, 24-hr Storm (8.7"); top area of pond.
25-yr/24-hr= 8.7 inches

Top W= 235.5 ft
Top L= 320 ft
Side Slope (S)= 3 (3 to 1)

^{V}required =	Rain (in) x (1 ft/12 in) x Top W x Top L	27,318 ft^3
^{V}required =	Q (ft^3) x 7.48 gallons/ft^3	**204,339 gallons**

Determine the required capacity for first degree contaminated stormwater for precipitation from a 25-yr, 24-hr Storm (8.7"); 75' x 75' working face.
25-yr/24-hr= 8.7 inches

^{V}required = (Rain (in) x (1 ft/12 in) x 75 ft x 75 ft) x 7.48 gallons/ft^3 **30,504 gallons**

Determine the required capacity for 1 ft of freeboard (top area of pond-conservative):
1 ft freeboard

Top W= 235.5 ft
Top L= 320 ft
Side Slope (S)= 3 (3 to 1)

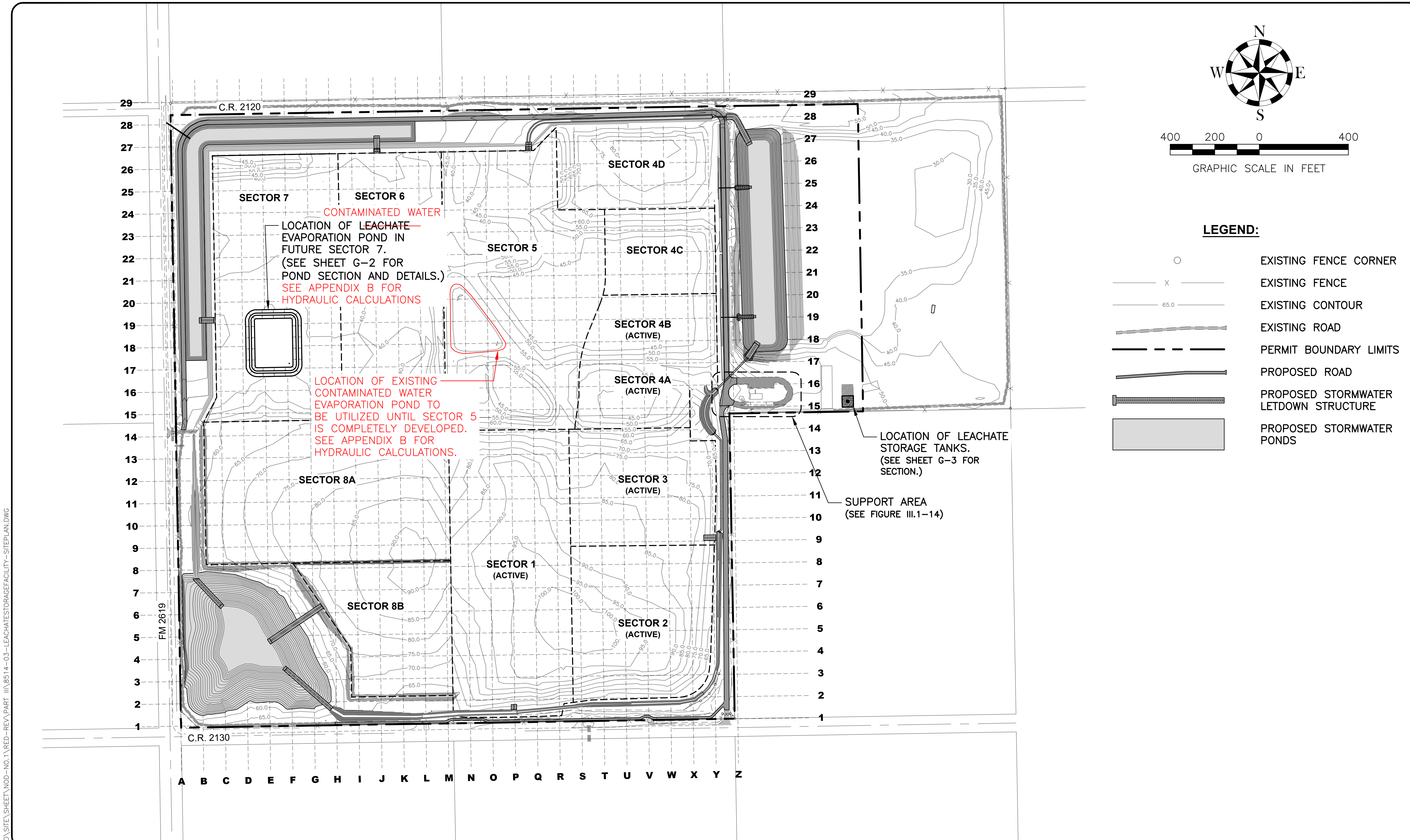
^{V}required =	(1ft) x 1/2 x Top W x Top L	37,680.00 ft^3
^{V}required =	Q (ft^3) x 7.48 gallons/ft^3	**281,846.40 gallons**

The required volume (leachate plus 25-yr/24-hr precipitation) is: 1,056,689 gallons which is less than the available volume of 2,036,430 gallons.

RESULTS:
The leachate storage pond is designed to adequately handle the maximum leachate production and the 25-yr/24-hr precipitation from Sectors 1-4D during operational conditions; including 1 ft. of freeboard.

APPENDIX G

LEACHATE STORAGE FACILITY DESIGN



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NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JOSE C. GARZA
91790
LICENSED PROFESSIONAL ENGINEER
02/11/19
Jose C. Garza, P.E.

Hanson No. 16L0438
Filename
Scale 1"=40'
Date 02/11/2019

LAYOUT	DT	02/11/2019
DRAWN	DT	02/11/2019
REVIEWED	JCG	02/11/2019

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TBPLS F-10039500
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TBAE F-BR 2458

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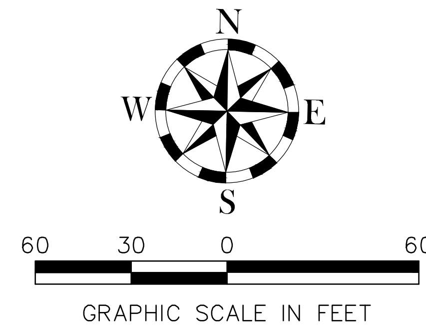
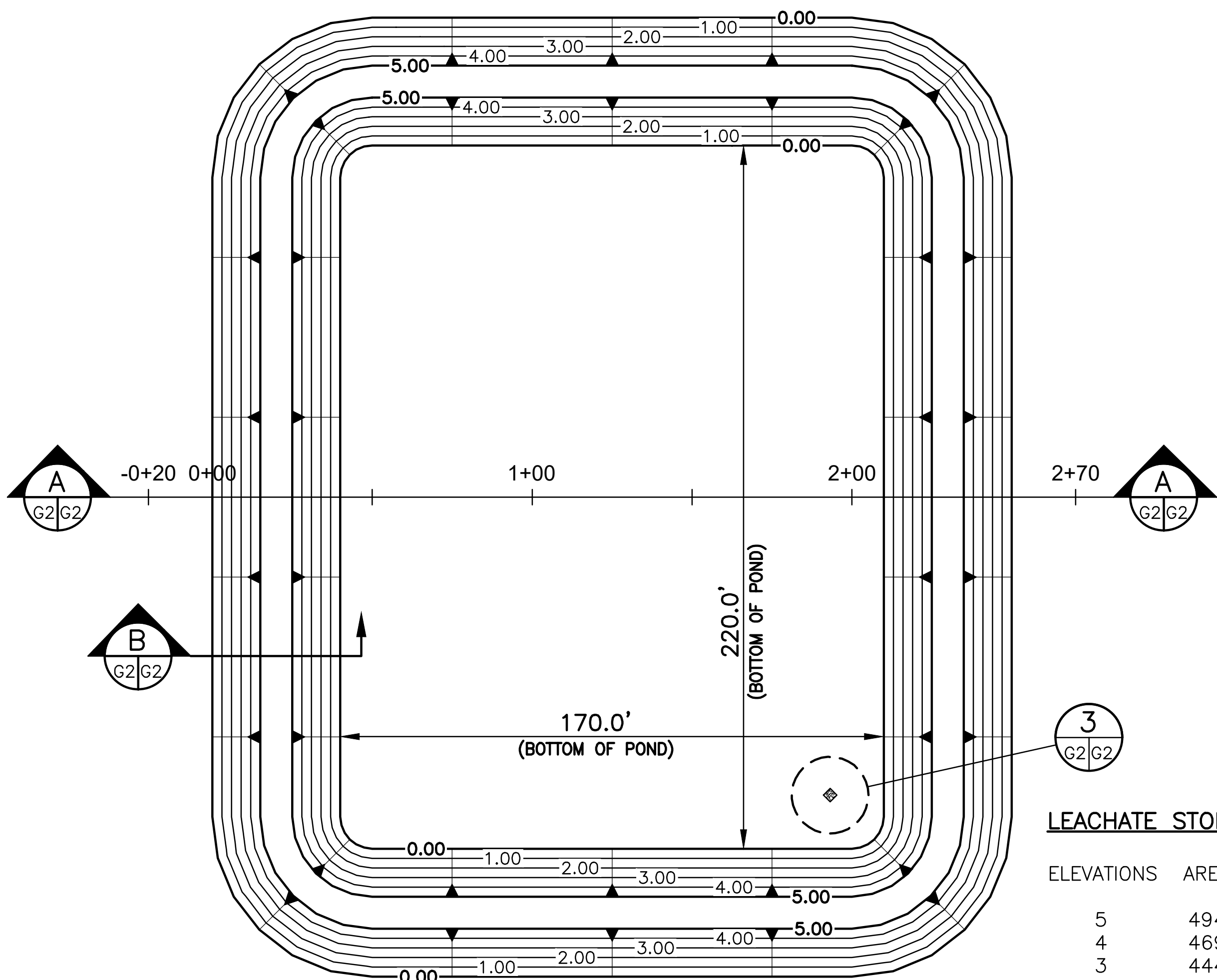
www.hanson-inc.com
Offices Nationwide

PART III, ATTACHMENT 15, APPENDIX G
LEACHATE STORAGE FACILITY SITE PLAN
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.15-G-1





CONTAMINATED WATER EVAPORATION

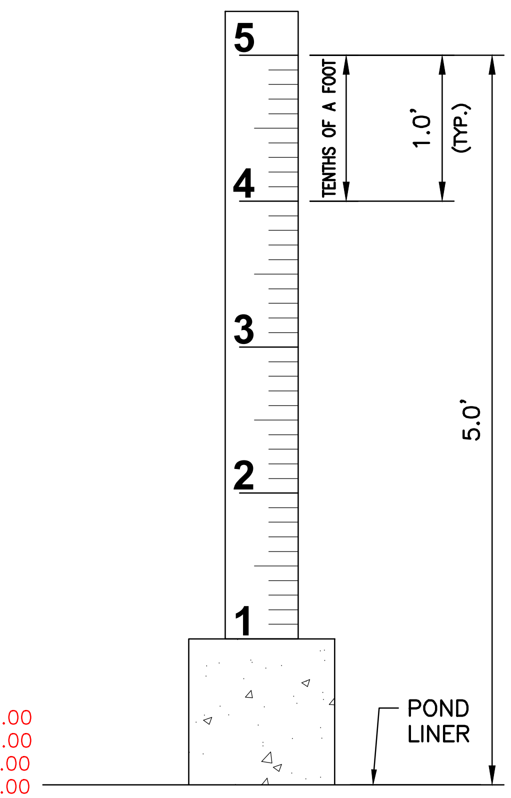
1 G2 G2 PLAN – ~~LEACHATE STORAGE~~ POND

SCALE: 1"=60'

LEACHATE STORAGE POND

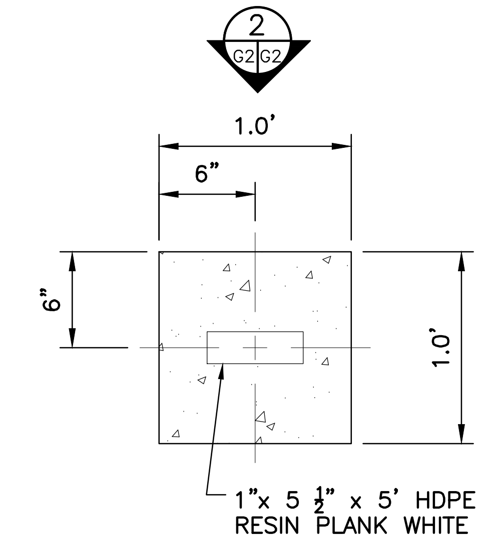
ELEVATIONS	AREA (SF)	AREA (AC)	PERIMETER	GALLONS
5	49441.14	1.14	856.63	~~1,617,699.60~~ 1,639,045.00
4	46903.22	1.08	837.84	~~1,257,469.61~~ 1,269,417.00
3	44421.20	1.02	819.04	~~915,888.60~~ 921,983.00
2	41995.09	0.96	800.24	~~592,797.03~~ 595,520.00
1	39624.89	0.91	781.45	~~287,576.90~~ 288,520.00
0	37310.58	0.86	762.65	0.00

SEE APPENDIX B FOR HYDRAULIC CALCULATIONS



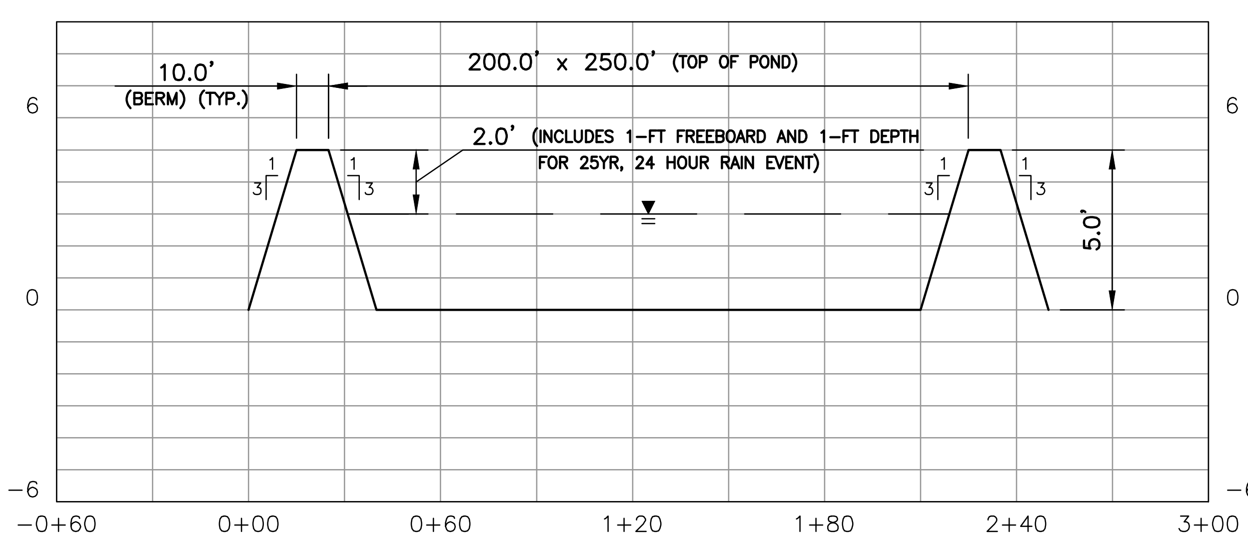
2 G2 G2 ELEVATION – POND LEVEL GAUGE

SCALE: N.T.S.



3 G2 G2 PLAN – LEVEL GAUGE

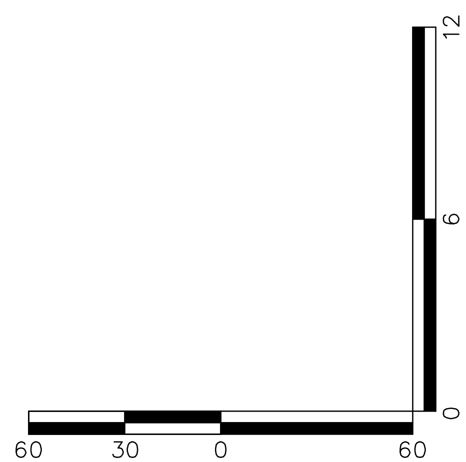
SCALE: N.T.S.

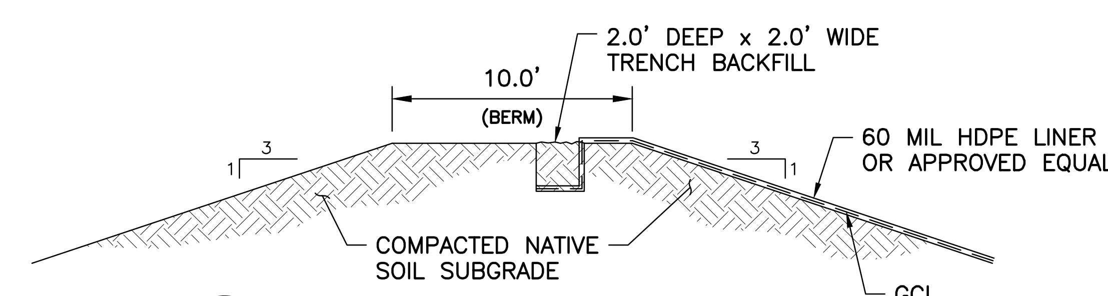


CONTAMINATED WATER EVAPORATION

A G2 G2 SECTION – ~~LEACHATE STORAGE~~ POND

SCALE: H:1"=60', V:1"=6'





B G2 G2 SECTION – U ANCHOR TRENCH

SCALE: N.T.S.

CONTAMINATED WATER EVAPORATION

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS JOSE C. GARZA 91790 LICENSED PROFESSIONAL ENGINEER 02/11/19
Jose C. Garza, P.E.

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 02/11/2019

LAYOUT	DT	02/11/2019
DRAWN	DT	02/11/2019
REVIEWED	JCG	02/11/2019

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PART III, ATTACHMENT 15, APPENDIX G
~~LEACHATE STORAGE~~ POND
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.15-G-2

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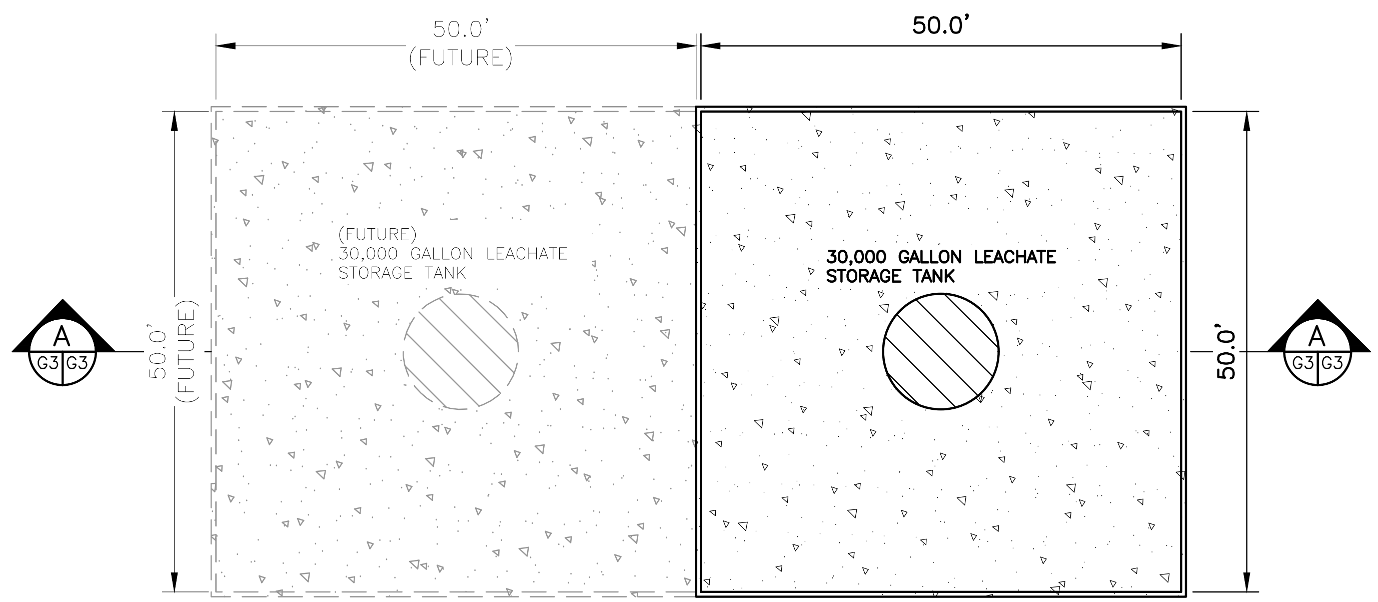
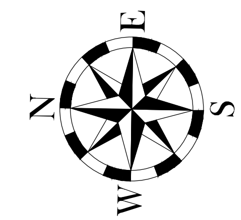


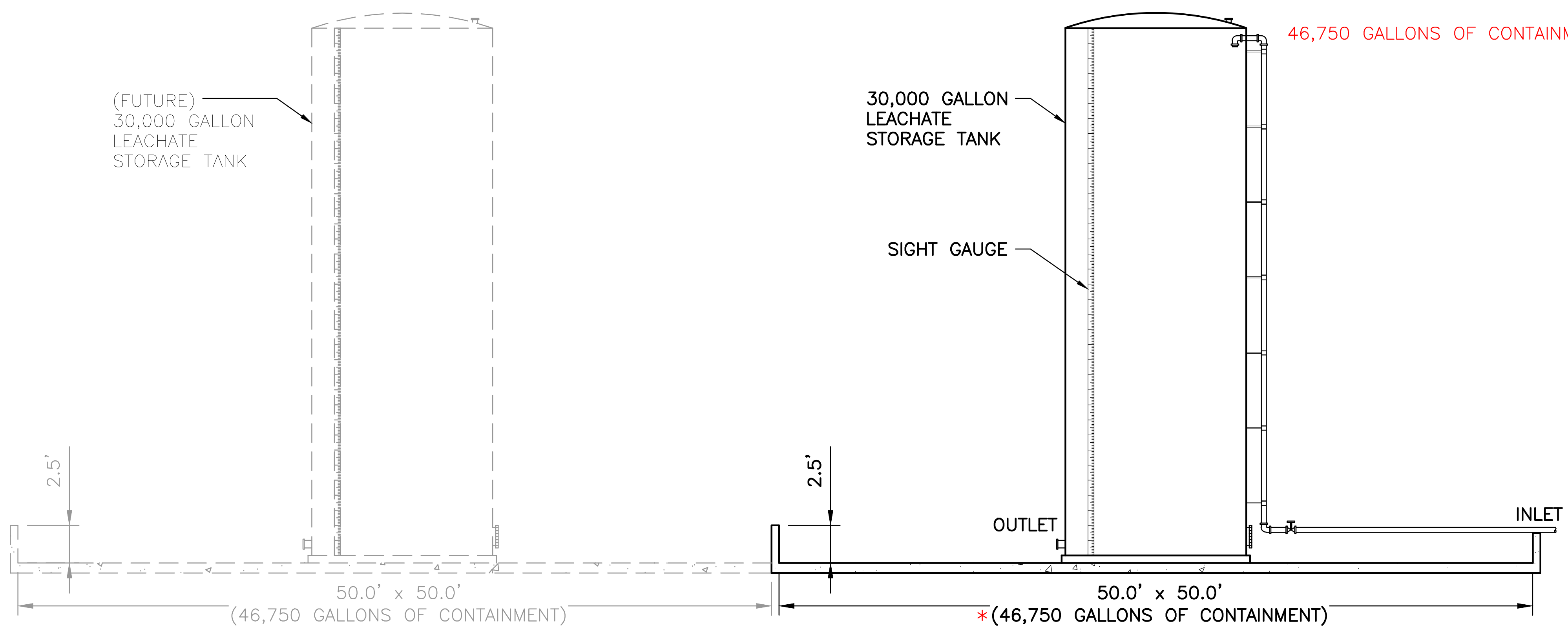


1 G3|G3 PLAN – LEACHATE STORAGE TANK & CONTAINMENT
1"=20'

NOTE:
* THE LEACHATE WILL BE PERIODICALLY COLLECTED AND TAKEN OR PUMPED DIRECTLY TO THE CITY OF KINGSVILLE MUNICIPAL WASTEWATER TREATMENT PLANT.

