CONTAMINANT DELINEATION PLAN
FOR THE
CLOSED PHASE I C&D LANDFILL

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

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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 Closed Phase I C&D Landfill 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 Closed Phase I C&D Landfill. 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) Evaluation of additional analytical leachate/landfill gas "indicator" parameters as a part of routine landfill monitoring to characterize the source of the groundwater impacts;

2) Evaluation of the active landfill gas extraction system in the Closed Phase I C&D Landfill as an effective interim groundwater remedy;

3) 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 CLOSED PHASE I C&D LANDFILL

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. The Closed Phase I disposal area is located in the southern portion of the site and is bounded by an unnamed tributary of Cane Creek to the north with other landfill disposal areas further to the north, private property to the west, and land owned by Mecklenburg County to the east. Adjacent land parcels to the south and southeast of the Closed Phase I Landfill are developed with single-family residences. Some adjacent parcels have been recently purchased by GWS. Cane Creek abuts the southeast property boundaries of the aforementioned land parcels on the south side of the closed landfill. The Closed Phase I disposal area is approximately 23.3 acres. Waste placement in this disposal area generally occurred during the years 1993 to 2002. It has been reported that the eastern and southern margins of this disposal area contain buried land-clearing debris approximately 30-40 feet wide and 20-30 feet deep. A Site Map is attached as Figure 1.

Routine semi-annual groundwater monitoring has been conducted at the landfill since June 1996. The approximate locations of monitoring wells are shown on Figures 1 and 2. During the October 2012 and subsequent routine monitoring events, VOCs including benzene and vinyl chloride were detected at concentrations exceeding the 2L Standards in several detection monitoring wells. Other VOCs that have been detected at low concentrations include 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, 1,4-dichlorobenzene, carbon disulfide, ethylbenzene, toluene, and xylenes. Vinyl chloride is the predominant VOC in site groundwater. A summary of recent groundwater data for the subject landfill is presented in Table 1.

Due to the proximity of a few private residential water supply wells (now inactive) downgradient of the landfill area, samples were collected from these private wells. VOCs detected in the landfill monitoring wells were also detected in the former Gilkerson residence well. The

Gilkerson and other neighboring residential water supply wells were made inactive and these residences connected to a public water supply. GWS has purchased the former Gilkerson and Wright parcels. Analytical results for the neighboring private wells are summarized 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).

A groundwater potentiometric map is presented in Figure 2. Groundwater movement beneath the northern half of the Closed Phase I Landfill is to the north and northwest toward the unnamed stream tributary that separates the Closed Phase I Landfill and the Infill Expansion Area. The "V″-shaped potentiometric contours in the vicinity of the stream tributary are indicative of shallow groundwater discharge from the northern half of the Closed Phase I Landfill to this adjacent stream. Only one well cluster MW-5/MW-5D is located along the southern margin of the stream tributary. An upward vertical hydraulic gradient of 0.06 feet/foot was calculated for this well cluster. Similar to the vertical gradients calculated for well clusters on the north side of the stream tributary, this vertical gradient to the south of the stream indicates ground water discharge from the deeper aquifer horizon to the stream tributary. A local groundwater divide is shown to bisect the Closed Phase I Landfill such that groundwater movement in the southern half of this landfill area is to the southeast toward Cane Creek, which lies beyond the landfill property boundary to the southeast. Please note that the landfill owner has recently purchased land parcels situated between the landfill property boundary and Cane Creek.

3.2 POTENTIAL SOURCE(S) AND DETECTED CONTAMINANTS

The mechanism for groundwater contamination beneath the landfill area is not clearly understood. The primary source for ground water contamination beneath the landfill occurs within the waste mass disposed in the landfill areas. 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. Elevated methane data have triggered the need to design and implement a landfill gas extraction system that was activated in April 2015.

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

Methane monitoring wells were installed at the Closed Phase I Landfill in March 2014. The approximate locations of these wells are depicted on the attached Figure 2. As shown in Table 3, elevated methane gas levels have been detected in gas monitoring wells GW-3, GW-4, GW-5, and GW-6 located near the southeast property boundary since March 2014.

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 Closed Phase I Landfill monitoring wells (MW-1, MW-4, MW-5, MW-10, and MW-11). With the exception of MW-11 data, a review of these data does not show a significant increase in the concentrations of these indicator parameters with the initial detection of vinyl chloride in these monitoring wells. Because the low-level detection of vinyl chloride in these wells was not associated with a significant increase in inorganic "indicator" compounds, migrating LFG is suspected to be the source of the vinyl chloride detected in these groundwater monitoring wells. MW-11 data indicate elevated indicator parameters concurrent with the initial detection of vinyl chloride, which suggest a leachate source in this area of the landfill.

VOCs Detected in Upgradient Monitoring Wells

There is no true upgradient monitoring well at the Closed Phase I Landfill.

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

Headspace gas samples were collected from two LFG extraction wells (GW-3 and GW-6) prior to start-up of the LFG collection system and from one groundwater monitoring well MW-4D-1 at the Closed Phase I Landfill. These samples were collected in Summa canisters and submitted with a chain-of-custody record to Enthalpy Analytical, Inc. and analyzed for 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 samples were 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 GW-3 and GW-6 and groundwater well MW-4D-1. Moreover, several commonly detected VOCs including cis-1,2-dichloroethene, vinyl chloride, ethylbenzene, and xylenes were found to have similar concentrations in the gas and groundwater well headspace samples.

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, vinyl chloride, cis-1,2-dichloroethene, 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 the 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.

Reduction of VOC Concentrations in Groundwater during LFG Mitigation

Published studies indicate that the installation and operation of LFG control systems appeared to reduce the VOC levels in groundwater at several landfill sites. GWS engaged CEC to design and install an LFG extraction system at the Closed Phase I Landfill. This gas control system has been operational since April 2, 2015. As discussed in Section 3.3.2, the increasing trend in VC concentrations in site groundwater monitoring wells from October 2012 to October 2014 corresponds with the initial detection of elevated methane gas levels in LFG monitoring wells GW-3, GW-4, GW-5, GW-6, and GW-8 in March 2014. The decreasing trend in VC concentrations in site groundwater monitoring wells indicated by the April 24, 2015 and subsequent October 21, 2015 monitoring data corresponds with the continuous operation of the site LFG collection system since April 2, 2015. If, as we believe, operation of the LFG collection system resulted in a significant reduction in vinyl chloride in groundwater, continued future operation of this system should be effective as a groundwater remedy.

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 flow patterns in the northern half of the Closed Phase I Landfill will result in the transport and discharge of groundwater-borne contaminants to the unnamed stream tributary to the north. 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 its 15A NCAC 2B Surface Water Standard of 2.4 ppb for Human Heath.

Groundwater movement in the southern half of the Closed Phase I Landfill is to the southeast toward Cane Creek. If not attenuated, impacted groundwater to the south of the landfill facility will discharge to Cane Creek. GWS has recently purchased residentially-developed land parcels located between the southeastern and southern perimeter of the closed landfill and Cane Creek. Moreover, private supply wells that were utilized at the residences on these land parcels have been made inactive, and the residences have been connected to a public water system. By removing these receptors, the current exposure pathway via impacted groundwater is not complete and the risk to human health reduced.

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. If

not attenuated, contaminant migration via deeper groundwater movement in a south or east direction from the Closed Phase I Landfill is anticipated to ultimately discharge to Cane Creek.

3.3.2 Vinyl Chloride Trends

As illustrated in the charts presented with Table 1, vinyl chloride was first detected in site groundwater in the October 2012 monitoring event, and its concentrations were observed to increase in several landfill monitoring wells up to October 2014. Concurrently, elevated methane levels were initially detected in site gas monitoring wells GW-3, GW-4, GW-5, GW-6, and GW-8 in March 2014 (i.e., indicating the presence of migrating LFG). Recent groundwater VOC data indicate a significant improvement in site groundwater quality from the historic maximum VOC levels. The Table 1 charts show a recent overall trend of decreasing vinyl chloride concentration in site monitoring wells.

Over the period from October 2013 to October 2014, vinyl chloride concentrations in deeper landfill monitoring wells were typically increasing. From October 2014 to October 2015, vinyl chloride trends decreased for eight of the deeper monitoring wells and increased for three deeper wells (MW-4A, MW-5D, and MW-6D) along the perimeter of the Closed Phase I Landfill. Although vinyl chloride was historically detected in wells MW-4D-1, MW-6D-1, MW-7D, MW-8D, MW-11A, MW-11D-1, the October 2015 data show vinyl chloride to be non-detect in these wells.

As illustrated in Figure 2, vinyl chloride is distributed at low ppb concentrations (1 to 6.6 ppb) at the downgradient perimeter of the Closed Phase I Landfill. Also observed in the potentiometric contour map, the Closed Phase I Landfill is bisected by a centrally located groundwater divide, and vinyl chloride has been detected in downgradient perimeter wells to the north, east, and south. The widespread distribution of vinyl chloride at low ppb levels along the entire downgradient perimeter of this closed landfill is not indicative of groundwater impacted by landfill leachate, yet may result from groundwater impacted by a more homogeneous medium such as migrating LFG.

It is premature to assign a cause(s) for this recent declining groundwater VOC trend. Groundwater levels were slightly higher in April 2015 when compared with October 2014 suggesting that seasonal groundwater fluctuation is not likely a significant factor. The site LFG extraction system began operation on April 2, 2015, and thus may be a factor in reducing vinyl chloride levels in groundwater. Further evaluation of additional groundwater monitoring data is needed following an extended period of gas extraction system operation to determine whether LFG extraction will be effective as a groundwater remedy.

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 Closed Phase I Landfill.

Monitoring Area	VOC Trend Analysis
MW-1	MW-1 is located along the north-central perimeter of the landfill adjacent to the tributary. MW-1 –VC decreased from 1.5 ppb to non-detect; toluene and xylenes decreased to non-detect. Elevated alkalinity, CO_2 and manganese (Mn) point to LFG impact to groundwater.
MW-4 Area	The well cluster at MW-4 is located in near proximity to gas collection well GW-5. Since the gas collection system was started: MW-4 - VC decreased from 7.0 to 1.2 ppb. Elevated alkalinity, CO_2 and Mn point to LFG impact to groundwater. MW-4A - VC decreased from 3.4 to 1.2 ppb; DCE decreased from 2.4 to 1.8 (<2L Std); DCA, toluene and xylenes decrease to non-detect. Elevated CO_2 points to LFG impact to groundwater. MW-4D – VC decreased from 6.9 to 0.65 ppb; DCA decreased from 2.8 to 1.3 (<2L Std); DCE decreased from 3.7 to 1.4 ppb (<2L Std); xylenes decrease to non-detect. Leachate indicator parameters were not elevated. MW-4D-1 – VC decreased from 1.2 ppb to non-detect; carbon disulfide decreased from 9.6 to 2.1 ppb (<2L Std); DCE and xylenes were essentially unchanged at 1.5 and 1.2 ppb (both <2L Std); DCA was detected at 1.0 ppb (<2L Std). Leachate indicator parameters were not elevated. The above data are evidence for LFG impact to site groundwater. These data predominantly show decreasing VOC levels since the gas collection system became active.
MW-5 Area	The well cluster at MW-5 is located on the northeast perimeter of the landfill adjacent to the tributary. MW-5 - VC decreased from 8.6 to 2.1 ppb; cis-DCE remained unchanged at 1.9 ppb (<2L Std); DCA and xylenes decrease to non-detect. MW-5D - VC has increased from 3.0 – 6.2 – 6.6 ppb; cis-DCE decreased from 4.3 to 3.8 ppb (<2L Std); DCA decreased from 2.9 to 2.8 ppb (<2L Std); chloroethane was present at 2.1 ppb; benzene increased from 1.2 to 1.3 ppb; xylenes decrease to non-detect. VC and other VOCs decreased in the shallow groundwater (MW-5). The data also suggest natural bio-decay of cis-DCE to VC and DCA to chloroethane. The decay process may be presently increasing the VC levels in the deeper well MW-5D.
MW-6 Area	The well cluster at MW-6 is located in near proximity to gas collection well GW-3. Since the gas collection system was started: MW-6 - VC decreased from 1.6 ppb to non-detect; xylenes decrease from 1.4 ppb to non-detect.

Monitoring Area	VOC Trend Analysis
	MW-6D - VC decreased from 5.7 to 1.5 ppb; DCE decreased from 1.3 ppb to non-detect. MW-6D-1 - VC decreased from 3.8 ppb to non-detect; carbon disulfide at 2.8 (<2L Std). The decrease in groundwater VOC levels concurrent with gas collection is evidence for LFG impact.
MW-7 Area	The well cluster at MW-7 is located in near proximity to gas collection well GW-7. Since the gas collection system was started: MW-7 - VC trend is mixed from 3.3 to 1.1 to 1.6 ppb; DCE increased from 2.3 to 2.6 ppb (<2L Std); toluene and xylenes decreased to non-detect. Leachate indicator parameters are not elevated. MW-7A – VC has not been detected in this well; DCE increased from 1.1 to 1.4 ppb (<2L Std). Leachate indicator parameters are not elevated. MW-7D – VC decreased from 1.6 ppb to non-detect; DCE increased from 1.1 to 1.5 ppb (<2L Std); carbon disulfide at 1.8 ppb (<2LStd). Leachate indicator parameters are not elevated. The above data are evidence for LFG impact to site groundwater. These data show decreasing VOC levels since the gas collection system became active.
MW-8 Area	The well cluster at MW-8 is located in near proximity to gas collection well GW-8. Since the gas collection system was started: MW-8 - VC decreased from 1.1 ppb to non-detect; carbon disulfide at 2.6 (<2L Std). Leachate indicator parameters are not elevated. MW-8D - VC decreased from 2.1 ppb to non-detect; no other VOCs detected. Leachate indicator parameters are not elevated. The above data appear to be evidence for LFG impact to site groundwater. These data show decreasing VC levels since the gas collection system became active.
MW-9	MW-9 is located in near proximity to gas collection well GW-9. Since the gas collection system was started: MW-9 – No VOCs have been detected in MW-9. Leachate indicator parameters are not elevated.
MW-10 Area	The well cluster at MW-10 is located along the northwest perimeter of the landfill adjacent to the tributary. MW-10 - VC decreased from 6.7 ppb to non-detect; no other VOCs detected. Leachate indicator parameters are not elevated. MW-10D - VC decreased from 8.1 to 2.4 ppb; benzene decreased from 2.9 to 1.3 ppb; toluene and xylenes decreased to non-detect. The decrease in groundwater VOC levels concurrent with gas collection may be evidence for LFG impact.
MW-11 Area	The well cluster at MW-11 is located at the east side of the landfill area in the vicinity of gas collection wells GW-1 and GW-2. MW-11 - VC decreased from 12.0 to 1.9 ppb; benzene decreased from 1.2 to 0.62 ppb (<2L Std). MW-11A – No VOCs detected. Leachate indicator parameters are not elevated. MW-11B - No VOCs detected. Leachate indicator parameters are not elevated. MW-11D-1 - VC decreased from 1.4 ppb to non-detect; no other VOCs detected. Leachate indicator parameters are not elevated. MW-11D-2 – Xylenes at 1.4 ppb (<2L Std). Leachate indicator parameters are not elevated. The significant decrease in groundwater VOC levels concurrent with gas collection is evidence for LFG impact.

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 INTERIM ABATEMENT MEASURES

4.1 NEIGHBORING PRIVATE WATER SUPPLY WELLS

Private residential supply wells located hydraulically down-gradient of the Closed Phase I Landfill have been made inactive (see Figure 1). These residences have been connected to a public water system. Moreover, the landfill owner has recently purchased the former Gilkerson and Wright parcels situated in this area. By removing these receptors, the current exposure pathway via impacted groundwater is not complete and the risk to human health reduced.

4.2 INSTALLATION AND OPERATION OF LANDFILL GAS (LFG) CONTROL SYSTEM

In addition, GWS engaged CEC to design, construct, and implement a LFG extraction well system to mitigate LFG migration at the Closed Phase I Landfill. The system consists of 15 perimeter LFG extraction wells, three LFG extraction wells placed in the waste mass, a blower and LFG collection piping and appurtenances. The approximate locations of LFG extraction wells are depicted on Figure 3. This system was made operational on April 2, 2015, and ran continually until June when an electrical problem interrupted the operation for approximately three weeks. The LFG extraction system has been operated continuously since these initial repairs were made with the exception of brief electrical outages. Initially, the extraction wells exhibited positive pressure buildup in all extraction wells, which can cause LFG migration. Since system startup, the positive pressure in the extraction wells has been reduced and all wells are now performing at a negative pressure (vacuum) at each well. Based on recent perimeter well monitoring, methane concentrations were reduced in the LFG monitoring wells; and as of February 2016, only one methane monitoring well (GW-6) continued to show elevated (~2.2%) methane levels. Recent routine monthly methane monitoring data for the Closed Phase I Landfill are summarized in Table 2.

5.0 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.

5.1 GROUNDWATER DISCHARGE TO SURFACE WATER

5.1.1 Discharge to Unnamed Tributary Stream

Groundwater flow patterns in the northern half of the Closed Phase I Landfill will result in the transport and discharge of groundwater-borne contaminants to the unnamed stream tributary to the north. 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.

5.1.2 Discharge to Cane Creek

Groundwater movement in the southern half of the Closed Phase I Landfill is to the southeast toward Cane Creek. Vinyl chloride was detected in shallow and deeper monitoring wells located along the southeast and south sides of the landfill property. If not attenuated, contaminant migration via groundwater movement in a southeast direction from the Closed Phase I Landfill 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.

5.2 AREA GROUNDWATER SUPPLY WELLS

As previously discussed in Section 4.1, private residential supply wells located hydraulically downgradient of the Closed Phase I Landfill 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.

5.3 MIGRATING LANDFILL GAS HAZARDS AND STRUCTURAL VAPOR INTRUSION

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

At the Closed Phase I Landfill, methane exceedances were documented at LFG monitoring wells GW-3, GW-4, GW-5, and GW-6. All of these LFG monitoring wells are located near the landfill property boundary. In response to the methane exceedances, GWS began operation of a LFG control system at the closed landfill on April 2, 2015. The approximate locations of LFG extraction wells are depicted on Figure 3. Based on recent perimeter monitoring well sampling, methane concentrations have been reduced; and as of February 2016, only one methane monitoring well (GW-6) continued to show elevated (~2.2%) methane levels. The facility is currently performing monthly methane monitoring at the Closed Phase I Landfill until further notice from the Solid Waste Section. Recent routine monthly methane monitoring data for the Closed Phase I Landfill are summarized in Table 2. Further, GWS installed and maintains indoor natural gas

monitors in the residences and enclosed structures located south of the landfill to detect methane above normal levels and to prevent harm to the residents.

In addition to the primary LFG constituents – methane and carbon dioxide – analyses of gas well headspace vapor samples detected several low-level hazardous VOCs in the site landfill gas (see Table 3 and Appendix A). The migration of hazardous VOC vapors in LFG into adjacent enclosed structures is also controlled by the continuous operation of the LFG control system.

5.3.2 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. The potential receptors for vapor intrusion due to partitioning from VOC-impacted groundwater are the residences and enclosed structures located south of the Closed Phase I Landfill. Given the low-ppb levels of the partitioning VOC vapors (see Table 3 and Appendix A) and the continued operation of the site LFG control system, an exposure pathway by structural vapor intrusion is not complete.

6.0 CONTAMINANT DELINEATION PLAN

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

6.2 EVALUATION OF LANDFILL GAS MITIGATION AS A GROUNDWATER REMEDY

Engineering studies by others indicate that the installation and operation of landfill gas control systems appeared to reduce the VOC levels in groundwater at several landfill sites. Thus, the groundwater response to the active gas mitigation should be monitored and evaluated over time with regard to its effectiveness to remedy groundwater impacts at the landfill.

6.3 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.

7.0 INTERIM GROUNDWATER REMEDY

In response to detecting methane in perimeter LFG monitoring wells, an LFG extraction well system has been installed and is currently operated at the Closed Phase I Landfill. This system consists of 15 LFG extraction wells installed along the southern and southeastern perimeter of the closed landfill, three LFG extraction wells placed in the waste mass in the northwest portion of the closed landfill, a blower, and LFG collection piping and appurtenances. Based on recent perimeter methane monitoring data, methane concentrations have been reduced drastically; and as of February 2016, only one methane monitoring well (GW-6) continues to show elevated methane levels.

Engineering studies by others indicate that the installation and operation of LFG control systems appeared to reduce the VOC levels in groundwater at several landfill sites. An evaluation of the most recent site groundwater monitoring data, which was collected after the start-up of the site LFG control system, indicates an overall significant diminishing trend in VC concentrations in shallow and deeper groundwater monitoring wells. We believe that deeper groundwater contaminated by the diffusion and downward vertical movement of contaminants from shallow groundwater, which is in direct contact with migrating LFG, will naturally attenuate should LFG mitigation abate the LFG source. Additional groundwater monitoring data is needed to evaluate the long-term effectiveness and permanence of LFG extraction as an interim groundwater remedy.

The source of contamination (i.e., leachate or LFG) can have a significant impact on the costs for control and remediation. Usually, costs for LFG control are less than for groundwater remediation. Where LFG is the source for groundwater impacts, aqueous treatment will not address the source directly; therefore, we propose to evaluate the effectiveness of the operating LFG extraction in removing the VOC source.

It is our technical opinion that more costly remediation approaches such as physical source removal, landfill capping, or aqueous treatments are not warranted at this time, and that they would not be effective if migrating LFG is the source of the site groundwater contamination.

8.0 SUMMARY

The NCDEQ - Solid Waste Section has requested a characterization of the nature and extent of the groundwater contamination at the Closed Phase I Landfill as a result of the detection of VOCs in several landfill monitoring wells and in a neighboring private water supply well (now inactive). 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.

