CONTAMINANT DELINEATION PLAN
FOR THE
INFILL EXPANSION AREA

NORTH MECK C&D LANDFILL FACILITY
15300 HOLBROOKS ROAD
HUNTERSVILLE, NORTH CAROLINA

Prepared For:

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC
19109 W. CATAWBA AVENUE
CORNELIUS, NORTH CAROLINA 28031-5611

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
1900 CENTER PARK DRIVE, SUITE A
CHARLOTTE NORTH CAROLINA 28217

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NORTH CAROLINA LICENSED SEAL 1031 GEOLOGIST EDWARD H. STEPHENS

Edward H. Stephens, L.G.
Project Manager

5-26-16

Scott L. Brown, P.E.
Vice President

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1.0 PURPOSE

On behalf of Greenway Waste Solutions of North Meck, LLC, Civil & Environmental Consultants, Inc. (CEC) has prepared this Contaminant Delineation Plan for the Infill Expansion Area at the North Meck C&D Landfill facility. The North Carolina Department of Environmental Quality (NCDEQ) - Solid Waste Section has requested a characterization of the nature and extent of the groundwater contamination at the Infill Expansion Area. This Plan is submitted in response to the detection of volatile organic compounds (VOCs) at concentrations above the 15A NCAC 02L groundwater quality standards (2L Standards) in detection/assessment monitoring wells at the subject landfill. This Plan proposes:

1) Additional site characterization in the landfill area exhibiting the most elevated groundwater contaminant concentrations to evaluate migration potential;

2) The installation of two groundwater monitoring well clusters at the eastern perimeter of the Infill Expansion Area Landfill to serve as detection monitoring wells at the point of compliance and subsequent routine semi-annual monitoring of these proposed new wells;

3) Evaluation of additional analytical leachate/landfill gas "indicator" parameters as a part of routine landfill monitoring to characterize the source of the groundwater impacts;

4) For six semi-annual groundwater assessment monitoring events, the historical data show that Appendix II semi-VOCs, herbicides, and PCBs are not of significant concern at the site. Consequently, GWS is petitioning the Solid Waste Section to amend the assessment monitoring requirements for the Infill Expansion Area by discontinuing routine groundwater and surface water sampling and analyses for Appendix II semi-VOCs, herbicides, and PCBs;

5) Assessment of the need for landfill gas extraction in the Infill Expansion Area; and

6) Development of a screening numerical model to simulate contaminant fate and transport to further evaluate risk associated with the migration of groundwater contaminants.

2.0 BACKGROUND

2.1 DESCRIPTION OF THE INFILL EXPANSION AREA

North Meck C&D Landfill is operated by Greenway Waste Solutions of North Meck, LLC (GWS) under Solid Waste Facility Permit Number 60-13. The facility address is 15300 Holbrooks Road, Huntersville, North Carolina. As shown in Figure 1, the "Infill Expansion Area" consists of three landfill expansion areas including: 1) Expansion Area 1 that is a closed C&D landfill cell on the west side; 2) Expansion Area 2 that contains Phase 1, 2 and 3 C&D landfill cells on the east side; and 3) an infill saddle or bridge expansion active C&D landfill cell that spans portions of Expansion Areas 1 and 2. The Infill Expansion Area is situated in the northern portion of the landfill property. The Infill Expansion Area is generally bounded by an unnamed tributary of Cane Creek to the south, beyond which lies a closed landfill area (i.e. Phase I Closed C&D Landfill). On the west and northwest, the Infill Expansion Area is bounded by private property, a Colonial Pipeline easement, and land owned by the Town of Huntersville. To the north, the Infill Expansion Area is bounded by additional GWS landfill property. Land owned by Mecklenburg County including the David B. Waymer Flying Regional Park (a former unlined municipal solid waste landfill - Holbrooks Road Landfill) bounds the site to the north and east. A Site Map is attached as Figure 1.

Waste placement in the closed landfill cell (Expansion Area 1) generally occurred during the years 2003 to 2007. The area of the closed Expansion Area 1 disposal cell is approximately 13.6 acres. Waste placement in Expansion Area 2 began in 2006, and portions of this area are presently being used for C&D disposal. The area of Expansion Area 2 is approximately 15.1 acres. The bridge landfill expansion cell was permitted in 2012, and it is currently being used for C&D disposal. The area of the bridge landfill expansion cell is approximately 16.2 acres.

Semi-annual groundwater monitoring has been conducted along the periphery of the Infill Expansion Area since 2009. The approximate locations of landfill monitoring wells are shown on Figure 2. During the July 2013 and subsequent monitoring events, VOCs were detected at concentrations exceeding the 2L Standards in several wells. VOCs detected in concentrations

greater than 2L Standards include benzene, methylene chloride, bis (2-ethylhexyl) phthalate, and vinyl chloride. Vinyl chloride is the predominant VOC in site groundwater and has been detected in 11 landfill monitoring wells. A summary of recent groundwater sample analytical data for the Infill Expansion Area is presented in Table 1.

3.0 CHARACTERIZATION OF SITE CONTAMINANT HYDROGEOLOGY

3.1 SITE HYDROGEOLOGY

Based on the NC Geologic Map (1985), the subject site is underlain by granitic rocks. The local groundwater system is comprised of two interconnected zones: 1) residual soil/saprolite/weathered fractured rock (regolith) overlying 2) fractured crystalline bedrock. The regolith layer is vertically stratified by degree of weathering. A highly weathered and structure-less residual soil occurs near the ground surface. The residual soil grades into saprolite, a coarser grained material that retains the structure of the parent bedrock. Beneath the saprolite, partially weathered/fractured bedrock occurs with depth until sound bedrock is encountered. A transition zone at the base of the regolith has been interpreted to be present in many areas of the Piedmont. The zone consists of partially weathered/fractured bedrock and lesser amounts of saprolite that grades into bedrock and has been described as "being the most permeable part of the system, even slightly more permeable than the soil zone" (Harned and Daniel 1992).

LeGrand (1988; 1989) developed a conceptual hydrogeologic model of the aforementioned composite regolith-fractured crystalline rock aquifer system in the Piedmont that is useful for the description of groundwater conditions. The basic hydrologic entity in this conceptual model is the surface drainage basin that contains a perennial stream. Each Piedmont drainage basin is similar to adjacent basins and the conditions are generally repetitive from basin to basin. Within a basin, movement of groundwater is generally restricted to the area extending from the drainage divides to a perennial stream. LeGrand refers to this hydrogeologic system as a "slope aquifer system". Rarely does groundwater move beneath a perennial stream to another more distant stream or across drainage divides. Therefore, in most cases in the Piedmont, the groundwater system is a two-medium system restricted to the local drainage basin (LeGrand 1988). Groundwater flow paths in the Piedmont are almost invariably restricted to the zone underlying the topographic slope extending from a topographic divide to an adjacent stream. Under natural conditions, the general direction of groundwater flow can be approximated from the surface topography (LeGrand 1989).

Groundwater potentiometric maps are presented in Figures 2 and 3. Groundwater movement across the Infill Expansion Area is to the southeast toward the unnamed stream tributary along the southern boundary of this area. The "V″-shaped potentiometric contours in the vicinity of the stream tributary are indicative of shallow groundwater discharge from the Infill Expansion Area to this adjacent stream. Vertical hydraulic gradients were calculated for well clusters MW-7/MW-7D, MW-8/MW-8D, and MW-9/MW-9D (the respective well pairs are closely spaced to each other), which are located along the north side of the tributary stream. Upward vertical gradients of 0.014 to 0.028 feet/foot, respectively, were determined for MW-7/MW-7D and MW-8/MW-8D. The hydraulic gradient at well cluster MW-9/MW-9D was essentially horizontal; however, this well cluster is located twice the distance (~50 feet further) from the stream than the other well pairs. These vertical gradient data indicate groundwater discharge from the deeper aquifer horizon (110 to 120 feet below grade) to the adjacent stream tributary.

3.2 POTENTIAL SOURCE(S) OF DETECTED CONTAMINANTS

The mechanism for groundwater contamination beneath the subject landfill area is not clearly understood. The primary source for ground water contamination beneath the landfill occurs within the buried waste mass. However, two secondary sources – landfill leachate and landfill gas (LFG) – are the media that typically come into contact with the underlying groundwater, which if contaminated may result in groundwater impacts. Leachate is not collected at the landfill; thus, direct analytical data is not available for its evaluation as a potential source of groundwater impact. Landfill gas (i.e. methane) is monitored on a quarterly schedule in perimeter wells at the landfill; yet, the monitoring data do not suggest significant lateral LFG gas migration. No LFG sampling has been conducted within the buried waste mass. To complicate this source evaluation, downgradient monitoring wells along the southern perimeter of the Infill Expansion Area are situated in near proximity of the edge of waste such that "migration″ of neither leachate nor LFG is needed to explain the VOC detections in these groundwater monitoring wells.

3.2.1 Landfill Leachate

Leachate is the resultant liquid created when rainfall percolates into the landfill waste mass and then slowly drains through the waste under gravity. During this process, the leachate picks up soluble contaminants from the waste itself. Xenobiotic organic compounds in leachate may include aromatic hydrocarbons, phenols, chlorinated aliphatics, pesticides, and plastizers. With the exception of phenols, all these organic groups have been observed in the site groundwater. Inorganic compounds in leachate may include arsenate, barium, borate, cobalt, lithium, mercury, selenate and sulfide.

If not controlled or collected, leachate can migrate through permeable material that exists under the landfill. Although geologic materials below the landfill can filter some of the leachate constituents, the more mobile constituents in the migrating leachate can enter the underlying groundwater. Where leachate seeps into groundwater, a plume of groundwater contamination will occur.

3.2.2 Landfill Gas (LFG)

Landfill gas (LFG) is the product of microbiological decomposition of buried organic matter. Certain microorganisms turn complex organic compounds in landfill waste into methane (~50-55%), carbon dioxide (~40-45%), and trace amounts of other compounds including hydrogen sulfide and other sulfur compounds. About 0.2 to 0.5% of LFG is composed of complex organic compounds that are not biodegraded. Monitoring is important if specific trace compounds are to be identified.

Appreciable volumes of LFG are generated in landfills in approximately one to three years, depending on the waste types, amount of moisture or other factors. Peak production of LFG is typically five to seven years after waste is disposed in the landfill.

The mechanisms for LFG transport are advection and diffusion. Advection transport is a function of barometric pressure variations and landfill pressure gradients, and it is the primary

transport mechanism with regard to emissions and migration control strategies. LFG will migrate vertically or laterally within subsurface materials along the path of least resistance. Highly impermeable landfill covers will likely promote lateral LFG migration. Diffusion transport is minor compared to advection; however, this mechanism is associated with the ultimate transfer of compounds into air, soil, and liquid media.

Some consultants and researchers have recently theorized that landfill gas may be a source of low-level VOC contamination of groundwater. Low-level VOCs found in LFG and in LFG condensate are sometimes found in off-site gas and groundwater monitoring wells. Detection levels range from the low ppb to low parts per million (ppm) levels. The more commonly identified VOCs reported in LFG are chlorinated aliphatics and aromatic hydrocarbons.

Researchers have found that LFG may be the source of groundwater contamination where:

- The presence of migrating LFG is confirmed in landfill gas monitoring wells;
- A significant increase in leachate "indicator" parameters is not associated with the VOCs;
- VOCs are in some cases detected in upgradient monitoring wells;
- Carbon, oxygen, and hydrogen isotopes indicate the lack of relationship between landfill leachate and the groundwater samples from the impacted well;
- There is a direct relationship between the LFG and gases observed in the headspace of monitoring wells;
- The VOC detected in groundwater was either the same compound or a degradation product of the VOC found in the LFG;
- Typical detected VOC parameters are associated with vapor-phase migration in landfills;
- Low levels of VOCs are detected above background values; and
- VOC concentrations in groundwater are reduced during LFG mitigation.

3.2.3 Site-Specific Evidence for LFG Impact to Groundwater

Presence of LFG in Gas Monitoring Wells

In the Infill Expansion Area, the facility performs routine methane monitoring in 11 gas monitoring wells (MMW-1 through MMW-11). The approximate locations of these gas

monitoring wells are depicted on the attached Figure 4. Methane levels were recently detected in MMW-3 at 0.1% methane and 4% LEL, and in MMW-11 at 8.9% methane and >100% LEL.

Association of Leachate Indicator Parameters and Vinyl Chloride

Published studies which characterize the chemical composition of landfill leachates have shown that sulfate and chloride are conservative (and therefore highly mobile) parameters that exist at significant concentrations (Gibbons, 1991; USEPA, 1987b). Therefore, in the event of a leachate release, these mobile indicator parameters, along with alkalinity and total dissolved solids (TDS), are likely to be the first parameters to be detected.

Leachate "indicator" parameter data are available for several Infill Expansion Area monitoring wells (MW-1, MW-4, MW-5, MW-7, MW-8, MW-9, and MW-10). Wells MW-1 and MW-10 are background wells located hydraulically upgradient of the landfill. A review of these data does not show a significant increase in the concentrations of these inorganic indicator parameters with the initial detection of vinyl chloride in these monitoring wells. Because the low-level detections of vinyl chloride were not associated with a significant increase in indicator compounds, migrating LFG is suspected to be the source of the vinyl chloride detected in the groundwater monitoring wells.

VOCs Detected in Upgradient Monitoring Wells

During the October 2014 monitoring event, vinyl chloride was detected at a concentration of 1.1 ppb in area background monitoring well MW-10.

Isotopic Relationship between Leachate and Groundwater Samples

Site-specific comparative isotopic studies have not been conducted to evaluate a relationship between landfill leachate and groundwater samples.

Relationship between LFG and Groundwater Monitoring Well Headspace Gases

A headspace gas sample was collected from MW-9 at the Infill Expansion Area. This sample was collected in a Summa canister and then submitted with a chain-of-custody record to Enthalpy Analytical, Inc. for the analyses of hydrogen, oxygen, nitrogen, carbon monoxide, methane, and carbon dioxide using ASTM D1946-90 (Reapproved 2000), Standard Practice for Analysis of Reformed Gas by Gas Chromatography. The sample was also analyzed for the TO-15 Target Compound List using EPA Method TO-15, Determination of VOCs in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). A tabulated summary of the headspace gas sample analytical results is presented in the attached Table 3, and the Enthalpy Analytical, Inc. laboratory data report is included in Appendix A.

Researchers found that a comparison of percent hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide, and methane would indicate a similar chemical fingerprint in the headspace of both LFG and groundwater wells (Romito and Allendorf. *Abstract. Observed Landfill Gas Effects on Ground Water Quality and Its Identification and Monitoring*). They also found that LFG impact to groundwater may be characterized by an increase in free carbon dioxide, a decrease in pH, and the detection of low concentrations of VOCs. As summarized in Table 3, there appears to be a strong correlation of percent hydrogen, oxygen, nitrogen, and carbon monoxide in the headspace of both LFG and groundwater wells. The correlation is not as conclusive for carbon dioxide and methane. Low concentrations of VOCs have been detected in site groundwater.

In his research, Morris did not attempt to correlate the headspace VOC concentrations for gas and groundwater wells; however, he did use well headspace data to demonstrate that similar VOCs were being detected in the headspace of gas wells and groundwater monitoring wells (Morris, Harry H. *Abstract. The Potential for Landfill Gas to Impact Ground Water Quality*). For the site-specific VOC data, similar analytes were detected in the headspace of the gas wells and groundwater well MW-9 Infill.

Also, Morris used theoretical vapor-to-water partitioning calculations to estimate the magnitude of VOC vapor concentrations which when partitioned would result in low-level ppb VOC levels in groundwater, and vice versa. The site-specific headspace VOC concentrations that were detected were not of sufficient magnitude to result in the detected groundwater VOC concentrations, and vice versa. We believe that our headspace collection method was not suited to evaluate VOC concentration data. In his case study, Morris designed special sampling devices to collect gas samples from the vadose zone gas in the area immediately above the capillary fringe, and the associated groundwater samples were collected immediately below the groundwater table. CEC collected samples of headspace gas from a sampling port adapted to the top-of-casing of a monitoring well - a point significantly above the soil-groundwater interface. Volumetric dilution within the well and/or vapor loss from the well may be too significant to use the well headspace data for the theoretical vapor-to-water partitioning concentration calculations.

Relationship between VOCs in Groundwater and VOCs in LFG

As noted in Table 1, the predominant VOCs detected in site groundwater are chlorinated aliphatic compounds including 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, and vinyl chloride, and aromatic compounds including benzene, ethylbenzene, toluene, and xylenes. In comparison, as presented in Table 3, cis-1,2-dichloroethene, vinyl chloride, benzene, toluene, and xylenes were identified in LFG samples. Observation of the same VOCs or degradation products in site groundwater and LFG is indicative that dissolution of LFG is a source of VOCs found in groundwater.

Typical VOC Parameters Associated with Vapor Phase Migration in Landfills

Published scientific literature indicates that the more commonly identified VOCs reported in LFG are benzene, dichlorodifluoromethane, 1,1-dichloroethane, 1,2-dichloroethane, methylene chloride, tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, toluene, vinyl chloride, and xylenes. A review of historical groundwater monitoring data for the landfill facility indicates that the primary VOCs detected are benzene, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, vinyl chloride, toluene, and xylenes. It is believed that reducing conditions in the landfill mass may sequentially degrade the primary aliphatic chlorinated VOCs

(tetrachloroethene → trichloroethene → cis-1,2-dichloroethene → vinyl chloride, and 1,1,1-trichloroethane → 1,1-dichloroethane → chloroethane) such that the parent and first-order degradation products are not frequently detected in the groundwater monitoring wells at the subject landfill.

Low Levels of VOCs Detected above Background Values

Groundwater concentrations associated with vapor to aqueous phase transfer are in the parts per billion range. Thus, another line of evidence that dissolution of LFG is the source of VOCs found in groundwater is the detection of low levels of VOCs in landfill groundwater samples. Morris charted maximum VOC concentrations for ten sites where groundwater VOCs were attributed to vapor phase contaminant migration. Historical concentration ranges of the primary VOCs detected in on-site monitoring wells are listed in Column 2 of Table 4. For comparison, the maximum VOC concentrations charted by Morris are listed in Column 3 of Table 4. The site-specific maximum VOC levels are lower than the study site levels with the exception of cis-1,2-dichloroethene. These data show that the site low-level VOC concentrations may be attributable to vapor phase migration.

3.3 VINYL CHLORIDE – PREDOMINANT GROUNDWATER CONTAMINANT

3.3.1 Fate and Transport of Vinyl Chloride

Vinyl chloride is the predominant contaminant in the area groundwater and appears to present the most significant concern based upon it prevalence. Vinyl chloride may be a primary decomposition byproduct of some disposed wastes; however, it seems more likely that vinyl chloride occurs as an anaerobic degradation byproduct of parent chlorinated aliphatic compounds. The presence of intermediate degradation byproducts - 1,1-dichloroethene and cis-1,2-dichloroethene – suggest that such reduction dechlorination is occurring in site groundwater.

Groundwater movement across the Infill Expansion Area will result in the transport and discharge of groundwater-borne contaminants to the unnamed stream tributary to the south.

Stream sampling results for the unnamed tributary do not indicate exceedances of the 15A NCAC 2B Surface Water Standard for vinyl chloride of 2.4 ppb for Human Health.

With regard to fate and transport of groundwater contaminants in deeper groundwater, it is anticipated that groundwater discharge will either occur in the tributary stream or ultimately into Cane Creek. Vinyl chloride has not been detected in deeper monitoring wells located along the east side of the landfill property where the tributary stream exits the site. It was detected in deeper monitoring wells located along the southeast and south sides of the landfill property.

3.3.2 Vinyl Chloride Trends

Recent groundwater VOC data indicate a significant improvement in site groundwater quality from the historic maximum VOC levels. As shown in the charts presented with Table 1, vinyl chloride was initially detected in five Infill Expansion Area detection monitoring wells in the July 2013 monitoring event. Vinyl chloride concentrations were observed to increase to their historical maximum detected levels in MW-4, MW-6, MW-7, MW-7D, MW-9, and MW-9D in either October or December 2013. In two landfill wells MW-2 and MW-5, the historical maximum VC levels were observed later in April 2014. And in MW-8 and MW-8D, the historical maximum vinyl chloride levels were observed in April 2015. The Table 1 charts show a recent overall trend of decreasing vinyl chloride concentrations in site monitoring wells. Vinyl chloride concentrations were observed to slightly increase in only one monitoring well (MW-7). Vinyl chloride levels have currently decreased to non-detect in four wells (MW-2, MW-8, MW-8D, and MW-10).

For most of the deeper monitoring wells, recent vinyl chloride concentrations were observed to be non-detect. In MW-7D, the vinyl chloride concentration decreased from 2.4 to 1.4 ppb. In MW-9D, the vinyl chloride concentration decreased from 16 to 15 ppb.

The most elevated VOC levels in area groundwater have been detected in monitoring wells MW-9 and MW-9D situated in the Expansion Area 1 Closed C&D Landfill in the northwest portion of the landfill facility.

3.3.3 Summary of October 2015 Groundwater Monitoring Data

A tabulated summary is presented in this section to update the Solid Waste Section with additional site data obtained during the October 2015 semi-annual groundwater monitoring event conducted at the Infill Expansion Area Landfill.

Monitoring Area	VOC Trend Analysis
MW-1	MW-1 is located along the northeast perimeter of the Infill Landfill Area and is an upgradient monitoring well. No VOCs were detected in MW-1. Leachate indicator parameter values are not elevated
MW-2	MW-2 is located along the east landfill property boundary. No VOCs were detected in MW-2. Leachate indicator parameter values are not elevated.
MW-3	MW-3 is located to the southeast of the Infill Landfill Area and north of the tributary stream. No VOCs were detected in MW-3. Leachate indicator parameter values are not elevated.
MW-4 Area	The well cluster MW-4/MW-4D is located to the southeast of the Infill Landfill Area and north of the tributary stream. MW-4 - VC decreased from 2.0 to 1.6 ppb. Alkalinity, CO_2, TDS, Cl, Mn, and NH_4 values are elevated above background. MW-4D - No VOCs were detected. Leachate indicator parameter values are not elevated.
MW-5 Area	The well cluster MW-5/MW-5D is located to the southeast of the Infill Landfill Area and north of the tributary stream. MW-5 - VC decreased from 6.0 to 3.3 ppb. Alkalinity, CO_2, TDS, Cl, and NH_4 values are elevated above background. MW-5D - No VOCs were detected. Leachate indicator parameter values are not elevated.
MW-6	MW-6 is located to the south of the Infill Landfill Area and north of the tributary stream. VC decreased from 4.2 to 2.5 ppb in MW-6. Alkalinity, CO_2, TDS, Cl, and NH_4 values are elevated above background.
MW-7 Area	The well cluster MW-7/MW-7D is located to the south of the Infill Landfill Area and north of the tributary stream. MW-7 - VC increased slightly from 2.7 to 2.8 ppb. Several pesticides, benzene, and 1,1-dichloroethene were detected. Alkalinity, CO_2, TDS, and Cl values are elevated above background. MW-7D - VC decreased from 2.4 to 1.4 ppb. Benzene, xylenes, and bis (2-ethylhexyl) phthalate were detected. Alkalinity, CO_2, TDS, and Cl values are elevated above background.
MW-8 Area	The well cluster MW-8/MW-8D is located to the southwest of the Infill Landfill Area and north of the tributary stream. MW-8 – No VOCs were detected. VC has decreased from 5.7 ppb to non-detect. Leachate indicator parameter values are not elevated. MW-8D – VC decreased from 3.7 ppb to non-detect. Trace levels of 1,1-dichloroethene and trichlorofluoromethane were detected in MW-8D. Leachate indicator parameter values are not elevated.
MW-9 Area	The well cluster MW-9/MW-9D is located to the southwest of the Infill Landfill Area and north of the tributary stream. MW-9 - VC decreased slightly from 20 to 19 ppb. Trace levels of benzene and cis-1,2-dichloroethene were detected. Alkalinity, CO_2, TDS, and Cl values are elevated above background. MW-9D - VC decreased slightly from 16 to 15 ppb. Methylene chloride, 1,1-dichloroethene, and cis-1,2-dichloroethene were detected. Alkalinity, CO_2, TDS, and Cl values are elevated above background.
MW-10	MW-10 is located to the northwest of the Infill Landfill Area and is an upgradient monitoring well. No VOCs were detected in MW-10. Alkalinity, CO_2, and TDS values appear to be somewhat elevated.

Table Notes:
Cl = chloride; CO_2 = carbon dioxide; DCA = dichloroethane; DCE = dichloroethene;
LFG = landfill gas; Mn = manganese; PCE = tetrachloroethene; TCE = trichloroethene;
TDS = total dissolved solids; VC = vinyl chloride;
2L Standards = 15A NCAC 2L .0202 Groundwater Quality Standards; µg/L = microgram per liter.

4.0 RISK ASSESSMENT

Exposure pathways have been identified for the detected site contaminants. An assessment of exposure pathways and the potential for exposure risk to impacted site groundwater and landfill gas is presented in this Section.

4.1 GROUNDWATER DISCHARGE TO SURFACE WATER

4.1.1 Discharge to Unnamed Tributary Stream

Groundwater flow patterns in the Infill Expansion Area will result in the transport and discharge of groundwater-borne contaminants to the unnamed stream tributary to the south. Vinyl chloride was detected in a tributary stream sample SW-2 at 1.3 ppb in October 2015 and in sample SW-4 at 1.2 ppb in October 2014. These detections are below the 15A NCAC 2B Surface Water Standard for vinyl chloride of 2.4 ppb for Human Heath. This tributary stream is situated internally to the landfill facility and is not frequented by the general public.

4.1.2 Discharge to Cane Creek

If not attenuated, contaminant migration via groundwater movement in a southeast direction from the Infill Expansion Area is anticipated to ultimately discharge to Cane Creek. It is important to note that the landfill owner has recently purchased land parcels located between the southern perimeter of the Closed Phase I Landfill and Cane Creek. The base flow in Cane Creek is significantly higher than in the centrally located tributary stream to the north; therefore, it is not anticipated that the low VOC concentrations detected in perimeter groundwater monitoring wells would result in potential exceedances of the surface water standards in Cane Creek.

4.2 AREA GROUNDWATER SUPPLY WELLS

Private residential supply wells located beyond the adjacent Closed Phase I Landfill to the south and southeast have been made inactive. These residences have been connected to a public water

system. By removing these receptors, the current exposure pathway via impacted groundwater is not complete.

With regard to future groundwater use in the area, Mecklenburg County has adopted Groundwater Well Regulations that restrict the use of existing and new water supply wells in an Area of Regulated Groundwater Usage (ARGU). ARGUs are established by the County around sites with reported violations of the 2L Groundwater Quality Standards. The Mecklenburg Priority List (MPL) was established in 1989 to respond to the need for a more aggressive program to protect citizens from drinking contaminated groundwater. A site is added to the MPL when information is provided that reports soil or groundwater contamination. In 1999, landfills were added as MPL sites. Thus, future groundwater use in the area is restricted by public institutional controls.

4.3 MIGRATING LANDFILL GAS HAZARDS AND STRUCTURAL VAPOR INTRUSION

4.3.1 Migrating Landfill Gas - Fire, Explosion, and Health Hazards

In the Infill Expansion Area, the facility performs routine methane monitoring in 11 LFG monitoring wells (MMW-1 through MMW-11). Methane levels were recently detected in MMW-3 at 0.1% methane and 4% LEL, and in MMW-11 at 8.9% methane and >100% LEL. These routine methane monitoring readings do not indicate a potential for fire and explosion hazards in on-site facility structures or at the facility property boundary. Recent routine monthly methane monitoring data for the Infill Expansion Area are summarized in Table 2.

4.3.2 VOC Vapor Partitioning from Groundwater – Inhalation Health Hazard

Structural vapor intrusion may occur where hazardous VOC vapors partition from groundwater, migrate beneath a building, and then enter the building. One or more of the identified volatile contaminants in site groundwater present a potential inhalation health risk due to vapor intrusion. This exposure pathway is not complete due to the intervening presence of the tributary stream

and Cane Creek to the south and east, which are local groundwater-to-surface water discharge features that present a natural barrier to off-site vapor migration.

5.0 CONTAMINANT DELINEATION PLAN

5.1 PROPOSED ADDITIONAL GROUNDWATER IMPACT INVESTIGATION

The most elevated site groundwater contaminant levels have been detected in the Infill Expansion Area monitoring wells MW-9 and MW-9D located internal to the landfill property boundary. CEC recommends that a well cluster (saprolite and bedrock well) be installed 50 feet from the property boundary to determine if impacted groundwater may be migrating beyond the landfill property boundary, and also to assess hydraulic gradients in the vicinity of the tributary stream in this landfill area. The approximate proposed location for this well cluster is shown on Figures 2 and 3. The monitoring wells will be constructed in accordance with NC well construction standards.

5.2 PROPOSED POINT OF COMPLIANCE MONITORING WELLS

It is CEC's understanding that the existing groundwater monitoring wells along the southern perimeter of the Infill Expansion Area Landfill were made part of the landfill permit because the adjacent Closed Phase I Landfill to the south was permitted under older solid waste management rules. The Solid Waste Section determined that downgradient perimeter monitoring wells situated on the north side of the tributary channel would be needed to distinguish which landfill areas caused the source of groundwater impact in the event that groundwater contamination was detected at the facility to apply the appropriate rules.

The subject tributary channel has been observed to be dry for approximately one-half its length across the landfill property. The eastern half of the channel has been observed to contain flowing surface water. From a hydrogeologic perspective, groundwater movement from adjacent portions of the landfill areas on both the north and south side of the tributary channel is initially toward the channel and then is directed to the east parallel to the channel. Groundwater appears to move under the dry channel before discharging to the surface in the eastern portion of the channel. Approximate groundwater potentiometric contours and groundwater flow paths are depicted on Figure 3 to illustrate this local flow regime. Vertical hydraulic head data recently

evaluated for several well clusters situated on both sides of the tributary channel indicate an upward hydraulic gradient in proximity of the channel. As such, groundwater that moves across the “internal” perimeter wells will continue to flow eastward such that groundwater quality can be monitored by a detection well network properly sited along the eastern and southeastern perimeter of the Infill Expansion Area. It is this reason that we believe the internal perimeter monitoring wells along the tributary channel are not “relevant point of compliance” wells, but do serve as “sentry” wells to discern from which landfill area the contaminants are sourced, and they can be utilized to evaluate contamination trends and to review any remedial efforts to mitigate contamination.

Based on the unique physical site conditions and compliance concerns, CEC is recommending that a new downgradient groundwater detection monitoring well cluster be installed at the southeastern corner of the Infill Area landfill in proximity to the intersection of the tributary creek and landfill property boundary. The approximate proposed location for this well cluster is shown on Figures 2 and 3. Once installed, the new well cluster along with existing monitoring wells MW-1, MW-2, and MW-3 are situated in appropriate downgradient locations to monitor groundwater quality along the eastern perimeter of the Infill Expansion Area such that they can serve as “relevant point of compliance” monitoring wells for the purpose of reviewing groundwater quality compliance. Assessment groundwater monitoring of the internal site wells situated north of the tributary stream within the Infill Expansion Area should be continued to evaluate contaminant trends and to review any remedial efforts to mitigate contamination.

5.3 ON-GOING EVALUATION OF LANDFILL IMPACTS DUE TO LFG MIGRATION

Researchers have identified several "indicator" parameters that not only detect landfill impacts due to leachate and gas migration, but can also distinguish between impacts related to leachate versus those associated with LFG. These analytical parameters, along with routinely monitored field analytical measurements, methane, and groundwater VOC data, will be evaluated to ascertain the most probable source for the observed groundwater impact. The specific indicator parameters along with their associated indicator characteristics are as follows:

- Chloride - If values elevated above background; probable source is leachate.
- Ammonia (as Nitrogen) - If values elevated above background; probable source is leachate.
- Total Dissolved Solids - If values elevated above background, probable source is leachate.
- Alkalinity (as Bicarbonate) - If values elevated above background; probable source is LFG.
- Carbon Dioxide - If values elevated above background; probable source is LFG.
- Calcium - If values elevated above background; indication of gas impact if other strong leachate indicators are not significantly noted.
- Manganese - If values elevated above background; indication of gas impact if other strong leachate indicators are not significantly noted.
- Arsenic - If values elevated above background, it is an indication of gas impact if other strong leachate indicators are not significantly noted.

5.4 PETITION TO DISCONTINUE MONITORING OF NON-PERTINENT APPENDIX II ANALYTICAL PARAMETERS

For the Infill Expansion Area Landfill, GWS is currently performing semi-annual groundwater sampling of 15 groundwater monitoring wells and six surface water locations for Appendix II analyses. In addition, at the adjacent Closed Phase I Landfill, GWS is currently performing semi-annual groundwater sampling of 23 groundwater monitoring wells and three water supply wells for Appendix I analyses. As such, groundwater compliance monitoring costs for the landfill facility are significant. To determine the Appendix II parameters that are relevant to the site, CEC evaluated historical monitoring data back to 2013 when contaminants were first detected in site groundwater. The predominant constituents detected at concentrations exceeding the 2L standards are VOCs including vinyl chloride, benzene, methylene chloride, and tetrachloroethene; metals including vanadium, cobalt, chromium, and lead; pesticides including dieldrin and heptachlor; and one semi-VOC, specifically bis(2-ethylhexyl)phthalate (BEHP). BEHP has been detected one time in two Infill wells since 2013. Thus, the historical data show that Appendix II VOCs, metals, and pesticides are pertinent monitoring parameters. Consequently, GWS is petitioning the Solid Waste Section to amend the assessment monitoring requirements for the Infill Expansion Area by

discontinuing routine groundwater and surface water sampling and analyses for Appendix II semi-VOCs, herbicides, and PCBs.

5.5 DEVELOPMENT OF SCREENING MODEL FOR GROUNDWATER FLOW AND SOLUTE FATE AND TRANSPORT

Per NCDEQ's request, CEC will develop a groundwater flow and solute transport screening model to predict contaminant migration and evaluate exposure risk. The selected model will have the capability of conservatively simulating the important processes identified in the conceptual model. CEC will use sensitivity analysis to define the effect of selected parameters on model results.

6.0 SUMMARY

The NCDEQ - Solid Waste Section has requested a characterization of the nature and extent of the groundwater contamination at the Infill Expansion Area of the North Meck C&D Landfill facility as a result of the detection of VOCs in several landfill monitoring wells. On behalf of GWS, CEC has prepared this Contaminant Delineation Plan to provide such a site characterization based upon available site data and to recommend the collection and evaluation of additional hydrogeologic/groundwater quality data to further assess site conditions.

During the July 2013 and subsequent semi-annual groundwater monitoring events, VOCs were detected at concentrations exceeding the NC 2L Standards in several Infill Expansion Area monitoring wells. The detected VOCs include benzene, methylene chloride, bis (2-ethylhexyl) phthalate, and vinyl chloride. Vinyl chloride is the predominant VOC in site groundwater and has been detected in 11 landfill monitoring wells. Recent groundwater VOC data indicate a significant improvement in site groundwater quality from the historic maximum VOC levels. Vinyl chloride levels have currently decreased to non-detect in four wells (MW-2, MW-8, MW-8D, and MW-10). For most of the deeper monitoring wells, recent vinyl chloride concentrations were observed to be non-detect.

The mechanism for groundwater contamination beneath the subject landfill area is not clearly understood. The buried waste mass is the primary source; however, two potential secondary sources – landfill leachate and landfill gas – will require further assessment. Leachate is not collected at the landfill; however, groundwater sample analyses to provide leachate "indicator″ parameters are being evaluated to assess whether leachate is a significant source. Landfill gas (i.e. methane) is monitored on a quarterly schedule in perimeter wells at the landfill, and the monitoring data do not suggest significant lateral gas migration. However, gas sampling has not been conducted within the buried waste mass. To complicate this source evaluation, downgradient monitoring wells along the southern perimeter of the Infill Expansion Area are situated in near proximity of the edge of waste such that "migration″ of neither leachate nor LFG is needed to explain the VOC detections in these groundwater monitoring wells.

Site-specific groundwater and landfill gas data have been evaluated with regard to several lines of evidence established by other researchers to assess the potential for migrating gas to impact groundwater. As discussed in Section 3.2.3, our evaluation suggests that landfill gas may be a significant source of the observed groundwater impacts at the subject landfill.

Our specific recommendations for the collection and evaluation of additional hydrogeologic and groundwater quality data to further assess site conditions include the following:

1) Additional site characterization in the landfill area exhibiting the most elevated groundwater contaminant concentrations in the vicinity of existing well cluster MW-9/MW-9D to include an addition well cluster (saprolite and bedrock wells) installed 50 feet within the property boundary to determine if impacted groundwater may be migrating beyond the landfill property boundary, and also to assess hydraulic gradients in the vicinity of the adjacent tributary stream in this area;

2) The installation of a groundwater monitoring well cluster at the eastern perimeter of the Infill Expansion Area Landfill to serve as detection monitoring wells at the true point of compliance, and subsequent routine semi-annual monitoring of these proposed new detection wells. The existing internal wells will then be used for assessment monitoring. The proposed monitoring well network for the Infill Expansion Area will consist of the following wells:

Detection Wells	Assessment Wells
MW-1	MW-4/4D
MW-2	MW-5/5D
MW-3	MW-6
MW-10	MW-7/7D
Proposed New Well Cluster @ SE	MW-8/8D
Proposed New Well Cluster @ MW-9/9D	MW-9/9D

3) Evaluation of additional analytical leachate/landfill gas "indicator" parameters as a part of routine landfill monitoring to characterize the source of the groundwater impacts;

4) For six semi-annual groundwater assessment monitoring events, the historical data show that Appendix II semi-VOCs, herbicides, and PCBs are not of significant concern at the site. Consequently, GWS is petitioning the Solid Waste Section to amend the assessment monitoring requirements for the Infill Expansion Area by discontinuing routine groundwater and surface water sampling and analyses for Appendix II semi-VOCs, herbicides, and PCBs;

5) Assessment of the need for landfill gas extraction in the Infill Expansion Area; and

6) Development of a screening numerical model to simulate contaminant fate and transport to further evaluate risk associated with the migration of groundwater contaminants.

On behalf of GWS, CEC is requesting that the Division approve this Contaminant Delineation Plan to evaluate additional landfill gas and groundwater monitoring data to determine the predominant contaminant source (leachate and/or landfill gas) for the observed groundwater impact, and to determine the effectiveness of landfill gas extraction as a permanent groundwater remedy.

7.0 REFERENCES

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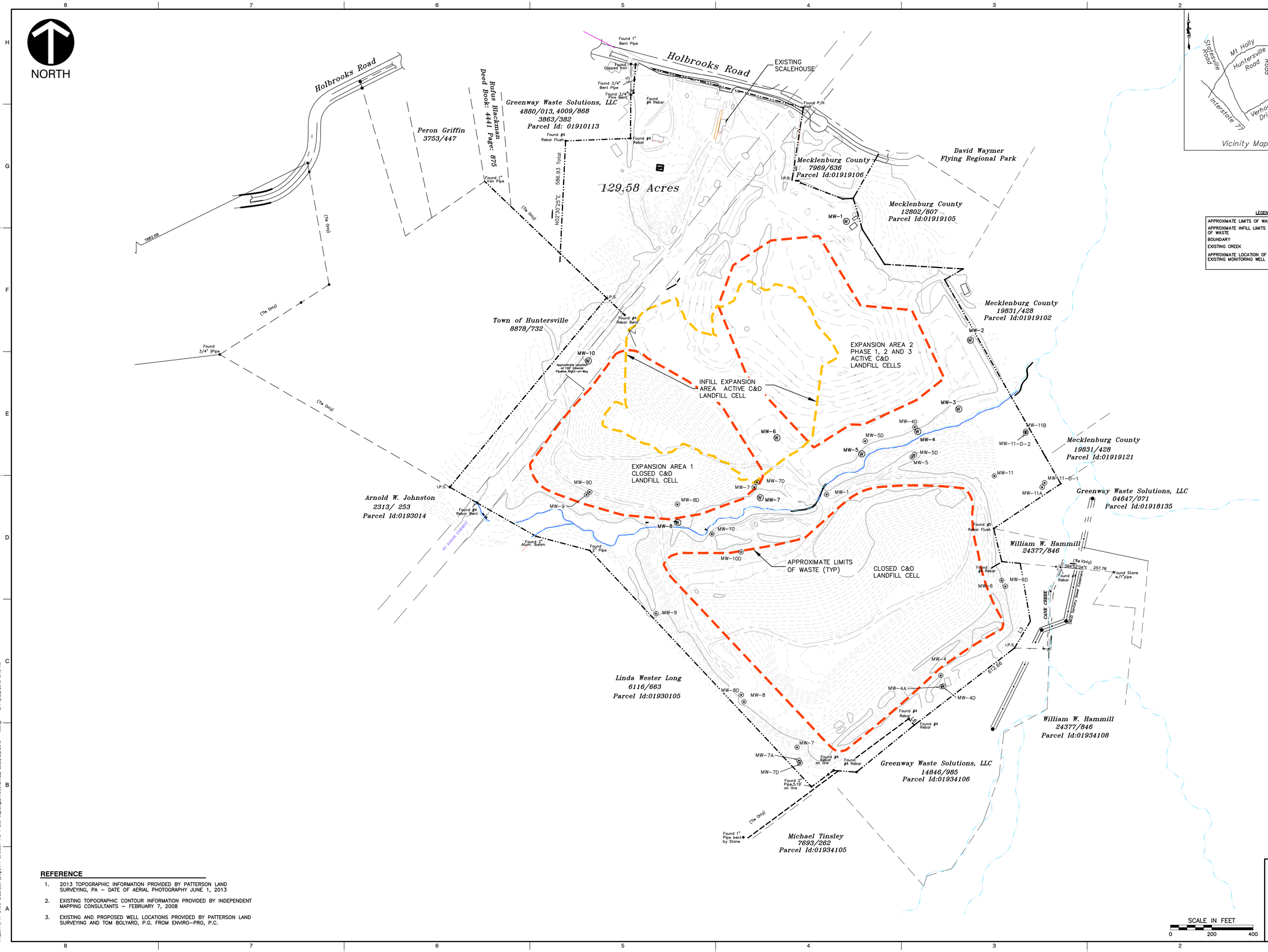
FIGURES



REFERENCE

1. 2013 TOPOGRAPHIC INFORMATION PROVIDED BY PATTERSON LAND SURVEYING, PA – DATE OF AERIAL PHOTOGRAPHY JUNE 1, 2013
2. EXISTING TOPOGRAPHIC CONTOUR INFORMATION PROVIDED BY INDEPENDENT MAPPING CONSULTANTS – FEBRUARY 7, 2008
3. EXISTING AND PROPOSED WELL LOCATIONS PROVIDED BY PATTERSON LAND SURVEYING AND TOM BOLYARD, P.G. FROM ENVIRO–PRO, P.C.

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
1900 Center Park Drive - Suite A - Charlotte, NC 28217
Ph: 980.237.0373 - Fax: 980.237.0372
www.cecinc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC NORTH MECKLENBURG LANDFILL HUNTERSVILLE, NC

SITE MAP

DATE:	AUGUST 2015	DRAWN BY:	JKS
DWG SCALE:	1" = 200'	CHECKED BY:	EHS
PROJECT NO:	111-370.0001		
APPROVED BY:	EHS		

DRAWING NO.: 1

SHEET OF

NORTH

NOTES:
1. GAS MONITORING WELL LOCATIONS ARE APPROXIMATE AND HAVE NOT BEEN SURVEYED.
2. GROUNDWATER POTENTIOMETRIC CONTOURS ARE APPROXIMATE AND INTERPOLATED BETWEEN WELL MEASURING POINTS.

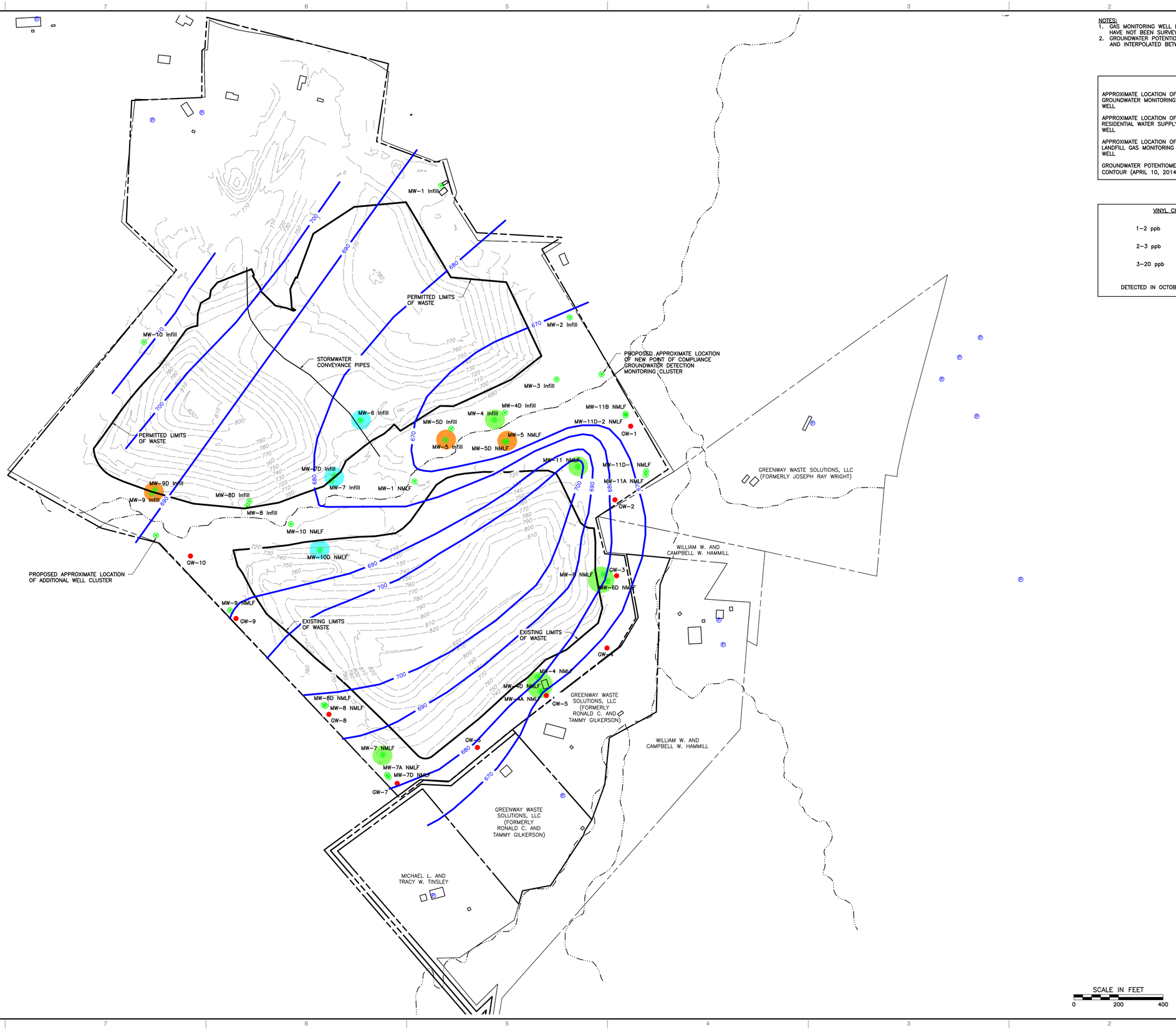
LEGEND

APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELL	W
APPROXIMATE LOCATION OF RESIDENTIAL WATER SUPPLY WELL	P
APPROXIMATE LOCATION OF LANDFILL GAS MONITORING WELL	●
GROUNDWATER POTENTIOMETRIC CONTOUR (APRIL 10, 2014)	680

VINYL CHLORIDE OCCURRENCE

1–2 ppb	
2–3 ppb	
3–20 ppb	

DETECTED IN OCTOBER 21, 2015 MONITORING EVENT



REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205
412-429-2324 · 800-365-2324
www.cecinc.com

GREENWAY WASTE SOLUTIONS AT NORTH MECK, LLC NORTH MECK LANDFILL HUNTERSVILLE, NC

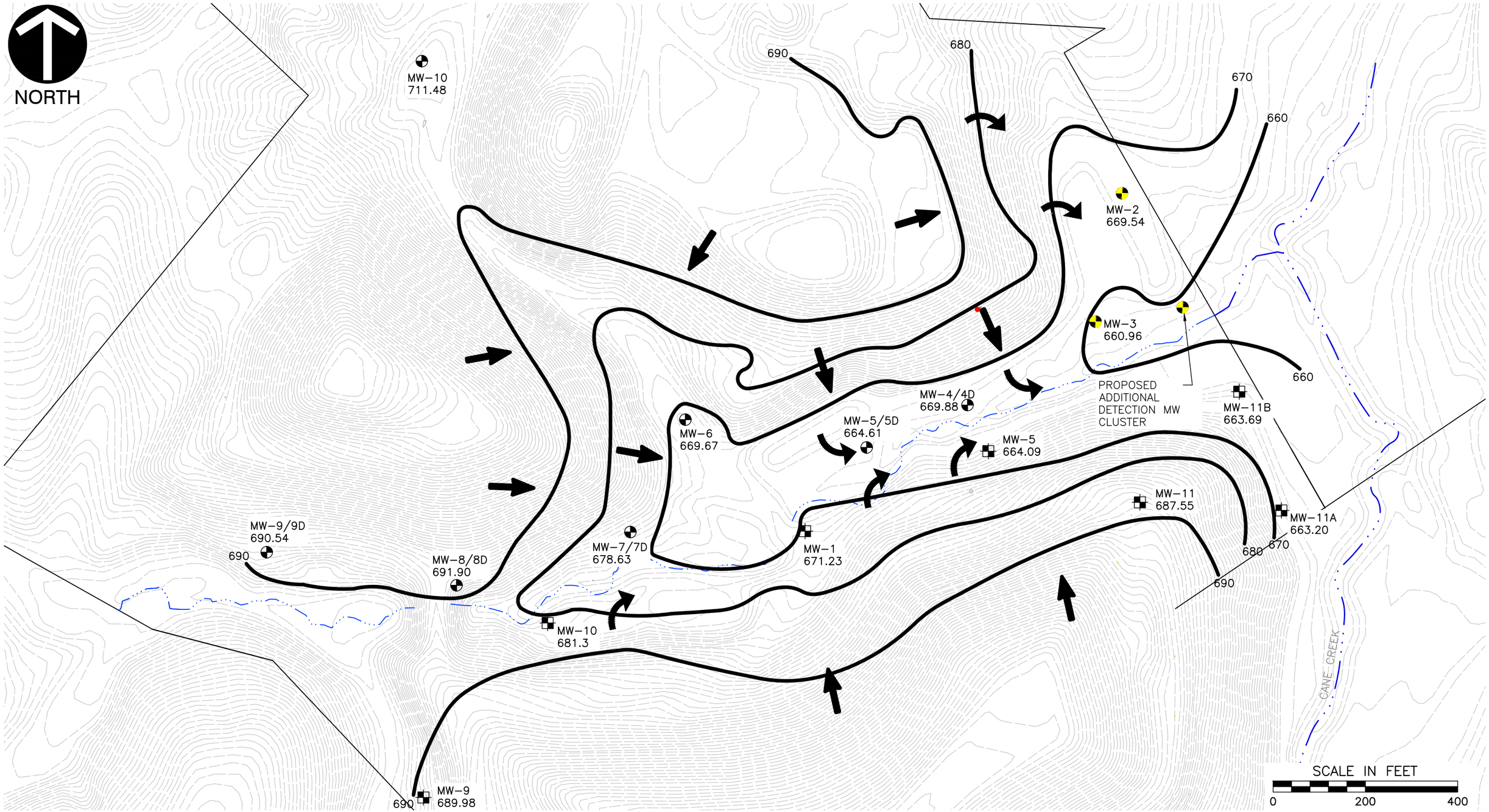
SITE MAP

DATE:	MARCH 2016
DRAWN BY:	PNP
DWG SCALE:	1"=200'
CHECKED BY:	EHS
PROJECT NO:	111-370.001
APPROVED BY:	EHS

FIGURE NO.: 2

SHEET 1 OF 1

P:\2011\111-370\-CADD\001\Dwg\111-370.001 Groundwater Map for Eng(24 X 36) LS(3/21/2016 - gwmap) - LP: 3/21/2016 8:14 AM



REFERENCE

TOPOGRAPHIC INFORMATION BASED UPON GIS DATA FROM MECKLENBURG COUNTY GIS, DATED 2012.