REQUIRED CONTAINMENT CAPACITY = 30,000 GALLONS + VOLUME FROM 25 YEAR, 24–HOUR RAIN EVENT (8.7 INCHES)
= 30,000 GAL + (8.7in x 1ft/12 in x 50 ft x 50 ft x 7.48 gal/ 1ft^3)
= 43,557.50 gal

46,750 GALLONS OF CONTAINMENT > 43,557.50 GALLONS OF REQUIRED CONTAINMENT.



A G3|G3 SECTION – LEACHATE STORAGE TANK & CONTAINMENT
1"=10'

NUMBER	REVISION	DATE	DRAWN	DESIGNED	REVIEWED

STATE OF TEXAS
JOSE C. GARZA
91790
LICENSED PROFESSIONAL ENGINEER
02/11/19
Jose C. Garza, P.E.

Hanson No. 16L0438
Filename
Scale AS SHOWN
Date 02/11/2019

LAYOUT	DT	02/11/2019
DRAWN	DT	02/11/2019
REVIEWED	JCG	02/11/2019

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PART III, ATTACHMENT 15, APPENDIX G
LEACHATE STORAGE TANK & CONTAINMENT
CITY OF KINGSVILLE LANDFILL
MSW PERMIT No. 235-C
KINGSVILLE, TEXAS
KLEBERG COUNTY, TEXAS

FIGURE:
III.15-G-3

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APPENDIX I

EPA SEMINAR PUBLICATION DESIGN AND CONSTRUCTION OF RCRA/CERCLA FINAL COVERS (CHAPTER 9 SENSITIVITY ANALYSIS OF HELP MODEL PARAMETERS)

United States Environmental Protection Agency
Office of Research and Development Washington, DC 20460
EPA/625/4-91/025
May 1991

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Seminar Publication

Design and Construction of RCRA/CERCLA Final Covers

Technology Transfer EPA/625/4-91/025

Seminar Publication

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May 1991

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CHAPTER 9
SENSITIVITY ANALYSIS OF HELP MODEL PARAMETERS

INTRODUCTION

This chapter examines the sensitivity of landfill water balance to numerous landfill design variables using the Hydrologic Evaluation of Landfill Performance (HELP) model. This information is useful in a variety of ways. It can aid the design engineer in selecting preliminary design alternatives for municipal or hazardous waste landfills. It can serve as a basis for regulatory agencies to establish and evaluate technical guidelines. It can also provide additional insight on the importance and interaction of specific design variables on the water balance. Finally, it can assist in evaluating the suitability of methodologies used in the computer model. The analyses include examination of both cover systems and lateral drainage/liner systems (1). The complete list of design characteristics examined is given in Table 9-1.

The analysis of landfill cover design is divided into two parts. First, water balance results are compared for different general design conditions such as climate (location), topsoil and vegetative characteristics, and cover design. Then, the effects resulting from changes in specific characteristics of the vegetative layer, such as runoff curve number, evaporative depth, and moisture retention properties, are examined. The water balance components examined in this chapter are surface runoff, evapotranspiration, lateral subsurface drainage to collection systems, and vertical percolation through the soil liner.

Table 9-1. Parameters Selected for Sensitivity Analysis

Typical Cover Systems
Quantity of vegetation
Cover soil thickness
Topsoil type
Use of lateral drainage layer
Geographical location or climate
Vegetative Layer
SCS runoff curve number
Evaporative depth
Drainable porosity
Plant available water
Municipal vs. hazardous waste cover design
Analysis of Percolation and Drainage Design
Hydraulic conductivity of barrier soil layer
Hydraulic conductivity of lateral drainage layer
Geomembrane leakage factor
Liner type (clay, geomembrane, or composite)
Slope of lateral drainage layer
Drainage length
Double liner system design

The analysis of liner systems examines the effects of slope, drain spacing, saturated hydraulic conductivity, and geomembrane leakage characteristics on leachate collection and leakage through liners. Two types of vertical inflows to the drain layer are considered. First, an inflow rate of 127 cm/yr (50 in./yr) was used to represent infiltration at an open landfill. This inflow was distributed in time according to actual rainfall patterns at Shreveport, Louisiana. Second, an inflow rate of 20 cm/yr (8 in./yr) uniformly distributed in time was used to represent infiltration at a covered landfill.

In the discussion that follows, the effects of the saturated hydraulic conductivities of the drain layer and liner are first investigated by holding the slope and drainage length constant. Then, the slope and drainage length are examined by holding the hydraulic conductivities constant. In all cases, the thickness of the lateral drainage layer was greater than the maximum head, and the thickness of the soil liner was 61 cm (24 in.).

COMPARISON OF TYPICAL COVER SYSTEMS

Design Parameters

Three locations were studied to determine the effect of various climatological regimes on cover performance—Santa Maria, California; Schenectady, New York; and Shreveport, Louisiana. These locations represent a wide range in levels of precipitation, temperature, and solar radiation as summarized in Table 9-2. Default values for precipitation, temperature, solar radiation, and leaf area index are stored in the HELP model for each site and were used for the sensitivity analysis simulations. The period of record stored in the HELP model for daily precipitation is 1974 through 1978.

Two cover designs were examined as shown in Figure 9-1. One is typical of some newer landfills where 0.61 m (2 ft)

Table 9-2. Climatological Regimes

Climatological Variable	Location		
	Santa Maria, CA	Schenectady, NY	Shreveport, LA
Precipitation[1]			
Mean annual (in.)	14	48	44
Mean winter (Nov-Apr) (in.)	12	19	22
Mean summer (May-Oct) (in.)	2	29	22
Temperature			
Mean annual (°F)	57	49	66
Mean Jan (°F)	51	23	47
Mean July (°F)	62	73	83
Days with minimum below 32°F	24	129	37
Solar radiation			
Mean daily (langleys)	450	290	410

[1]These mean values are for the period simulated by the HELP model in this section, 1974-1978.

of topsoil overlies a 0.31-m (1-ft) thick lateral drainage layer having a saturated hydraulic conductivity of 3 x 10^{-2} cm/sec, a slope of 0.01 m/m (0.03 ft/ft) and a maximum drainage length of 61 m (200 ft). The drainage layer is underlain by a 0.61-m (2-ft) thick soil liner having a saturated hydraulic conductivity of 1 x 10^{-7} cm/sec. The other design is typical of older municipal sanitary landfills where a topsoil layer overlies a 0.61-m (2-ft) thick soil liner having a saturated hydraulic conductivity of 1 x 10^{-6} cm/sec.

Two types of topsoil were considered in the cover designs: sandy loam and silty, clayey loam. The sandy loam characteristics were those of the HELP model default soil texture 6, which represents Unified Soil Classification System (USCS) soil class SM and U.S. Department of Agriculture (USDA) soil class SL. The silty, clayey loam characteristics were those of the HELP model default soil texture 12, which represents USCS soil class CL and USDA soil class SICL. The topsoil-type designation was used to select soil porosity, field capacity, wilting point, and hydraulic conductivity, besides influencing the selection of the runoff curve number. In addition to two types of topsoil, two thickness of topsoil were examined—46 cm (18 in.) and 91 cm (36 in.).

The vegetative cover was designated as being either a good stand of grass or a poor stand of grass. This selection dictated the values for leaf area index, evaporative depth, and runoff curve number, and influenced the value used for the saturated hydraulic conductivity of the topsoil. For a given vegetative cover and topsoil material, the runoff curve number was obtained from the HELP Model User's Guide (2). These numbers were 60 for good grass on sandy loam; 80 for poor grass on sandy loam; 81 for good grass on silty, clayey loam; and 92 for poor grass on silty, clayey loam. These curve numbers are in agreement with values obtained from Section 4, Hydrology, National Engineering Handbook (3). The depth of the evaporative zone was chosen as 18 cm (7 in.) for poor grass and 36 cm (14 in.) for good grass.

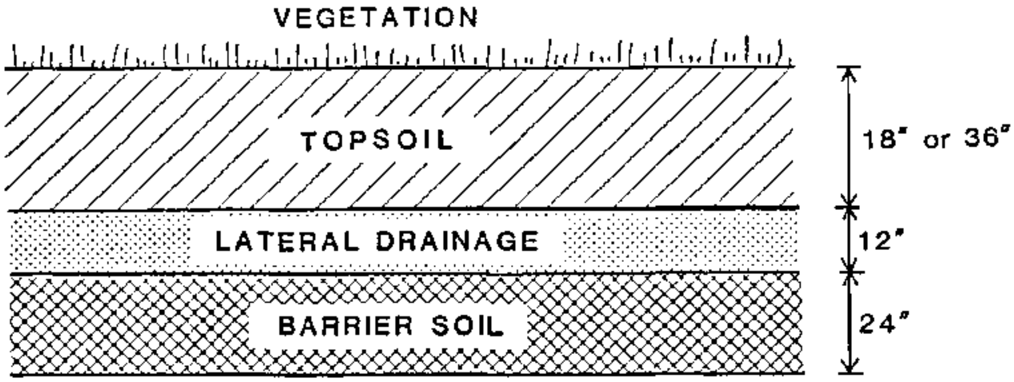
Results

Figures 9-2 and 9-3 summarize the results obtained in the general sensitivity analysis performed on the cover systems, respectively, with and without lateral drainage. The height of each bar segment represents the corresponding mean annual value of water balance component in inches which is given next to each bar segment. The results provide a comparison of the effects of varying quantity of vegetation, cover design, topsoil type, topsoil thickness, and climatological regime.

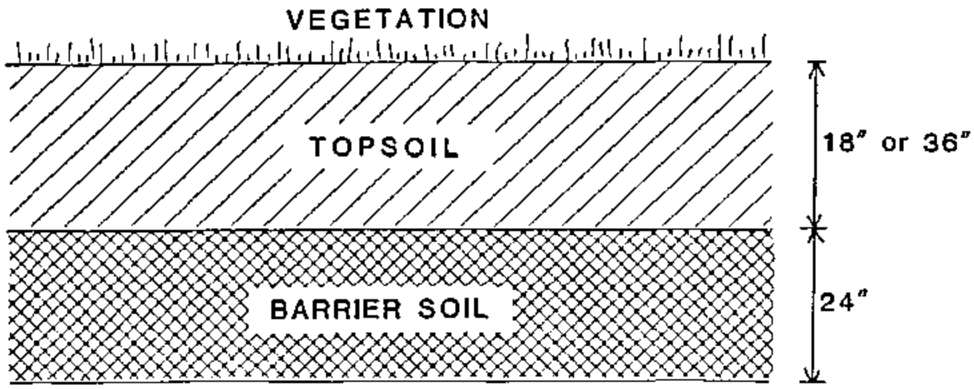
Effects of Vegetation

Two levels of vegetation were examined—a poor stand of grass and a good stand of grass; the latter represents three times the quantity of vegetation as that of the former. Table 9-3 presents the water balance results for both cover systems at all three sites as a function of level of vegetation. The results are given in units of percent of the precipitation during the simulation period.

Vegetation reduces surface runoff and increases evapotranspiration. Evapotranspiration is greater because the plant demand for moisture and a greater quantity of water is available for evapotranspiration due to greater infiltration and a greater evaporative zone. Runoff is less because vegetation increases the minimum infiltration rate, drying rate, interception, and surface roughness, which results in a decrease in the runoff curve



a) Three Layer Landfill Cover Design



b) Two Layer Landfill Cover Design

Figure 9-1. Cover designs for sensitivity analysis.

number. The influence of surface vegetation on the volume of lateral drainage and percolation or leakage from the cover is varied. However, the quantity of vegetation tends to have very little effect on the percolation or leakage through the cover system. For the cover with lateral drainage, the increase in infiltration with good grass was greater than the increase in evapotranspiration, resulting in a larger volume of lateral drainage and a negligible change in percolation. For the cover without lateral drainage, the increase in infiltration yielded high heads or depths of saturation above the liner that permitted greater evapotranspiration by maintaining higher moisture contents in the evaporative zone. Consequently, the increase in evapotranspiration was greater than the increase in infiltration. This resulted in a trend toward a small decrease in percolation for a higher level of vegetation. The opposite trend may occur for vegetative layers having lower saturated hydraulic conductivities and higher plant available water capacities. The results were similar at all three sites despite quite different climates. In summary, vegetation decreases runoff and increases evapotranspiration but tends to have little effect on the water balance. The magnitude of the effects is design dependent and to a lesser degree climate dependent. The main function of vegetation is to control erosion.

Effects of Topsoil Thickness

Two topsoil thicknesses were examined—46 cm (18 in.) and 91 cm (36 in.). Table 9-4 presents the water balance results for the two-layer cover system as a function of topsoil thickness at all three sites. The results are given in units of percent of the precipitation during the simulation period. The cover system with lateral drainage was not used in this analysis because lateral drainage would negate the effects by preventing or minimizing the in-

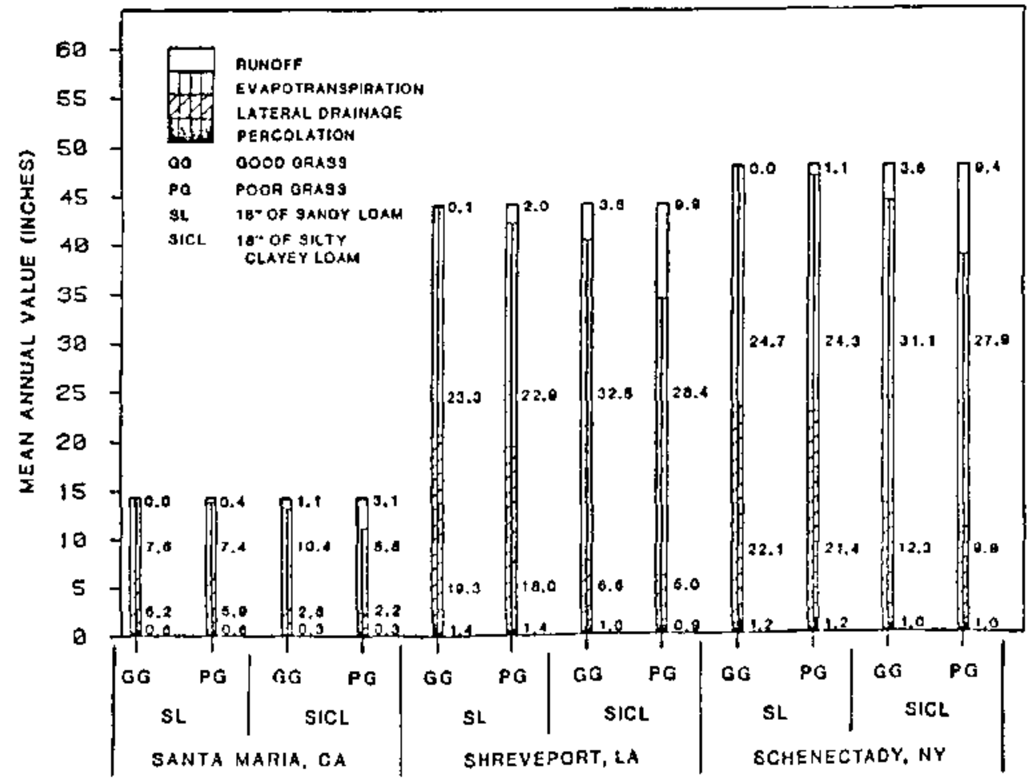


Figure 9-2. Bar graph for three-layer cover design showing effect of surface vegetation, topsoil type, and location.

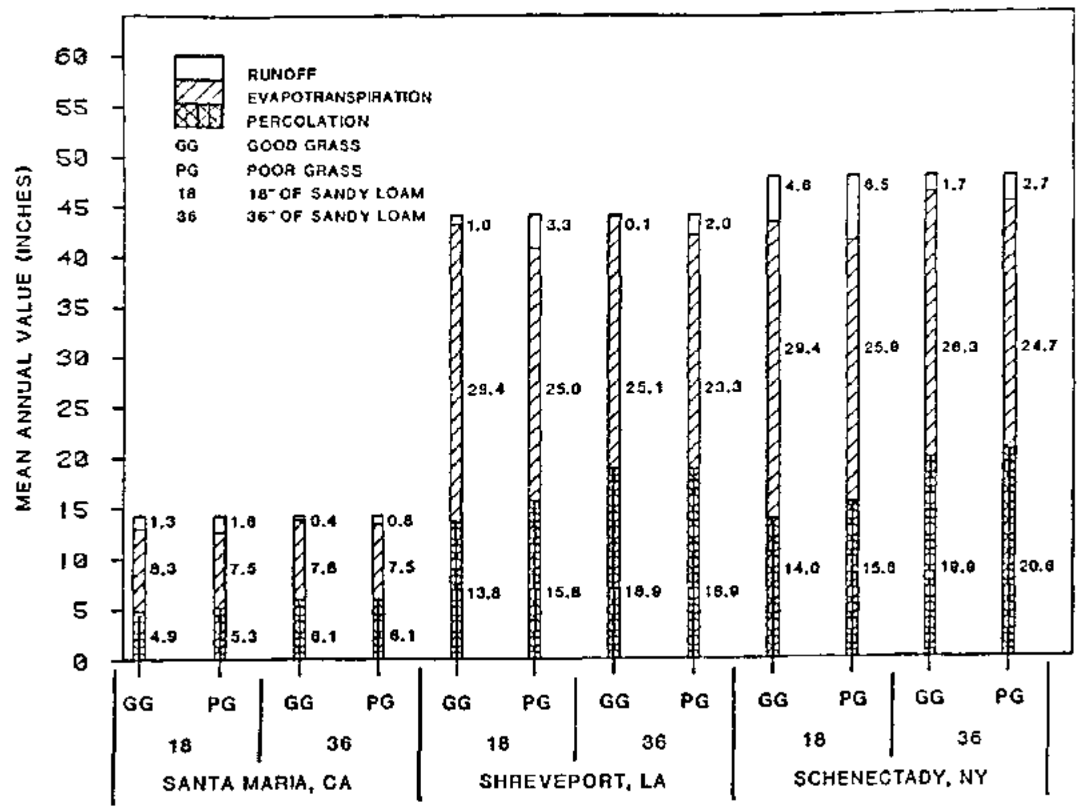


Figure 9-3. Bar graph for two-layer cover design showing effect of topsoil depth, surface vegetation, and location.

Table 9-3. Effects of Climate and Vegetation

81 cm (36 in.) of Sandy Loam Topsoil
61 cm (24 in.) of 1 x 10^{-6} cm/sec Clay Liner

	Locations		
	CA	LA (Percent of Precipitation)	NY
Poor grass			
Runoff	5.6	4.6	5.5
Evapotranspiration	51.8	53.0	52.1
Percolation	42.6	42.4	42.4
Good grass			
Runoff	3.1	0.2	3.5
Evapotranspiration	55.0	57.2	55.3
Percolation	42.9	42.6	41.2

46 cm (18 in.) of Sandy Loam Topsoil
31 cm (12 in.) of 0.03 cm/sec Sand with 61 m (200 ft) Drain Length at 3% Slope
61 cm (24 in.) of 1 x 10^{-7} cm/sec Clay Liner

	Locations		
	CA	LA (Percent of Precipitation)	NY
Poor grass			
Runoff	3.0	4.4	2.2
Evapotranspiration	51.6	51.9	50.3
Lateral drainage	41.2	40.6	44.0
Percolation	4.2	3.1	2.5
Good grass			
Runoff	0.0	0.2	0.0
Evapotranspiration	52.6	53.0	51.0
Lateral drainage	43.2	43.7	45.5
Percolation	4.2	3.1	2.5

Table 9-4. Effects of Climate and Topsoil Thickness

Sandy Loam Topsoil with a Poor Stand of Grass
61 cm (24 in.) of 1 x 10^{-6} cm/sec Clay Liner

	Locations		
	CA	LA (Percent of Precipitation)	NY
46 cm (18 in.) of topsoil			
Runoff	11.2	7.5	13.4
Evapotranspiration	51.9	56.9	54.5
Percolation	36.9	35.6	32.1
91 cm (36 in.) of topsoil			
Runoff	5.6	4.6	5.5
Evapotranspiration	51.8	53.0	52.1
Percolation	42.6	42.4	42.4

trusion of the saturated zone above the liner into the evaporative zone.