Since the October 2012 semi-annual groundwater monitoring event, VOCs including benzene and vinyl chloride have been detected at concentrations exceeding the NC 2L Standards in several Closed Phase I Landfill monitoring wells. Other VOCs that have been detected at low levels include 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, 1,4-dichlorobenzene, carbon disulfide, ethylbenzene, toluene, and xylenes. Vinyl chloride is the predominant VOC in site groundwater and has been detected in 19 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 10 wells (MW-1, MW-4D-1, MW-6D-1, MW-6, MW-7D, MW-8, MW-8D, MW-10, MW-11A, and MW-11D-1).

Concurrent with the historical increasing trend of vinyl chloride concentrations in site groundwater, elevated methane levels were detected in several perimeter gas monitoring wells beginning in March 2014. The methane data indicated the presence of migrating landfill gas. Therefore, GWS engaged CEC to design, construct, and implement a gas extraction well system to mitigate gas migration at the Closed Phase I Landfill, which was made operational on April 2, 2015. The gas extraction system has been continuously operated with the exception of brief electrical outages. Based on recent methane monitoring data, methane concentrations are reduced; and as of February 2016, only one methane monitoring well (GW-6) continued to show elevated methane levels (~2.2%). As significantly, vinyl chloride concentrations in groundwater generally decreased in the Closed Phase I C&D Landfill during the timeframe the gas extraction system has been operating.

The mechanism for groundwater contamination beneath the subject landfill area is not clearly understood. Leachate and landfill gas are the possible sources. 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 historic monitoring data do indicate significant lateral gas migration. 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. Our current evaluation suggests that landfill gas may be a significant source of the observed groundwater impacts at the subject landfill. The improvement in site groundwater quality with concurrent gas control appears to be empirical evidence that landfill gas is impacting site groundwater.

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

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

2) Evaluation of the active landfill gas extraction system in the Closed Phase I C&D Landfill as an effective interim groundwater remedy;

3) 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.

9.0 REFERENCES

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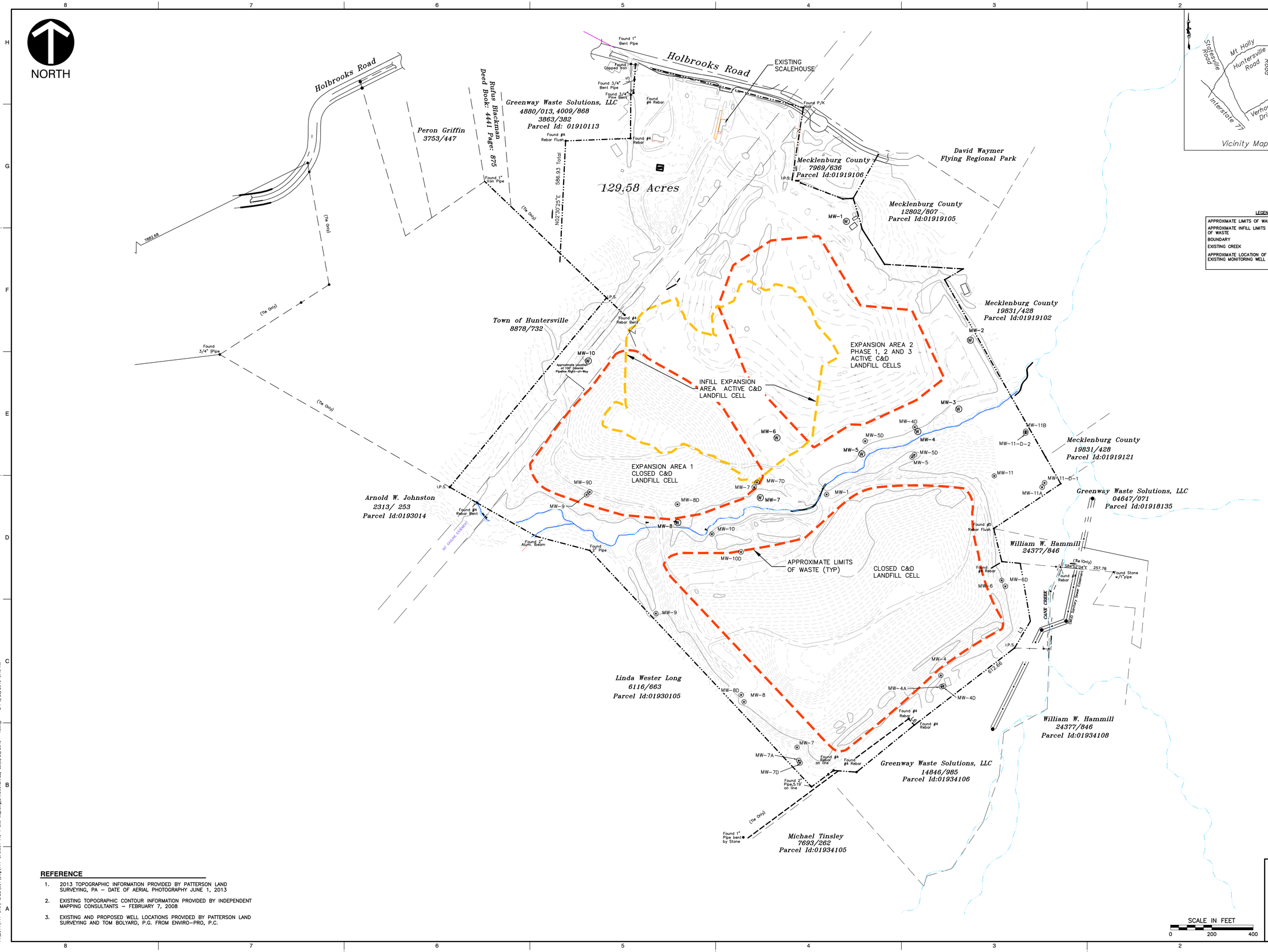
FIGURES



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

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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.

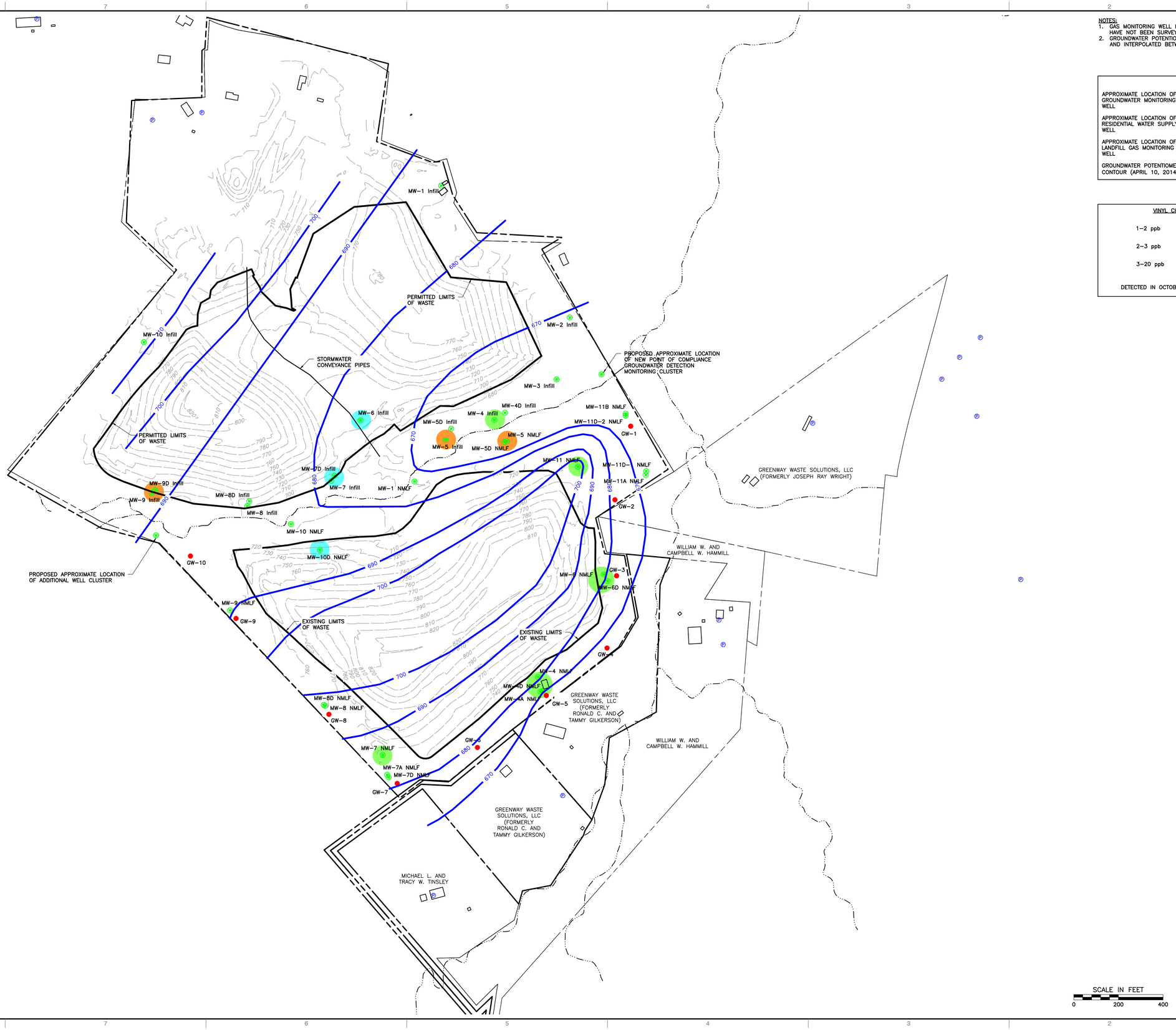
LEGEND

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

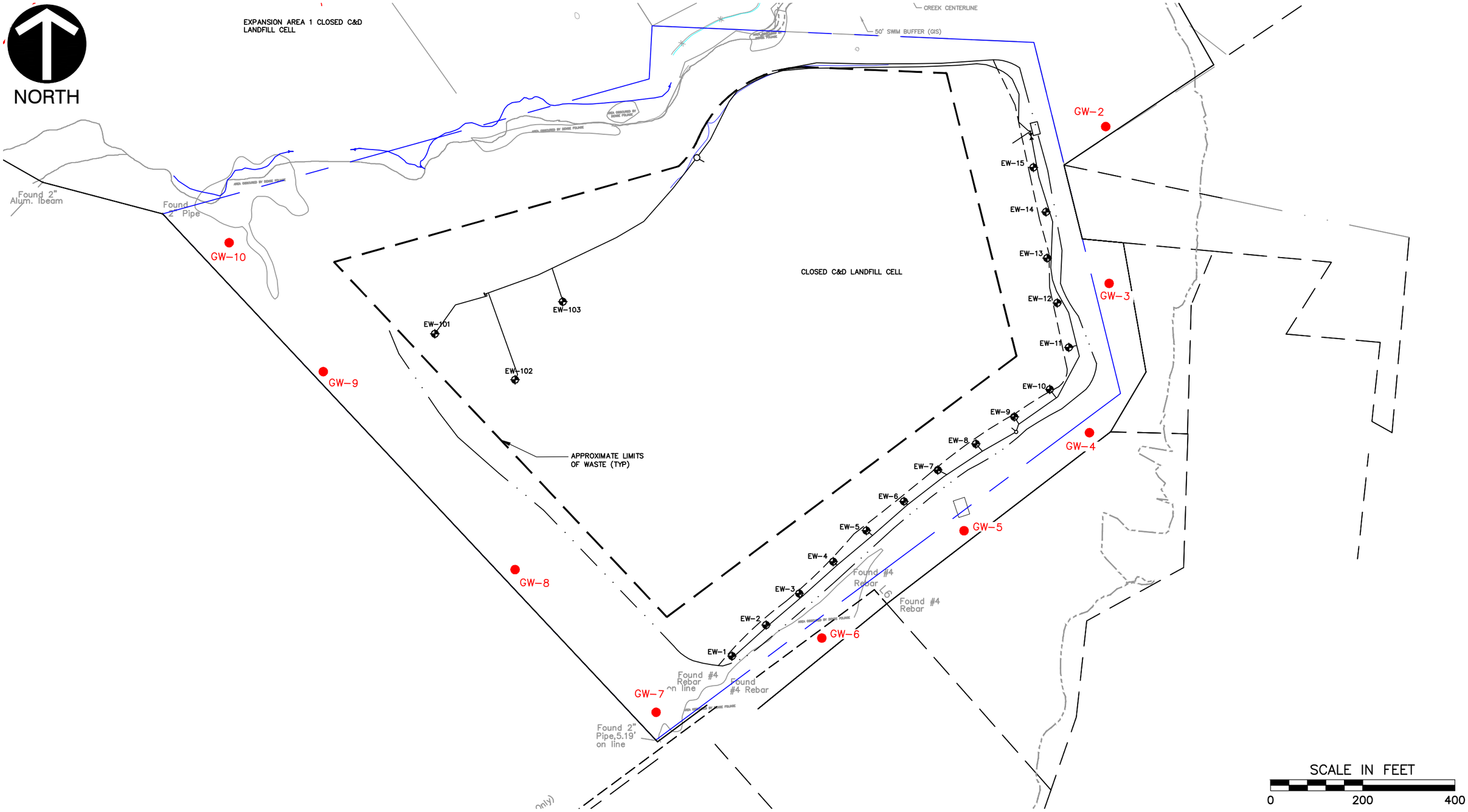
SITE MAP

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



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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.:
DATE:	JULY 2014	DWG SCALE:	1"=200'	PROJECT NO:	111-370.001	3

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: 9/24/2015 11:00 AM

TABLES

Table 1. Summary of Recent Site Groundwater Monitoring Data
North Meck Closed Phase I C&D Landfill
CEC Project No. 111-370.001

Constituent	**NCDENR Standard (mg/L) ***	MW-1							MW-4						
		10.24.12	4.25.13	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.24.12	4.25.13	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6										0.028				
Arsenic	0.01	**0.0131**	**0.012**				**0.01**								0.0019
Barium	0.7	0.193	0.12	0.071	0.065	0.11	0.077	0.46	0.527	0.62	0.62	0.65	0.61	0.65	0.55
Benzene	0.001														
Beryllium	NS							0.0016							
Cadmium	0.002							0.00064							
Calcium	NS							110							55
Chloroethane	3														
Chromium	0.01	0.0086													
Cobalt	NS								0.0117						0.018
Copper	1	0.0314				0.0073		0.067			0.0059				0.019
Carbon Disulfide	0.7														0.0017
1,1-Dichloroethane	0.006														
1,1-Dichloroethene	0.007														
1,4-Dichlorobenzene	0.006														
cis-1,2-Dichloroethene	0.07														
bis (2-Ethylhexyl) phthalate	0.003														
Ethylbenzene	0.6														
Toluene	0.6						0.0011								
Xylenes	0.5						0.0013								
Heptachlor	0.000008														
beta-BHC	NS														
Lead	0.015							0.016							
Manganese	0.05							**4.5**							**3.3**
Mercury	0.001			0.0001											
Methylene Chloride	0.005														
Nickel	0.1														0.008
Selenium	0.02														
Sulfide	NS														
Tetrahydrofuran	NS														
Vanadium	NS	0.0534						0.071							
Vinyl Chloride	0.00003				**0.0015**					**0.0035**	**0.0071**	**0.0068**	**0.007**	**0.0027**	**0.0012**
Zinc	1	0.0457		0.02	0.043	0.031		0.2			0.027				0.14
Alkalinity	NS	289	330					370	306	390					320
Ammonia-N	NS							0.9							1
Total Dissolved Solids	500	371	380					460	357	420					440
Sulfate	250	14.4	31							8					
Carbon Dioxide	NS							440							660
Chloride	250	3.04	3.6					3.3	5.74	4.7					8.1

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

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

Constituent	**NCDENR Standard (mg/L) ***	MW-4A					MW-4D				
		10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6										
Arsenic	0.01										0.0015
Barium	0.7	0.27	0.12	0.083	0.11	0.11	0.086	0.089	0.14	0.11	0.14
Benzene	0.001										
Beryllium	NS										
Cadmium	0.002										
Calcium	NS					34					84
Chloroethane	3										
Chromium	0.01	**0.027**							0.008		
Cobalt	NS										
Copper	1	0.086				0.0053			0.016		
Carbon Disulfide	0.7										
1,1-Dichloroethane	0.006			0.0012			0.0024	0.0028	0.0028	0.0025	0.0013
1,1-Dichloroethene	0.007		0.0017	0.0024		0.0018	0.0011	0.0026	0.0037		0.0014
1,4-Dichlorobenzene	0.006										
cis-1,2-Dichloroethene	0.07										
bis (2-Ethylhexyl) phthalate	0.003										
Ethylbenzene	0.6						0.0015				
Toluene	0.6				0.003		0.0074				
Xylenes	0.5				0.0039		0.0081			0.0011	
Heptachlor	0.000008										
beta-BHC	NS										
Lead	0.015	**0.026**									
Manganese	0.05					0.026					**0.46**
Mercury	0.001	0.00032			0.00025	0.0001		0.0003	0.00048		
Methylene Chloride	0.005										
Nickel	0.1										0.0066
Selenium	0.02										
Sulfide	NS										
Tetrahydrofuran	NS										
Vanadium	NS	0.068									
Vinyl Chloride	0.00003	**0.0034**	**0.0034**	**0.0034**		**0.0012**	**0.0047**	**0.006**	**0.0069**	**0.0017**	**0.00065**
Zinc	1	0.013	0.32	0.015	0.29	0.89			0.045		0.043
Alkalinity	NS					170					190
Ammonia-N	NS					0.17					0.82
Total Dissolved Solids	500					280					270
Sulfate	250										
Carbon Dioxide	NS					380					210
Chloride	250					8.2					8.4

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-5							MW-5D				
		10.24.12	4.25.13	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6												
Arsenic	0.01												0.001
Barium	0.7	**1.32**	0.46	0.41	0.37	0.46	0.28	0.28	0.28	0.32	0.32	0.32	0.29
Benzene	0.001	0.00053								**0.0011**		**0.0012**	**0.0013**
Beryllium	NS	0.001											
Cadmium	0.002							0.11					
Calcium	NS							99					250
Chloroethane	3											0.0022	0.0021
Chromium	0.01	**0.0319**	0.0053			0.0055			**0.013**				
Cobalt	NS	0.0338											
Copper	1	**1.13**	0.16	0.11	0.063	0.14	0.011	0.021	0.028	0.019	0.0072	0.0058	0.0052
Carbon Disulfide	0.7												
1,1-Dichloroethane	0.006	0.00073					0.0033		0.0036	0.0033	0.0019	0.0029	0.0028
1,1-Dichloroethene	0.007												
1,4-Dichlorobenzene	0.006												
cis-1,2-Dichloroethene	0.07	0.0019	0.0021	0.0021	0.0018	0.0019	0.0019	0.0019	0.0065	0.0054	0.0031	0.0043	0.0038
bis (2-Ethylhexyl) phthalate	0.003												
Ethylbenzene	0.6												
Toluene	0.6												
Xylenes	0.5						0.0011					0.0015	
Heptachlor	0.000008												
beta-BHC	NS												
Lead	0.015	0.0137											
Manganese	0.05							**0.29**					**0.8**
Mercury	0.001	0.00012											
Methylene Chloride	0.005												
Nickel	0.1	0.0243											0.0096
Selenium	0.02							0.0014					0.0041
Sulfide	NS												
Tetrahydrofuran	NS								0.036	0.037	0.033	0.03	0.024
Vanadium	NS	0.324	0.051					0.0072					0.007
Vinyl Chloride	0.00003	**0.00095**	**0.0046**	**0.0075**	**0.0064**	**0.0086**	**0.003**	**0.0021**	**0.012**	**0.013**	**0.003**	**0.0062**	**0.0066**
Zinc	1	0.327	0.049	0.031	0.026	0.055		0.085					0.078
Alkalinity	NS	232	230					310					620
Ammonia-N	NS							0.096					0.085
Total Dissolved Solids	500	433	470					**590**					**1200**
Sulfate	250	114	100										
Carbon Dioxide	NS							870					1400
Chloride	250	26.8	25					28					84

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-6							MW-6D				
		10.24.12	4.25.13	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6												
Arsenic	0.01							0.0012					0.0013
Barium	0.7	0.288	0.31	0.32	0.3	0.32	0.3	0.29	0.21	0.22	0.24	0.25	0.22
Benzene	0.001												
Beryllium	NS												
Cadmium	0.002							0.00015					
Calcium	NS							140					190
Chloroethane	3												
Chromium	0.01					0.0067							
Cobalt	NS												
Copper	1	0.0096		0.01	0.011	0.02	0.0065		0.011				0.0013
Carbon Disulfide	0.7												
1,1-Dichloroethane	0.006												
1,1-Dichloroethene	0.007											0.0013	
1,4-Dichlorobenzene	0.006												
cis-1,2-Dichloroethene	0.07												
bis (2-Ethylhexyl) phthalate	0.003												
Ethylbenzene	0.6												
Toluene	0.6												
Xylenes	0.5						0.0014						
Heptachlor	0.000008												
beta-BHC	NS												
Lead	0.015											0.013	
Manganese	0.05							0.15					**1.6**
Mercury	0.001			0.00017									
Methylene Chloride	0.005												
Nickel	0.1	0.0131						0.012					0.0058
Selenium	0.02							0.0017					
Sulfide	NS												
Tetrahydrofuran	NS								0.018	0.025	0.027		0.0029
Vanadium	NS												0.0057
Vinyl Chloride	0.00003			**0.0029**	**0.0016**				**0.0047**	**0.0057**		**0.0014**	**0.0015**
Zinc	1	0.028	0.021	0.13	0.04	0.06	0.02	0.081	0.02	0.025			0.056
Alkalinity	NS	662	670					660					730
Ammonia-N	NS							0.063					0.087
Total Dissolved Solids	500	**773**	**700**					**870**					**910**
Sulfate	250	31.3	17										
Carbon Dioxide	NS							900					990
Chloride	250	30	30					37					21