WATER LEVEL DATA FROM MAY 18, 2014

LEGEND

- INFILL EXPANSION AREA DETECTION WELL
- INFILL EXPANSION AREA ASSESSMENT WELL
- CLOSED PHASE I LANDFILL MONITORING WELL
- 689.98 WATER TABLE ELEVATION
- GROUNDWATER LEVEL POTENTIOMETRIC CONTOUR
- APPROXIMATE GROUNDWATER FLOW DIRECTION

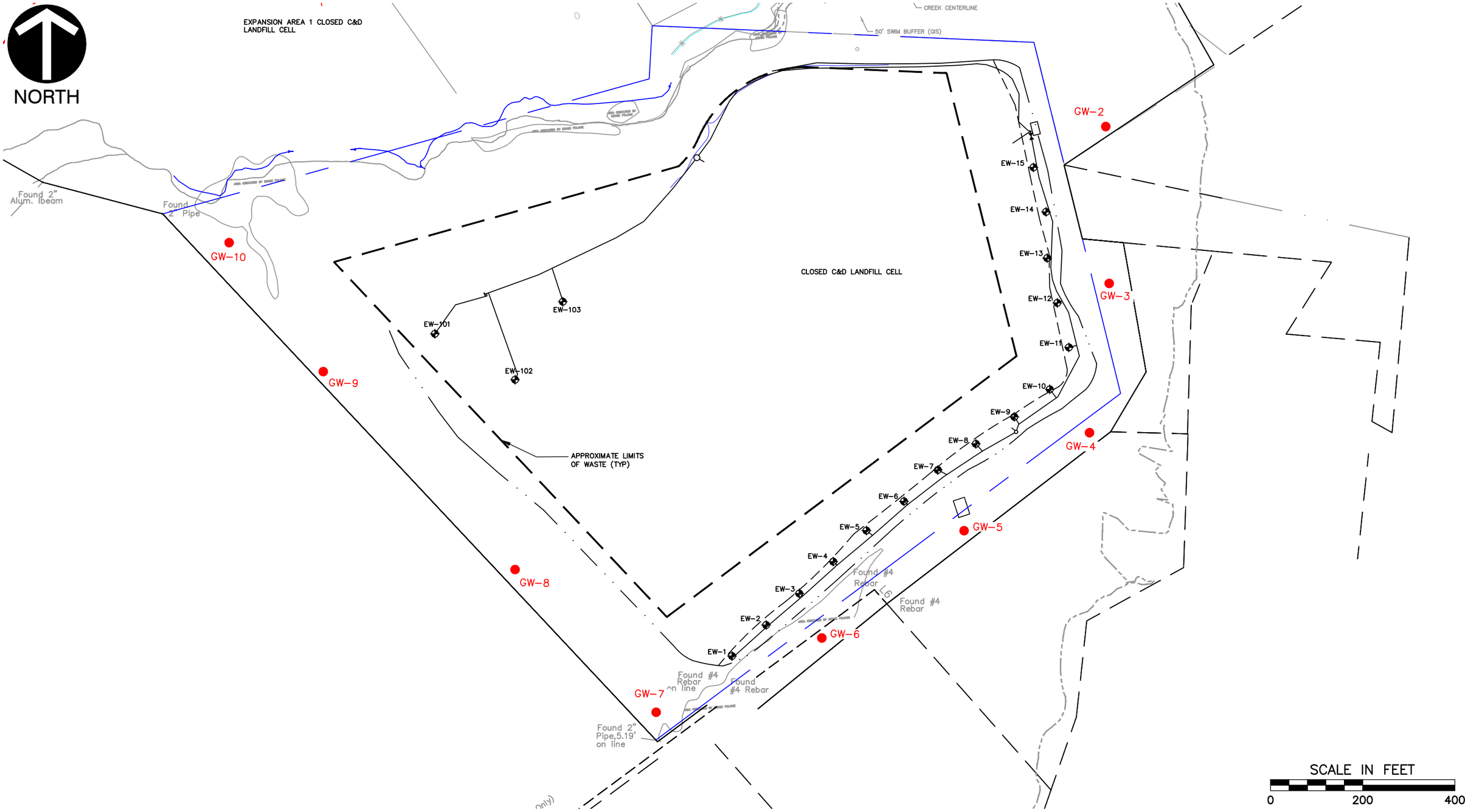
CEC
Civil & Environmental Consultants, Inc.
1900 Center Park Drive - Suite A - Charlotte, NC 28217
Ph: 980.237.0373 · Fax: 980.237.0372
www.cecinc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC
NORTH MECKLENBURG LANDFILL
HUNTERSVILLE, NORTH CAROLINA

GROUNDWATER POTENTIOMETRIC MAP

DRAWN BY:	PNP	CHECKED BY:	EHS	APPROVED BY:	EHS	FIGURE NO.:	3
DATE:	MAY 2016	DWG SCALE:	1"=200'	PROJECT NO:	111-370.001		

P:\2011\111-370\-CADD\001\Dwg\111370-Stream.Topo.Potentiometric.May.2016.dwg{LAYOUT1} LS:(5/26/2016 - ppressley) - LP: 5/26/2016 9:21 AM



Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205
412-429-2324 · 800-365-2324
www.cecinc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC
NORTH MECKLENBURG LANDFILL
HUNTERSVILLE, NC

LANDFILL GAS EXTRACTION WELL SYSTEM

DRAWN BY:	NTB	CHECKED BY:	PNP	APPROVED BY:	EHS	FIGURE NO.:	4
DATE:	JULY 2014	DWG SCALE:	1"=200'	PROJECT NO:	111-370.001		

P:\2011\111-370\-CADD\001\Dwg\111-370-C201-PROPOSED SITE PLAN-REV1.7.6.15.For.Remedial.Action.Plan.dwg{11X17} LS:(9/24/2015 - kstills) - LP: 5/26/2016 9:22 AM

TABLES

Table 1. Summary of Recent Site Groundwater Monitoring Data
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-1								MW-2							
		6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.13	7.15.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6					0.28		0.048		.							
Aluminium	NS																
Arsenic	0.01				0.0011						0.0109						
Barium	0.7	0.0733	0.0706	0.095	0.15	0.1	0.11	0.13	0.14	0.0501	0.639	0.082	0.19	0.18	0.096	0.081	0.15
Benzene	0.001																
Beryllium	0.004 **										0.0027		0.00043				
Cadmium	2																
Calcium	NS								42								97
Chloroform	0.07																
Chloroethane	3																
Chromium	0.01										0.0214						
Cobalt	0.001 **												**0.0066**				
Copper	1	0.0314			0.017	0.002	0.0028	0.0014			0.0951	0.009	0.037	0.015	0.0049	0.0025	0.02
Carbon Disulfide	0.7																
1,1-Dichloroethane	0.006																
1,1-Dichloroethene	0.35																
1,4-Dichlorobenzene	0.006																
cis-1,2-Dichloroethene	0.07																
Dinoseb	0.007																
Dieldrin	0.000002 **																
bis (2-Ethylhexyl) phthalate	0.003																
Ethylbenzene	0.6																
Toluene	0.6																
Xylenes	0.5																
Heptachlor	0.000008																
Heptaclor Epoxide	0.000004																
alpha-BHC	NS																
beta-BHC	NS																
gamma-BHC	NS																
Lead	0.015				0.0023						**0.0213**		0.0020	0.0015			
Manganese	0.05																0.027
Mercury	0.001										0.00014						
Methylene Chloride	0.005																
2,4-Methylphenol	NS																
Nickel	0.1				0.0051						0.0191						
Selenium	0.02																
Tetrachloroethene	0.0007																
Tetrahydrofuran	NS																
Trichlorofluoromethane	2																
Vanadium	0.0003 **	**0.0079**	**0.0074**		**0.023**	**0.0091**	**0.0067**		**0.0058**		**0.206**		**0.023**	**0.0085**			**0.011**
Vinyl Chloride	0.00003													**0.007**			
Zinc	1	0.0175	0.012	0.028	0.047	0.0045	0.052	0.022	0.025	0.0118	0.171		0.044	0.071	0.047	0.013	0.052
Alkalinity	NS	120	126	130					130	17.9	14.4	13					110
Ammonia-N	NS																
Carbon Dioxide	NS								180								230
Total Dissolved Solids	500	203	223	210					320	201	259	270					500
Sulfate	250	7.6	8.21	15						92.2	74.1	140					
Sulfide	NS								1.3								
Chloride	250	6.5	6.97	6.2					45	6.47	8.74	6.6					10

* NCDENR Standard = 15A NCAC 02L .0202 Groundwater Standards (Eff. April 1, 2013)
** Interim Maximum Allowable Concentration
Bold values exceed the NCDENR Standard

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-3								MW-4								
		6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.13	7.5.13	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6																	
Aluminium	NS																	
Arsenic	0.01															0.0016		0.0024
Barium	0.7	0.107	0.0767	0.079	0.077	0.094	0.061	0.081	0.12	0.328	0.0794	0.65		0.33	0.57	0.5	0.23	0.48
Benzene	0.001																	
Beryllium	0.004 **														0.0013			
Cadmium	2														0.00055	0.0015		
Calcium	NS								72									69
Chloroform	0.07																	
Chloroethane	3																	
Chromium	0.01									0.0188		0.03						
Cobalt	0.001 **									**0.0142**		**0.033**		**0.042**	**0.031**	**0.032**	**0.04**	**0.03**
Copper	1				0.0015	0.0037	0.0011		0.0026	0.0331	0.0148	0.063		0.0012	0.021	0.043	0.0032	0.0022
Carbon Disulfide	0.7								0.013									
1,1-Dichloroethane	0.006																	
1,1-Dichloroethene	0.35																	
1,4-Dichlorobenzene	0.006																	
cis-1,2-Dichloroethene	0.07																	
Dinoseb	0.007													0.0017				
Dieldrin	0.000002 **																	
bis (2-Ethylhexyl) phthalate	0.003																	
Ethylbenzene	0.6																	
Toluene	0.6																	
Xylenes	0.5																	
Heptachlor	0.000008													**0.069**				
Heptaclor Epoxide	0.000004																	
alpha-BHC	NS																	
beta-BHC	NS																	
gamma-BHC	NS																	
Lead	0.015									0.0086		0.01			0.0033	0.0013		
Manganese	0.05								**1.5**									**42**
Mercury	0.001															0.00016		
Methylene Chloride	0.005																	
2,4-Methylphenol	NS															0.0022		
Nickel	0.1									0.0114								
Selenium	0.02						0.001							0.0026		0.0018	0.0022	
Tetrachloroethene	0.0007																	
Tetrahydrofuran	NS								0.0093								0.016	0.027
Trichlorofluoromethane	2																	
Vanadium	0.0003 **	**0.0153**				**0.0068**				**0.0632**	**0.0063**	**0.012**			**0.018**	**0.009**		
Vinyl Chloride	0.00003											**0.0023**	**0.019**	**0.013**	**0.0089**	**0.0014**	**0.0021**	**0.0016**
Zinc	1	0.0103	0.0128		0.016	0.041	0.03	0.011	0.027	0.0834	0.014	0.011		0.016	0.2	0.2	0.032	0.094
Alkalinity	NS	25.8	27.5	28					53	218	248	110						370
Ammonia-N	NS																	4.6
Carbon Dioxide	NS								140									710
Total Dissolved Solids	500	314	268	260					420	339	373	230						620
Sulfate	250	168	126	140						23.8	6.88	23						
Sulfide	NS																	
Chloride	250	11.6	7.95	7.7					8.4	12.1	9.96	12						20

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-4D					MW-5								
		12.9.13	6.19.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.13	7.5.13	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6														
Aluminium	NS														
Arsenic	0.01			0.001			0.0085	0.0059			0.0013	0.0014	0.0018		0.0015
Barium	0.7	0.041	0.035	0.052	0.034	0.033	0.26	0.379	0.32		0.34	0.48	0.34	0.34	0.32
Benzene	0.001														0.00055
Beryllium	0.004 **														
Cadmium	2			0.00016											
Calcium	NS					38									120
Chloroform	0.07														
Chloroethane	3														
Chromium	0.01						0.009					0.0099	0.0059		
Cobalt	0.001 **						**0.0069**					**0.0088**	**0.005**		
Copper	1	0.0045		0.017	0.025	0.0013	0.0105	0.0229			0.0035	0.019	0.019	0.0037	0.0047
Carbon Disulfide	0.7														0.012
1,1-Dichloroethane	0.006														
1,1-Dichloroethene	0.35														
1,4-Dichlorobenzene	0.006														
cis-1,2-Dichloroethene	0.07							0.00066	0.0011			0.0019			
Dinoseb	0.007										0.0023				
Dieldrin	0.000002 **														
bis (2-Ethylhexyl) phthalate	0.003														
Ethylbenzene	0.6														
Toluene	0.6														
Xylenes	0.5														
Heptachlor	0.000008														
Heptaclor Epoxide	0.000004														
alpha-BHC	NS														
beta-BHC	NS														
gamma-BHC	NS												0.000047		
Lead	0.015	0.0019					0.0053	0.0083			0.0018	0.0074	0.0046		0.0015
Manganese	0.05					0.011									**4.6**
Mercury	0.001														
Methylene Chloride	0.005														
2,4-Methylphenol	NS														
Nickel	0.1											0.0063	0.0055		0.0052
Selenium	0.02				0.0015						0.0019	0.0014	0.003	0.0022	0.0023
Tetrachloroethene	0.0007														
Tetrahydrofuran	NS									0.032	0.042		0.0068	0.0087	0.023
Trichlorofluoromethane	2		0.001		0.001										
Vanadium	0.0003 **			0.0095			0.037	0.0502			0.011	0.041	0.024		0.0068
Vinyl Chloride	0.00003								**0.003**	**0.0066**	**0.0077**	**0.0086**	**0.0028**	**0.0062**	**0.0033**
Zinc	1		0.014	0.029			0.0244	0.0147	0.031			0.19	0.14	0.064	0.064
Alkalinity	NS					130	517	508	430						570
Ammonia-N	NS														2.8
Carbon Dioxide	NS					140									840
Total Dissolved Solids	500					220	**625**	**607**	460						720
Sulfate	250						4.5	7.05	5.3						
Sulfide	NS		20		1.4								2		
Chloride	250					12	33.1	28.8	25						45

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-5D						MW-6								
		10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.15	7.5.13	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6							0.0141								
Aluminium	NS															
Arsenic	0.01						0.0012					0.0019	**0.015**	**0.0033**		
Barium	0.7		0.065	0.035	0.034	0.032	0.036	0.359	0.122	0.22		0.22	0.16	0.15	0.11	0.23
Benzene	0.001															0.00028
Beryllium	0.004 **															
Cadmium	2							0.0017								0.00015
Calcium	NS						35									100
Chloroform	0.07															
Chloroethane	3															
Chromium	0.01											0.0052				0.0053
Cobalt	0.001 **											**0.0055**				
Copper	1		0.0039	0.0032	0.0017	0.0017	0.0046	0.0067				0.011	0.011	0.011		0.018
Carbon Disulfide	0.7															
1,1-Dichloroethane	0.006															
1,1-Dichloroethene	0.35															
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07															
Dinoseb	0.007															
Dieldrin	0.000002 **															
bis (2-Ethylhexyl) phthalate	0.003			**0.013**												
Ethylbenzene	0.6															
Toluene	0.6															
Xylenes	0.5															
Heptachlor	0.000008															
Heptaclor Epoxide	0.000004															
alpha-BHC	NS															
beta-BHC	NS															
gamma-BHC	NS															
Lead	0.015											0.0045		0.0018		
Manganese	0.05						**0.37**									**3.7**
Mercury	0.001															
Methylene Chloride	0.005															
2,4-Methylphenol	NS															
Nickel	0.1															
Selenium	0.02													0.0015	0.0013	0.0021
Tetrachloroethene	0.0007															
Tetrahydrofuran	NS							0.0055					0.0084			
Trichlorofluoromethane	2															
Vanadium	0.0003 **						**0.0059**	**0.0158**				**0.025**		0.0084		
Vinyl Chloride	0.00003										**0.0091**	**0.0011**	**0.0023**	**0.0013**	**0.0042**	**0.0025**
Zinc	1		0.01	0.017	0.019		0.013	0.0122				0.022	0.067	0.069	0.0016	0.054
Alkalinity	NS						130	470	362	270						440
Ammonia-N	NS															0.85
Carbon Dioxide	NS						150									590
Total Dissolved Solids	500						220	591	514	380						610
Sulfate	250							3.06	4.04	44						
Sulfide	NS			2.4			1.8									
Chloride	250						12	49.3	27.5	20						48

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-7									MW-7D					
		6.15.12	1.14.13	7.5.13	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6															
Aluminium	NS															
Arsenic	0.01							0.0013		0.0013			0.0016	0.0032		0.0018
Barium	0.7	0.0795	0.0823	0.15		0.14	0.13	0.12	0.11	0.15		0.19	0.2	0.22	0.23	0.27
Benzene	0.001		0.00055		**0.0015**	**0.0011**		**0.0011**	0.00093	0.0017						0.00078
Beryllium	0.004 **															
Cadmium	2					0.00025						0.00012				
Calcium	NS									53						210
Chloroform	0.07															
Chloroethane	3															
Chromium	0.01															
Cobalt	0.001 **					**0.0055**						**0.0062**				
Copper	1		0.0059	0.013		0.011	0.0023	0.0028		0.0037		0.0026		0.0023	0.002	0.001
Carbon Disulfide	0.7										0.002					
1,1-Dichloroethane	0.006															
1,1-Dichloroethene	0.35			0.001	0.0023	0.0018		0.001	0.001	0.0045						
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07		0.00019													
Dinoseb	0.007											0.0015				
Dieldrin	0.000002 **									**0.000087**						
bis (2-Ethylhexyl) phthalate	0.003															**0.028**
Ethylbenzene	0.6															
Toluene	0.6														0.0023	0.0015
Xylenes	0.5														0.0033	0.0018
Heptachlor	0.000008								**0.000064**	**0.000089**						**0.000061**
Heptaclor Epoxide	0.000004									0.00014						
alpha-BHC	NS							0.00028								
beta-BHC	NS							0.0012	0.00062	0.00016						
gamma-BHC	NS															
Lead	0.015					0.0015										
Manganese	0.05									0.042						**0.86**
Mercury	0.001			0.00017		0.00017										
Methylene Chloride	0.005															
2,4-Methylphenol	NS													0.0015		0.014
Nickel	0.1											0.014	0.013	0.012	0.012	
Selenium	0.02					0.0011	0.0013	0.0028	0.0032	**0.026**		0.0022	0.0015	0.0029	0.0038	0.0022
Tetrachloroethene	0.0007															
Tetrahydrofuran	NS							0.0064	0.0036	0.014	0.0079	0.0061	0.0064	0.0086	0.0063	0.013
Trichlorofluoromethane	2					0.027										
Vanadium	0.0003 **	**0.0075**	**0.0073**							**0.0055**						
Vinyl Chloride	0.00003			**0.0011**	**0.0062**	**0.0056**		**0.0011**	**0.0027**	**0.0028**	**0.0074**	**0.0075**	**0.0060**		**0.0024**	**0.0014**
Zinc	1	0.0251	0.0244	0.031		0.088	0.073	0.062	0.03	0.075		0.019	0.08	0.093	0.11	0.059
Alkalinity	NS	210	223	230						340						
Ammonia-N	NS															
Carbon Dioxide	NS									800						
Total Dissolved Solids	500	378	409	420						620						
Sulfate	250	62.7	60.9	83												
Sulfide	NS												6.8			
Chloride	250	26.5	29.5	31						49						

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-8									MW-8D					
		6.15.12	1.14.13	7.5.13	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6															
Aluminium	NS															
Arsenic	0.01									0.0013			0.0011			
Barium	0.7	0.036	0.0405	0.05		0.13	0.053	0.043	0.041	0.048		0.056	0.052	0.053	0.051	0.055
Benzene	0.001															
Beryllium	0.004 **					0.00047										
Cadmium	2															
Calcium	NS									34						54
Chloroform	0.07		0.00024													
Chloroethane	3															
Chromium	0.01					**0.027**						0.0061				
Cobalt	0.001 **		**0.0069**			**0.022**				**0.0058**						
Copper	1		0.0069	0.02		0.093		0.0014	0.0011	0.0083		0.0051	0.003	0.0076	0.0011	0.0017
Carbon Disulfide	0.7															
1,1-Dichloroethane	0.006															
1,1-Dichloroethene	0.35										0.0018	0.0013	0.003	0.0026	0.0018	0.0012
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07															
Dinoseb	0.007															
Dieldrin	0.000002 **															
bis (2-Ethylhexyl) phthalate	0.003															
Ethylbenzene	0.6															
Toluene	0.6															
Xylenes	0.5															
Heptachlor	0.000008															
Heptaclor Epoxide	0.000004															
alpha-BHC	NS															
beta-BHC	NS															
gamma-BHC	NS															
Lead	0.015					0.0047										
Manganese	0.05									**0.27**						
Mercury	0.001															
Methylene Chloride	0.005															
2,4-Methylphenol	NS															
Nickel	0.1					0.023										
Selenium	0.02						0.002	0.0031	0.0032	0.002				0.0013	0.002	
Tetrachloroethene	0.0007															
Tetrahydrofuran	NS			0.027												
Trichlorofluoromethane	2										0.0016	0.0012	0.0019	0.0019	0.0022	
Vanadium	0.0003 **	**0.0092**	**0.0074**			**0.087**	**0.0052**			**0.0067**		**0.0073**	**0.0056**	**0.0054**		
Vinyl Chloride	0.00003			**0.0023**	**0.0041**	**0.0033**	**0.0038**	**0.0027**	**0.0057**				**0.0013**		**0.0037**	
Zinc	1	0.0112	0.0175	0.032		0.083	0.022	0.035		0.024		0.011	0.024	0.028		0.016
Alkalinity	NS	140	154	140						110						160
Ammonia-N	NS									0.14						
Carbon Dioxide	NS									270						160
Total Dissolved Solids	500	342	379	310						350						280
Sulfate	250	7.82	7.85	4.9												
Sulfide	NS									BDL			2.4			1.7
Chloride	250	72	7.07	63						73						31

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
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Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-9									MW-9D					
		6.15.12	1.14.13	7.5.13	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	10.9.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6															
Aluminium	NS															
Arsenic	0.01									0.0011		0.001	0.001	0.0012		
Barium	0.7	0.0278	0.259	0.26		0.4	**0.92**	0.56	0.33	0.35		0.23	0.36	0.32	0.58	0.15
Benzene	0.001		**0.0010**	**0.0014**	**0.0014**	**0.0013**		**0.0015**	0.0016	0.0015						
Beryllium	0.004 **															
Cadmium	2															
Calcium	NS									74						87
Chloroform	0.07															
Chloroethane	3															
Chromium	0.01						**0.051**	**0.028**						0.0057	0.024	
Cobalt	0.001 **		**0.0161**			**0.009**	**0.033**	**0.013**		**0.0054**					**0.017**	
Copper	1		0.0061			0.016	0.14	0.078	0.0013	0.0062		0.0022	0.0015	0.0037	0.083	0.0061
Carbon Disulfide	0.7															
1,1-Dichloroethane	0.006				0.00163	0.0012		0.0011			0.0013	0.0014		0.0012		
1,1-Dichloroethene	0.35			0.0022	0.0058	0.0037					0.018	0.016	0.12	0.018	0.0087	0.0088
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07		0.0017	0.0026	0.0041	0.0034	0.0017	0.0029	0.0026	0.0037	0.0024	0.0025	0.0018	0.0029	0.0026	0.0028
Dinoseb	0.007															
Dieldrin	0.000002 **															
bis (2-Ethylhexyl) phthalate	0.003						0.013									
Ethylbenzene	0.6															
Toluene	0.6															
Xylenes	0.5															
Heptachlor	0.000008						0.000055	0.000077	0.000065	0.000063					**0.000081**	
Heptaclor Epoxide	0.000004															
alpha-BHC	NS															
beta-BHC	NS							0.00026							0.00036	
gamma-BHC	NS															
Lead	0.015						0.0094	0.0033							0.0029	
Manganese	0.05									**0.18**						0.049
Mercury	0.001					0.00091		**0.015**		0.00052					**0.0041**	
Methylene Chloride	0.005			0.0012	0.0019	0.0013					**0.0089**	**0.0093**	**0.006**	**0.0076**	**0.0073**	**0.0078**
2,4-Methylphenol	NS															
Nickel	0.1		0.0059			0.0066	0.024	0.015				0.011		0.0055	0.014	0.0054
Selenium	0.02							0.0013	0.0013			0.0017			0.0013	
Tetrachloroethene	0.0007										**0.001**	**0.001**				
Tetrahydrofuran	NS									0.0053	0.0085	0.0097	0.012	0.015	0.01	0.011
Trichlorofluoromethane	2	0.00099	0.00032													
Vanadium	0.0003 **		**0.0064**			**0.025**	**0.21**	**0.098**		**0.0086**					**0.088**	
Vinyl Chloride	0.00003			**0.036**	**0.073**	**0.063**	**0.034**	**0.046**	**0.020**	**0.019**	**0.057**	**0.0059**	**0.039**	**0.039**	**0.016**	**0.015**
Zinc	1		0.0128			0.024	0.34	0.24	0.041	0.071		0.016	0.15	0.14	0.099	0.16
Alkalinity	NS	175	326	310						580						640
Ammonia-N	NS									0.11						0.14
Carbon Dioxide	NS									1300						670
Total Dissolved Solids	500	430	489	350						810						850
Sulfate	250	105	71.3	59												
Sulfide	NS						1.6			BDL			2.4			2.1
Chloride	250	20.3	32.2	43						35						24

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stanc

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	MW-10								SW-1							
		6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6																
Aluminium	NS												0.56				
Arsenic	0.01																
Barium	0.7	0.0322	0.037	0.035	0.043	0.042	0.048	0.046	0.088	0.0251	0.0235	0.029	0.029	0.03	0.027	0.03	0.029
Benzene	0.001																
Beryllium	0.004 **																
Cadmium	2																
Calcium	NS								100								
Chloroform	0.07																
Chloroethane	3																
Chromium	0.01																
Cobalt	0.001 **																
Copper	1		0.0066		0.015	0.0032	0.013	0.004	0.021					0.0016			
Carbon Disulfide	0.7																
1,1-Dichloroethane	0.006																
1,1-Dichloroethene	0.35																
1,4-Dichlorobenzene	0.006																
cis-1,2-Dichloroethene	0.07																
Dinoseb	0.007																
Dieldrin	0.000002 **																
bis (2-Ethylhexyl) phthalate	0.003																
Ethylbenzene	0.6																
Toluene	0.6																
Xylenes	0.5																
Heptachlor	0.000008																
Heptaclor Epoxide	0.000004																
alpha-BHC	NS																
beta-BHC	NS																
gamma-BHC	NS																
Lead	0.015																
Manganese	0.05								0.015								
Mercury	0.001																
Methylene Chloride	0.005																
2,4-Methylphenol	NS																
Nickel	0.1																
Selenium	0.02				0.0016	0.0015	0.0021	0.0023	0.0016								
Tetrachloroethene	0.0007																
Tetrahydrofuran	NS																
Trichlorofluoromethane	2		0.00037														
Vanadium	0.0003 **				**0.0082**		**0.0079**										
Vinyl Chloride	0.00003						**0.0011**										
Zinc	1		0.0121		0.017	0.02	0.028		0.033					0.015			
Alkalinity	NS	175	193	190					260								
Ammonia-N	NS																
Carbon Dioxide	NS								500								
Total Dissolved Solids	500	413	442	400					500								
Sulfate	250	112	118	120													
Sulfide	NS					2			1.3								
Chloride	250	20.5	20.7	18					17								

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	SW-2								SW-3							
		6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6					0.025	0.025										
Aluminium	NS				0.3								0.099				
Arsenic	0.01					0.0035											0.0013
Barium	0.7	0.0396	0.0364	0.047	0.11	0.2	0.13	0.049	0.099	0.0439	0.036	0.049	0.056	0.06	0.051	0.053	0.096
Benzene	0.001																
Beryllium	0.004 **																
Cadmium	2																
Calcium	NS																
Chloroform	0.07																
Chloroethane	3																
Chromium	0.01						0.0063										
Cobalt	0.001 **					0.0066											
Copper	1				0.002	0.0035	0.017							0.0013			0.0026
Carbon Disulfide	0.7																
1,1-Dichloroethane	0.006																
1,1-Dichloroethene	0.35																
1,4-Dichlorobenzene	0.006																
cis-1,2-Dichloroethene	0.07																
Dinoseb	0.007																
Dieldrin	0.000002 **																
bis (2-Ethylhexyl) phthalate	0.003																
Ethylbenzene	0.6																
Toluene	0.6																
Xylenes	0.5																
Heptachlor	0.000008																
Heptaclor Epoxide	0.000004																
alpha-BHC	NS																
beta-BHC	NS																
gamma-BHC	NS																
Lead	0.015																
Manganese	0.05																
Mercury	0.001																
Methylene Chloride	0.005																
2,4-Methylphenol	NS																
Nickel	0.1				0.005	0.0085											
Selenium	0.02					0.0017											
Tetrachloroethene	0.0007																
Tetrahydrofuran	NS					**0.019**											
Trichlorofluoromethane	2																
Vanadium	0.0003 **					**0.01**											
Vinyl Chloride	0.00003				**0.0013**												
Zinc	1					0.085	0.021	0.02	0.015					0.027			0.017
Alkalinity	NS																
Ammonia-N	NS																
Carbon Dioxide	NS																
Total Dissolved Solids	500																
Sulfate	250																
Sulfide	NS																
Chloride	250																

* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

Constituent	NCDENR Standard (mg/L) *	SW-4								SW-1(Pipe Inf)							
		6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15	6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6																
Aluminium	NS																
Arsenic	0.01					0.001								0.0017			
Barium	0.7	0.0624	0.0348	0.05	0.12	0.097	0.13	0.076	0.042		0.0503	0.052	0.055	0.076	0.1	0.033	0.085
Benzene	0.001																
Beryllium	0.004 **																
Cadmium	2																
Calcium	NS																
Chloroform	0.07																
Chloroethane	3																
Chromium	0.01																
Cobalt	0.001 **																
Copper	1					0.0016											0.012
Carbon Disulfide	0.7																
1,1-Dichloroethane	0.006																
1,1-Dichloroethene	0.35																
1,4-Dichlorobenzene	0.006																
cis-1,2-Dichloroethene	0.07																
Dinoseb	0.007																
Dieldrin	0.000002 **																
bis (2-Ethylhexyl) phthalate	0.003																
Ethylbenzene	0.6																
Toluene	0.6																
Xylenes	0.5																
Heptachlor	0.000008																
Heptaclor Epoxide	0.000004																
alpha-BHC	NS																
beta-BHC	NS																
gamma-BHC	NS																
Lead	0.015																
Manganese	0.05																
Mercury	0.001																
Methylene Chloride	0.005																
2,4-Methylphenol	NS																
Nickel	0.1																
Selenium	0.02				0.001												
Tetrachloroethene	0.0007																
Tetrahydrofuran	NS				0.012												
Trichlorofluoromethane	2								0.0029								
Vanadium	0.0003 **	**0.0064**															
Vinyl Chloride	0.00003						**0.0012**		**0.00066**								
Zinc	1	0.0289				0.044								0.032			0.023
Alkalinity	NS																
Ammonia-N	NS																
Carbon Dioxide	NS																
Total Dissolved Solids	500																
Sulfate	250																
Sulfide	NS																
Chloride	250																

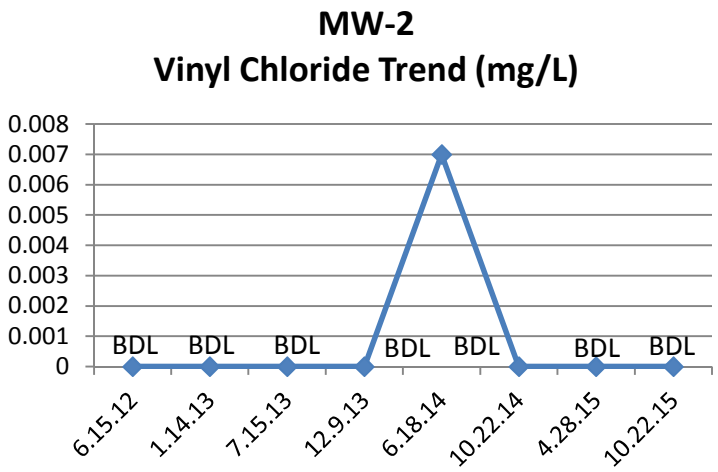
* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

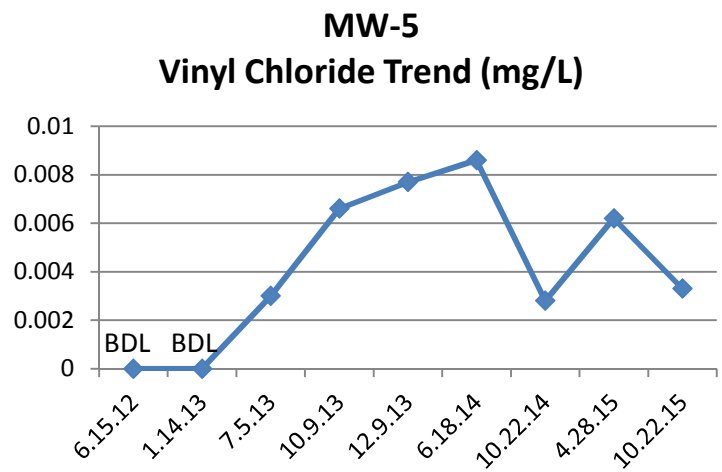
Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

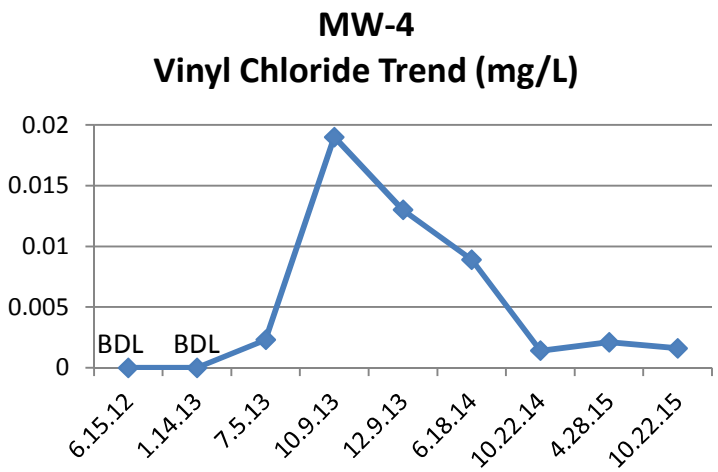
Constituent	NCDENR Standard (mg/L) *	SW-2(Pipe Eff)							
		6.15.12	1.14.13	7.5.13	12.9.13	6.18.14	10.22.14	4.28.15	10.22.15
Acetone	6								
Aluminium	NS				0.15				
Arsenic	0.01				0.0024	0.002			0.0013
Barium	0.7		0.0366	0.055	0.066	0.083	0.12		0.081
Benzene	0.001								
Beryllium	0.004 **								
Cadmium	2								
Calcium	NS								
Chloroform	0.07								
Chloroethane	3								
Chromium	0.01								
Cobalt	0.001 **								
Copper	1				0.0017				0.0014
Carbon Disulfide	0.7								
1,1-Dichloroethane	0.006								
1,1-Dichloroethene	0.35								
1,4-Dichlorobenzene	0.006								
cis-1,2-Dichloroethene	0.07								
Dinoseb	0.007								
Dieldrin	0.000002 **								
bis (2-Ethylhexyl) phthalate	0.003								
Ethylbenzene	0.6								
Toluene	0.6								
Xylenes	0.5								
Heptachlor	0.000008								
Heptaclor Epoxide	0.000004								
alpha-BHC	NS								
beta-BHC	NS								
gamma-BHC	NS								
Lead	0.015								
Manganese	0.05								
Mercury	0.001								
Methylene Chloride	0.005								
2,4-Methylphenol	NS								
Nickel	0.1								
Selenium	0.02				0.0018				
Tetrachloroethene	0.0007								
Tetrahydrofuran	NS								
Trichlorofluoromethane	2								
Vanadium	0.0003 **								
Vinyl Chloride	0.00003								
Zinc	1		0.0112			0.031			0.02
Alkalinity	NS								
Ammonia-N	NS								
Carbon Dioxide	NS								
Total Dissolved Solids	500								
Sulfate	250								
Sulfide	NS								
Chloride	250								

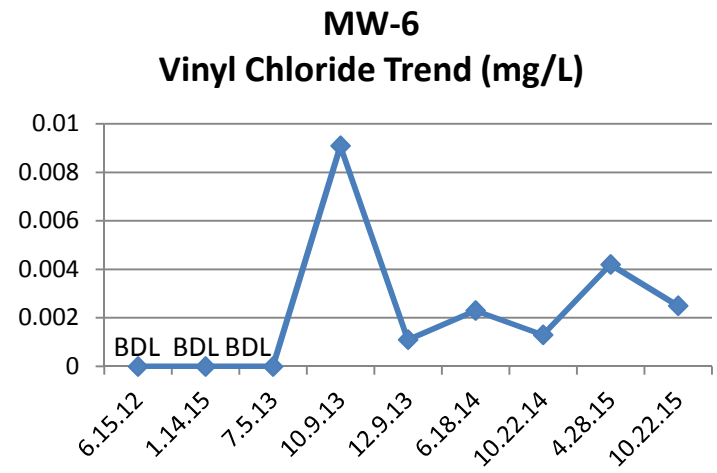
* NCDENR Standard = 15A NCAC 02L .0202
** Interim Maximum Allowable Concentrati
Bold values exceed the NCDENR Stan

Charts for Table 1
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

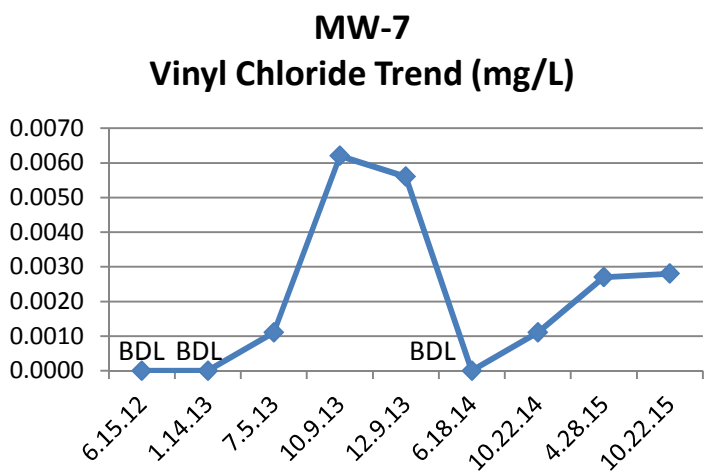


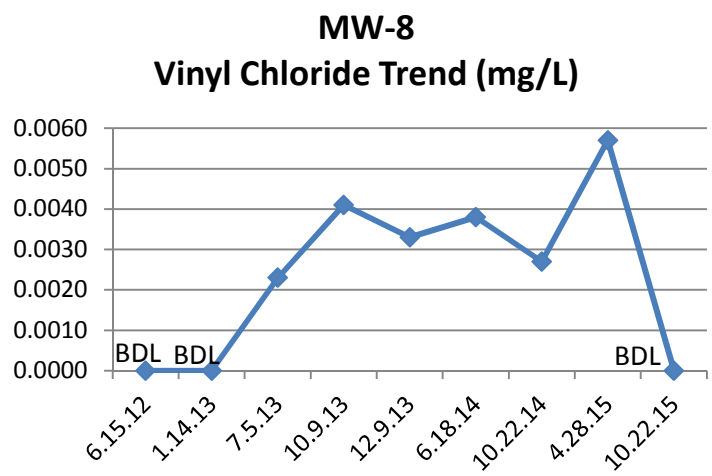


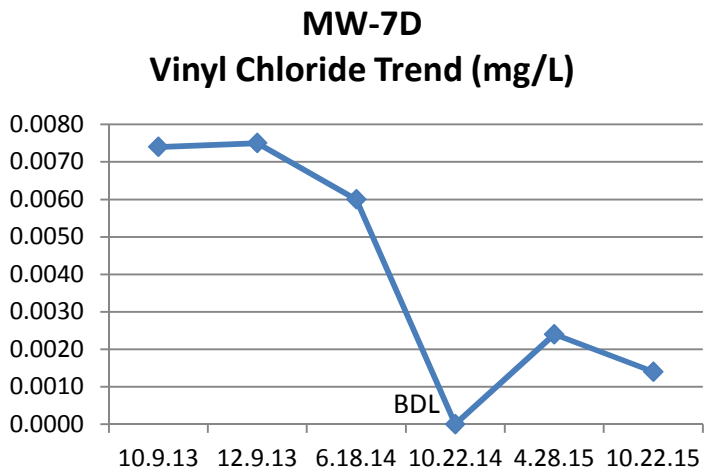


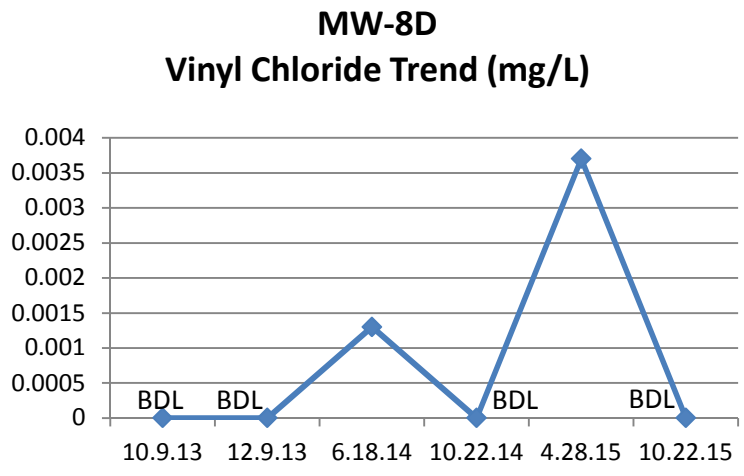


Charts for Table 1
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

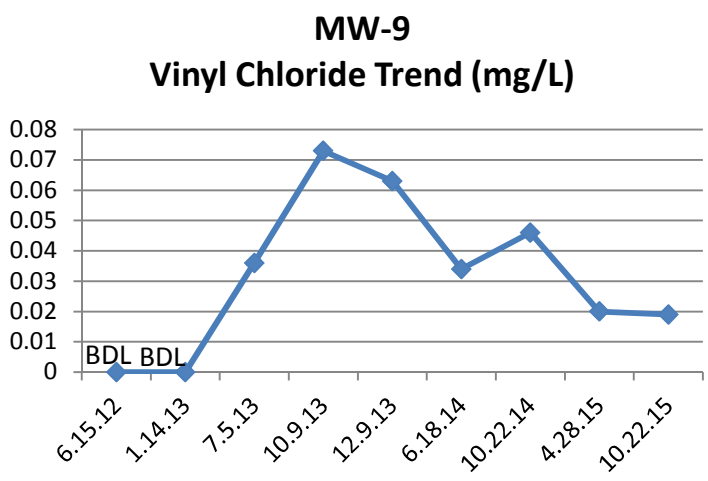


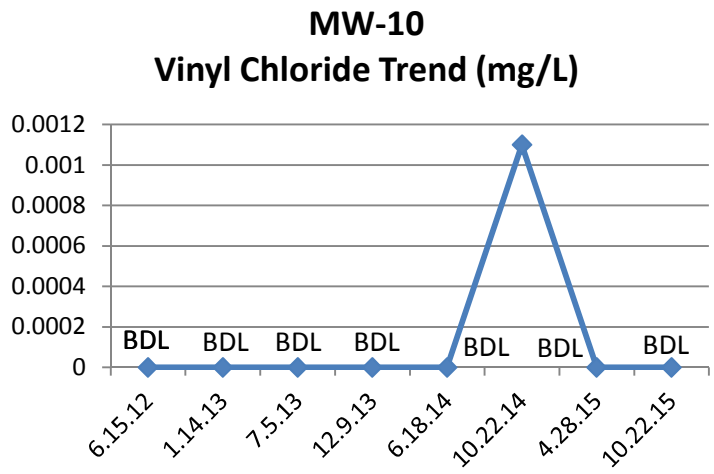


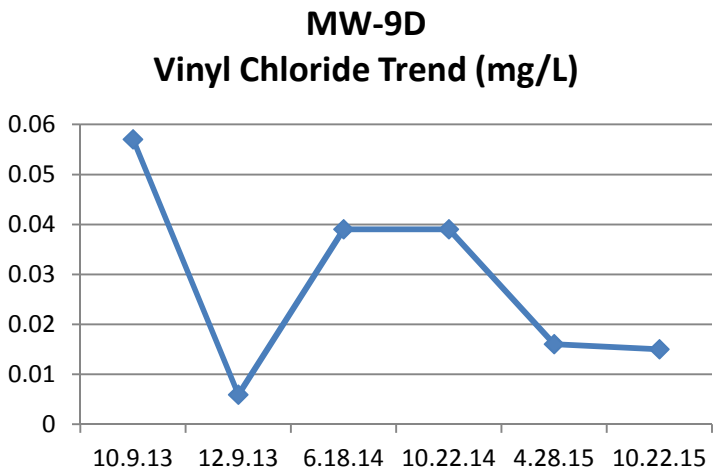


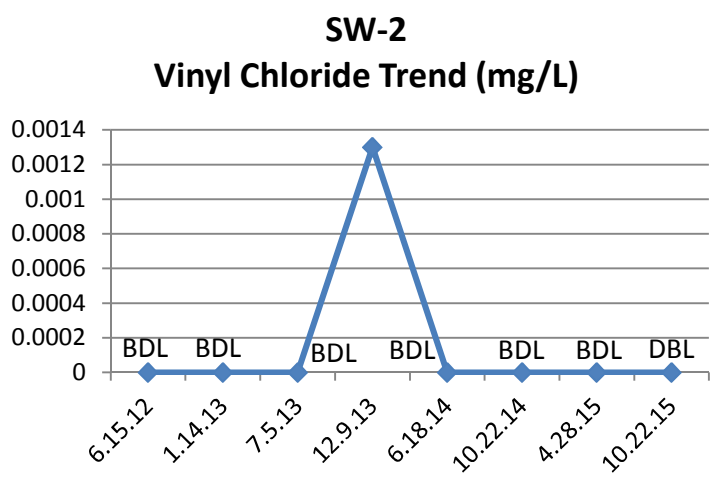


Charts for Table 1
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001









Charts for Table 1
North Meck C&D Landfill - Infill Expansion Area
CEC Project No. 111-370.001

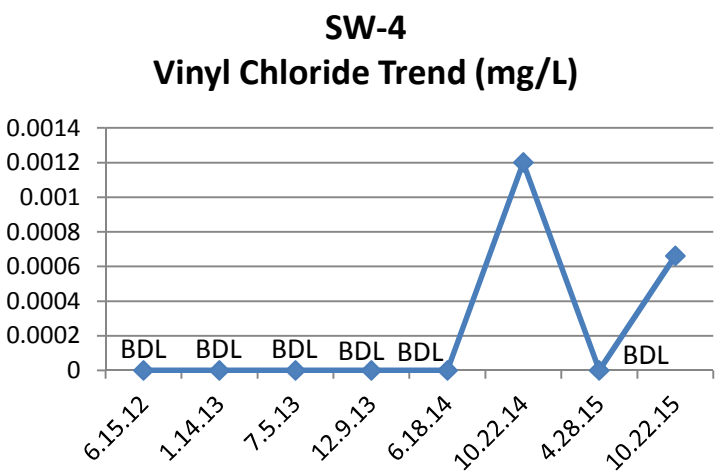


Table 2. Summary of Recent Site Methane Monitoring Data
Infill Expansion Area Landfill
CEC Project No. 111-370.001

% Methane					
	Sample Date				
Well ID	1/19/14	5/8/14	1/9/15	7/24/15	10/22/15
MMW-1	0.0	0.0	0.0	0.0	0.0
MMW-2	0.1	0.4	0.0	0.0	0.0
MMW-3	1.6	4.3	0.2	5.3	7.8
MMW-4	0.1	0.0	0.0	0.0	0.0
MMW-5	0.0	0.0	0.0	0.0	0.0
MMW-6	0.0	0.0	0.0	0.0	6.7
MMW-7	0.0	0.0	0.0	0.0	0.0
MMW-8	0.0	0.0	0.0	0.0	0.0
MMW-9	0.0	0.0	0.0	0.0	0.0
MMW-10	0.0	0.0	0.0	0.0	0.0
MMW-11	2.4	3.7	10.7	12.5	17.3

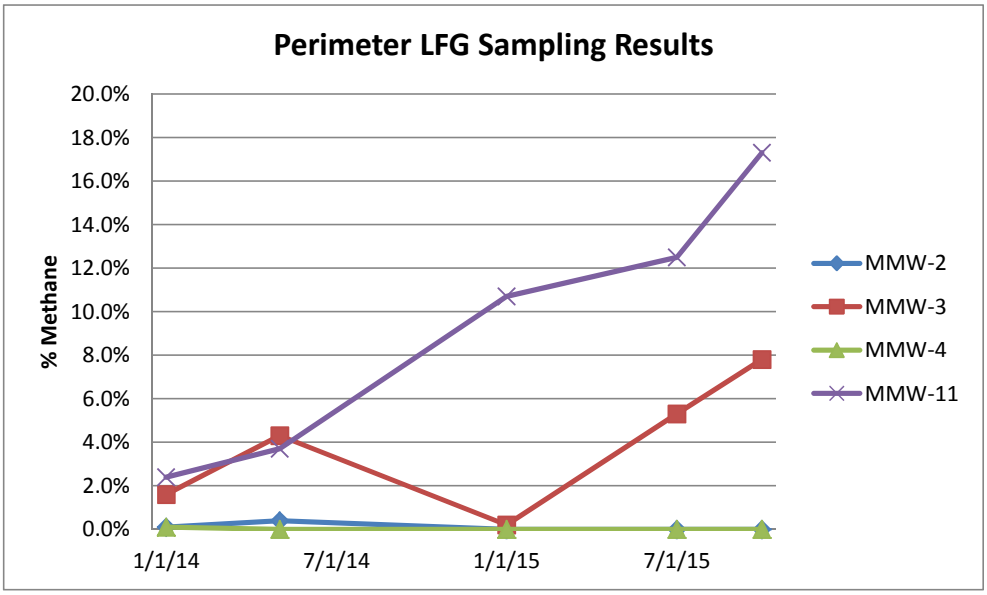


Table 3
Landfill Gas and Groundwater Monitoring Well Headspace Vapor Data
North Meck C&D Landfill
CEC Project No. 111-370.001

	GW-3		GW-6		MW-4D-1		MW-9-INFILL	
	Percent (%)							
Carbon Dioxide	6.04		0.131		0.355		0.131	
Carbon Monoxide	0.0904		0.0913		0.0922		0.0914	
Hydrogen	0.121		0.122		0.124		0.123	
Methane	2.5		0.0733		0.074		0.0734	
Nitrogen	70.4		74.6		74.5		75.5	
Oxygen	16.9		19.4		19.4		19.6	
	ppbv	**µg/m3**	**ppbv**	**µg/m3**	**ppbv**	**µg/m3**	**ppbv**	**µg/m3**
Propylene	ND	ND			39.9	69.8	2.37	4.14
Dichlorodifluoromethane (Freon 12)	1.14	5.72	0.672	3.38	1.33	6.69	0.632	3.18
Chloromethane	0.678	1.42	0.786	1.65	0.734	1.54	0.877	1.84
Vinyl Chloride	0.231	0.601	0.278	0.721	0.25	0.649	0.879	2.28
Bromomethane	0.965	3.81	ND	ND	ND	ND	ND	ND
Chloroethane	1.65	4.41	ND	ND	0.589	1.58	0.797	2.14
Trichlorofluoromethane (Freon 11)	0.244	1.4	0.276	1.57	0.257	1.47	0.237	1.35
Ethanol	18.1	34.6	3.22	6.16	3.33	6.38	4.97	9.52
Acrolein	ND	ND	0.626	1.46	ND	ND	0.685	1.6
Trichlorotrifluoroethane (Freon 113)	ND	ND	ND	ND	0.109	0.847	0.107	0.83
Acetone	130	313	13.3	32	16.3	39.3	7.78	18.8
Carbon Disulfide	0.368	1.16	0.119	0.377	0.214	0.676	0.284	0.898
Isopropyl Alcohol	6.37	15.9	1.99	4.97	0.943	2.35	2.7	6.75
Methylene Chloride	ND	ND	0.207	0.73	ND	ND	ND	ND
Hexane	16.6	59.4	9.97	35.7	16.6	59.4	0.231	0.828
1,1-Dichloroethane	ND	ND	ND	ND	0.139	0.572	0.651	2.68
Vinyl Acetate	0.0958	0.343	ND	ND	ND	ND	ND	ND
cis-1,2,-Dichloroethene	ND	ND	0.14	0.565	0.13	0.524	0.472	1.9
2-Butanone (MEK)	ND	ND	0.872	2.61	6.11	18.3	1.02	3.05
Tetrahydrofuran	ND	ND	ND	ND	13.1	39.3	0.0961	0.288
Cyclohexane	18	62.9	2.5	8.73	3.93	13.7	ND	ND
Carbon Tetrachloride	0.0952	0.609	0.109	0.7	0.105	0.672	0.106	0.68
Benzene	5.57	18.1	2	6.51	0.538	1.75	0.263	0.854
2,2,4-Trimethylpentane	106	503	6.42	30.5	4	19	ND	ND
Heptane	2.57	10.7	2.93	12.2	4.68	19.5	0.216	0.902
1,2-Dichloropropane	ND	ND	0.183	0.86	ND	ND	ND	ND
Methyl Isobutyl Ketone	ND	ND	ND	ND	ND	ND	0.0929	0.387
Toluene	0.798	3.06	0.991	3.8	0.486	1.86	0.395	1.51
Tetrachloroethene	0.14	0.965	0.935	6.44	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND	0.143	0.595
Ethylbenzene	0.219	0.968	0.201	0.885	0.183	0.806	0.111	0.491
m-/p-Xylenes	0.738	3.26	0.53	2.34	0.364	1.6	ND	ND
o-Xylene	0.2	0.884	ND	ND	0.142	0.627	ND	ND
1,2,4-Trimethylbenzene	0.129	0.646	0.13	0.648	0.0989	0.494	ND	ND
1,3,5-Trimethylbenzene	ND	ND	0.0866	0.433	ND	ND	ND	ND

ppbv = parts per billion per volume
µg/m3 = micorgrams per cubic meter

Table 4

Maximum Detected Groundwater VOC Concentrations in Site Landfill Compared with Maximum Groundwater VOC Concentrations Attributed to Vapor Phase Migration from Morris (Rust Environmental & Infrastructure)

Analyte	Maximum VOC Concentration in Site Landfill Wells (µg/L)	Maximum VOC Concentration Attributed to Vapor Phase Migration from Morris [1]
Chlorinated VOCs		
1,1-Dichloroethane	3.3	120
1,1-Dichloroethene	3.7	ND
cis-1,2-Dichloroethene	54	10
Vinyl Chloride	27	42
Aromatic VOCs		
Benzene	2.7	17
Ethylbenzene	1.5	34
Toluene	7.4	140
Xylenes	8.1	ND

ND = No Data Available

[1] Data from Table 3 in Morris, Harry H. *The Potential for Landfill Gas to Impact Ground Water Quality. Abstract.* Rust Environmental & Infrastructure (see below).

Table 3
Maximum VOC Conentrations Detected in Ground Water Attributed to Vapor Phase Contaminant Migration

COMPOUND	SITE NUMBER											MAXIMUM
	01 (UG/L)	02 (UG/L)	03* (UG/L)	04 (UG/L)	05 (UG/L)	06 (UG/L)	07 UG/L	08 (UG/L)	09 (UG/L)	10 (UG/L)	No. of Sites	CONCENTRATION (UG/L)
TRICHLOROETHYLENE		20		3	30			3	5.7	3	6	30
TETRACHLOROETHYLENE		67		5	100			7	52	5	6	100
1,1,1-TRICHLOROETHANE		184					12				2	184
METHYLENE CHLORIDE					17				44	8	3	44
TRANS-1,2-DICHLOROETHYLENE		230									1	230
VINYL CHLORIDE	10	42			32				28		4	42
1,1-DICHLOROETHANE		117		10	22	120	14	7		11	7	120
CIS-1,2-DICHLOROETHYLENE				10						10	2	10
DICHLORODIFLUOROMETHANE								24			1	24
TOLUENE					140						1	140
BENZENE					17						1	17
CHLOROFORM		3									1	3
ETHYLBENZENE					34						1	34
XYLENE												
1,2-DICHLOROETHANE		65									1	65

APPENDIX A

Civil & Environmental Consultants, Inc. - Charlotte

1900 Center Park Drive, Suite A
Charlotte, NC 28217

111-370-.001

Analytical Report
(1114-90)

EPA Method TO-15

TO-15 Target Compound List

ASTM D1946-90

Carbon dioxide, Carbon monoxide, Hydrogen,
Methane, Nitrogen, Oxygen

Enthalpy Analytical, Inc.

Phone: (919) 850 - 4392 / Fax: (919) 850 - 9012 / www.enthalpy.com
800-1 Capitola Drive Durham, NC 27713-4385

I certify that to the best of my knowledge all analytical data presented in this report:

- Have been checked for completeness
- Are accurate, error-free, and legible
- Have been conducted in accordance with approved protocol, and that all deviations and analytical problems are summarized in the appropriate narrative(s)

This analytical report was prepared in Portable Document Format (.PDF) and contains 117 pages.