Significant differences existed between the 46- and 91-cm (18- and 36-in.) topsoil depth simulations in the absence of lateral drainage. The effects were similar at all three sites. Runoff and evapotranspiration were greater for the shallower depth to the liner, indicating that the head above the barrier soil layer maintained higher moisture contents in the evaporative zone. The percolation was subsequently less than the cases with greater topsoil thickness. The 91-cm (36-in.) depth to the liner permits larger heads and longer sustaining heads since a greater thickness of material below the evaporative zone is free from abstraction of water by evapotranspiration. The larger heads provide a greater pressure gradient to increase the leakage rate through the cover system.

In general, the effects of topsoil thickness vary greatly as the thickness increases from several inches to several feet. Throughout the transition, the quantity of runoff should continue to decrease until the depth to the liner becomes sufficiently great so as to prevent the zone of saturation to ever climb into the evaporative zone. Similarly, the percolation through the liner should continue to increase until there is no interaction between the saturation zone and the evaporative zone. The evapotranspiration is expected to increase initially as the available storage in the evaporative zone increases, i.e., until the depth to the liner equals the maximum depth that evapotranspiration can reach. At greater depths the evapotranspiration should continue to decrease until the depth to the liner is sufficient to prevent any further interactions between the evaporative and saturation zones.

While percolation increases with topsoil thickness given identical properties for all layers in the cover system, adequate thickness must be provided in a design to ensure the integrity of the cover system. A small topsoil thickness would not provide adequate water storage to support vegetation, maintain soil stability, and control erosion. Similarly, a shallow depth to the liner would promote desiccation or freezing of the liner, which may greatly increase its permeability and, therefore, the percolation.

Effects of Topsoil Type

Two topsoil types were examined—sandy loam and silty, clayey loam. Table 9-5 presents the water balance results for the three-layer cover system as a function of topsoil type at all three sites. The results are given in units of percent of the precipitation during the simulation period. The cover system without lateral drainage was not used in this analysis because the intrusion of the saturated zone above the liner into the evaporative zone would decrease the magnitude of the effects.

The results show that the clayey topsoil significantly increased both runoff and evapotranspiration, which in turn greatly decreased lateral drainage and percolation. The results were similar at all three sites. Runoff increased from about 3 percent to 20 percent of the precipitation, due primarily to the larger runoff curve number selected for the clayey soil based on its lower minimum infiltration rate. Evapotranspiration increased approximately from 51 percent to 61 percent of precipitation, due to the lower hydraulic conductivity of the clayey soil and, more importantly, the larger plant available water capacity (field capacity minus wilting point). The lower hydraulic conductivity of the clayey soil slowed the drainage rate, maintaining moisture contents above field capacity for longer periods of time and allowing greater evapotranspiration. The larger plant available water capacity of the clayey soil provided a larger moisture reservoir available for evapotranspiration after gravity drainage ceased. The lateral drainage was reduced from about 42 percent to 16 percent of the precipitation and

Table 9-5. Effects of Climate and Topsoil Types

46 cm (18 in.) of Topsoil with a Poor Stand of Grass
31 cm (12 in.) of 0.03 cm/sec Sand with 61 m (200 ft) Drain Length at 3% Slope
61 cm (24 in.) of 1 x 10^{-7} cm/sec Clay Liner

	Locations		
	CA	LA (Percent of Precipitation)	NY
Sandy loam			
Runoff	3.0	4.4	2.2
Evapotranspiration	51.6	51.9	50.3
Lateral drainage	41.2	40.6	44.0
Percolation	4.2	3.1	2.5
Silty, clayey loam			
Runoff	21.6	22.3	19.2
Evapotranspiration	61.2	64.4	58.6
Lateral drainage	15.0	11.3	20.3
Percolation	2.2	2.0	1.9

the percolation was reduced from about 3 percent to 2 percent of precipitation.

Use of Lateral Drainage Layer

Direct comparison of the use of a lateral drainage layer was not made since different liner systems were used in the two cover designs. The impact of the use of a lateral drainage layer was explained briefly above. In general, the use of a lateral drainage layer would be expected to decrease the height of the saturation zone above the liner by draining some of the infiltrated water from the cover system. As such, percolation through clay liners would decrease slightly. In addition, runoff and evapotranspiration also would tend to decrease but the magnitude of the change would be design dependent. Topsoil thickness, topsoil type, vegetation, and climate would have impacts.

Effects of Climate

The effects of climate were examined in each of the previous sections. As shown in Figures 9-2 and 9-3, climate affects the absolute magnitude, in inches, of the water budget components. However, Tables 9-3, 9-4, and 9-5 show that climate has a much smaller effect on the relative magnitude of the water budget components in terms of percent of the precipitation. The relative proportions of the water budget components are primarily design dependent while the magnitudes are strongly dependent on the magnitude of the precipitation.

The effect of temperature and solar radiation can be determined by comparing the results for the Louisiana and New York sites. These two sites have similar annual rainfall, although the New York site had somewhat higher annual and summer rainfall. The higher temperature and solar radiation in Louisiana produced about an inch or two more evapotranspiration despite the larger quantity of rainfall in New York. Consequently, the lateral drainage tended to be slightly less at the Louisiana site. However, these differences are much smaller than the differences caused by changes in designs.

Vegetative Layer Properties

The effects of vegetative layer properties on the water balance of two cover systems are presented below. The vegetative layer properties examined are runoff curve number, evaporative depth, drainable porosity, and plant available water capacity. Vegetated cover designs with and without lateral drainage were used in the analyses; the vegetation was assumed to be a fair stand of grass. The thickness of the vegetative layer was 46 cm (18 in.) in both designs. The simulations were performed using climatic data for Santa Maria, California, and Shreveport, Louisiana, and topsoil properties typical of sandy loam and silty, clayey loam. Tables 9-6 and 9-7 summarize the parameter combinations examined under this part of the sensitivity analysis study and present the results of the simulations as percentage of precipitation.

Effects of SCS Runoff Curve Number

The SCS runoff curve number was varied from 65 to 90 for the sandy loam and from 75 to 95 for the silty, clayey loam. The range of curve number was selected to include values representative of the entire range of possible slopes and land management practices used at landfills. The depth of the evaporative zone was 25 cm (10 in.) in all cases. Simulations for the three-layer cover design were performed for both soil types, whereas simulations for the two-layer cover design were performed only for sandy loam. The results are presented in Table 9-6.

An increase in runoff curve number produced an increase in runoff and a decrease in evapotranspiration, lateral drainage, and percolation. The percent increase in runoff was less for the two-layer cover design than for the three-layer cover design. This result was due to the higher average moisture content in the topsoil layer of the two-layer design caused by the restriction to vertical flow imposed by the soil liner in the absence of lateral drainage. This limited the infiltration capacity of the topsoil, causing more frequent saturation of the topsoil and, therefore, more runoff. Thus, runoff volume at low curve numbers was higher for the two-layer cover compared to the three-layer cover. This effect was not as great at high curve numbers because infiltration for both designs was significantly reduced by the curve number itself rather than saturated conditions.

The effects of location or climate on runoff are difficult to discern from the results; however, results in terms of percent of the precipitation did not differ greatly between the two sites. For example, in comparing runoff from Santa Maria and Shreveport, a smaller percentage of precipitation could be expected to drain from the surface as runoff in Santa Maria due to the higher evaporative demand combined with lower total precipitation and longer periods of time between storms. This effect is seen in the data for the three-layer design, but the difference is not as large as may have been expected. Only small differences occur largely because the majority of the rainfall at Santa Maria occurs during the winter when the evaporative demand is the lowest. In addition, several unusually large storms occurred at Santa Maria that yielded unusually large runoff. However, for simulations of the two-layer design with low curve numbers, the influence of the two large storms in Santa Maria caused the runoff percentage to exceed that in Shreveport. This would not be the case if the two storms were excluded.

Summarizing the curve number effects, increasing the curve number directly causes an increase in runoff and a decrease in infiltration. The majority of the decrease in infiltration is reflected as decreases in lateral drainage and evapotranspiration. The decrease in leakage through the cover system is generally small. Changes in slope, vegetation, and land management practices yield only small changes in runoff for soil types and conditions with curve numbers below 75. The climate, design, and topsoil characteristics affect the volume of runoff for a given curve number. The nature of the effects is closely tied to the potential for evapotranspiration, vertical drainage from the topsoil, and lateral drainage.

Effects of Evaporative Depth

Evaporative depth as defined by its use in the HELP model is the thickness of the evapotranspiration zone, the maximum depth from which water can be extracted to satisfy evapotranspiration demand. This depth is a function of soil properties, vegetation, climate, and design. The evaporative depth was varied from 10 to 46 cm (4 to 18 in.) for both sandy loam and silty, clayey loam. The runoff curve number was 75 for the sandy loam and 85 for the silty, clayey loam. Simulations for the three-layer cover design were performed for both soil types, whereas simulations for the two-layer cover design were performed only for sandy loam. The results are presented in Table 9-6.

Evapotranspiration increased with increasing evaporative depth while lateral drainage and percolation decreased; the effect on runoff varied. The interrelationship between these variables is complex and depends on many factors. The increase in evaporative depth allows evapotranspiration to deplete soil moisture from greater depths, generally increasing the total volume of evapotranspiration. However, since the total evapotranspiration demand remains constant, a smaller volume of water depletion occurs per unit depth. Consequently, the average moisture content throughout the evaporative zone would be higher, resulting in a higher runoff curve number and, therefore, larger runoff. However, when the time period between storms is sufficiently long, evapotranspiration demand is able to deplete soil moisture to equal levels with either small or large evaporative depths. In this case, runoff volume could decrease with increasing evaporative depth since antecedent moisture conditions would remain the same and the increased storage volume in the deeper evaporative zone would increase the infiltration capacity.

The effect of evaporative depth on the volume of lateral drainage and percolation is directly related to the composite effect on evapotranspiration and runoff. In the examples chosen for Table 9-6, the increase in evapotranspiration with increased evaporative depth was greater than any increase in infiltration; therefore, lateral drainage and percolation always decreased.

An increase in evaporative depth caused an increase in infiltration for the two-layer cover compared to a slight decrease for the three-layer cover. This difference relates to the different mechanisms controlling infiltration in these two cases. For the two-layer cover, the hydraulic conductivity of the clay liner was much less than the sandy loam topsoil. Therefore, infiltration tended to saturate the topsoil layer, and the total volume of infiltration was dependent primarily on the volume of storage available in this layer. A larger evaporative depth increased the potential for a larger volume of available storage and thus for more infiltration. For the three-layer cover, the lateral drainage layer generally maintained a free drainage condition at the topsoil/lateral drainage layer interface. Infiltration was then controlled primarily by the hydraulic conductivity of the topsoil and the available storage in the top segment of the subprofile. As explained above, this condition could result in either an increase or decrease in infiltration with an increase in evaporative depth.

Summarizing the effects of evaporative depth, an increase in evaporative depth produces an increase in evapotranspiration and, therefore, generally a decrease in lateral drainage and percolation. The effects on runoff are mixed but typically very small. The size of the changes are difficult to predict because the effects of evaporative depth changes are indirect. Changing the evaporative depth changes the potential storage in the potential storage in the evaporative zone that may not significantly change the net evapotranspiration. As evidence of this, the change in evapotranspiration is very small when the evaporative depth is increased beyond 46 cm (18 in.). In addition, the topsoil characteristics, climate, and design affect the response to a change in evaporative depth.

Effects of Drainable Porosity

Drainable porosity is defined as the difference between porosity and field capacity; that is, the amount of water that could be vertically drained from a saturated soil by gravity forces alone. Values ranged from 0.254 to 0.686 cm/cm (0.100 to 0.270 in./in.) in this study. These values represent the volume of moisture storage capacity in excess of field capacity, divided by the bulk volume of soil including voids. Values for field capacity and wilting point remained constant at 0.668 and 0.338 cm/cm (0.263 and 0.133 in./in.), respectively. Only sandy loam soil was considered. The evaporative depth was 25 cm (10 in.), and the SCS curve number was 75. Both two- and three-layer cover designs were simulated. The results are presented in Table 9-7.

An increase in drainable porosity increases the moisture storage volume above field capacity and decreases unsaturated hydraulic conductivity for a given moisture content given a constant saturated hydraulic conductivity. Therefore, more water can infiltrate and be made available for evapotranspiration during vertical drainage. This increases the volume of evapotranspiration and decreases the volume of lateral drainage and percolation as shown in Table 9-7. However, the effect of increased drainable porosity on runoff is varied. For the three-layer cover, runoff decreased slightly at Santa Maria and increased slightly at Shreveport. For the two-layer cover,

Table 9-6. Effects of Evaporative Depth and Runoff Curve Number

Description[1]				Average Annual Volume (Percent Precipitation)[2] Three-Layer Cover Design				Two-Layer Cover Design		
Site	Soil Type	Evap. Depth (in.)	SCS Curve Number	Runoff	ET[3]	Lat.[4] Drng.	Liner[5] Perc.	Runoff	ET[3]	Liner[6] Perc.
CA	SL	10	65	0.1	52.7	43.6	4.2	7.1	53.8	39.9
CA	SL	10	80	2.6	51.9	41.9	4.2	8.7	53.0	39.1
CA	SL	10	90	11.3	49.5	35.9	4.1	14.4	50.4	36.0
CA	SICL	10	75	5.5	70.8	22.1	2.2			
CA	SICL	10	85	12.7	67.6	18.0	2.2			
CA	SICL	10	95	34.4	57.3	6.4	1.6			
CA	SL	4	75	1.1	41.3	53.3	4.5	8.9	42.9	48.5
CA	SL	10	75	1.1	52.4	42.9	4.2	7.8	53.4	39.6
CA	SL	18	75	1.3	61.9	34.1	3.9	6.9	63.8	30.6
CA	SICL	4	85	12.6	53.3	30.5	3.7			
CA	SICL	10	85	12.7	67.6	18.0	2.2			
CA	SICL	18	85	12.0	77.0	11.2	1.2			
LA	SL	10	65	0.5	52.1	44.1	3.1	2.0	57.9	39.4
LA	SL	10	80	4.2	50.9	41.6	3.1	5.1	55.9	38.3
LA	SL	10	90	15.3	47.1	34.5	3.0	15.6	49.1	34.8
LA	SICL	10	75	5.8	71.2	20.3	2.3			
LA	SICL	10	85	13.5	69.6	14.5	2.2			
LA	SICL	10	95	36.5	59.0	3.0	1.4			
LA	SL	4	75	2.0	38.8	55.7	3.2	8.2	45.1	45.2
LA	SL	10	75	2.1	51.6	43.0	3.1	3.3	57.0	39.0
LA	SL	18	75	2.3	62.4	32.0	3.0	3.0	66.5	30.2
LA	SICL	4	85	12.4	55.6	28.8	2.0			
LA	SICL	10	85	13.5	68.1	14.4	2.1			
LA	SICL	18	85	14.3	75.8	8.1	1.2			

[1]CA = Santa Maria, CA; LA = Shreveport, LA; SL = sandy loam (HELP model default texture 6); SICL = silty, clayey loam (HELP model default texture 12). Fair grass and 46-cm (18-in.) topsoil layer was used for all cases.

[2]Change in storage is not included in this table; therefore, the water balance components shown do not always add up to 100.0 percent.

[3]ET = evapotranspiration.

[4]Lateral drainage from a 31-cm (12-in.) layer having a slope of 3 percent, a drainage length of 61 m (200 ft), and a hydraulic conductivity of 3×10^{-2} cm/sec.

[5]Percolation through 61-cm (24-in.) liner having a hydraulic conductivity of 10^{-7} cm/sec.

[6]Percolation through 61-cm (24-in.) liner having a hydraulic conductivity of 10^{-6} cm/sec.

runoff decreased significantly at both locations since the relative soil moisture is lower and the available storage is greater. An increase in drainable porosity reduces the head or depth of saturation resulting from a fixed quantity of infiltration. This decreases the lateral drainage while having only small effects on percolation. The design and climate affects the magnitudes of the changes in the water budget components.

Effects of Plant Available Water Capacity

Plant available water capacity is defined as the difference between field capacity and wilting point, or the amount of water available for plant uptake after vertical drainage by gravity has ceased. Values ranged from 0.178 to 0.508 cm/cm (0.070 to 0.200 in./in.) in this analysis. These values represent the volume of potential moisture storage between wilting point and field capacity, divided by the

Table 9-7. Effects of Drainable Porosity and Plant Available Water Capacity

Description[1]			Average Annual Volume (Percent Precipitation)[2] Three-Layer Cover Design				Two-Layer Cover Design		
Site	DP	PAWC	Runoff	ET[3]	Lat.[4] Drng.	Liner[5] Perc.	Runoff	ET[3]	Liner[6] Perc.
CA	0.18	0.07	1.07	48.51	46.45	4.31	8.57	49.78	42.16
CA	0.18	0.13	1.14	52.54	42.83	4.22	7.87	53.55	39.41
CA	0.18	0.20	1.30	56.43	39.43	4.12	7.06	57.18	37.02
CA	0.10	0.13	1.17	48.87	47.38	4.33	10.48	50.40	40.02
CA	0.18	0.13	1.14	52.53	42.81	4.22	7.87	53.55	39.41
CA	0.27	0.13	1.1	55.8	39.6	4.1	5.22	57.34	38.20
LA	0.18	0.07	2.08	47.38	47.12	3.12	4.36	54.57	40.08
LA	0.18	0.13	2.15	51.74	42.86	3.08	3.45	57.05	38.84
LA	0.18	0.20	2.26	55.68	38.92	3.04	2.98	59.99	36.69
LA	0.10	0.13	2.10	46.93	47.66	3.12	6.63	55.24	37.65
LA	0.18	0.13	2.15	51.74	42.86	3.08	3.45	57.05	38.84
LA	0.27	0.13	2.2	55.7	38.8	3.0	2.32	59.60	37.49

[1]CA = Santa Maria, CA; LA = Shreveport, LA; DP = drainable porosity (vol/vol); PAWC = plant available water capacity (vol/vol). All cases are for 46 cm (18 in.) of sandy loam topsoil (HELP model default texture 6); fair grass; evaporative depth = 25 cm (10 in.); and curve number = 75.

[2]Change in storage is not included in this table; therefore, the water balance components shown do not always add up to 100.0 percent.

[3]ET = evapotranspiration.

[4]Lateral drainage from a 31-cm (12-in.) layer having a slope of 3 percent, a drainage length of 61 m (200 ft), and a hydraulic conductivity of 3×10^{-2} cm/sec.

[5]Percolation through 61-cm (24-in.) liner having a hydraulic conductivity of 10^{-7} cm/sec.

[6]Percolation through 61-cm (24-in.) liner having a hydraulic conductivity of 10^{-6} cm/sec.

bulk volume of soil including voids. The values for wilting point and drainable porosity remained constant at 0.338 and 0.457 cm/cm (0.133 and 0.180 in./in.), respectively. Only sandy loam soil was considered. The evaporative depth was 25 cm (10 in.), and the SCS runoff curve number was 75. Both two- and three-layer cover designs were simulated. The results are presented in Table 9-7.

Increasing the plant available water capacity provides a greater volume of water available for evapotranspiration after vertical drainage has nearly ceased. This results in larger volumes of evapotranspiration as shown in Table 9-7. Consequently, the lateral drainage and percolation decreases. The change in the volume of runoff was design dependent. Since increasing the plant available water capacity results in an increased moisture content at field capacity, there is a greater potential for higher antecedent moisture conditions or relative moisture content, resulting in a higher curve number. As such, the runoff for the three-layer cover systems increased with increasing plant available water capacity. Runoff decreased for the two-layer cover systems because infiltration is limited by the storage volume above the liner. As such, increasing the plant available water capacity increases the storage volume, reducing the limits on infiltration and the runoff. As shown in Table 9-7, the runoff from the two-layer cover approaches the runoff from the three-layer cover as the storage potential in the two-layer cover becomes large, that is for large values of drainable porosity and plant available water capacity. In all cases the increases in evapotranspiration were great enough to offset any decrease in runoff; therefore, leachate drainage and percolation always decreased. The size of the changes in the water budget components were dependent on the climate and design. The results would also be dependent on the type of topsoil.

Liner/Drain Systems

This section examines the effects of liner/drain system design on the performance of the drain system under conditions typical of cover systems, and leachate collection systems in open and closed landfills. Performance was determined by the apportionment of the drainage into the drain layer between lateral drainage and percolation through the liner. In addition, the effect of design on the resulting depth of saturation also was examined. For

Table 9-8. Sensitivity of Lateral Drainage and Liner Percolation to Lateral Drainage Slope and Length

Annual[1] Infilt. (in.)	Slope S (ft/ft)	Length L (ft)	S*L (ft)	L/S (ft)	Avg. Annual Vol. (% Inflow) Lat.[2] Drng.	Liner[3] Perc.	Max. Head In Lat. Drng. Layer (in.)
50	0.01	25	0.25	2,500	96.71	3.29	13.8
50	0.01	75	0.75	7,500	95.89	4.11	29.7
50	0.01	225	2.25	22,500	93.43	6.57	58.2
50	0.03	25	0.75	830	96.85	3.15	12.3
50	0.03	75	2.25	2,500	96.36	3.64	24.8
50	0.03	225	6.75	7,500	95.10	4.90	42.3
50	0.09	25	2.25	280	97.37	2.63	8.5
50	0.09	75	6.75	830	96.87	3.13	16.2
8	0.01	25	0.25	2,500	83.73	16.27	1.2
8	0.01	75	0.75	7,500	82.29	17.71	3.4
8	0.01	225	2.25	22,500	78.51	21.49	9.4
8	0.03	25	0.75	830	84.16	15.84	0.5
8	0.03	75	2.25	2,500	83.59	16.41	1.1
8	0.03	225	6.75	7,500	82.28	17.72	3.5
8	0.09	25	2.25	280	84.35	15.65	0.2
8	0.09	75	6.75	830	84.23	15.77	0.4

[1]Value of 50 in./yr represents inflow through an open landfill; the temporal distribution is based on rainfall records for Shreveport, LA. Value of 8 in./yr represents inflow through landfill cover; the temporal distribution is uniform throughout the year.