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-7					MW-7A					MW-7D				
		10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6															
Arsenic	0.01															
Barium	0.7	0.26	0.25	0.24	0.31	0.26	0.22	0.3	0.26	0.3	0.28	0.19	0.22	0.21	0.18	0.019
Benzene	0.001															
Beryllium	NS															
Cadmium	0.002															
Calcium	NS					86					61					82
Chloroethane	3															
Chromium	0.01															
Cobalt	NS															
Copper	1	0.0063			0.0045	0.0048				0.0078	0.0016					
Carbon Disulfide	0.7															0.0018
1,1-Dichloroethane	0.006															
1,1-Dichloroethene	0.007		0.0013	0.0023		0.0026			0.0011		0.0014			0.0011		0.0015
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07															
bis (2-Ethylhexyl) phthalate	0.003															
Ethylbenzene	0.6															
Toluene	0.6				0.0011										0.0011	
Xylenes	0.5				0.0015					0.0016					0.0014	
Heptachlor	0.000008															
beta-BHC	NS															
Lead	0.015		0.013													
Manganese	0.05					**0.19**					**0.2**					**0.17**
Mercury	0.001										0.0002					
Methylene Chloride	0.005															
Nickel	0.1															
Selenium	0.02					0.0016					0.0014					
Sulfide	NS															
Tetrahydrofuran	NS															
Vanadium	NS															
Vinyl Chloride	0.00003	**0.0014**	**0.0014**	**0.0033**	**0.0011**	**0.0016**							**0.0013**	**0.0016**		
Zinc	1			0.048	0.032	0.073					0.0074					0.05
Alkalinity	NS					310					230					270
Ammonia-N	NS					0.19					0.053					0.073
Total Dissolved Solids	500					470					350					390
Sulfate	250															
Carbon Dioxide	NS					370					350					310
Chloride	250					44					30					35

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-8					MW-8D					MW-9				
		10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6			0.02	0.36	0.027										
Arsenic	0.01															
Barium	0.7	0.23	0.2	0.057	0.045	0.15	0.14	0.09	0.091	0.034	0.072	0.25	0.11	0.21	0.21	0.07
Benzene	0.001															
Beryllium	NS															
Cadmium	0.002															
Calcium	NS					57					85					13
Chloroethane	3															
Chromium	0.01	0.0066	**0.029**	0.0057								**0.016**		**0.012**	**0.015**	
Cobalt	NS				0.027	0.045										
Copper	1	0.035	0.12	0.015		0.06	0.038			0.03	0.0065	0.043	0.013	0.029	0.031	0.0049
Carbon Disulfide	0.7					0.0026										
1,1-Dichloroethane	0.006															
1,1-Dichloroethene	0.007															
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07															
bis (2-Ethylhexyl) phthalate	0.003															
Ethylbenzene	0.6															
Toluene	0.6															
Xylenes	0.5															
Heptachlor	0.000008															
beta-BHC	NS															
Lead	0.015	**0.015**	**0.027**			0.015										
Manganese	0.05					**4.4**					**0.081**					**0.06**
Mercury	0.001						0.00012									
Methylene Chloride	0.005															
Nickel	0.1					0.026										
Selenium	0.02										0.0017					
Sulfide	NS															
Tetrahydrofuran	NS															
Vanadium	NS	0.082	0.12			0.059						0.058			0.05	0.063
Vinyl Chloride	0.00003			**0.0011**			**0.0016**	**0.0017**	**0.0021**							
Zinc	1	0.071	0.18	0.028		0.13				0.97	0.033	0.081	0.094	0.083	0.08	0.026
Alkalinity	NS					250					250					40
Ammonia-N	NS					0.46										0.3
Total Dissolved Solids	500					220					430					250
Sulfate	250															
Carbon Dioxide	NS					290					240					100
Chloride	250					7.9					55					14

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-10							MW-10D				
		10.24.12	4.25.13	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6												
Arsenic	0.01	0.0096	**0.012**		**0.013**			0.0051					0.0023
Barium	0.7	0.426	0.22	0.17	0.54	0.25	0.52	0.27	0.29	0.19	0.2	0.2	0.19
Benzene	0.001								**0.0031**	**0.0027**	**0.0029**	**0.0025**	**0.0013**
Beryllium	NS	0.0015											
Cadmium	0.002												
Calcium	NS							50					380
Chloroethane	3												
Chromium	0.01	**0.033**											
Cobalt	NS	0.018						0.0069	0.033		0.026	0.026	0.024
Copper	1	0.0655		0.011				0.0051	0.068	0.011	0.015	0.007	0.0076
Carbon Disulfide	0.7												
1,1-Dichloroethane	0.006												
1,1-Dichloroethene	0.007												
1,4-Dichlorobenzene	0.006								0.003	0.0029	0.0024		
cis-1,2-Dichloroethene	0.07												
bis (2-Ethylhexyl) phthalate	0.003												
Ethylbenzene	0.6												
Toluene	0.6											0.003	
Xylenes	0.5											0.004	
Heptachlor	0.000008												
beta-BHC	NS												
Lead	0.015	**0.0311**						0.0019					
Manganese	0.05							**2.9**					**13**
Mercury	0.001	0.00012							0.00013				
Methylene Chloride	0.005												
Nickel	0.1	0.017							0.051	0.043		0.04	0.042
Selenium	0.02												0.0089
Sulfide	NS												
Tetrahydrofuran	NS								0.12	0.11	0.091	0.085	0.061
Vanadium	NS	0.162						0.012					0.005
Vinyl Chloride	0.00003		**0.0022**	**0.0053**	**0.0072**	**0.0067**	**0.0031**		**0.025**	**0.027**	**0.029**	**0.0081**	**0.0024**
Zinc	1	0.107						0.076	0.037				0.053
Alkalinity	NS	175	220					220					1600
Ammonia-N	NS							1.5					0.51
Total Dissolved Solids	500	212	130					340					**2300**
Sulfate	250	2.72											
Carbon Dioxide	NS							320					2000
Chloride	250	12.3	13					16					130

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-11							MW-11A				
		10.24.12	4.25.13	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15
Acetone	6												
Arsenic	0.01			**0.014**				0.0012					
Barium	0.7	0.244	0.14	0.27	0.1	0.28	0.24	0.26	0.047	0.047	0.05	0.04	0.054
Benzene	0.001	0.00087		**0.001**			**0.0012**	0.00062					
Beryllium	NS												
Cadmium	0.002												
Calcium	NS							270					13
Chloroethane	3												
Chromium	0.01												
Cobalt	NS												
Copper	1		0.01	0.0065	0.014	0.032	0.042	0.014					0.00082
Carbon Disulfide	0.7												
1,1-Dichloroethane	0.006												
1,1-Dichloroethene	0.007												
1,4-Dichlorobenzene	0.006												
cis-1,2-Dichloroethene	0.07												
bis (2-Ethylhexyl) phthalate	0.003												
Ethylbenzene	0.6												
Toluene	0.6												
Xylenes	0.5											0.0011	
Heptachlor	0.000008												
beta-BHC	NS												
Lead	0.015												
Manganese	0.05							**1.8**					0.015
Mercury	0.001												
Methylene Chloride	0.005												
Nickel	0.1	0.0164						0.023					
Selenium	0.02							0.0027					
Sulfide	NS												
Tetrahydrofuran	NS	0.0284	0.028	0.052	0.023	0.028	0.03	0.022					
Vanadium	NS							0.0054					
Vinyl Chloride	0.00003		**0.0027**	**0.0086**	**0.0092**	**0.012**	**0.002**	**0.0019**	**0.0037**				
Zinc	1							0.068					0.016
Alkalinity	NS	227	990					990					88
Ammonia-N	NS							0.16					ND
Total Dissolved Solids	500	**1160**	**1200**					**1400**					240
Sulfate	250	156	100										
Carbon Dioxide	NS							1400					150
Chloride	250	59.7	49					45					9.1

* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

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

Constituent	**NCDENR Standard (mg/L) ***	MW-11B		MW-11D-1					MW-11D-2					MW-4D-1		
			10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.3.13	4.10.14	10.23.14	4.24.15	10.21.15	10.23.14	4.24.15	10.21.15
Acetone	6															
Arsenic	0.01															0.0015
Barium	0.7		0.2	0.13	0.13	0.13	0.1	0.074	0.12	0.15	0.056	0.13	0.083	0.03	0.031	0.032
Benzene	0.001															
Beryllium	NS															
Cadmium	0.002															
Calcium	NS		15					57					14			37
Chloroethane	3															
Chromium	0.01			0.0076	0.0076											
Cobalt	NS															
Copper	1		0.043	0.0059	0.02	0.02	0.01	0.027	0.0078				0.0015			
Carbon Disulfide	0.7													0.0096		0.0021
1,1-Dichloroethane	0.006															0.001
1,1-Dichloroethene	0.007													0.0012		0.0015
1,4-Dichlorobenzene	0.006															
cis-1,2-Dichloroethene	0.07															
bis (2-Ethylhexyl) phthalate	0.003															
Ethylbenzene	0.6															
Toluene	0.6															
Xylenes	0.5												0.0014		0.0012	0.0012
Heptachlor	0.000008															
beta-BHC	NS															
Lead	0.015															
Manganese	0.05		**0.11**					0.014					**0.098**			0.03
Mercury	0.001			0.00014												
Methylene Chloride	0.005															
Nickel	0.1															
Selenium	0.02							0.001								
Sulfide	NS															
Tetrahydrofuran	NS			0.0084												
Vanadium	NS		0.017													
Vinyl Chloride	0.00003			**0.0045**		**0.002**	**0.0014**							**0.0012**		
Zinc	1		0.058					0.026					0.022			
Alkalinity	NS		65					280					75			150
Ammonia-N	NS		0.087					0.15					ND			0.074
Total Dissolved Solids	500		**670**					400					190			210
Sulfate	250															
Carbon Dioxide	NS		130					290					140			140
Chloride	250		4.6					19					4.4			13

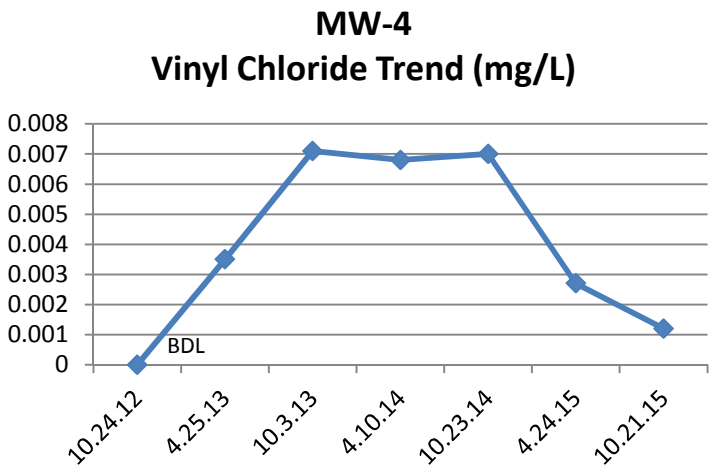
* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

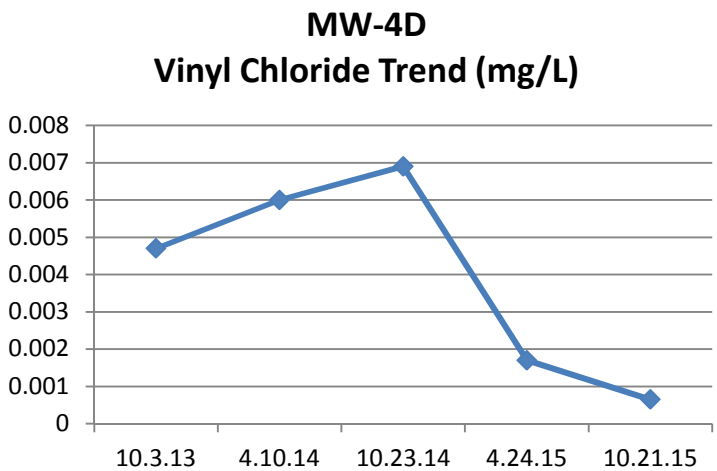
Table 1. Summary of Recent Site Groundwater Monitoring Data (Continued)
North Meck Closed Phase I C&D Landfill
CEC Project No. 111-370.001

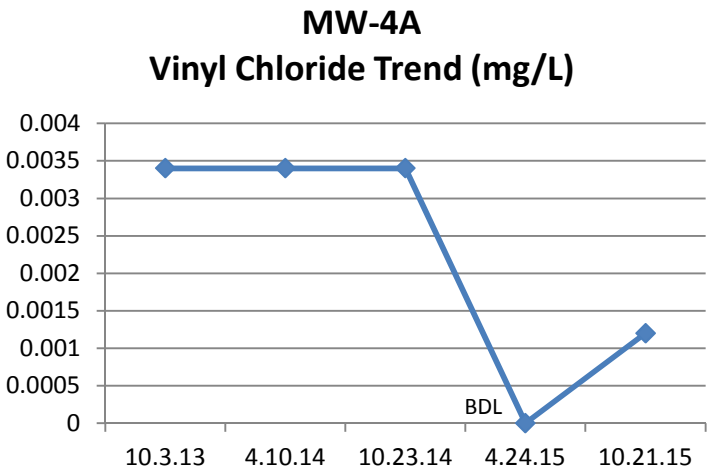
Constituent	**NCDENR Standard (mg/L) ***	MW-6D-1			Tinsley WSW			Gilkerson WSW			Hammill WSW		
		10.23.14	4.24.15	10.21.15		4.24.15	10.21.15		4.24.15	10.21.15		4.24.15	10.21.15
Acetone	6												
Arsenic	0.01			0.0017									0.0053
Barium	0.7	0.25	0.23	0.29		0.1	0.095		0.031	0.048		0.044	0.049
Benzene	0.001												
Beryllium	NS												
Cadmium	0.002			0.00013									
Calcium	NS			150			63			22			110
Chloroethane	3												
Chromium	0.01												
Cobalt	NS												
Copper	1									0.0076			0.0047
Carbon Disulfide	0.7			0.0028									
1,1-Dichloroethane	0.006												
1,1-Dichloroethene	0.007												
1,4-Dichlorobenzene	0.006												
cis-1,2-Dichloroethene	0.07												
bis (2-Ethylhexyl) phthalate	0.003												
Ethylbenzene	0.6												
Toluene	0.6												
Xylenes	0.5		0.0011										
Heptachlor	0.000008												
beta-BHC	NS												
Lead	0.015												
Manganese	0.05			**0.37**			**0.12**			**0.12**			**0.062**
Mercury	0.001												
Methylene Chloride	0.005												
Nickel	0.1												
Selenium	0.02			0.0012									
Sulfide	NS												
Tetrahydrofuran	NS	0.12	0.11	0.11									
Vanadium	NS									0.0077			
Vinyl Chloride	0.00003	**0.0038**											
Zinc	1			0.073		0.024	0.033			0.02		0.053	0.025
Alkalinity	NS			500			150			82			
Ammonia-N	NS			0.068			ND			0.074			
Total Dissolved Solids	500			**600**			320			140			
Sulfate	250												
Carbon Dioxide	NS			490			130			100			
Chloride	250			25			17			7.7			

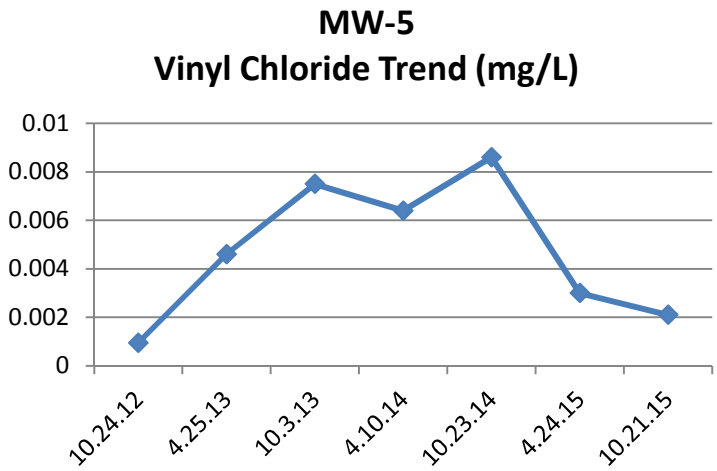
* NCDENR Standard = 15A NCAC 02L .0202
Bold values exceed the NCDENR Standard

Charts for Table 1
North Meck Closed Phase I C&D Landfill
CEC Project No. 111-370.001

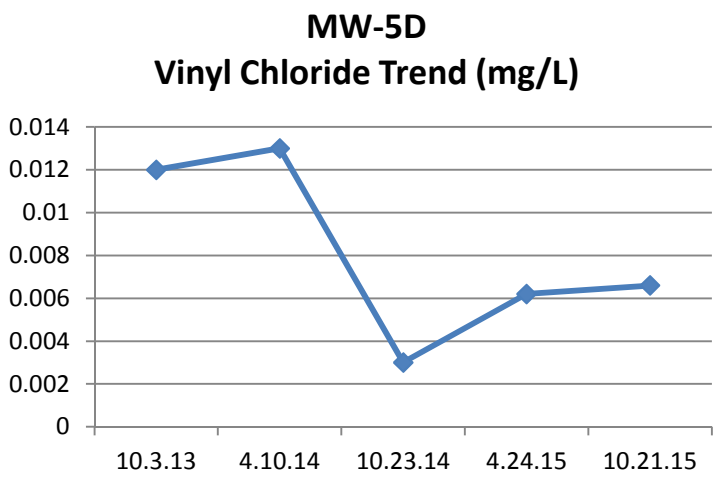


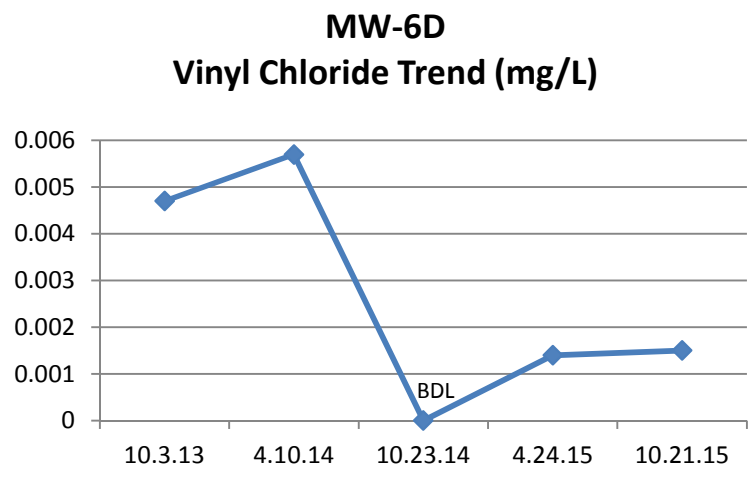


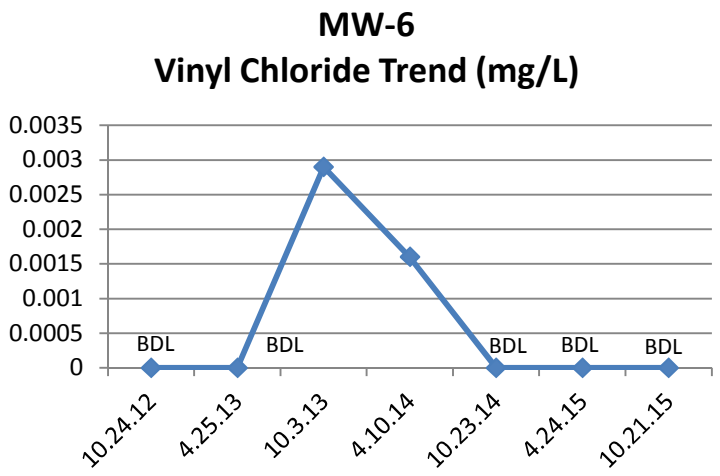


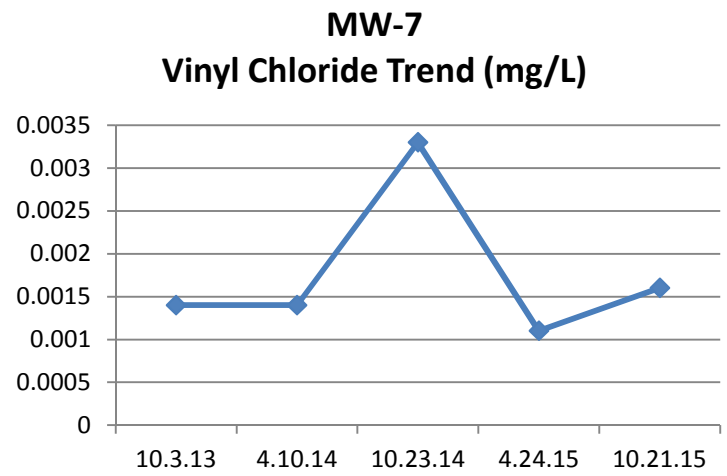


Charts for Table 1
North Meck Closed Phase I C&D Landfill
CEC Project No. 111-370.001