Kristen H Bounds

QA Reviewed by – Kristen H. Bounds

Report Issued: 04/27/2015

Summary of Results

Company	Civil & Env Consultants, Inc.
Analyst	JKG
Parameters	ASTM D1946-90

Client #	111-370-.001
Job #	1114-90
# Samples	4 cans

Compound	Sample ID / Sample Concentration (%)		
	MW-4D-1	***MW-9-INFILL***	***GW-3***
	Can #174	***Can #198***	***Can #124***
Hydrogen	0.124 ND	0.123 ND	0.121 ND
Oxygen	19.4	19.6	16.9
Nitrogen	74.5	75.5	70.4
Carbon Monoxide	0.0922 ND	0.0914 ND	0.0904 ND
Methane	0.0740 ND	0.0734 ND	2.50
Carbon Dioxide	0.355 J	0.131 ND	6.04

	GW-6
	Can #943
Hydrogen	0.122 ND
Oxygen	19.4
Nitrogen	74.6
Carbon Monoxide	0.0913 ND
Methane	0.0733 ND
Carbon Dioxide	0.131 ND

Results

Enthalpy Analytical

Company: Civil & Environmental Consultants, Inc. - Charlotte
Client No: 111-370-.001
Job No: 1114-90

Parameters: ASTM D1946-90
Samples: 4 cans
Analyst: Justin Guenzler

Sample ID	Filename #1	Filename #2	Analysis Method	Curve Min	Curve Max	MDL	Ret Time (min)	Ret Time (min)	%dif RT	Tank Dil	Conc #1	Conc #2	%dif conc	Units	Avg Conc	Final Conc %	Flag
Hydrogen																	
MW-4D-1 (Can #174)	006F0501.D	006F0502.D	BETTYP162_FGA.M	0.310	28.5	0.0510	NA	NA	NA	2.425	0.0510	0.0510	0.0	%	0.0510	0.124	ND
MW-9-Infill (Can #198)	005F0601.D	005F0602.D	BETTYP162_FGA.M	0.310	28.5	0.0510	NA	NA	NA	2.406	0.0510	0.0510	0.0	%	0.0510	0.123	ND
GW-3 (Can #124)	004F0701.D	004F0702.D	BETTYP162_FGA.M	0.310	28.5	0.0510	NA	NA	NA	2.378	0.0510	0.0510	0.0	%	0.0510	0.121	ND
GW-6 (Can #943)	004F0101.D	004F0102.D	BETTYP162_FGA.M	0.310	28.5	0.0510	NA	NA	NA	2.403	0.0510	0.0510	0.0	%	0.0510	0.122	ND
Oxygen																	
MW-4D-1 (Can #174)	006F0501.D	006F0502.D	BETTYP162_FGA.M	0.544	100	0.0544	4.49	4.50	0.0	2.425	7.97	7.99	0.1	%	7.98	19.4	
MW-9-Infill (Can #198)	005F0601.D	005F0602.D	BETTYP162_FGA.M	0.544	100	0.0544	4.49	4.49	0.0	2.406	8.15	8.17	0.1	%	8.16	19.6	
GW-3 (Can #124)	004F0701.D	004F0702.D	BETTYP162_FGA.M	0.544	100	0.0544	4.50	4.50	0.0	2.378	7.09	7.12	0.2	%	7.11	16.9	
GW-6 (Can #943)	004F0101.D	004F0102.D	BETTYP162_FGA.M	0.544	100	0.0544	4.50	4.49	0.0	2.403	8.09	8.05	0.2	%	8.07	19.4	
Nitrogen																	
MW-4D-1 (Can #174)	006F0501.D	006F0502.D	BETTYP162_FGA.M	0.380	99.9	0.0382	4.76	4.76	0.0	2.425	30.5	31.0	0.8	%	30.7	74.5	
MW-9-Infill (Can #198)	005F0601.D	005F0602.D	BETTYP162_FGA.M	0.380	99.9	0.0382	4.76	4.76	0.0	2.406	31.3	31.5	0.2	%	31.4	75.5	
GW-3 (Can #124)	004F0701.D	004F0702.D	BETTYP162_FGA.M	0.380	99.9	0.0382	4.77	4.77	0.0	2.378	29.6	29.7	0.2	%	29.6	70.4	
GW-6 (Can #943)	004F0101.D	004F0102.D	BETTYP162_FGA.M	0.380	99.9	0.0382	4.76	4.76	0.0	2.403	31.0	31.1	0.2	%	31.1	74.6	
Carbon monoxide																	
MW-4D-1 (Can #174)	006F0501.D	006F0502.D	BETTYP162_FGA.M	0.380	99.5	0.0380	NA	NA	NA	2.425	0.0380	0.0380	0.0	%	0.0380	0.0922	ND
MW-9-Infill (Can #198)	005F0601.D	005F0602.D	BETTYP162_FGA.M	0.380	99.5	0.0380	NA	NA	NA	2.406	0.0380	0.0380	0.0	%	0.0380	0.0914	ND
GW-3 (Can #124)	004F0701.D	004F0702.D	BETTYP162_FGA.M	0.380	99.5	0.0380	NA	NA	NA	2.378	0.0380	0.0380	0.0	%	0.0380	0.0904	ND
GW-6 (Can #943)	004F0101.D	004F0102.D	BETTYP162_FGA.M	0.380	99.5	0.0380	NA	NA	NA	2.403	0.0380	0.0380	0.0	%	0.0380	0.0913	ND

Enthalpy Analytical

Company: Civil & Environmental Consultants, Inc. - Charlotte
Client No: 111-370-.001
Job No: 1114-90

Parameters: ASTM D1946-90
Samples: 4 cans
Analyst: Justin Guenzler

Sample ID	Filename #1	Filename #2	Analysis Method	Curve Min	Curve Max	MDL	Ret Time (min)	Ret Time (min)	%dif RT	Tank Dil	Conc #1	Conc #2	%dif conc	Units	Avg Conc	Final Conc %	Flag
Methane																	
MW-4D-1 (Can #174)	006F0501.D	006F0502.D	BETTYP162_FGA.M	0.310	100	0.0305	NA	NA	NA	2.425	0.0305	0.0305	0.0	%	0.0305	0.0740	ND
MW-9-Infill (Can #198)	005F0601.D	005F0602.D	BETTYP162_FGA.M	0.310	100	0.0305	NA	NA	NA	2.406	0.0305	0.0305	0.0	%	0.0305	0.0734	ND
GW-3 (Can #124)	004F0701.D	004F0702.D	BETTYP162_FGA.M	0.310	100	0.0305	9.88	9.88	0.0	2.378	1.05	1.06	0.3	%	1.05	2.50	
GW-6 (Can #943)	004F0101.D	004F0102.D	BETTYP162_FGA.M	0.310	100	0.0305	NA	NA	NA	2.403	0.0305	0.0305	0.0	%	0.0305	0.0733	ND
Carbon Dioxide																	
MW-4D-1 (Can #174)	006F0501.D	006F0502.D	BETTYP162_FGA.M	0.540	100	0.0544	13.20	13.19	0.0	2.425	0.143	0.150	2.4	%	0.146	0.355	J
MW-9-Infill (Can #198)	005F0601.D	005F0602.D	BETTYP162_FGA.M	0.540	100	0.0544	NA	NA	NA	2.406	0.0544	0.0544	0.0	%	0.0544	0.131	ND
GW-3 (Can #124)	004F0701.D	004F0702.D	BETTYP162_FGA.M	0.540	100	0.0544	13.17	13.17	0.0	2.378	2.52	2.56	0.7	%	2.54	6.04	
GW-6 (Can #943)	004F0101.D	004F0102.D	BETTYP162_FGA.M	0.540	100	0.0544	NA	NA	NA	2.403	0.0544	0.0544	0.0	%	0.0544	0.131	ND

Sample Name	: MW-4D-1 Can 174
Sample Info	: 1114-90, 500mL load
Data File	: L1501442.D
Dilution	: 1
Pressurization Factor	: 2.425
Acquisition Date	: 2015-04-14 19:09:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Propylene	39.9	0.255	0.0849	69.8	0.445	0.148	
Freon 12 (CCl2F2)	1.33	0.233	0.0849	6.69	1.17	0.427	
Freon 114 (C2Cl2F4)	ND	0.233	0.0849	ND	1.65	0.603	
Chloromethane	0.734	0.233	0.0849	1.54	0.489	0.178	m
Chloroethene (Vinyl chloride)	0.250	0.235	0.0849	0.649	0.611	0.221	
1,3-Butadiene	ND	0.247	0.0849	ND	0.556	0.191	
Bromomethane	ND	0.235	0.0849	ND	0.928	0.335	
Chloroethane	0.589	0.233	0.0849	1.58	0.624	0.228	
Bromoethene (Vinyl bromide)	ND	0.250	0.0849	ND	1.11	0.377	
Freon 11 (CCl3F)	0.257	0.243	0.0849	1.47	1.38	0.485	
Ethanol	3.33	0.255	0.170	6.38	0.488	0.325	
Acrolein	ND	0.238	0.0849	ND	0.554	0.198	
Freon 113 (C2Cl3F3)	0.109	0.252	0.0849	0.847	1.96	0.661	J
1,1-Dichloroethene	ND	0.255	0.0849	ND	1.03	0.342	
Acetone	16.3	0.257	0.170	39.3	0.621	0.410	
Carbon disulfide	0.214	0.255	0.170	0.676	0.806	0.537	J
Isopropyl alcohol	0.943	0.269	0.170	2.35	0.672	0.424	
Allyl chloride (3-chloropropene)	ND	0.259	0.0849	ND	0.825	0.270	
Acetonitrile	ND	0.228	0.170	ND	0.389	0.290	
Methylene chloride	ND	2.50	0.970	ND	8.82	3.42	
trans-1,2-Dichloroethene	ND	0.250	0.0849	ND	1.01	0.342	
Methyl tert-butyl ether	ND	0.250	0.0849	ND	0.915	0.311	
Acrylonitrile	ND	0.243	0.0849	ND	0.535	0.187	
Hexane	16.6	0.252	0.0849	59.4	0.903	0.304	
1,1-Dichloroethane	0.139	0.247	0.0849	0.572	1.02	0.349	J
Vinyl acetate	ND	0.255	0.0849	ND	0.911	0.304	
cis-1,2-Dichloroethylene	0.130	0.252	0.0849	0.524	1.02	0.342	m J
Methyl ethyl ketone (2-Butanone)	6.11	0.252	0.0849	18.3	0.756	0.254	
Ethyl acetate	ND	0.252	0.0849	ND	0.924	0.311	
Chloroform	ND	0.252	0.0849	ND	1.25	0.421	
Tetrahydrofuran	13.1	0.247	0.0849	39.3	0.741	0.254	
1,1,1-Trichloroethane	ND	0.243	0.0849	ND	1.34	0.471	
Cyclohexane	3.93	0.250	0.0849	13.7	0.874	0.297	m
Carbon tetrachloride	0.105	0.247	0.0849	0.672	1.58	0.543	J
Benzene	0.538	0.247	0.0849	1.75	0.803	0.276	
2,2,4-trimethylpentane	4.00	0.252	0.0849	19.0	1.20	0.403	
1,2-Dichloroethane	ND	0.247	0.0849	ND	1.02	0.349	
Heptane	4.68	0.252	0.0849	19.5	1.05	0.354	
Trichloroethene	ND	0.247	0.0849	ND	1.35	0.464	
1,2-Dichloropropane	ND	0.247	0.0849	ND	1.16	0.399	
Methyl methacrylate	ND	0.245	0.0849	ND	1.02	0.353	
1,4-Dioxane	ND	0.247	0.0849	ND	0.906	0.311	
Bromodichloromethane	ND	0.247	0.0849	ND	1.68	0.578	
cis-1,3-Dichloropropene	ND	0.257	0.0849	ND	1.19	0.392	
Methyl isobutyl ketone	ND	0.243	0.0849	ND	1.01	0.353	
Toluene	0.486	0.250	0.0849	1.86	0.957	0.325	
trans-1,3-Dichloropropene	ND	0.262	0.0849	ND	1.21	0.392	
1,1,2-Trichloroethane	ND	0.247	0.0849	ND	1.37	0.471	
Tetrachloroethene	ND	0.243	0.0849	ND	1.67	0.585	
2-Hexanone (Methyl butyl ketone)	ND	0.259	0.0849	ND	1.08	0.353	

Sample Name	: MW-4D-1 Can 174
Sample Info	: 1114-90, 500mL load
Data File	: L1501442.D
Dilution	: 1
Pressurization Factor	: 2.425
Acquisition Date	: 2015-04-14 19:09:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Dibromochloromethane	ND	0.247	0.0849	ND	2.14	0.735	
1,2-Dibromoethane	ND	0.245	0.0849	ND	1.91	0.663	
Chlorobenzene	ND	0.250	0.0849	ND	1.17	0.397	
Ethylbenzene	0.183	0.247	0.0849	0.806	1.09	0.375	J
1,1,1,2-Tetrachloroethane	ND	0.255	0.0849	ND	1.78	0.592	
m-/p-Xylenes	0.364	0.480	0.170	1.60	2.12	0.749	J
o-Xylene	0.142	0.250	0.0849	0.627	1.10	0.375	J
Styrene	ND	0.247	0.0849	ND	1.07	0.367	
Bromoform	ND	0.240	0.0849	ND	2.52	0.892	
1,1,2,2-Tetrachloroethane	ND	0.250	0.0849	ND	1.74	0.592	
4-Ethyltoluene	ND	0.245	0.0849	ND	1.22	0.424	
2-Chlorotoluene	ND	0.250	0.0849	ND	1.31	0.447	
1,3,5-Trimethylbenzene	ND	0.243	0.0849	ND	1.21	0.424	
1,2,4-Trimethylbenzene	0.0989	0.243	0.0849	0.494	1.21	0.424	m J
1,3-Dichlorobenzene	ND	0.247	0.0849	ND	1.51	0.519	
1,4-Dichlorobenzene	ND	0.240	0.0849	ND	1.47	0.519	
Benzyl chloride	ND	0.247	0.0849	ND	1.30	0.447	
1,2-Dichlorobenzene	ND	0.243	0.0849	ND	1.48	0.519	
1,2,4-Trichlorobenzene	ND	0.221	0.0849	ND	1.66	0.640	
Hexachlorobutadiene	ND	0.226	0.0849	ND	2.44	0.920	
Naphthalene	ND	0.235	0.0849	ND	1.25	0.452	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,062,384	12.39	9.50	PASS
1,4-Difluorobenzene (IS)	3,105,439	14.29	9.60	PASS
Chlorobenzene-d5 (IS)	2,944,921	18.75	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: MW-9-Infill Can 198
Sample Info	: 1114-90, 500mL load
Data File	: L1501443.D
Dilution	: 1
Pressurization Factor	: 2.406
Acquisition Date	: 2015-04-14 19:59:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Propylene	2.37	0.253	0.0842	4.14	0.442	0.147	
Freon 12 (CCl2F2)	0.632	0.231	0.0842	3.18	1.16	0.423	m
Freon 114 (C2Cl2F4)	ND	0.231	0.0842	ND	1.64	0.598	
Chloromethane	0.877	0.231	0.0842	1.84	0.485	0.177	m
Chloroethene (Vinyl chloride)	0.879	0.233	0.0842	2.28	0.606	0.219	
1,3-Butadiene	ND	0.245	0.0842	ND	0.552	0.189	
Bromomethane	ND	0.233	0.0842	ND	0.921	0.332	
Chloroethane	0.797	0.231	0.0842	2.14	0.619	0.226	
Bromoethene (Vinyl bromide)	ND	0.248	0.0842	ND	1.10	0.374	
Freon 11 (CCl3F)	0.237	0.241	0.0842	1.35	1.37	0.481	J
Ethanol	4.97	0.253	0.168	9.52	0.484	0.323	
Acrolein	0.685	0.236	0.0842	1.60	0.550	0.196	
Freon 113 (C2Cl3F3)	0.107	0.250	0.0842	0.830	1.95	0.656	J
1,1-Dichloroethene	ND	0.253	0.0842	ND	1.02	0.339	
Acetone	7.78	0.255	0.168	18.8	0.616	0.407	
Carbon disulfide	0.284	0.253	0.168	0.898	0.800	0.533	
Isopropyl alcohol	2.70	0.267	0.168	6.75	0.667	0.421	
Allyl chloride (3-chloropropene)	ND	0.257	0.0842	ND	0.819	0.268	
Acetonitrile	ND	0.226	0.168	ND	0.386	0.287	
Methylene chloride	ND	2.48	0.962	ND	8.75	3.40	
trans-1,2-Dichloroethene	ND	0.248	0.0842	ND	0.999	0.339	
Methyl tert-butyl ether	ND	0.248	0.0842	ND	0.908	0.309	
Acrylonitrile	ND	0.241	0.0842	ND	0.531	0.186	
Hexane	0.231	0.250	0.0842	0.828	0.896	0.302	J
1,1-Dichloroethane	0.651	0.245	0.0842	2.68	1.01	0.346	
Vinyl acetate	ND	0.253	0.0842	ND	0.904	0.301	
cis-1,2-Dichloroethylene	0.472	0.250	0.0842	1.90	1.01	0.339	
Methyl ethyl ketone (2-Butanone)	1.02	0.250	0.0842	3.05	0.750	0.252	
Ethyl acetate	ND	0.250	0.0842	ND	0.916	0.308	
Chloroform	ND	0.250	0.0842	ND	1.24	0.418	
Tetrahydrofuran	0.0961	0.245	0.0842	0.288	0.736	0.252	J
1,1,1-Trichloroethane	ND	0.241	0.0842	ND	1.33	0.467	
Cyclohexane	ND	0.248	0.0842	ND	0.867	0.295	
Carbon tetrachloride	0.106	0.245	0.0842	0.680	1.57	0.538	J
Benzene	0.263	0.245	0.0842	0.854	0.797	0.273	
2,2,4-trimethylpentane	ND	0.250	0.0842	ND	1.19	0.400	
1,2-Dichloroethane	ND	0.245	0.0842	ND	1.01	0.346	
Heptane	0.216	0.250	0.0842	0.902	1.04	0.351	J
Trichloroethene	ND	0.245	0.0842	ND	1.34	0.460	
1,2-Dichloropropane	ND	0.245	0.0842	ND	1.15	0.396	
Methyl methacrylate	ND	0.243	0.0842	ND	1.01	0.350	
1,4-Dioxane	ND	0.245	0.0842	ND	0.899	0.308	
Bromodichloromethane	ND	0.245	0.0842	ND	1.67	0.573	
cis-1,3-Dichloropropene	ND	0.255	0.0842	ND	1.18	0.388	
Methyl isobutyl ketone	0.0929	0.241	0.0842	0.387	1.00	0.351	m J
Toluene	0.395	0.248	0.0842	1.51	0.949	0.323	
trans-1,3-Dichloropropene	ND	0.260	0.0842	ND	1.20	0.388	
1,1,2-Trichloroethane	ND	0.245	0.0842	ND	1.36	0.467	
Tetrachloroethene	ND	0.241	0.0842	ND	1.66	0.581	
2-Hexanone (Methyl butyl ketone)	0.143	0.257	0.0842	0.595	1.07	0.351	J

Sample Name	: MW-9-Infill Can 198
Sample Info	: 1114-90, 500mL load
Data File	: L1501443.D
Dilution	: 1
Pressurization Factor	: 2.406
Acquisition Date	: 2015-04-14 19:59:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Dibromochloromethane	ND	0.245	0.0842	ND	2.12	0.729	
1,2-Dibromoethane	ND	0.243	0.0842	ND	1.90	0.658	
Chlorobenzene	ND	0.248	0.0842	ND	1.16	0.394	
Ethylbenzene	0.111	0.245	0.0842	0.491	1.08	0.372	J
1,1,1,2-Tetrachloroethane	ND	0.253	0.0842	ND	1.76	0.588	
m-/p-Xylenes	ND	0.476	0.168	ND	2.10	0.743	
o-Xylene	ND	0.248	0.0842	ND	1.09	0.372	
Styrene	ND	0.245	0.0842	ND	1.06	0.365	
Bromoform	ND	0.238	0.0842	ND	2.50	0.885	
1,1,2,2-Tetrachloroethane	ND	0.248	0.0842	ND	1.73	0.588	
4-Ethyltoluene	ND	0.243	0.0842	ND	1.21	0.421	
2-Chlorotoluene	ND	0.248	0.0842	ND	1.30	0.443	
1,3,5-Trimethylbenzene	ND	0.241	0.0842	ND	1.20	0.421	
1,2,4-Trimethylbenzene	ND	0.241	0.0842	ND	1.20	0.421	
1,3-Dichlorobenzene	ND	0.245	0.0842	ND	1.50	0.515	
1,4-Dichlorobenzene	ND	0.238	0.0842	ND	1.46	0.515	
Benzyl chloride	ND	0.245	0.0842	ND	1.29	0.443	
1,2-Dichlorobenzene	ND	0.241	0.0842	ND	1.47	0.515	
1,2,4-Trichlorobenzene	ND	0.219	0.0842	ND	1.65	0.635	
Hexachlorobutadiene	ND	0.224	0.0842	ND	2.43	0.913	
Naphthalene	ND	0.233	0.0842	ND	1.24	0.449	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,076,307	12.39	9.50	PASS
1,4-Difluorobenzene (IS)	3,134,842	14.29	9.60	PASS
Chlorobenzene-d5 (IS)	2,932,308	18.74	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: GW-3 Can 124
Sample Info	: 1114-90, 500mL load
Data File	: L1501439.D
Dilution	: 1
Pressurization Factor	: 2.378
Acquisition Date	: 2015-04-14 16:48:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Propylene	ND	0.250	0.0832	ND	0.437	0.146	
Freon 12 (CCl2F2)	1.14	0.228	0.0832	5.72	1.15	0.418	m
Freon 114 (C2Cl2F4)	ND	0.228	0.0832	ND	1.62	0.591	
Chloromethane	0.678	0.228	0.0832	1.42	0.479	0.175	m
Chloroethene (Vinyl chloride)	0.231	0.231	0.0832	0.601	0.599	0.216	
1,3-Butadiene	ND	0.243	0.0832	ND	0.545	0.187	
Bromomethane	0.965	0.231	0.0832	3.81	0.910	0.328	
Chloroethane	1.65	0.228	0.0832	4.41	0.612	0.223	
Bromoethene (Vinyl bromide)	ND	0.245	0.0832	ND	1.09	0.370	
Freon 11 (CCl3F)	0.244	0.238	0.0832	1.40	1.36	0.475	
Ethanol	18.1	0.250	0.166	34.6	0.478	0.319	
Acrolein	ND	0.233	0.0832	ND	0.543	0.194	
Freon 113 (C2Cl3F3)	ND	0.247	0.0832	ND	1.93	0.648	
1,1-Dichloroethene	ND	0.250	0.0832	ND	1.01	0.335	
Carbon disulfide	0.368	0.250	0.166	1.16	0.790	0.527	
Isopropyl alcohol	6.37	0.264	0.166	15.9	0.659	0.416	
Allyl chloride (3-chloropropene)	ND	0.254	0.0832	ND	0.809	0.265	
Acetonitrile	ND	0.224	0.166	ND	0.381	0.284	
Methylene chloride	ND	2.45	0.951	ND	8.65	3.36	
trans-1,2-Dichloroethene	ND	0.245	0.0832	ND	0.987	0.335	
Methyl tert-butyl ether	ND	0.245	0.0832	ND	0.898	0.305	
Acrylonitrile	ND	0.238	0.0832	ND	0.525	0.184	
Hexane	16.6	0.247	0.0832	59.4	0.886	0.298	
1,1-Dichloroethane	ND	0.243	0.0832	ND	0.998	0.342	
Vinyl acetate	0.0958	0.250	0.0832	0.343	0.894	0.298	J
cis-1,2-Dichloroethylene	ND	0.247	0.0832	ND	0.997	0.335	
Methyl ethyl ketone (2-Butanone)	ND	0.247	0.0832	ND	0.741	0.249	
Ethyl acetate	ND	0.247	0.0832	ND	0.906	0.305	
Chloroform	ND	0.247	0.0832	ND	1.23	0.413	
Tetrahydrofuran	ND	0.243	0.0832	ND	0.727	0.249	
1,1,1-Trichloroethane	ND	0.238	0.0832	ND	1.32	0.462	
Cyclohexane	18.0	0.245	0.0832	62.9	0.857	0.291	m
Carbon tetrachloride	0.0952	0.243	0.0832	0.609	1.55	0.532	J
Benzene	5.57	0.243	0.0832	18.1	0.788	0.270	
1,2-Dichloroethane	ND	0.243	0.0832	ND	0.998	0.342	
Heptane	2.57	0.247	0.0832	10.7	1.03	0.347	
Trichloroethene	ND	0.243	0.0832	ND	1.32	0.455	
1,2-Dichloropropane	ND	0.243	0.0832	ND	1.14	0.391	
Methyl methacrylate	ND	0.240	0.0832	ND	1.00	0.346	
1,4-Dioxane	ND	0.243	0.0832	ND	0.888	0.305	
Bromodichloromethane	ND	0.243	0.0832	ND	1.65	0.567	
cis-1,3-Dichloropropene	ND	0.252	0.0832	ND	1.16	0.384	
Methyl isobutyl ketone	ND	0.238	0.0832	ND	0.990	0.347	
Toluene	0.798	0.245	0.0832	3.06	0.938	0.319	
trans-1,3-Dichloropropene	ND	0.257	0.0832	ND	1.18	0.384	
1,1,2-Trichloroethane	ND	0.243	0.0832	ND	1.35	0.462	
Tetrachloroethene	0.140	0.238	0.0832	0.965	1.64	0.574	J
2-Hexanone (Methyl butyl ketone)	ND	0.254	0.0832	ND	1.06	0.347	
Dibromochloromethane	ND	0.243	0.0832	ND	2.10	0.721	
1,2-Dibromoethane	ND	0.240	0.0832	ND	1.88	0.650	

Sample Name	: GW-3 Can 124
Sample Info	: 1114-90, 500mL load
Data File	: L1501439.D
Dilution	: 1
Pressurization Factor	: 2.378
Acquisition Date	: 2015-04-14 16:48:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Chlorobenzene	ND	0.245	0.0832	ND	1.15	0.389	
Ethylbenzene	0.219	0.243	0.0832	0.968	1.07	0.367	J
1,1,1,2-Tetrachloroethane	ND	0.250	0.0832	ND	1.74	0.581	
m-/p-Xylenes	0.738	0.471	0.166	3.26	2.08	0.735	
o-Xylene	0.200	0.245	0.0832	0.884	1.08	0.367	J
Styrene	ND	0.243	0.0832	ND	1.05	0.360	
Bromoform	ND	0.235	0.0832	ND	2.47	0.874	
1,1,2,2-Tetrachloroethane	ND	0.245	0.0832	ND	1.71	0.581	
4-Ethyltoluene	ND	0.240	0.0832	ND	1.20	0.416	
2-Chlorotoluene	ND	0.245	0.0832	ND	1.29	0.438	
1,3,5-Trimethylbenzene	ND	0.238	0.0832	ND	1.19	0.416	
1,2,4-Trimethylbenzene	0.129	0.238	0.0832	0.646	1.19	0.416	J
1,3-Dichlorobenzene	ND	0.243	0.0832	ND	1.48	0.509	
1,4-Dichlorobenzene	ND	0.235	0.0832	ND	1.44	0.509	
Benzyl chloride	ND	0.243	0.0832	ND	1.28	0.438	
1,2-Dichlorobenzene	ND	0.238	0.0832	ND	1.45	0.509	
1,2,4-Trichlorobenzene	ND	0.216	0.0832	ND	1.63	0.628	
Hexachlorobutadiene	ND	0.221	0.0832	ND	2.40	0.902	
Naphthalene	ND	0.231	0.0832	ND	1.23	0.443	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	999,150	12.39	9.50	PASS
1,4-Difluorobenzene (IS)	2,951,626	14.29	9.60	PASS
Chlorobenzene-d5 (IS)	2,747,416	18.75	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: GW-3 Can 124
Sample Info	: 1114-90, 50mL load=*10
Data File	: L1501444.D
Dilution	: 10
Pressurization Factor	: 2.378
Acquisition Date	: 2015-04-14 20:42:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Acetone	130	2.52	1.66	313	6.09	4.02	
2,2,4-trimethylpentane	106	2.47	0.832	503	11.7	3.95	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,011,981	12.38	9.50	PASS
1,4-Difluorobenzene (IS)	2,997,809	14.29	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: GW-6 Can 943
Sample Info	: 1114-90, 500mL load
Data File	: L1501440.D
Dilution	: 1
Pressurization Factor	: 2.403
Acquisition Date	: 2015-04-14 17:37:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Propylene	ND	0.102	0.0841	ND	0.178	0.147	
Freon 12 (CCl2F2)	0.672	0.0913	0.0841	3.38	0.459	0.423	
Freon 114 (C2Cl2F4)	ND	0.0932	0.0841	ND	0.662	0.598	
Chloromethane	0.786	0.0923	0.0841	1.65	0.194	0.177	m
Chloroethene (Vinyl chloride)	0.278	0.0932	0.0841	0.721	0.242	0.219	m
1,3-Butadiene	ND	0.0990	0.0841	ND	0.223	0.189	
Bromomethane	ND	0.0932	0.0841	ND	0.368	0.332	
Chloroethane	ND	0.0932	0.0841	ND	0.250	0.226	
Bromoethene (Vinyl bromide)	ND	0.0990	0.0841	ND	0.440	0.374	
Freon 11 (CCl3F)	0.276	0.0980	0.0841	1.57	0.560	0.480	
Ethanol	3.22	0.102	0.102	6.16	0.195	0.195	
Acrolein	0.626	0.0942	0.0841	1.46	0.220	0.196	
Freon 113 (C2Cl3F3)	ND	0.100	0.0841	ND	0.779	0.655	
1,1-Dichloroethene	ND	0.102	0.0841	ND	0.411	0.339	
Acetone	13.3	0.255	0.168	32.0	0.615	0.406	
Carbon disulfide	0.119	0.101	0.101	0.377	0.319	0.319	
Isopropyl alcohol	1.99	0.107	0.107	4.97	0.267	0.267	
Allyl chloride (3-chloropropene)	ND	0.103	0.0841	ND	0.327	0.268	
Acetonitrile	ND	0.0904	0.0904	ND	0.154	0.154	
Methylene chloride	0.207	0.100	0.100	0.730	0.353	0.353	
trans-1,2-Dichloroethene	ND	0.0990	0.0841	ND	0.399	0.339	
Methyl tert-butyl ether	ND	0.100	0.0841	ND	0.366	0.308	
Acrylonitrile	ND	0.0961	0.0841	ND	0.212	0.186	
Hexane	9.97	0.101	0.0841	35.7	0.362	0.301	
1,1-Dichloroethane	ND	0.0980	0.0841	ND	0.403	0.346	
Vinyl acetate	ND	0.101	0.0841	ND	0.361	0.301	
cis-1,2-Dichloroethylene	0.140	0.100	0.0841	0.565	0.403	0.339	
Methyl ethyl ketone (2-Butanone)	0.872	0.100	0.0841	2.61	0.300	0.252	
Ethyl acetate	ND	0.100	0.0841	ND	0.366	0.308	
Chloroform	ND	0.100	0.0841	ND	0.496	0.417	
Tetrahydrofuran	ND	0.0980	0.0841	ND	0.294	0.252	
1,1,1-Trichloroethane	ND	0.0971	0.0841	ND	0.538	0.466	
Cyclohexane	2.50	0.100	0.0841	8.73	0.350	0.294	m
Carbon tetrachloride	0.109	0.0971	0.0841	0.700	0.621	0.538	
Benzene	2.00	0.0990	0.0841	6.51	0.321	0.273	
2,2,4-trimethylpentane	6.42	0.100	0.0841	30.5	0.475	0.399	
1,2-Dichloroethane	ND	0.0980	0.0841	ND	0.403	0.346	
Heptane	2.93	0.100	0.0841	12.2	0.416	0.350	
Trichloroethene	ND	0.0990	0.0841	ND	0.541	0.459	
1,2-Dichloropropane	0.183	0.0990	0.0841	0.860	0.465	0.395	
Methyl methacrylate	ND	0.0980	0.0841	ND	0.408	0.350	
1,4-Dioxane	ND	0.0990	0.0841	ND	0.363	0.308	
Bromodichloromethane	ND	0.0990	0.0841	ND	0.674	0.573	
cis-1,3-Dichloropropene	ND	0.0971	0.0841	ND	0.448	0.388	
Methyl isobutyl ketone	ND	0.0971	0.0841	ND	0.404	0.350	
Toluene	0.991	0.0990	0.0841	3.80	0.379	0.322	
trans-1,3-Dichloropropene	ND	0.104	0.0841	ND	0.479	0.388	
1,1,2-Trichloroethane	ND	0.0990	0.0841	ND	0.549	0.466	
Tetrachloroethene	0.935	0.0961	0.0841	6.44	0.663	0.580	
2-Hexanone (Methyl butyl ketone)	ND	0.103	0.0841	ND	0.428	0.350	

Sample Name	: GW-6 Can 943
Sample Info	: 1114-90, 500mL load
Data File	: L1501440.D
Dilution	: 1
Pressurization Factor	: 2.403
Acquisition Date	: 2015-04-14 17:37:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Dibromochloromethane	ND	0.0980	0.0841	ND	0.849	0.728	
1,2-Dibromoethane	ND	0.0980	0.0841	ND	0.766	0.657	
Chlorobenzene	ND	0.0990	0.0841	ND	0.463	0.394	
Ethylbenzene	0.201	0.0980	0.0841	0.885	0.433	0.371	
1,1,1,2-Tetrachloroethane	ND	0.101	0.0841	ND	0.704	0.587	
m-/p-Xylenes	0.530	0.190	0.168	2.34	0.840	0.742	
o-Xylene	ND	0.0990	0.0841	ND	0.437	0.371	
Styrene	ND	0.0971	0.0841	ND	0.420	0.364	
Bromoform	ND	0.0952	0.0841	ND	1.00	0.884	
1,1,2,2-Tetrachloroethane	ND	0.0990	0.0841	ND	0.691	0.587	
4-Ethyltoluene	ND	0.0952	0.0841	ND	0.475	0.420	
2-Chlorotoluene	ND	0.0990	0.0841	ND	0.521	0.443	
1,3,5-Trimethylbenzene	0.0866	0.0942	0.0841	0.433	0.471	0.420	J
1,2,4-Trimethylbenzene	0.130	0.0942	0.0841	0.648	0.471	0.420	m
1,3-Dichlorobenzene	ND	0.0961	0.0841	ND	0.587	0.514	
1,4-Dichlorobenzene	ND	0.0942	0.0841	ND	0.576	0.514	
Benzyl chloride	ND	0.0961	0.0841	ND	0.506	0.443	
1,2-Dichlorobenzene	ND	0.0932	0.0841	ND	0.570	0.514	
1,2,4-Trichlorobenzene	ND	0.0865	0.0841	ND	0.652	0.634	
Hexachlorobutadiene	ND	0.0875	0.0841	ND	0.948	0.912	
Naphthalene	ND	0.0952	0.0841	ND	0.507	0.448	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,058,339	12.38	9.50	PASS
1,4-Difluorobenzene (IS)	2,543,895	14.29	9.60	PASS
Chlorobenzene-d5 (IS)	1,800,572	18.75	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Lab QC

Sample Name	: GW-3 Can 124 LD
Sample Info	: 1114-90, 50mL load=*10
Data File	: L1501445.D
Dilution	: 10
Pressurization Factor	: 2.378
Acquisition Date	: 2015-04-14 21:26:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	% Diff	Flag *
Acetone	128	2.52	1.66	309	6.09	4.02	1.5	m
2,2,4-trimethylpentane	108	2.47	0.832	512	11.7	3.95	1.8	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,006,337	12.38	9.50	PASS
1,4-Difluorobenzene (IS)	2,920,971	14.28	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: Humid Blank
Sample Info	: Can #10892, 125mL load
Data File	: L1501436.D
Dilution	: 1
Pressurization Factor	: 1.000
Acquisition Date	: 2015-04-14 12:57:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Propylene	0.0688	0.105	0.0350	0.120	0.184	0.0612	J
Freon 12 (CCl2F2)	ND	0.0960	0.0350	ND	0.483	0.176	
Freon 114 (C2Cl2F4)	ND	0.0960	0.0350	ND	0.682	0.249	
Chloromethane	ND	0.0960	0.0350	ND	0.201	0.0735	
Chloroethene (Vinyl chloride)	ND	0.0970	0.0350	ND	0.252	0.0909	
1,3-Butadiene	ND	0.102	0.0350	ND	0.229	0.0787	
Bromomethane	ND	0.0970	0.0350	ND	0.383	0.138	
Chloroethane	ND	0.0960	0.0350	ND	0.257	0.0939	
Bromoethene (Vinyl bromide)	ND	0.103	0.0350	ND	0.458	0.156	
Freon 11 (CCl3F)	ND	0.100	0.0350	ND	0.571	0.200	
Ethanol	0.105	0.105	0.0700	0.202	0.201	0.134	
Acrolein	ND	0.0980	0.0350	ND	0.228	0.0816	
Freon 113 (C2Cl3F3)	ND	0.104	0.0350	ND	0.810	0.273	
1,1-Dichloroethene	ND	0.105	0.0350	ND	0.423	0.141	
Acetone	0.142	0.106	0.0700	0.342	0.256	0.169	
Carbon disulfide	ND	0.105	0.0700	ND	0.332	0.222	
Isopropyl alcohol	ND	0.111	0.0700	ND	0.277	0.175	
Allyl chloride (3-chloropropene)	ND	0.107	0.0350	ND	0.340	0.111	
Acetonitrile	0.0737	0.0940	0.0700	0.126	0.160	0.119	J
Methylene chloride	ND	1.03	0.400	ND	3.64	1.41	
trans-1,2-Dichloroethene	ND	0.103	0.0350	ND	0.415	0.141	
Methyl tert-butyl ether	ND	0.103	0.0350	ND	0.377	0.128	
Acrylonitrile	ND	0.100	0.0350	ND	0.221	0.0772	
Hexane	ND	0.104	0.0350	ND	0.373	0.125	
1,1-Dichloroethane	ND	0.102	0.0350	ND	0.420	0.144	
Vinyl acetate	ND	0.105	0.0350	ND	0.376	0.125	
cis-1,2-Dichloroethylene	ND	0.104	0.0350	ND	0.419	0.141	
Methyl ethyl ketone (2-Butanone)	ND	0.104	0.0350	ND	0.312	0.105	
Ethyl acetate	ND	0.104	0.0350	ND	0.381	0.128	
Chloroform	ND	0.104	0.0350	ND	0.516	0.174	
Tetrahydrofuran	ND	0.102	0.0350	ND	0.306	0.105	
1,1,1-Trichloroethane	ND	0.100	0.0350	ND	0.555	0.194	
Cyclohexane	ND	0.103	0.0350	ND	0.360	0.122	
Carbon tetrachloride	ND	0.102	0.0350	ND	0.652	0.224	
Benzene	ND	0.102	0.0350	ND	0.331	0.114	
2,2,4-trimethylpentane	ND	0.104	0.0350	ND	0.494	0.166	
1,2-Dichloroethane	ND	0.102	0.0350	ND	0.420	0.144	
Heptane	ND	0.104	0.0350	ND	0.433	0.146	
Trichloroethene	ND	0.102	0.0350	ND	0.557	0.191	
1,2-Dichloropropane	ND	0.102	0.0350	ND	0.479	0.164	
Methyl methacrylate	ND	0.101	0.0350	ND	0.420	0.146	
1,4-Dioxane	ND	0.102	0.0350	ND	0.374	0.128	
Bromodichloromethane	ND	0.102	0.0350	ND	0.695	0.238	
cis-1,3-Dichloropropene	ND	0.106	0.0350	ND	0.489	0.161	
Methyl isobutyl ketone	ND	0.100	0.0350	ND	0.416	0.146	
Toluene	ND	0.103	0.0350	ND	0.395	0.134	
trans-1,3-Dichloropropene	ND	0.108	0.0350	ND	0.498	0.161	
1,1,2-Trichloroethane	ND	0.102	0.0350	ND	0.566	0.194	
Tetrachloroethene	ND	0.100	0.0350	ND	0.689	0.241	
2-Hexanone (Methyl butyl ketone)	ND	0.107	0.0350	ND	0.446	0.146	

Sample Name	: Humid Blank
Sample Info	: Can #10892, 125mL load
Data File	: L1501436.D
Dilution	: 1
Pressurization Factor	: 1.000
Acquisition Date	: 2015-04-14 12:57:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Dibromochloromethane	ND	0.102	0.0350	ND	0.883	0.303	
1,2-Dibromoethane	ND	0.101	0.0350	ND	0.789	0.273	
Chlorobenzene	ND	0.103	0.0350	ND	0.482	0.164	
Ethylbenzene	ND	0.102	0.0350	ND	0.450	0.154	
1,1,1,2-Tetrachloroethane	ND	0.105	0.0350	ND	0.733	0.244	
m-/p-Xylenes	ND	0.198	0.0700	ND	0.874	0.309	
o-Xylene	ND	0.103	0.0350	ND	0.455	0.154	
Styrene	ND	0.102	0.0350	ND	0.442	0.152	
Bromoform	ND	0.0990	0.0350	ND	1.04	0.368	
1,1,2,2-Tetrachloroethane	ND	0.103	0.0350	ND	0.719	0.244	
4-Ethyltoluene	ND	0.101	0.0350	ND	0.505	0.175	
2-Chlorotoluene	ND	0.103	0.0350	ND	0.542	0.184	
1,3,5-Trimethylbenzene	ND	0.100	0.0350	ND	0.500	0.175	
1,2,4-Trimethylbenzene	ND	0.100	0.0350	ND	0.500	0.175	
1,3-Dichlorobenzene	ND	0.102	0.0350	ND	0.623	0.214	
1,4-Dichlorobenzene	ND	0.0990	0.0350	ND	0.605	0.214	
Benzyl chloride	ND	0.102	0.0350	ND	0.537	0.184	
1,2-Dichlorobenzene	ND	0.100	0.0350	ND	0.611	0.214	
1,2,4-Trichlorobenzene	ND	0.0910	0.0350	ND	0.686	0.264	
Hexachlorobutadiene	ND	0.0930	0.0350	ND	1.01	0.379	
Naphthalene	0.0404	0.0970	0.0350	0.215	0.517	0.186	J

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,011,486	12.38	9.50	PASS
1,4-Difluorobenzene (IS)	2,936,361	14.28	9.60	PASS
Chlorobenzene-d5 (IS)	2,831,383	18.74	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: 5ppbv TO15 LCS
Sample Info	: Can #1404; 125mL load
Data File	: L1501435.D
Dilution	: 1
Pressurization Factor	: 1.000
Acquisition Date	: 2015-04-14 12:14:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Propylene	5.17	0.105	0.0350	9.04	0.184	0.0612	
Freon 12 (CCl2F2)	5.09	0.0960	0.0350	25.6	0.483	0.176	
Freon 114 (C2Cl2F4)	5.40	0.0960	0.0350	38.4	0.682	0.249	
Chloromethane	4.89	0.0960	0.0350	10.3	0.201	0.0735	
Chloroethene (Vinyl chloride)	4.94	0.0970	0.0350	12.8	0.252	0.0909	
1,3-Butadiene	5.06	0.102	0.0350	11.4	0.229	0.0787	
Bromomethane	4.78	0.0970	0.0350	18.8	0.383	0.138	
Chloroethane	4.47	0.0960	0.0350	12.0	0.257	0.0939	
Bromoethene (Vinyl bromide)	4.84	0.103	0.0350	21.5	0.458	0.156	
Freon 11 (CCl3F)	4.43	0.100	0.0350	25.3	0.571	0.200	
Ethanol	5.49	0.105	0.0700	10.5	0.201	0.134	
Acrolein	4.98	0.0980	0.0350	11.6	0.228	0.0816	
Freon 113 (C2Cl3F3)	5.42	0.104	0.0350	42.2	0.810	0.273	
1,1-Dichloroethene	5.70	0.105	0.0350	23.0	0.423	0.141	
Acetone	5.04	0.106	0.0700	12.2	0.256	0.169	
Carbon disulfide	5.88	0.105	0.0700	18.6	0.332	0.222	
Isopropyl alcohol	5.97	0.111	0.0700	14.9	0.277	0.175	
Allyl chloride (3-chloropropene)	5.64	0.107	0.0350	17.9	0.340	0.111	
Acetonitrile	4.99	0.0940	0.0700	8.51	0.160	0.119	m
Methylene chloride	5.17	1.03	0.400	18.3	3.64	1.41	
trans-1,2-Dichloroethene	5.35	0.103	0.0350	21.6	0.415	0.141	
Methyl tert-butyl ether	5.26	0.103	0.0350	19.3	0.377	0.128	
Acrylonitrile	5.01	0.100	0.0350	11.0	0.221	0.0772	
Hexane	5.28	0.104	0.0350	18.9	0.373	0.125	
1,1-Dichloroethane	5.30	0.102	0.0350	21.8	0.420	0.144	
Vinyl acetate	5.42	0.105	0.0350	19.4	0.376	0.125	
cis-1,2-Dichloroethylene	5.42	0.104	0.0350	21.9	0.419	0.141	m
Methyl ethyl ketone (2-Butanone)	5.39	0.104	0.0350	16.2	0.312	0.105	
Ethyl acetate	5.04	0.104	0.0350	18.5	0.381	0.128	
Chloroform	5.36	0.104	0.0350	26.6	0.516	0.174	
Tetrahydrofuran	5.11	0.102	0.0350	15.3	0.306	0.105	
1,1,1-Trichloroethane	5.15	0.100	0.0350	28.6	0.555	0.194	
Cyclohexane	5.37	0.103	0.0350	18.8	0.360	0.122	
Carbon tetrachloride	5.18	0.102	0.0350	33.1	0.652	0.224	
Benzene	5.36	0.102	0.0350	17.4	0.331	0.114	
2,2,4-trimethylpentane	5.18	0.104	0.0350	24.6	0.494	0.166	
1,2-Dichloroethane	5.27	0.102	0.0350	21.7	0.420	0.144	
Heptane	4.98	0.104	0.0350	20.8	0.433	0.146	
Trichloroethene	5.40	0.102	0.0350	29.5	0.557	0.191	
1,2-Dichloropropane	5.37	0.102	0.0350	25.2	0.479	0.164	
Methyl methacrylate	5.41	0.101	0.0350	22.5	0.420	0.146	
1,4-Dioxane	5.53	0.102	0.0350	20.2	0.374	0.128	
Bromodichloromethane	5.43	0.102	0.0350	37.0	0.695	0.238	
cis-1,3-Dichloropropene	5.39	0.106	0.0350	24.9	0.489	0.161	
Methyl isobutyl ketone	5.42	0.100	0.0350	22.6	0.416	0.146	
Toluene	5.46	0.103	0.0350	20.9	0.395	0.134	
trans-1,3-Dichloropropene	5.63	0.108	0.0350	26.0	0.498	0.161	
1,1,2-Trichloroethane	5.55	0.102	0.0350	30.8	0.566	0.194	
Tetrachloroethene	5.29	0.100	0.0350	36.4	0.689	0.241	
2-Hexanone (Methyl butyl ketone)	5.55	0.107	0.0350	23.1	0.446	0.146	

Sample Name	: 5ppbv TO15 LCS
Sample Info	: Can #1404; 125mL load
Data File	: L1501435.D
Dilution	: 1
Pressurization Factor	: 1.000
Acquisition Date	: 2015-04-14 12:14:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Concentration (PPBV)	RL (PPBV)	MDL (PPBV)	Concentration (ug/m3)	RL (ug/m3)	MDL (ug/m3)	Flag *
Dibromochloromethane	5.31	0.102	0.0350	46.0	0.883	0.303	
1,2-Dibromoethane	5.42	0.101	0.0350	42.4	0.789	0.273	
Chlorobenzene	5.26	0.103	0.0350	24.6	0.482	0.164	
Ethylbenzene	5.42	0.102	0.0350	23.9	0.450	0.154	
1,1,1,2-Tetrachloroethane	5.28	0.105	0.0350	36.8	0.733	0.244	
m-/p-Xylenes	10.5	0.198	0.0700	46.3	0.874	0.309	
o-Xylene	5.54	0.103	0.0350	24.4	0.455	0.154	
Styrene	5.44	0.102	0.0350	23.6	0.442	0.152	
Bromoform	5.21	0.0990	0.0350	54.7	1.04	0.368	
1,1,2,2-Tetrachloroethane	5.52	0.103	0.0350	38.5	0.719	0.244	
4-Ethyltoluene	5.32	0.101	0.0350	26.6	0.505	0.175	
2-Chlorotoluene	5.39	0.103	0.0350	28.3	0.542	0.184	
1,3,5-Trimethylbenzene	5.33	0.100	0.0350	26.6	0.500	0.175	
1,2,4-Trimethylbenzene	5.29	0.100	0.0350	26.4	0.500	0.175	
1,3-Dichlorobenzene	5.39	0.102	0.0350	32.9	0.623	0.214	
1,4-Dichlorobenzene	5.14	0.0990	0.0350	31.4	0.605	0.214	
Benzyl chloride	5.26	0.102	0.0350	27.7	0.537	0.184	
1,2-Dichlorobenzene	4.95	0.100	0.0350	30.3	0.611	0.214	
1,2,4-Trichlorobenzene	4.53	0.0910	0.0350	34.1	0.686	0.264	
Hexachlorobutadiene	4.36	0.0930	0.0350	47.3	1.01	0.379	
Naphthalene	4.94	0.0970	0.0350	26.3	0.517	0.186	

Internal Standards	Response	Retention Time (min)	Concentration (PPBV)	Flag *
Bromochloromethane (IS)	1,000,128	12.37	9.50	PASS
1,4-Difluorobenzene (IS)	2,963,546	14.28	9.60	PASS
Chlorobenzene-d5 (IS)	2,830,287	18.75	9.60	PASS

(ND) = Not Detected
*** (J) = Below Calibration Range, (E) = Above Calibration Range, (m) = Manual Integration**
IS Acceptance Criteria: RT +/- 20 sec, Response +/- 40%

Sample Name	: 5ppbv TO15 LCS
Sample Info	: Can #1404; 125mL load
Data File	: L1501435.D
Dilution	: 1
Pressurization Factor	: 1.000
Acquisition Date	: 2015-04-14 12:14:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Response	Concentration (PPBV)	Tag Value (PPBV)	% Recovery	Flag
Propylene	139,055	5.17	5.30	97.5	PASS
Freon 12 (CCl2F2)	997,231	5.09	4.75	107.2	PASS
Freon 114 (C2Cl2F4)	960,108	5.40	4.85	111.3	PASS
Chloromethane	178,831	4.89	4.80	101.9	PASS
Chloroethene (Vinyl chloride)	246,303	4.94	4.85	101.9	PASS
1,3-Butadiene	249,009	5.06	5.15	98.3	PASS
Bromomethane	341,260	4.78	4.85	98.5	PASS
Chloroethane	131,107	4.47	4.85	92.1	PASS
Bromoethene (Vinyl bromide)	360,041	4.84	5.15	94.0	PASS
Freon 11 (CCl3F)	842,478	4.43	5.10	86.9	PASS
Ethanol	95,151	5.49	5.30	103.7	PASS
Acrolein	90,808	4.98	4.90	101.7	PASS
Freon 113 (C2Cl3F3)	537,022	5.42	5.20	104.2	PASS
1,1-Dichloroethene	527,133	5.70	5.30	107.6	PASS
Acetone	567,734	5.04	5.30	95.0	PASS
Carbon disulfide	814,411	5.88	5.25	112.1	PASS
Isopropyl alcohol	524,656	5.97	5.55	107.5	PASS
Allyl chloride (3-chloropropene)	122,728	5.64	5.35	105.4	PASS
Acetonitrile	158,442	4.99	4.70	106.1	PASS
Methylene chloride	325,523	5.17	5.20	99.5	PASS
trans-1,2-Dichloroethene	422,088	5.35	5.15	104.0	PASS
Methyl tert-butyl ether	794,737	5.26	5.20	101.1	PASS
Acrylonitrile	159,883	5.01	5.00	100.2	PASS
Hexane	298,547	5.28	5.25	100.6	PASS
1,1-Dichloroethane	484,102	5.30	5.10	103.9	PASS
Vinyl acetate	772,387	5.42	5.25	103.3	PASS
cis-1,2-Dichloroethylene	417,176	5.42	5.20	104.3	PASS
Methyl ethyl ketone (2-Butanone)	111,936	5.39	5.20	103.7	PASS
Ethyl acetate	85,166	5.04	5.20	96.9	PASS
Chloroform	738,955	5.36	5.20	103.2	PASS
Tetrahydrofuran	107,109	5.11	5.10	100.2	PASS
1,1,1-Trichloroethane	833,655	5.15	5.05	102.0	PASS
Cyclohexane	315,780	5.37	5.20	103.3	PASS
Carbon tetrachloride	918,334	5.18	5.05	102.5	PASS
Benzene	706,470	5.36	5.15	104.0	PASS
2,2,4-trimethylpentane	995,282	5.18	5.20	99.7	PASS
1,2-Dichloroethane	555,039	5.27	5.10	103.3	PASS
Heptane	185,907	4.98	5.20	95.9	PASS
Trichloroethene	560,550	5.40	5.15	104.9	PASS
1,2-Dichloropropane	242,061	5.37	5.15	104.2	PASS
Methyl methacrylate	263,526	5.41	5.10	106.1	PASS
1,4-Dioxane	224,788	5.53	5.15	107.3	PASS

Sample Name	: 5ppbv TO15 LCS
Sample Info	: Can #1404; 125mL load
Data File	: L1501435.D
Dilution	: 1
Pressurization Factor	: 1.000
Acquisition Date	: 2015-04-14 12:14:00
Instrument Method	: MM624-L
Matrix	: AIR

Target Compound	Response	Concentration (PPBV)	Tag Value (PPBV)	% Recovery	Flag
Bromodichloromethane	872,471	5.43	5.15	105.5	PASS
cis-1,3-Dichloropropene	510,185	5.39	5.05	106.7	PASS
Methyl isobutyl ketone	685,227	5.42	5.05	107.4	PASS
Toluene	963,450	5.46	5.15	106.1	PASS
trans-1,3-Dichloropropene	589,038	5.63	5.40	104.3	PASS
1,1,2-Trichloroethane	412,965	5.55	5.15	107.8	PASS
Tetrachloroethene	672,454	5.29	5.00	105.7	PASS
2-Hexanone (Methyl butyl ketone)	689,565	5.55	5.35	103.7	PASS
Dibromochloromethane	1,056,925	5.31	5.10	104.1	PASS
1,2-Dibromoethane	828,029	5.42	5.10	106.3	PASS
Chlorobenzene	1,001,595	5.26	5.15	102.2	PASS
Ethylbenzene	1,358,700	5.42	5.10	106.2	PASS
1,1,1,2-Tetrachloroethane	696,225	5.28	5.25	100.5	PASS
m-/p-Xylenes	2,117,998	10.5	9.90	106.0	PASS
o-Xylene	1,124,627	5.54	5.15	107.6	PASS
Styrene	950,983	5.44	5.05	107.8	PASS
Bromoform	1,015,828	5.21	4.95	105.2	PASS
1,1,2,2-Tetrachloroethane	822,317	5.52	5.15	107.1	PASS
4-Ethyltoluene	1,696,134	5.32	4.95	107.5	PASS
2-Chlorotoluene	1,426,580	5.39	5.15	104.6	PASS
1,3,5-Trimethylbenzene	1,338,025	5.33	4.90	108.8	PASS
1,2,4-Trimethylbenzene	1,339,612	5.29	4.90	107.9	PASS
1,3-Dichlorobenzene	1,066,200	5.39	5.00	107.8	PASS
1,4-Dichlorobenzene	1,058,566	5.14	4.90	104.9	PASS
Benzyl chloride	1,317,097	5.26	5.00	105.1	PASS
1,2-Dichlorobenzene	960,095	4.95	4.85	102.1	PASS
1,2,4-Trichlorobenzene	785,071	4.53	4.50	100.6	PASS
Hexachlorobutadiene	508,421	4.36	4.55	95.9	PASS
Naphthalene	1,845,941	4.94	4.95	99.8	PASS

Client Name: Civil & Environmental Consultants, Inc.
Client #: 111-370-.001
Enthalpy Job #: 1114-90

Controller Data Sheet

Controller ID	Blank Check File	Initial Flow (cc/min)	Return Flow (cc/min)
E-007	T1402902	33.0	32.7
E-027	T1402904	43.8	44.9
E-002	T1402907	41.7	42.8
E-037	T1402908	43.4	44.3

Canister Data Sheet

Canister ID	Blank Check File	Pre-Sample Pressure to field (mm Hg)	Post-Sample Pressure - from field (mm Hg)	Final Pressure - at Lab (mm Hg)	Tank Pressurization Factor
124	T1402899	760	-36.4	971	2.378
174	T1402897	760	-28.2	1,026	2.425
943	T1402894	760	-31.6	1,001	2.403
198	T1402895	760	-36.4	992	2.406

Canister Certification Type: [Individual] Batch

Narrative Summary

Enthalpy Analytical Narrative Summary

Company	Civil & Env. Consultants
Analyst	JKG
Parameters	ASTM D1946-90

Client #	111-370-.001
Job #	1114-90
# Samples	4 canisters

Custody

Summer Mims received the samples on 4/13/15 after being relinquished by Civil and Environmental Consultants, Inc. of Charlotte, NC. The samples were received at ambient temperature and were in good condition. Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, Inc.