[2]Lateral drainage from a layer having a slope of 3 percent, drainage length of 75 ft, porosity of 0.351 vol/vol, field capacity of 0.174 vol/vol, and a saturated hydraulic conductivity of 10^{-2} cm/sec

[3]Percolation through a 24-in.-thick soil liner having a saturated hydraulic conductivity of 10^{-7} cm/sec.

the cover system or open landfill the drainage into the drain layer was 127 cm/yr (50 in./yr), distributed temporally in accordance with the precipitation at Shreveport. For the closed landfill the drainage into the drain layer was distributed uniformly through time at a rate of 20 cm/yr (8 in./yr).

Four types of liner/drain systems are examined in the various parts of this study to determine their performance: a sand drainage layer underlain by a clay liner, a sand drainage layer underlain by a geomembrane, a sand drainage layer underlain by a composite liner, and double liner systems. For the clay liner system this sensitivity analysis determines the effects of the saturated hydraulic conductivity of the liner and drain layer, slope of the liner, and drain spacing. For the geomembrane and composite liner systems, the effects of synthetic liner leakage fraction and saturated hydraulic conductivity of the geomembrane's subsoil are examined. The sensitivity of the parameters affecting the synthetic liner leakage fraction are presented graphically. For the double liner systems, the effectiveness of several different systems in preventing and detecting leakage from the primary liner prior to leaking through the secondary liner was compared. In all systems the thickness of the drain layer was greater than the peak depth of saturation in the drain layer, and the thickness of the clay liner or subsoil below a geomembrane was 61 cm (24 in.).

Clay Liner/Drain Systems

Saturated Hydraulic Conductivities. The liner/drain system used in this analysis is shown as Design A in Figure 9-10. The value of KD (the saturated hydraulic conductivity of the drain layer) ranged from 0.001 to 1 cm/sec while the value of KP (the saturated hydraulic conductivity of the clay liner) ranged from 10^{-8} to 10^{-5} cm/sec. The slope of the liner surface toward the drainage collector was 3 percent, and the maximum drainage length to the collector was 23 m (75 ft). The results of the drainage efficiency determinations for the various combinations of KD and KP are shown in Figure 9-4, where the average annual volumes of lateral drainage and percolation expressed as a percentage of annual inflow are plotted.

For the large unsteady inflows totaling 127 cm/yr (50 in./yr), only designs where the saturated hydraulic conductivity of the liner was equal to or less than 10^{-7} cm/sec limited the percolation through the liner to volumes less than 5 percent of the annual inflow (6.4 cm [2.5 in.]). The effect of KD on the drainage efficiency for these low permeability liners is fairly small. Changing KD from 0.001 cm/sec to 1 cm/sec reduced the percolation from 7 percent to 1 percent of the inflow for a KP of 10^{-7} cm/sec and from 0.7 percent to 0.1 percent for a KP of 10^{-8} cm/sec. For a KP value of 10^{-6} cm/sec, only a KD value of 1 cm/sec or greater can reduce the percolation to less than 10 percent of the annual inflow. Liners having a KP of 10^{-5} cm/sec are largely ineffective no matter how large the value of KD is.

For smaller steady inflows of 20 cm/yr (8 in./yr) typical of the infiltration through some cover systems, only liners having a value of KP equal to or less than 10^{-7} cm/sec limited leakage except for designs having a KP of 10^{-6} cm/sec and a very large KD value, 1 cm/sec or greater. As above, the effect of KD on the drainage efficiency is small. Changing KD from 0.001 cm/sec to 1 cm/sec reduced the percolation from 22 percent to 15 percent of the inflow for a KP of 10^{-7} cm/sec and from 2.3 percent to 1.5 percent for a KP of 10^{-8} cm/sec. Liners having a KP of 10^{-7} cm/sec leaked between 2.5 and 5.1 cm/yr (1 and 2 in./yr) while liners having a KP of 10^{-8} cm/sec leaked between 0.25 and 0.51 cm/yr (0.1 to 0.2 in./yr).

Summarizing the results shown in Figure 9-4, the saturated hydraulic conductivity of the liner is the primary control of leakage through a clay liner. At hydraulic conductivities below about 10^{-6} cm/sec the leakage is nearly proportional to the value of KP; that is, an order of magnitude decrease in the value of KP yields nearly an order of magnitude decrease in percolation. The value of KD has only a small effect on the leakage through liners having a KP of 10^{-7} cm/sec or less. Changing the value of KD by three orders of magnitude when using these low permeability liners yields much less than an order of magnitude change in percolation.

Similar effects are also seen in Figures 9-5 and 9-6 which relate the KD/KP design ratio to the resulting ratio of lateral drainage to percolation. The curves in Figure 9-5 are log-least-squares regressions for several ranges of steady-state heads resulting from a steady-state inflow of 20 cm/yr (8 in./yr). The curves in Figure 9-6 are log-least-squares regressions for several ranges of peak $\bar{y}$ resulting from a unsteady inflow of 127 cm/yr (50 in./yr). The plotted points are QD/QP ratios for the given KD/KP ratio; their symbols indicate the value of KD used in obtaining the result. The actual steady-state $\bar{y}$ and peak $\bar{y}$ values were both grouped into four ranges of heads. In Figure 9-5 steady-state heads ranging from 26 to 30.7 cm (10.2 to 12.1 in.) were grouped together as were heads ranging from 3.56 to 4.06 cm (1.4 to 1.6 in.), equaling 0.508 cm (0.2 in.), and less than 0.127 cm (0.05 in.). In Figure 9-6 peak heads ranging from 6.1 to 6.4 cm (2.4 to 2.5 in.) were grouped together as were heads ranging from 19.3 to 23.6 cm (7.6 to 9.3 in.), from 41.15 to 69.6 cm (16.2 to 27.4 in.), and from 116.1 to 153.2 cm (45.7 to 60.3 in.).

Figures 9-5 and 9-6 show that percolation tends to dominate at ratios of KD/KP below 10^7. This is particularly true as the depth of saturation or inflow decreases. When heads remain constant, the ratio of lateral drainage to percolation is a linear function of KD/KP. Using the maximum head allowed by RCRA of 31 cm (12 in.) and the current minimum KD/KP ratio implied by RCRA of 10^5, a percolation of 2.3 percent of inflow results; however, an unusually large steady-state inflow of 203 cm/yr (80 in./yr) or 0.559 cm/day (0.22 in./day) is required to achieve this condition. When using the RCRA guidance design, therefore, the peak and steady-state average heads will be considerably smaller than 31 cm (12 in.) at virtually all locations.

Slope and Drainage Length. The combinations of slope and drainage length used in this analysis are listed in Table 9-8 along with resulting average annual volumes of lateral drainage and percolation expressed as a percentage of annual inflow. The table also contains the resulting maximum heads above the soil liner. The slope (S) ranged from 0.003 to 0.028 cm/cm (0.01 to 0.09 ft/ft) (1 to 9 percent) while the drainage length (L) ranged from 8 to 69 m (25 to 225 ft). The saturated hydraulic conductivities of the lateral drainage and soil liners were 10^{-2} and 10^{-7} cm/sec, respectively. The product S*L and the ratio L/S ranged from 0.76 to 2 m (0.25 to 6 ft) and 85 to 6,858 m (280 to 22,500 ft), respectively. S*L is the head contributed by the liner at the crest of the drainage layer.

The results indicate that the volumes of lateral drainage and percolation vary little with changes in slope and drainage length under both steady and unsteady inflows. A ninefold increase in slope reduced the percolation by a maximum of 25 percent for the unsteady inflow and 13 percent for the steady inflow. As the drainage length is reduced and the slope increased, the lateral drainage rate increases. As a result, the head decreases and is maintained at smaller depths for shorter durations. Consequently, the percolation decreases since it is a function of the head on the liner. A ninefold decrease in drainage length reduced the percolation by a maximum of 50 percent for the unsteady inflow and 25 percent for the steady inflow. A ninefold increase in slope and decrease in length decreased the percolation by about 60 percent for the unsteady inflow and about 30 percent for the steady inflow.

The head in the drain layer varies greatly with changes in slope and drainage length. For a steady inflow the average head increases linearly with an increase in drainage length and an increase in the inverse of the slope, as shown in Figure 9-7. A similar relationship exists between the peak average head during the simulation and L/S for unsteady inflow. The average head is slightly influenced by the product of the slope and drainage length when the head is similar to this product.

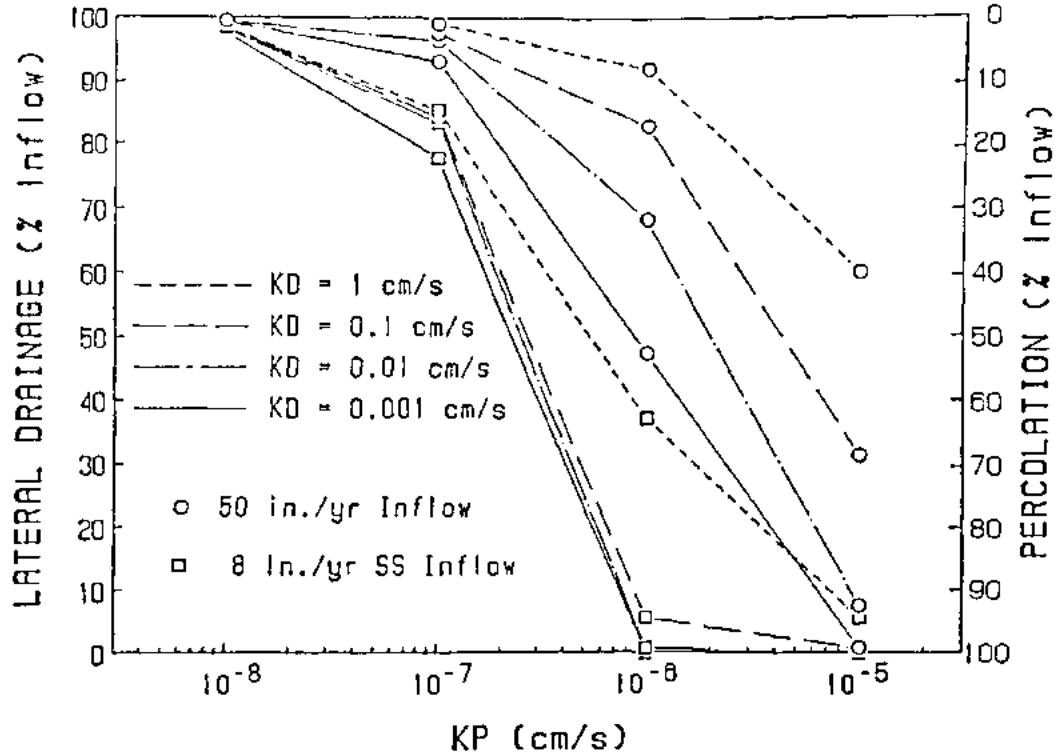


Figure 9-4. Effect of saturated hydraulic conductivity on lateral drainage and percolation.

Geomembrane/Drain Systems

A single synthetic liner under a drain layer as shown in Design B in Figure 9-10 is examined in this section. It is assumed that the synthetic liner was laid directly on a 3-m (10-ft) thick layer of native subsoil. The drainage layer had a saturated hydraulic conductivity of 10^{-2} cm/sec, a slope of 3 percent, and a drainage length of 23 m (75 ft). This case will be used to demonstrate the influence of the synthetic liner leakage fraction and the saturated hydraulic conductivity of the native subsoil on the liner system performance. The properties of the subsoil ranged from sand to clay in the analysis.

Liner Leakage Fraction. Brown et al. (4) conducted laboratory experiments and developed predictive equations to quantify leakage rates through various size holes in synthetic liners over soil. They assumed that the measured leakage rates corresponded to a uniform vertical percolation rate equal to the saturated hydraulic conductivity through a circular cross-sectional area of the soil liner directly beneath the hole. Using the data relating leakage and cross-sectional area of flow, Brown et al. (4) developed predictive equations for the radius or area of this flow cross section as a function of hole size, depth of leachate ponding, and saturated hydraulic conductivity of the soil. Figure 9-8 presents their results. The radius of saturated flow through the subsoil was significantly greater than the radius of the hole in the synthetic liner. In this paper, the cross-sectional area of saturated flow was multiplied by the number of holes per unit area of synthetic liner to compute the synthetic liner leakage fraction. Liner leakage fraction is simply defined as the total horizontal area of saturated flow through the subsoil beneath all of the liner holes divided by the horizontal area of the liner.

Liner leakage fraction is a function of many parameters, some quantitatively defined and others qualitatively defined. Liner leakage fraction increases linearly with increases in the number of holes of the same size and shape. Shape also has a strong effect on the leakage; tears have larger leakage than punctures. Increasing the size of circular holes yields only a slight increase in the leakage, while increasing the length of a tear or bad seam increases the leakage nearly linearly. Leakage also increases nearly linearly with increases in head or depth of saturation above the liner. The leakage fraction also is affected by the gap width between the liner and the subsoil. Gap width is a measure of the seal between the liner and the subsoil. The smaller the gap the better the seal. The seal is a function of the subsoil, installation, liner placement, and subsoil preparation. Installation of the liner on coarse-grained subsoil, clods, debris, or filter fabric provides a poor seal as will wrinkles in the liner. Coarse-grained subsoils decrease the leakage fraction while greatly increasing the leakage. The greater permeability of coarse materials allows greater flow through a smaller area of saturated flow, reducing the

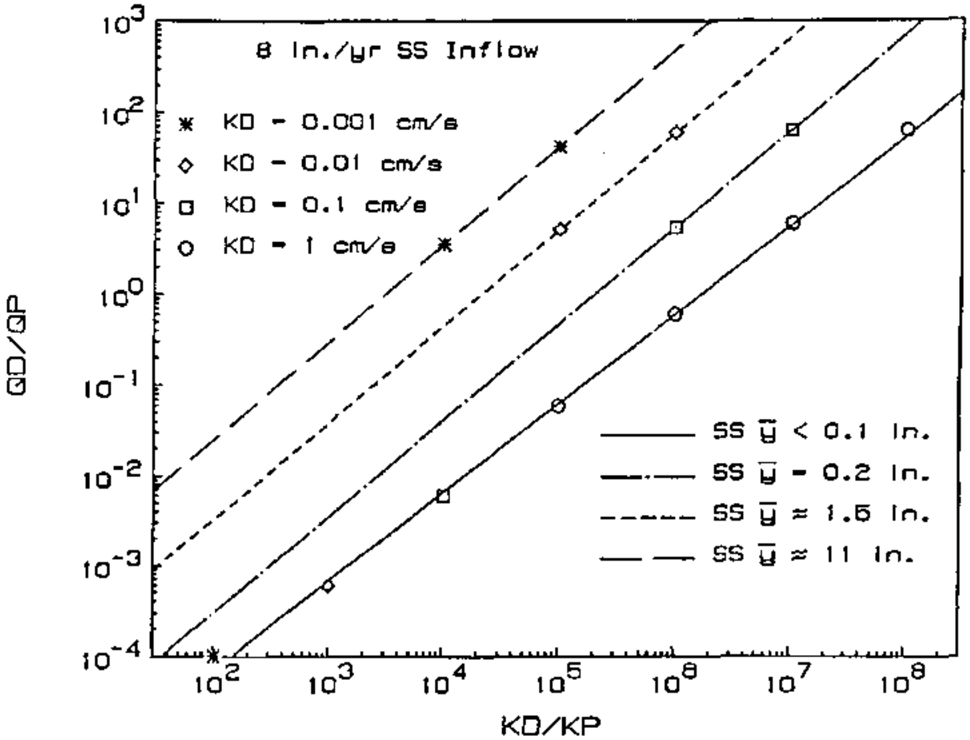


Figure 9-5. Effect of ratio of drainage-layer saturated hydraulic conductivity to soil-liner saturated hydraulic conductivity on ratio of lateral drainage to percolation for steady-state (SS) inflow of 20 cm/yr (8 in./yr).

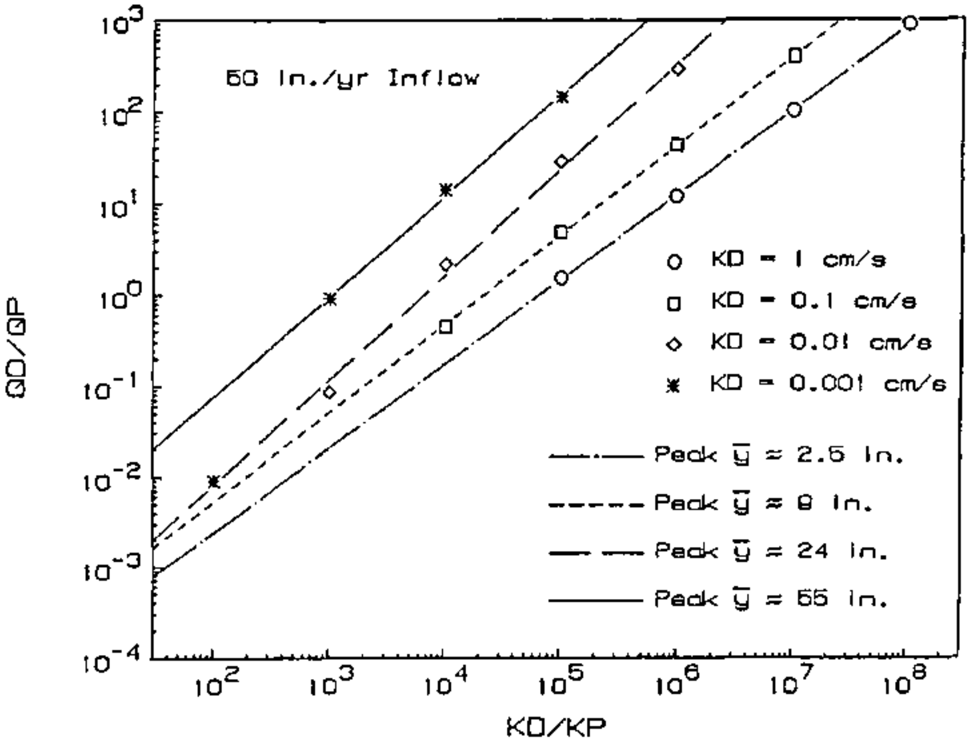


Figure 9-6. Effect of ratio of drainage-layer saturated hydraulic conductivity to soil-liner saturated hydraulic conductivity on ratio of lateral drainage to percolation for unsteady inflow of 127 cm/yr (50 in./yr).

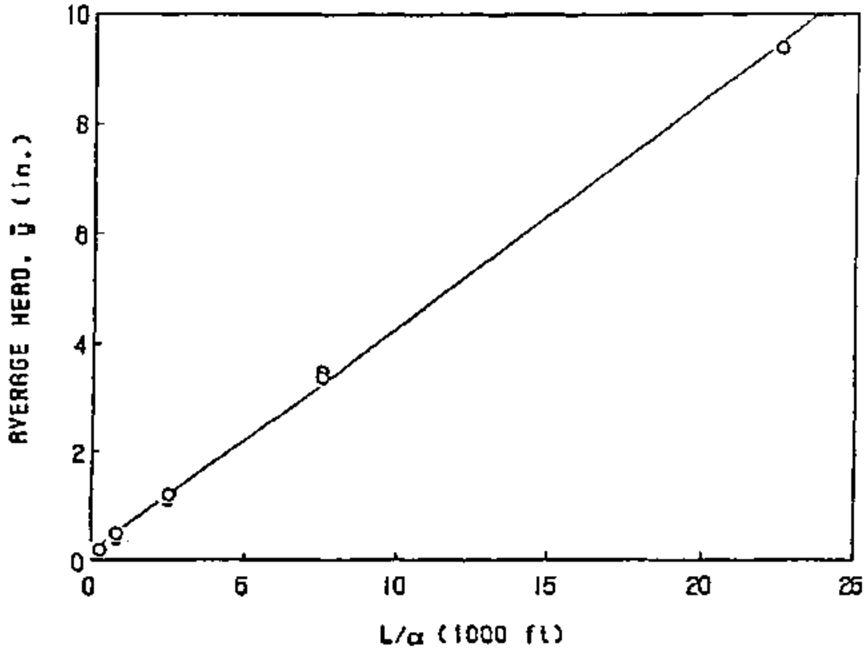


Figure 9-7. Effect of ratio of drainage length to drainage layer slope on the average saturated depth in drainage layer (KD=10^{-2} cm/s) above a soil liner (KP=10^{-7} cm/s) under a steady-state inflow rate of 20 cm/yr (8 in./yr).

spreading required to accommodate the leakage through the liner.

System Performance. The percolation rate through a leaking synthetic liner is a linear function of the leakage fraction for a given subsoil when the average head on the liner is constant. The percolation rate expressed as a percentage of inflow rate is shown graphically in Figure 9-9 as a function of the leakage fraction. This relationship is shown for a range of values of the average head and for a steady inflow rate of 20 cm/yr (8 in./yr). Figure 9-9 emphasizes the significant influence of average head or inflow on controlling the distribution of the inflow between vertical percolation and lateral drainage. This figure shows that to maintain the vertical percolation rate at less than 1 percent of the inflow rate for heads greater than 0.25 cm (0.1 in.), the leakage fraction for a clay subsoil (KP = 10^{-6} cm/sec) must be less than 5 x 10^{-4} and for a sandy subsoil (KP = 10^{-3} cm/sec) must be less than 5 x 10^{-7}. The overall effectiveness of a geomembrane is equivalent to a soil liner having a saturated hydraulic conductivity equal to the product of the leakage fraction and the saturated hydraulic conductivity of the subsoil when the permeability of the subsoil is equal to greater than the conductivity of the material above the liner.

Double Liner Systems

Four double liner systems shown as Designs C through F in Figure 9-10 are examined in this section. These designs are presented here to illustrate the strengths and weaknesses of various double liner configurations and to show why certain designs would be expected to yield poor performance. The designs are evaluated for effectiveness in early leak detection and for minimization of vertical percolation out of the landfill (5).