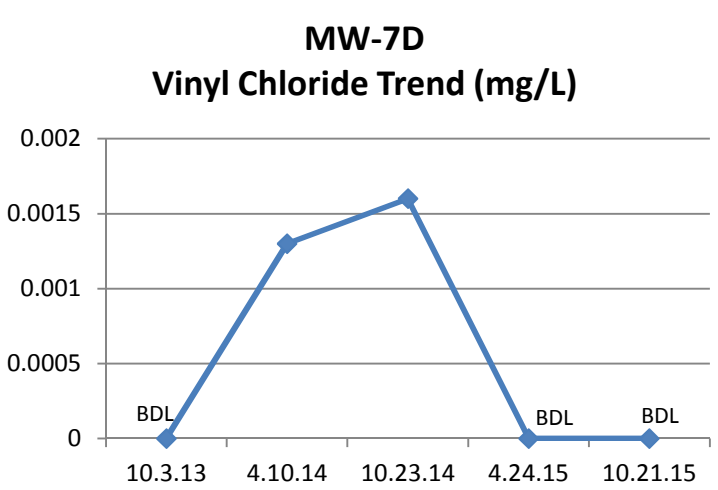


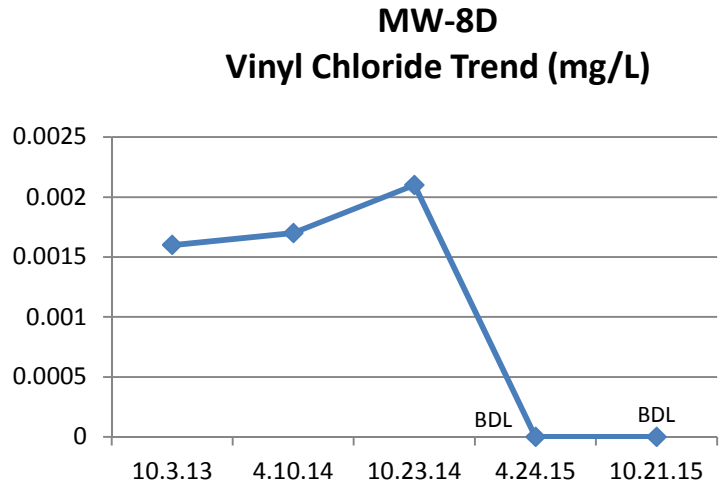


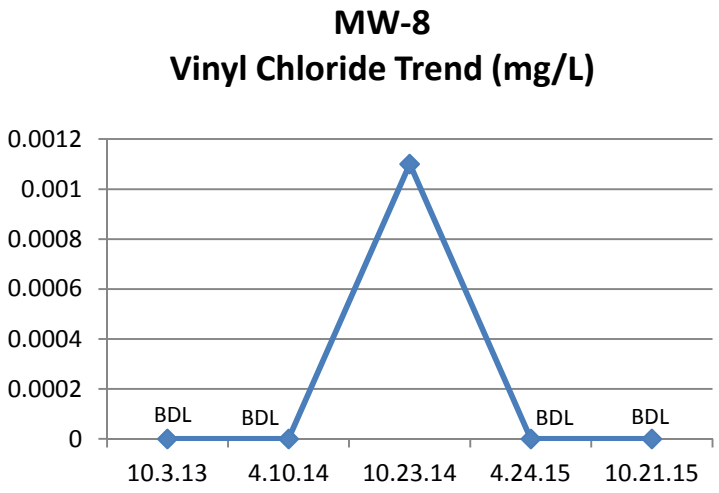


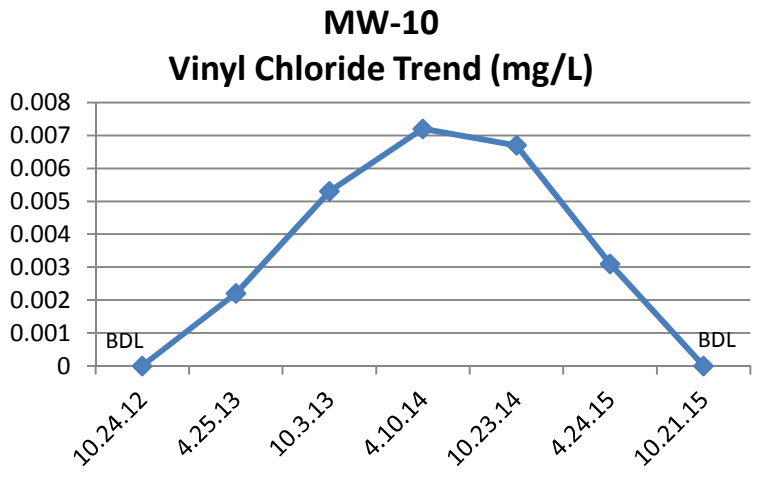


Charts for Table 1
North Meck Closed Phase I C&D Landfill
CEC Project No. 111-370.001

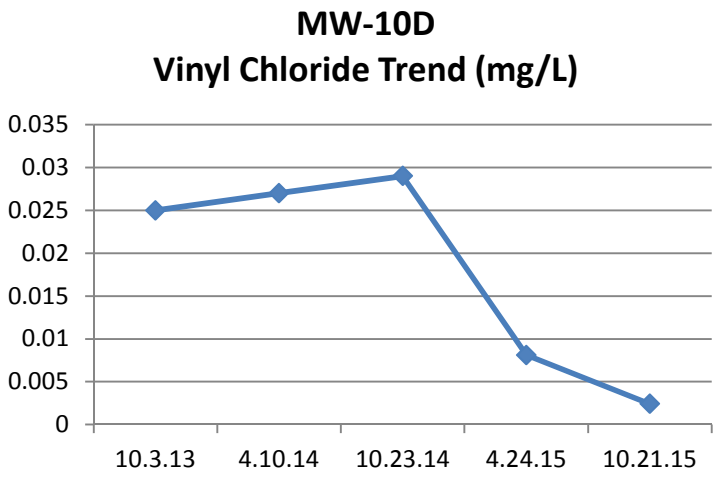


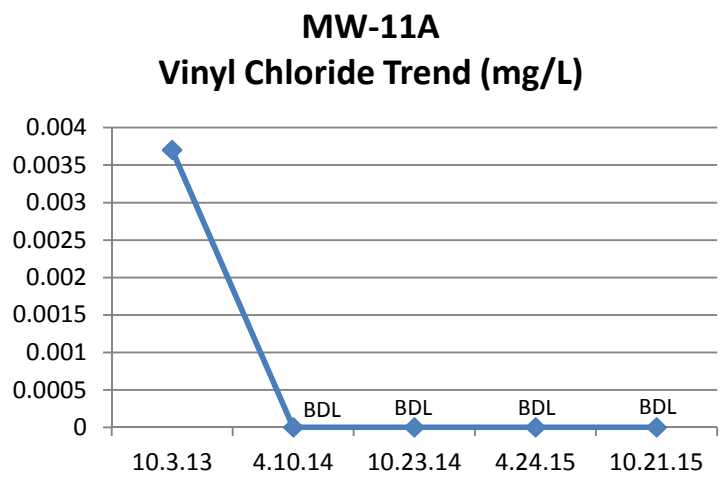


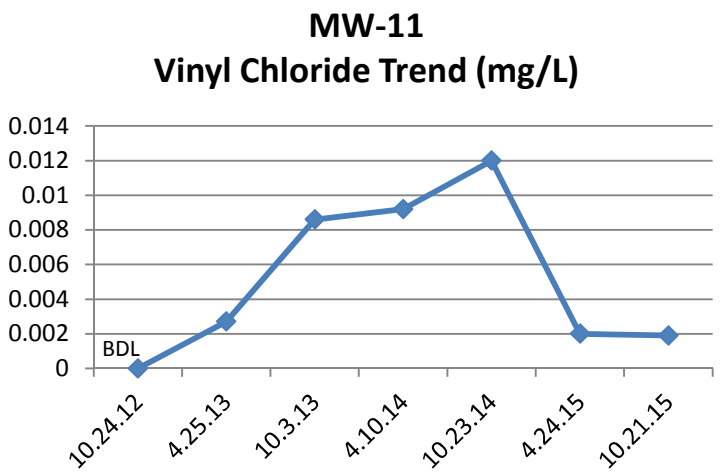




Charts for Table 1
North Meck Closed Phase I C&D Landfill
CEC Project No. 111-370.001







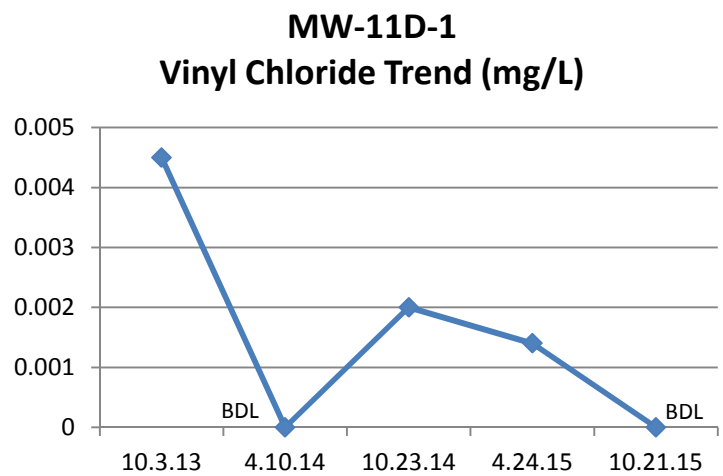


Table 2. Summary of Recent Site Methane Monitoring Data
Closed Phase 1 C&D Landfill
CEC Project No. 111-370.001

% Methane														
	Sample Date													
Well ID	2/2/15	3/2/15	4/1/15	5/1/15	6/2/15	7/1/15	8/1/15	9/1/15	10/2/15	11/5/2015	12/3/2015	1/6/2016	2/1/2016	3/1/2016
GW-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-3	27.7	20.4	22.2	7.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-5	5.9	1.9	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-6	23.4	13.4	8.1	5.2	6.7	16.3	12.2	10.2	7.8	2.6	1.8	2.7	2.2	0.9
GW-7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-8	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GW-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gilkerson Barn	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

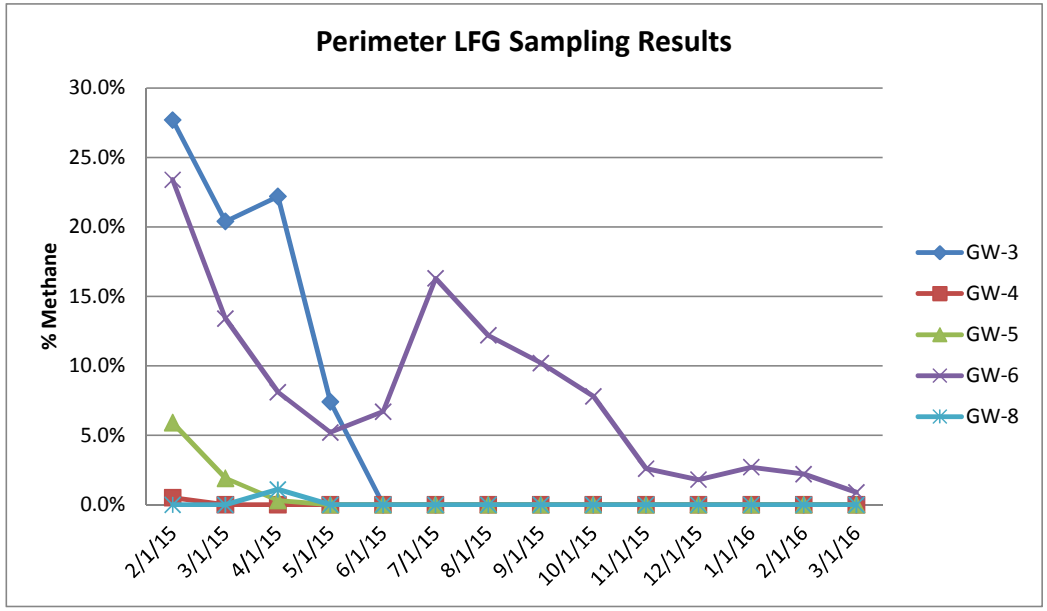


Table 3
Landfill Gas and Groundwater Monitoring Well Headspace Vapor Data
North Meck C&D Landfill
CEC Project No. 111-370.001

	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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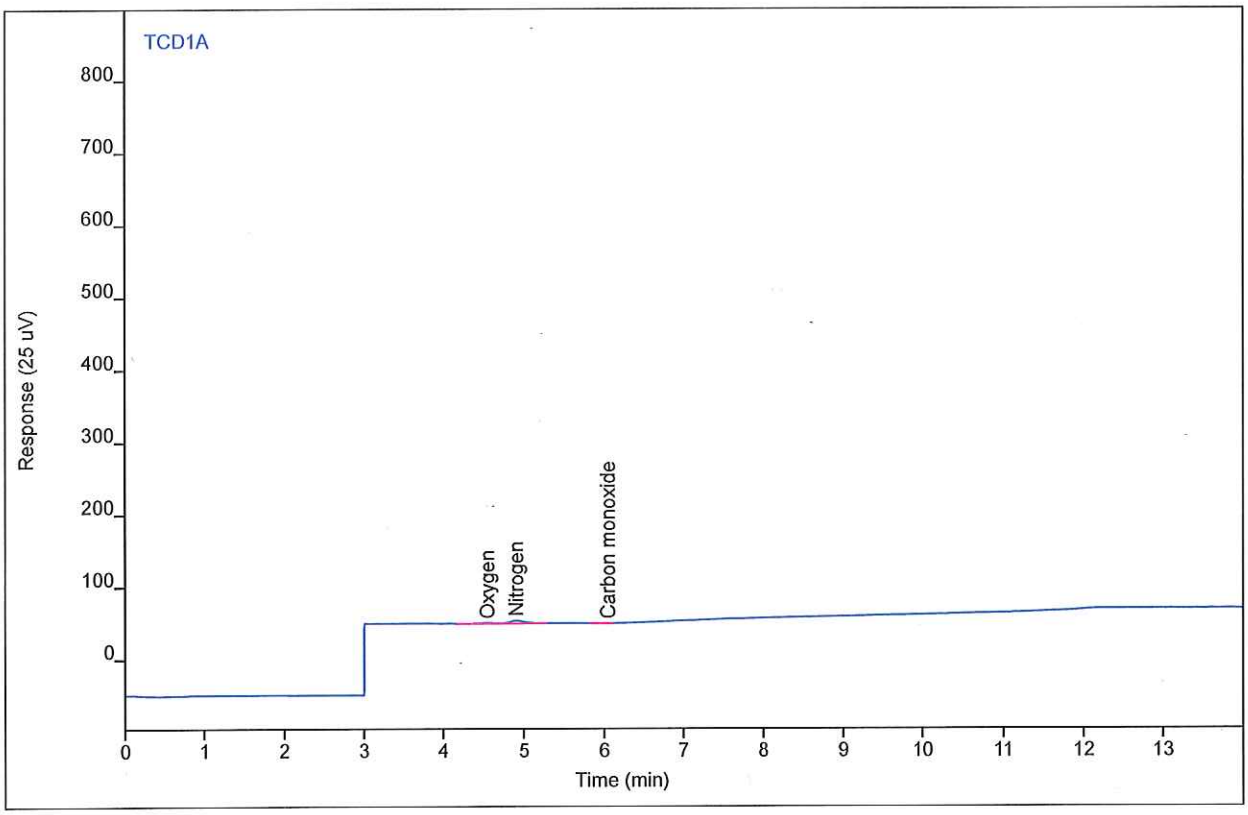
Raw Data

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

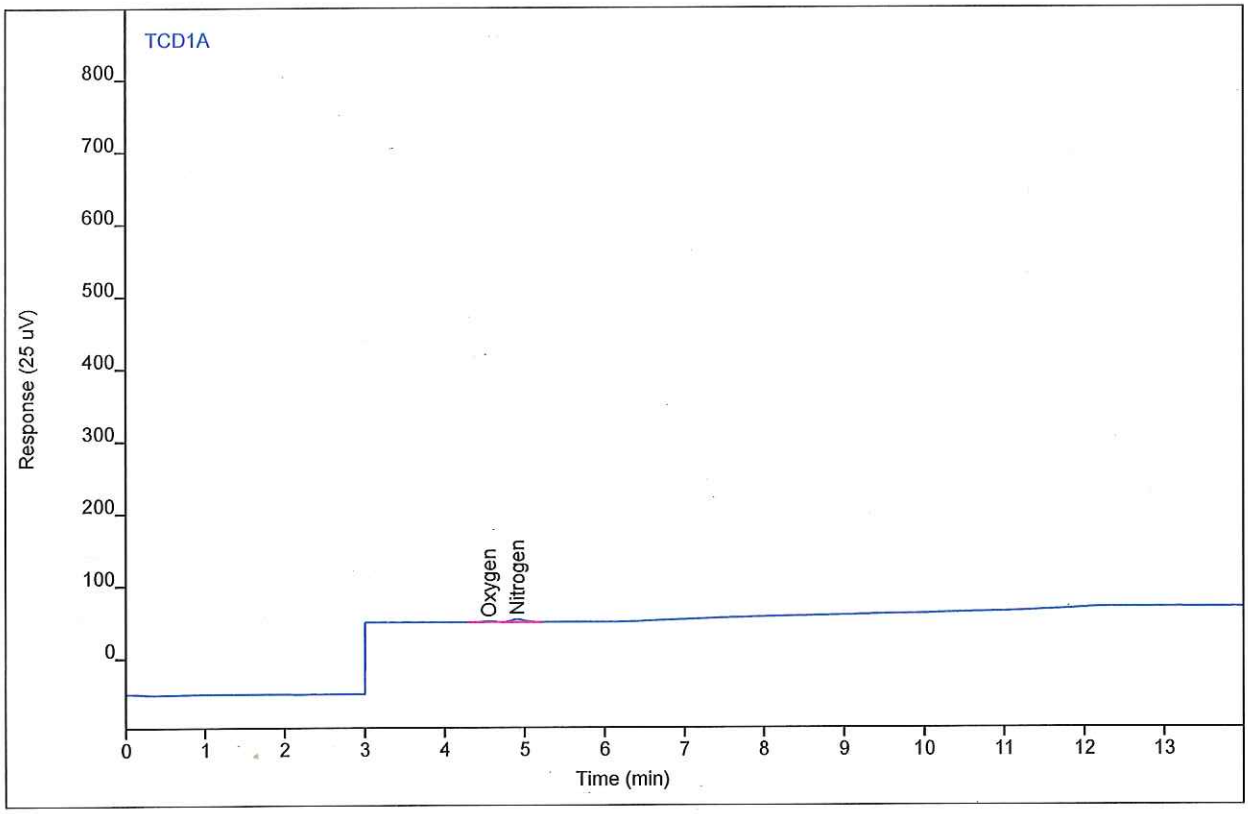


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	VV	4.55	10.8272	0.90833	0.03356	1	0.03356	%
Nitrogen	VB	4.90	44.5427	3.81658	0.11689	1	0.11689	%
Carbon monoxide	BV	6.04	1.55345	0.20753	0.00466	1	0.00466	%
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

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

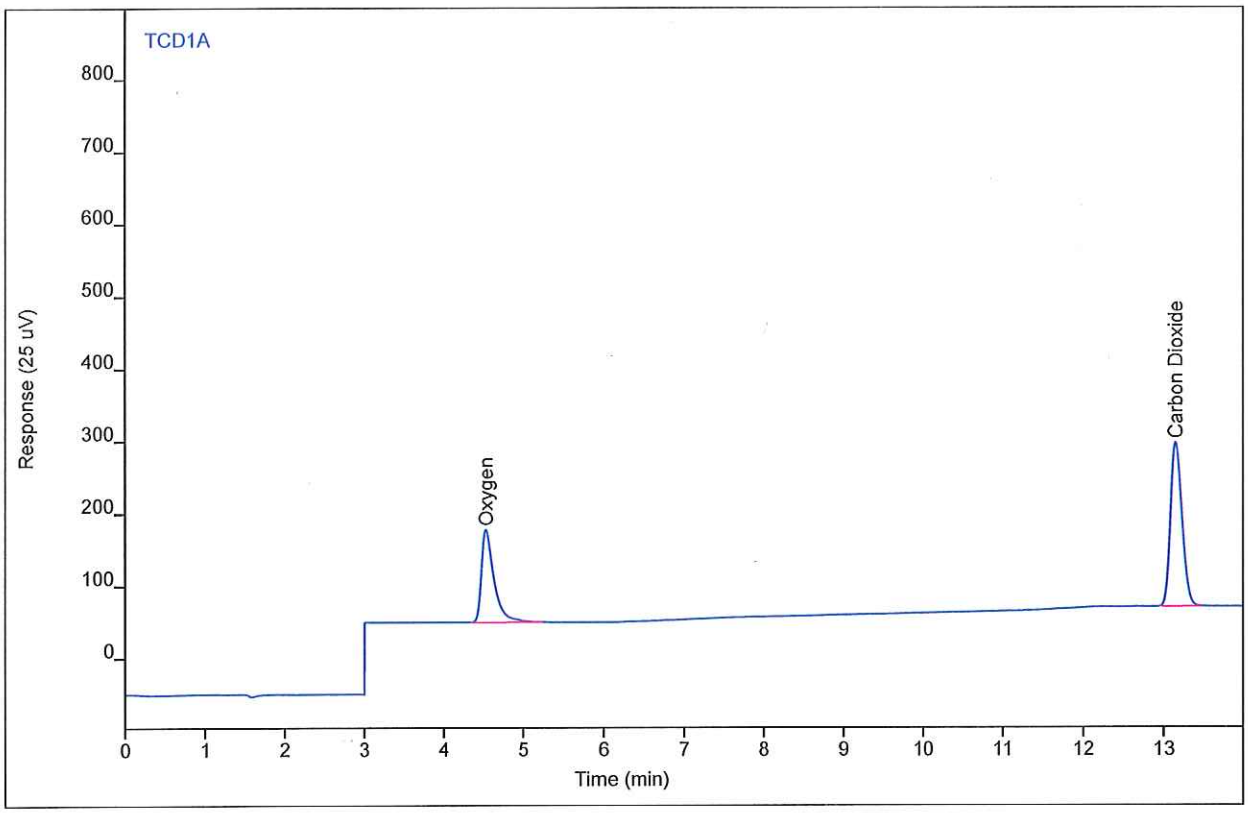


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.56	12.5810	1.09068	0.03899	1	0.03899	%
Nitrogen	VV	4.91	46.6754	3.98789	0.12249	1	0.12249	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