Analysis

The samples were analyzed for hydrogen, oxygen, nitrogen, carbon monoxide, methane, and carbon dioxide using the analytical procedures in ASTM D1946 – 90 (Reapproved 2000), Standard Practice for Analysis of Reformed Gas by Gas Chromatography.

All samples and standards were introduced directly to the column using an automated multi-port Valco gas sampling valve equipped with a stainless steel loop. All target analytes were referenced to certified gas phase standards.

Upon receipt, the canister pressures were measured and recorded. The cans were then pressurized with helium and a dilution ratio was calculated for each can (see Canister and Controller Data Sheet).

The Agilent Technologies Model 6890N, Gas Chromatograph "Betty" (S/N US10430048) was used for these analyses.

Calibration

The calibration curve is located in the Raw Data section of this report and referenced in the Analysis Method column on the Detailed Results page.

For each calibration curve used, the first page of the curve contains all method specific parameters (i.e., curve type, origin, weight, etc.) used to quantify the samples. The calibration curve section also includes a table with the Retention Time (RetTime), Level (Lvl), Amount (corresponding units), Area, Response Factor (Amt/Area) and the analyte Name. The calibration table is used to identify (by retention time) and quantify each target compound.

Chromatographic Conditions

The acquisition method (GC142P133_CAL.M) is included in the Raw Data section of this report.

Enthalpy Analytical Narrative Summary
(continued)

QC Notes	No analytes of interest were detected in the analysis of the laboratory helium blank at concentration levels greater than the LOQ.
Reporting Notes	These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above. The results presented in this report are representative of the samples as provided to the laboratory.

Enthalpy Analytical Narrative Summary

Company	Civil & Env. Consultants
Analyst	DBS / TDD
Parameters	EPA Method TO-15

Client #	111-370-.001
Job #	1114-90
# Samples	4 Canisters

Custody

Summer Mims received the samples on 4/13/15 after being relinquished by Civil & Environmental Consultants, Inc. of Charlotte, NC. The samples were received at ambient temperature and were in good condition. Prior to, during, and after analysis, the samples were kept under lock with access only to authorized personnel by Enthalpy Analytical, Inc.

Analysis

The samples were analyzed for the TO-15 Target Compound List using the analytical procedures in EPA Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).

Upon receipt, the canister pressures were measured and recorded. The cans were then pressurized with helium and a dilution ratio was calculated for each can (see Canister and Controller Data Sheet).

All samples were analyzed undiluted and sample ***GW-3 Can 124*** was also analyzed at a subsequent 10-fold analytical dilution to bring all target analytes within the instrument's calibrated range. Only acetone and 2,2,4-trimethylpentane were reported from the diluted analysis. Analytical dilution factors are displayed in the sample header information.

The Hewlett Packard Model 5890, Gas Chromatograph "Lurch" (S/N 2750A15233) was equipped with a 5971A Mass Selective Detector and a Restek Rxi-624 Sil MS, 60 m x 0.32 mm x 1.8 µm (S/N 1035491) capillary column for these analyses. All samples and standards were introduced directly to the analyzer using an Entech 7100A Preconcentrator.

Calibration

The initial calibration L041115A met 30% RSD criteria. The initial calibration verification met 30% recovery criteria. The continuing calibration met 30% difference criteria. The calibration data are not included in this report but are available upon request.

Chromatographic Conditions

The acquisition method (MM624-L.M) has not been included in this report but is available upon request.

Enthalpy Analytical Narrative Summary
(continued)

QC Notes	The BFB analysis met method specified tune criteria.
	All internal standard area response and retention time criteria were met.
	The Laboratory Control Sample met 30% Recovery criteria.
	The Laboratory Duplicate analysis met 25% Difference criteria.
	No target compounds were identified in the Humid Blank at concentrations greater than 3 times the MDL.
	The samples were analyzed within the 30-day holding time specified in the method.
Reporting Notes	These analyses met the requirements of the TNI Standard. Any deviations from the requirements of the reference method or TNI Standard have been stated above.
	The results presented in this report are representative of the samples as provided to the laboratory.
	The TO-15 analyses presented in this report were performed at 2202 Ellis Road, Durham, NC 27703.

General Reporting Notes

The following are general reporting notes that are applicable to all Enthalpy Analytical, Inc. data reports, unless specifically noted otherwise.

- Any analysis which refers to the method as ***"Type"*** represents a planned deviation from the reference method. For instance a Hydrogen Sulfide assay from a Tedlar bag would be labeled as "EPA Method 16-Type" because Tedlar bags are not mentioned as one of the collection options in EPA Method 16.
- The acronym ***MDL*** represents the Minimum Detection Limit. Below this value the laboratory cannot determine the presence of the analyte of interest reliably.
- The acronym ***LOQ*** represents the Limit of Quantification. Below this value the laboratory cannot quantitate the analyte of interest within the criteria of the method.
- The acronym ***ND*** following a value indicates a non-detect or analytical result below the MDL.
- The letter ***J*** in the Qualifier or Flag column in the results indicates that the value is between the MDL and the LOQ. The laboratory can positively identify the analyte of interest as present, but the value should be considered an estimate.
- The letter ***E*** in the Qualifier or Flag column indicates an analytical result exceeding 100% of the highest calibration point. The associated value should be considered as an estimate.
- The acronym ***DF*** represents Dilution Factor. This number represents dilution of the sample during the preparation and/or analysis process. The analytical result taken from a laboratory instrument is multiplied by the DF to determine the final undiluted sample results.
- The addition of ***MS*** to the Sample ID represents a Matrix Spike. An aliquot of an actual sample is spiked with a known amount of analyte so that a percent recovery value can be determined. The MS analysis indicates what effect the sample matrix may have on the target analyte, i.e. whether or not anything in the sample matrix interferes with the analysis of the analyte(s).
- The addition of ***MSD*** to the Sample ID represents a Matrix Spike Duplicate. Prepared in the same manner as a MS, the use of duplicate matrix spikes allows further confirmation of laboratory quality by showing the consistency of results gained by performing the same steps multiple times.
- The addition of ***LD*** to the Sample ID represents a Laboratory Duplicate. The analyst prepares an additional aliquot of sample for testing and the results of the duplicate analysis are compared to the initial result. The result should have a difference value of within 10% of the initial result (if the results of the original analysis are greater than the LOQ).
- The addition of ***AD*** to the Sample ID represents an Alternate Dilution. The analyst prepares an additional aliquot at a different dilution factor (usually double the initial factor). This analysis helps confirm that no additional compound is present and coeluting or sharing absorbance with the analyte of interest, as they would have a different response/absorbance than the analyte of interest.

General Reporting Notes

(continued)

- The Sample ID ***LCS*** represents a Laboratory Control Sample. Clean matrix, similar to the client sample matrix, prepared and analyzed by the laboratory using the same reagents, spiking standards and procedures used for the client samples. The LCS is used to assess the control of the laboratory's analytical system. Whenever spikes are prepared for our client projects, two spikes are retained as LCSs. The LCSs are labeled with the associated project number and kept in-house at the appropriate temperature conditions. When the project samples are received for analysis, the LCSs are analyzed to confirm that the analyte could be recovered from the media, separate from the samples which were used on the project and which may have been affected by source matrix, sample collection and/or sample transport.
- **Significant Figures**: Where the reported value is much greater than unity (1.00) in the units expressed, the number is rounded to a whole number of units, rather than to 3 significant figures. For example, a value of 10,456.45 ug catch is rounded to 10,456 ug. There are five significant digits displayed, but no confidence should be placed on more than two significant digits.
- **Manual Integration**: The data systems used for processing will flag manually integrated peaks with an "M". There are several reasons a peak may be manually integrated. These reasons will be identified by the following two letter designations on sample chromatograms, if provided in the report. The peak was ***not integrated*** by the software **"NI"**, the peak was ***integrated incorrectly*** by the software **"II"** or the ***wrong peak*** was integrated by the software **"WP"**. These codes will accompany the analyst's manual integration stamp placed next to the compound name on the chromatogram.

Sample Custody

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

1900 Center Park Drive, Suite A, Charlotte, North Carolina 28217 — Toll-Free: 855-859-9932 Direct: 980-237-0373

Company: CEC City, State: Contact: Quentin Best	Laboratory: Enthalpy Analytical Project No. 111-370-.001 Purchase Order: NC15-028	Number of Containers 4	Sampling Methods % Methane

Sample Description	Can #	Sample ID	Date	Sample Disposition and Remarks
Summa Canister	174	MW-4D-1	4/1/2015	
Summa Canister	198	MW-9-Infill	4/1/2015	
Summa Canister	124	GW-3	3/31/2015	
Summa Canister	943	GW-6	3/31/2015	
	SDM 4-13-15			

Relinquished By:	Date/Time 4-6-15 10Am	*Special Instructions:*
Relinquished By:	Date/Time	Questions- please contact Quentin Best or Paul Jenkins
Received for Laboratory By: 4-13-15 1030 Temp = Amb	Methane, CO2, O2,	

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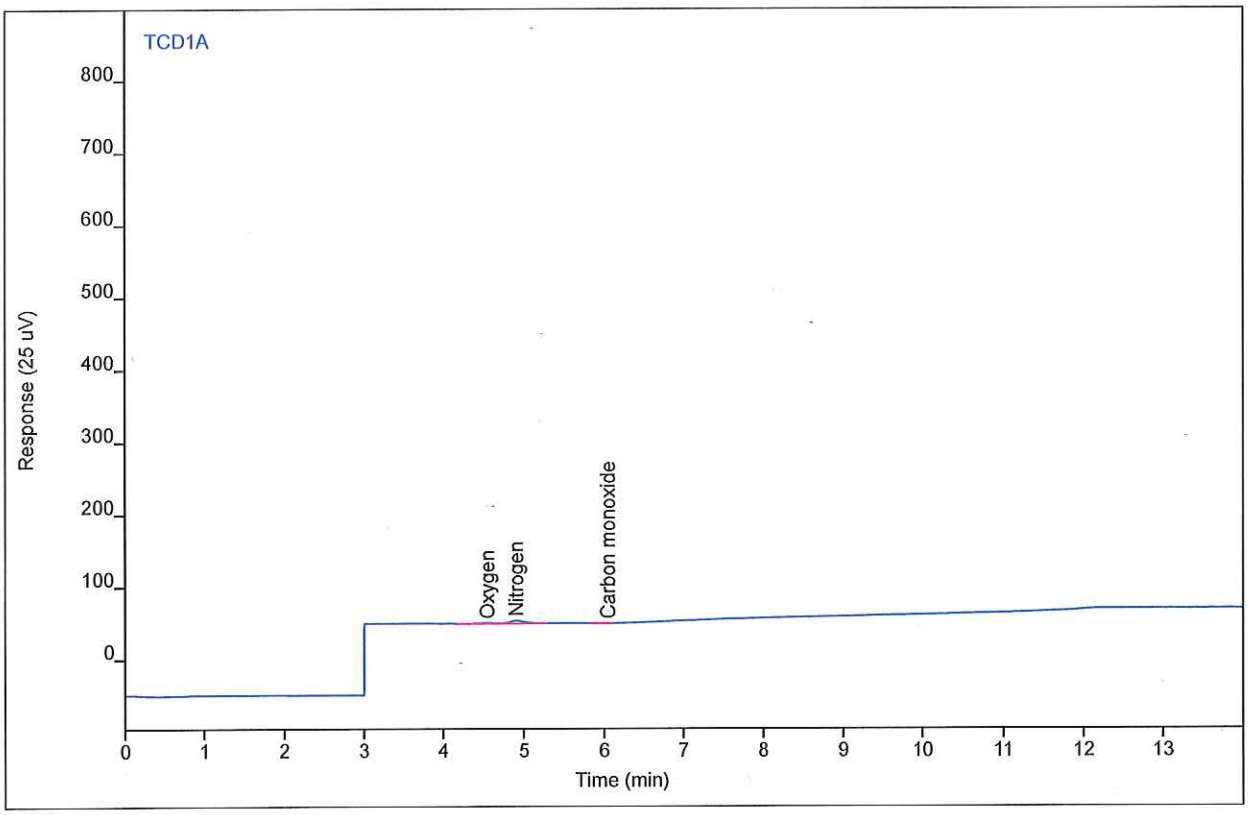
Raw Data

Chromatogram Report

Enthalpy Analytical

Sample Name	He Blank #LB	Sample Type	Sample
Sequence Name	BETTYP171 ver.1	Vial Number	Vial 1
Data File	001F0203.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	3 of 4
Injection Date	4/21/2015 3:46 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:16 PM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

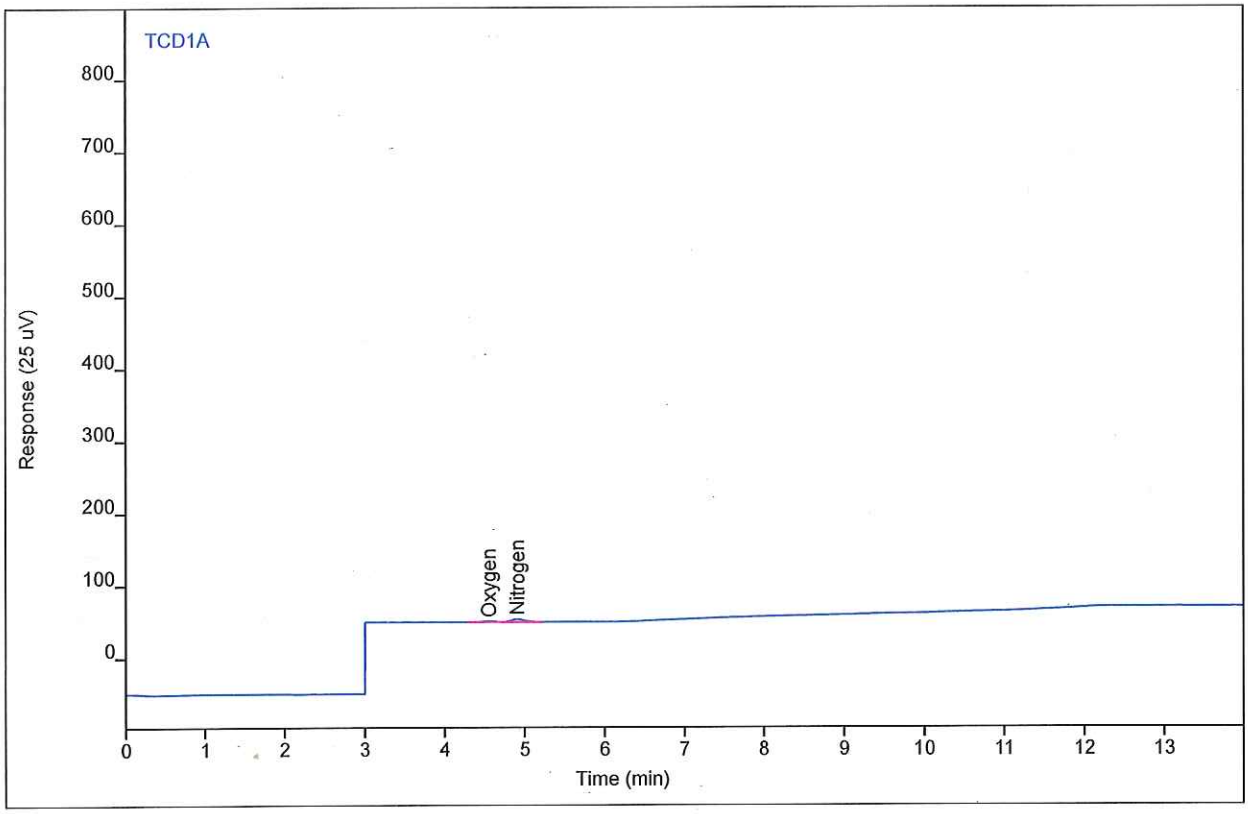


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	VV	4.55	10.8272	0.90833	0.03356	1	0.03356	%
Nitrogen	VB	4.90	44.5427	3.81658	0.11689	1	0.11689	%
Carbon monoxide	BV	6.04	1.55345	0.20753	0.00466	1	0.00466	%
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

Chromatogram Report

Enthalpy Analytical

Sample Name	He Blank #LB	Sample Type	Sample
Sequence Name	BETTYP171 ver.1	Vial Number	Vial 1
Data File	001F0204.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	4 of 4
Injection Date	4/21/2015 4:06 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:16 PM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

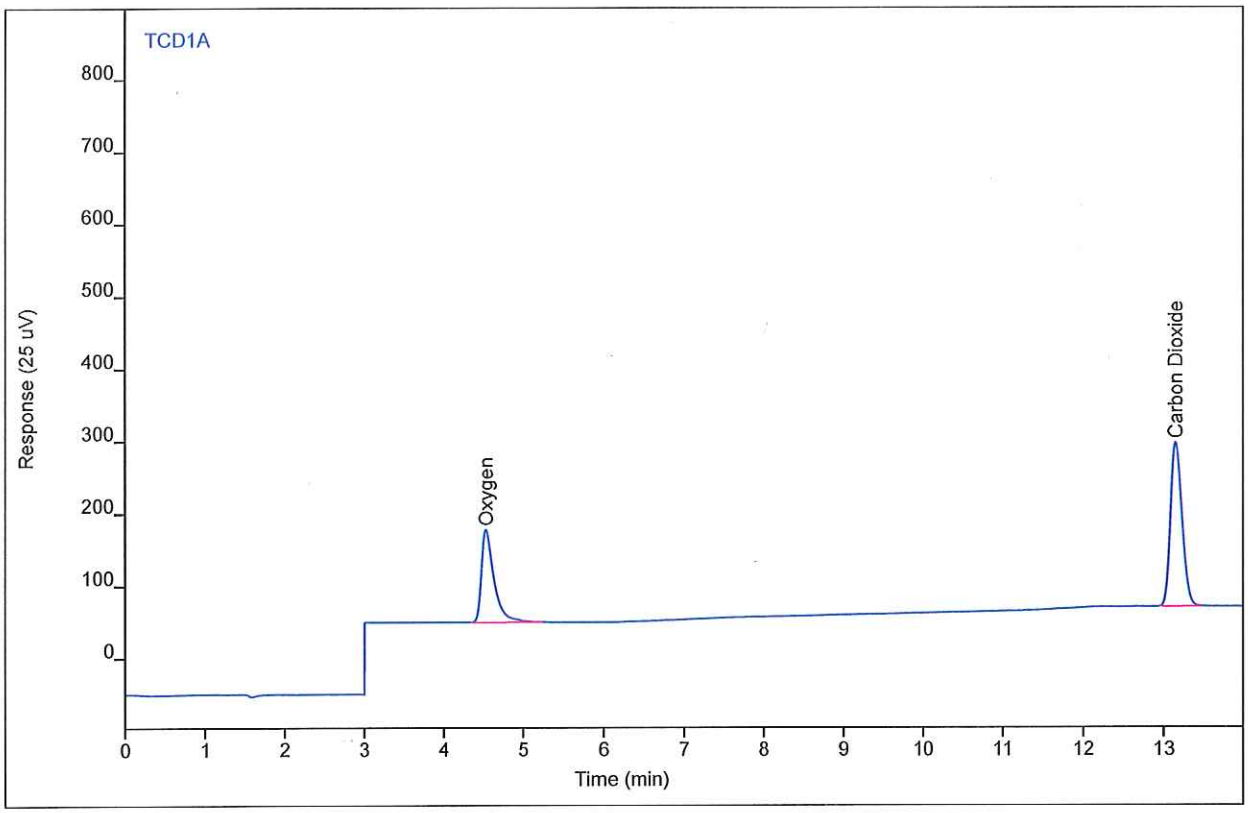


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.56	12.5810	1.09068	0.03899	1	0.03899	%
Nitrogen	VV	4.91	46.6754	3.98789	0.12249	1	0.12249	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP171 ver.1	Vial Number	Vial 9
Data File	009F0301.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/21/2015 4:30 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:16 PM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

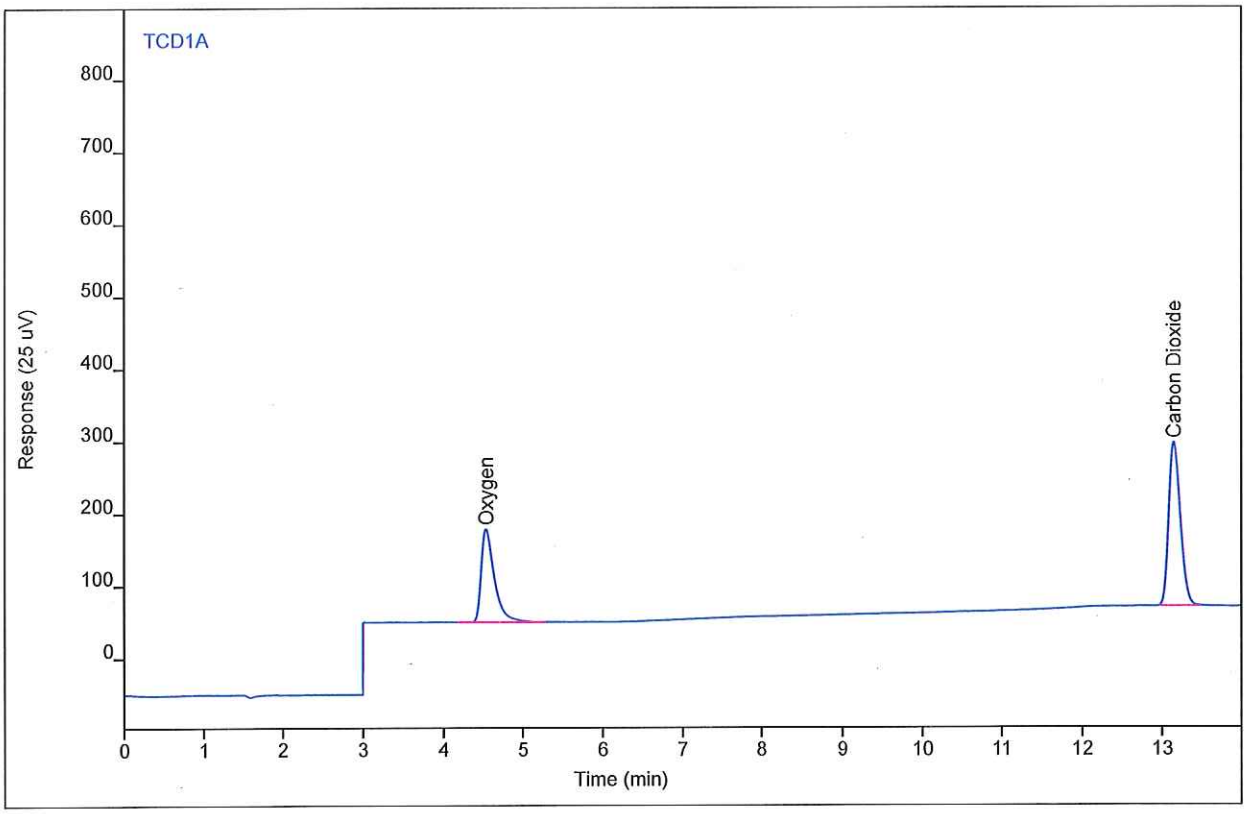


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1446.54	127.631	5.09336	1	5.09336	%
Carbon Dioxide	BB	13.14	2288.27	226.378	5.10543	1	5.10543	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP171 ver.1	Vial Number	Vial 9
Data File	009F0302.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/21/2015 4:53 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:16 PM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

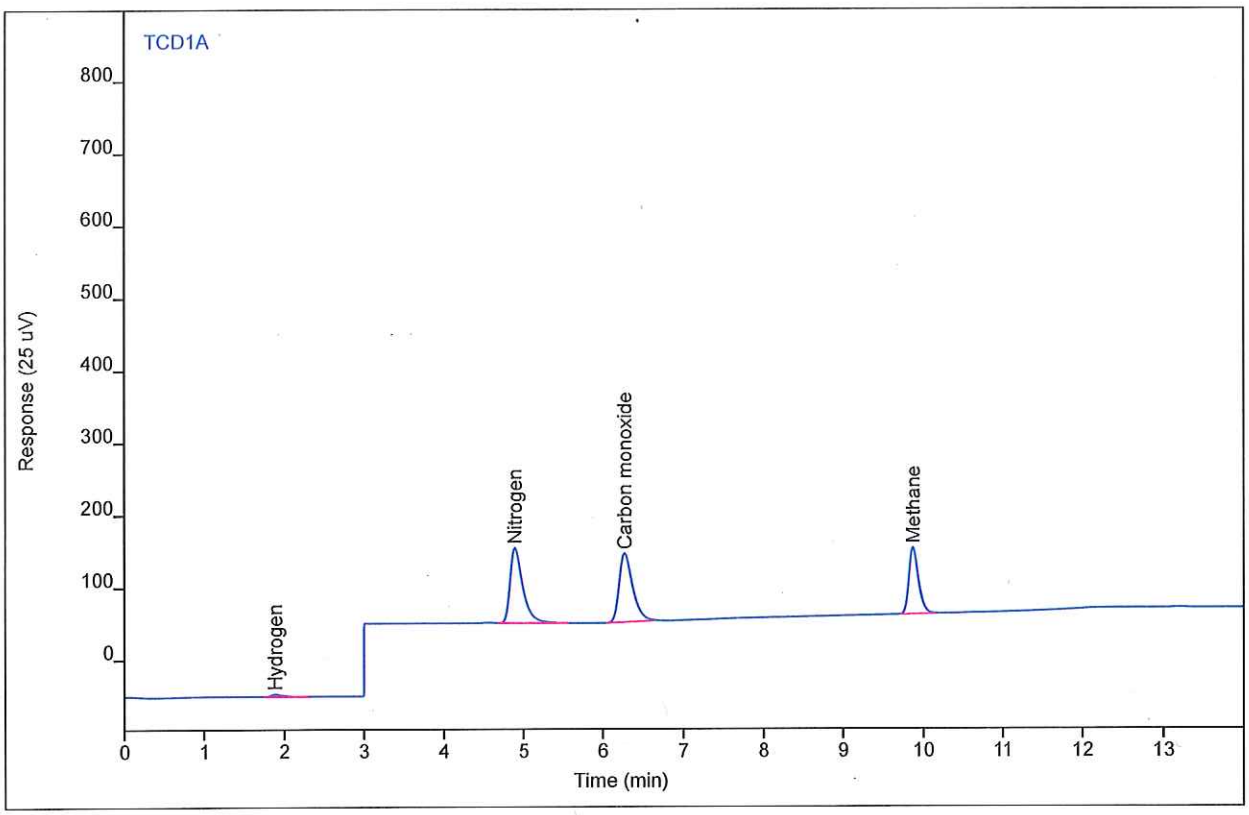


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1456.70	128.346	5.12972	1	5.12972	%
Carbon Dioxide	BB	13.14	2281.15	225.671	5.08931	1	5.08931	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP171 ver.1	Vial Number	Vial 9
Data File	009F0401.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/21/2015 5:39 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:16 PM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

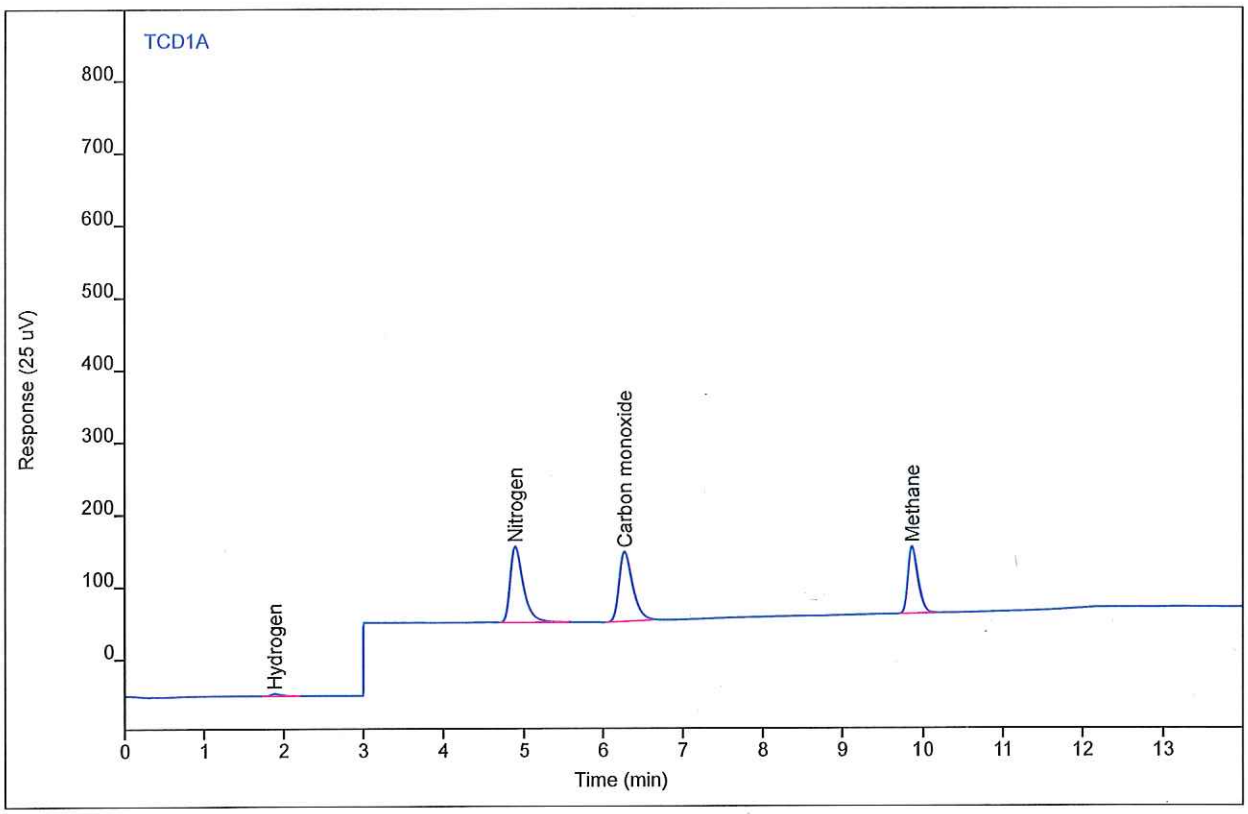


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	29.4411	3.16858	2.90430	1	2.90430	%
Nitrogen	VB	4.89	1179.81	103.702	3.61219	1	3.61219	%
Carbon monoxide	BB	6.27	1132.01	94.7080	3.54565	1	3.54565	%
Methane	BB	9.87	797.242	91.6598	2.82994	1	2.82994	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP171 ver.1	Vial Number	Vial 9
Data File	009F0402.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/21/2015 6:02 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:16 PM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

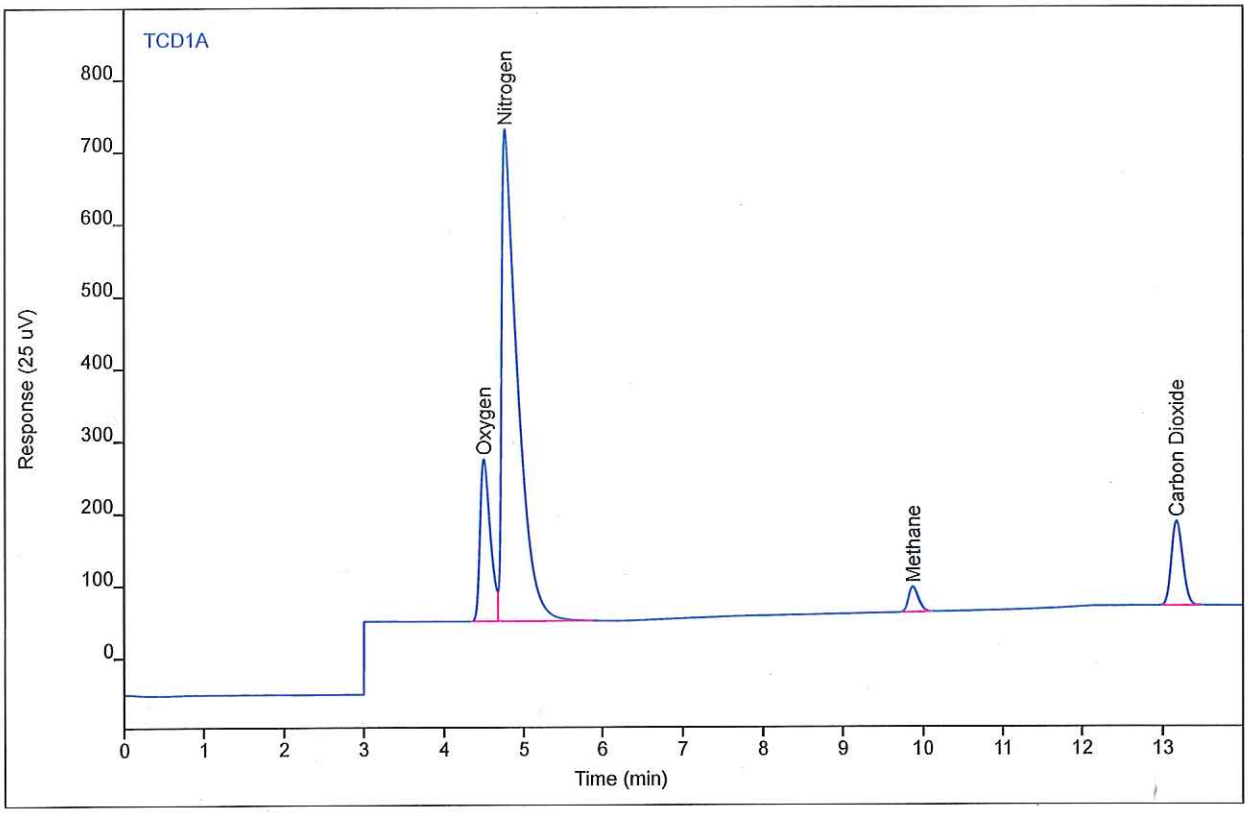


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	28.0103	3.08782	2.76136	1	2.76136	%
Nitrogen	BB	4.89	1190.58	104.594	3.64580	1	3.64580	%
Carbon monoxide	BB	6.27	1147.06	96.0321	3.59306	1	3.59306	%
Methane	BB	9.87	802.892	92.4147	2.85012	1	2.85012	%

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.GW-3 Can124.Can	Sample Type	Sample
Sequence Name	BETTYP171B ver.5	Vial Number	Vial 4
Data File	004F0701.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 2
Injection Date	4/21/2015 4:59 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 12:50 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM



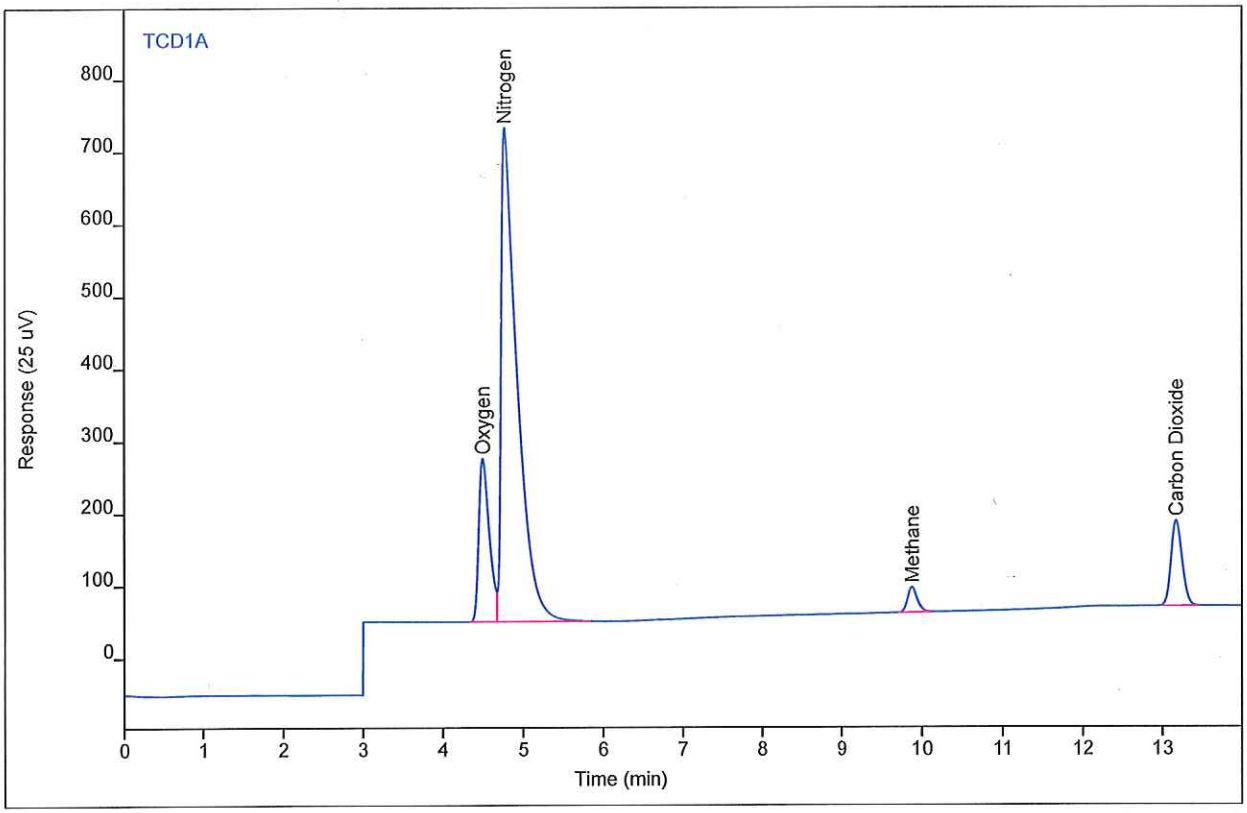
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2004.07	223.812	7.08889	1	7.08889	%
Nitrogen	VB	4.77	9485.80	679.820	29.5506	1	29.5506	%
Carbon monoxide		(6.28)				1		
Methane	BB	9.88	298.436	34.5796	1.04860	1	1.04860	%
Carbon Dioxide	BB	13.17	1145.47	116.386	2.52102	1	2.52102	%

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.GW-3 Can124.Can
Sequence Name	BETTYP171B ver.5
Data File	004F0702.D
File Location	GC/2015/Betty/Quarter 2
Injection Date	4/21/2015 5:20 PM
File Modified	4/23/2015 12:50 PM
Instrument	
Operator	Kristen McKinley

Sample Type	Sample
Vial Number	Vial 4
Injection Volume	250
Injection	2 of 2
Acquisition Method	GC142P133_CAL.M
Analysis Method	BETTYP162_FGA.M
Method Modified	4/16/2015 3:55 PM
Printed	4/23/2015 2:09 PM

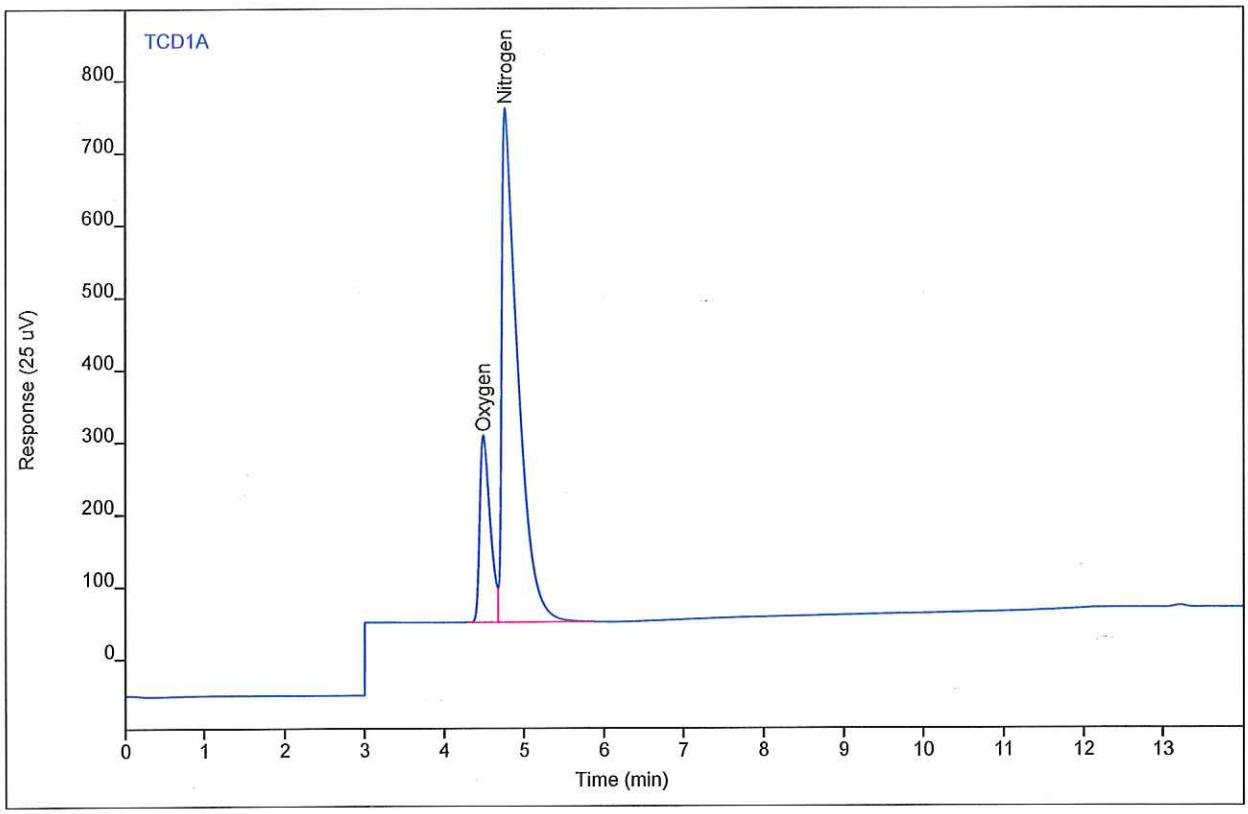


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2013.20	225.247	7.12158	1	7.12158	%
Nitrogen	VB	4.77	9526.49	682.162	29.6777	1	29.6777	%
Carbon monoxide		(6.28)				1		
Methane	BB	9.88	300.491	34.7780	1.05594	1	1.05594	%
Carbon Dioxide	BB	13.17	1160.96	117.873	2.55605	1	2.55605	%

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.MW-9-Infill Can198.Can	Sample Type	Sample
Sequence Name	BETTYP171B ver.5	Vial Number	Vial 5
Data File	005F0601.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 2
Injection Date	4/21/2015 4:17 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 12:50 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

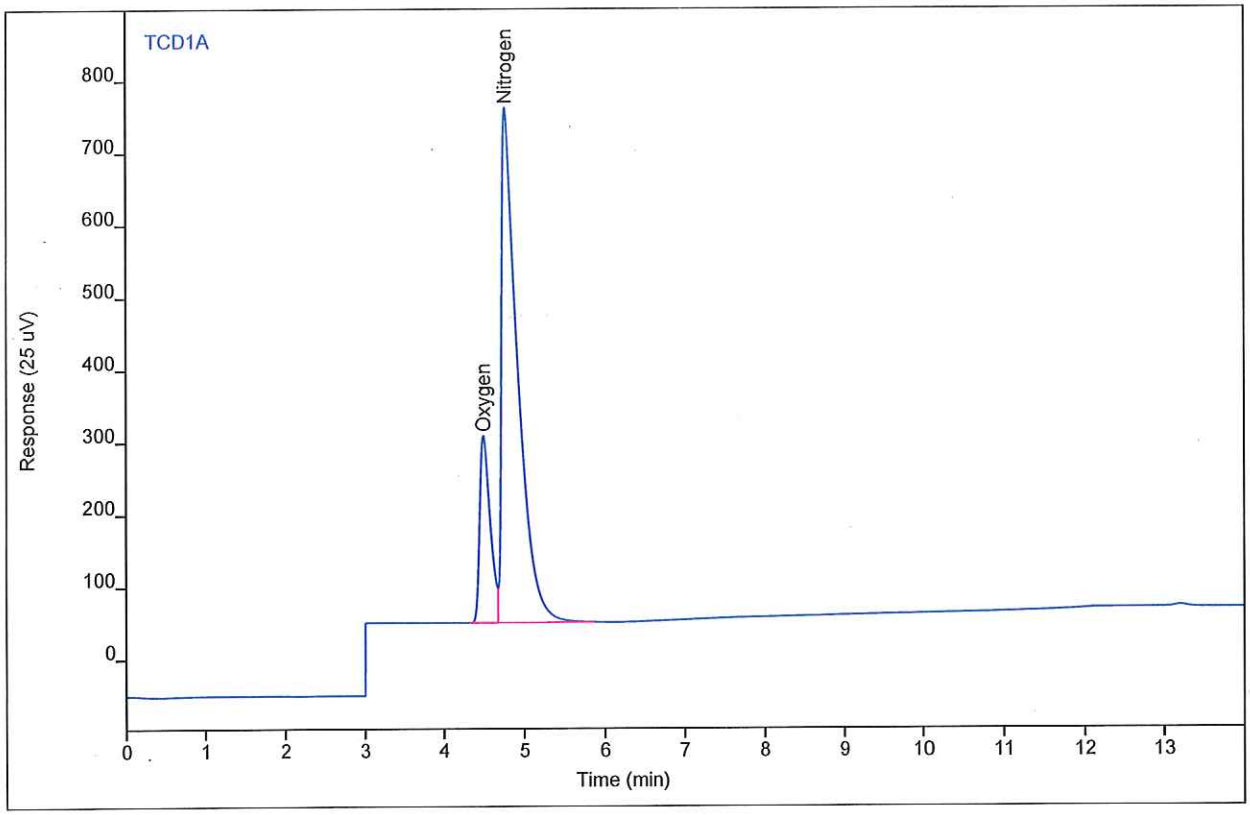


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.49	2301.58	257.861	8.15378	1	8.15378	%
Nitrogen	VB	4.76	10057.9	710.076	31.3373	1	31.3373	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.MW-9-Infill Can198.Can	Sample Type	Sample
Sequence Name	BETTYP171B ver.5	Vial Number	Vial 5
Data File	005F0602.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 2
Injection Date	4/21/2015 4:38 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 12:50 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM



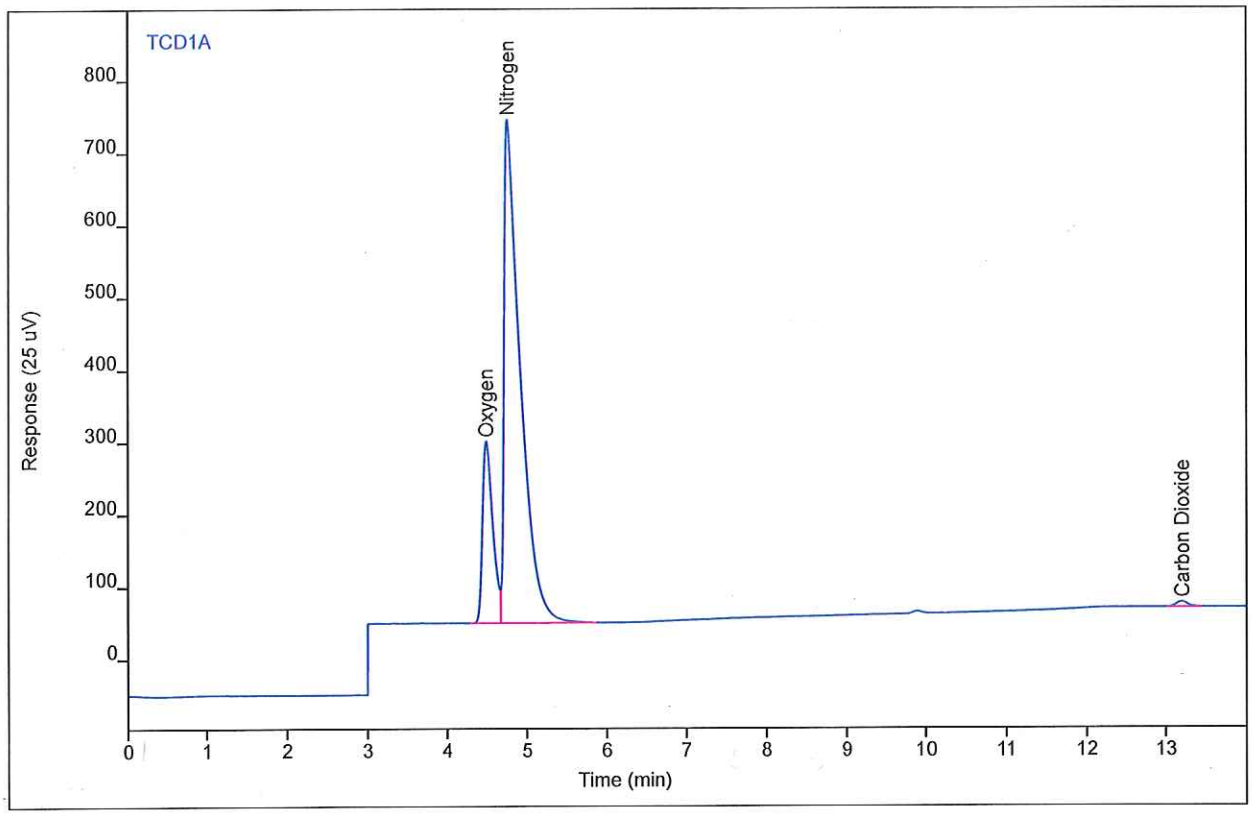
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.49	2305.59	258.017	8.16812	1	8.16812	%
Nitrogen	VB	4.76	10094.6	711.417	31.4519	1	31.4519	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.MW-4D-1 Can174.Can
Sequence Name	BETTYP171B ver.5
Data File	006F0501.D
File Location	GC/2015/Betty/Quarter 2
Injection Date	4/21/2015 3:35 PM
File Modified	4/23/2015 12:50 PM
Instrument	
Operator	Justin Guenzler

Sample Type	Sample
Vial Number	Vial 6
Injection Volume	250
Injection	1 of 2
Acquisition Method	GC142P133_CAL.M
Analysis Method	BETTYP162_FGA.M
Method Modified	4/16/2015 3:55 PM
Printed	4/23/2015 2:09 PM

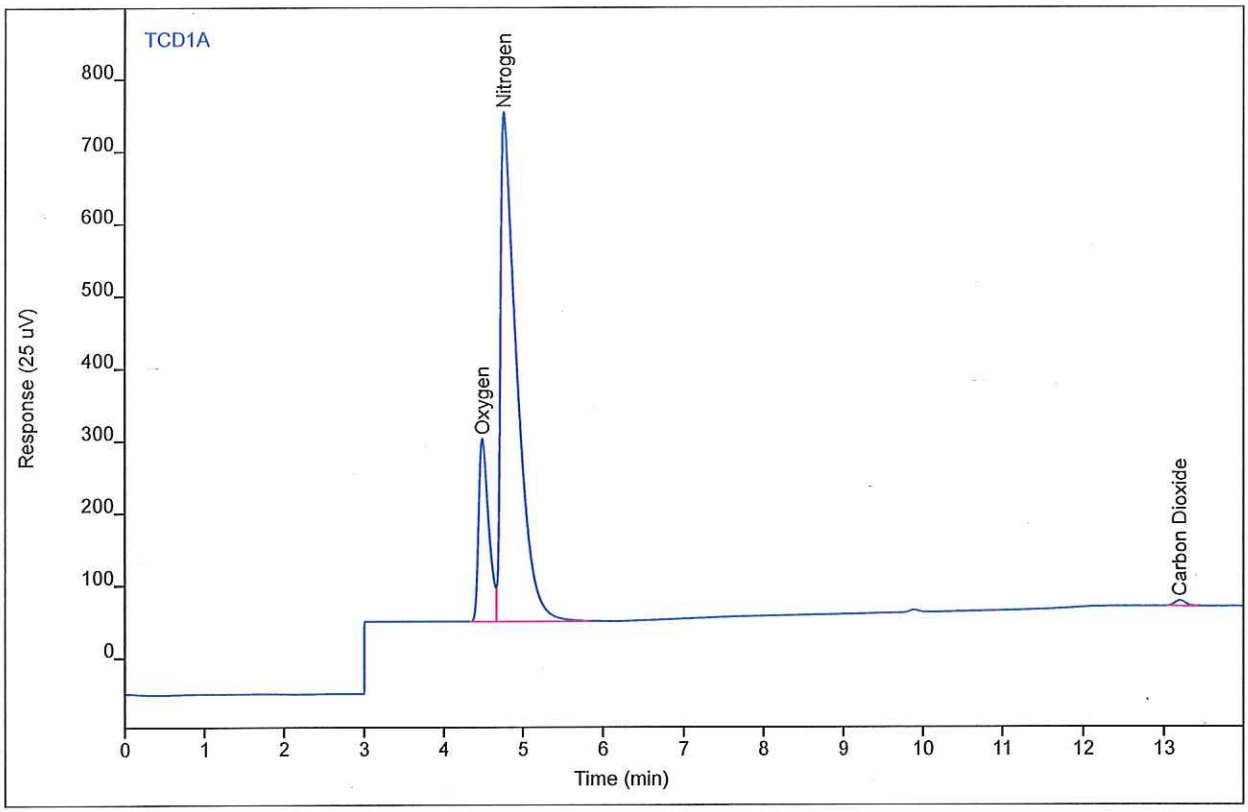


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	MF	4.49	2250.62	251.316	7.97136	1	7.97136	%
Nitrogen	FM	4.76	9790.49	696.148	30.5021	1	30.5021	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide	BB	13.20	71.2777	7.27565	0.14283	1	0.14283	%

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.MW-4D-1 Can174.Can	Sample Type	Sample
Sequence Name	BETTYP171B ver.5	Vial Number	Vial 6
Data File	006F0502.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 2
Injection Date	4/21/2015 3:56 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 12:50 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	Justin Guenzler	Printed	4/23/2015 2:09 PM