For this discussion it is assumed that the slope of the drainage layer is 3 percent, the drainage length is 23 m (75 ft), the saturated hydraulic conductivity of the drainage layer is 10^{-2} cm/sec, and the saturated hydraulic conductivity of the soil liner is 10^{-7} cm/sec. In evaluating designs with double synthetic liners, it was assumed that the degree of degradation of each synthetic liner was identical. However, identical degradation would not yield identical leakage fractions for both liners since they have different heads on the liners and different subsoils. For Design E the leakage fraction of the lower liner was increased by a factor of 8 to account for different subsoils, but this corrected leakage fraction was then reduced by a factor ranging from 1 to 24 to account for different heads. For Design F the leakage fraction of the lower liner was reduced by a factor between 8 and 24, varying as a function of the differences between the heads on the two liners. Larger reduction factors were used for smaller leakage fractions in both designs. The leakage fraction used for the top synthetic liner is used for reporting the results.

Designs C through F were evaluated using the HELP model, which predicted lateral drainage in each drainage

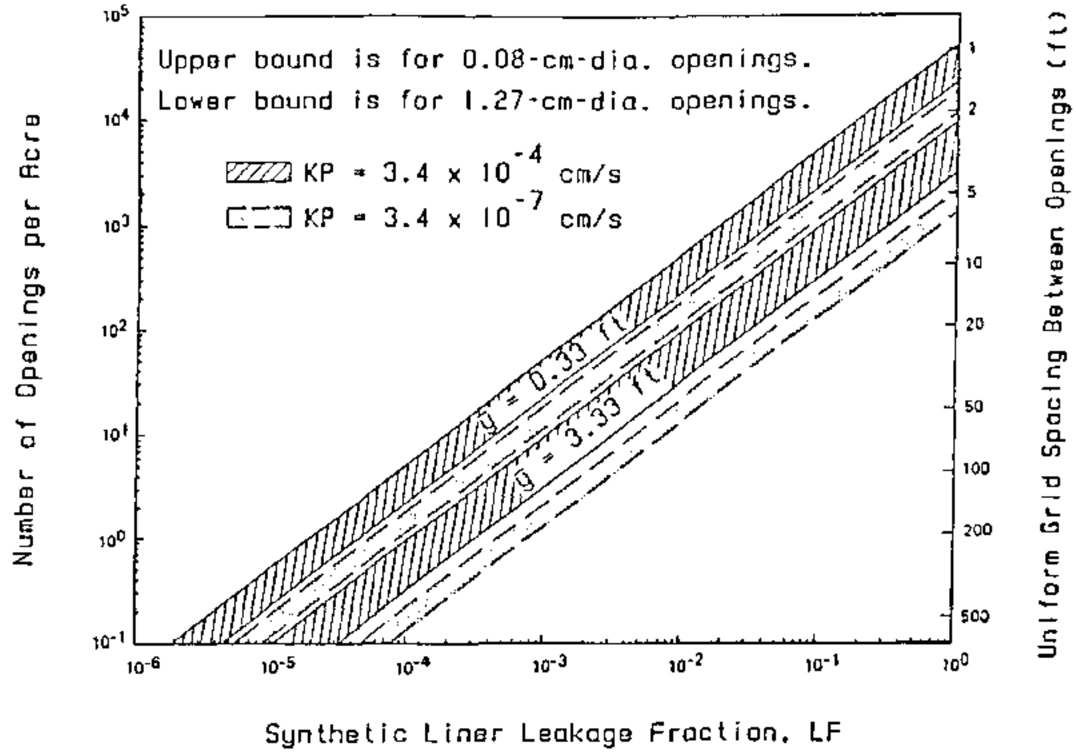


Figure 9-8. Synthetic liner leakage fraction as a function of density of holes, size of holes, head on the liner, and saturated hydraulic conductivity of the liner.

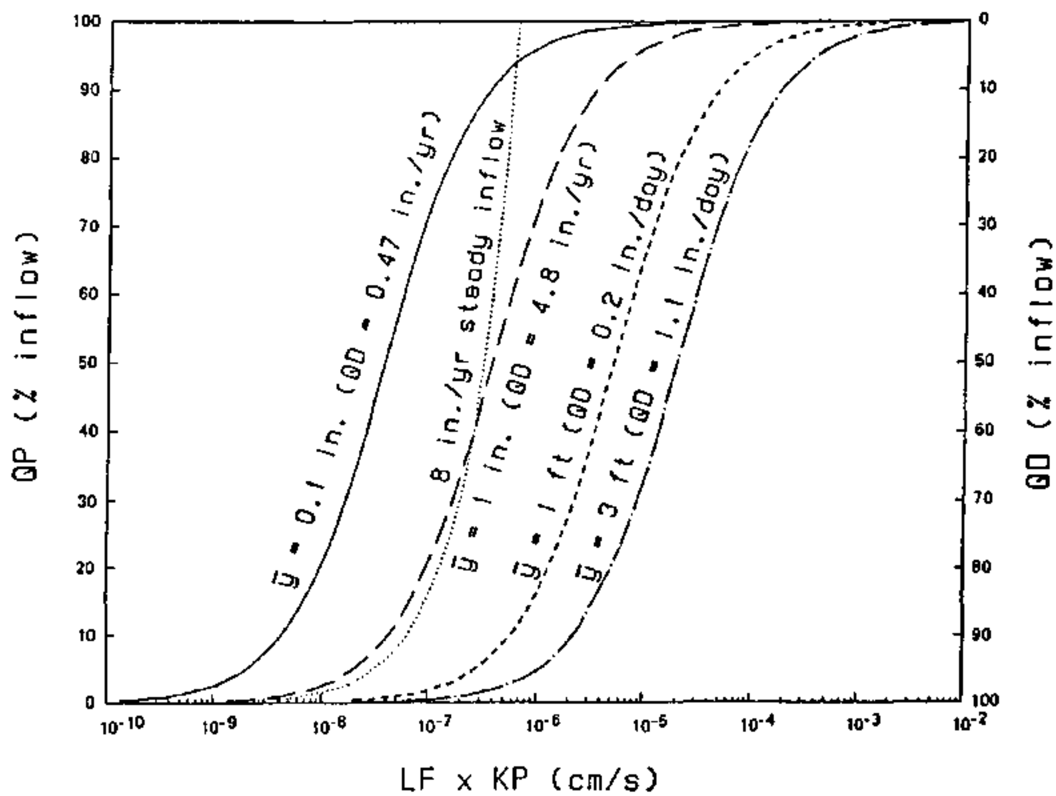


Figure 9-9. Effect of leakage fraction on system performance.

layer and vertical percolation through each synthetic liner and each soil liner. These predictions were based on 20 cm/yr (8 in./yr) of infiltration passing through the waste layer and reaching the primary leachate collection system. This inflow was distributed uniformly in time. Figures 9-11 and 9-12 show the results in terms of lateral drainage from the secondary drainage layer and vertical percolation through the bottom soil liner as functions of synthetic liner leakage fraction of the top membrane.

Design C consists of a primary leachate drainage layer underlain by a synthetic liner, a secondary drainage layer, and a soil liner. As shown in Figure 11, this design is not very effective. Large quantities of leakage occurred at fairly low leakage fractions and no leakage (lateral drainage) was detected from the secondary drainage layer until the synthetic liner leakage fraction exceeded about 10^{-5}. At smaller synthetic liner leakage fractions, the leachate percolated vertically through the soil liner as fast as the leakage through the synthetic liner occurred. The product of the saturated hydraulic conductivity of the secondary drainage layer times the synthetic liner leakage fraction must be greater than or approximately equal to the saturated hydraulic conductivity of the soil liner before leakage will be detected using this design. At the time leakage is detected, the vertical percolation rate through the soil liner could be about 16 percent of total inflow.

Design D consists of a primary drainage layer underlain by a synthetic liner, a soil liner, a secondary drainage layer, and a second soil liner. The soil liner immediately below the synthetic liner is very effective in minimizing vertical percolation (leakage through the primary liner); however, a synthetic liner leakage fraction greater than 10^{-2} to 10^{-1} would be required before leachate would be collected from the secondary drainage layer. Because the vertical percolation through the first liner is so small, practically all of the leakage is removed by vertical percolation through the bottom soil liner as shown in Figure 9-12. This design is ineffective since the leakage detection system would not function.

Design E consists of a primary drainage layer underlain by a synthetic liner, a secondary drainage layer, a second synthetic liner, and a soil liner. In this case, any leakage through the upper synthetic liner will readily pass through the underlying drainage medium to the lower synthetic liner. Since the lower synthetic liner is underlain by a soil liner, most leakage will be collected by lateral drainage. Figure 9-11 shows that leakage will be detected far in advance of significant vertical percolation from the landfill. That is, the leakage fraction of the synthetic liners at which leakage detection will occur is several orders of magnitude smaller than the leakage fraction at which significant vertical percolation from the landfill will occur. The leakage lost by percolation is vir-

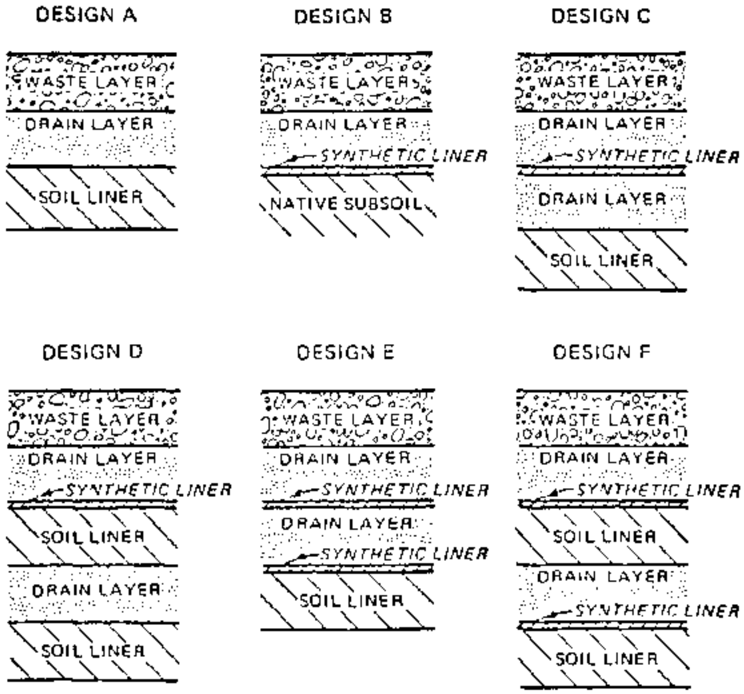


Figure 9-10. Liner designs.

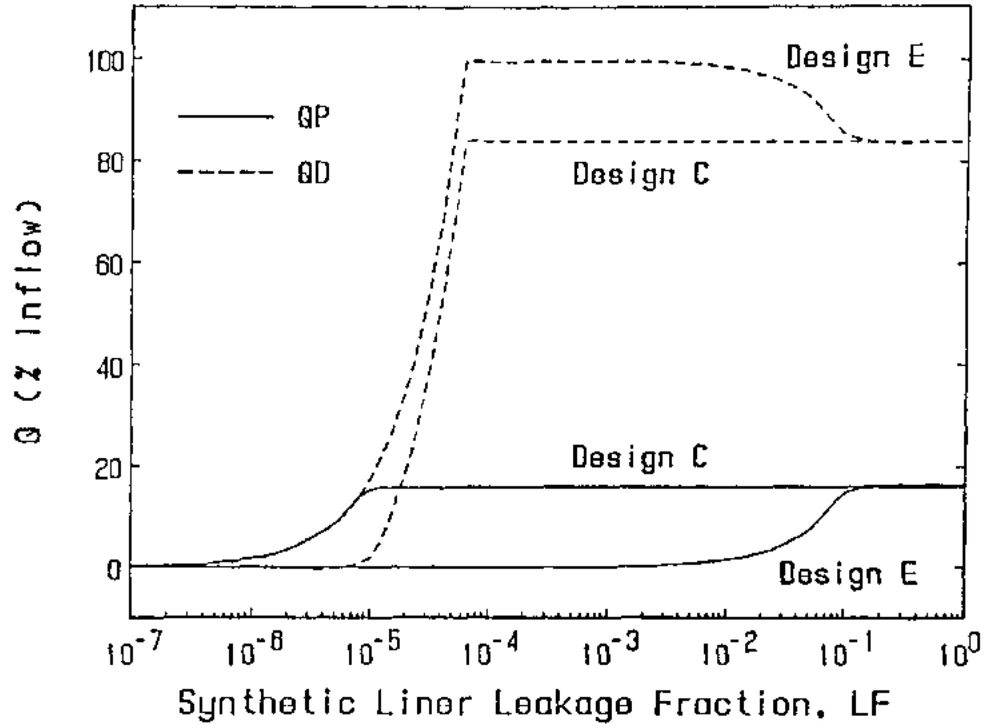


Figure 9-11. Percent of inflow to primary leachate collection layer discharging from leakage detection layer and bottom liner double-liner systems C and E.

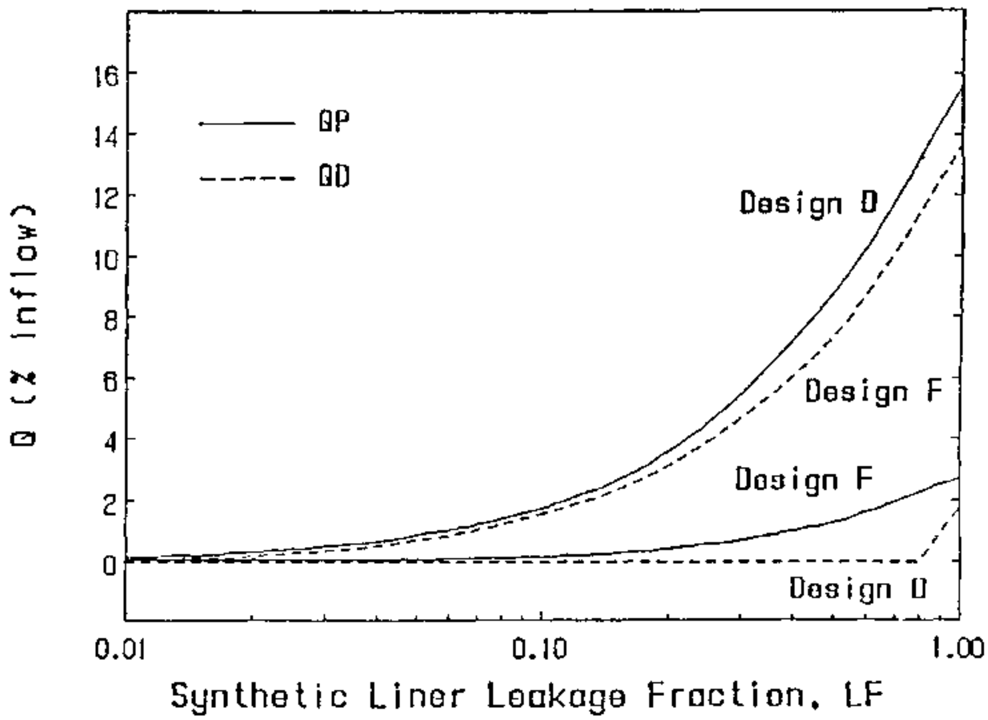


Figure 9-12. Percent of inflow to primary leachate collection layer discharging from leakage detection layer and bottom liner for double-liner systems D and F.

tually the same as for Design D but detection is much better. This design is effective at minimizing leakage from the landfill and at detecting leakage through the primary liner, but significant leakage through the primary liner may occur at fairly low liner leakage fractions.

Design F consists of a primary drainage layer underlain by a synthetic liner, a soil liner, a secondary drainage layer, a second synthetic liner, and a second soil liner. Figure 9-12 shows that the addition of the lower synthetic liner improves the system performance in comparison to the performance of Design D. Leakage is detected whenever leakage occurs. Even at leakage fractions of 10^{-3} when only 0.02 percent of the inflow leaks through the primary liner, half of the leakage is collected in the secondary drainage layer. The depth of saturation in the secondary drainage layer is lower than in the primary layer. This sufficiently reduces the leakage through the second synthetic liner to permit detection whenever the primary liner leaks. Design F is a very effective double-liner design because it minimizes the leakage through the primary liner and from the landfill and collects leakage at all leakage fractions.

A comparison of the four designs shows that Design F is the most effective in detecting the earliest leaks with the least amount of vertical leakage through the primary liner and also through the bottom soil liner. Design D yields the same quantity of leakage through the primary liner; however, leakage in Design D would probably never be detected or collected. Therefore, the bottom liner in Design D is not functional. Designs D and E yield the same leakage through the bottom liner but Design E detects leakage through the primary liner at the lowest leakage fraction. Design C also detects leaks at very small leakage fractions but allows significant vertical percolation through the bottom soil liner before detection. The leakage through the primary liner in Designs C and E is large even at low leakage fractions. Therefore, synthetic membranes placed on highly permeable subsoils are ineffective except for very low inflows and for very low leakage fractions. Synthetic membranes are best used in conjunction with a low-permeability soil as a composite liner. Comparison of the results for Designs B and C demonstrates this point. Both designs are composed of one synthetic membrane and one soil liner, but the leakage from the composite liner (Design B) shown in Figure 9-9 as the curve for 20 cm/yr (8 in./yr) steady inflow is much lower than the leakage from the double liner system (Design C) as shown in Figure 9-11.

It is interesting to compare the single-liner performance of Design B to the double-liner performance of Design D, assuming the soil-liner-saturated hydraulic conductivity in Design B is the same as Design D. The vertical percolation leaving the system in Design B is essentially the same as that leaving the secondary liner in Design D as seen by comparing Figure 9-12 to the curve in Figure 9-9 for 20 cm/yr (8 in./yr) steady inflow. The secondary liner in Design D is nonfunctional since the percolation rate of the second soil liner is generally equal to or greater than the leakage rate.

SUMMARY OF SENSITIVITY ANALYSIS

The interrelationship between variables influencing the hydrologic performance of a landfill cover is complex. It is difficult to isolate one parameter and exactly predict its effect on the water balance without first placing restrictions (sometimes severe restrictions) on the values of the remaining parameters. With this qualification in mind, the following general summary statements are made.

The primary importance of the topsoil depth is to control the extent or existence of overlap between the evaporative depth and the head in the lateral drainage layer. The greater this overlap, the greater will be evapotranspiration and runoff. Surface vegetation has a significant effect on evapotranspiration from soils with long flow-through travel times and large plant available water capacities; otherwise, the effect of vegetation on evapotranspiration is small. The general influence of surface vegetation on lateral drainage and percolation is difficult to predict outside the context of an individual cover design. Clay soils increase runoff and evapotranspiration and decrease lateral drainage and percolation. Simulations of landfills in colder climates and in areas of lower solar radiation are likely to show less evapotranspiration and greater lateral drainage and percolation. An increase in the runoff curve number will increase runoff and decrease evapotranspiration, lateral drainage, and percolation. As evaporative depth, drainable porosity, or plant available water increase, evapotranspiration tends to increase and lateral drainage and percolation tend to decrease; the effect on runoff is varied.

The sensitivity analysis shows that the ratio of lateral drainage to percolation is a positive function of the ratio of KD/KP and the average head above the liner. However, the average head is a function of QD/QD and L/S. The quantity of lateral drainage, and, therefore, also the average head, is in turn a function of the infiltration. Therefore, the ratio of lateral drainage to percolation increases with increases in infiltration and the ratio of KD/KP for a given drain and liner design. The ration of lateral drainage to percolation for a given ratio of KD/DP increases with increases in infiltration and the term S/L. The percolation and average head above the liner is a positive function of the term L/S.

Leakage through geomembrane increases with the number and size of holes, the depth of water buildup on the liner, the permeability of the subsoil, and the gap between the liner and the subsoil. Geomembranes reduce leakage through liner systems by reducing the area of saturated flow through the subsoil. The overall effectiveness of a geomembrane system is equivalent to a soil liner having a saturated hydraulic conductivity equal to the product of the saturated hydraulic conductivity of the subsoil and the ratio of the reduced area of flow through the subsoil to the area of the liner. Composite liners provide the best reduction in leakage. Drain systems that yield low head buildup on the geomembrane improve the performance of a geomembrane system.

REFERENCES

1. Schroeder, P. R., and Peyton, R. L. 1987. "Verification of the Hydrologic Evaluation of Landfill Performance (HELP) Model Using Field Data." EPA 600/2-87-050. EPA Hazardous Waste Engineering Research Laboratory, Cincinnati, OH.
2. Schroeder, P. R., R. L. Peyton, and J. M. Sjostrom. 1988. Hydrologic Evaluation of Landfill Performance (HELP) Model: Vol. III User's Guide for Version 2. Internal Working Document. USAE Waterways Experiment Station, Vicksburg, MS.
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4. Brown, K.W., J.C. Thomas, R.L. Lytton, P. Jayawikrama, and S.C. Bahrt. 1987. Quantification of Leak Rates Through Holes in Landfill Liners. EPA/600/S2-87-062. EPA Office of Research and Development, Cincinnati, OH.
5. Peyton, R. L. and Schroeder, P. R. 1990. "Evaluation of Landfill-Liner Designs." Vol. 116, No. 3, Journal of Environmental Engineering Division, American Society of Civil Engineers.

APPENDIX J

GROUNDWATER INFLOW

GROUNDWATER INFLOW

OBJECTIVE:

Estimate the groundwater inflow rate to the leachate collection system in accordance with 30 TAC §330.337(d)

GIVEN:

The maximum volume of groundwater inflow through a geomembrane is dependent on the following:

1. the permeability of the layer beneath the geomembrane, in this case the geosynthetic clay liner (GCL),
2. the potentiometric conditions of the groundwater,
3. the geomembrane hole size and spacing.

The liner system will be geosynthetic clay liner (GCL) overlain with geomembrane. The maximum permeability and thickness of the geosynthetic clay liner is :

GCL Properties

k= 3.00E-09 cm/s
t= 0.6 cm
t= 0.0197 ft

A drainage geocomposite overlays the geomembrane to collect leachate and transport it to the leachate collection trenches. The geocomposite thickness is:

t= 0.635 cm
t= 0.0208 ft

The location in the landfill at which the proposed liner elevation will be the greatest distance below the historic high groundwater elevation is adjacent to the sump in Sector 7 based upon the September 2018 historic high groundwater map. At this location the depth below groundwater is approximately 18 feet. For this analysis the head is conservatively assumed to be 20 feet.

h = 20 feet

Based on standard geosynthetic installation practice, the geomembrane defect was assumed as a single circular 1 cm^2 hole per acre of geomembrane liner.