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

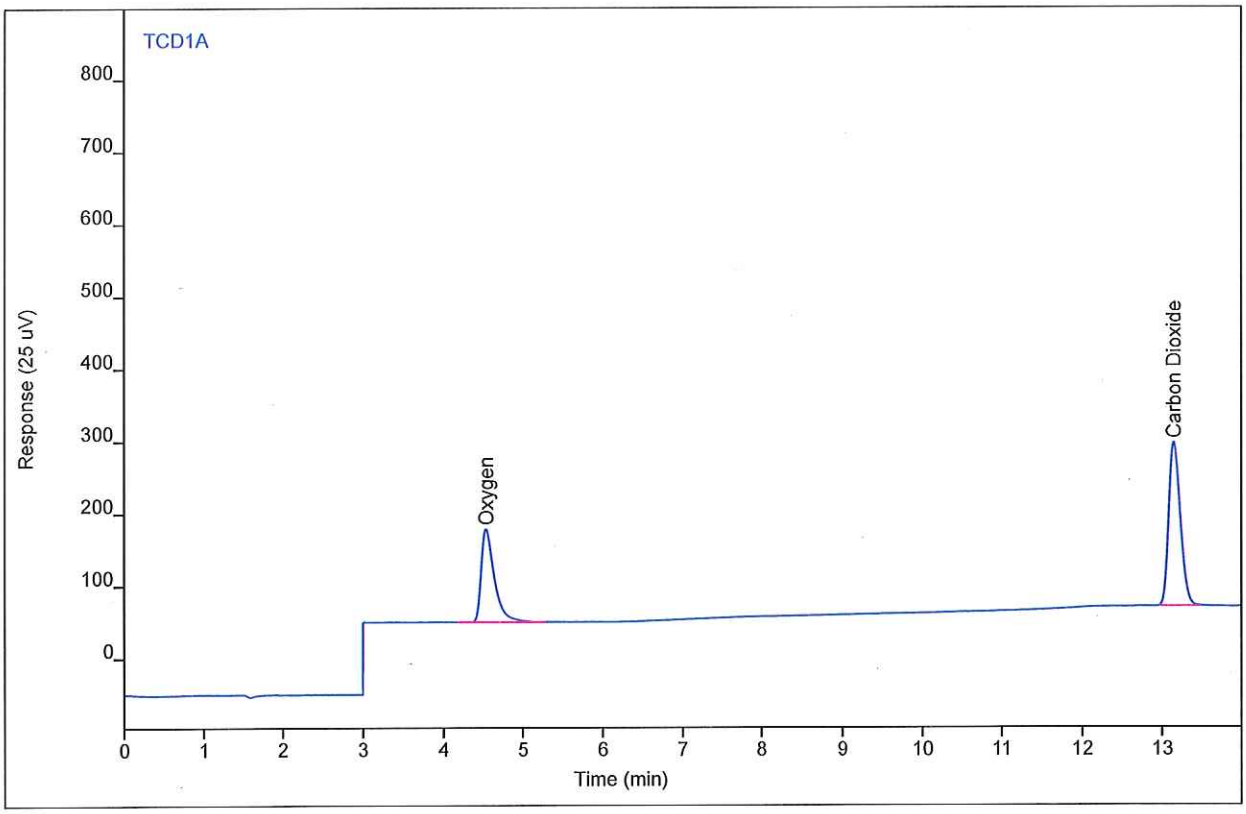


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1446.54	127.631	5.09336	1	5.09336	%
Carbon Dioxide	BB	13.14	2288.27	226.378	5.10543	1	5.10543	%

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

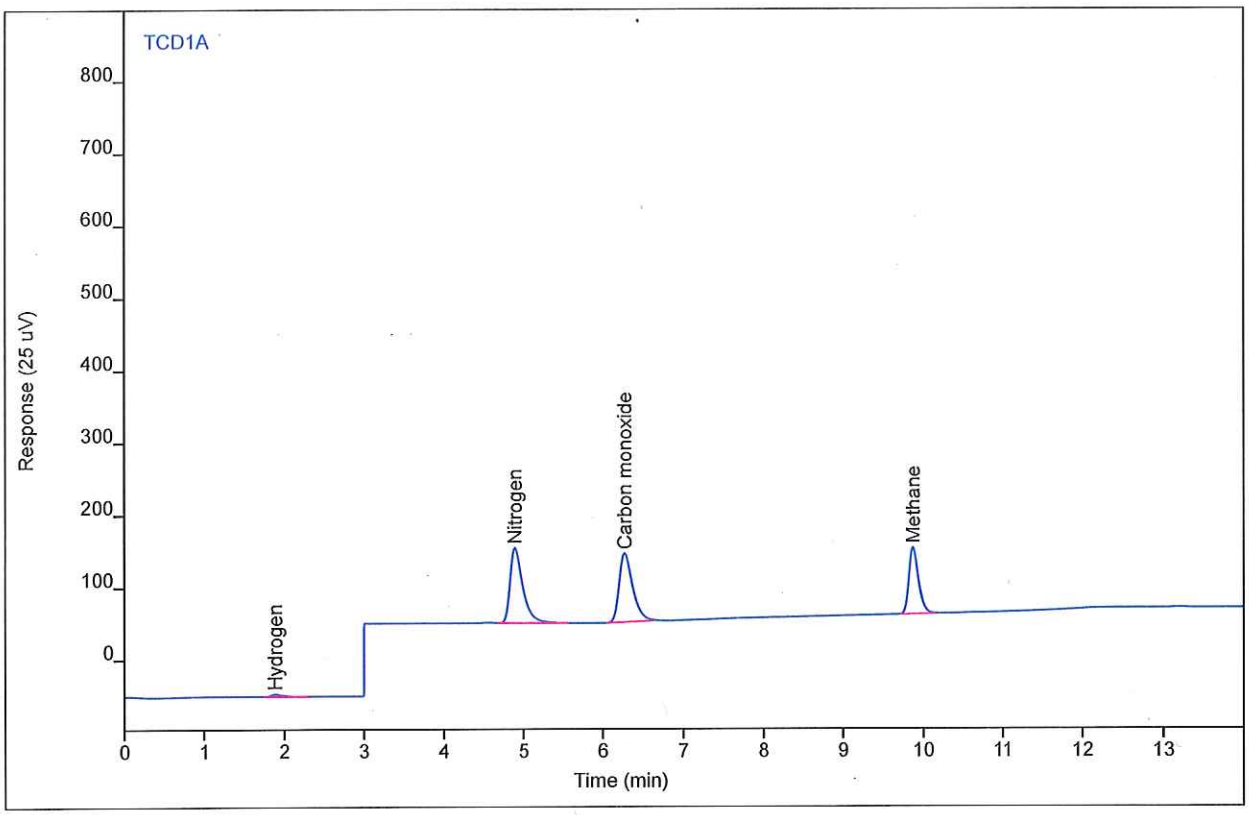


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1456.70	128.346	5.12972	1	5.12972	%
Carbon Dioxide	BB	13.14	2281.15	225.671	5.08931	1	5.08931	%

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

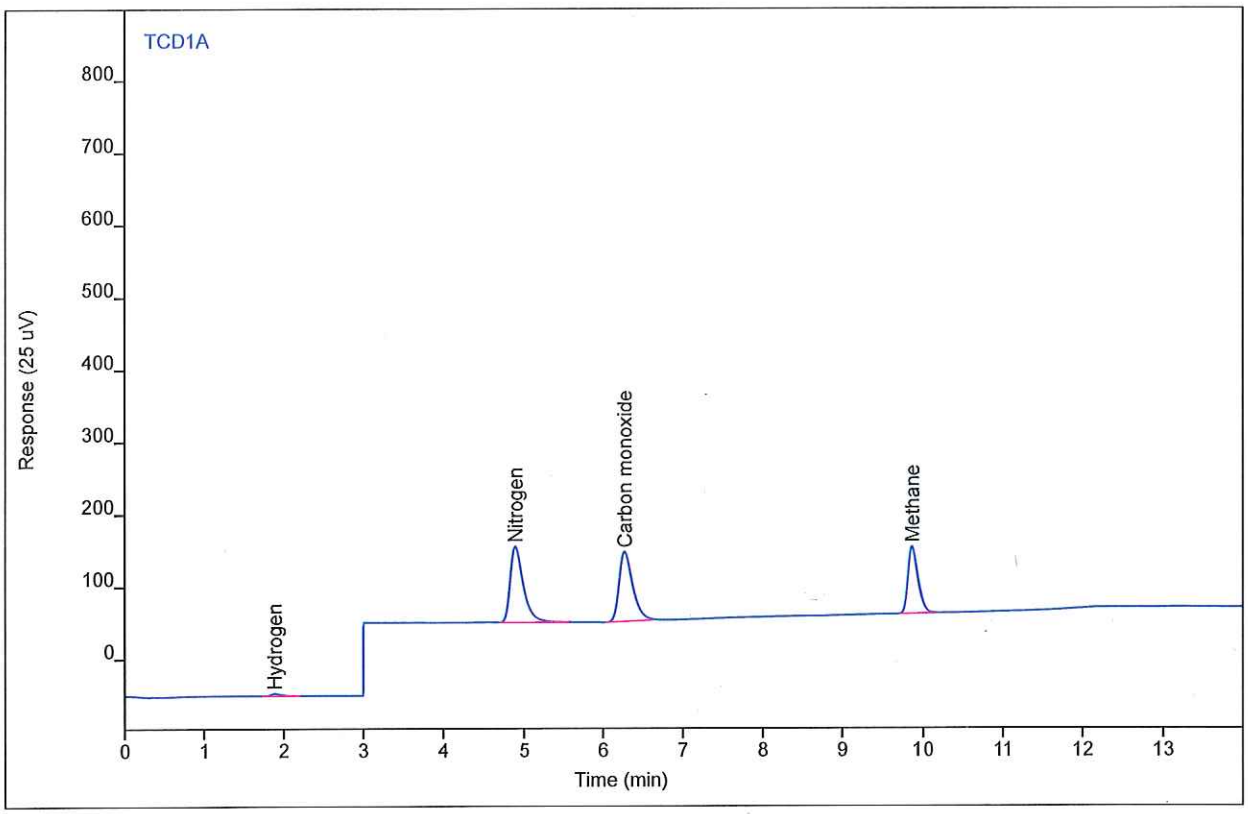


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	29.4411	3.16858	2.90430	1	2.90430	%
Nitrogen	VB	4.89	1179.81	103.702	3.61219	1	3.61219	%
Carbon monoxide	BB	6.27	1132.01	94.7080	3.54565	1	3.54565	%
Methane	BB	9.87	797.242	91.6598	2.82994	1	2.82994	%

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

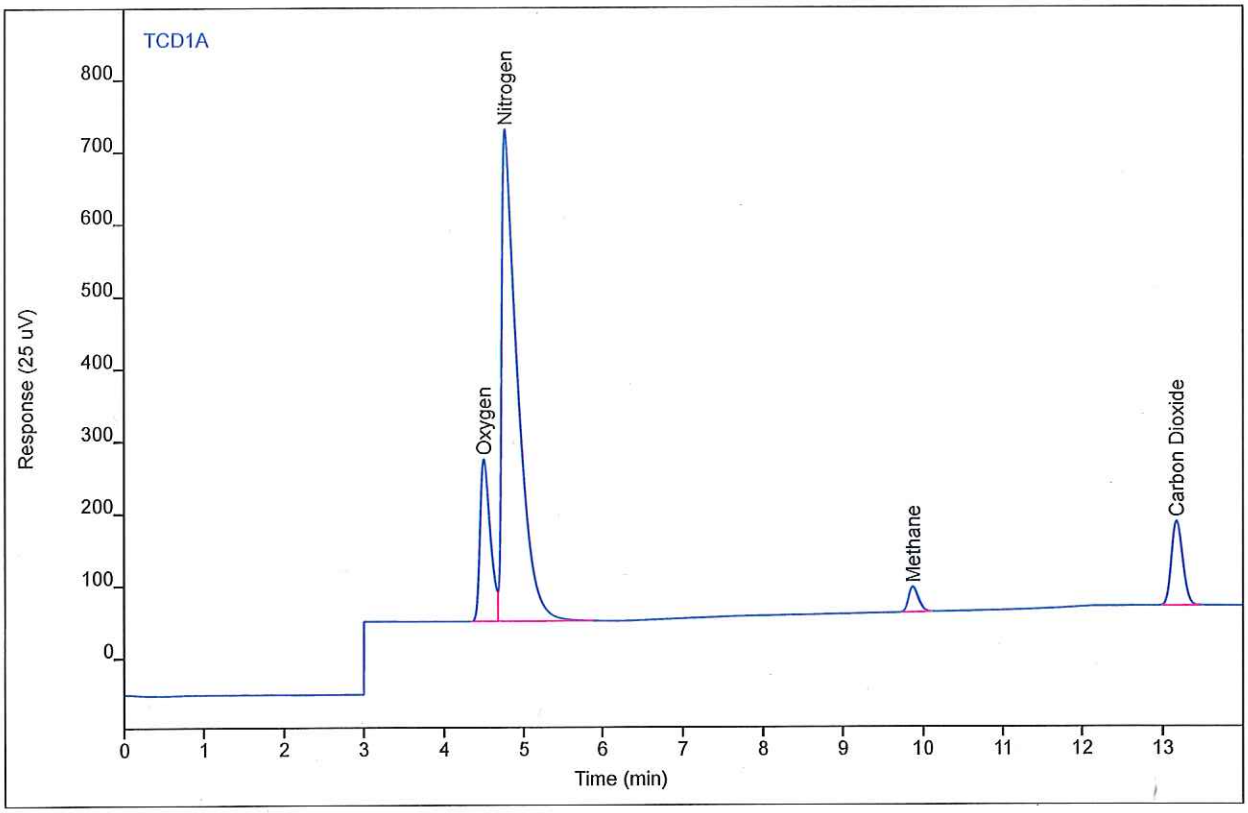


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	28.0103	3.08782	2.76136	1	2.76136	%
Nitrogen	BB	4.89	1190.58	104.594	3.64580	1	3.64580	%
Carbon monoxide	BB	6.27	1147.06	96.0321	3.59306	1	3.59306	%
Methane	BB	9.87	802.892	92.4147	2.85012	1	2.85012	%

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



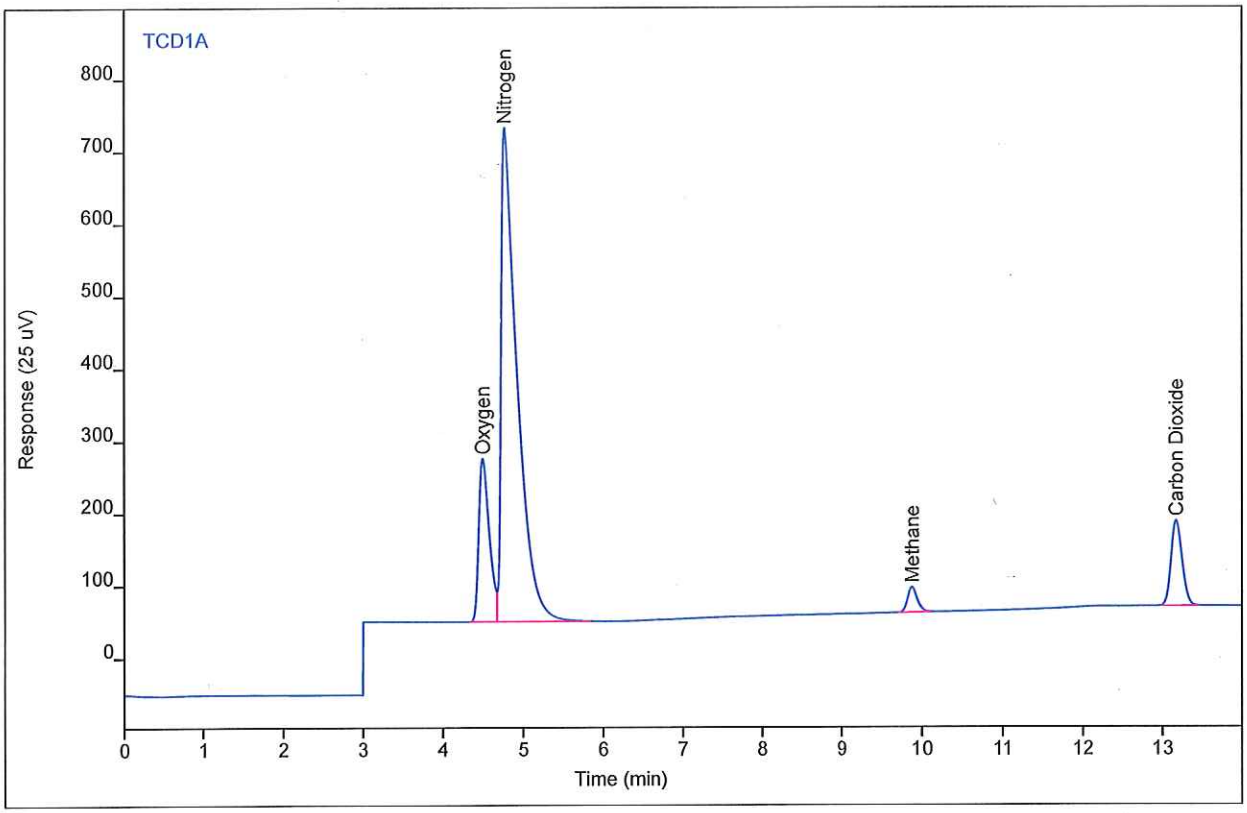
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2004.07	223.812	7.08889	1	7.08889	%
Nitrogen	VB	4.77	9485.80	679.820	29.5506	1	29.5506	%
Carbon monoxide		(6.28)				1		
Methane	BB	9.88	298.436	34.5796	1.04860	1	1.04860	%
Carbon Dioxide	BB	13.17	1145.47	116.386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

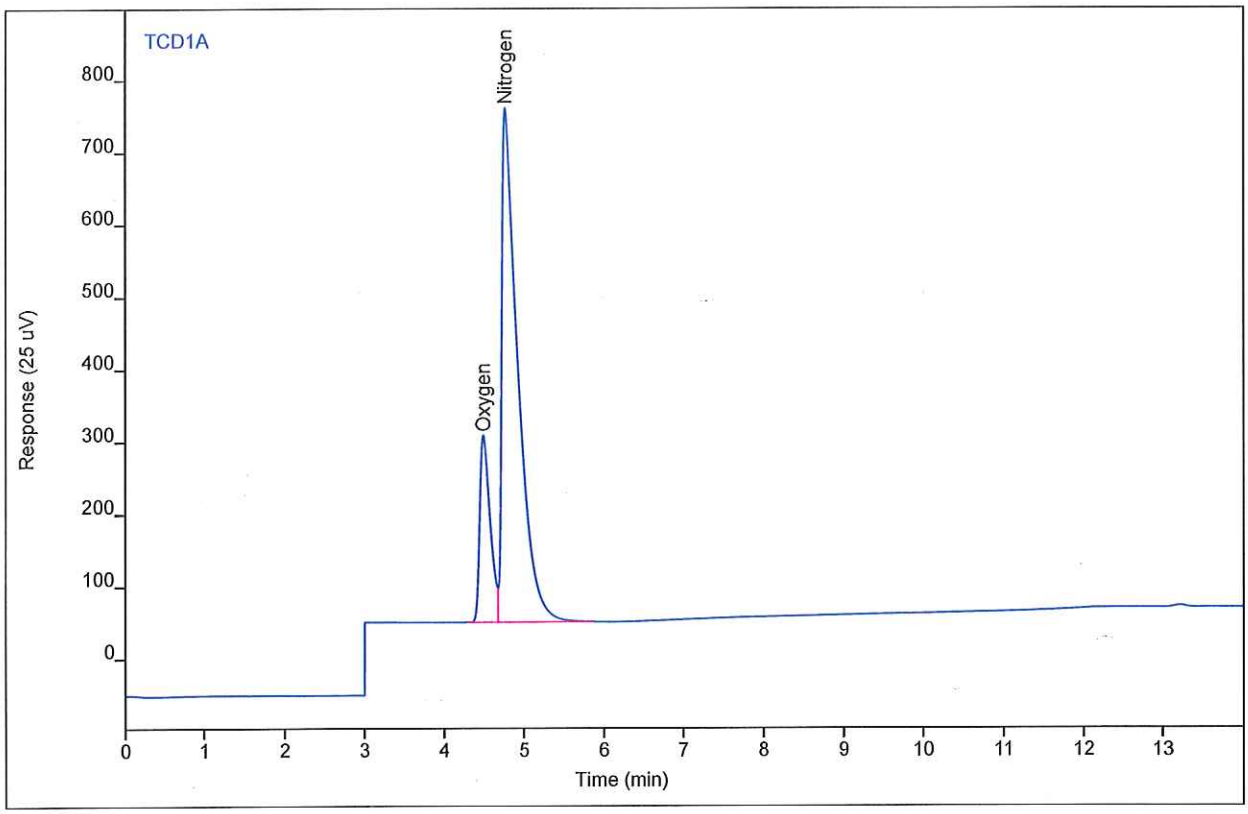


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2013.20	225.247	7.12158	1	7.12158	%
Nitrogen	VB	4.77	9526.49	682.162	29.6777	1	29.6777	%
Carbon monoxide		(6.28)				1		
Methane	BB	9.88	300.491	34.7780	1.05594	1	1.05594	%
Carbon Dioxide	BB	13.17	1160.96	117.873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