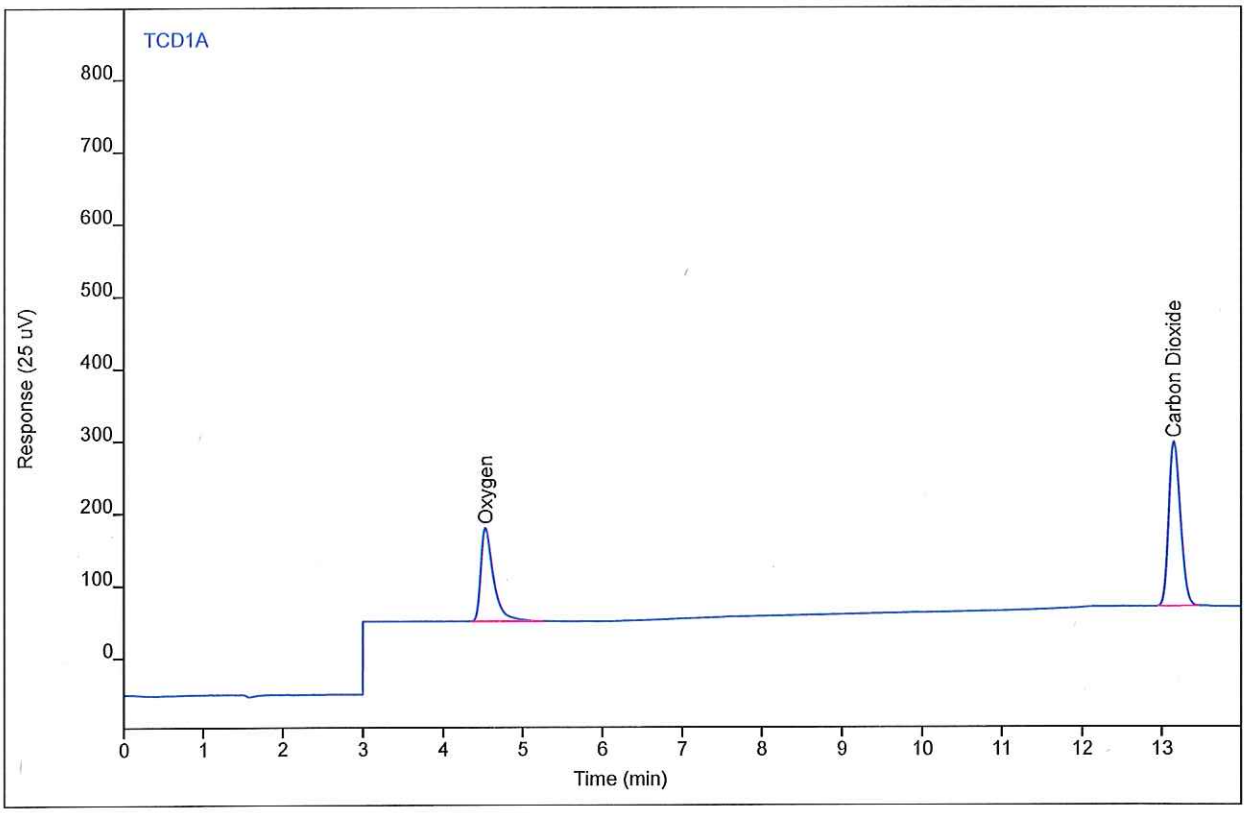


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2254.73	252.377	7.98609	1	7.98609	%
Nitrogen	VB	4.76	9940.04	703.803	30.9691	1	30.9691	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide	BB	13.19	74.7161	7.52204	0.14972	1	0.14972	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F0201.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/22/2015 9:32 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:48 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

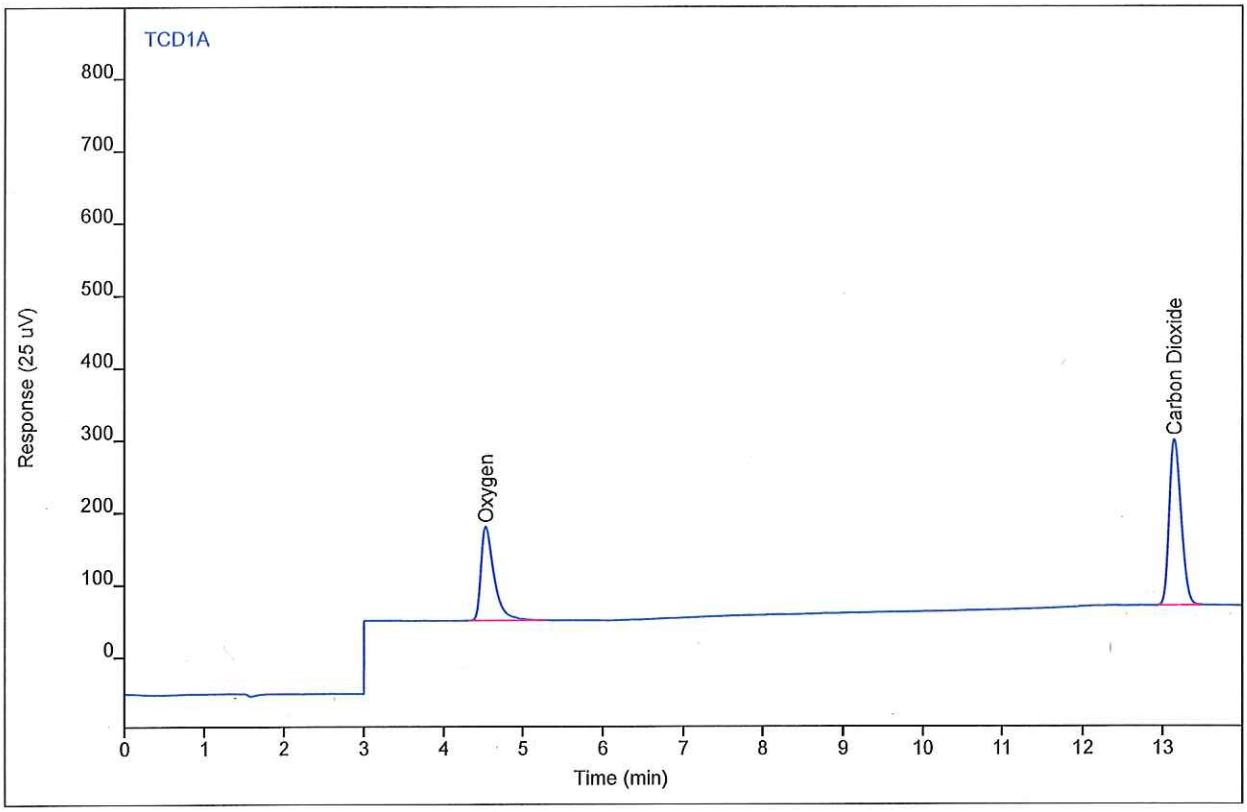


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.53	1465.72	128.799	5.16201	1	5.16201	%
Carbon Dioxide	BB	13.14	2288.11	226.910	5.10507	1	5.10507	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F0202.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/22/2015 9:55 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:48 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

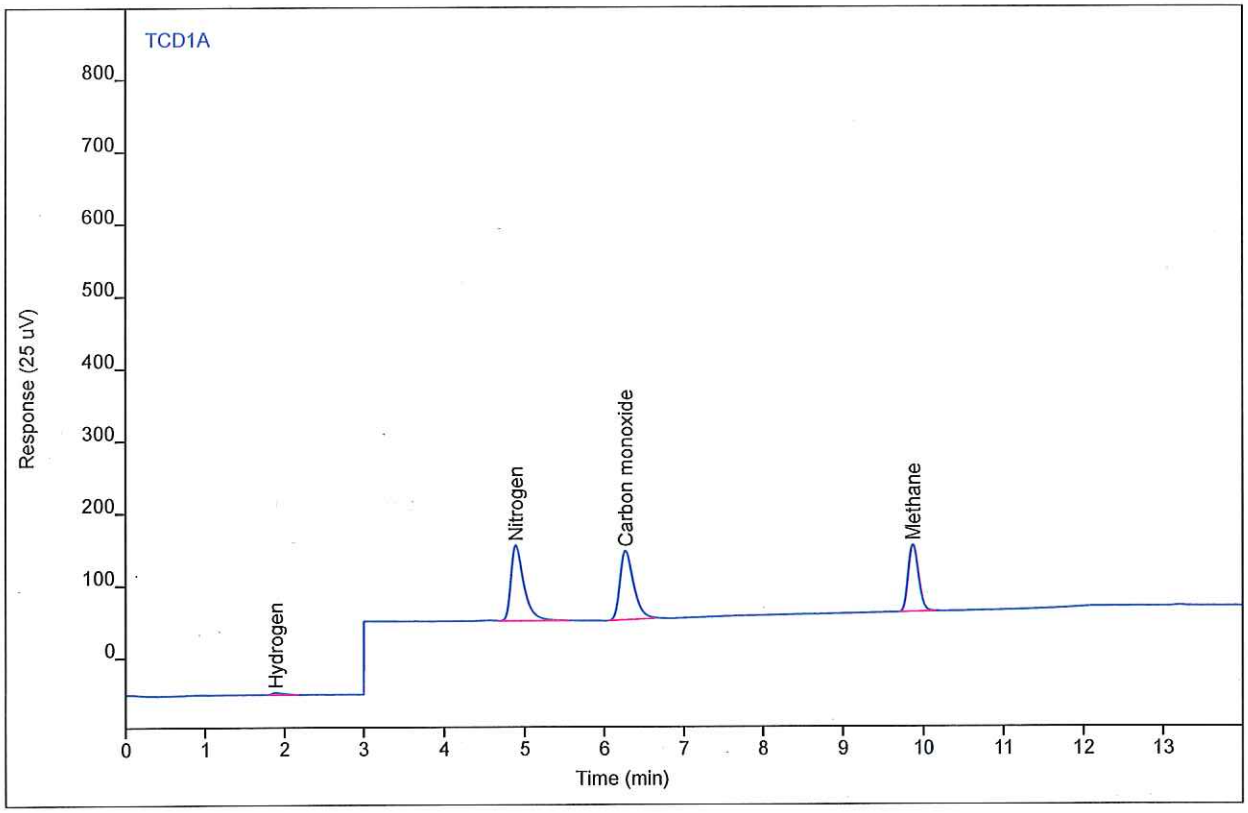


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.53	1471.55	129.405	5.18287	1	5.18287	%
Carbon Dioxide	BB	13.14	2316.94	228.939	5.17026	1	5.17026	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F0301.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/22/2015 10:43 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:48 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

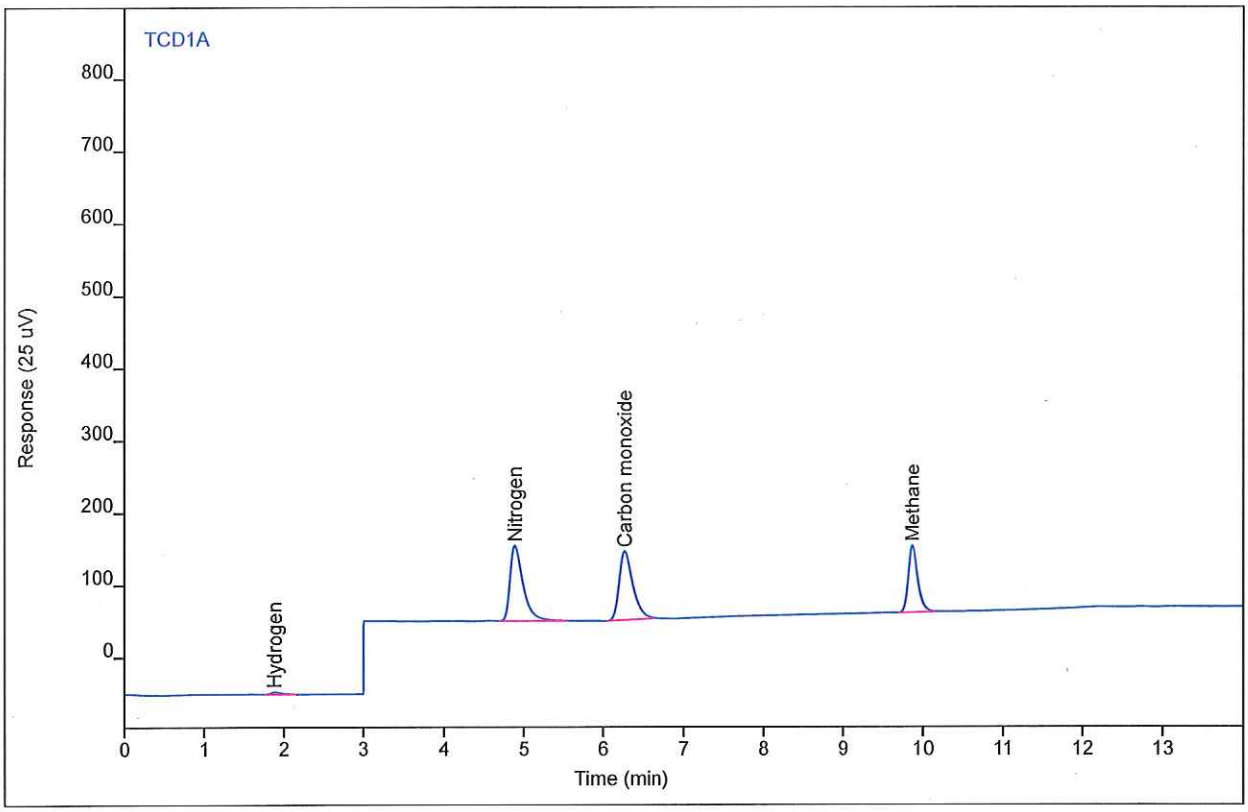


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	29.0529	3.04813	2.86552	1	2.86552	%
Nitrogen	VB	4.89	1187.79	104.147	3.63709	1	3.63709	%
Carbon monoxide	BB	6.27	1136.14	95.1003	3.55869	1	3.55869	%
Methane	BB	9.87	803.334	92.2075	2.85170	1	2.85170	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F0302.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/22/2015 11:06 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:48 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

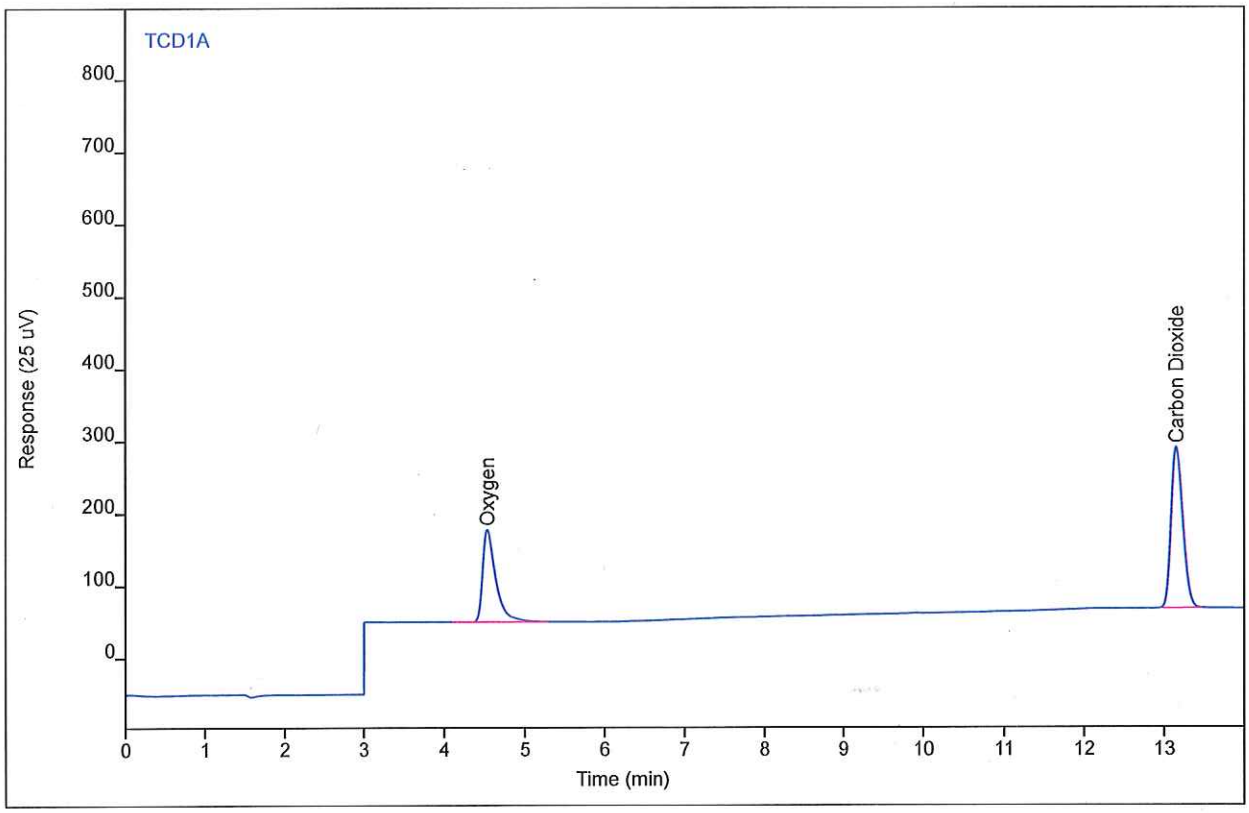


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	29.7581	3.17099	2.93596	1	2.93596	%
Nitrogen	VB	4.89	1187.29	103.887	3.63554	1	3.63554	%
Carbon monoxide	BB	6.27	1130.89	94.7024	3.54215	1	3.54215	%
Methane	BB	9.87	797.328	91.7390	2.83025	1	2.83025	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F1901.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/23/2015 4:31 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:50 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

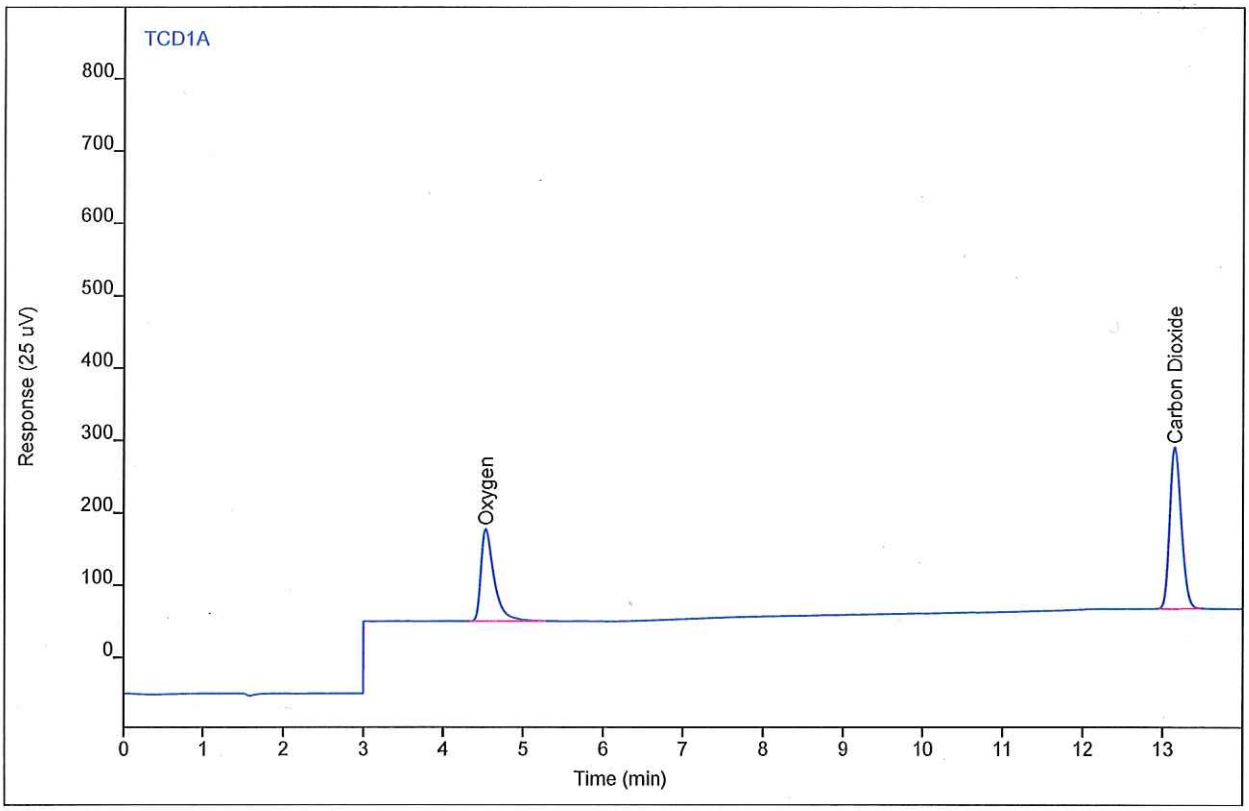


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1446.72	127.198	5.09401	1	5.09401	%
Carbon Dioxide	BB	13.15	2245.00	222.245	5.00758	1	5.00758	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F1902.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/23/2015 4:54 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:50 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

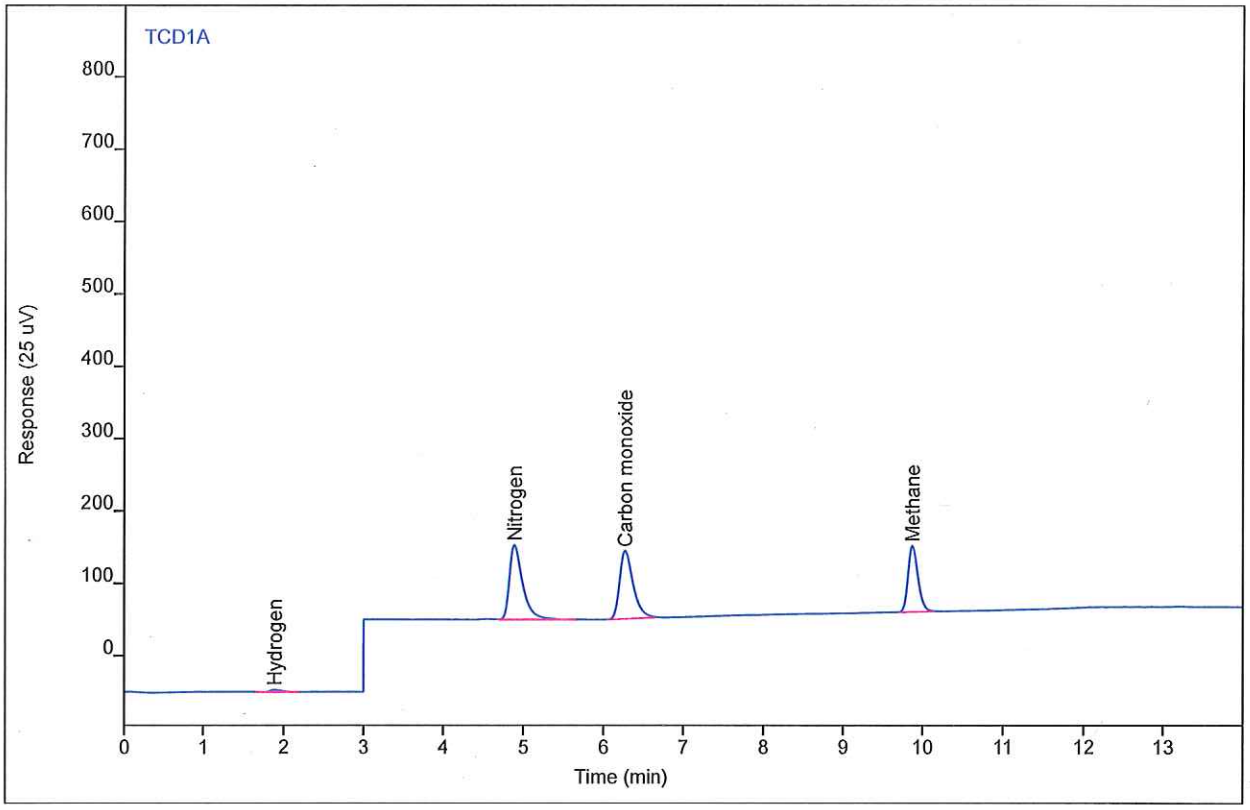


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1441.98	126.954	5.07704	1	5.07704	%
Carbon Dioxide	BB	13.15	2256.27	222.854	5.03305	1	5.03305	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F2001.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/23/2015 5:41 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:51 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

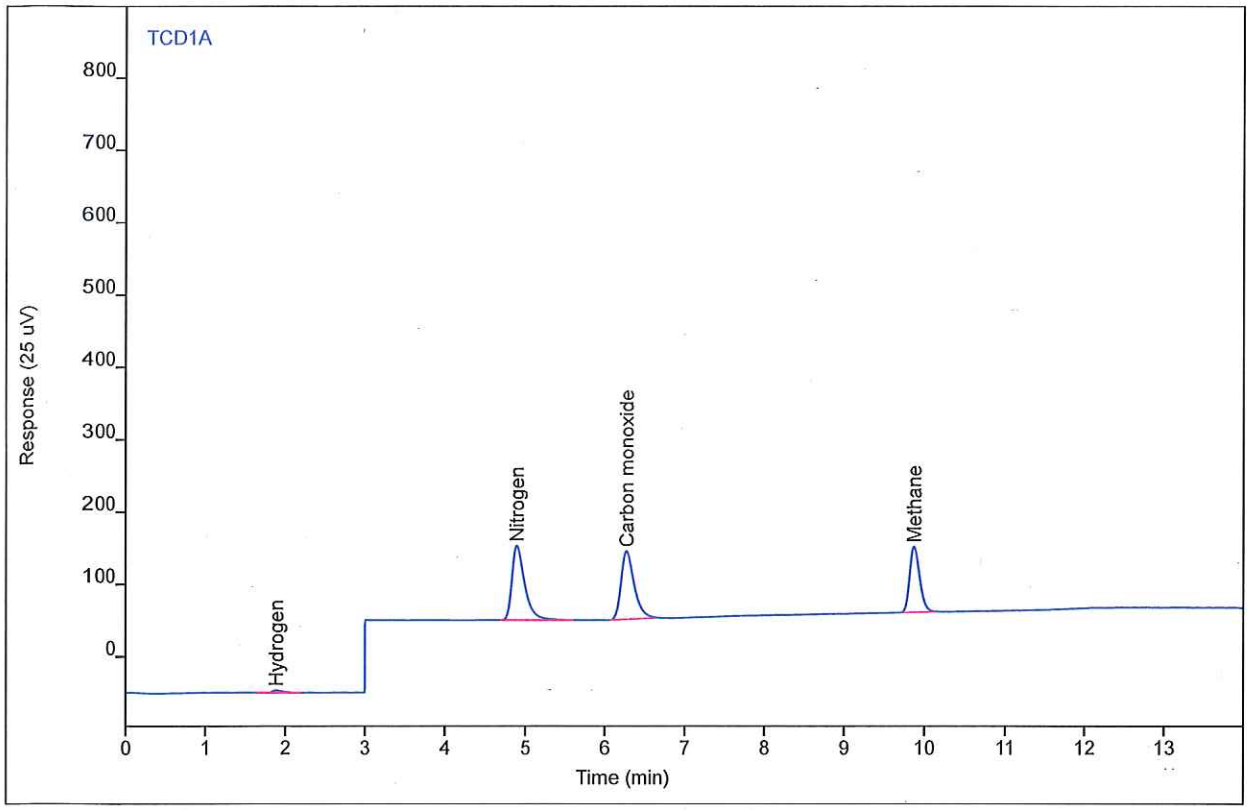


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	29.5285	3.07236	2.91303	1	2.91303	%
Nitrogen	VB	4.89	1179.83	102.916	3.61225	1	3.61225	%
Carbon monoxide	BB	6.27	1121.33	93.6328	3.51203	1	3.51203	%
Methane	BB	9.87	789.003	90.6668	2.80052	1	2.80052	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP172 ver.1	Vial Number	Vial 9
Data File	009F2002.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/23/2015 6:05 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 7:51 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

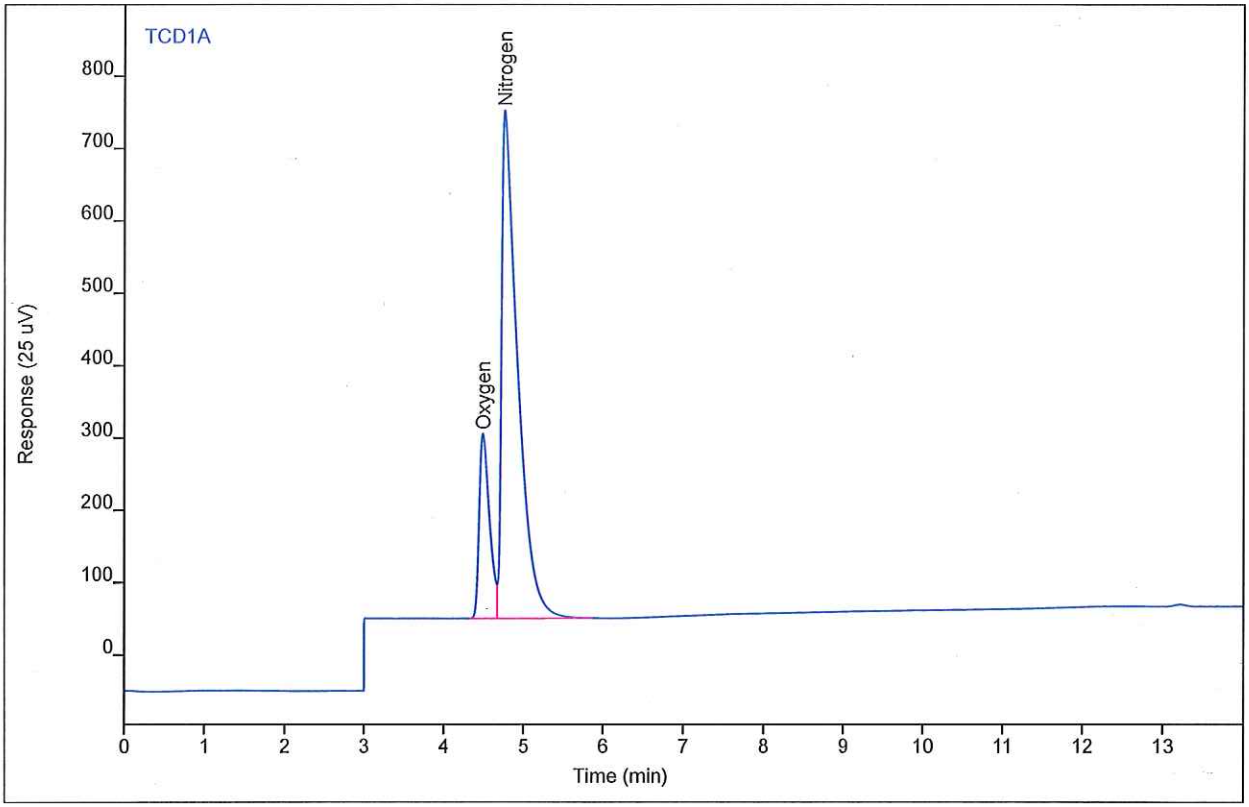


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	28.3892	3.20736	2.79922	1	2.79922	%
Nitrogen	VB	4.89	1175.85	102.757	3.59980	1	3.59980	%
Carbon monoxide	BB	6.27	1118.39	94.0702	3.50278	1	3.50278	%
Methane	BB	9.87	791.234	90.4882	2.80848	1	2.80848	%

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.GW-6 Can943.Can	Sample Type	Sample
Sequence Name	BETTYP172B ver.1	Vial Number	Vial 4
Data File	004F0101.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 2
Injection Date	4/23/2015 7:25 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:27 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM



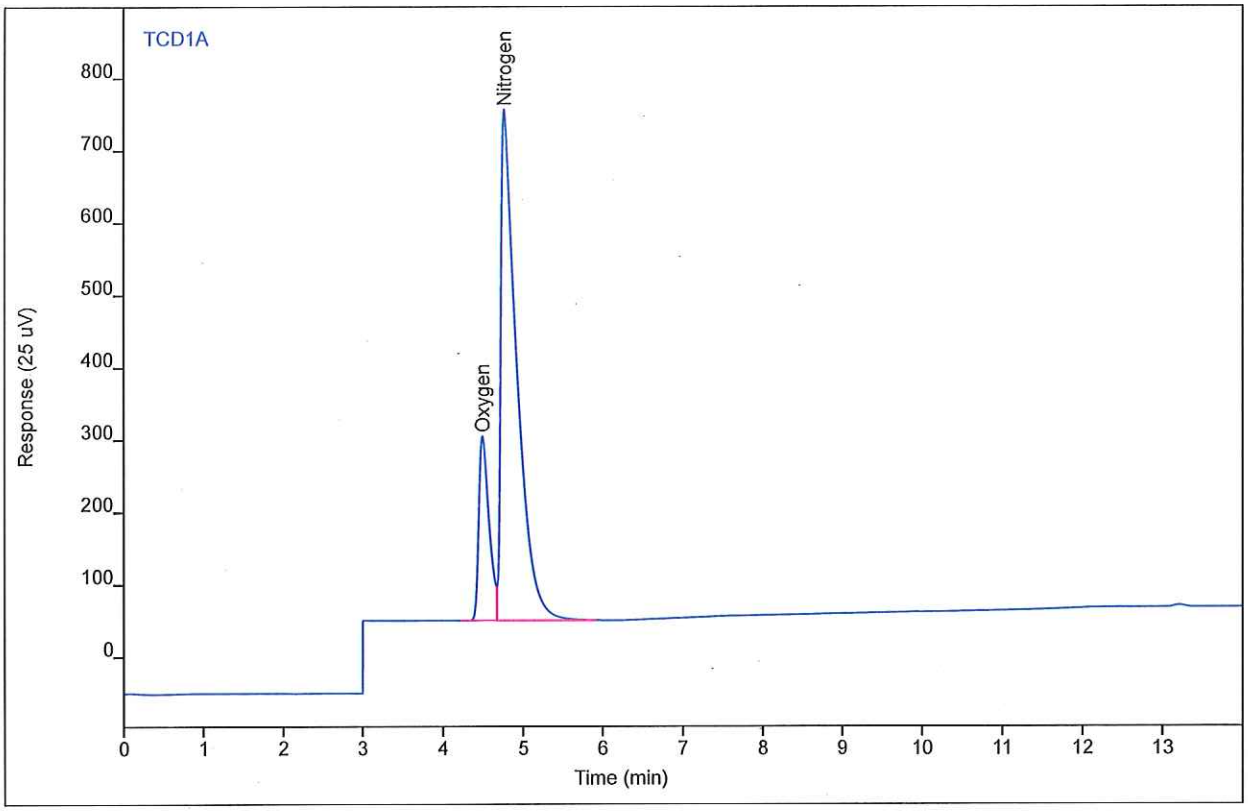
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2284.01	255.446	8.09086	1	8.09086	%
Nitrogen	VB	4.76	9952.99	702.631	31.0096	1	31.0096	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

Chromatogram Report

Enthalpy Analytical

Sample Name	1114-90.GW-6 Can943.Can
Sequence Name	BETTYP172B ver.1
Data File	004F0102.D
File Location	GC/2015/Betty/Quarter 2
Injection Date	4/23/2015 7:46 AM
File Modified	4/23/2015 1:27 PM
Instrument	
Operator	disconnected

Sample Type	Sample
Vial Number	Vial 4
Injection Volume	250
Injection	2 of 2
Acquisition Method	GC142P133_CAL.M
Analysis Method	BETTYP162_FGA.M
Method Modified	4/16/2015 3:55 PM
Printed	4/23/2015 2:09 PM

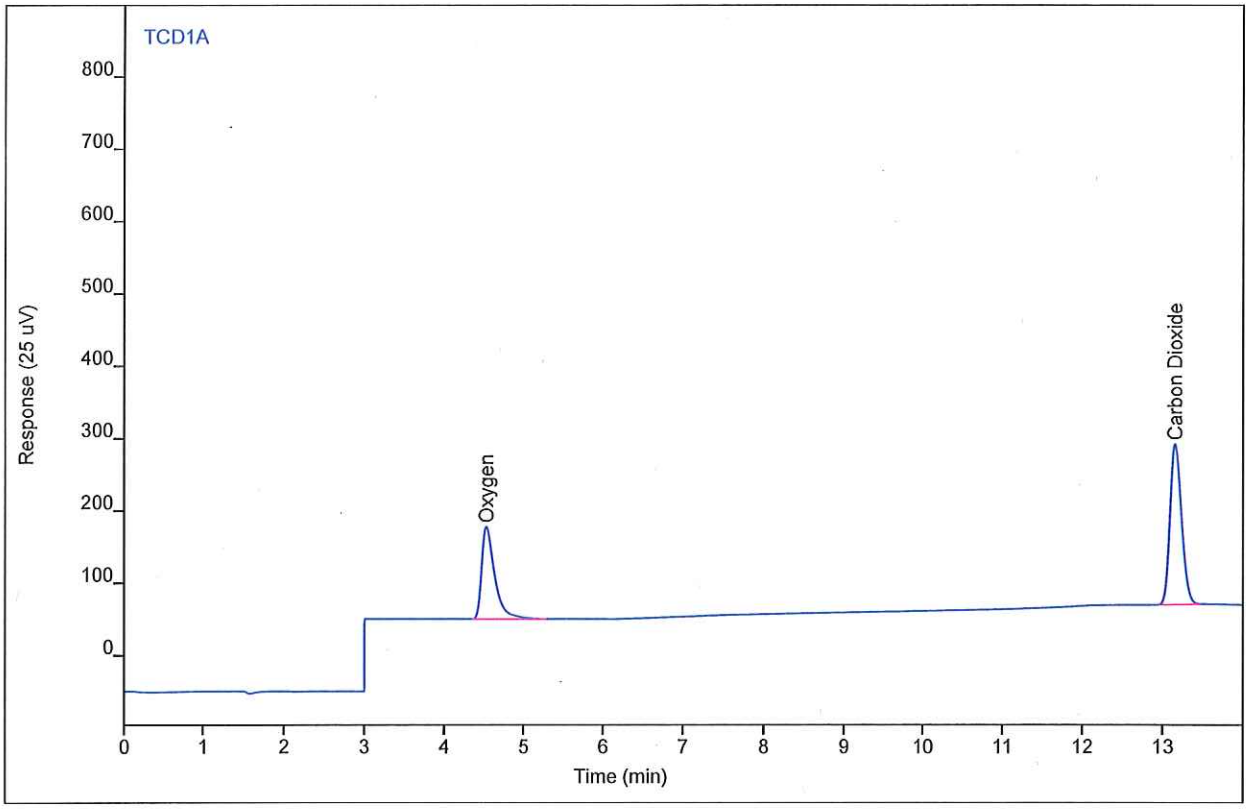


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.49	2273.59	254.469	8.05360	1	8.05360	%
Nitrogen	VB	4.76	9983.05	705.514	31.1035	1	31.1035	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP172B ver.1	Vial Number	Vial 9
Data File	009F0301.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 3
Injection Date	4/23/2015 9:00 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:27 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

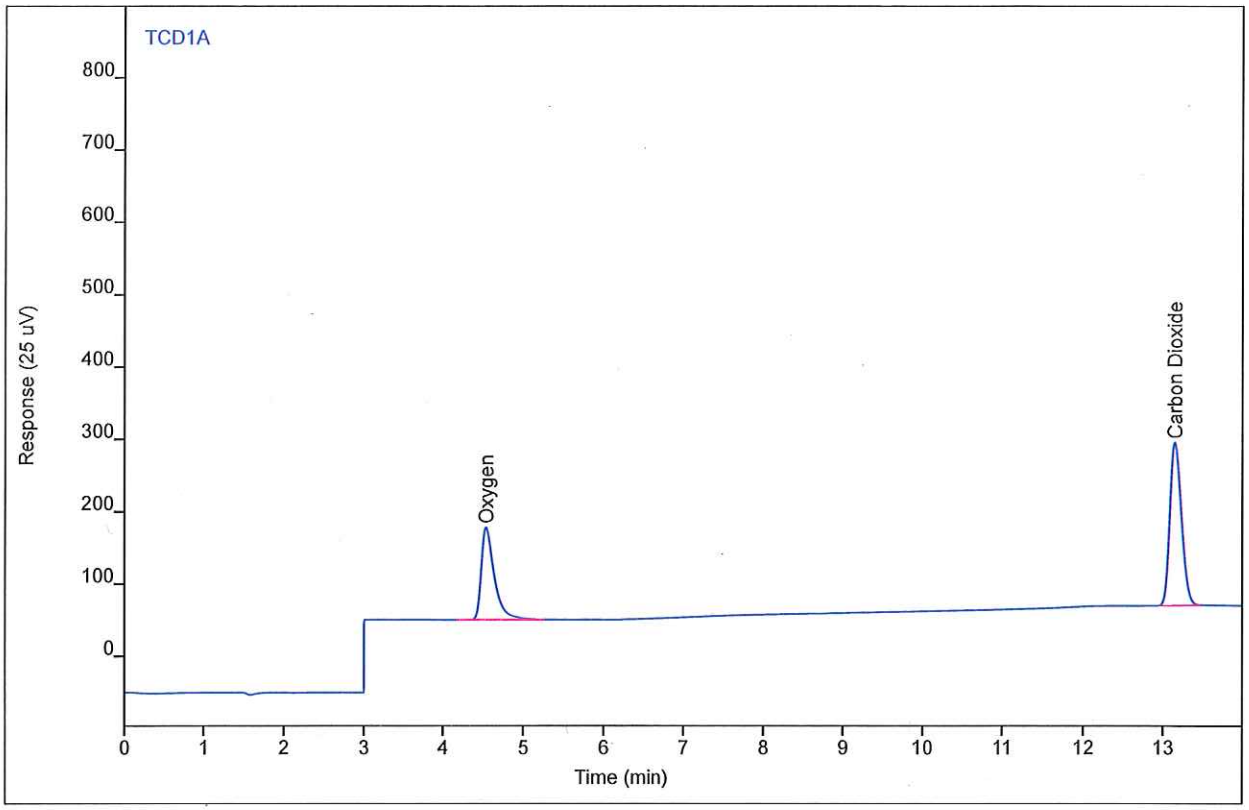


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.53	1443.80	127.361	5.08354	1	5.08354	%
Carbon Dioxide	BB	13.15	2235.73	221.667	4.98661	1	4.98661	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP172B ver.1	Vial Number	Vial 9
Data File	009F0302.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	2 of 3
Injection Date	4/23/2015 9:24 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:27 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

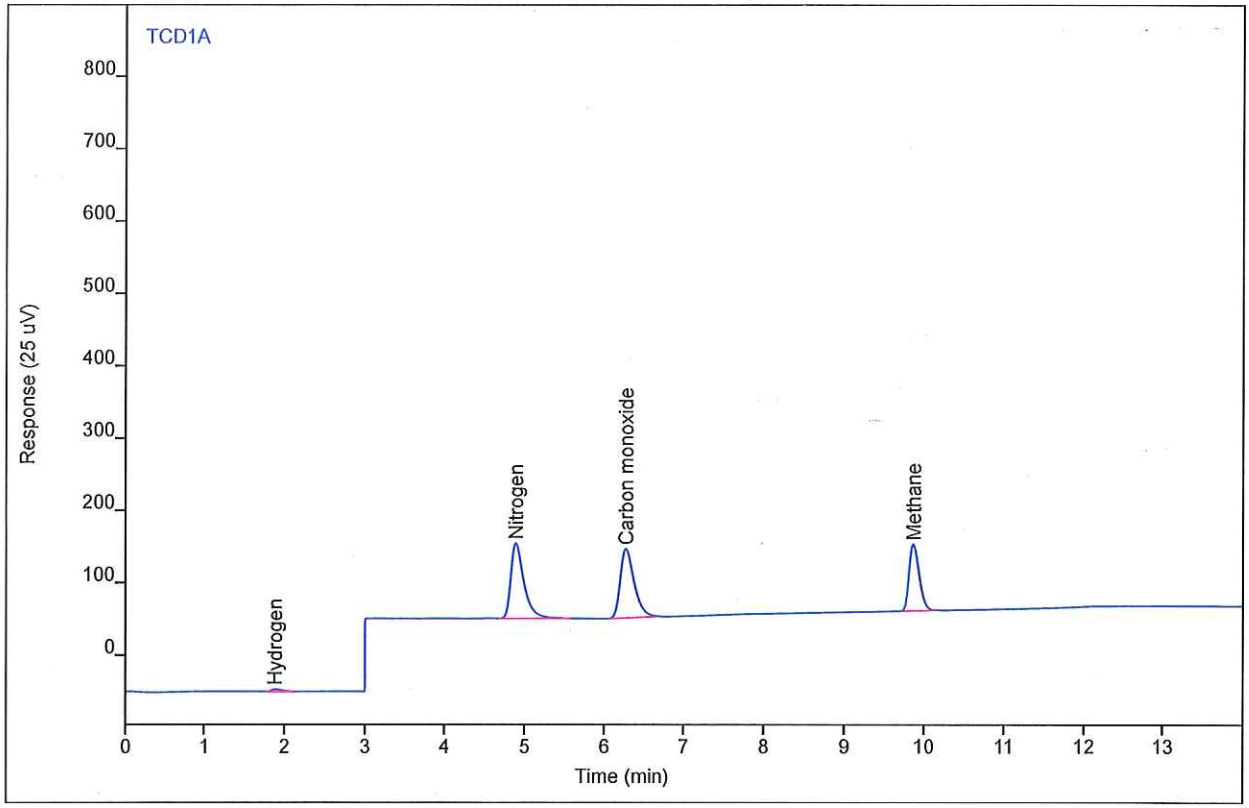


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1438.71	127.296	5.06533	1	5.06533	%
Carbon Dioxide	BB	13.15	2271.94	225.067	5.06850	1	5.06850	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP172B ver.1	Vial Number	Vial 9
Data File	009F0403.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	3 of 3
Injection Date	4/23/2015 10:58 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:28 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM

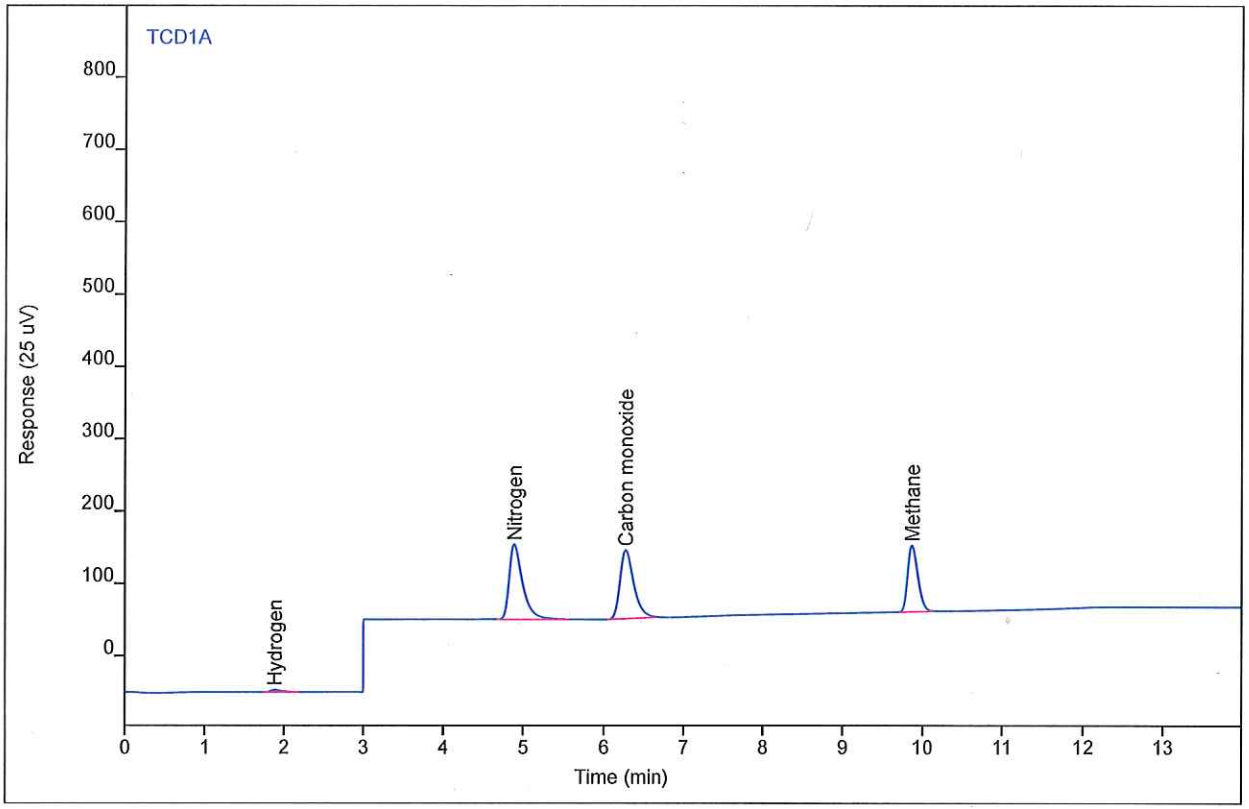


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	28.7109	3.10524	2.83135	1	2.83135	%
Nitrogen	VB	4.89	1188.21	103.899	3.63841	1	3.63841	%
Carbon monoxide	BB	6.27	1137.77	95.0750	3.56379	1	3.56379	%
Methane	BB	9.87	799.797	91.6369	2.83907	1	2.83907	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP172B ver.1	Vial Number	Vial 9
Data File	009F0501.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 2	Injection	1 of 1
Injection Date	4/23/2015 11:21 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/23/2015 1:28 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/16/2015 3:55 PM
Operator	disconnected	Printed	4/23/2015 2:09 PM



Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	29.1724	3.10690	2.87745	1	2.87745	%
Nitrogen	VB	4.89	1184.48	103.513	3.62676	1	3.62676	%
Carbon monoxide	BB	6.27	1131.57	94.5638	3.54429	1	3.54429	%
Methane	BB	9.87	795.423	91.2212	2.82345	1	2.82345	%

Calibration Table

Calib. Data Modified : Thursday, April 16, 2015 3:54:52 PM

Rel. Reference Window : 2.000 %
Abs. Reference Window : 0.000 min
Rel. Non-ref. Window : 2.000 %
Abs. Non-ref. Window : 0.200 min
Uncalibrated Peaks : not reported
Partial Calibration : Yes, identified peaks are recalibrated
Correct All Ret. Times: No, only for identified peaks

Curve Type : Linear
Origin : Connected
Weight : Quadratic (Amnt)

Recalibration Settings:
Average Response : Average all calibrations
Average Retention Time: Floating Average New 75%

Calibration Report Options :
Printout of recalibrations within a sequence:
Calibration Table after Recalibration
Normal Report after Recalibration
If the sequence is done with bracketing:
Results of first cycle (ending previous bracket)

Signal 1: TCD1 A,
Signal 2: FID2 B,

RetTime [min]	Sig	Lvl	Amount [%]	Area	Amt/Area	Ref	Grp	Name
1.891	1	5	3.10000e-1	3.45112	8.98259e-2			Hydrogen
		6	7.90000e-1	8.43194	9.36914e-2			
		7	2.76000	28.40667	9.71603e-2			
		8	8.20000	75.91559	1.08015e-1			
		29	28.54000	300.93891	9.48365e-2			
4.537	1	1	5.44000e-1	172.41122	3.15525e-3			Oxygen
		2	1.33000	409.30358	3.24942e-3			
		3	4.81000	1426.44307	3.37202e-3			
		4	10.01000	2828.97437	3.53838e-3			
		23	99.99900	2.61493e4	3.82416e-3			
4.896	1	5	3.80000e-1	142.17762	2.67271e-3			Nitrogen
		6	9.60000e-1	342.00709	2.80696e-3			
		7	3.37000	1167.98800	2.88530e-3			
		8	10.00000	3245.48145	3.08121e-3			
		22	99.90000	2.93587e4	3.40274e-3			
6.280	1	5	3.80000e-1	125.16341	3.03603e-3			Carbon monoxide
		6	9.60000e-1	317.65998	3.02210e-3			
		7	3.37000	1120.40861	3.00783e-3			
		8	10.00000	3226.82992	3.09902e-3			
		25	99.50000	2.95829e4	3.36343e-3			
9.879	1	5	3.10000e-1	90.26483	3.43434e-3			Methane
		6	7.70000e-1	226.64438	3.39739e-3			
		7	2.70000	791.58162	3.41089e-3			
		8	8.00000	2209.74951	3.62032e-3			
		24	99.99900	2.69359e4	3.71248e-3			
13.183	1	1	5.40000e-1	263.65535	2.04813e-3			Carbon Dioxide
		2	1.33000	647.06974	2.05542e-3			

RetTime [min]	Lvl Sig	Amount [%]	Area	Amt/Area	Ref	Grp	Name
	3	4.81000	2255.16528	2.13288e-3			
	4	10.01000	4470.61702	2.23906e-3			
	21	99.99000	4.10379e4	2.43653e-3			

More compound-specific settings:

Compound: Hydrogen
Time Window : From 1.773 min To 2.009 min

Compound: Oxygen
Time Window : From 4.255 min To 4.693 min

Compound: Nitrogen
Time Window : From 4.556 min To 5.096 min

Compound: Carbon monoxide
Time Window : From 5.680 min To 6.430 min

Compound: Methane
Time Window : From 9.461 min To 10.229 min

Compound: Carbon Dioxide
Time Window : From 12.568 min To 13.413 min

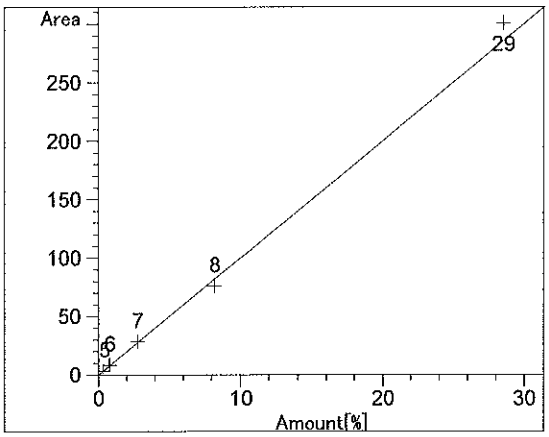
1 Warnings or Errors :