A = 1 cm^2

METHOD:

The maximum unit groundwater flow rate through the liner system can be determined using the following Darcy equation:

Q = kiA

Where:

k = hydraulic conductivity of the liner component below the geomembrane (cm/sec)
i = change in head from outside to inside the landfill over the liner thickness,
A = the area of assumed pin holes and defects in the geomembrane (cm^2)

Q =	3.04483E-06	cm^3/sec	per acre (1 defect per acre is assumed)
	1.08E-10	ft^3/sec	per acre
	0.00	ft^3/day	per acre or 0.00 inch/year

CONCLUSION:

The calculations demonstrate that the estimated maximum groundwater inflow rate through the liner system is insignificant. This is primarily due to the geosynthetic clay liner with a low permeability. Therefore, it is not included in the HELP model in Part III, Attachment 15, Appendix A. The leachate collection system is designed to handle both the leachate generated and the groundwater inflow from materials beneath and lateral to the liner system. This groundwater inflow analysis demonstrates that groundwater inflow into the leachate collection system using the alternative liner system is negligible relative to leachate production rates.

CITY OF KINGSVILLE LANDFILL

PART III

ATTACHMENT 16

SECTOR 4C LINER CONSTRUCTION CORRESPONDENCE

CITY OF KINGSVILLE

P. O. BOX 1458 – KINGSVILLE, TEXAS 78364

February 20, 2002

Mr. Jerry Allred
Texas Natural Resource Conservation Commission
Municipal Solid Waste Permits Section
Building F, MC 124
12015 Park 35 Circle
Austin, Texas 78753

Re: Municipal Solid Waste - Kleberg County, Texas
City of Kingsville Landfill - Permit No. MSW-235B
Liner Evaluation Report - Sector 1, Type IV

Dear Mr. Allred:

On behalf of the City of Kingsville, SECOR International Incorporated (SECOR) has prepared the attached ALiner Evaluation Report≅ (LER) for Sector 1, Type IV of Permit No. MSW-235B at the City of Kingsville Landfill. The specific location of the cell under construction is depicted on the attached site plan.

This SLER provides documentation of the construction of approximately 5.4 acres of a composite liner and leachate collection system. The materials of a composite system that include a geosynthetic clay liner, a geomembrane, a geosynthetic drainage system and a protective soil cover. This LER submittal includes the completed GCLER and GLER forms along with project location plan, laboratory test results and field documentation data. This work complies with the currently approved site SLQCP.

In accordance with 30 TAC 305.44, by signing below, I make the following certification:

> *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.*

We are providing an original and two copies of this LER document for your review. If you have any questions regarding the information contained in this report, please contact myself at (361) 595-8098 or Mr. J. Roy Murray at (281) 397-6747.

Sincerely,
City of Kingsville

Dianne Leubert
Director of Landfill Operations

cc: J. Roy Murray - SECOR
Mike Purvis - RJR Engineering Ltd., L.L.P.

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

March 4, 2002

The Honorable Filemon Esquivel, Jr.
Mayor of Kingsville
P.O. Box 1458
Kingsville, Texas 78364-1458

Re: Municipal Solid Waste - Kleberg County
City of Kingsville - Permit No. MSW-235B
Geomembrane Liner Evaluation Report (GLER) - Type IV, Sector 1
Mail Log No. 1562

Dear Mayor Esquivel:

On February 22, 2002, the Texas Natural Resource Conservation Commission (TNRCC) received a GLER for Sector 1 of the Type IV landfill. It consists of an evaluation for 153,149, 33,019, 15,414, and 33,642 square feet of a geomembrane liner installed on the floor, south side slope, east side slope, and north side slope respectively. The GLER was prepared by SECOR International, Inc., and was signed and sealed on February 15, 2002, by Mr. James R. Murray, P.E. (#73860) with SECOR, and Mr. John M. Purvis, P.E. (#84783) with RJR Engineering, L.L.P., Ltd., as the Professionals of Record. The GLER was also signed by Ms. Dianne Leubert, Director of Landfill Operations, as the permittee representative, on February 20, 2002.

The GLER is approved as the documentation submitted by Messrs. Murray and Purvis, as the Professionals of Record, indicates that the installation of the geomembrane liner complies with the Soils and Liner Quality Control Plan and the groundwater protection requirements contained in the State of Texas Municipal Solid Waste Rules.

Part I. of the GLER form indicates that we may expect to receive the next GLER submittal in June 2015. An attachment to the to the GLER form indicates that the protective cover installation was completed on January 19, 2002. Please provide an Interim Status Report (ISR) within six months completion of the protective cover and every six months thereafter, until the entire liner system is covered by municipal solid waste, as required by 30 TAC §330.206(e). The ISR should be developed by the POR who signed and sealed the liner evaluation reports and submitted to the MSW Permits Section of the TNRCC.

Please contact Mr. Gale Baker at 512/239-6730 if you have any questions concerning this matter.

Sincerely,

Jeff Davis, Team Leader
MSW Permits Section
Waste Permits Division

JD/gb

cc: Mr. Hector M. Hinojosa, City Manager, Kingsville
Ms. Dianne Leubert, Director of Landfill Operations, Kingsville
Mr. James R. Murray, P.E., SECOR International, Inc., Houston
Mr. John M. Purvis, P.E., RJR Engineering, L.L.P., Ltd, Houston

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tnrcc.state.tx.us

THE CITY OF KINGSVILLE LANDFILL

TCEQ PERMIT MSW 235C

PERMIT AMENDMENT APPLICATION

PART IV

CITY OF KINGSVILLE, KLEBERG COUNTY, TEXAS

September 2018

Revision 1 – November 2018

Revision 2 - February 2019

Prepared by

HANSON

Engineering | Planning | Allied Services

TBPE F-417

HANSON PROJECT NO. 16L0438-0003

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LIST OF ACRONYMS

ADC – Alternate Daily Cover

CESQG – Conditionally Exempt Small Quantity Generator

CFC – Chlorinated Fluorocarbon

CFR – Code of Federal Regulations

DIY – Do It Yourself

EPA – Environmental Protection Agency

GLER – Geosynthetics Liner Evaluation Report

GWSAP – Groundwater Sampling and Analysis Plan

LCS – Leachate Collection System

LCWMP – Leachate and Contaminated Water Management Plan

LFG – Landfill Gas

LGMP – Landfill Gas Management Plan

LQCP – Liner Quality Control Plan

M/S – Landfill Manager/Supervisor

MSW – Municipal Solid Waste

MSWLF – Municipal Solid Waste Landfill

MSWMR – Municipal Solid Waste Management Regulations

PCB – Polychlorinated Biphenyl

RRC – Railroad Commission of Texas

SDP – Site Development Plan

SLER – Soil Liner Evaluation Report

SOP – Site Operating Plan

SOR – Site Operating Record

SPCC – Spill Prevention, Control, and Countermeasures Plan

SWAP – Special Waste Acceptance Plan

SWPPP – Stormwater Pollution Prevention Plan

TAC – Texas Administrative Code

TCEQ – Texas Commission on Environmental Quality

TPDES – Texas Pollutant Discharge Elimination System

TXDOT – Texas Department of Transportation

1 INTRODUCTION

The City of Kingsville Landfill (Kingsville Landfill/facility), Municipal Solid Waste Permit 235-B, is located southeast of the City of Kingsville at the northeast corner of the intersection of Farm to Market Road 2619 and County Road 2130. The City of Kingsville Landfill is owned and operated by the City of Kingsville (City). The facility services residences and businesses within Kleberg County and portions of several surrounding counties, including Nueces, Jim Wells, Brooks and Kenedy.

This Site Operating Plan (SOP) is being submitted as part of a lateral and vertical landfill expansion permit amendment. The SOP consists of procedures to be followed by the landfill personnel for day-to-day operations at the City of Kingsville Landfill, a Type I Municipal Solid Waste (MSW) facility that may also receive construction and demolition debris, and other non-putrescible wastes and special wastes. The SOP is submitted to address the requirements of 30 TAC §330.65 and §330.121 through §330.179.

Pursuant to §330.121 this SOP, along with the site permit, site development plan, records specified in §330.125, and a current copy of the Municipal Solid Waste Management Regulations (MSWMR), will be maintained in the Site Operating Record (SOR). The City of Kingsville Landfill will be operated in accordance with the requirements of this SOP and other applicable local, state, or federal regulations. The SOP will be retained as part of the operating record during the active life of the site and throughout the post-closure maintenance period.

1.1 PRE-OPERATION NOTICE §330.123

The facility, in accordance with §330.123, will provide written notice to TCEQ in the form of a Soils and Liner Evaluation Report (SLER), and/or Geosynthetic Clay Liner Evaluation Report (GCLER) and Geomembrane Liner Evaluation Report (GLER) detailing the final construction and lining of a new disposal cell. The reports will be submitted to the Texas Commission on Environmental Quality (TCEQ) for review and approval 14 days prior to the placement of any waste in the new cell. If verbal or written response from the TCEQ is not provided by the end of the 14th day following TCEQ receipt of the report(s), the Municipal Solid Waste Landfill (MSWLF) unit will be considered approved for placement of solid waste.

1.2 RECORDKEEPING REQUIREMENTS §330.125

A copy of the current SOP, Site Permit, Site Development Plan (SDP), Final Closure Plan, Post-Closure Plan, Leachate and Contaminated Water Management Plan (LCWMP), Groundwater Sampling and Analysis Plan (GWSAP), Landfill Gas Management Plan (LGMP), and any other plans required by the permit along with all issued modifications, and any temporary authorizations granted will be maintained in the Site Operating Record (SOR) at the City of Kingsville Landfill or at an alternated location approved by the TCEQ.

2 PERSONNEL §330.127(1)

The landfill personnel will include, at a minimum, a M/S, two Equipment Operators, a Gate/Scale Attendant, and at least one Laborer(s) for other assigned tasks. The organizational chart (Figure 1) at the end of this section provides the positions and chain-of-command of personnel necessary to operate this facility.

2.1 Landfill Manager/Supervisor

The M/S will be responsible for all activities at the landfill and will be the designated contact person for regulatory compliance matters. He/she will provide on-site management of the landfill operations and will be responsible for the implementation of site permit requirements. The M/S will maintain an adequate level of competency, training and experience to fulfil these duties.

The M/S's responsibilities include, but are not limited to, the following:

- Supervising personnel including Laborers, Equipment Operators, and Scale/Gate Attendants in the performance of daily landfill operations and assigning duties as necessary.
- Ensuring adequate staffing to provide facility operation in accordance with the Site Development Plan (SDP), the SOP, and the TCEQ regulations.
- Monitoring and evaluating the performance of employees with respect to assigned duties and compliance with regulatory requirements.
- Ensuring compliance of day-to-day operations with TCEQ operating requirements and with the current SOP.
- Ensuring that all equipment and operating systems required under the permit (i.e., leachate collection systems, methane gas collection system, etc.) are properly maintained.
- Anticipating changes to the operating practices necessary due to changes in the weather, disposal location, or other conditions affecting site operations.
- Performing inspections and completing inspection forms and checklists.
- Overseeing all construction activities.
- Coordinating fire protection training of landfill employees according to Section 4.4 of this plan.
- Serving as the emergency contact and coordinator for the facility.

The minimum qualifications for the M/S include the following: (1) must hold a Class-A~~, B or C~~ license as defined in 30 TAC §30.213~~0~~, (2) must be an experienced personnel manager, and (3) must be familiar with and have the aptitude to implement operational aspects of solid waste disposal operations (including knowledge of relevant regulations and permit requirements, waste-handling and safe management practices for disposal of municipal solid waste, health and safety, and waste identification).

4 GENERAL INSTRUCTIONS §330.127(3)

The operational procedures outlined in this SOP will be followed and will be considered a part of the SOR of this MSWLF facility. This facility is designed for Type I MSW disposal and consists of separate cells.

Each cell will be constructed as the operation advances.

Operations will be conducted in a professional manner by qualified and trained personnel. Operational objectives will consist of placing the maximum amount of waste in a specified area, and operating the site in compliance with the TCEQ regulations, the site permit, and the SOP. The following Facility Operations, Inspection, and Maintenance listing includes general instructions that the operating personnel will follow concerning the operational requirements of the facility.

TABLE 4: GENERAL OPERATIONAL INSTRUCTIONS

DESCRIPTION OF ACTIVITY	TASK	FREQUENCY	INSPECTOR	INSPECTION DOCUMENTATION
Entrance Gate and Perimeter Fences	Conduct inspection of gate and perimeter fences to ensure that no breach has occurred. If breach occurs, notify TCEQ as specified in section 4.5	Daily~~Weekly~~	Landfill Manager /Supervisor or Designee	Note status on Access Inspection Log, maintain in SOR
Cover Application Record	Record date of cover, how it was accomplished, and the last area covered, according to 330.165	Daily	Landfill Manager /Supervisor or Designee	Document daily, intermediate and final cover application, sign form and place in SOR
Perimeter Drainage Channel and Pond Maintenance	Inspect channels for litter and debris, clear flowline, inspect detention ponds for damage.	Weekly	Landfill Manager /Supervisor or Designee	Document weekly and place in SOR
Random Load Inspection	Conduct inspection of vehicle to ensure that no unauthorized wastes are in the load	Daily as specified in Section 4.2.3	Landfill Manager /Supervisor or Designee	Place completed Load Inspection Report in SOR
Unauthorized Material Removal	Document removal of unauthorized materials from landfill	Per occurrence	Landfill Manager /Supervisor or Designee	Complete Unauthorized Material Removal form and place in SOR

Leachate Collection System	Measure depth of leachate in sumps, storage tanks, and record volume of leachate removed from site	~~Quarterly~~Monthly	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
Final Cover Inspection	Inspect final cover for erosion, and damage to drainage structures	Weekly and after a rainfall event resulting in runoff	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
On-site Litter/Spilled Waste Materials Collection	Inspect site for litter/spilled waste materials. Collect Litter/clean-up -spilled waste materials on a daily basis and return to working face for proper disposal	Daily	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
Mud and Debris Cleaned from Public Roads	Inspect public roads for evidence of mud and debris tracked from site	Daily during periods of inclement weather	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
Fire Extinguisher/ Fire Fighting Equipment	Inspect all fire extinguishers and/or fire fighting equipment, promptly repair or replace defective equipment.	Annually	Landfill Manager /Supervisor or Designee	Properly mark tags on fire extinguishers, document results of equipment inspections, place in SOR
Markers and Benchmarks	Inspect markers and benchmarks for damage. Replace markers that are removed or destroyed within 15 days of removal or destruction.	Monthly	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
Roadway Regrading	Inspect on-site access roadways to ensure clean and safe condition.	Monthly	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
Site Signs	Inspect all site signs for damage, general location, and accuracy of posted information.	Weekly	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR
Odor	Inspect perimeter of the site to assess the performance of the site operations to control odor	Weekly	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR

Ponded Water	Inspect site for potential ponding of water and ponded water. ponded water elimination, filling in and regrading the area within seven days of the occurrence.~~Fill and grade low areas as soon as practical.~~	Weekly	Landfill Manager /Supervisor or Designee	Complete documentation and place in SOR

4.1 PERSONNEL TRAINING §330.127(4)

It will be the responsibility of the permittee to ensure that the M/S is knowledgeable in the proper operation of a municipal solid waste landfill and the current operational standards required by the TCEQ. The M/S will be an experienced manager and will maintain the required license as defined in 30 TAC §30.~~210~~213. It will be the responsibility of the M/S to ensure that all landfill personnel are properly trained and are operating the landfill in accordance with this SOP and operational standards required by the permit and the TCEQ municipal solid waste regulations.

Training for personnel will be ongoing and will be directed by a person trained in waste management procedures. Facility personnel will be instructed in the required waste management procedures and contingency plan implementation relevant to the positions in which they are employed. The training program will include:

- Prohibited waste recognition training;
- Emergency response procedures, including fire and explosion;
- Use of emergency equipment, communications or alarm systems;
- Response to environmental contamination incidents; and
- Shutdown of operations.

New employees will receive a comprehensive overview of landfill operations, focusing on information that is necessary to protect the health and welfare of the new employee and enable them to perform their duties in accordance with this SOP, the operational standards required by the permit and the TCEQ municipal solid waste regulations. Initial training subject matter will include:

- Review of the SDP and Attachments;
- The SOP;
- The Spill Prevention Control and Countermeasure Plan;
- The Storm Water Pollution Prevention Plan; and
- General safety procedures.

should be maintained in the site operating records and should include evidence of successful completion of the training, type of training received, and the name of the instructor. The minimum level of training for the facility manager should be a Class A~~, B, or C~~ license as defined in §30.~~210~~213. In addition, key on-site personnel should attend a course for screening for unauthorized waste.

4.2.2 Wastes Prohibited From Disposal

The City of Kingsville Landfill will not accept the following types of waste for disposal:

- ~~Regulated~~ Municipal Hazardous Waste other than from a Conditionally Exempt Small Quantity Generator (CESQG) as defined in 30 TAC §330.171(c)(6);
- Polychlorinated Biphenyls (PCBs) as discussed in section 4.2.1;
- Class 1, Class 2, and Class 3 industrial waste;
- Do-it-yourself (DIY) used motor vehicle oil will not be intentionally or knowingly accepted for disposal per §330.15(e)(2);
- Whole used or scrap tires shall not be accepted for disposal or disposed of in any MSW landfill, unless processed prior to disposal in a manner acceptable to the executive director per §330.15(e)(4);
- Lead acid storage batteries will not be intentionally or knowingly accepted for disposal per §330.15(e)(1);
- Used oil filters from internal combustion engines will not be intentionally or knowingly accepted for disposal per §330.171(d);
- Items containing chlorinated fluorocarbon (CFC) unless all the CFC contained within them is properly managed as defined in §330.15(e)(5);
- The following special wastes without prior approval from TCEQ and accompanied with the relevant analytical test results, MSDS documents, or process knowledge documents:
    - Septic tank pumpings which have been stabilized and have passed the paint filter test;
    - Wastes from commercial or industrial wastewater treatment plants; air pollution control facilities; and tanks, drums, or containers used for shipping or storing any material that has been listed as a hazardous constituent in 40 CFR, Part 261, Appendix VIII but has not been listed as a commercial chemical product in 40 CFR Part 261.33(e) or (f);
    - Drugs, contaminated foods, or contaminated beverages, other than those contained in normal household waste;
    - Incinerator ash;
    - Light ballasts and/or small capacitors containing PCB compounds with a PCB content less than 50 parts per million;
    - And waste generated outside the boundaries of Texas that contains:
    - Any industrial waste,

stormwater diversion and containment berms and stockpiled earthen material may be used for fire fighting purposes.

4.4.1.2.4.6 Tire Storage and Processing Area

Landfill personnel, including equipment operators, will watch for signs of fire at the tire storage and processing area. Landfill personnel will watch for fire, smoke, steam, or signs of heat. If signs of fire are detected at the tire storage and processing area, all vehicles and equipment will be immediately moved away from the fire. The unloading of materials will either be relocated to a safe location away from the fire and a collection area established there or halted all together until the fire is extinguished.

If detected soon enough, a small fire may be fought with a hand-held fire extinguisher. The fire area may be watered down or smothered with 6 inches of soil, as appropriate, to ensure that the fire is out.

If the fire cannot be quickly extinguished with the fire extinguisher, the bulldozer, earth moving equipment, and water truck will immediately mobilize to the site of the fire. All available landfill personnel will assist with fire protection measures unless otherwise directed by the M/S.

Fire fighting methods for tires or tire pieces include smothering with soil, separating burning material from other waste, spraying with water from an on-site water truck, or pumping with water from an on-site pond. The burning material should be isolated or pushed away immediately before the fire can spread, or fire breaks should be cut around the fire before it can spread. If moving the material is not possible, or if it is unsafe, efforts should be made to cover the burning area with earth immediately to smother the fire.

4.4.1.2.4.7 Liquid Waste Solidification Area

Landfill personnel, including equipment operators, will watch for signs of fire at the liquid waste solidification area. Landfill personnel will watch for fire, smoke, steam, or signs of heat. If signs of fire are detected at the liquid waste solidification area, all vehicles and equipment will be immediately moved away from the fire. The unloading of materials will either be relocated to a safe location away from the fire and a collection area established there or halted all together until the fire is extinguished.

If detected soon enough, a small fire may be fought with a hand-held fire extinguisher. The fire area may be watered down or smothered with 6 inches of soil, as appropriate, to ensure that the fire is out.

If the fire cannot be quickly extinguished with the fire extinguisher, the bulldozer, earth moving equipment, and water truck will immediately mobilize to the site of the fire. All available landfill personnel will assist with fire protection measures unless otherwise directed by the M/S.

Fire fighting methods for processed liquid wastes or bulking agents include smothering with soil, separating burning material from other waste, spraying with water from an on-site water truck, or pumping with water from an on-site pond. The burning material should be isolated or pushed away immediately before the fire can spread, or fire breaks should be cut around the fire before it can spread. If moving the material is not possible, or if it is unsafe, efforts should be made to cover the burning area with earth immediately to smother the fire.

4.4.1.2.4.8 White Goods and Metal Recyclable Storage Area

Landfill personnel, including equipment operators, will watch for signs of fire at the white goods and metal recyclable storage area. Landfill personnel will watch for fire, smoke, steam, or signs of heat. If signs of fire are detected at the white goods and metal recyclable storage area, all vehicles and equipment will be immediately moved away from the fire. The unloading of materials will either be relocated to a safe location away from the fire and a collection areas established there or halted all together until the fire is extinguished.

If detected soon enough, a small fire may be fought with a hand-held fire extinguisher. The fire area may be watered down or smothered with 6 inches of soil, as appropriate, to ensure that the fire is out.

If the fire cannot be quickly extinguished with the fire extinguisher, the bulldozer, earth moving equipment, and water truck will immediately mobilize to the site of the fire. All available landfill personnel will assist with fire protection measures unless otherwise directed by the M/S.