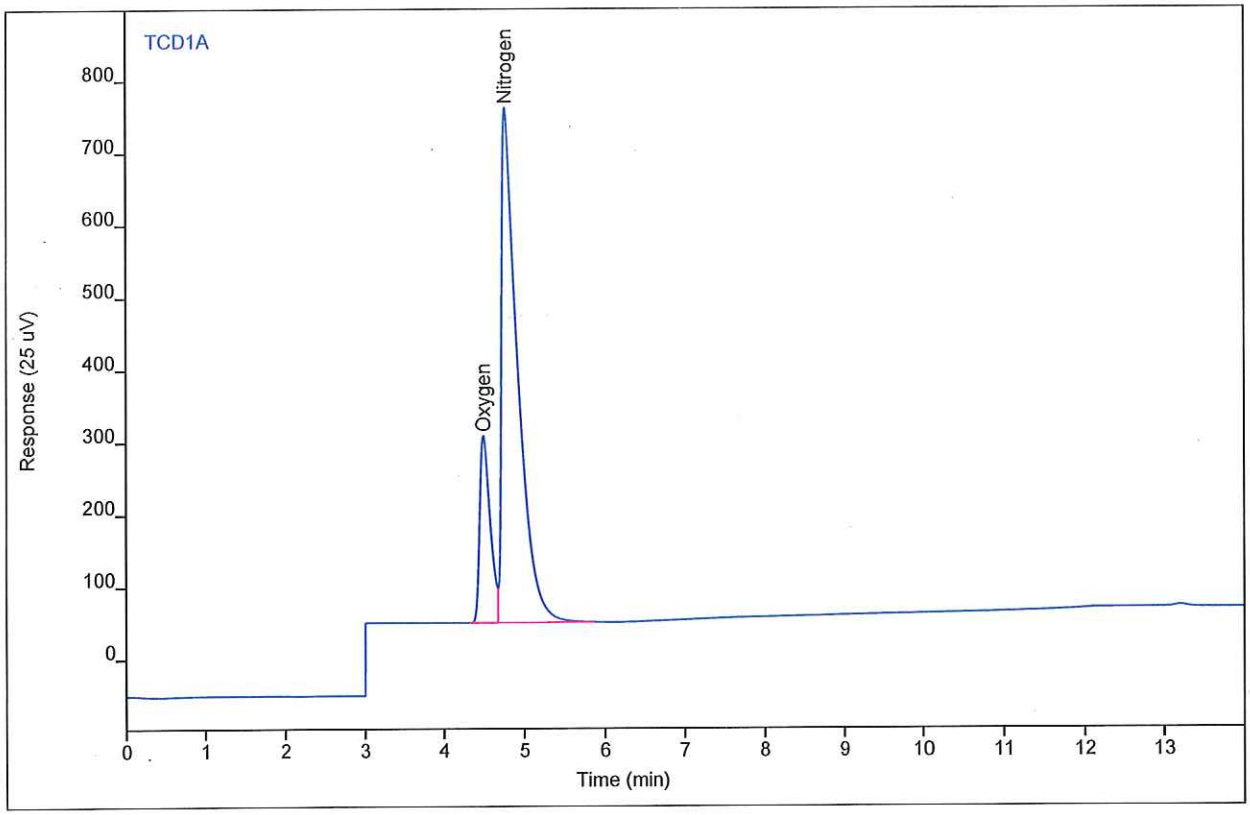


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.49	2301.58	257.861	8.15378	1	8.15378	%
Nitrogen	VB	4.76	10057.9	710.076	31.3373	1	31.3373	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

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



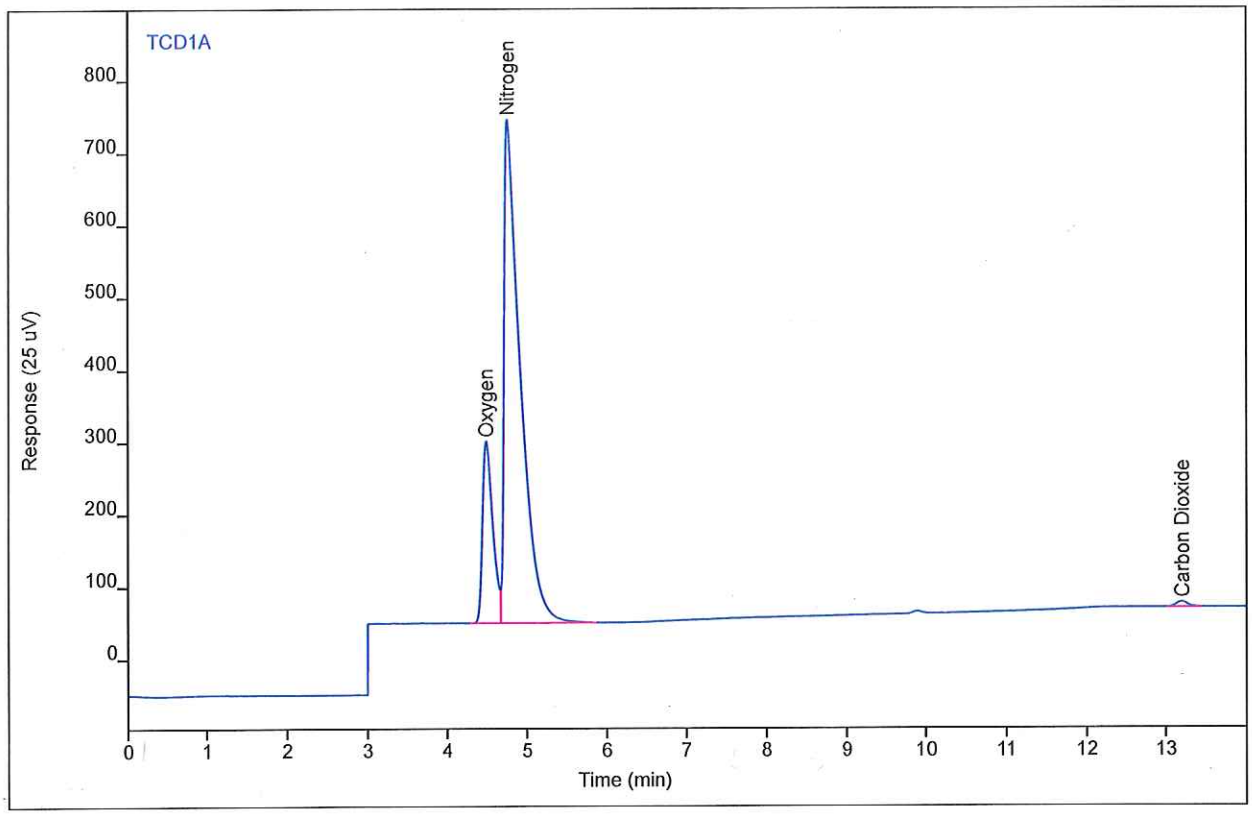
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.49	2305.59	258.017	8.16812	1	8.16812	%
Nitrogen	VB	4.76	10094.6	711.417	31.4519	1	31.4519	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

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

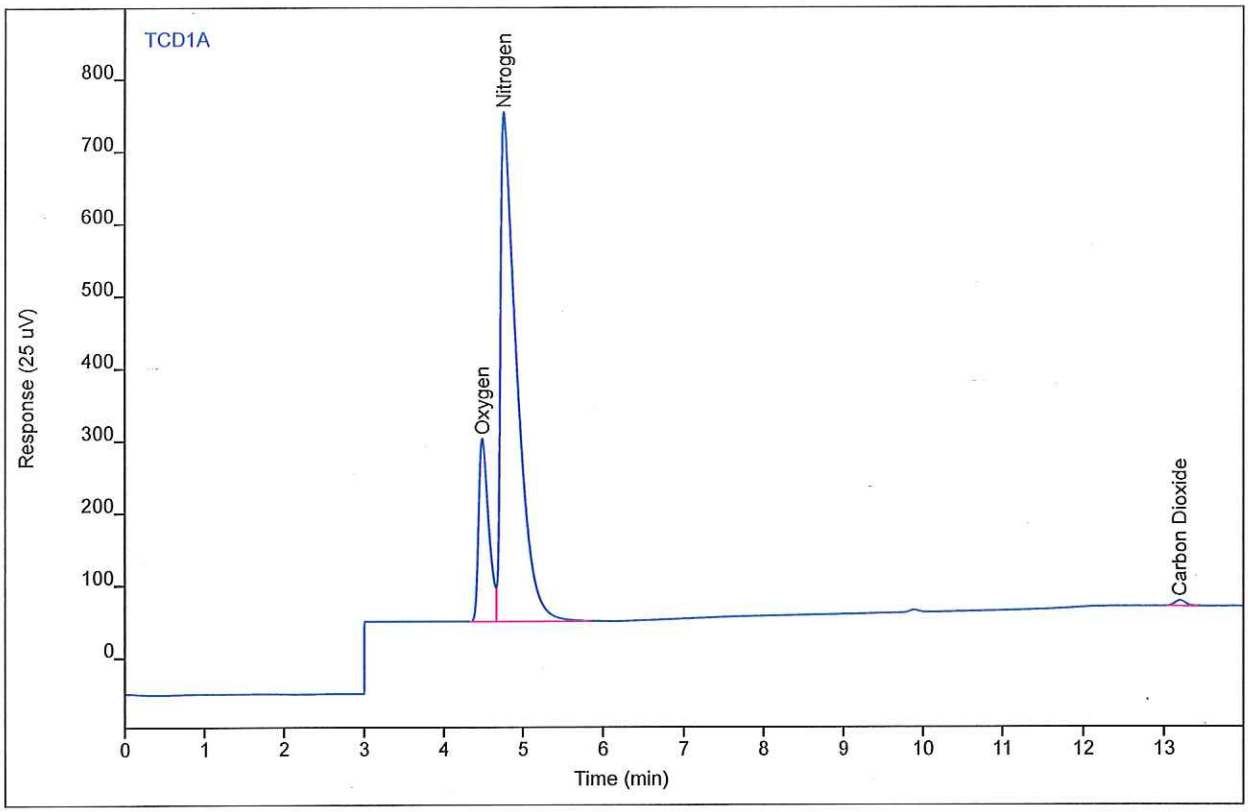


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	MF	4.49	2250.62	251.316	7.97136	1	7.97136	%
Nitrogen	FM	4.76	9790.49	696.148	30.5021	1	30.5021	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide	BB	13.20	71.2777	7.27565	0.14283	1	0.14283	%

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

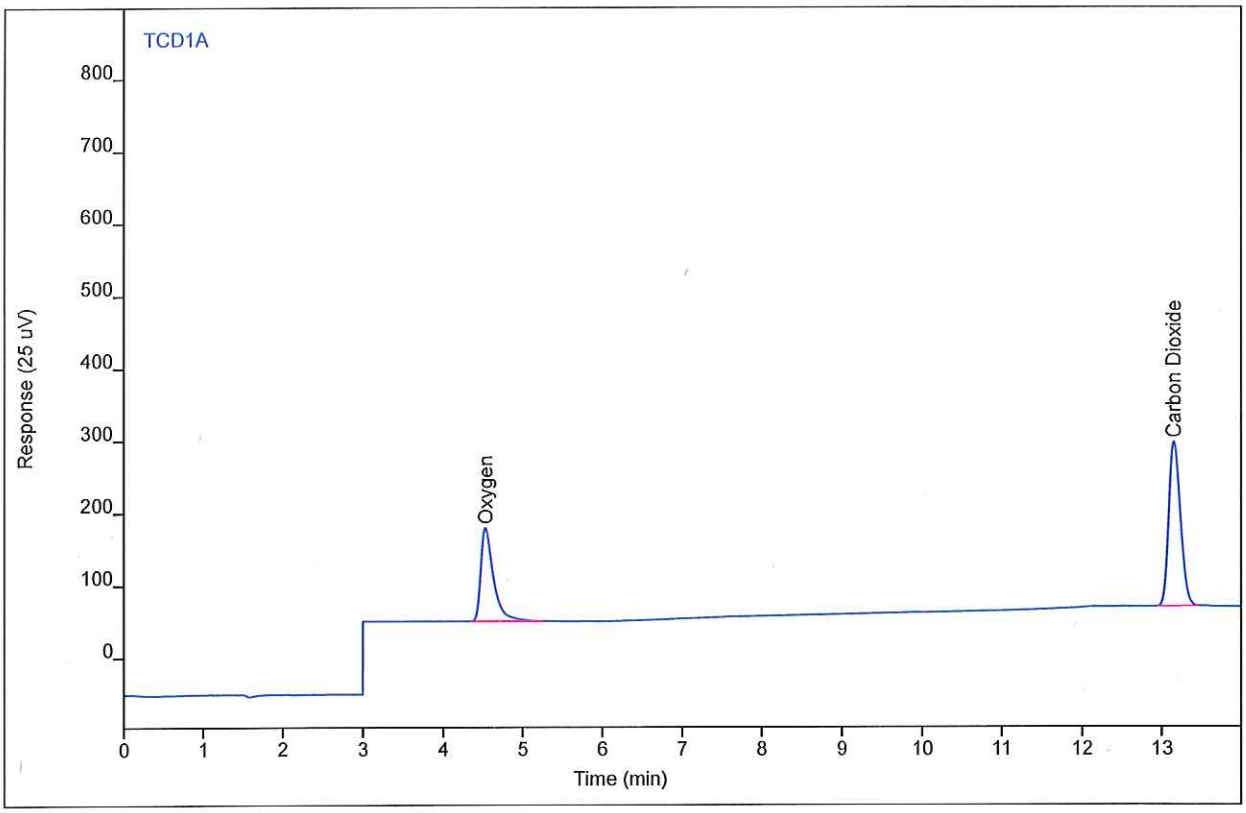


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.50	2254.73	252.377	7.98609	1	7.98609	%
Nitrogen	VB	4.76	9940.04	703.803	30.9691	1	30.9691	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide	BB	13.19	74.7161	7.52204	0.14972	1	0.14972	%

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

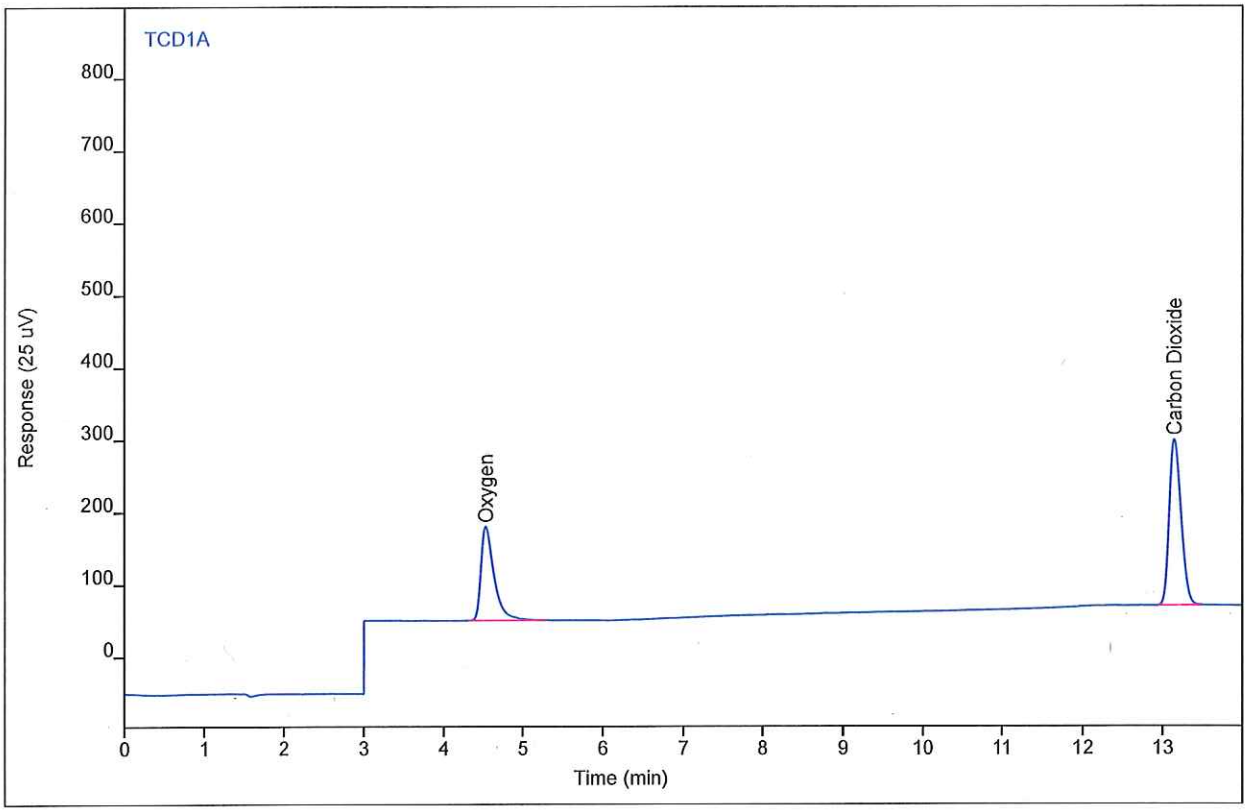


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.53	1465.72	128.799	5.16201	1	5.16201	%
Carbon Dioxide	BB	13.14	2288.11	226.910	5.10507	1	5.10507	%

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

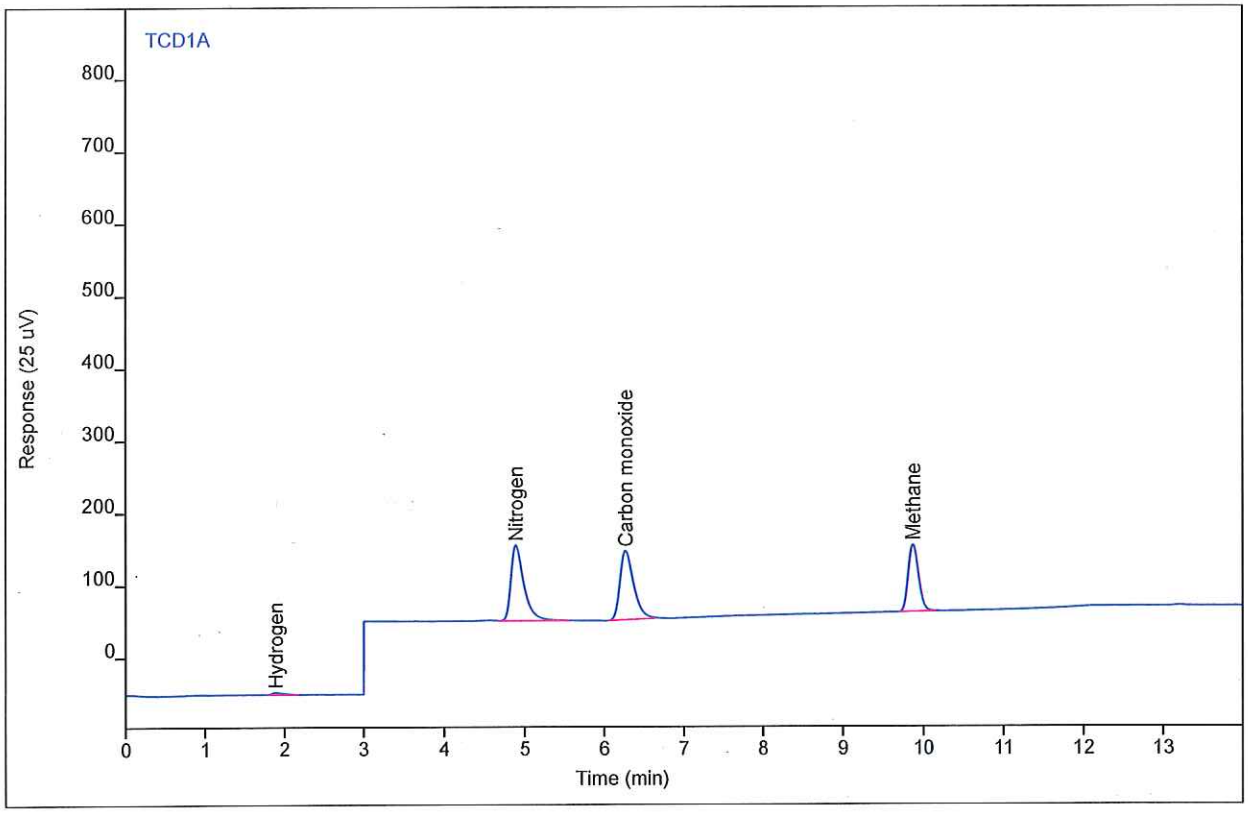


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.53	1471.55	129.405	5.18287	1	5.18287	%
Carbon Dioxide	BB	13.14	2316.94	228.939	5.17026	1	5.17026	%

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

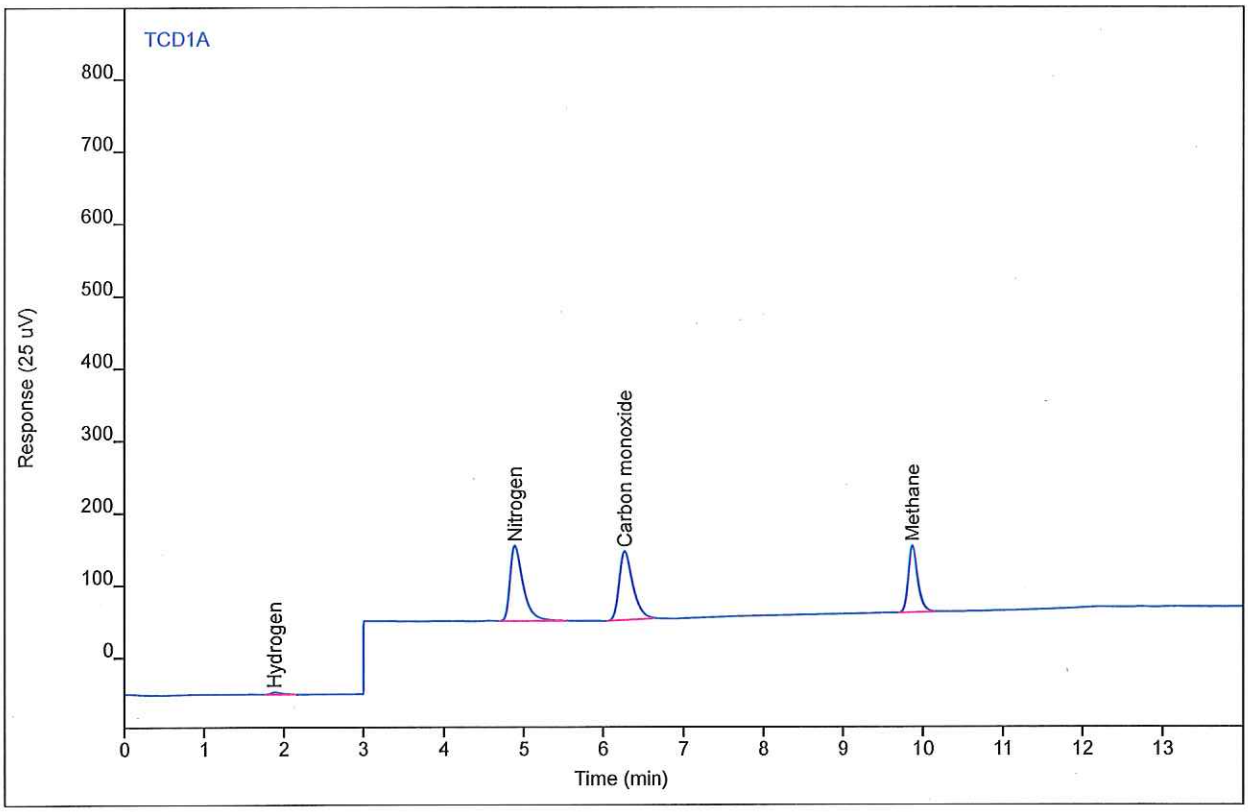


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	29.0529	3.04813	2.86552	1	2.86552	%
Nitrogen	VB	4.89	1187.79	104.147	3.63709	1	3.63709	%
Carbon monoxide	BB	6.27	1136.14	95.1003	3.55869	1	3.55869	%
Methane	BB	9.87	803.334	92.2075	2.85170	1	2.85170	%