Warning : Overlapping peak time windows at 4.537 min, signal 1

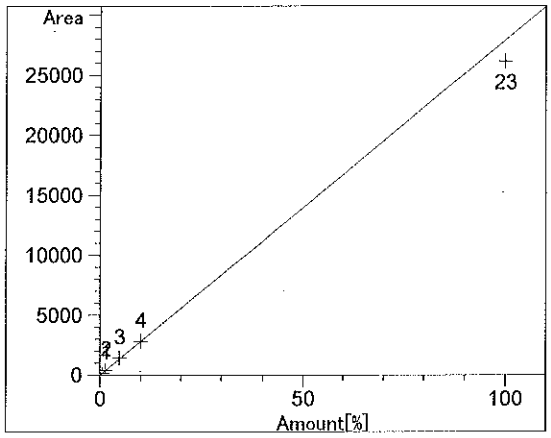
Peak Sum Table

No Entries in table

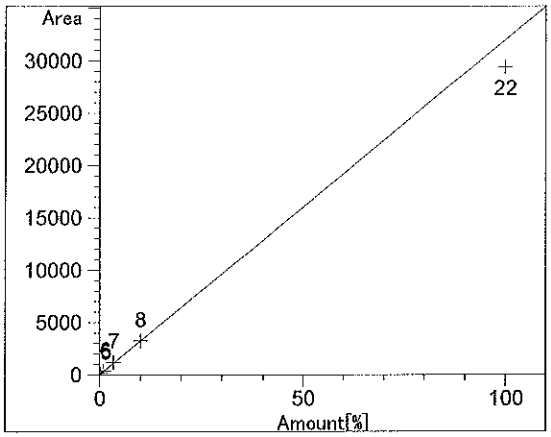
Calibration Curves



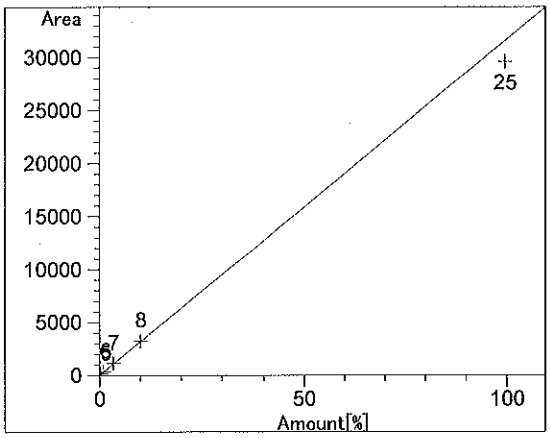
Hydrogen at exp. RT: 1.891
TCD1 A,
Correlation: 0.99835
Residual Std. Dev.: 9.39047
Formula: y = mx + b
m: 10.00987
b: 3.69469e-1
x: Amount
y: Area
Calibration Level Weights:
Level 5 : 1
Level 6 : 0.153982
Level 7 : 0.012616
Level 8 : 0.001429
Level 29 : 0.000118



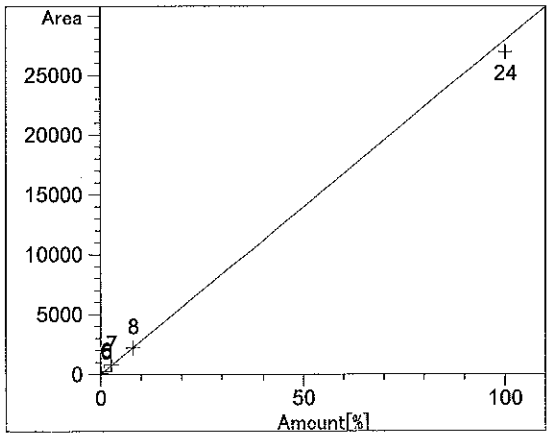
Oxygen at exp. RT: 4.537
TCD1 A,
Correlation: 0.99861
Residual Std. Dev.: 1047.10945
Formula: y = mx + b
m: 279.38654
b: 23.52715
x: Amount
y: Area
Calibration Level Weights:
Level 1 : 1
Level 2 : 0.167299
Level 3 : 0.012791
Level 4 : 0.002953
Level 23 : 0.00003



Nitrogen at exp. RT: 4.896
TCD1 A,
Correlation: 0.99789
Residual Std. Dev.: 1532.98969
Formula: y = mx + b
m: 320.21937
b: 23.11905
x: Amount
y: Area
Calibration Level Weights:
Level 5 : 1
Level 6 : 0.156684
Level 7 : 0.012715
Level 8 : 0.001444
Level 22 : 0.000014

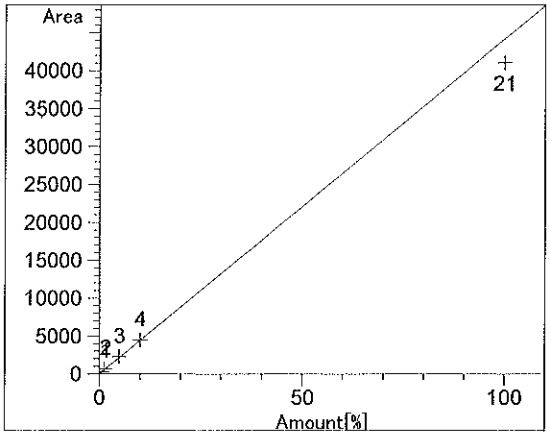


Carbon monoxide at exp. RT: 6.280
TCD1 A,
Correlation: 0.99887
Residual Std. Dev.: 1165.48483
Formula: y = mx + b
m: 317.53234
b: 6.14602
x: Amount
y: Area
Calibration Level Weights:
Level 5 : 1
Level 6 : 0.156684
Level 7 : 0.012715
Level 8 : 0.001444
Level 25 : 0.000015



Methane at exp. RT: 9.879
TCD1 A,
Correlation: 0.99925
Residual Std. Dev.: 618.58255
Formula: y = mx + b
m: 280.01724
b: 4.80977
x: Amount
y: Area
Calibration Level Weights:
Level 5 : 1
Level 6 : 0.162085
Level 7 : 0.013182
Level 8 : 0.001502

Level 24 : 9.61019e-006



Carbon Dioxide at exp. RT: 13.183
TCD1 A,
Correlation: 0.99823
Residual Std. Dev.: 1852.68537
Formula: y = mx + b
m: 442.18907
b: 30.70588
x: Amount
y: Area
Calibration Level Weights:
Level 1 : 1
Level 2 : 0.164848
Level 3 : 0.012604
Level 4 : 0.00291
Level 21 : 0.000029

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Enthalpy Analytical

Company: Civil & Environmental Consultants, Inc. - Charlotte
Client No: 111-370-.001
Job No: 1114-90

Parameters: ASTM D1946-90
Samples: 4 cans
Analyst: Justin Guenzler

SAMPLE NAME	Filename #1	Filename #2	Analysis Method	Ret Time (min)	Ret Time (min)	%dif RT	Conc # 1	Conc # 2	%dif conc	Units	Avg Conc	Standard Tag	% Tag
Hydrogen -- Calibration Standards, Laboratory Blanks and Controls													
He Blank #LB	001F0203.D	001F0204.D	BETTYP162_FGA.M	NA	NA	NA	0.0510	0.0510	0.0	%	0.0510	NA	NA
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0401.D	009F0402.D	BETTYP162_FGA.M	1.89	1.89	0.0	2.90	2.76	2.5	%	2.83	2.76	103
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0301.D	009F0302.D	BETTYP162_FGA.M	1.89	1.89	0.2	2.87	2.94	1.2	%	2.90	2.76	105
BettyP118 #FG7 ENV(1=530,3=319.02)	009F2001.D	009F2002.D	BETTYP162_FGA.M	1.89	1.89	0.0	2.91	2.80	2.0	%	2.86	2.76	103
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0403.D	009F0501.D	BETTYP162_FGA.M	1.89	1.89	0.1	2.83	2.88	0.8	%	2.85	2.76	103
Oxygen -- Calibration Standards, Laboratory Blanks and Controls													
He Blank #LB	001F0203.D	001F0204.D	BETTYP162_FGA.M	NA	NA	NA	0.0544	0.0544	0.0	%	0.0544	NA	NA
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F0301.D	009F0302.D	BETTYP162_FGA.M	4.54	4.54	0.0	5.09	5.13	0.4	%	5.11	4.81	106
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F0201.D	009F0202.D	BETTYP162_FGA.M	4.53	4.53	0.0	5.16	5.18	0.2	%	5.17	4.81	108
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F1901.D	009F1902.D	BETTYP162_FGA.M	4.54	4.54	0.0	5.09	5.08	0.2	%	5.09	4.81	106
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F0301.D	009F0302.D	BETTYP162_FGA.M	4.53	4.54	0.0	5.08	5.07	0.2	%	5.07	4.81	105
Nitrogen -- Calibration Standards, Laboratory Blanks and Controls													
He Blank #LB	001F0203.D	001F0204.D	BETTYP162_FGA.M	4.90	4.91	0.1	0.117	0.122	2.3	%	0.120	NA	NA
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0401.D	009F0402.D	BETTYP162_FGA.M	4.89	4.89	0.0	3.61	3.65	0.5	%	3.63	3.37	108
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0301.D	009F0302.D	BETTYP162_FGA.M	4.89	4.89	0.0	3.64	3.64	0.0	%	3.64	3.37	108
BettyP118 #FG7 ENV(1=530,3=319.02)	009F2001.D	009F2002.D	BETTYP162_FGA.M	4.89	4.89	0.0	3.61	3.60	0.2	%	3.61	3.37	107
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0403.D	009F0501.D	BETTYP162_FGA.M	4.89	4.89	0.0	3.64	3.63	0.2	%	3.63	3.37	108

Enthalpy Analytical

Company: Civil & Environmental Consultants, Inc. - Charlotte
Client No: 111-370-.001
Job No: 1114-90

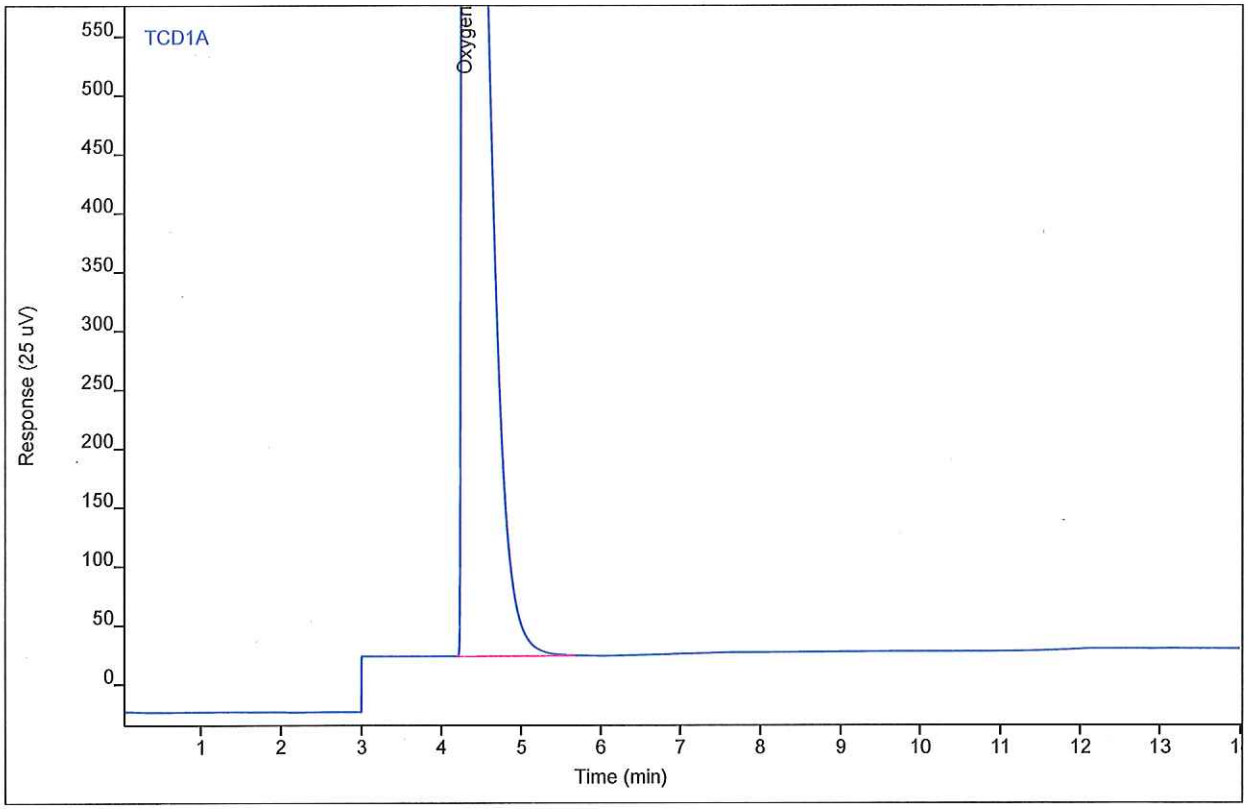
Parameters: ASTM D1946-90
Samples: 4 cans
Analyst: Justin Guenzler

SAMPLE NAME	Filename #1	Filename #2	Analysis Method	Ret Time (min)	Ret Time (min)	%dif RT	Conc # 1	Conc # 2	%dif conc	Units	Avg Conc	Standard Tag	% Tag
Carbon monoxide -- Calibration Standards, Laboratory Blanks and Controls													
He Blank #LB	001F0203.D	001F0204.D	BETTYP162_FGA.M	NA	NA	NA	0.0380	0.0380	0.0	%	0.0380	NA	NA
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0401.D	009F0402.D	BETTYP162_FGA.M	6.27	6.27	0.0	3.55	3.59	0.7	%	3.57	3.37	106
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0301.D	009F0302.D	BETTYP162_FGA.M	6.27	6.27	0.0	3.56	3.54	0.2	%	3.55	3.37	105
BettyP118 #FG7 ENV(1=530,3=319.02)	009F2001.D	009F2002.D	BETTYP162_FGA.M	6.27	6.27	0.0	3.51	3.50	0.1	%	3.51	3.37	104
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0403.D	009F0501.D	BETTYP162_FGA.M	6.27	6.27	0.0	3.56	3.54	0.3	%	3.55	3.37	105
Methane -- Calibration Standards, Laboratory Blanks and Controls													
He Blank #LB	001F0203.D	001F0204.D	BETTYP162_FGA.M	NA	NA	NA	0.0305	0.0305	0.0	%	0.0305	NA	NA
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0401.D	009F0402.D	BETTYP162_FGA.M	9.87	9.87	0.0	2.83	2.85	0.4	%	2.84	2.70	105
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0301.D	009F0302.D	BETTYP162_FGA.M	9.87	9.87	0.0	2.85	2.83	0.4	%	2.84	2.70	105
BettyP118 #FG7 ENV(1=530,3=319.02)	009F2001.D	009F2002.D	BETTYP162_FGA.M	9.87	9.87	0.0	2.80	2.81	0.1	%	2.80	2.70	104
BettyP118 #FG7 ENV(1=530,3=319.02)	009F0403.D	009F0501.D	BETTYP162_FGA.M	9.87	9.87	0.0	2.84	2.82	0.3	%	2.83	2.70	105
Carbon dioxide -- Calibration Standards, Laboratory Blanks and Controls													
He Blank #LB	001F0203.D	001F0204.D	BETTYP162_FGA.M	NA	NA	NA	0.0544	0.0544	0.0	%	0.0544	NA	NA
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F0301.D	009F0302.D	BETTYP162_FGA.M	13.14	13.14	0.0	5.11	5.09	0.2	%	5.10	4.81	106
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F0201.D	009F0202.D	BETTYP162_FGA.M	13.14	13.14	0.0	5.11	5.17	0.6	%	5.14	4.81	107
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F1901.D	009F1902.D	BETTYP162_FGA.M	13.15	13.15	0.0	5.01	5.03	0.3	%	5.02	4.81	104
BettyP070 #FG3 ENV(1=374.56,2=391.18)	009F0301.D	009F0302.D	BETTYP162_FGA.M	13.15	13.15	0.0	4.99	5.07	0.8	%	5.03	4.81	105

Chromatogram Report

Enthalpy Analytical

Sample Name	O2 99.999% #FG23	Sample Type	Calibration
Sequence Name	BETTYP162 1 ver.3	Vial Number	Vial 16
Data File	016F0201.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	1 of 3
Injection Date	4/1/2015 12:05 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/17/2015 7:11 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/17/2015 7:09 AM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM

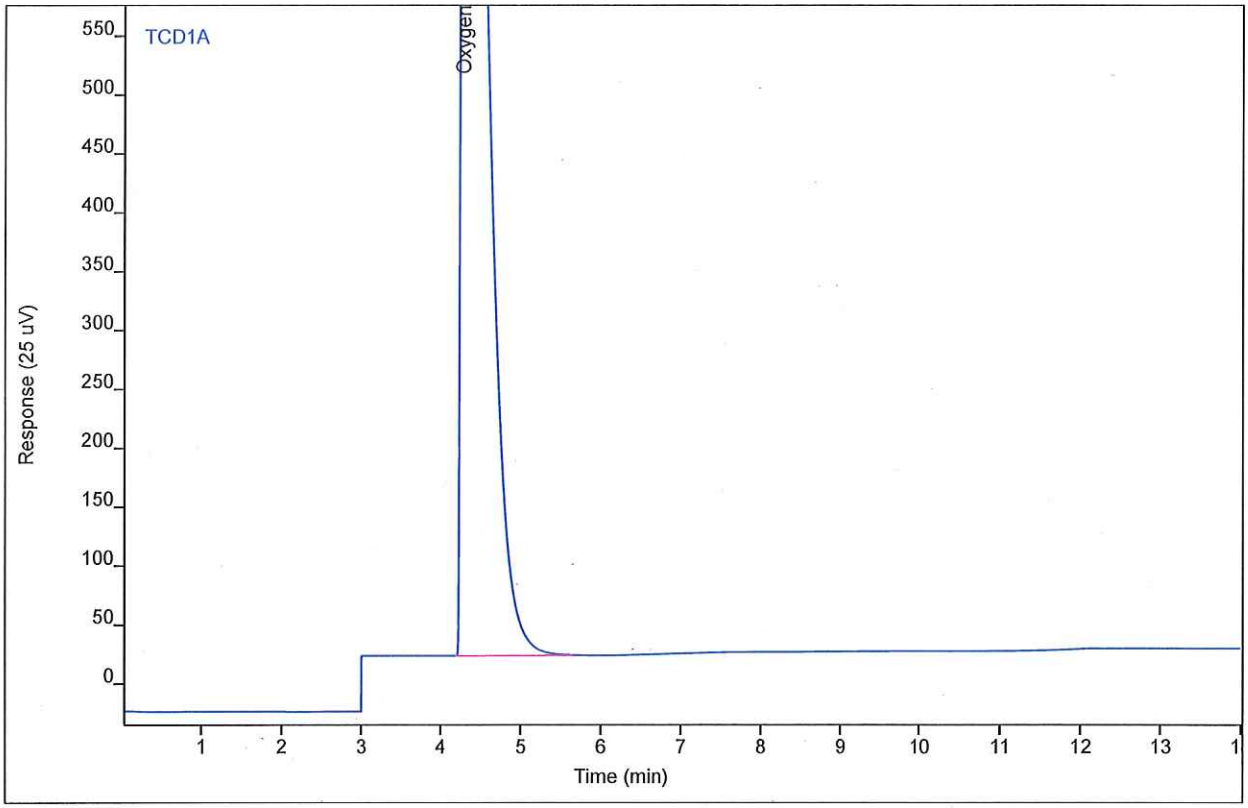


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.29	26216.3	1465.39	93.7509	1	93.7509	%

Chromatogram Report

Enthalpy Analytical

Sample Name	O2 99.999% #FG23	Sample Type	Calibration
Sequence Name	BETTYP162 1 ver.3	Vial Number	Vial 16
Data File	016F0202.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 3
Injection Date	4/1/2015 12:26 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/17/2015 7:11 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/17/2015 7:09 AM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM

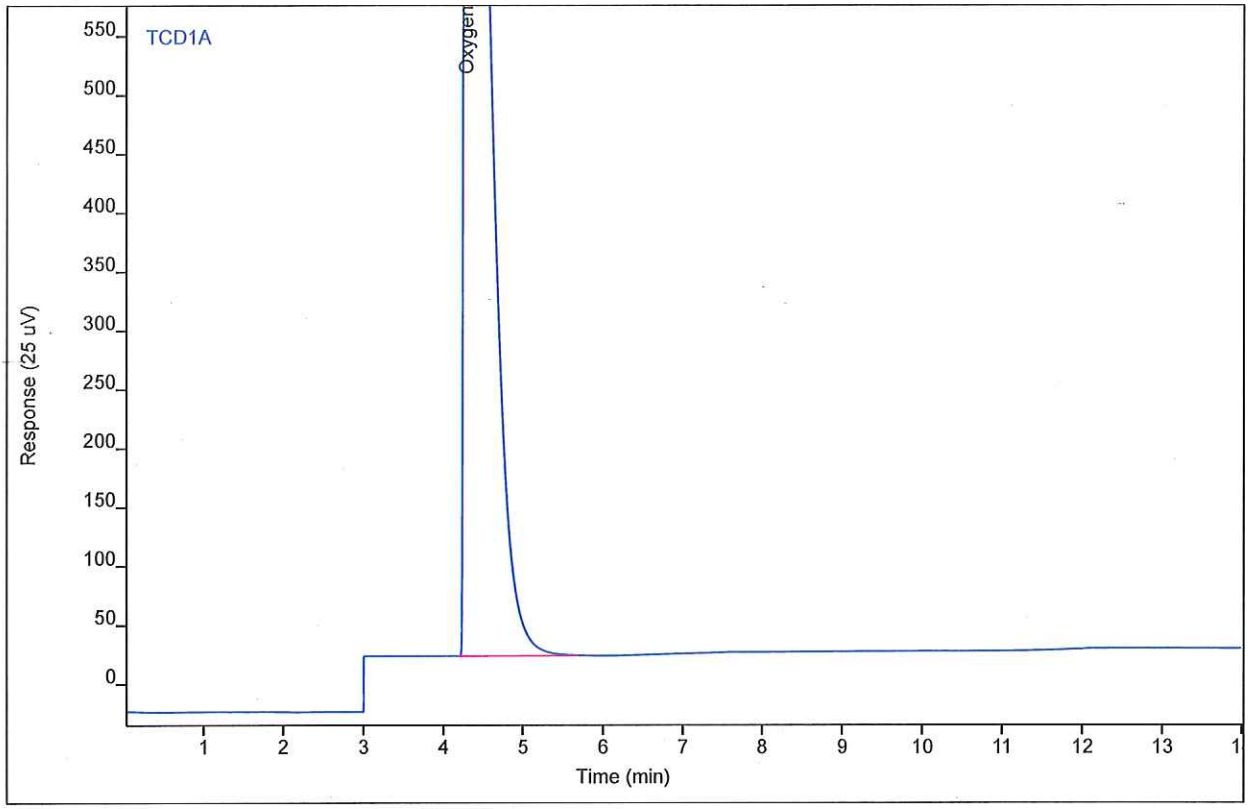


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.29	26088.9	1459.55	93.2950	1	93.2950	%

Chromatogram Report

Enthalpy Analytical

Sample Name	O2 99.999% #FG23	Sample Type	Calibration
Sequence Name	BETTYP162 1 ver.3	Vial Number	Vial 16
Data File	016F0203.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 3
Injection Date	4/1/2015 12:47 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/17/2015 7:11 AM	Analysis Method	BETTYP162_FGA.M
Instrument	Betty	Method Modified	4/17/2015 7:09 AM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM

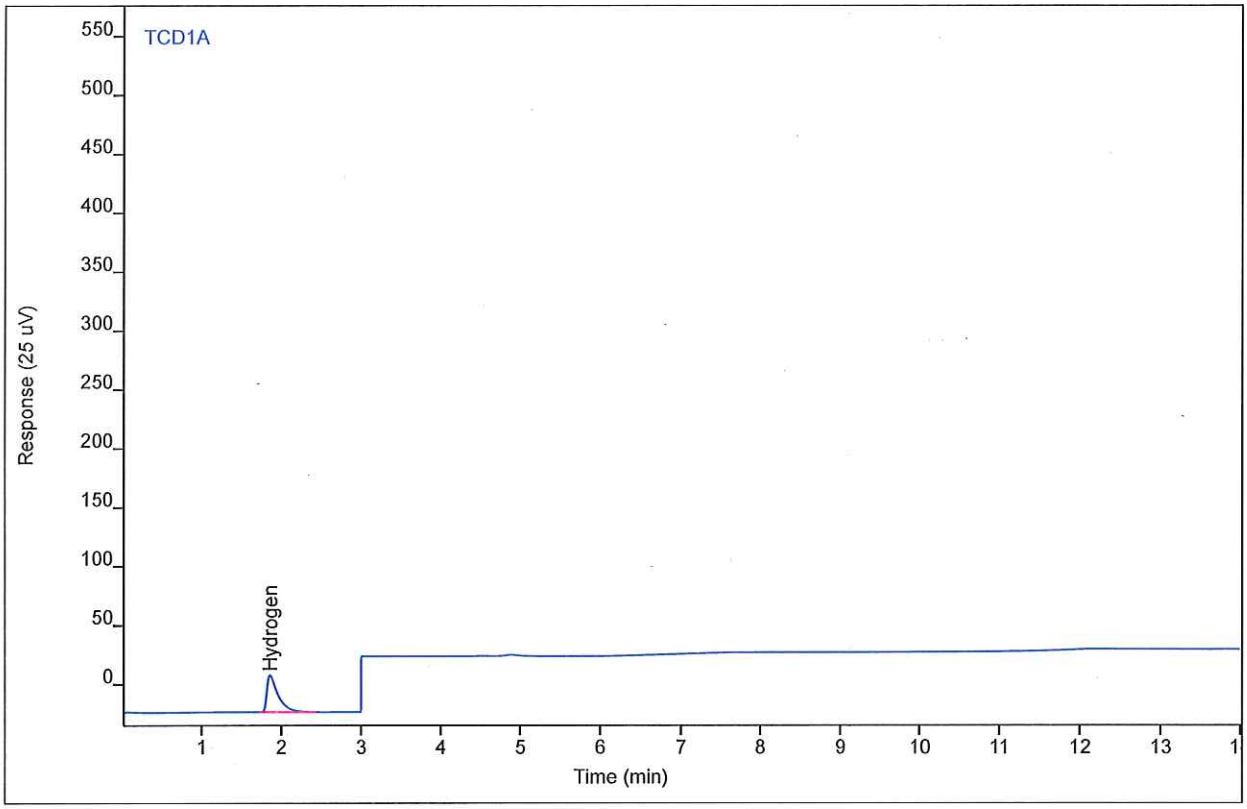


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.29	26142.7	1464.05	93.4876	1	93.4876	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP162 #FG29 ENV(1=706.66,6=396.04)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0404.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 6
Injection Date	4/1/2015 4:46 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

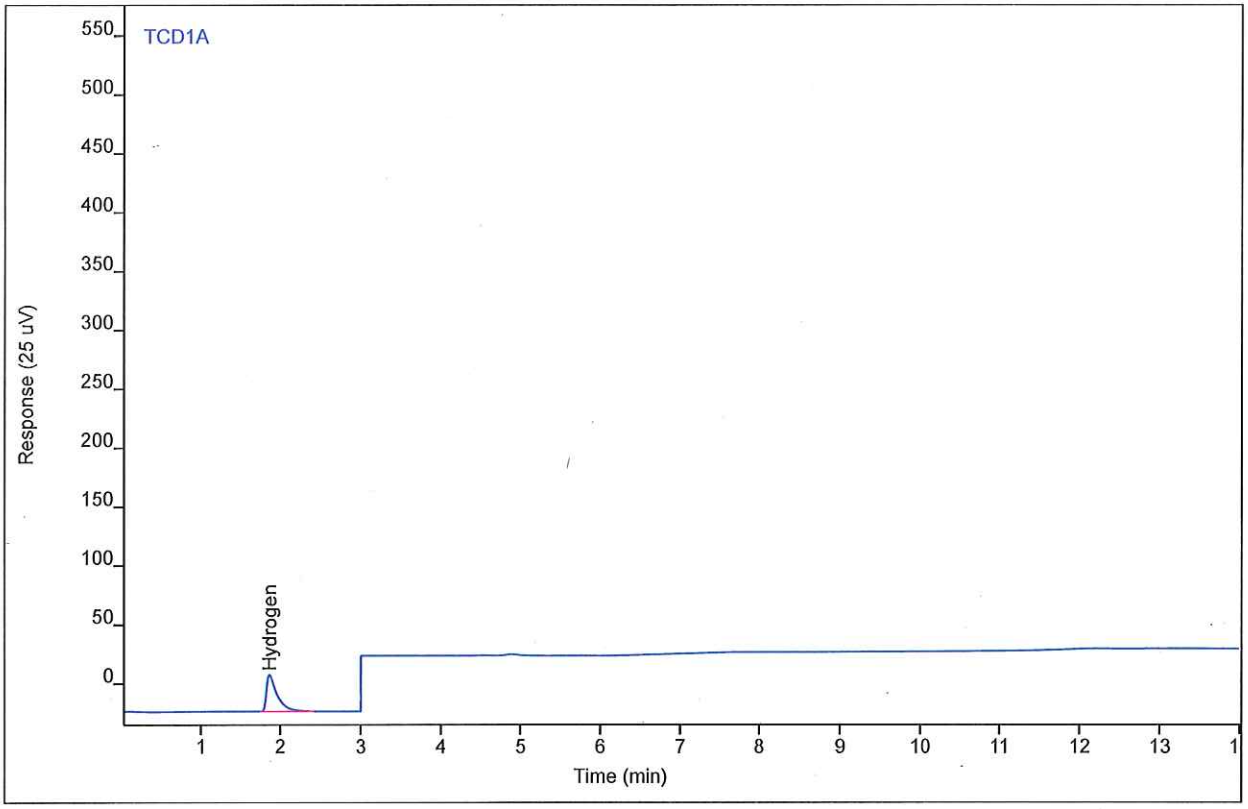


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.86	301.978	31.2546	30.1311	1	30.1311	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP162 #FG29 ENV(1=706.66,6=396.04)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0405.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	5 of 6
Injection Date	4/1/2015 5:10 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

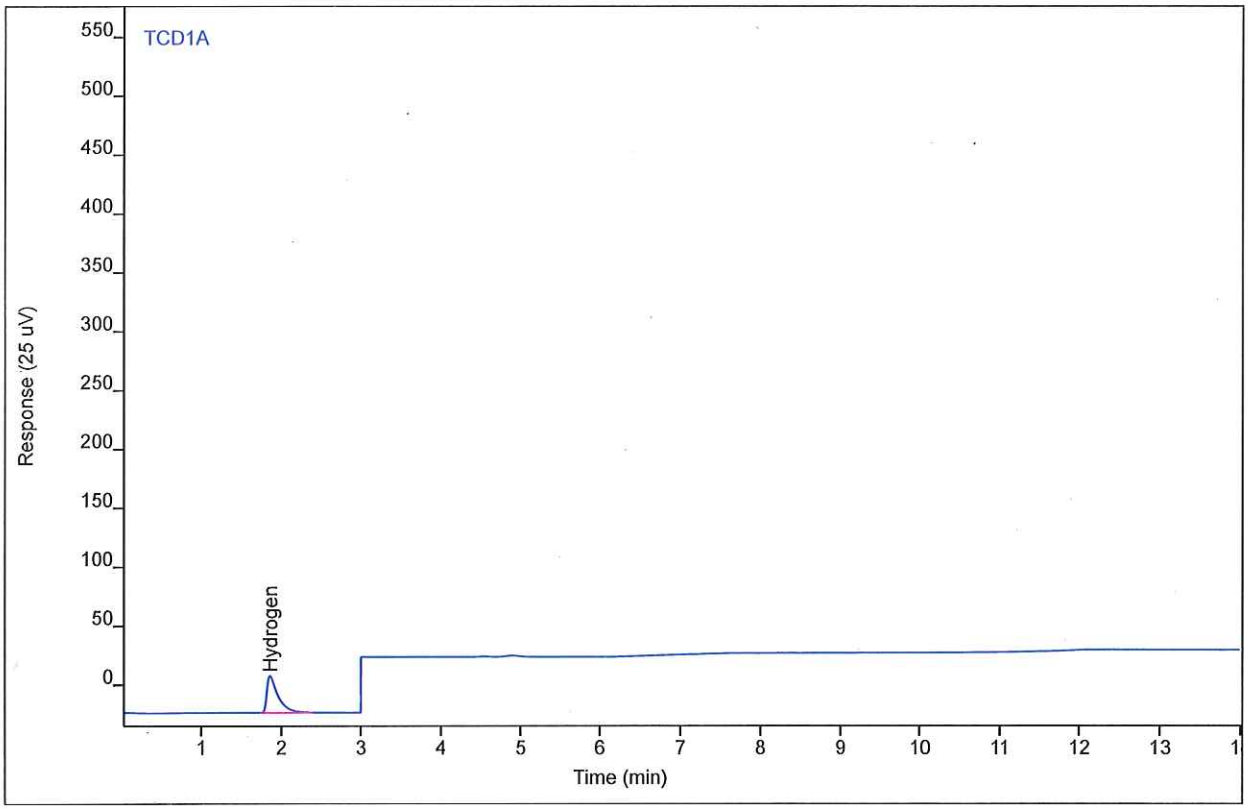


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.86	300.205	31.0667	29.9540	1	29.9540	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP162 #FG29 ENV(1=706.66,6=396.04)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0406.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	6 of 6
Injection Date	4/1/2015 5:33 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

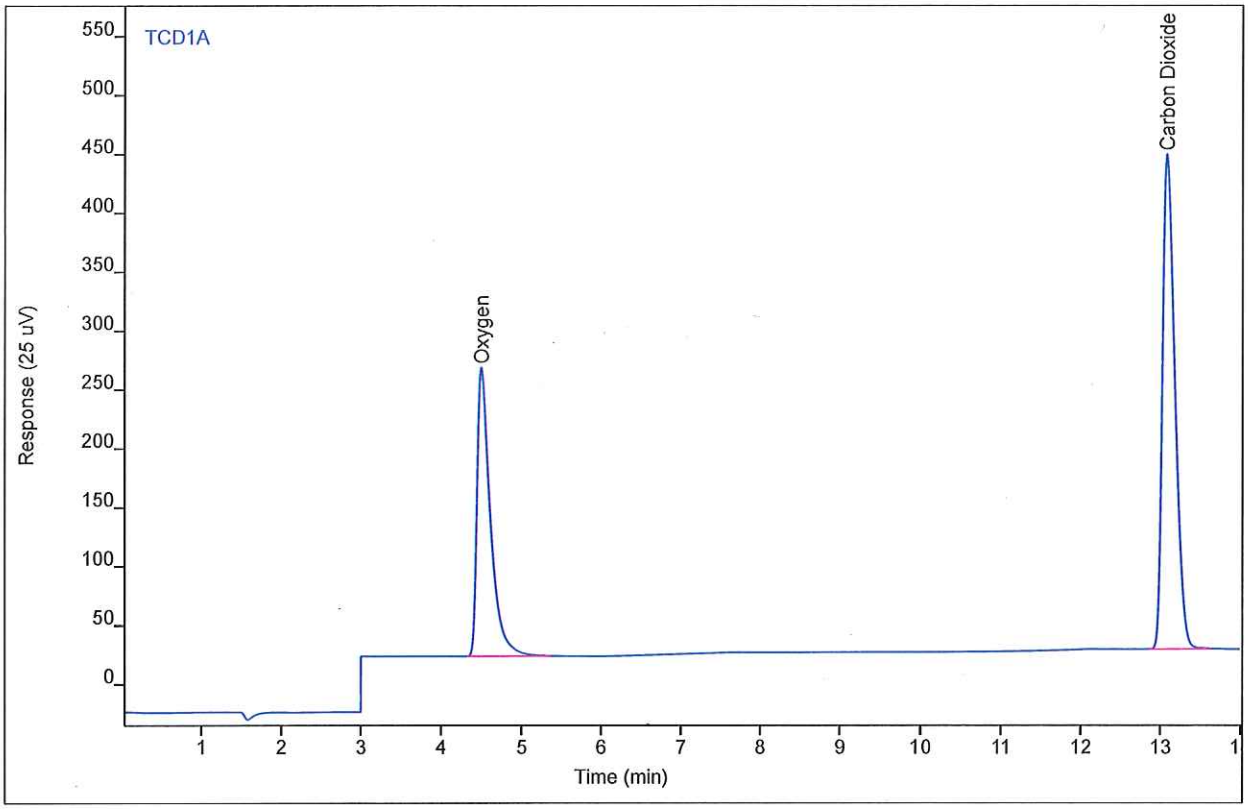


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.86	300.634	31.1949	29.9969	1	29.9969	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG4 ENV(1=0,2=358.99)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0602.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/1/2015 8:25 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

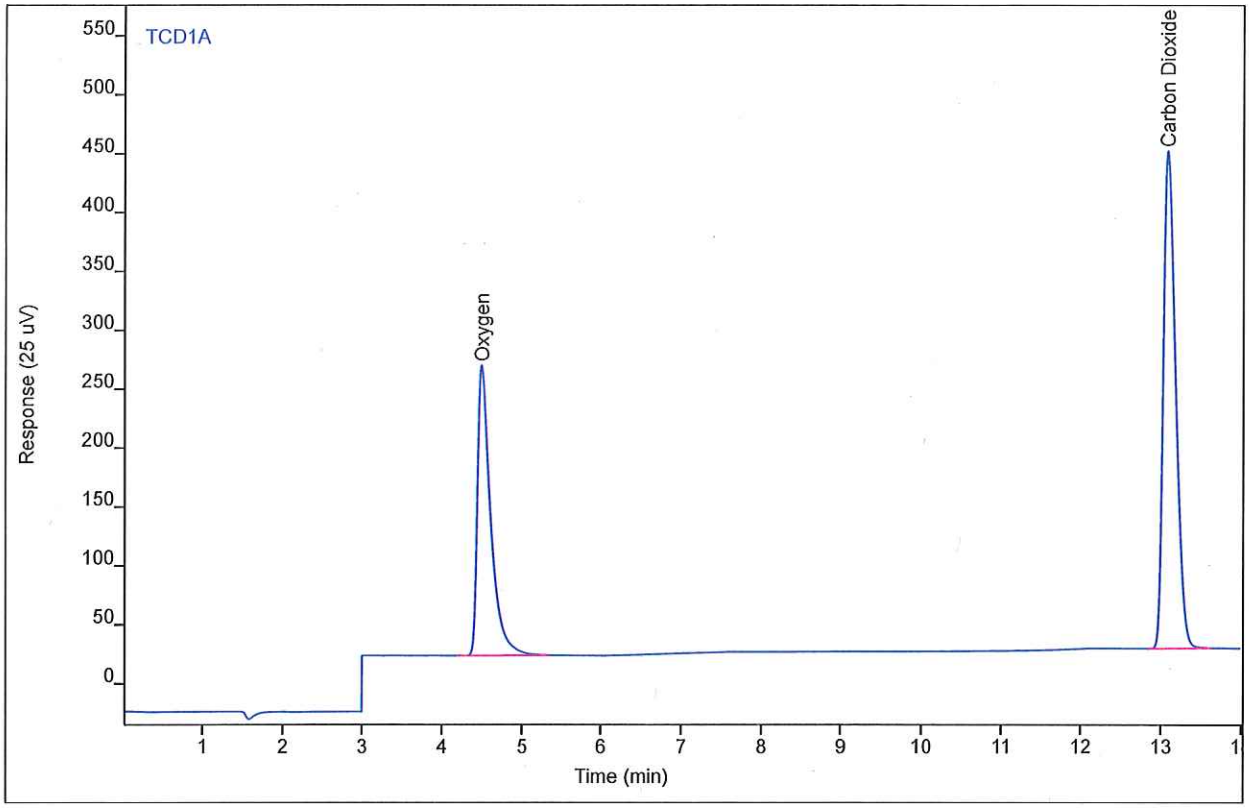


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.50	2819.65	244.859	10.0081	1	10.0081	%
Carbon Dioxide	MM	13.08	4452.30	419.837	9.99932	1	9.99932	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG4 ENV(1=0,2=358.99)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0603.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/1/2015 8:48 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM



Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.50	2835.93	246.125	10.0663	1	10.0663	%
Carbon Dioxide	MM	13.08	4486.46	422.657	10.0766	1	10.0766	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG4 ENV(1=0,2=358.99)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0604.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/1/2015 9:11 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
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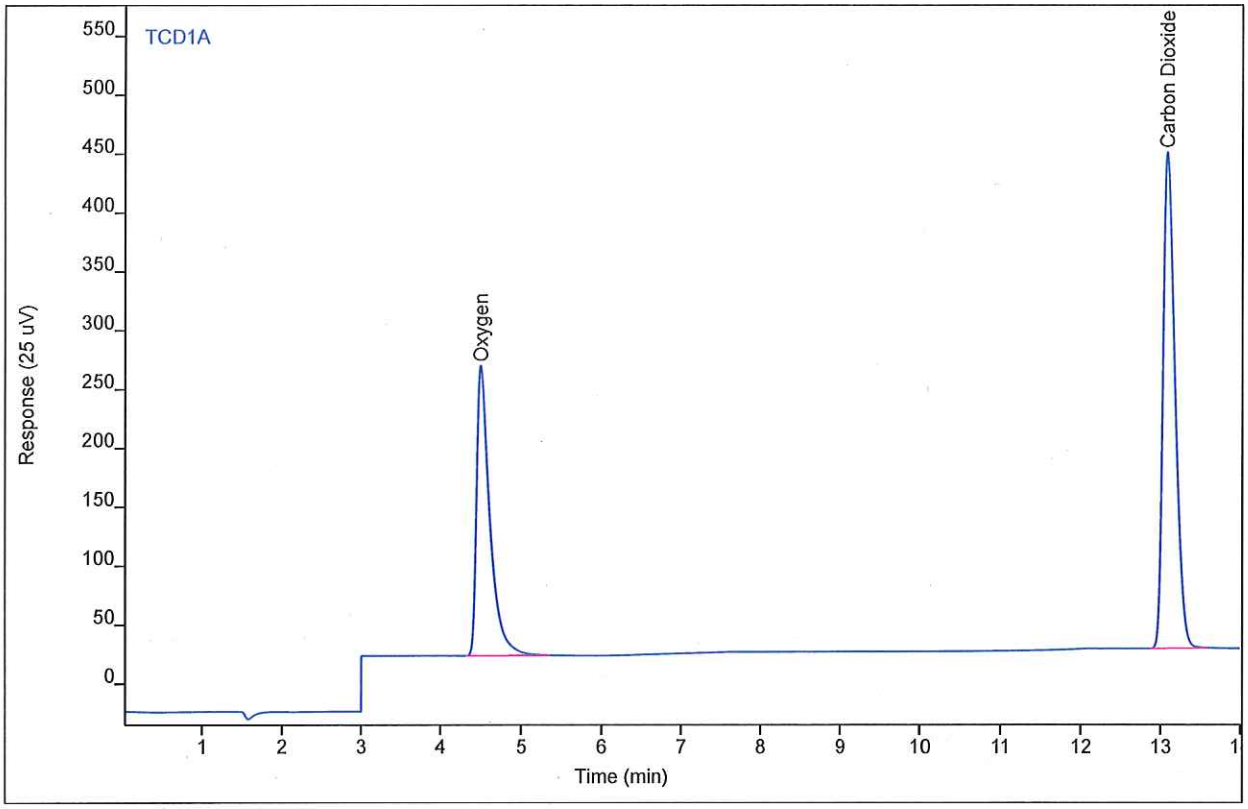
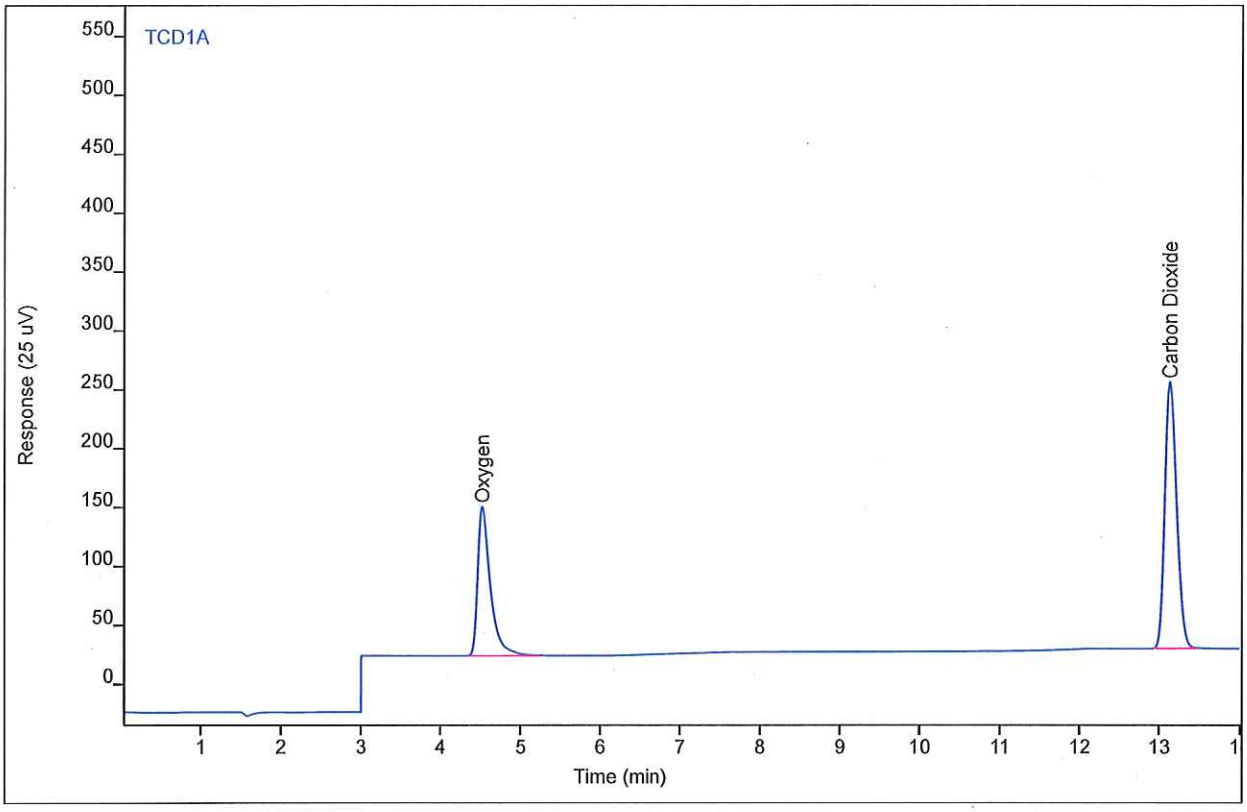


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.50	2831.35	246.058	10.0499	1	10.0499	%
Carbon Dioxide	MM	13.08	4473.10	421.476	10.0464	1	10.0464	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0702.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/1/2015 9:58 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

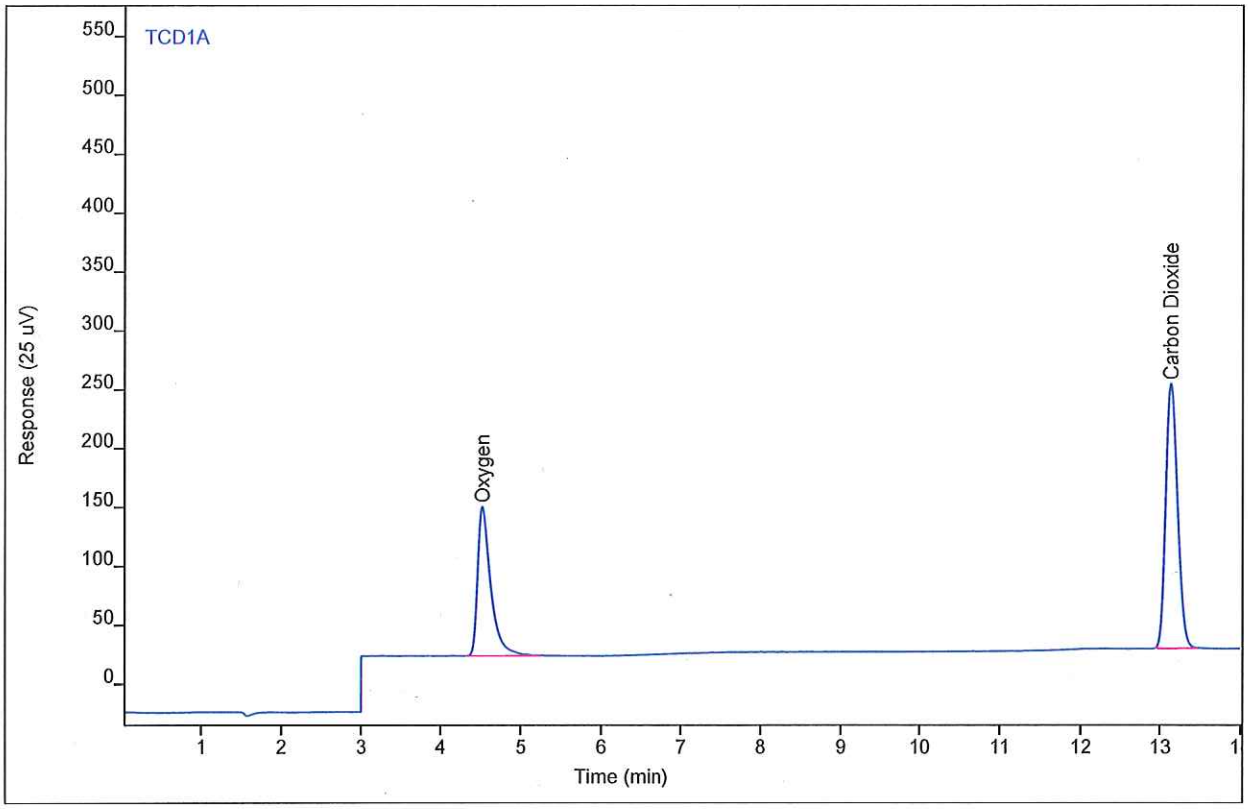


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.52	1428.93	126.312	5.03031	1	5.03031	%
Carbon Dioxide	BB	13.13	2260.64	225.950	5.04294	1	5.04294	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0703.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/1/2015 10:21 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

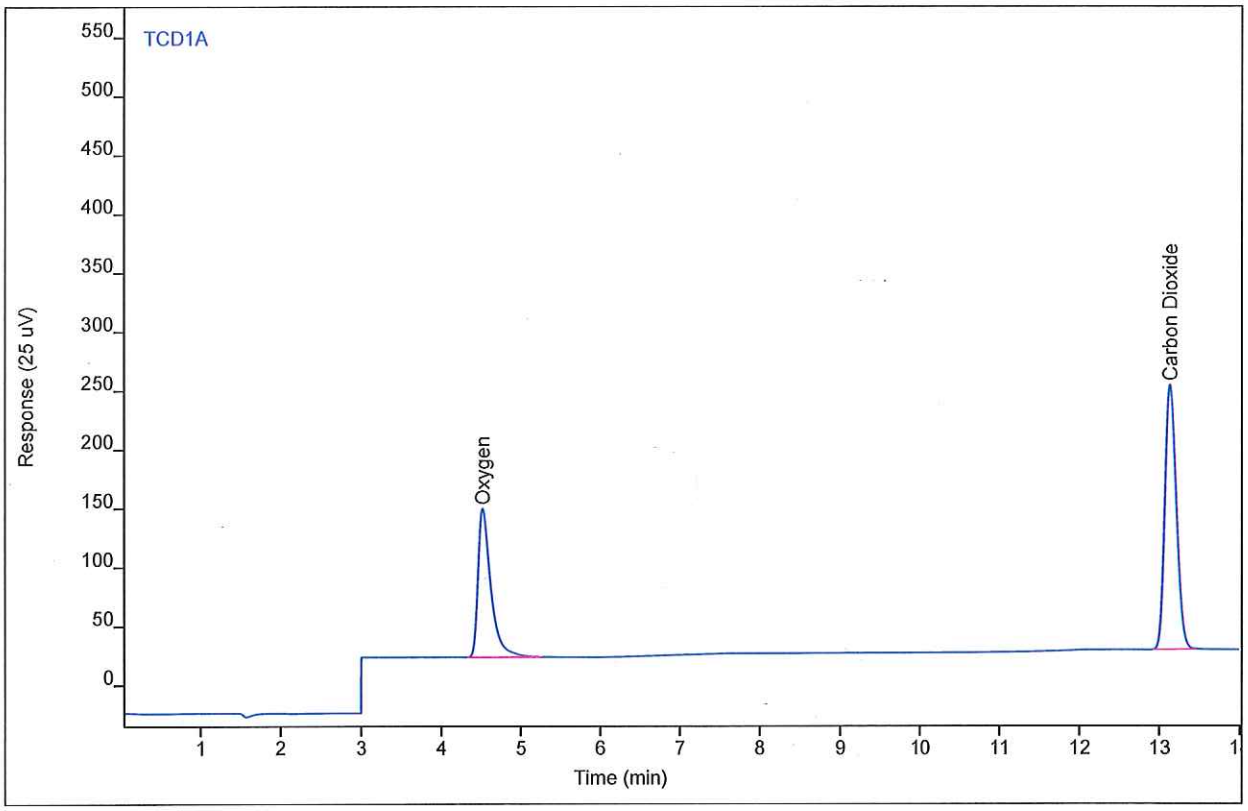


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.52	1425.79	126.378	5.01907	1	5.01907	%
Carbon Dioxide	BB	13.13	2252.43	224.516	5.02437	1	5.02437	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG3 ENV(1=374.56,2=391.18)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0704.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/1/2015 10:44 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

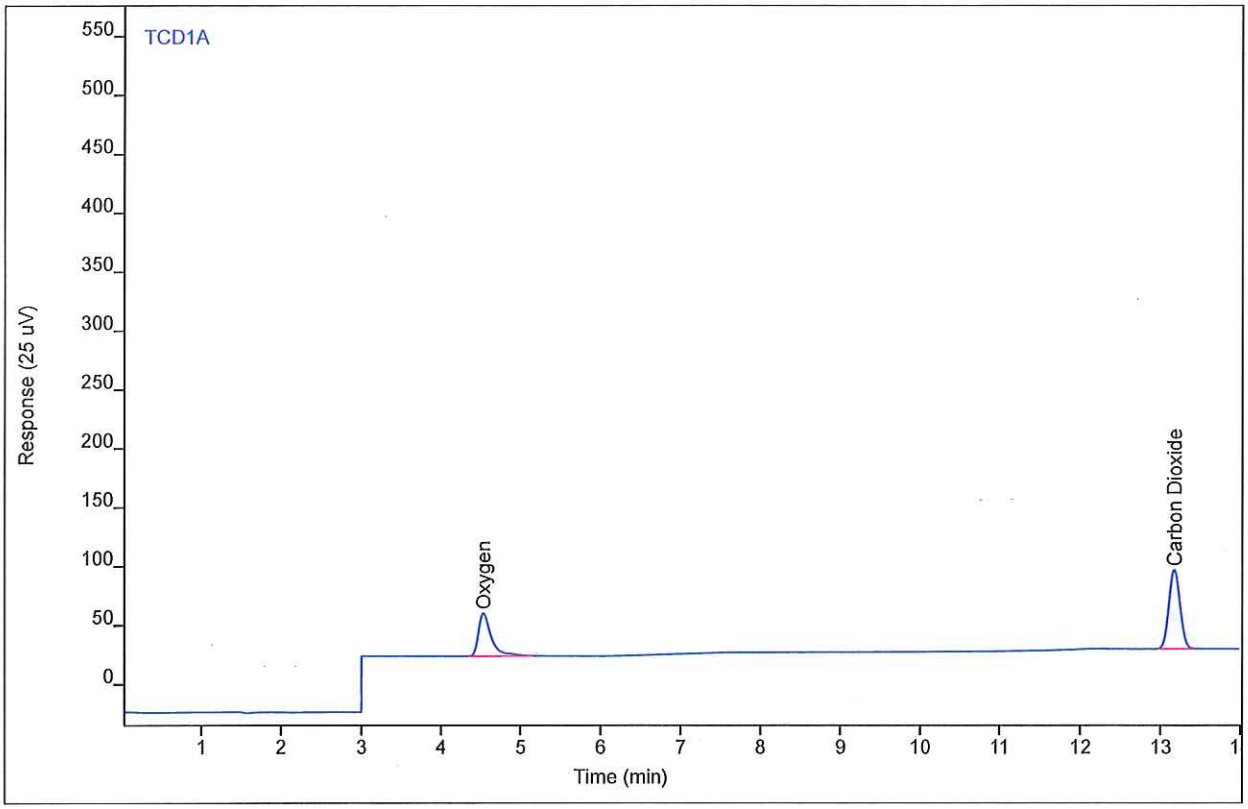


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.52	1424.62	125.881	5.01487	1	5.01487	%
Carbon Dioxide	BB	13.13	2252.43	224.437	5.02438	1	5.02438	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG2 ENV(1=1272.08,2=219.94)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0802.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/1/2015 11:30 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