Fire fighting methods for white goods or metal recyclable materials include smothering with soil, separating burning material from other waste, spraying with water from an on-site water truck, or pumping with water from an on-site pond. The burning material should be isolated or pushed away immediately before the fire can spread, or fire breaks should be cut around the fire before it can spread. If moving the material is not possible, or if it is unsafe, efforts should be made to cover the burning area with earth immediately to smother the fire.

~~4.4.1.2.4.6~~4.4.1.2.4.9 Working Face/Landfill Fires

Landfill personnel, including equipment operators, will watch for signs of fire on the working face and landfill waste mass in general. Landfill personnel will watch for fire, smoke, steam, or signs of heat.

If signs of fire are detected at the working face or on the landfill, all vehicles and equipment will be immediately moved away from the fire. The unloading of incoming waste will either be relocated to a safe location away from the fire and a working face established there or halted all together until the fire is extinguished.

The bulldozer, earth moving equipment, and the water truck will immediately mobilize to the site of the fire. All available landfill personnel will assist with fire protection measures unless otherwise directed by the M/S.

Fire fighting methods for burning solid waste include smothering with soil, separating burning material from other waste, spraying with water from an on-site water truck, or pumping with water from an on-site pond. Small fires might be controlled with hand-held fire extinguishers. If the fire is at an active disposal area, if possible, the burning waste should be isolated or pushed away immediately before the fire can spread, or fire breaks should be cut around the fire before it can spread. If moving the waste is not possible, or if it is unsafe, efforts should be made to cover the working face with earth immediately to smother the fire. The faster that soil can be placed over the fire, the more effective this method will be in controlling and extinguishing the fire. The ~~working face diversion and containment berms and~~ stockpiled earthen material may be used for firefighting purposes.

A sufficient volume of earthen material will be available at all times to cover a potential fire area equivalent to the size of the working face with six inches of earthen material within one hour. This source of earthen material may be on-site soil stockpiles, ~~working face diversion and/or containment berms,~~ areas of future excavation, or some combination thereof.

The volume of earthen material required is calculated as:

Volume (cubic yards) = [(L × W × 0.5 feet) ÷ 27] x 1.2

Where: L = Length of the working face (feet)
W = Width of the working face (feet)
1.2 = A 20% Factor of Safety

Examples of required earthen material volumes are included in the following table.

TABLE 6: REQUIRED EARTHEN MATERIAL FOR FIRE CONTROL

LENGTH OF WORKING FACE (Feet)	WIDTH OF WORKING FACE (Feet)	VOLUME NEEDED TO COVER WORKING FACE (Cubic Yards)
100	50	111
200	50	222
100	100	222
200	100	444
300	100	667

Sufficient on-site equipment must be provided to place a six inch layer of earthen material over any waste not already covered with daily cover in one (1) hour, 30 TAC §330.129.

1. **The active working face(s):** Municipal solid waste will be unloaded at the active working face(s). Unloading of municipal solid waste at the active working face will be confined to as small an area as practical and will not exceed 30,000 square feet, or about 300 feet by 100 feet. The size of the working face will be directly impacted by the amount of waste being received and may vary accordingly. There may be one, two or three working faces open at any given time. Typically, there will be one general purpose waste unloading area. The M/S may designate up to three waste unloading areas; one for commercial customers, one for light commercial/residential customers, and one for other wastes requiring special attention or while moving a working face (i.e., establishing a working face in a new location, while covering, or during periods of emergency clean up operations (i.e., hurricane, hailstorm, flood, etc.).

2. **White Goods and Metal Recyclable Storage Area~~Large item salvage area~~:** The white goods and metal recyclable ~~large items/white goods~~ unloading and storage area will not be larger than 20,000 square feet (100 feet by 200 feet). Large items/white goods may include ovens, dishwashers, freezers, air conditioners, and other items. These items will not be stored in excess of 180 days.

3. **Tire ~~collection~~ storage and processing area:** Tires will be managed in a manner that minimizes possible ponding of water in order to eliminate potential conditions that would promote disease vectors. The quantity of tires stored on-site will not exceed 500 tires on the ground (maximum storage area of 25 feet by 25 feet), or 2,000 tires in enclosed containers (maximum storage area of one standard 40 to 52 foot trailer). The tires will be processed/reduced in size to the extent practical for disposal in the landfill or sent to an authorized tire recycler. Whole used or scrap tires will not be disposed of in the landfill. Tires will not be stored in excess of 180 days.

4. **Liquid waste solidification area:** Liquid waste will be unloaded into one (1) of four (4) approximately eight (8) feet by 20 feet liquid tight mixing containers and will be located within a lined landfill sector. The maximum size of the liquid waste solidification area will be 30 feet by 50 feet. Bulking agents such as on-site soil, sawdust, kiln dust, coal combustion residuals, auto-fluff or other inert material with absorptive capacity will be mixed with the liquids until the resulting mixture passes the paint filter test and any other requirements outlined for the specific material. Once the liquids have been solidified, the solidified waste material will be transported and disposed of in the working face. Liquid waste will be unloaded directly into the mixing containers and solidification will begin upon receipt. See Part IV, Attachment 5 for the Liquid Waste Solidification Operating Plan.

5. **Brush storage and processing area:** Vegetative material not mixed with other wastes will be diverted to a location outside of the active disposal area and drainage ways so that they do not interfere with on-site drainage or wash off-site. The maximum size of the unloading area for brush and yard waste is 200 feet by 400 feet. Brush will be processed for mulch. Brush will not be stored in excess of 180 days.

4.7 HOURS OF OPERATION §330.135

Authorized Waste Acceptance Hours are Monday through Friday 7:00 a.m. to 7:00 p.m. and Saturday, 8:00 a.m. to 4:30 p.m. The actual waste acceptance hours will fall within the authorized hours. These hours are posted on the site entrance sign. Waste may not be accepted at the gatehouse before or after these hours.

Other site operations may be conducted at any time from 6:00 a.m. to 9:00 p.m. seven (7) days a week. These operations include construction, earthmoving, monitoring, transportation of construction materials, heavy equipment operation, and other non-waste acceptance operations. The facility may operate within these hours at the discretion of site management.

~~Any change that increases the hours of operation will be preceded by written notification of the change to TCEQ.~~ In the event of an emergency, such as a hurricane, or other circumstances, the M/S may modify the hours of operation with notification by telephone, following with written notification as soon as practical. The facility will record in the site operating record the dates, times, and duration when any alternative operating hours are utilized

4.8 SITE SIGN §330.137

A conspicuous sign measuring a minimum four feet by four feet will be maintained at the public entrance to the site. The sign will state, in letters at least three inches high, the type of site, the hours and days of operation, an emergency 24-hour contact phone number(s) that reaches an individual with the authority to obligate the facility at all times that the facility is closed, the local emergency fire department phone number (City of Kingsville Fire Department can be reached at 911 or (361) 592-6445), and the permit number. A sign prohibiting receipt of hazardous waste, closed drums and smoking will be posted near the facility entrance or gatehouse. A sign must be prominently displayed at the facility entrances stating that all loads will be properly covered or otherwise secured. The facility sign will be readable from the facility entrance.

4.9 CONTROL OF WINDBLOWN SOLID WASTE AND LITTER §330.139

The working face will be maintained and operated in a manner to control windblown solid waste. Windblown material and litter will be collected and properly managed to control unhealthy, unsafe, or unsightly conditions by the following methods:

- Waste transportation vehicles using the facility will be required to use adequate covers or other means of containment. The adequacy of covers or containment of incoming wastes will be checked at the facility entrance. A sign will be prominently displayed at the gatehouse stating that all loads will be properly covered.
- The active working face will be limited to as small an area as practical for the safe operation of compaction equipment, as well as delivery and placement of daily cover soils, and alternate daily cover.

- The working face will be covered daily to avoid prolonged exposure of waste. A minimum of six inches of "daily" cover soil, alternate daily cover, or approved equivalent will be placed over all exposed waste at the end of each working day ~~or at least once every 24 hours~~.
- Litter fences may be utilized in the immediate vicinity of the working face to help control windblown material. The M/S or his designee will be responsible for determining the need, type and placement of litter screens and fences. Litter fences will either be portable, free-standing screens which can be easily moved, as necessary, with equipment, and/or temporary fences which consist of poles driven into the ground surface with fencing between them. Numbers and sizes of portable wind fences are included in Section 3.0. Typically, the litter fences will be placed downwind and extend the full width of the working face.
- Litter scattered throughout the site, along fences and access roads, in the adjacent drainage channels and internal access roads and at the gate due to wind or as a result of waste falling from vehicles will be picked up once a day by landfill personnel and returned to the active working face of the disposal area(s). The M/S will ensure that on-site litter clean up efforts are recorded on a daily log which will be maintained in the SOR.
- Screening barriers such as temporary berms ~~and piles of brush~~ may be used in conjunction with portable and temporary wind screens.

4.10 EASEMENTS AND BUFFER ZONES §330.141

4.10.1 Easements

In accordance with §330.141**,** solid waste unloading, storage, disposal, or processing operations will not occur within any easement, or right-of-way that crosses the site. No solid waste disposal will occur within 25 feet of the centerline of any utility line or pipeline easement, unless otherwise authorized by TCEQ. All pipeline and utility easements will be clearly marked with posts which extend at least six feet above ground level, spaced at intervals no greater than 300 feet (see Section 4.11).

The City of Kingsville Landfill has one (1) aerial electrical powerline easement but has no other pipeline, utility, or other easements or rights-of-way within the existing and/or proposed permit boundary. The aerial electrical powerline easement is shown on Part III, Attachment 1, Figure III.1-2.

4.10.2 Buffer Zones

The buffer zone is defined as the area located between the permit boundary and the waste footprint. No solid waste unloading, storage, disposal, or solid waste processing and disposal operations will occur within any buffer zone. The buffer zones will provide safe passage for fire fighting and other emergency vehicles.

4.11.2 Site Grid System Markers §330.143(b)(5)

Site grid system markers (White) will be installed at the facility. The grid system will encompass at least the area expected to be filled within the next 3 year period. Grid markers will be maintained during the active life of the site: post-closure maintenance of the grid system is recommended but not required. The grid system will consist of lettered markers along one (1) side and numbered markers along the other perpendicular side. Markers will be spaced no greater than 100 feet apart measured along perpendicular lines. Where markers cannot be seen from opposite boundaries, intermediate markers will be installed, where feasible.

4.11.3 SLER or GLER Area Markers §330.143(b)(6)

SLER or GLER area markers (Red) will be placed so that all areas for which a SLER or GLER has been submitted and approved by TCEQ are readily determinable. Such markers are to provide site workers immediate knowledge of the extent of approved disposal areas. These markers will be located so that they are not destroyed during operations until operations extend into the next SLER or GLER. The location of these markers will be tied into the site grid system and will be reported on each SLER/GLER submitted. SLER and GLER markers will not be placed inside the constructed/evaluated areas.

4.11.4 100 Year Flood Limit Protection Markers §330.143(b)(7)

Flood protection markers (Blue) must be installed in any area within a solid waste disposal facility that is subject to flooding prior to the construction of flood protection levee. The area subject to flooding will be clearly marked by means of permanent posts spaced not more than 300 feet apart or closer if necessary to retain visual continuity. City of Kingsville Landfill is NOT located within a 100 year floodplain.

4.11.5 Site Boundary Markers §330.143(b)(2)

Site boundary markers (Black) will be placed at each corner of the site and along each boundary line at intervals no greater than 300 feet. Fencing may be placed within these markers as required.

4.11.6 Buffer Zone Markers §330.143(b)(3)

Markers (Yellow) identifying the buffer zone will be placed along each buffer zone boundary at all corners and between corners at intervals no greater than 300 feet. Placement of the landfill grid markers may be made along a buffer zone boundary.

4.11.7 Permanent Benchmark §330.143(b)(8)

A permanent monument has been established at the site. The monument is established at the site in an area that is readily accessible and will not be used for disposal. The monument elevation was surveyed from a known United States Coast and Geodetic Survey benchmark. The location (NAD 27: N 27° 26' 41.95", W 97° 48' 55.89") and elevation (52.61 ft above mean sea level) of the reference benchmark monument are provided in Part II~~I~~, Attachment 1, Figure II~~I~~.1-2,

4.14 ODOR MANAGEMENT PLAN §330.149

This odor management plan addresses the identification of potential sources of odors at the City of Kingsville Landfill and includes methods to control odors or sources of odors.

4.14.1 Sources of Odor

Sources of landfill odor can vary considerably and may include the wastes being delivered to the landfill, the open working face, the leachate collection system, ponded water and landfill gas. Many of the wastes received at a landfill are a source of odor upon receipt, such as sludges and dead animals. Other wastes have the potential for becoming a source of odor by their biodegradable characteristics, generating gases as they advance through the decomposition process. Leachate, liquid that has passed through or emerged from solid waste, may also be a source of odor if not properly handled or managed in a timely manner. Ponded water and landfill gas could become sources of odor as well.

4.14.2 Odor Control

Among the measures that may be employed to reduce potential odors are the following:

- Minimize the size of the working face area.
- Place daily cover (a minimum of six inches of soil, or an alternate daily cover material such as tarps or foam material) over the fill area at the end of the working day. If necessary, increase the thickness of daily cover applied to the working face.
- Inspect daily, intermediate, and final cover areas to confirm that no trash is exposed and no erosion of cover material has occurred. Damaged and/or eroded cover areas will be promptly repaired. If odors result during the use of alternate daily cover material, re-evaluate the use of that particular ADC. The ADC may be replaced with a different ADC or earthen material.
- Identify any waste stream that requires special attention to control odor.
    - Dead animals will be isolated within the active working face and immediately covered with three feet of waste or two feet of soil upon receipt. Additional daily cover soil may be placed if needed.
    - If the gate attendant or operator notes a load with significant odors, the load will be promptly covered with soil or solid waste when it arrives at the working face.
    - Sludges, septage, and grease trap waste that pass the paint filter test may be mixed with other absorptive wastes to minimize odors.
    - Known sources of odorous waste may be allocated a time of day for these wastes to be received so that they can be given special attention.
- Inspect the leachate collection and storage system to confirm that it is functioning as designed.
- ~~Inspect and evaluate leachate recirculation procedures.~~
- Ensure that leachate removal from the site is done under appropriate weather conditions.

- Control water ponded over waste disposal areas to avoid it becoming an odor nuisance.
- Manage spills of odorous material in a timely manner.
  Promptly remove and dispose of odorous items from the recycling area.

4.14.3 Odor Response Procedures

If an odor that may be associated with landfill operation is detected within the site boundary, landfill personnel will attempt to determine the source of the odor. Areas to assess include the active working face, the leachate collection sumps, the leachate evaporation pond, ~~the composting area,~~ and/or the gas extraction system (if installed). If an identifiable odor is determined to be originating at these or any other area of the facility, the M/S will be notified and remedial actions will be initiated.

Remedial actions may include any or all of the following:

- Increasing the amount of daily cover for certain waste streams;
- Suspending the use of ADC or making sure certain wastes are covered with soil prior to application of ADC;
- Discontinuing certain waste streams;
- Aerating the leachate evaporation ponds;
- Controlling head levels in the leachate collection system;
- ~~Checking the composting area for any potential sources of odor;~~ and
- Making adjustments to the gas extraction system.

The investigation and remediation of odors will be documented and placed in the site operating record.

4.15 DISEASE VECTOR CONTROL §330.151

The City of Kingsville personnel will control all conditions favorable to the production or harboring of disease vectors such as rodents, flies, mosquitoes, and other insects or animals capable of transmitting diseases to humans. The primary means of control will be to prevent vectors from coming into contact with deposited waste through proper waste compaction and daily cover application. The working face will be confined to as small an area as practical and waste deposited at the working face will be promptly compacted. Daily cover and/or alternate daily cover will be applied at the end of each operating day. Landfill cover procedures are described in Section 4.22 of this SOP. Ponded water will be controlled as detailed in Section 4.23 of this SOP.

Site personnel should be observant for insects and rodents and will report problems to the M/S. Professional exterminators will be contacted, if necessary, to provide additional control of rodents or other pests that may appear at the site. If chemicals are needed for disease vector control, a professional will apply the appropriate chemical at the industry recommended rate, and use the appropriate health and safety practices to minimize any potential adverse effects.

4.16 SITE ACCESS ROADS §330.153

The site entrance road is a 24-foot wide, above-grade, all-weather roadway that extends from CR 2130 to the gate house. Other internal landfill roadways are constructed of crushed stone or similar material surface provide to provide for all-weather access from the scale house to the landfill unloading area(s). The site entrance and access roads will be maintained in a clean and safe condition. This includes the maintenance and grading of the roadway sections, mud control, litter and debris control, and dust control. Records of roadway inspections, as well as litter, dust and mud control efforts will be kept in the SOR to demonstrate compliance with the requirements of this section.

4.16.1 Re-grading of Site Access Roads

The site access roads will be inspected monthly for signs of depressions, pot holes, and rutting. The site will re-grade any depressions or rutting as necessary to provide a smooth, firm surface for all weather operations and to ensure uninterrupted access to the unloading area(s). Pot holes will be filled with road building material and graded to conform to the surrounding surface. At a minimum, site access roads will be re-graded twice a year.

4.16.2 Control and Minimization of Mud

Tracking of mud onto public roads will be controlled by minimizing the amount of mud on site entrance and access roads and on vehicles leaving the site. Vehicles leaving the site will traverse all weather site access roads and paved site entrance roads allowing for mud to be removed from the vehicle. Mud on the site entrance and access roads will be removed as necessary to prevent tracking of mud onto public access roads. Mud and debris tracked onto public roadways from landfill operations will be removed at least once per day on days when mud and associated debris are being tracked onto the public roadway.~~ on days when mud can be reasonably considered to be associated with landfill operations.~~ The M/S or his designee may implement further measures such as a temporary wheel wash when deemed necessary.

4.16.3 Control and Minimization of Dust

Dust from on-site and other access roads will not be allowed to become a nuisance to surrounding areas ~~The landfill access roads will be maintained in a reasonably dust free condition~~ ~~by~~ with periodic spraying from a water truck. The M/S or his designee will routinely inspect the site during dry weather conditions and establish a frequency, if necessary, to spray the access roads with water to prevent dust from blowing off-site. The water used for dust control may be from a municipal water line, from on-site excavations, from on-site detention ponds, or from the adjacent drainage ditches.

4.16.4 Control and Minimization of Litter

Litter and debris that are tracked onto public roadways will be picked up at least once per day and returned to the working face of the landfill. Litter on CR 2130 and FM 2619 will picked up in accordance with Section 4.12, Materials Along Route to Site. Litter along the site entrance waste will be spread in lifts that are approximately 2 feet thick and will be compacted using landfill compactors or similar equipment. The compaction equipment will pass over the waste a sufficient number of times to achieve thorough compaction. The number of passes required may be increased depending upon the nature of waste that is being compacted.

When waste is used as ballast, as described in Part III, Attachment 10, Liner Quality Control Plan (LQCP), the first five feet or the total thickness of ballast, whichever is greater, placed on the liner system will be free of brush and large bulky items, which may damage the underlying parts of the liner system or which cannot be compacted to required density. When waste is used as ballast, a wheeled trash compactor having a minimum weight of 40,000 pounds, or similar equipment, will be properly utilized to reach a compaction density of at least 1,000 pounds per cubic yard. For additional information see Part III, Attachment 10, LQCP.

To prevent the formation of potentially unstable interim slope conditions, the sequence of fill will be developed in a manner that solid waste will be compacted in horizontal lifts. The filling operation will start at the bottom of the landfill and continue vertically in horizontal lifts. Under no condition will the maximum allowable interim slope or slope lengths be exceeded without prior TCEQ authorization.

4.22 LANDFILL COVER §330.165

4.22.1 Soil Management

Management of soil for use in and around the landfill area will be an ongoing process. Soil for use as daily cover, intermediate cover, final cover and other uses will be obtained from on-site and off-site soil borrow sources. Soil from on-site sources will be obtained from excavation that is ongoing as part of the development of future landfill cells or from other suitable areas.

The earthen material will consist of soil that has not previously come into contact with waste and will be of sufficient volume to meet the required six inches of daily cover over the working face. The soil may also be used in emergency situations for fire control as specified in Section 4.4.1.2.4.6 of this SOP.

Stockpiles at the working face and in other areas of the landfill will be managed so as to not interfere with vehicular traffic or impede drainage and will be maintained in conformance with the Erosion Control Plan. Stockpiles will be oriented generally parallel to the direction of surface drainage in any given area and will not alter drainage patterns.

4.22.2 Daily Cover

Daily cover will be applied at the end of each ~~work~~ operating day to control disease vectors, windblown debris and odors, contaminated stormwater runoff, reduce the possibility of fire, prevent scavenging, and improve the operation of the site. At the end of each operating day~~least once every 24 hours~~, the exposed solid waste fill areas will be covered by a minimum of 6 inches of earthen material that has not been previously mixed with garbage, rubbish or other solid waste. An approved alternative daily cover (ADC) material may also be used.

To ensure that the daily cover will be adequate (i.e., minimize vectors, contaminated storm water runoff, odors, etc.), the following procedures will be followed:

- The daily cover will be sloped to drain.
- The daily cover will be spread and compacted with a minimum of two passes with the bulldozer tracks or compactor to minimize infiltration of storm water, provide proper drainage, and to ensure that no waste is visibly protruding through the cover.
- The M/S or his designee will document where daily cover has been placed and visually inspect during placement that a minimum of 6 inches (compacted thickness) of soil daily cover or appropriate thickness of ADC has been placed and that no waste is exposed through it. The M/S or his designee will document on a daily basis the daily cover completion and placement area and indicate that he has visually verified the type (soil or ADC), thickness, and condition in the Cover Application Record.
- After each rainfall event resulting in runoff, the M/S will inspect all daily cover areas for erosion resulting in exposed waste and those areas will be repaired as necessary. Runoff from such areas will be handled as contaminated water until repairs are completed.
- The M/S will inspect for seeps from daily cover. Any leachate from waste below the daily cover will be controlled by placing soil berms and diverting the leachate to the contaminated water collection area. Contaminated water will be treated as outlined in Part III, Attachment 15 - Leachate and Contaminated Water Plan.