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

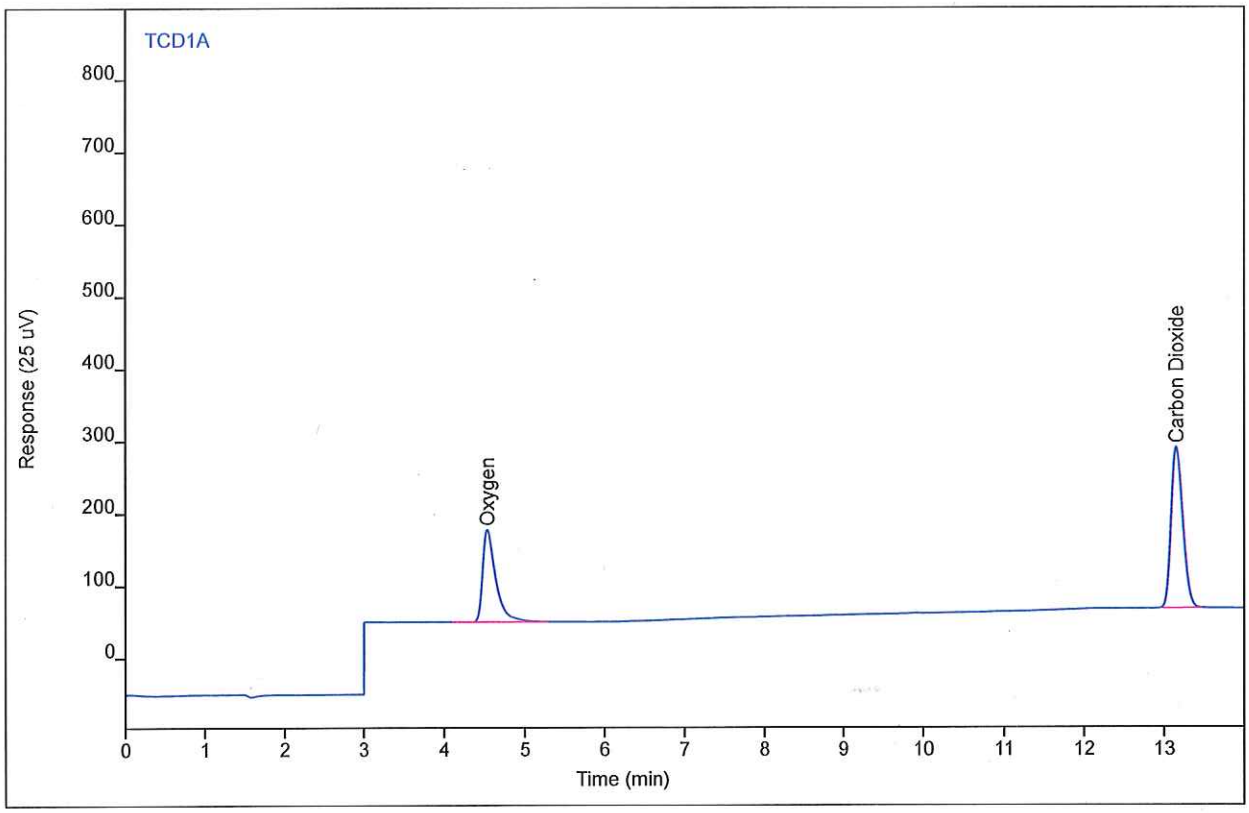


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	29.7581	3.17099	2.93596	1	2.93596	%
Nitrogen	VB	4.89	1187.29	103.887	3.63554	1	3.63554	%
Carbon monoxide	BB	6.27	1130.89	94.7024	3.54215	1	3.54215	%
Methane	BB	9.87	797.328	91.7390	2.83025	1	2.83025	%

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

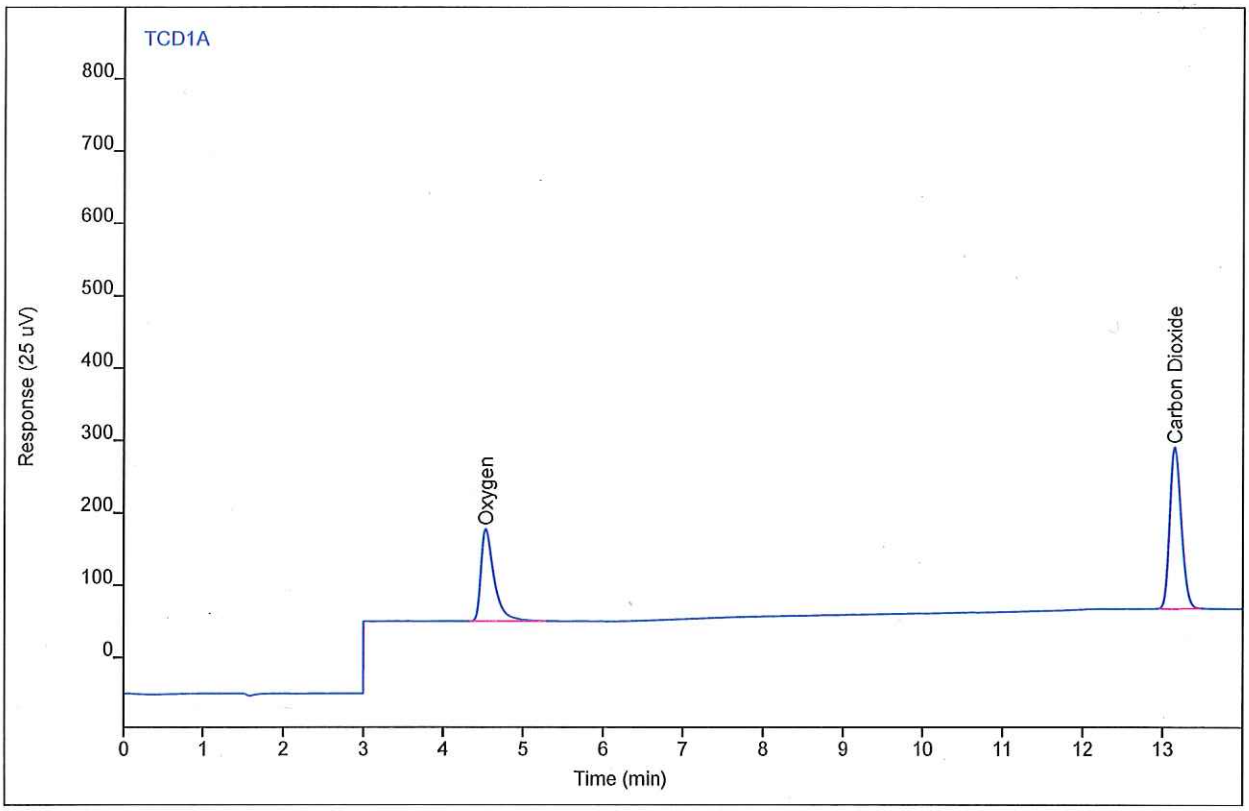


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1446.72	127.198	5.09401	1	5.09401	%
Carbon Dioxide	BB	13.15	2245.00	222.245	5.00758	1	5.00758	%

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

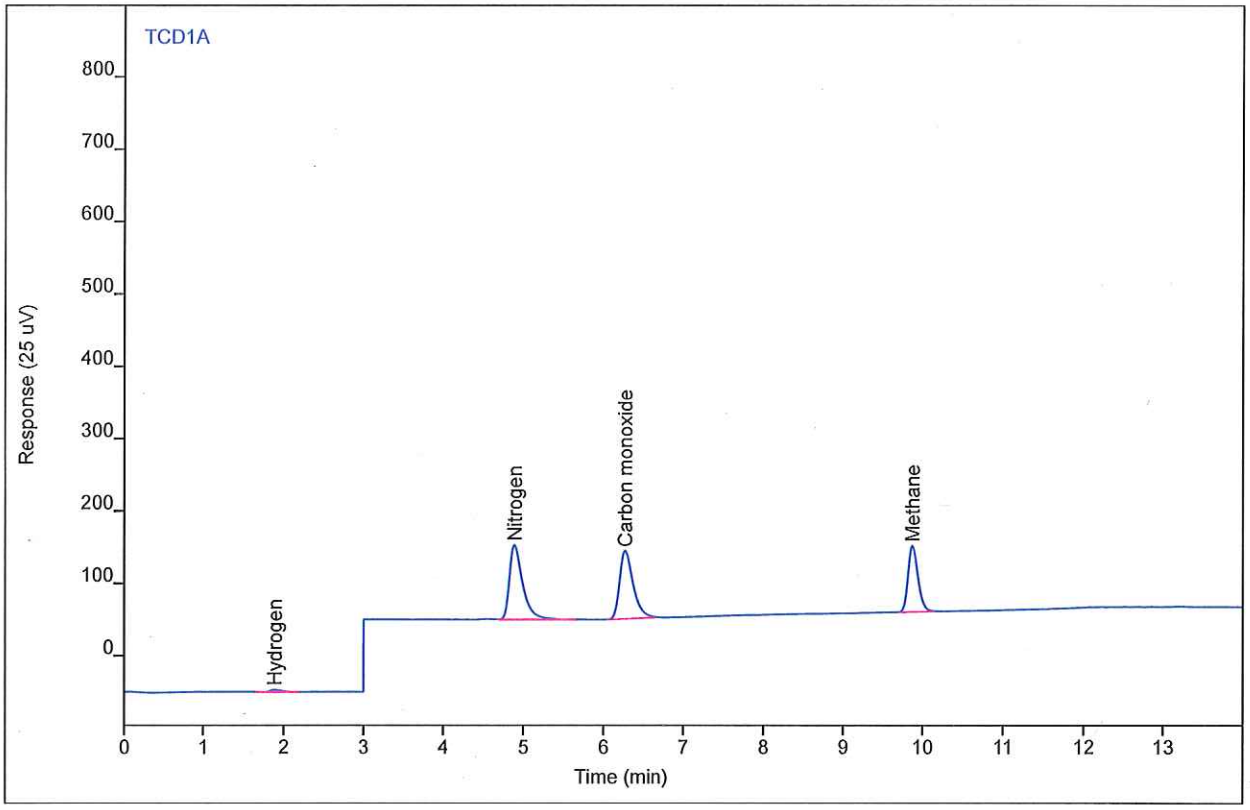


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1441.98	126.954	5.07704	1	5.07704	%
Carbon Dioxide	BB	13.15	2256.27	222.854	5.03305	1	5.03305	%

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

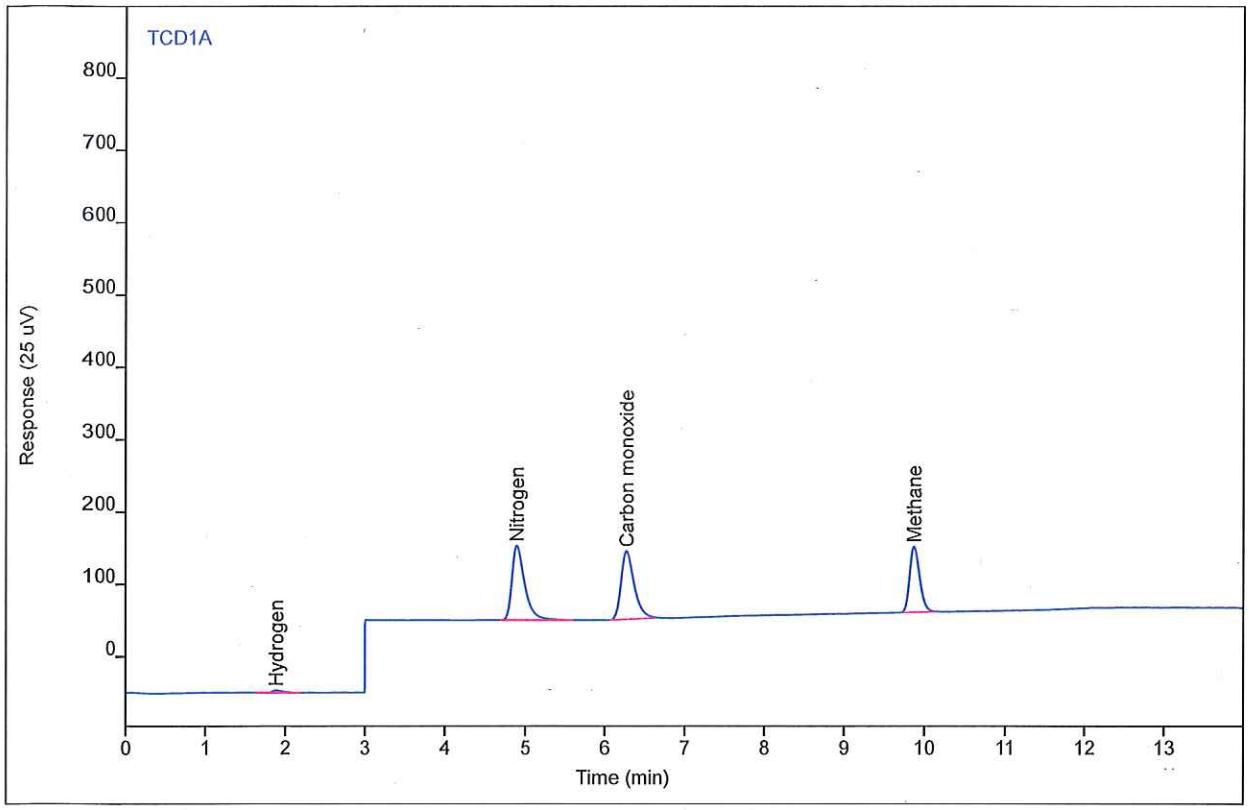


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	29.5285	3.07236	2.91303	1	2.91303	%
Nitrogen	VB	4.89	1179.83	102.916	3.61225	1	3.61225	%
Carbon monoxide	BB	6.27	1121.33	93.6328	3.51203	1	3.51203	%
Methane	BB	9.87	789.003	90.6668	2.80052	1	2.80052	%

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

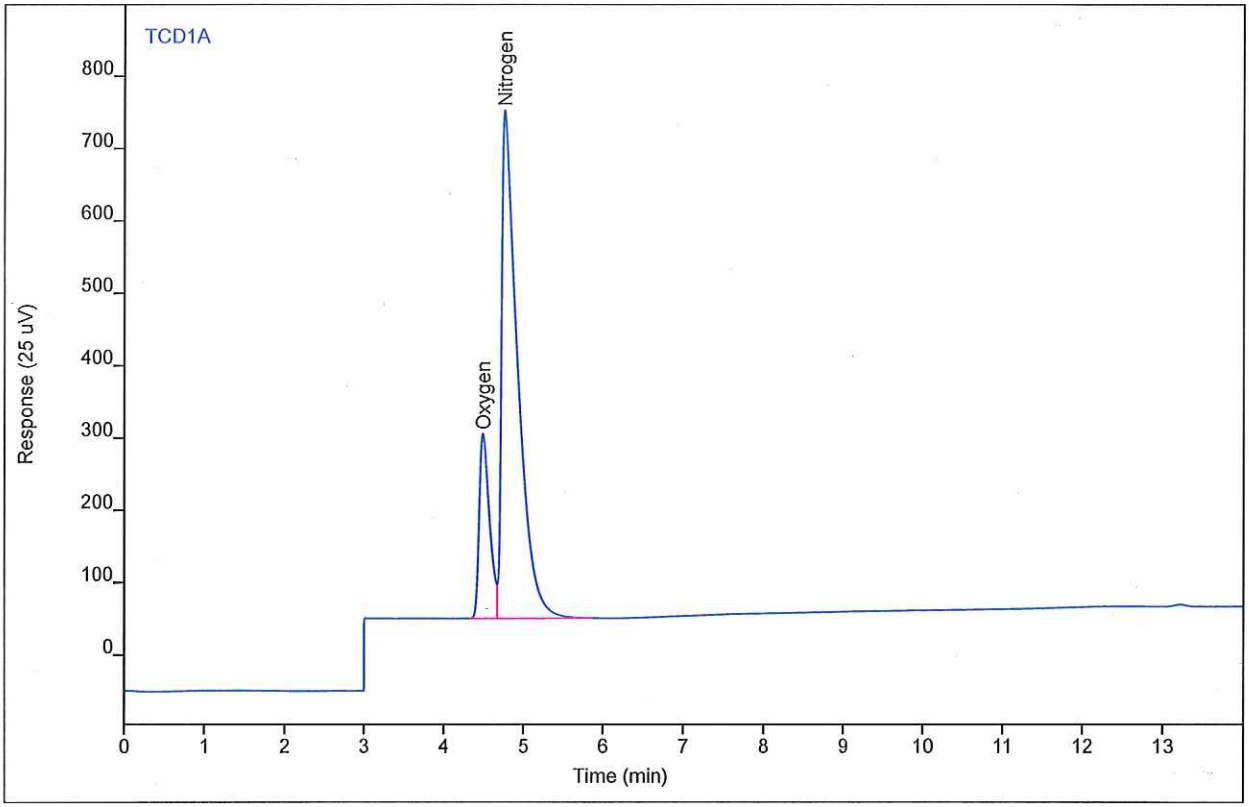


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.89	28.3892	3.20736	2.79922	1	2.79922	%
Nitrogen	VB	4.89	1175.85	102.757	3.59980	1	3.59980	%
Carbon monoxide	BB	6.27	1118.39	94.0702	3.50278	1	3.50278	%
Methane	BB	9.87	791.234	90.4882	2.80848	1	2.80848	%

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
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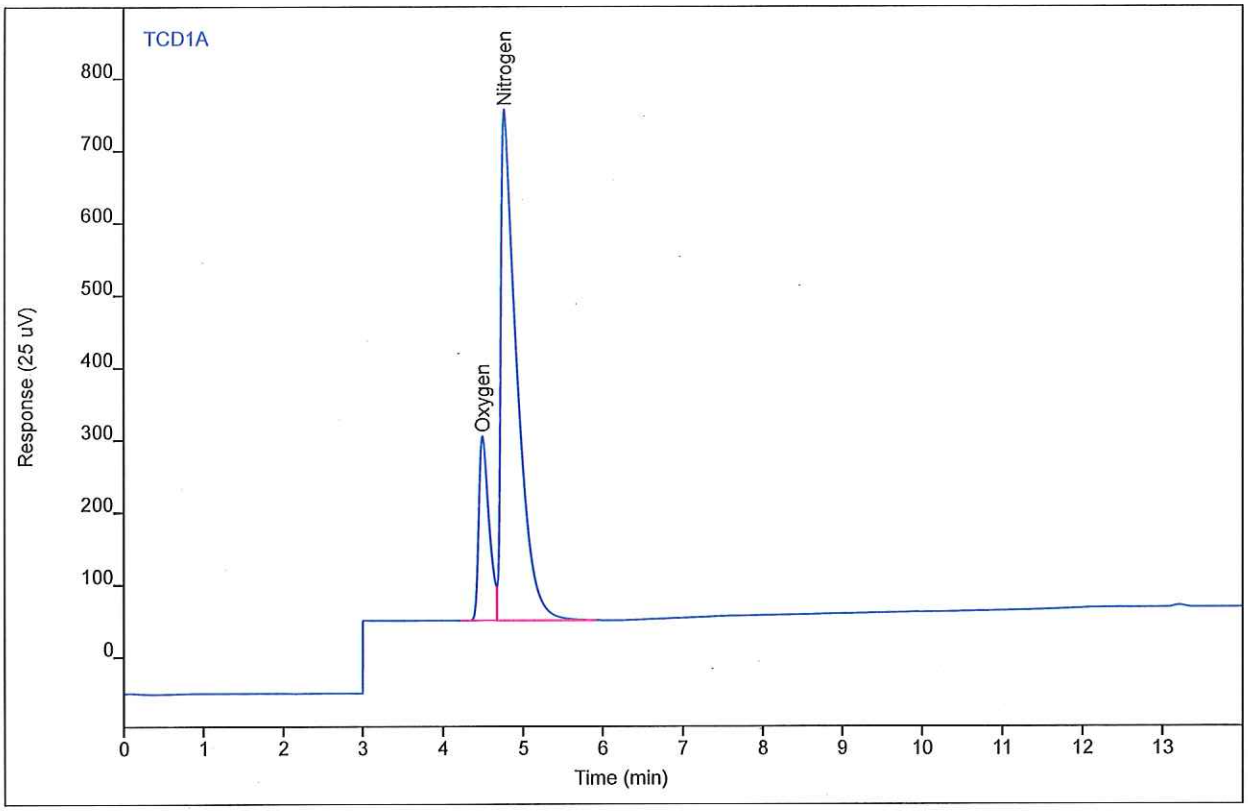
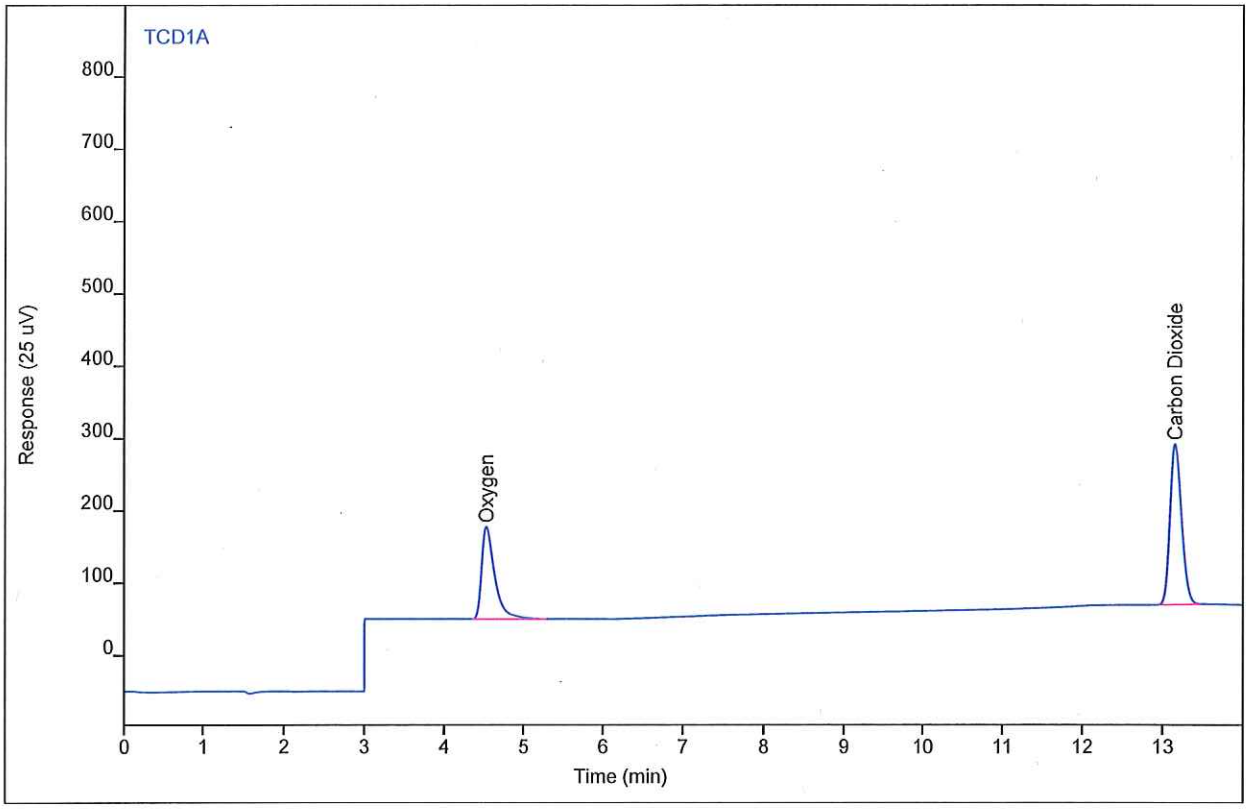