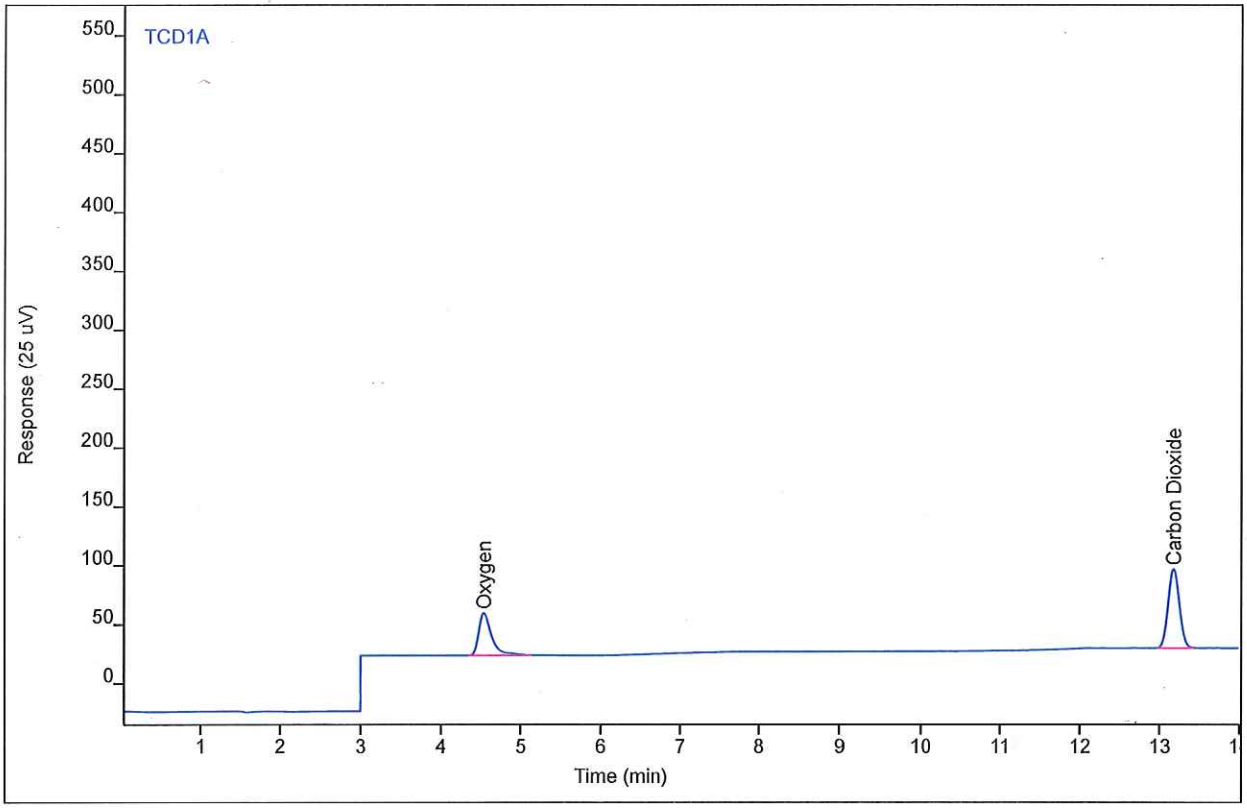


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB R	4.54	413.003	36.2668	1.39404	1	1.39404	%
Carbon Dioxide	BB	13.17	645.826	66.8852	1.39108	1	1.39108	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG2 ENV(1=1272.08,2=219.94)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0803.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/1/2015 11:53 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

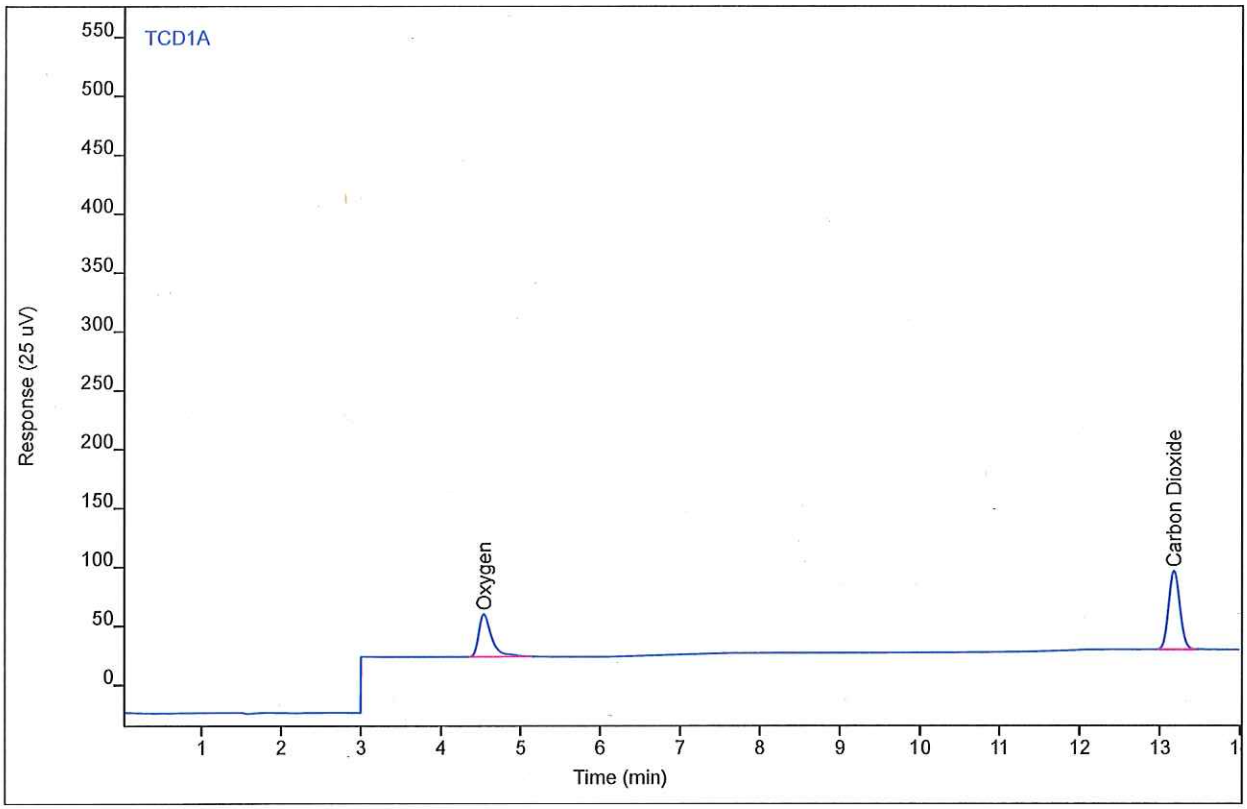


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB R	4.54	405.892	35.8930	1.36859	1	1.36859	%
Carbon Dioxide	BB	13.17	651.602	66.8818	1.40414	1	1.40414	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG2 ENV(1=1272.08,2=219.94)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0804.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/2/2015 12:16 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

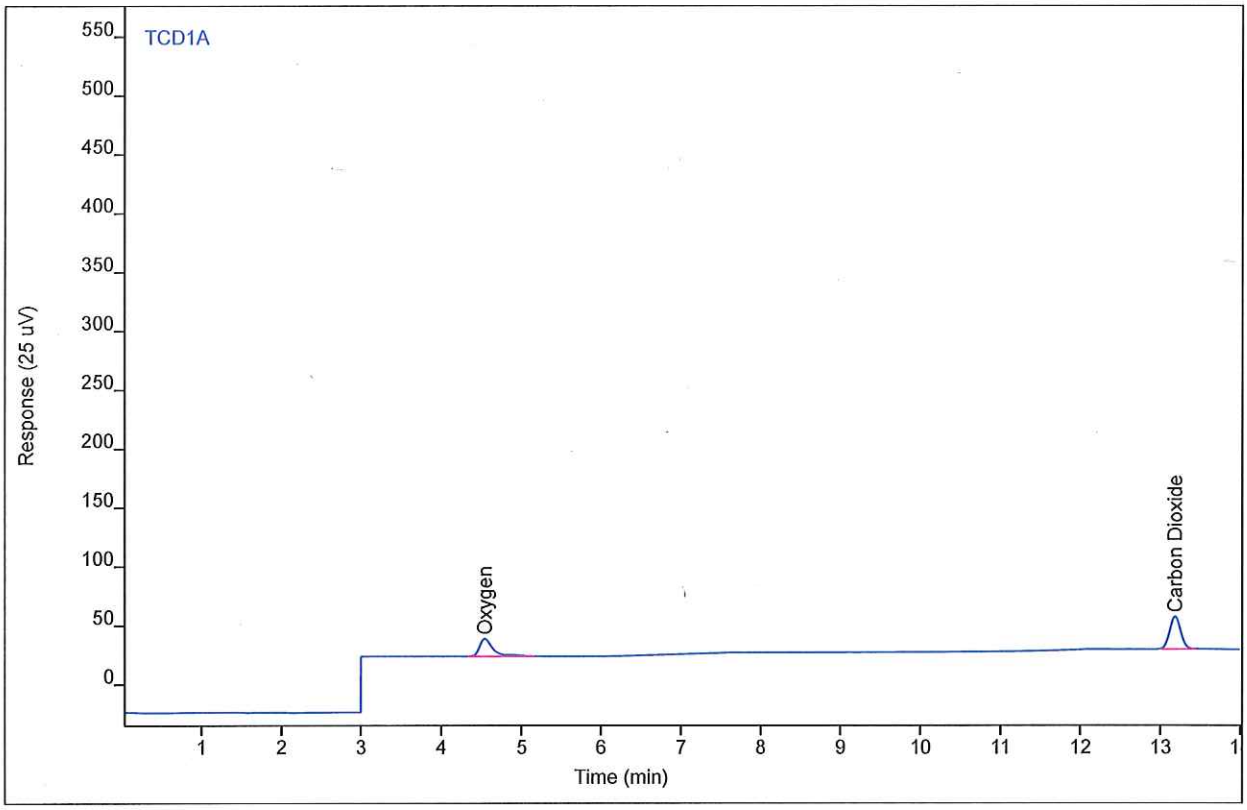


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB R	4.54	409.016	35.9957	1.37977	1	1.37977	%
Carbon Dioxide	BB	13.17	643.782	66.4107	1.38646	1	1.38646	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG1 ENV(1=3392.23,2=219.94)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0902.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/2/2015 1:02 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

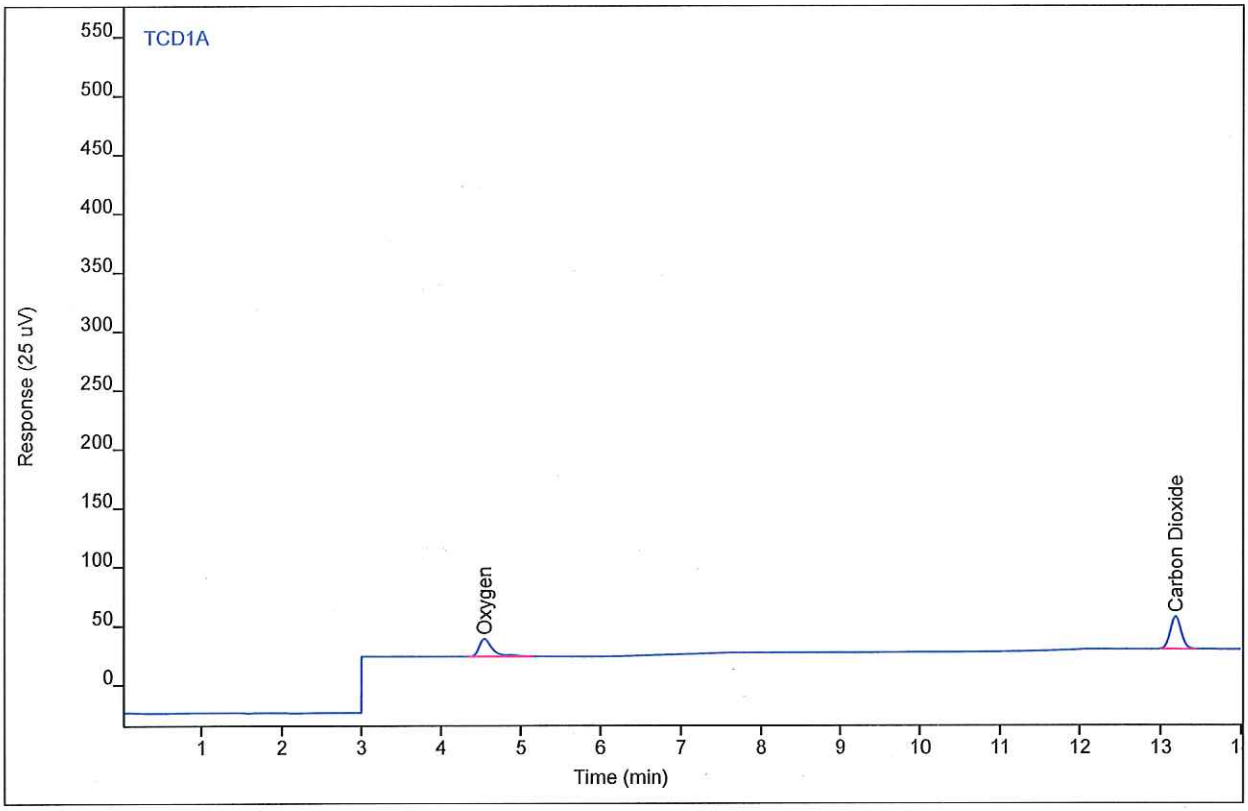


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	MM R	4.54	173.497	14.8950	0.53775	1	0.53775	%
Carbon Dioxide	BB	13.18	264.377	27.4602	0.52976	1	0.52976	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG1 ENV(1=3392.23,2=219.94)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0903.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/2/2015 1:25 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:40 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

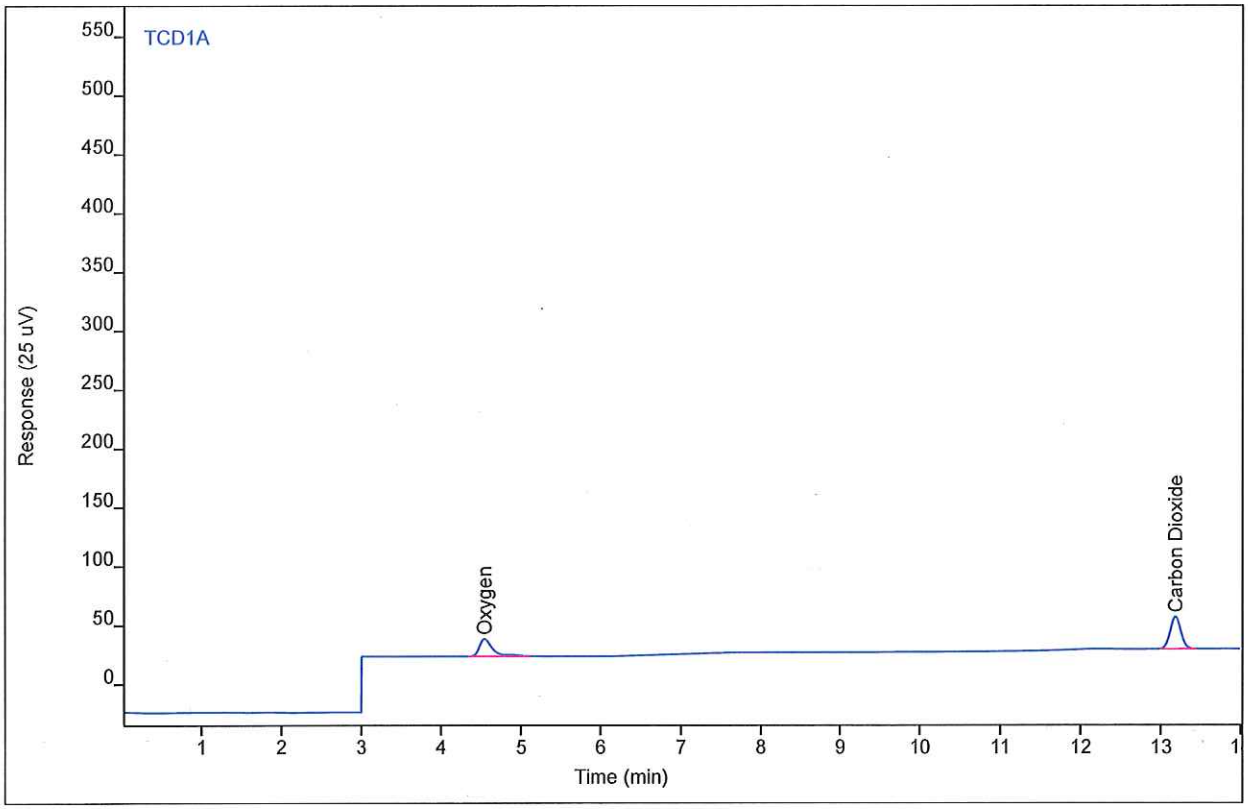


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	MM R	4.54	172.909	14.9106	0.53593	1	0.53593	%
Carbon Dioxide	BB	13.18	264.328	27.4332	0.52966	1	0.52966	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP070 #FG1 ENV(1=3392.23,2=219.94)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F0904.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/2/2015 1:48 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:40 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

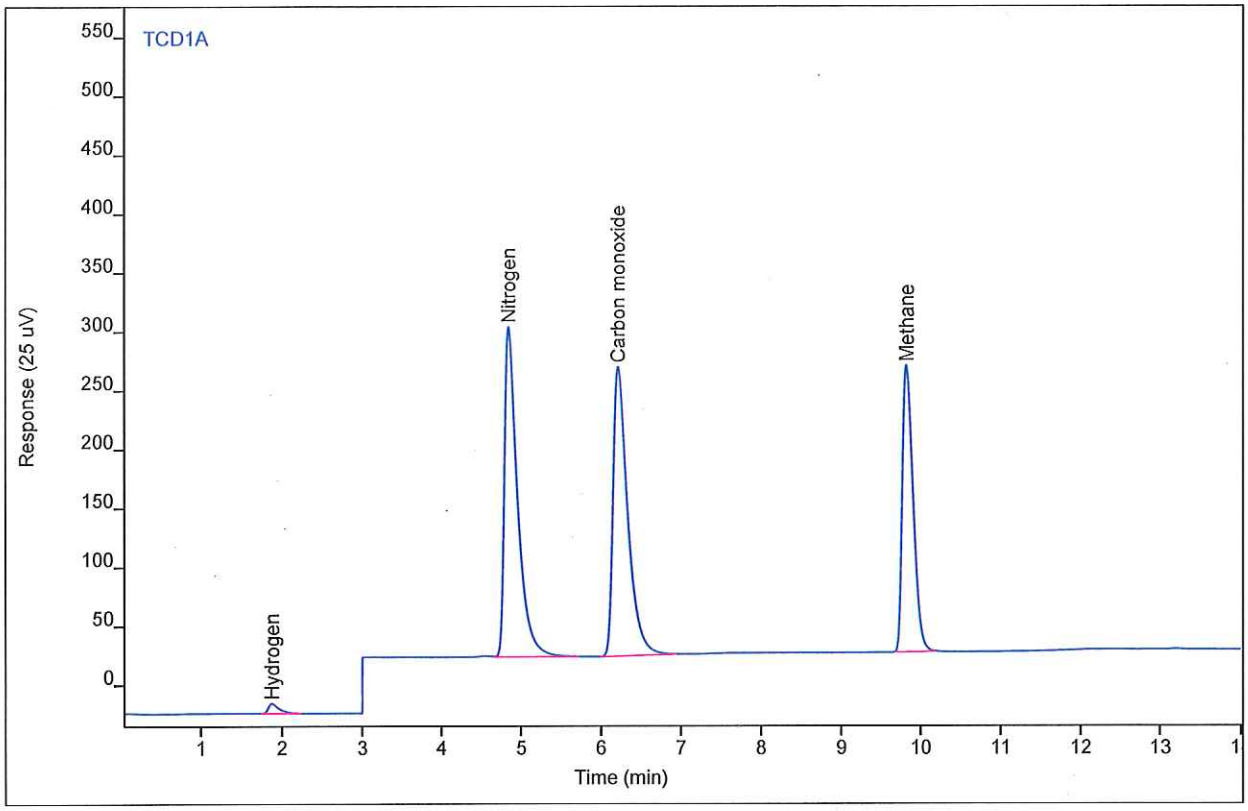


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	MM R	4.54	170.827	14.7673	0.52948	1	0.52948	%
Carbon Dioxide	BB	13.18	262.262	27.3092	0.52552	1	0.52552	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG8 ENV(1=0,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1002.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/2/2015 2:34 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

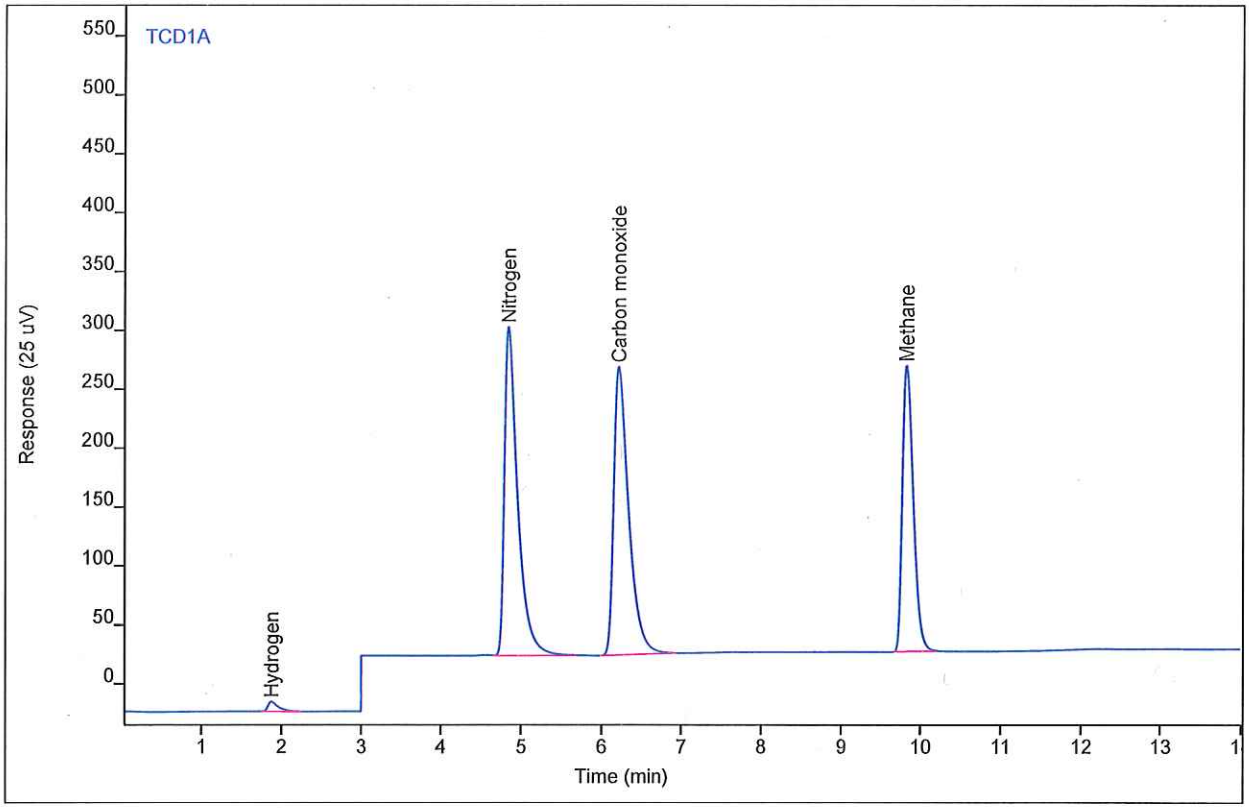


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	75.9483	8.29744	7.55043	1	7.55043	%
Nitrogen	VB	4.84	3253.80	279.959	10.0890	1	10.0890	%
Carbon monoxide	MM	6.21	3229.76	245.543	10.1521	1	10.1521	%
Methane	BB	9.83	2212.24	242.820	7.88319	1	7.88319	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG8 ENV(1=0,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1003.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/2/2015 2:57 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

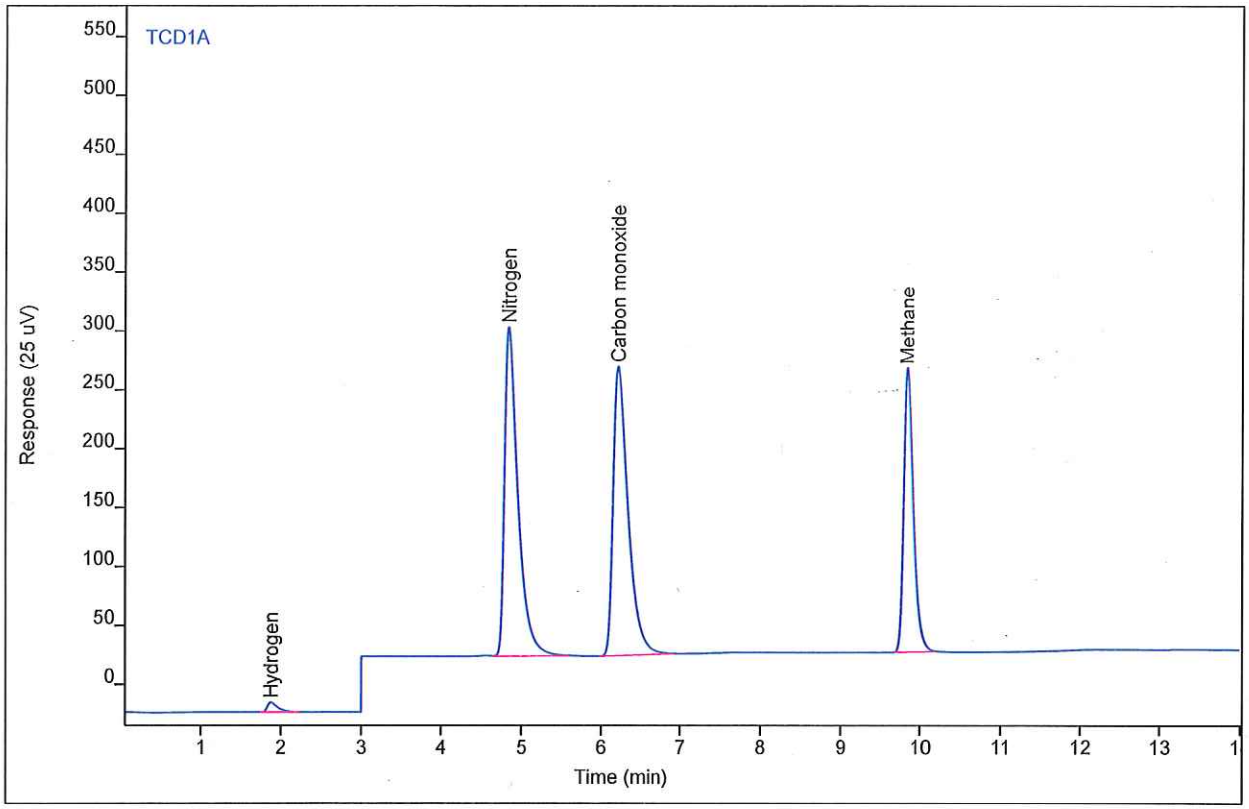


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	76.3980	8.31680	7.59536	1	7.59536	%
Nitrogen	VB	4.84	3241.38	278.937	10.0502	1	10.0502	%
Carbon monoxide	MM	6.21	3221.61	244.840	10.1264	1	10.1264	%
Methane	BB	9.83	2207.06	242.514	7.86468	1	7.86468	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG8 ENV(1=0,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1004.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/2/2015 3:20 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

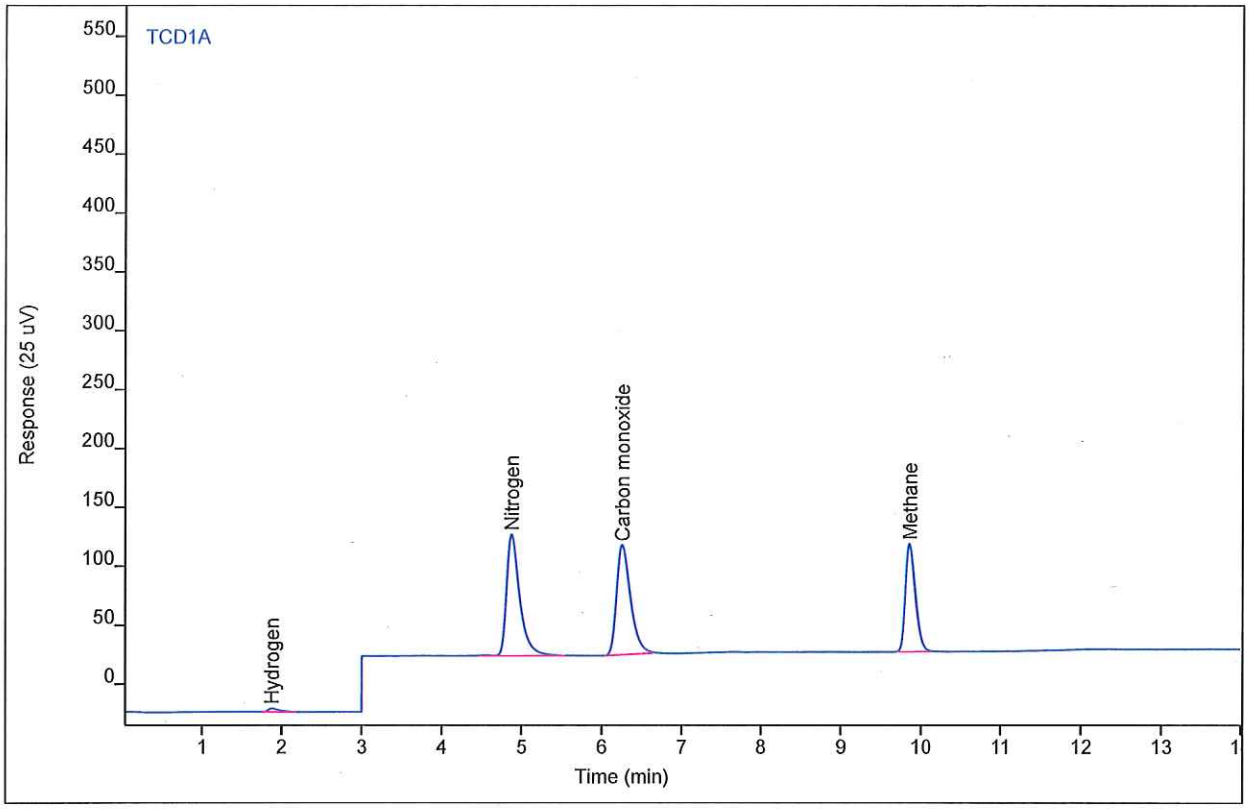


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	75.4004	8.23677	7.49570	1	7.49570	%
Nitrogen	VB	4.84	3241.27	279.283	10.0498	1	10.0498	%
Carbon monoxide	MM	6.21	3229.13	245.546	10.1501	1	10.1501	%
Methane	BB	9.83	2209.95	241.058	7.87503	1	7.87503	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1102.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/2/2015 4:06 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

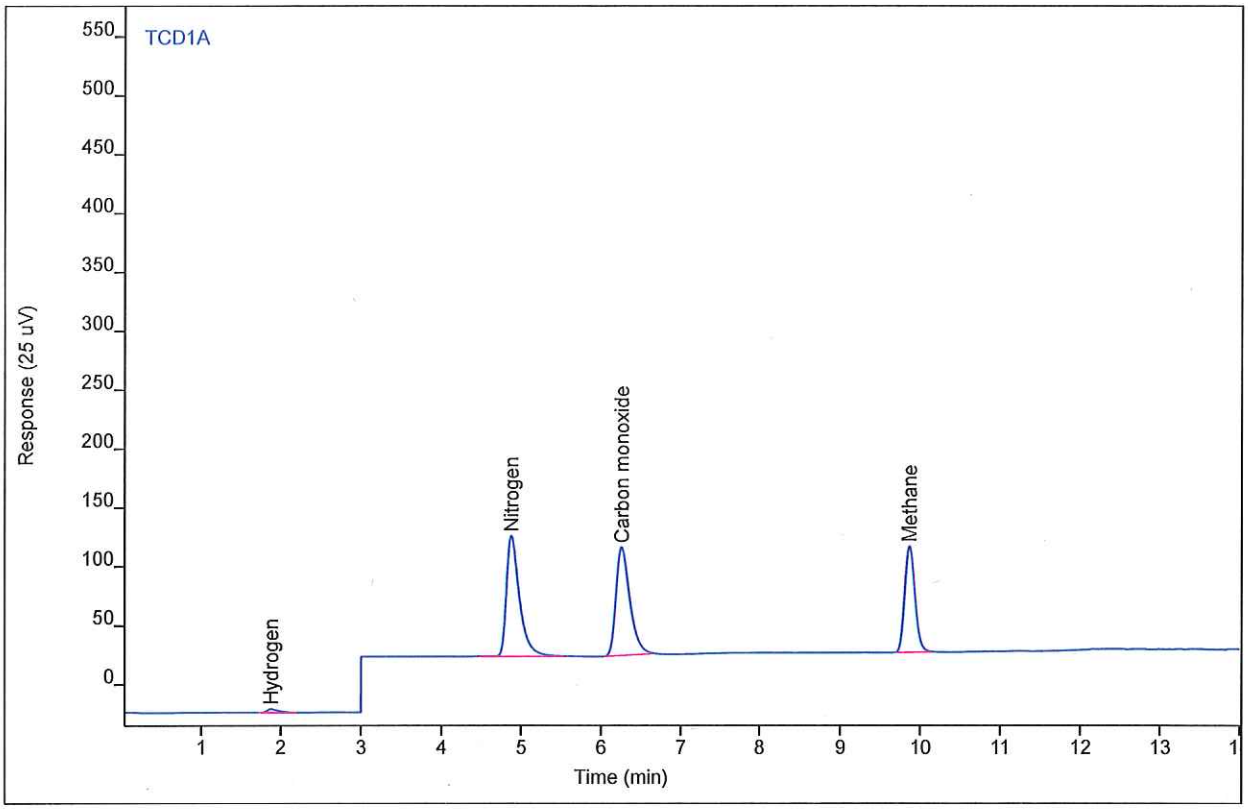


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	28.6519	2.99091	2.82546	1	2.82546	%
Nitrogen	BB	4.88	1173.21	102.835	3.59156	1	3.59156	%
Carbon monoxide	BB	6.26	1130.68	92.8537	3.54147	1	3.54147	%
Methane	BB	9.86	795.768	91.2777	2.82468	1	2.82468	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1103.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/2/2015 4:29 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

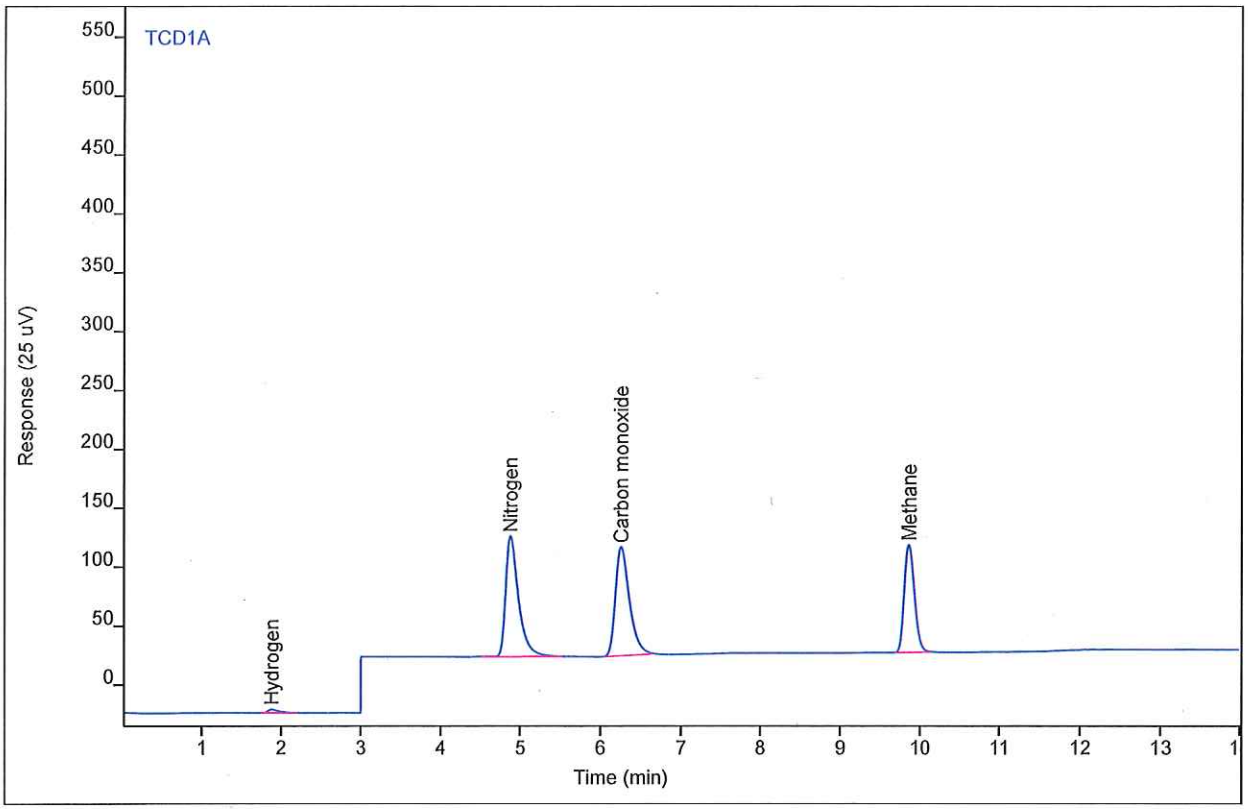


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	28.0610	2.97272	2.76643	1	2.76643	%
Nitrogen	BB	4.88	1166.32	102.180	3.57005	1	3.57005	%
Carbon monoxide	BB	6.26	1111.96	91.7782	3.48253	1	3.48253	%
Methane	BB	9.86	785.804	89.9478	2.78909	1	2.78909	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG7 ENV(1=530,3=319.02)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1104.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/2/2015 4:52 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

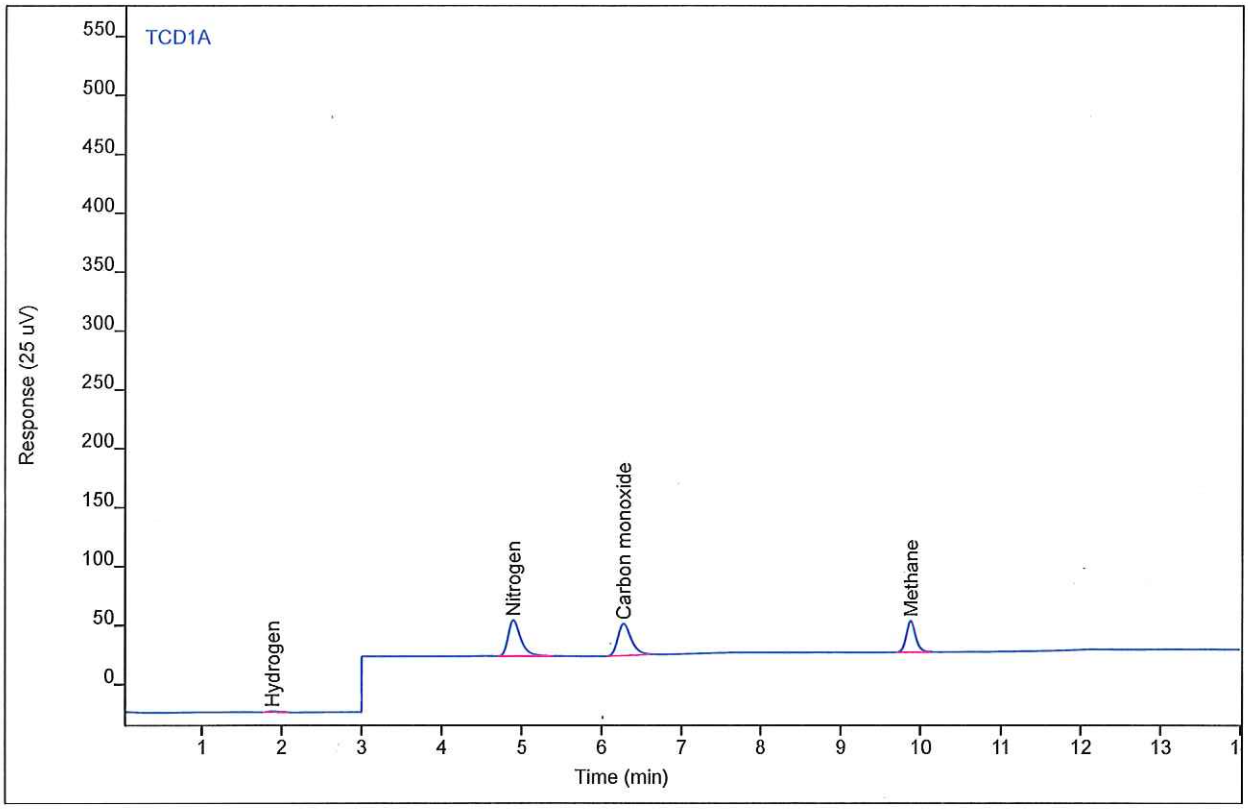


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	28.5071	3.01138	2.81099	1	2.81099	%
Nitrogen	BB	4.88	1164.44	102.073	3.56418	1	3.56418	%
Carbon monoxide	BB	6.26	1118.59	92.1577	3.50340	1	3.50340	%
Methane	BB	9.86	793.173	91.0586	2.81541	1	2.81541	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG6 ENV(1=1271.99,3=159.51)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1202.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/2/2015 5:38 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:55 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

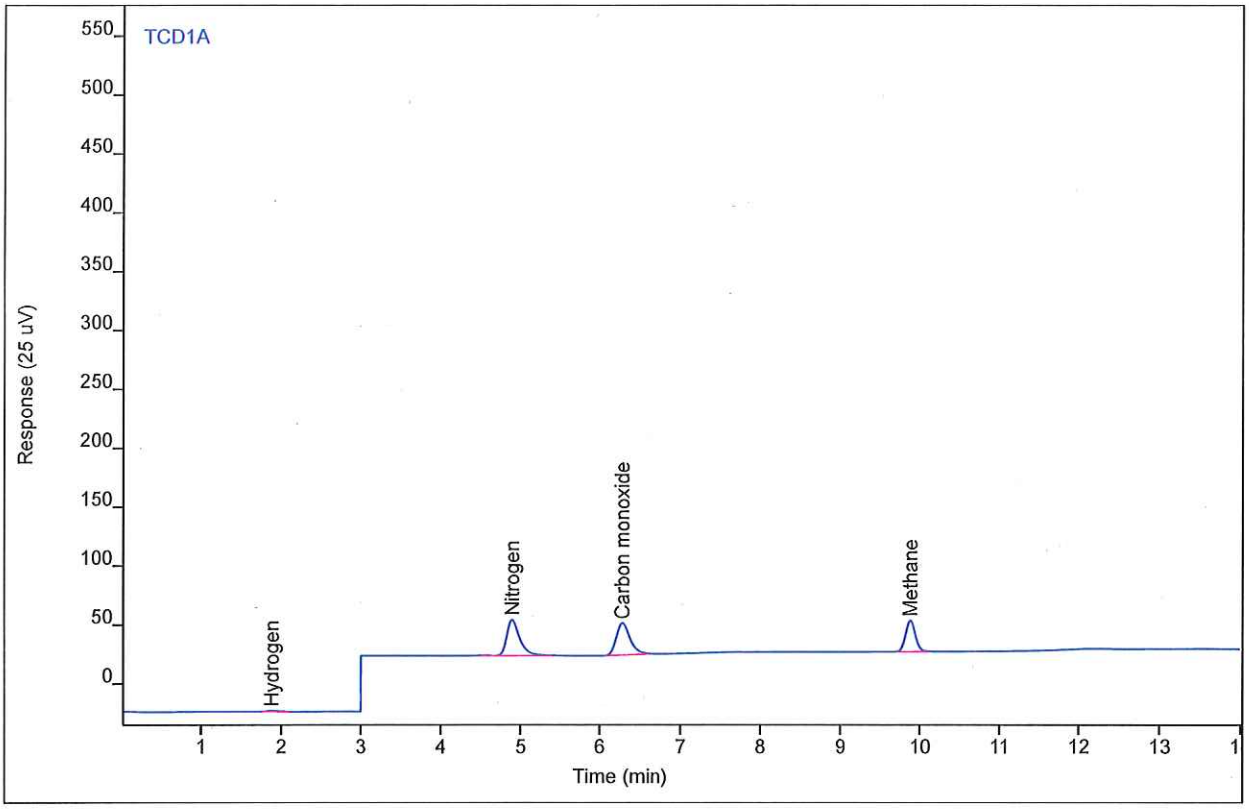


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	8.50511	0.88954	0.81276	1	0.81276	%
Nitrogen	BB	4.90	341.481	30.3389	0.99420	1	0.99420	%
Carbon monoxide	BB	6.28	316.361	26.9290	0.97696	1	0.97696	%
Methane	BB	9.88	226.924	26.4825	0.79322	1	0.79322	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG6 ENV(1=1271.99,3=159.51)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1203.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/2/2015 6:01 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:56 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

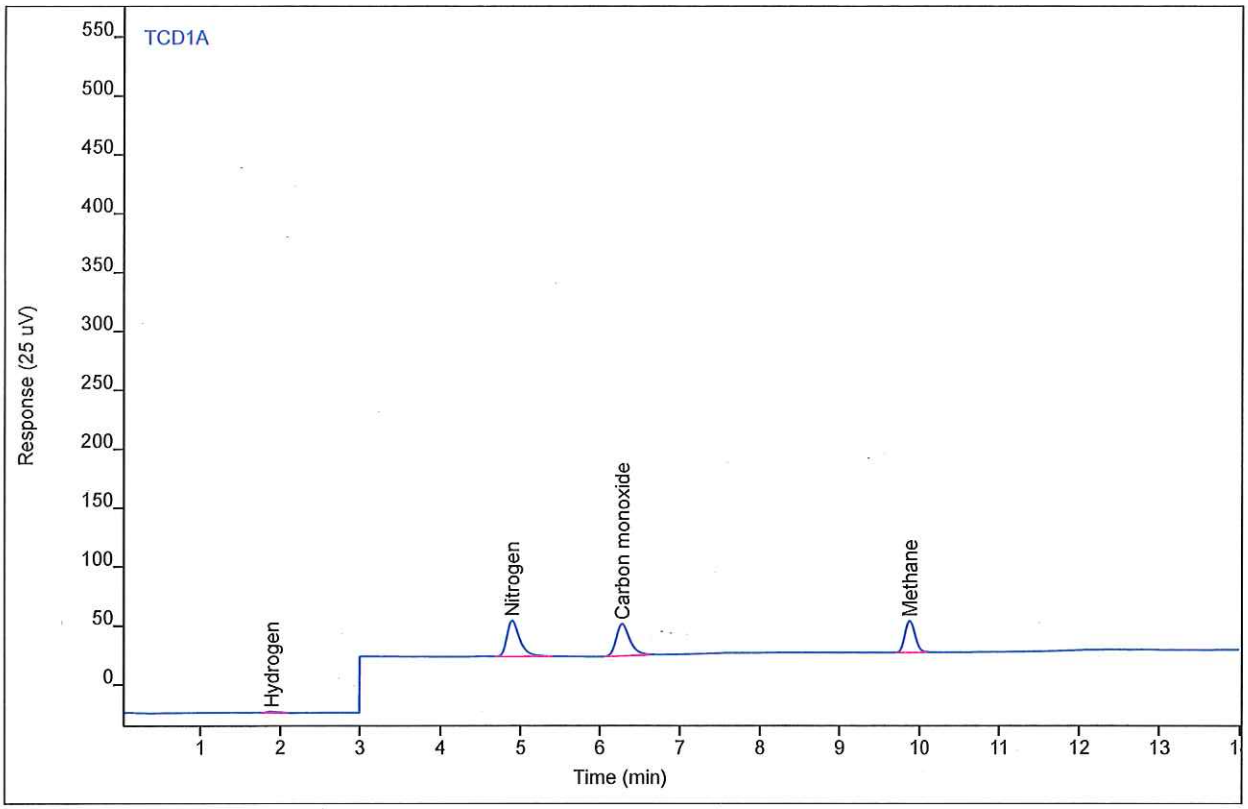


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.88	8.52784	0.88596	0.81503	1	0.81503	%
Nitrogen	BB	4.90	342.667	30.3278	0.99790	1	0.99790	%
Carbon monoxide	BB	6.28	317.586	26.9631	0.98081	1	0.98081	%
Methane	BB	9.88	225.817	26.3520	0.78926	1	0.78926	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG6 ENV(1=1271.99,3=159.51)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1204.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/2/2015 6:24 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:56 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

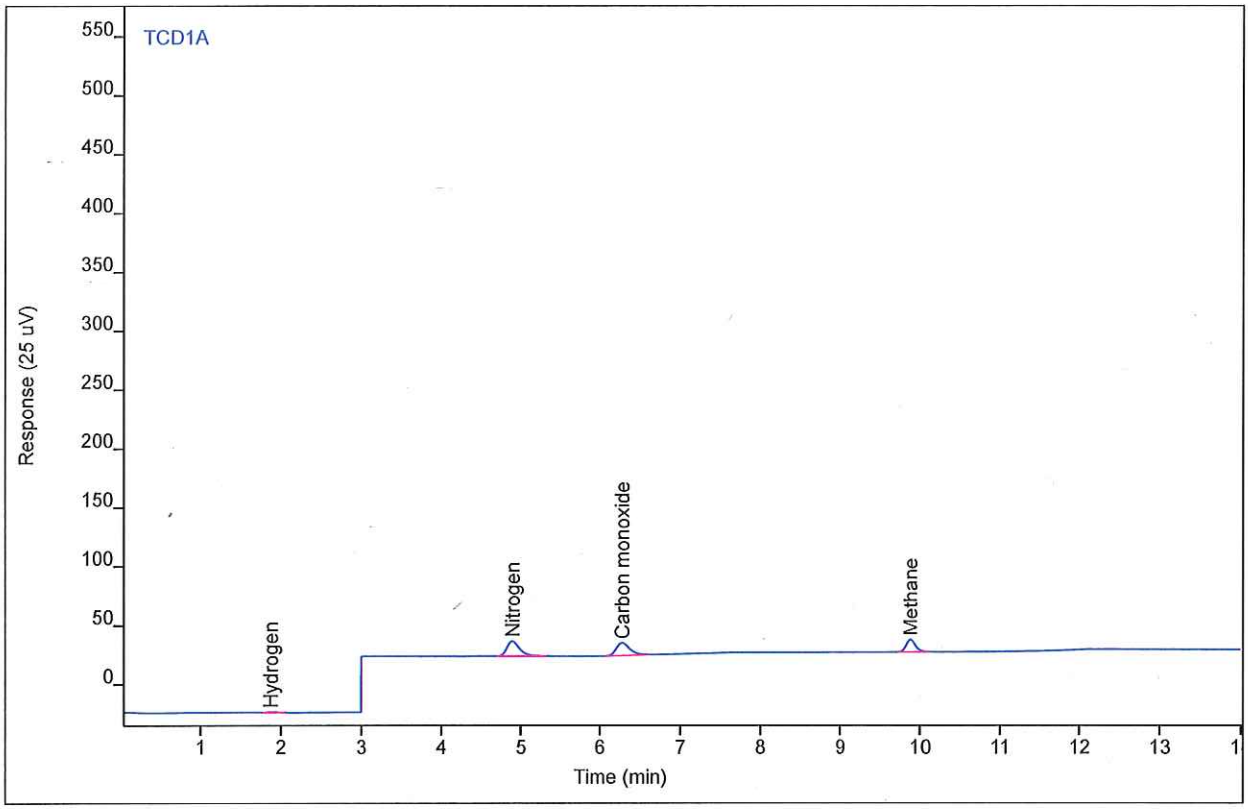


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	8.26287	0.86397	0.78856	1	0.78856	%
Nitrogen	VB	4.90	341.873	30.3285	0.99542	1	0.99542	%
Carbon monoxide	BB	6.28	319.033	27.0845	0.98537	1	0.98537	%
Methane	BB	9.88	227.192	26.5915	0.79417	1	0.79417	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG5 ENV(1=3391.99,3=159.51)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1301.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	1 of 4
Injection Date	4/2/2015 6:47 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:56 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

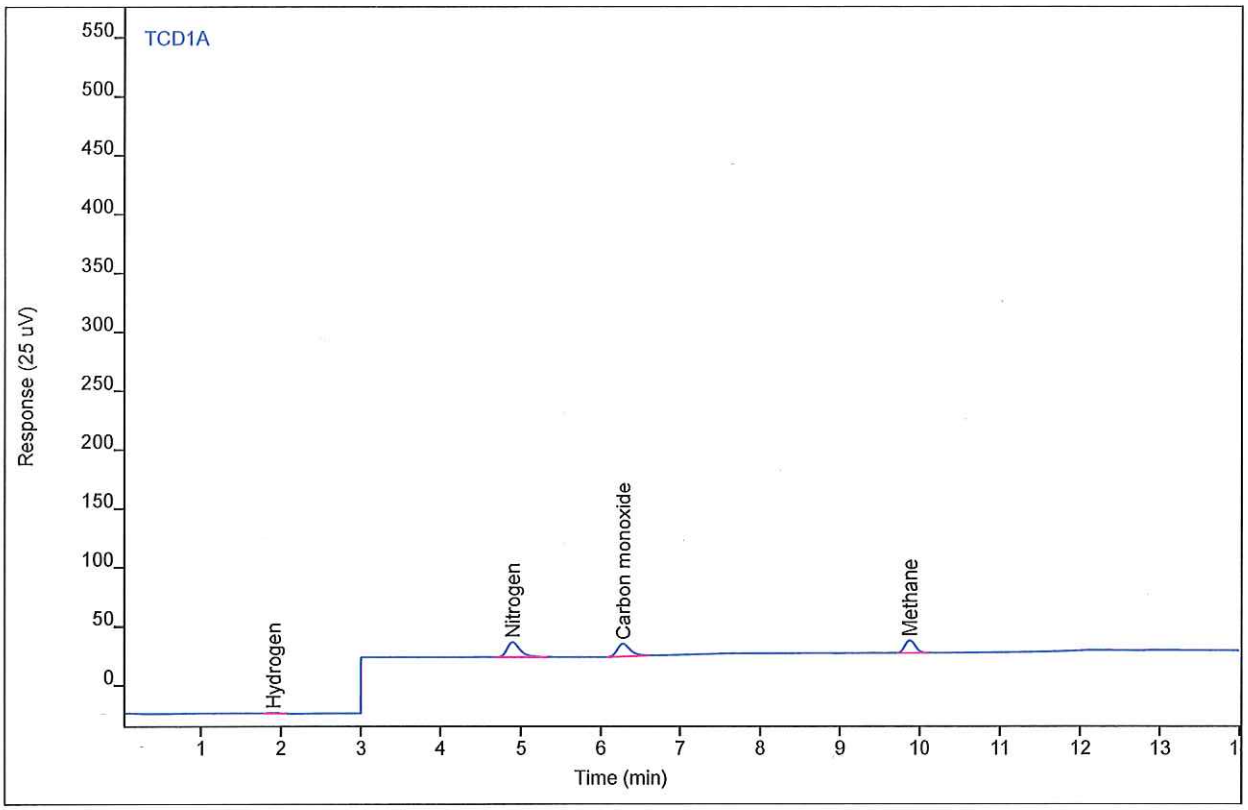


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.88	3.38828	0.38222	0.30248	1	0.30248	%
Nitrogen	BB	4.90	141.123	12.6570	0.37034	1	0.37034	%
Carbon monoxide	BB	6.28	124.686	10.7331	0.37364	1	0.37364	%
Methane	BB	9.88	90.2059	10.5159	0.30523	1	0.30523	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG5 ENV(1=3391.99,3=159.51)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1302.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/2/2015 7:10 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:56 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM



Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.91	3.50202	0.38980	0.31295	1	0.31295	%
Nitrogen	BB	4.90	142.085	12.6254	0.37287	1	0.37287	%
Carbon monoxide	BB	6.29	125.419	10.7224	0.37584	1	0.37584	%
Methane	BB	9.88	89.7667	10.5543	0.30375	1	0.30375	%

Chromatogram Report

Enthalpy Analytical

Sample Name	BettyP118 #FG5 ENV(1=3391.99,3=159.51)	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 9
Data File	009F1303.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/2/2015 7:33 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:56 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
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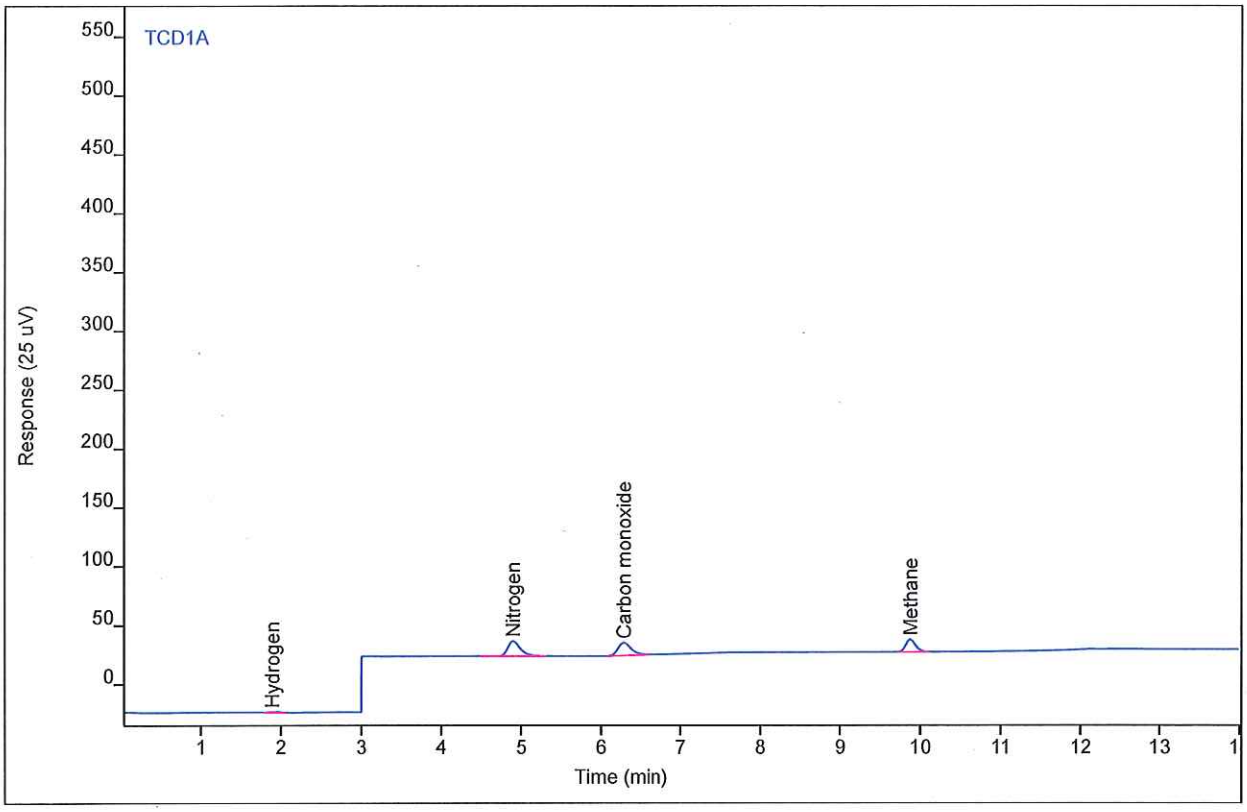
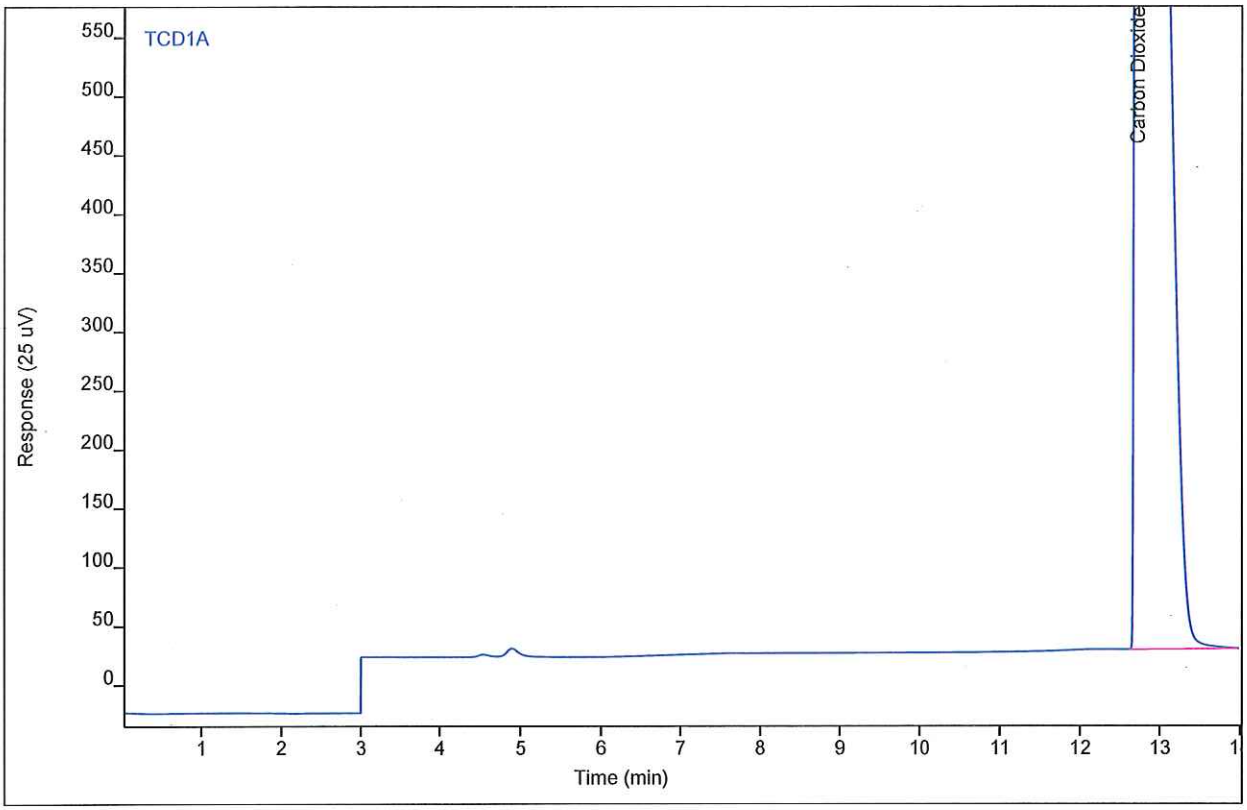


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	3.46306	0.38870	0.30916	1	0.30916	%
Nitrogen	BB	4.90	143.325	12.6508	0.37612	1	0.37612	%
Carbon monoxide	BB	6.29	125.385	10.7889	0.37574	1	0.37574	%
Methane	BB	9.88	90.8219	10.5619	0.30732	1	0.30732	%

Chromatogram Report

Enthalpy Analytical

Sample Name	CO2 99.99% #FG21	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F0301.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	1 of 3
Injection Date	4/1/2015 2:31 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:47 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

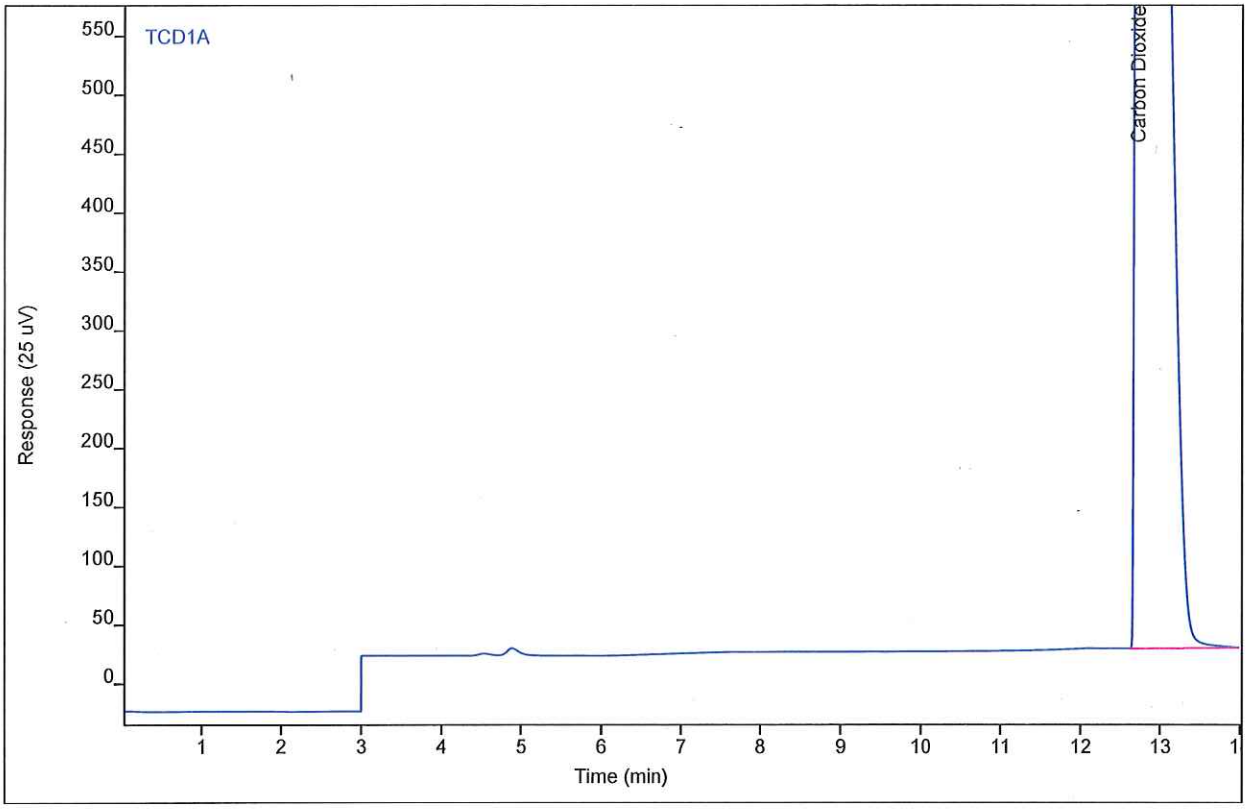


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon Dioxide	MM	12.72	40964.5	2054.92	92.5707	1	92.5707	%

Chromatogram Report

Enthalpy Analytical

Sample Name	CO2 99.99% #FG21	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F0302.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 3
Injection Date	4/1/2015 2:52 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:47 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

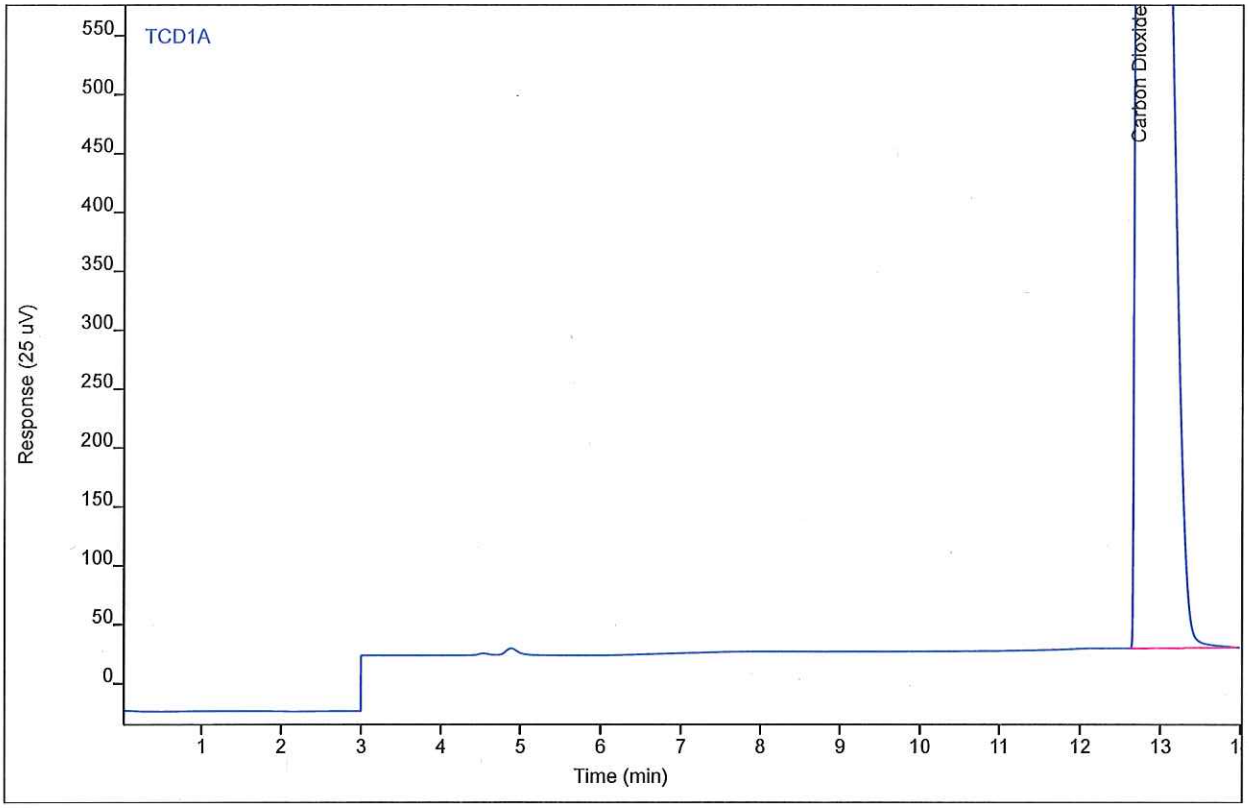


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon Dioxide	MM	12.72	41097.6	2060.12	92.8718	1	92.8718	%

Chromatogram Report

Enthalpy Analytical

Sample Name	CO2 99.99% #FG21	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F0303.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 3
Injection Date	4/1/2015 3:13 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:47 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

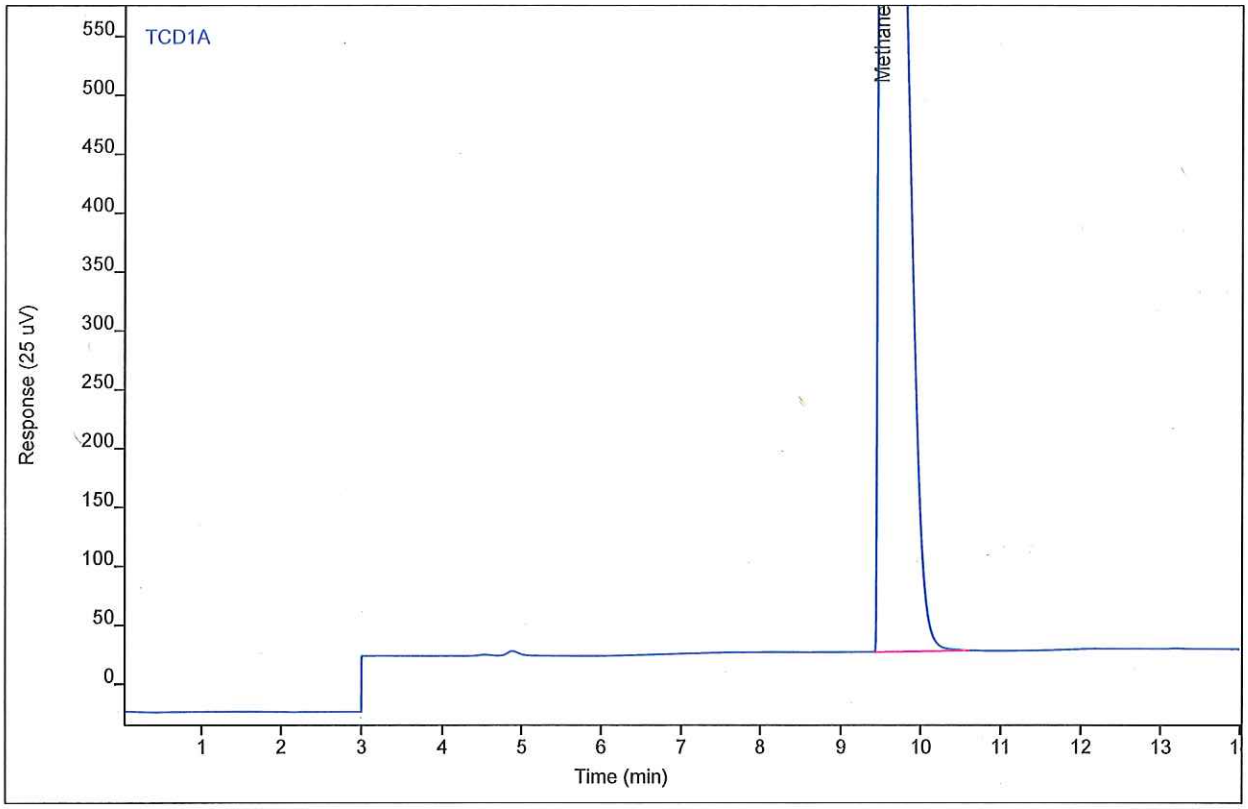


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon Dioxide	MM	12.72	41051.6	2057.94	92.7677	1	92.7677	%

Chromatogram Report

Enthalpy Analytical

Sample Name	Methane 99.999% #FG24	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F0504.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 6
Injection Date	4/1/2015 6:57 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

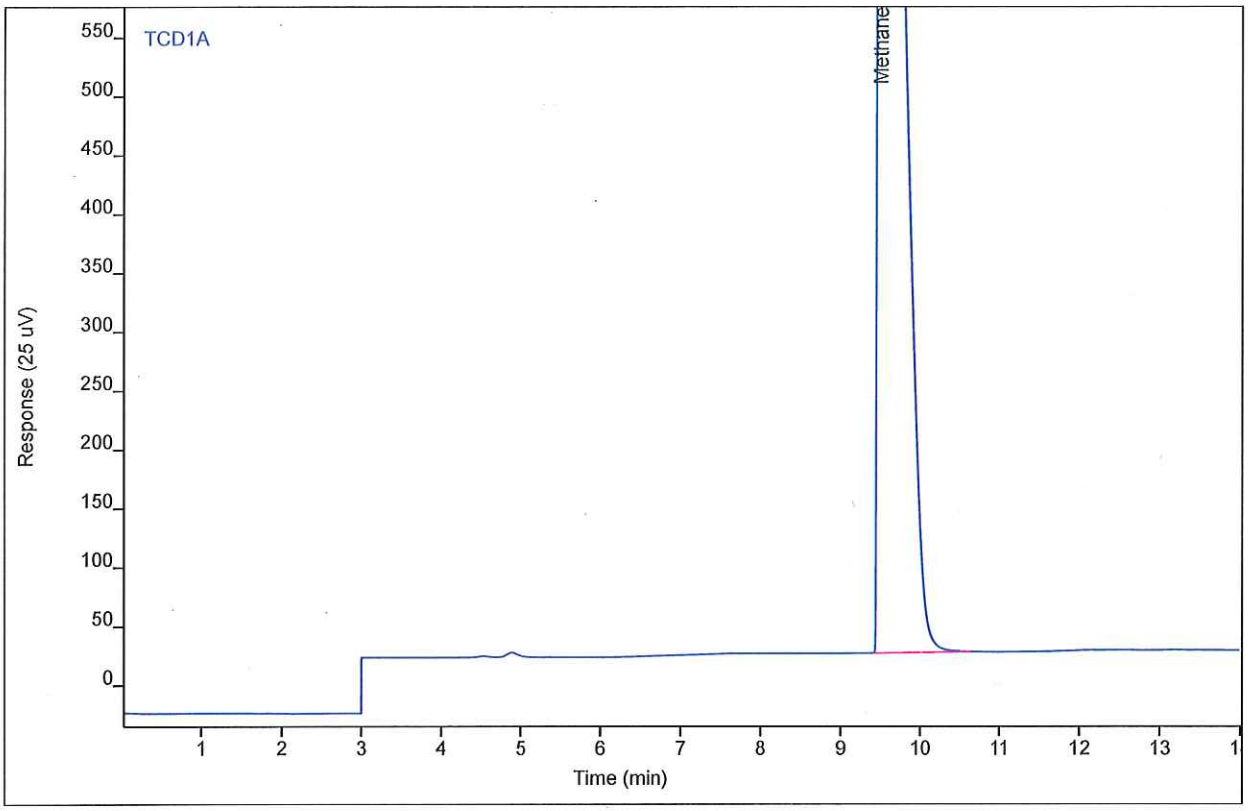


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Methane	MM	9.51	26924.5	1562.80	96.1358	1	96.1358	%

Chromatogram Report

Enthalpy Analytical

Sample Name	Methane 99.999% #FG24	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F0505.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	5 of 6
Injection Date	4/1/2015 7:17 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

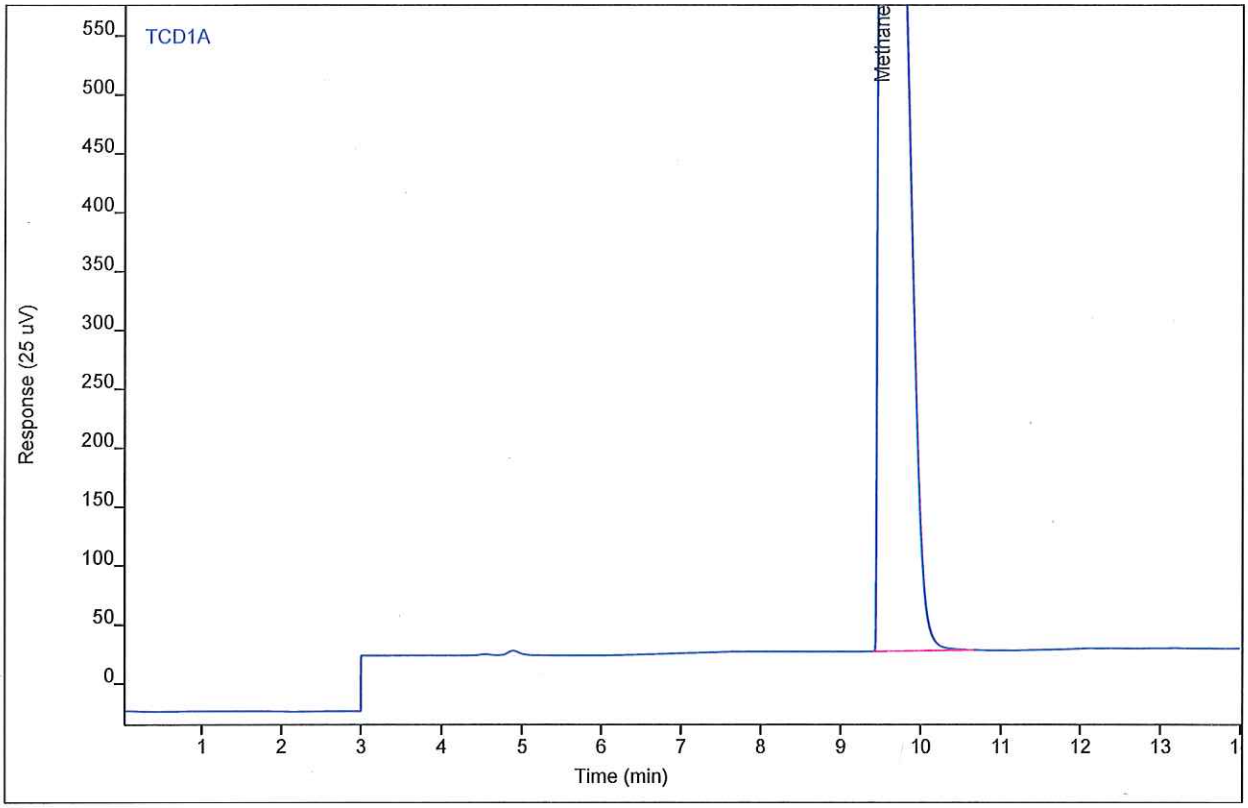


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Methane	MM	9.51	27007.9	1561.74	96.4337	1	96.4337	%

Chromatogram Report

Enthalpy Analytical

Sample Name	Methane 99.999% #FG24	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F0506.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	6 of 6
Injection Date	4/1/2015 7:38 PM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:45 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

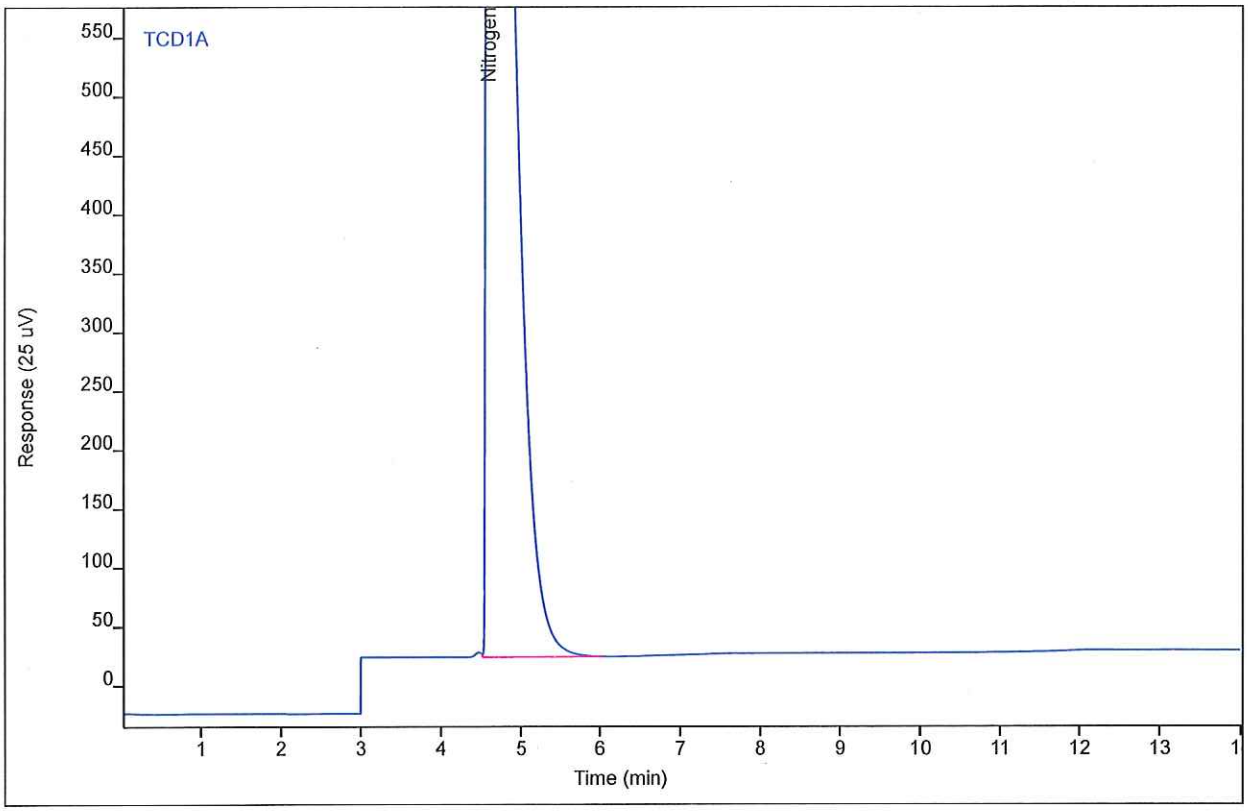


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Methane	MM	9.51	26875.2	1555.55	95.9599	1	95.9599	%

Chromatogram Report

Enthalpy Analytical

Sample Name	#FG22 N2 99.9%	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F1502.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	2 of 4
Injection Date	4/2/2015 8:56 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/17/2015 7:09 AM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM

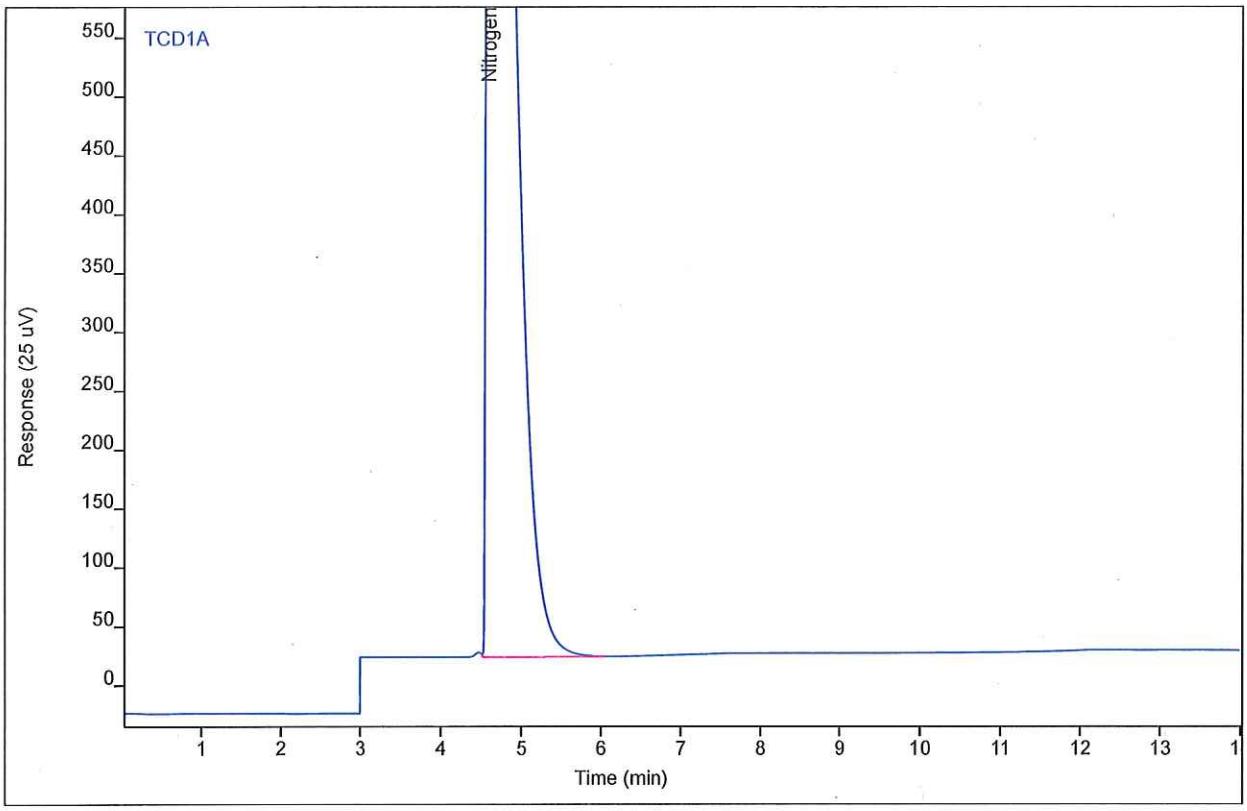


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Nitrogen	VB	4.59	29381.3	1548.91	91.6813	1	91.6813	%

Chromatogram Report

Enthalpy Analytical

Sample Name	#FG22 N2 99.9%	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F1503.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	3 of 4
Injection Date	4/2/2015 9:17 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/17/2015 7:09 AM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM

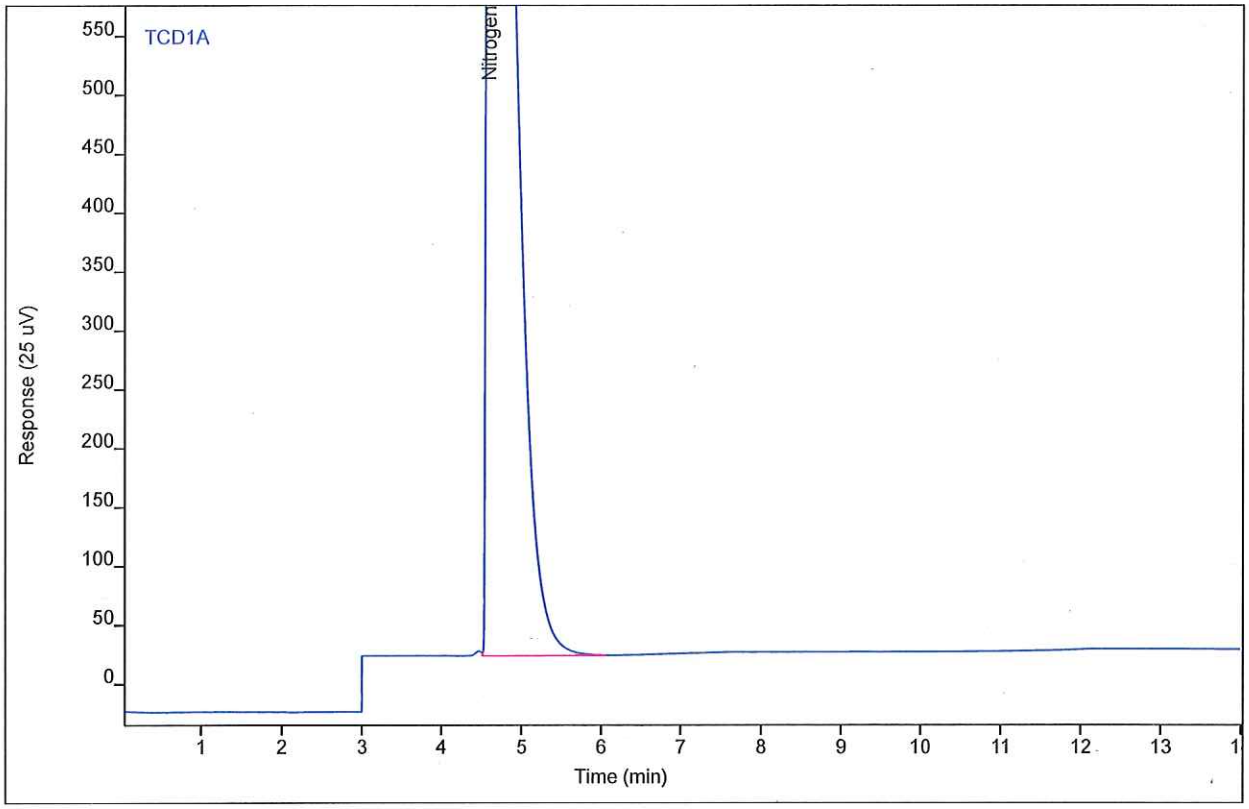


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Nitrogen	VB	4.60	29377.8	1547.66	91.6706	1	91.6706	%

Chromatogram Report

Enthalpy Analytical

Sample Name	#FG22 N2 99.9%	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F1504.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	4 of 4
Injection Date	4/2/2015 9:37 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/17/2015 7:09 AM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM

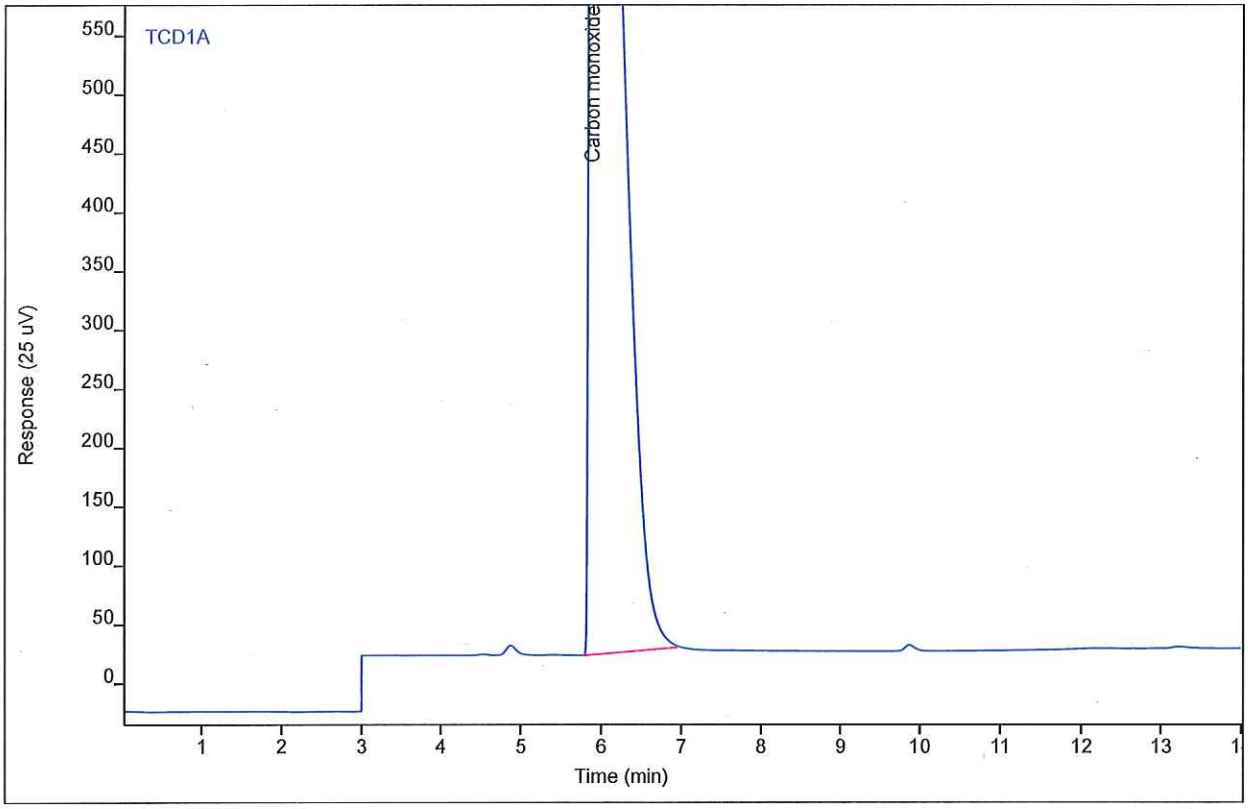


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Nitrogen	VB	4.59	29317.1	1546.16	91.4811	1	91.4811	%

Chromatogram Report

Enthalpy Analytical

Sample Name	#FG25 CO 99.9%	Sample Type	Calibration
Sequence Name	BETTYP162B ver.6	Vial Number	Vial 16
Data File	016F1801.D	Injection Volume	250
File Location	GC/2015/Betty/Quarter 1	Injection	1 of 3
Injection Date	4/2/2015 11:49 AM	Acquisition Method	GC142P133_CAL.M
File Modified	4/16/2015 3:42 PM	Analysis Method	BETTYP162_FGA.M
Instrument		Method Modified	4/2/2015 2:56 PM
Operator	Chester Burnett	Printed	4/17/2015 7:15 AM



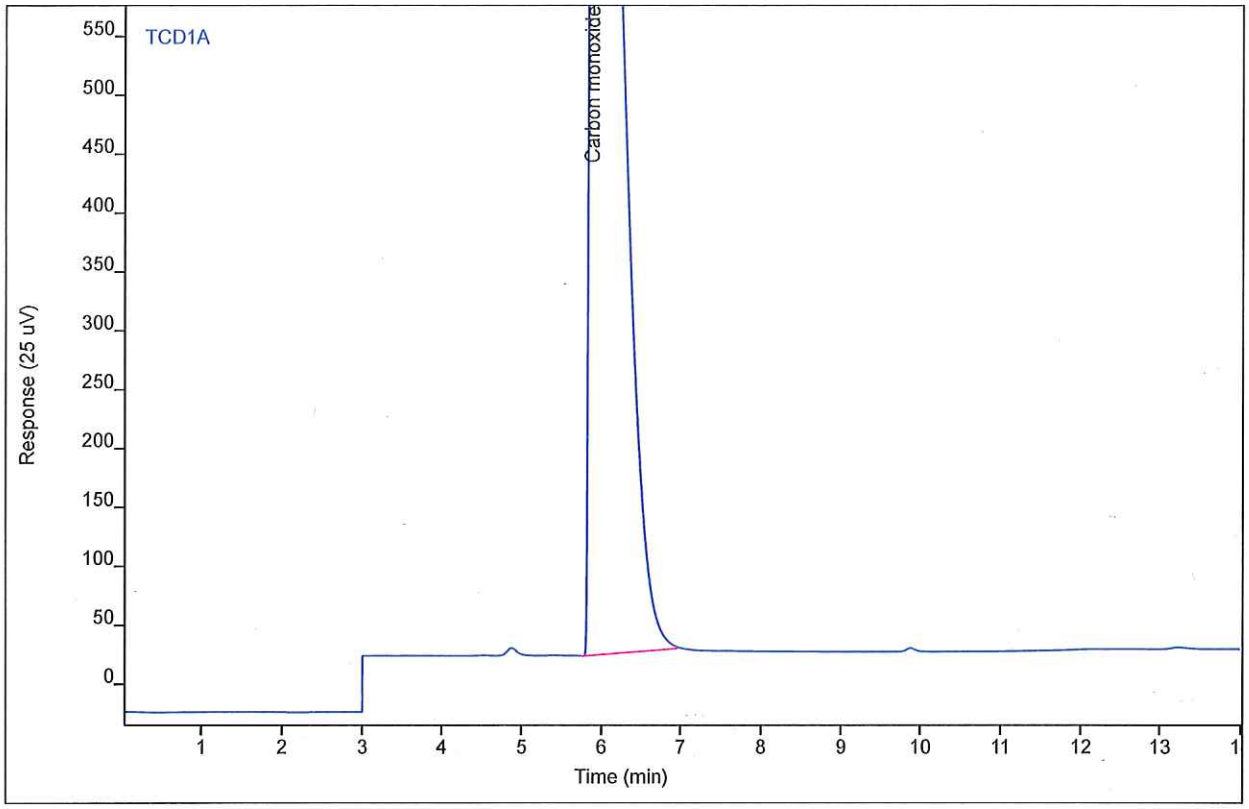
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon monoxide	BB	5.88	29570.8	1288.01	93.1074	1	93.1074	%

Chromatogram Report

Enthalpy Analytical

Sample Name	#FG25 CO 99.9%
Sequence Name	BETTYP162B ver.6
Data File	016F1802.D
File Location	GC/2015/Betty/Quarter 1
Injection Date	4/2/2015 12:10 PM
File Modified	4/16/2015 3:42 PM
Instrument	
Operator	Chester Burnett

Sample Type	Calibration
Vial Number	Vial 16
Injection Volume	250
Injection	2 of 3
Acquisition Method	GC142P133_CAL.M
Analysis Method	BETTYP162_FGA.M
Method Modified	4/2/2015 2:56 PM
Printed	4/17/2015 7:15 AM



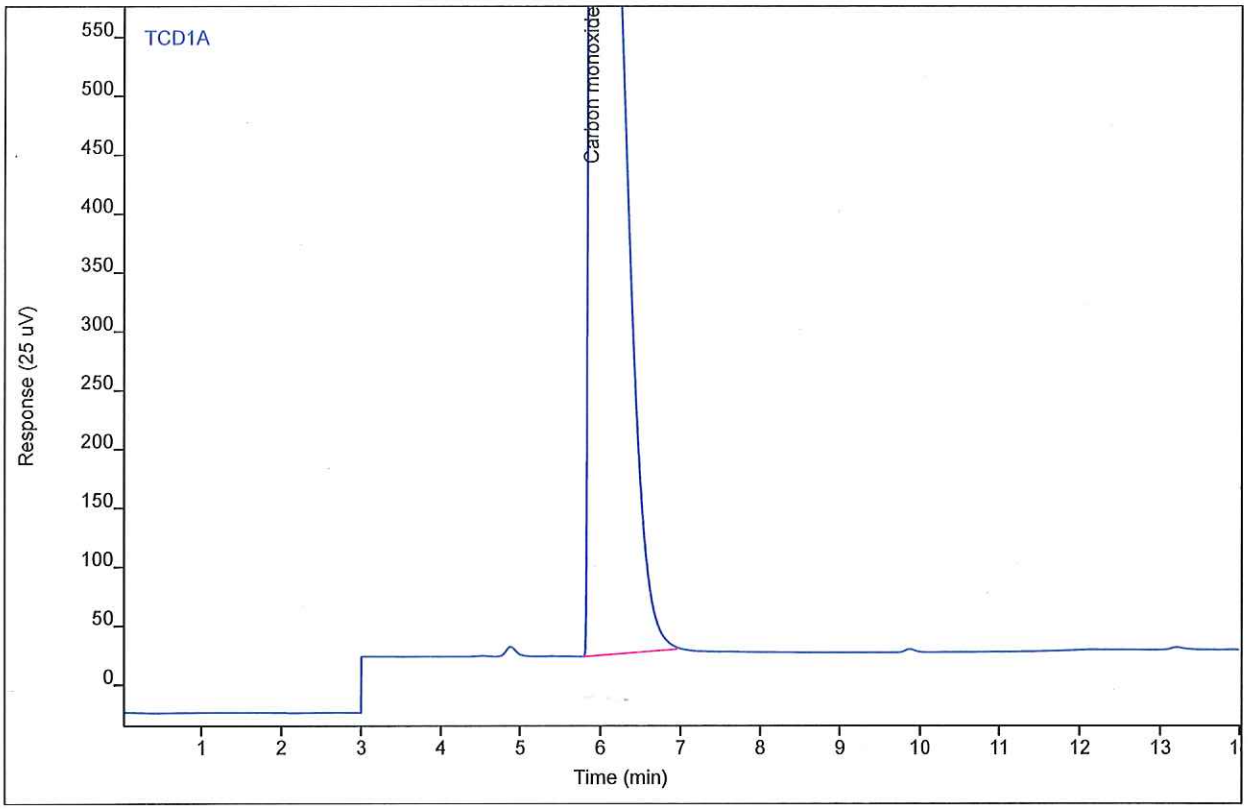
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon monoxide	BB	5.88	29718.9	1291.26	93.5739	1	93.5739	%

Chromatogram Report

Enthalpy Analytical

Sample Name	#FG25 CO 99.9%
Sequence Name	BETTYP162B ver.6
Data File	016F1803.D
File Location	GC/2015/Betty/Quarter 1
Injection Date	4/2/2015 12:31 PM
File Modified	4/16/2015 3:42 PM
Instrument	
Operator	Chester Burnett

Sample Type	Calibration
Vial Number	Vial 16
Injection Volume	250
Injection	3 of 3
Acquisition Method	GC142P133_CAL.M
Analysis Method	BETTYP162_FGA.M
Method Modified	4/2/2015 2:56 PM
Printed	4/17/2015 7:15 AM



Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon monoxide	BB	5.88	29459.2	1284.43	92.7560	1	92.7560	%

PRAXAIR
Making our planet more productive

Issue Date: 12-08-2014

To:

Attn:

Praxair Order Number:
Customer Order Number:
Customer Reference Number:

Product Lot Number: 1124002724A1
Product Part Number: ME 5.0RS-G

CERTIFICATE OF ANALYSIS

(Methane 99.999%, Research)

Cylinder Serial Number	*Analytes*	*Specification*	
RA071907	Methane	99.999	%
RA072283	Ethane	ND < 0.1	ppm
*RA072293	Nitrogen	ND < 0.1	ppm
RA072328	Oxygen	0.1	ppm
	Moisture	0.3	ppm
	Other Hydrocarbons	ND < 0.1	ppm

Cylinder Style: G
Cylinder Pressure @70°F (21°C): 2000 PSI
Cylinder Volume: 40 Cubic Feet

Valve Outlet Connection: 350 CGA
Filling Method: Pressure

Approved Signer: _____
Patrick Philpot

CUSTOMGAS
SOLUTIONS

1750 East Club Boulevard
Durham, NC 27704
Phone: (919) 220-2570
Fax: (919) 220-4540

Certificate of Analysis

Customer:

Enthalpy Analytical, Inc.
800-1 Capitola Drive
Durham, NC 27713

Tel: (919) 595-1377

Cylinder Number: XC010510B
Cylinder Size/CGA: 150/590
Fill Pressure: 2015 PSIA
Gas Volume:3700 liters
Date of Mfg: 02/04/14
Expiration Date: 02/04/16

Customer Number	Ship VIA	Job No.	Customer PO	Mixture Type
00127703NC	Pick up	011614-004	01151401	Gravimetric

Component	Nominal Concentration	Actual Concentration*	Mixture Type
Oxygen	10 %	10.01 % +/- 0.2 %	Gravimetric Master Gas
Carbon Dioxide	10 %	10.01 % +/- 0.2 %	
Helium	balance	balance	

NOTES: **Blend Tolerance:** +/- 2 %
Analytical Tolerance: +/- 2 %
Traceability: NIST by weight set. NIST Traceability No MT5061.
Internal Standards by analysis
Reactive Mixtures: Analyzed twice with required agreement between analyses of 2%.
Required wait time between analyses of >7 days.
Caution: Do not use below 150 PSIG.

Authorized Signature:

Joseph A. Ernst

*Every effort has been made to establish the actual concentration of the components using master gas blending technology however, Custom Gas Solutions shall have no liability in excess of the established charge for this material.

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott

6141 EASTON ROAD, BLDG 1, PLUMSTEADVILLE, PA 18949-0310 Phone: 800-331-4953 Fax: 215-766-7226

CERTIFIED MASTER CLASS
Single-Certified Calibration Standard

CERTIFICATE OF ACCURACY: Certified Master Class Calibration Standard

Product Information
Document # : 55814398-001
Item No.: MC500418-P-44
P.O. No.: 06181401

Cylinder Number: NKA197
Cylinder Size: 44
Certification Date: 30Jun2014
Expiration Date: 01Jul2017
Lot Number: PLU0288940

Customer

ENTHALPY ANALYTICAL, INC.
GREG TATE
800-1 CAPITOLA DRIVE
DURHAM, NC 27703
US

CERTIFIED CONCENTRATION

Component Name	Concentration (Moles)		Accuracy (+/-%)
CARBON MONOXIDE	10.0	%	2
HYDROGEN	8.2	%	2
METHANE	8.0	%	2
NITROGEN	10.0	%	2
HELIUM		BALANCE	

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY: LAMONT SHIELDS DATE: 7-3-14

SPECIFICATIONS

Component Name	Requested Concentration (Moles)		Certified Concentration (Moles)		Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)
CARBON MONOXIDE	10.	%	10.0	%	.0	2.00
HYDROGEN	8.	%	8.2	%	2.5	2.00
METHANE	8.	%	8.0	%	.0	2.00
NITROGEN	10.	%	10.0	%	.0	2.00
HELIUM		BAL		BAL		

TRACEABILITY

Traceable To
Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: 44

Pressure: 2015 PSIG
Expiration Date: 01Jul2017

Valve Connection: CGA 350

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

6890 GC METHOD

OVEN

Initial temp: 40 C (On)
Initial time: 6.00 min
Ramps:

#	Rate	Final temp	Final time
1	30.00	220	2.00
2	0 (Off)		

Post temp: 40 C
Post time: 0.00 min
Run time: 14.00 min

Maximum temp: 250 C
Equilibration time: 0.50 min

CRYO (N2)

Cryo: Off
Cryo fault: On
Cryo timeout: 40.00 min (On)
Quick cryo cool: Off
Ambient temp: 30 C

FRONT INLET (SPLIT/SPLITLESS)

Mode: Splitless
Initial temp: 200 C (On)
Pressure: 60.0 psi (On)
Purge flow: 0.0 mL/min
Purge time: 0.00 min
Total flow: 12.3 mL/min
Gas saver: Off
Gas type: Helium

BACK INLET (SPLIT/SPLITLESS)

Mode: Split
Initial temp: 200 C (On)
Pressure: 11.6 psi (On)
Split ratio: 5:1
Split flow: 12.3 mL/min
Total flow: 17.6 mL/min
Gas saver: Off
Gas type: Helium

COLUMN 1

Packed Column
Model Number: 19808
Description: Rt-ShinCarbon 2m x 1mm I
Max temperature: 250 C
Mode: constant pressure
Pressure: 60.0 psi
Inlet: Front Inlet
Outlet: Front Detector
Outlet pressure: ambient

COLUMN 2

Capillary Column
Model Number: 10198
Description: Rtx-1 30m x 0.32mm x 4um
Max temperature: 250 C
Nominal length: 30.0 m
Nominal diameter: 320.00 um
Nominal film thickness: 4.00 um
Mode: constant flow
Initial flow: 2.5 mL/min
Nominal init pressure: 11.6 psi
Average velocity: 39 cm/sec
Inlet: Back Inlet
Outlet: (other)
Outlet pressure: ambient

FRONT DETECTOR (TCD)

Temperature: 275 C (On)
Reference flow: 20.0 mL/min (On)
Mode: Constant makeup flow
Makeup flow: 10.0 mL/min (On)
Makeup Gas Type: Helium
Filament: On
Negative polarity: On

BACK DETECTOR (FID)

Temperature: 250 C (On)
Hydrogen flow: 60.0 mL/min (On)
Air flow: 450.0 mL/min (On)
Mode: Constant makeup flow
Makeup flow: 40.0 mL/min (On)
Makeup Gas Type: Nitrogen
Flame: On
Electrometer: On
Lit offset: 2.0

SIGNAL 1

Data rate: 20 Hz
Type: front detector
Save Data: On

SIGNAL 2

Data rate: 20 Hz
Type: back detector
Save Data: On

THERMAL AUX 1

Use: Valve Box Heater
Initial temp: 130 C (On)

VALVES

Valve 1 Gas Sampling
Loop Volume: 0.250 mL

POST RUN

Post Time: 0.00 min

method: C:\GC\2014\BETTY\METHODS\GC142P133_CAL.M
Modified on: 5/5/2014 at 7:51:02 AM

Load Time: 0.10 min
Inject Time: 0.50 min
Inlet: Front Inlet

Valve 2 Gas Sampling
Loop Volume: 0.250 mL
Load Time: 0.10 min
Inject Time: 0.50 min
Inlet: Front Inlet

TIME TABLE

Time(min)	Parameter & Setpoint	
3.00	Front Detector Polarity:	Off

This Is The Last Page Of This Report.