4.22.3 Alternate Daily Cover

Alternative material daily cover (ADC) materials may be utilized at this facility with the approval of the Executive Director. These materials may include the use of synthetic material tarps, commercial foam or sprayer products, or petroleum contaminated soils. Information regarding the specific ADC materials currently authorized by the TCEQ for use at the City of Kingsville Landfill is provided in Part IV, Attachment 2 – Alternative Daily Cover Operating Plan. A copy of the authorization letter dated January 20, 2011 for the use of synthetic tarps as alternative daily cover is provided in Part IV, Attachment 2, Appendix 1. The use of ADC is limited to a 24-hour period after which either waste or daily cover, as defined in §330.165(a) and applied as described in Part IV, Attachment 2 – Alternative Daily Cover Operating Plan, must be placed.

In accordance with 30 TAC §330.165(d), the use of an ADC material not previously authorized, may be allowed by a temporary authorization under 30 TAC §305.~~70(m)~~62(k)(1)(A) followed by a permit amendment or a modification in accordance with 30 TAC§ 305.70(k)(1). If the TCEQ grants temporary authorization for the use of additional ADC, status reports of the ADC will be submitted to TCEQ on a two month basis that describes the effectiveness of the alternative material, any problems that may have occurred, and corrective actions required and

4.27 LEACHATE AND GAS CONDENSATE RECIRCULATION §330.177

~~Consistent with §330.177, recirculation of leachate and gas condensate will only occur in landfill units that are designed and constructed with a leachate collection system and a composite liner.~~ The Kingsville Landfill will not recirculate leachate and gas condensate.

CITY OF KINGSVILLE LANDFILL

ATTACHMENT 1

FORMS

CONTENTS

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WASTE INSPECTION/SCREENING FORM

Inspection No.: ____________________

Date: ____________________ Time: ____________________

Name of Inspector(s): ____________________

Type of Inspection: ☐ Initial Screening ☐ Random Screening

☐ Suspected Unauthorized Waste

Other: ____________________

Transporter/Generator Information:

Company Name: ____________________

Address: ____________________

Contact Person: ____________________

Phone: ____________________ Fax: ____________________

Driver Name: ____________________ Driver's License # ____________________

Type of Vehicle: ____________________

Source of Load: ____________________

Size of Load: ____________________

Contents of Load: ____________________

____

____

Indicators of Prohibited Waste: ____________________

____

____

Unusual Odors:	☐ Yes	☐ No
Unusual Colors:	☐ Yes	☐ No
Heat/Excessive Smoke:	☐ Yes	☐ No

Inspection Results/Comments: ____________________

____

____

____

____

SPECIAL WASTE INSPECTION FORM

Inspection No.: ______________________________

Date: ______________________________ Time: ______________________________

Name of Inspector(s): ______________________________

Type of Inspection: ☐ Initial Screening ☐ Random Screening

☐ Suspected Unauthorized Waste

Other: ______________________________

Transporter/Generator Information:

Company Name: ______________________________

Address: ______________________________

Contact Person: ______________________________

Phone: ______________________________ Fax: ______________________________

Driver Name: ______________________________ Driver's License # ______________________________

Type of Vehicle: ______________________________

Source of Load: ______________________________

Size of Load: ______________________________

Contents of Load: ______________________________

____

Indicators of Prohibited Waste: ______________________________

____

Physical Screening

Indicate Yes or No for each of the following tests. Note any Discrepancies. Do the characteristics of the waste match the provided information on the special waste profile?

Characteristics Profile		**Yes**	**No**	**Comments and/or Observations**
Color	______________	☐	☐	______________________________
Odor	______________	☐	☐	______________________________
Physical State	______________	☐	☐	______________________________
Free Liquids	______________	☐	☐	______________________________

Inspection No.: ______________________________

Date: ______________________ Time:- ______________________

Name of Inspector(s): ______________________________

Waste Accepted:

______________________________ (Inspector Signature) ______________ (Date)

Waste Rejected:

Reasons for rejection

☐ Extraneous and/or Unauthorized Material ☐ Suspected Hazardous Waste

☐ Suspected PCB Waste ☐ Does not match profile

Other: ______________________________

Comments: ______________________________

____

____

______________________________ (Inspector Signature) ______________ (Date)

______________________________ (M/S or Designee Signature) ______________ (Date)

CITY OF KINGSVILLE LANDFILL

ATTACHMENT 2

ALTERNATE DAILY COVER (ADC) OPERATING PLAN

TABLE OF CONTENTS

CITY OF KINGSVILLE LANDFILL
PART IV
ATTACHMENT 2
APPENDIX 1

AUTHORIZATION LETTER DATED JANUARY 20, 2011
FOR THE USE OF SYNTHETIC TARPS AS
ALTERNATIVE DAILY COVER

MSW/235B/PA

Texas Commission on Environmental Quality

Protecting Texas by Reducing and Preventing Pollution

January 20, 2011

RECEIVED
JAN 21 2011
TCEQ
FIELD OPS/REGION 14

Ms. Courtney Alaverez
Interim City Manager
City of Kingsville
200 E. Kleberg Ave.
Kingsville, TX 78363

Re: City of Kingsville Landfill - Kleberg County
Municipal Solid Waste - Permit No. 235B
Permit Modification – Synthetic Tarps as Alternative Daily Cover
Tracking No. 14526502; CN600674246/RN102334570

Dear Ms. Alaverez:

We have reviewed your application for a municipal solid waste permit modification dated December 3, 2010, requesting to authorize the use of synthetic tarps as alternative daily cover. The information presented is technically sufficient for a municipal solid waste permit modification.

Enclosed is a copy of the above referenced modification which is now part of your permit and should be attached thereto. The documentation prepared and submitted to support the modification request shall be considered as requirements of the permit.

If you have questions concerning this matter, please contact Ms. Gulay Aki at (512) 239-2340. When addressing written correspondence, please use mail code MC 124.

This action is taken under authority delegated by the Executive Director of the Texas Commission on Environmental Quality.

Sincerely,

Richard C. Carmichael, Ph.D., P.E.
Manager, Municipal Solid Waste Permits Section
Waste Permits Division

RCC/GA/fp

Enclosure

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

MODIFICATION TO
MUNICIPAL SOLID WASTE PERMIT NO. 235B
CITY OF KINGSVILLE LANDFILL

Municipal Solid Waste Permit No. 235B is hereby modified as follows:

Description of Change:

Modification authorizes the use of synthetic tarps as alternate daily cover.

The details of this permit modification are contained in the application dated December 3, 2010.

Part of Permit Modified:

Part IV of the Application
Site Operating Plan
Title page
Table of contents
Attachment A – Alternative Daily Cover Operating Plan is added new.

This modification is a part of Permit No. 235B and should be attached thereto.

APPROVED, ISSUED, AND EFFECTIVE in accordance with Title 30 Texas Administrative Code Chapter 305, Section 305.70(l). No public notice is required for this modification. This modification is a minor change and does not substantially alter the permit.

ISSUED DATE:

JAN 20 2011

For the Commission

CITY OF KINGSVILLE LANDFILL

ATTACHMENT 3

SPECIAL WASTE ACCEPTANCE PLAN

CONTENTS

TABLES

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1.0 INTRODUCTION

This Waste Acceptance Plan (WAP) outlines the procedures for the identification, acceptance and management of special waste. The objectives of the WAP are as follows:

- Define procedures which will be followed to determine whether or not the facility is permitted to accept a specific waste for disposal.
- Outline the procedures for identifying and preventing the disposal of unacceptable wastes that are delivered to the facility.
- Establish the necessary conditions to ensure the safe and environmentally sound management (including collection, storage, transportation, and disposal) of the waste.

Special waste is any solid waste or combination of solid wastes that because of its quantity, concentration, physical or chemical characteristics, or biological properties requires special handling and disposal to protect human health or the environment. Special wastes as defined in 30 TAC §330.3, 30 TAC §330.171, and 30 TAC §330.173 include the following:

a) Municipal ~~Hazardous~~ hazardous waste from conditionally exempt small-quantity generators that may be exempt from full controls under Chapter 335, Subchapter N (relating to Household Materials Which Could Be Classified as Hazardous Wastes);
b) Class 1 industrial nonhazardous waste;
c) Untreated medical waste;
d) Municipal wastewater treatment plant sludges, other types of domestic sewage treatment plant sludges, and water-supply treatment plant sludges;
e) Septic tank pumpings;
f) Grease and grit trap wastes;
g) Wastes from commercial or industrial wastewater treatment plants; air pollution control facilities; and tanks, drums, or containers used for shipping or storing any material that has been listed as a hazardous constituent in 40 Code of Federal Regulations (CFR) Part 261, Appendix VIII but has not been listed as a commercial chemical product in 40 CFR §261.33(e) or (f);
h) Slaughterhouse wastes;
i) Dead animals;
j) Drugs, contaminated foods, or contaminated beverages, other than those contained in normal household waste;
k) Pesticide (insecticide, herbicide, fungicide, or rodenticide) containers;
l) Discarded materials containing asbestos;
m) Incinerator ash;

2.0 DISPOSAL OF SPECIAL WASTES

The City of Kingsville is required to handle special wastes in a manner that is consistent with TCEQ regulations. The facility will handle special waste according to the following guidelines.

2.0.1 SPECIAL WASTES THAT DO NOT REQUIRE SPECIAL WASTE DISPOSAL AUTHORIZATION FROM TCEQ

The following special wastes may be accepted for disposal at the City of Kingsville Landfill without prior written authorization from the TCEQ provided the waste is handled in accordance with the procedures listed below:

1. **Special Wastes from Health Care Related Facilities**
   Special wastes from health care related facilities must be treated in accordance with the procedures specified in 30 TAC §330, Subchapter Y (relating to Medical Waste Management).

2. **Dead Animals and/or Slaughterhouse Waste**
   Dead animals and/or slaughterhouse waste may be accepted without further approval provided the carcasses and/or slaughterhouse waste are covered by 3 feet of other solid waste or at least 2 feet of soil immediately upon receipt. ~~Dead animals may also be composted in accordance with 30 TAC Chapter 332.~~

3. **Non-Regulated Asbestos-Containing Materials (non-RACM)**
   Non-regulated asbestos-containing materials (non-RACM) may be accepted for disposal provided the wastes are placed on the active working face and covered in accordance with 30 TAC §330 (relating to Municipal Solid Wastes). Under no circumstances may any material containing non-RACM be placed on any surface or roadway which is subject to vehicular traffic or disposed of by any other means by which the material could be crumbled into a friable state.

4. **Empty Containers which have been used for Pesticides, Herbicides, Fungicides, or Rodenticides** Empty containers which have been used for pesticides, herbicides, fungicides, or rodenticides must be disposed of in accordance with subparagraphs (a) and (b) of this paragraph.

   a) These containers may be disposed of at the disposal facility provided that:
      i. The containers are triple-rinsed prior to receipt at the landfill;
      ii. The containers are rendered unusable prior to or upon receipt at the landfill; and
      iii. The containers are covered by the end of the same working day they are received.

   b) Those containers for which triple-rinsing is not feasible or practical (e.g. paper bags, cardboard containers) may be disposed of under the provisions of subparagraph (5) of this section or in accordance with 30 TAC §330.173;

5. **Municipal Hazardous Waste from a Conditionally Exempt Small Quantity Generator (CESQG)** Municipal hazardous waste from a conditionally exempt small quantity generator (CESQG) may be accepted provided the amount of waste does not exceed 220 pounds (1 00 kilograms) per month per generator, and provided the facility owner/operator authorizes acceptance of the waste.

6. **Sludge, Grease Trap Waste, or Grit Trap Waste from Municipal Sources**
Sludge, grease trap waste, or grit trap waste from municipal sources can be accepted for disposal only if the material has been treated or processed and the treated/processed material has been tested, in accordance with Test Method 9095 (Paint Filter Liquids Test), as described in "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods: (EPA Publication Number SW -846), as amended, and is certified to contain no free liquids. ~~Dry sludge, from the Kingsville Wastewater treatment plants may be placed, one-time, over the final cover at a rate not to exceed 8 tons per acre for vegetation growth enhancement. The dry sludge shall be required to pass the Paint Filter Test and no application shall exceed 8 tons per acre.~~

7. **Soil Contaminated by Petroleum Products, Crude Oils, or Chemicals**
Soil contaminated by petroleum products, crude oils, or chemicals (also referred to as petroleum contaminated soils) may be accepted for disposal without specific TCEQ approval only if they are tested as being under the limits specified in the following table.

TABLE 1: MAXIMUM CONTAMINANT LEVEL *§335.521(a)(1)*

CONTAMINANT	CONSTITUENTS OF CONCERN	MAXIMUM CONTAMINANT LEVEL MUST BE LESS THAN
Automotive Gasoline	Benzene TPH Lead	0.5 mg/l 1500 mg/kg 1.5 mg/l
All Other Fuels (i.e., Diesel, Kerosene, Aviation, Fuel Oil, etc.)	Benzene TPH Lead	0.5 mg/l 1500 mg/kg 1.5 mg/l
Used Motor Oil from an Internal Combustion Engine.	Benzene TPH Lead	0.5 mg/l 1500 mg/kg 1.5 mg/l

Other soils contaminated by petroleum products, crude oils, or chemicals (not addressed in the table) will require specific authorization on a case-by-case basis prior to disposal. Requests for authorization to dispose of contaminated soils will be accompanied by analytical data (including signed laboratory reports, chain-of custody information, Quality Control Data, and a sampling plan) or data as required by the TCEQ.

3.0 SPECIAL WASTE EVALUATION GUIDELINES

Before accepting any special waste for disposal at this facility, the waste must be evaluated to assure that the waste is non-hazardous and to determine the acceptability of the waste pursuant to facility permit conditions, applicable regulations, and operating capabilities.

3.0.1 WASTE PROFILING

The customer/generator must provide sufficient documentation that their wastes meet all of the requirements. This type of documentation, when necessary, should include information such as the generator's information, description of the waste, description of the process generating the waste, volume of waste, waste/chemical composition, physical characteristics, and any other information the M/S deems necessary. This documentation may be included on a Waste Profile Form (WPF) such as the one included in Part IV, Attachment 1.

3.0.2 ANALYTICAL REQUIREMENTS

The waste generator may also be required to provide analytical data depending on the type of waste stream to be deposited. Any analytical data submitted to the City of Kingsville Landfill for use in the waste evaluation process must meet the following criteria:

- All laboratory data and analyses must comply with the requirements of 30 TAC Chapter 25 (Environmental Testing Laboratory Accreditation and Certification);
- Analytical sampling, analysis, and interpretations must be in strict accordance with current local, state and federal regulatory requirements;
- Analytical data must be less than 12 months old; and
- The analytical information provided must be legible, signed by the laboratory, and must include:
    - A description of the waste material analyzed;
    - The analytical methods used;
    - The concentration of the observed value in appropriate units; and
    - The detection limit of the analytical method if chemical constituents are not detected.

Should there be any changes in the process from which the waste is produced, the generator will be required to provide notification and additional process and/or chemical analysis data. If the waste received at the landfill differs from that of the approved waste stream, disposal will be temporarily stopped until the generator can provide additional process and/or chemical analysis data in order to determine the cause of the change in waste characteristics and any associated disposal requirements.

CITY OF KINGSVILLE LANDFILL

ATTACHMENT 5

LIQUID WASTE SOLIDIFICATION OPERATING PLAN

CONTENTS

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1.0 Background and Purpose

For those wastes sent to the Liquid Waste Solidification Area (LWSA), the LWSA site operating plan (SOP) is as follows. The LWSA SOP is to document the design and operation procedures of a liquid waste solidification/bulking operation, which will consist of four (4) approximately eight (8) feet by 20 feet liquid tight mixing containers located within a lined landfill sector of the City of Kingsville Landfill permit boundary. Processing or bulking of liquid material is typically needed to allow direct disposal to the landfill (i.e., liquid waste material requires bulking to pass the paint filter test). The liquid material collected at the facility will be bulked and disposed of in the landfill.

2.0 Liquid Waste Processing Operations

The liquids collected at the facility will be bulked (i.e., solidified) and disposed of in the landfill. The installation of a liquid processing operation at the Facility will provide an essential service for food, beverage, and other commercial and industrial facilities in the surrounding region.

Liquid waste will be unloaded into one (1) of four (4) approximately eight (8) feet by 20 feet liquid tight mixing containers and will be located within a lined landfill sector. The maximum size of the liquid waste solidification area will be 30 feet by 50 feet. Bulking agents such as on-site soil, sawdust, kiln dust, coal combustion residuals, auto-fluff or other inert material with absorptive capacity will be mixed with the liquids until the resulting mixture passes the paint filter test and any other requirements outlined for the specific material. Once the liquids have been solidified, the solidified waste material will be transported and disposed of in the working face. Liquid waste will be unloaded directly into the mixing containers and solidification will begin upon receipt

Dust and odors will be controlled by covering the containers or by adding sawdust or wood chips to the waste.

Any rainfall or water entering the LWSA will be managed as contaminated water and will be solidified before disposal in the landfill.

Control of liquids processed at the operation will be controlled by the procedures in Part IV – Attachment 3– Special Waste Acceptance Plan. A more complete discussion of the quality control process is presented in the following sections.

3.0 Description of Waste

Untreated liquid wastes which typically cannot pass the paint filter test include nonhazardous industrial wastes and sludges, food and beverage byproducts and other nonhazardous liquids. These liquids will generally be transported to the facility by private haulers in vacuum trucks, tank trucks, and sealed containers in accordance with §330.171(b)(3). The facility is approved to accept liquid waste by approval of this permit for processing in the LWSA. The liquids will originate from food and beverage processing plants, and other commercial and industrial facilities.

4.0 Processing Method

The bulking/solidification process involves the addition of a solid material that will absorb the liquid and form a sludge that can pass the paint filter test to be disposed of in the landfill.

Liquid waste will be unloaded directly into the mixing containers and solidification will begin upon receipt. Liquid waste will be unloaded into one (1) of four (4) approximately eight (8) feet by 20 feet liquid tight mixing containers located within a lined landfill sector.

Bulking agents will be mixed with the liquids until the resulting mixture passes the paint filter test and any other requirements outlined for the specific material. The bulking agent used in the liquid waste solidification process will be soil, sawdust, kiln dust, coal combustion residuals, auto-fluff or other inert material with absorptive capacity as approved by the Texas Commission on Environmental Quality (TCEQ).

Once the liquids have been solidified, the solidified waste material will be transported and disposed of in the working face.

The bulking process has the advantages of being a simple process that does not require discharge to a wastewater treatment plant.

5.0 Monitoring

Incoming liquid waste will be documented on a Part IV, Attachment 1, Form 3 – Special Waste Inspection Form, or other required manifest. Incoming waste will also be pre-characterized by the generator in accordance with the facility's approved waste acceptance procedures listed in the Part IV – Attachment 3. The pre-characterization will include analytical analysis and/or process information as necessary to make the determination that the waste is nonhazardous. No waste material will be accepted at the site that is not precharacterized or does not have the proper manifest(s).

The landfill may request and use additional information to assist in evaluating an industrial or non-industrial liquid waste for management at the Facility. Such information includes, but is not limited to, analytical data, product and/or raw component Material Safety Data Sheets (MSDS), additional waste composition data, and pertinent letters or memoranda

Upon arrival, each load shall be verified and the shipment compared to the waste approval records for conformity. Any discrepancy which cannot be rectified will result in the rejection of the load.

6.0 Storage and Processing

Accepted loads of liquids will be directed to the LWSA for discharge into the mixing containers and solidification will begin upon receipt. Bulked wastes will pass a paint filter test (EPA SW-846/9095) before disposal at the landfill working face.

Operation of the facility will include the following:

- Control of dust by wetting the roads and facility area and covering the bulking agents when not in use.
- Control of odors by covering the containers, or using sawdust or wood chips for temporary odor masking.
- Protect the health and environment of employees, citizens, and surrounding communities by operating the facility in accordance with TCEQ, EPA, OSHA, and other applicable regulations.

Facility personnel will be trained in the bulking/solidification procedure, acceptable testing method, recognition of waste streams and their compatibility, daily operations, recordkeeping and reporting, implementation of emergency procedures, fire protection, and regulations pertaining to liquid waste disposal as set forth by the TCEQ.

7.0 Testing and Recordkeeping

The testing and recordkeeping requirements are listed below.

- The Paint Filter Liquid Test (EPA Method SW-846/9095) is required immediately prior to disposal of the waste in the landfill. Representative grab samples shall be obtained at a rate of one per batch of treated material.
- Records concerning the type, quantity, source, and test results of liquid wastes processed shall be maintained on a daily basis, and become part of the site operating record.

8.0 Training of Operational Personnel

Personnel involved in the bulking/ shall receive adequate training in the bulking procedure, acceptable testing method, recognition of waste streams and their compatibility, daily operations, recordkeeping and reporting, implementation of emergency procedures, and regulations pertaining to liquid waste disposal.

9.0 Closure

All liquid wastes will be treated and disposed of in the landfill or an off-site permitted disposal facility. A notice will be sent to the TCEQ and placed in the Site Operating Record noting the specific steps taken to decommission the facility.

10.0 Fire Protection

Landfill personnel, including equipment operators, will watch for signs of fire at the liquid waste solidification area. Landfill personnel will watch for fire, smoke, steam, or signs of heat. If signs of fire are detected at the liquid waste solidification area, all vehicles and equipment will be immediately moved away from the fire. The unloading of materials will either be relocated to a safe location away from the fire and a collection area established there or halted all together until the fire is extinguished.

If detected soon enough, a small fire may be fought with a hand-held fire extinguisher. The fire area may be watered down or smothered with 6 inches of soil, as appropriate, to ensure that the fire is out.

If the fire cannot be quickly extinguished with the fire extinguisher, the bulldozer, earth moving equipment, and water truck will immediately mobilize to the site of the fire. All available landfill personnel will assist with fire protection measures unless otherwise directed by the M/S.

Fire fighting methods for processed liquid wastes or bulking agents include smothering with soil, separating burning material from other waste, spraying with water from an on-site water truck, or pumping with water from an on-site pond. The burning material should be isolated or pushed away immediately before the fire can spread, or fire breaks should be cut around the fire before it can spread. If moving the material is not possible, or if it is unsafe, efforts should be made to cover the burning area with earth immediately to smother the fire.