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen		(1.89)				1		
Oxygen	BV	4.49	2273.59	254.469	8.05360	1	8.05360	%
Nitrogen	VB	4.76	9983.05	705.514	31.1035	1	31.1035	%
Carbon monoxide		(6.28)				1		
Methane		(9.88)				1		
Carbon Dioxide		(13.18)				1		

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

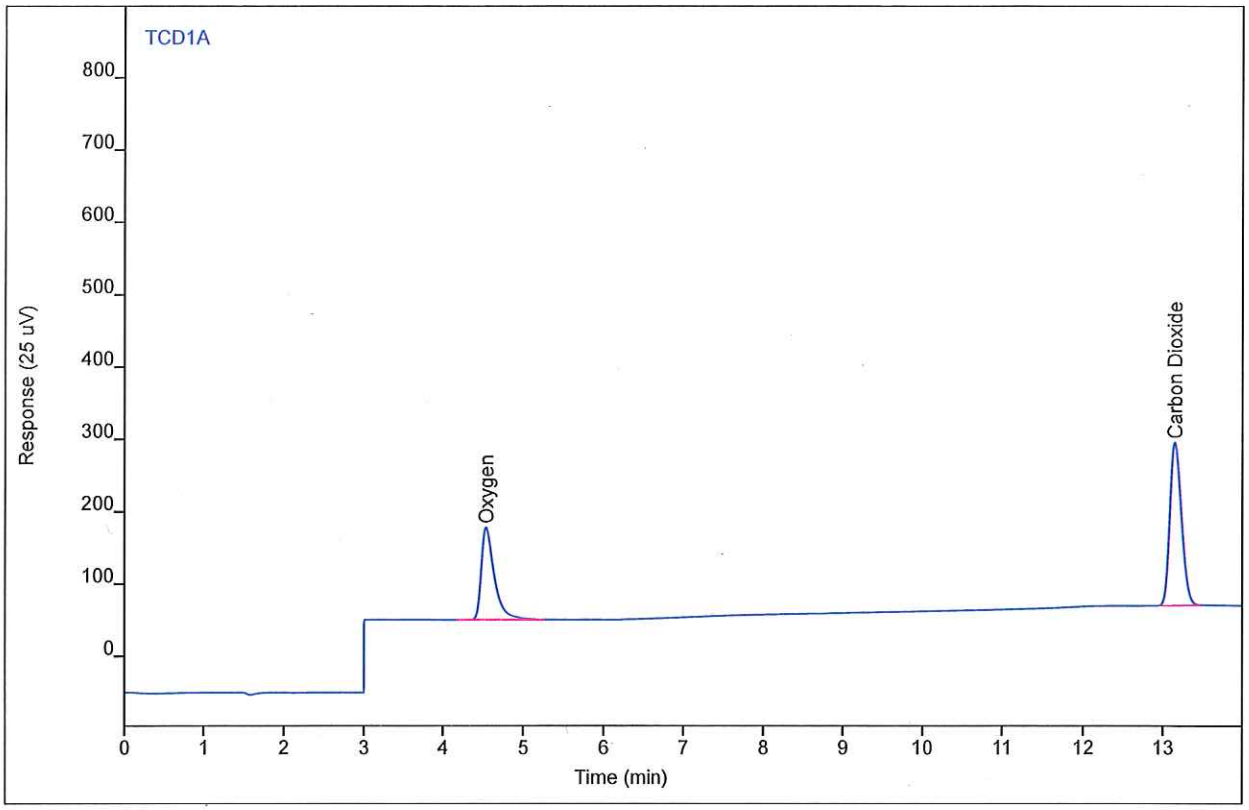


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.53	1443.80	127.361	5.08354	1	5.08354	%
Carbon Dioxide	BB	13.15	2235.73	221.667	4.98661	1	4.98661	%

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

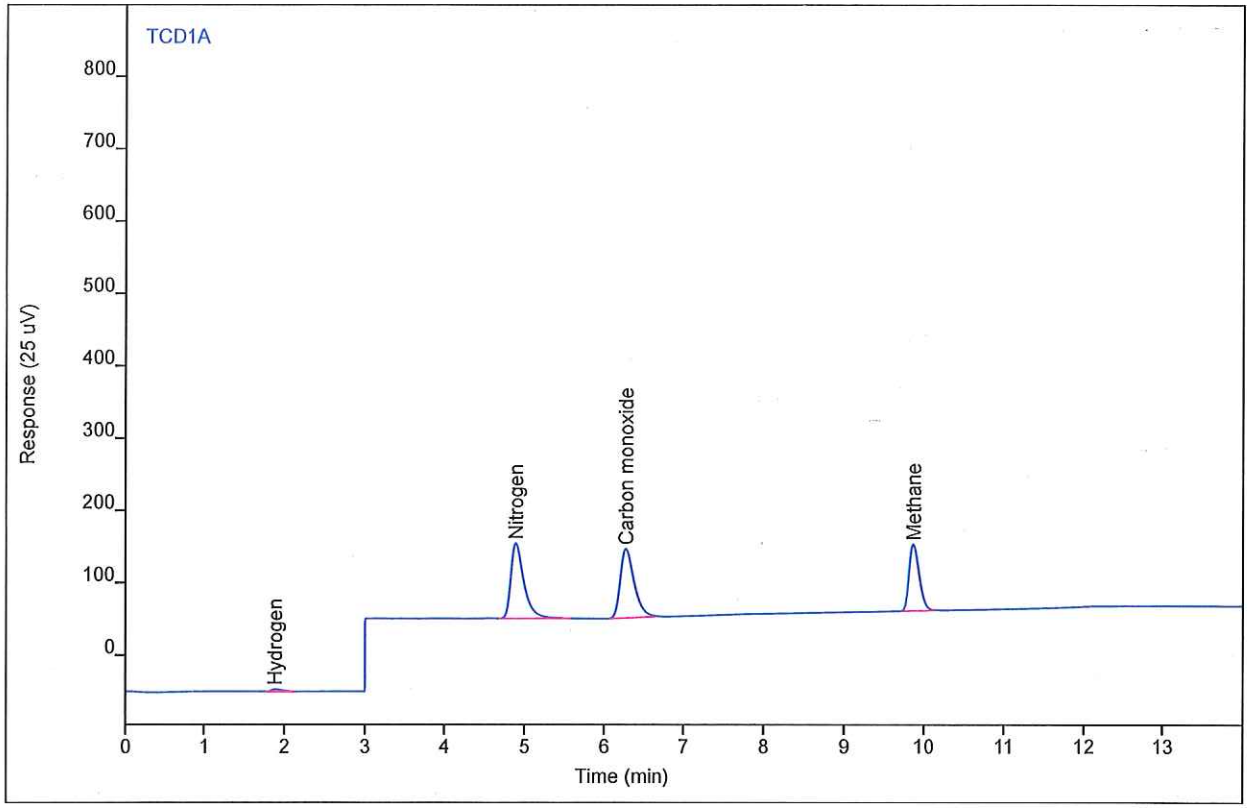


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.54	1438.71	127.296	5.06533	1	5.06533	%
Carbon Dioxide	BB	13.15	2271.94	225.067	5.06850	1	5.06850	%

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

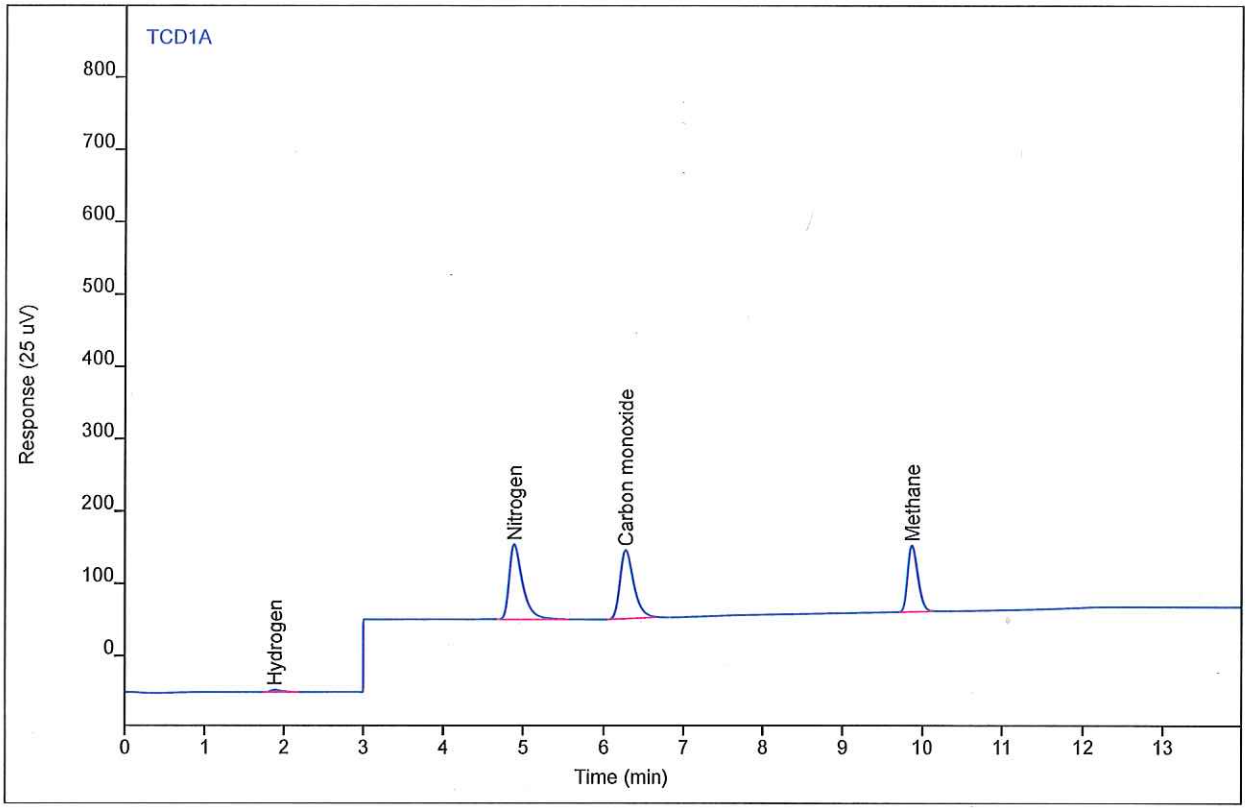


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	28.7109	3.10524	2.83135	1	2.83135	%
Nitrogen	VB	4.89	1188.21	103.899	3.63841	1	3.63841	%
Carbon monoxide	BB	6.27	1137.77	95.0750	3.56379	1	3.56379	%
Methane	BB	9.87	799.797	91.6369	2.83907	1	2.83907	%

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

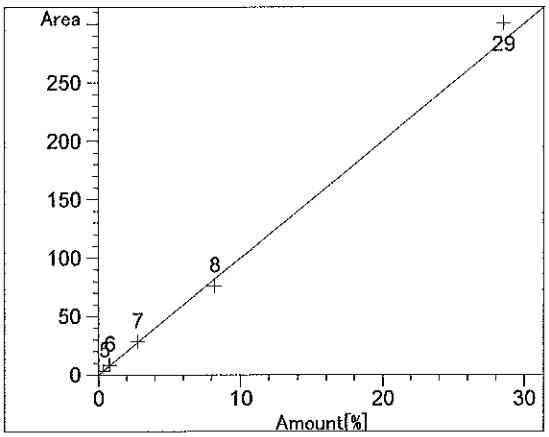
1 Warnings or Errors :

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

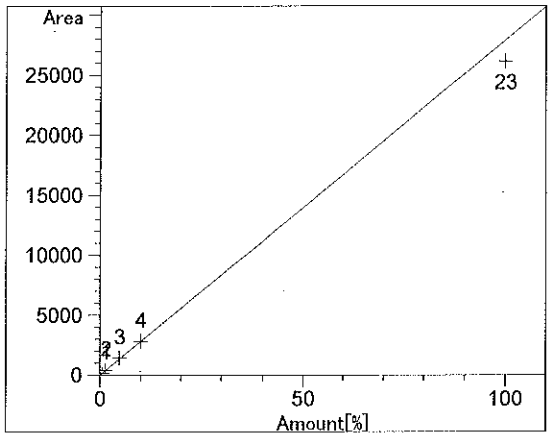
Peak Sum Table

No Entries in table

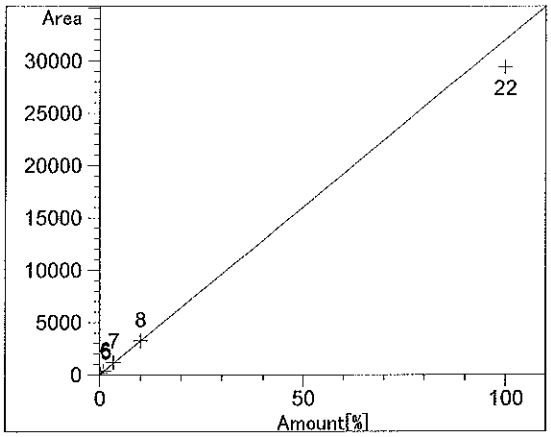
Calibration Curves



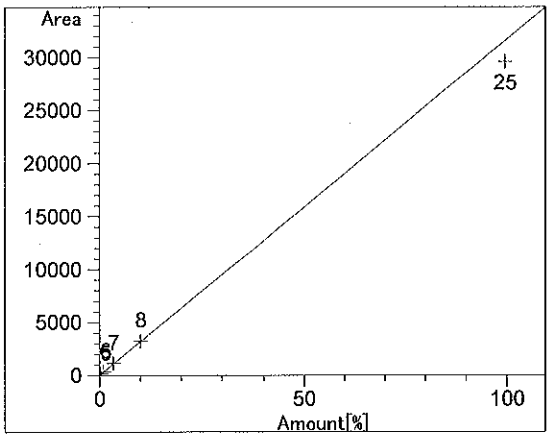
Hydrogen at exp. RT: 1.891
TCD1 A,
Correlation: 0.99835
Residual Std. Dev.: 9.39047
Formula: y = mx + b
m: 10.00987
b: 3.69469e-1
x: Amount
y: Area
Calibration Level Weights:
Level 5 : 1
Level 6 : 0.153982
Level 7 : 0.012616
Level 8 : 0.001429
Level 29 : 0.000118



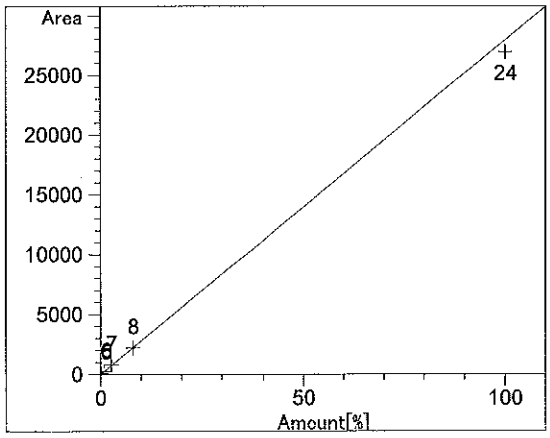
Oxygen at exp. RT: 4.537
TCD1 A,
Correlation: 0.99861
Residual Std. Dev.: 1047.10945
Formula: y = mx + b
m: 279.38654
b: 23.52715
x: Amount
y: Area
Calibration Level Weights:
Level 1 : 1
Level 2 : 0.167299
Level 3 : 0.012791
Level 4 : 0.002953
Level 23 : 0.00003



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

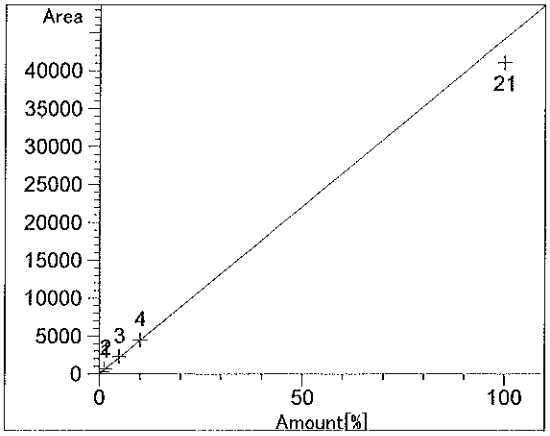


Carbon monoxide at exp. RT: 6.280
TCD1 A,
Correlation: 0.99887
Residual Std. Dev.: 1165.48483
Formula: y = mx + b
m: 317.53234
b: 6.14602
x: Amount
y: Area
Calibration Level Weights:
Level 5 : 1
Level 6 : 0.156684
Level 7 : 0.012715
Level 8 : 0.001444
Level 25 : 0.000015



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

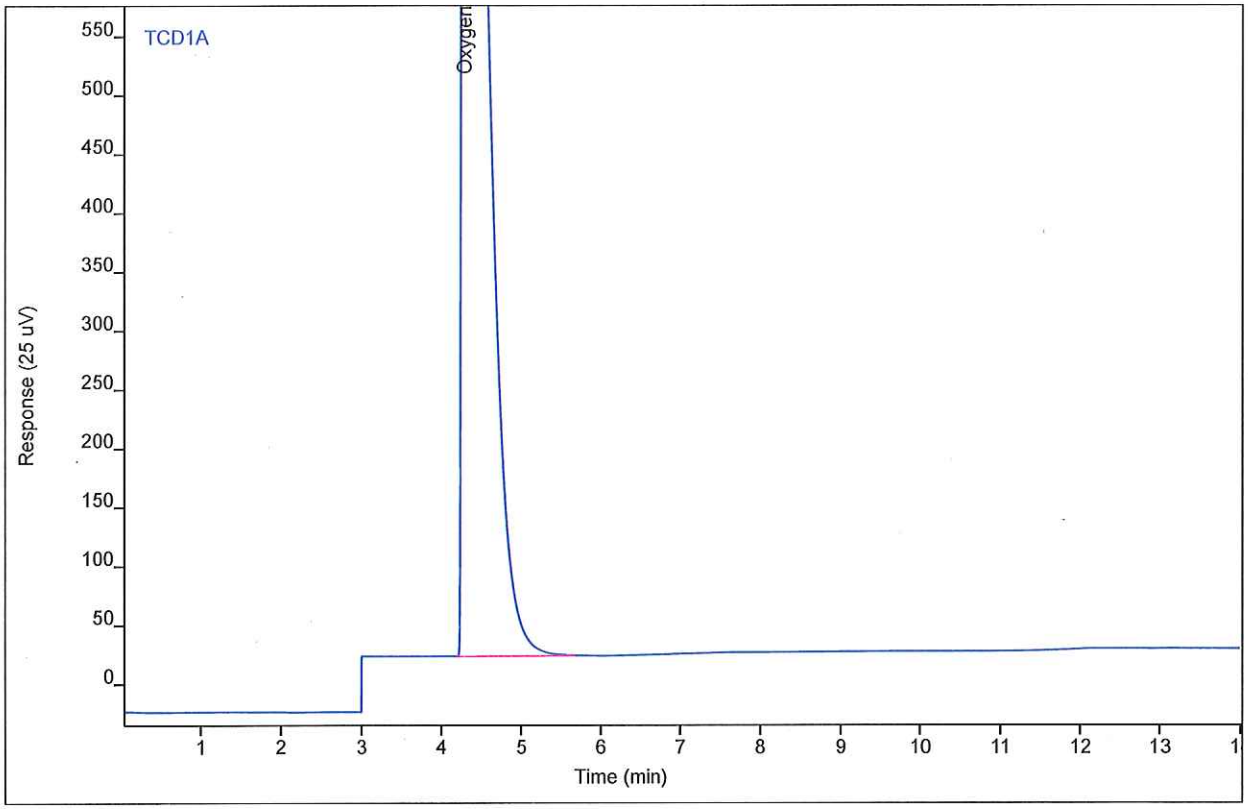
Parameters: ASTM D1946-90
Samples: 4 cans
Analyst: Justin Guenzler

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

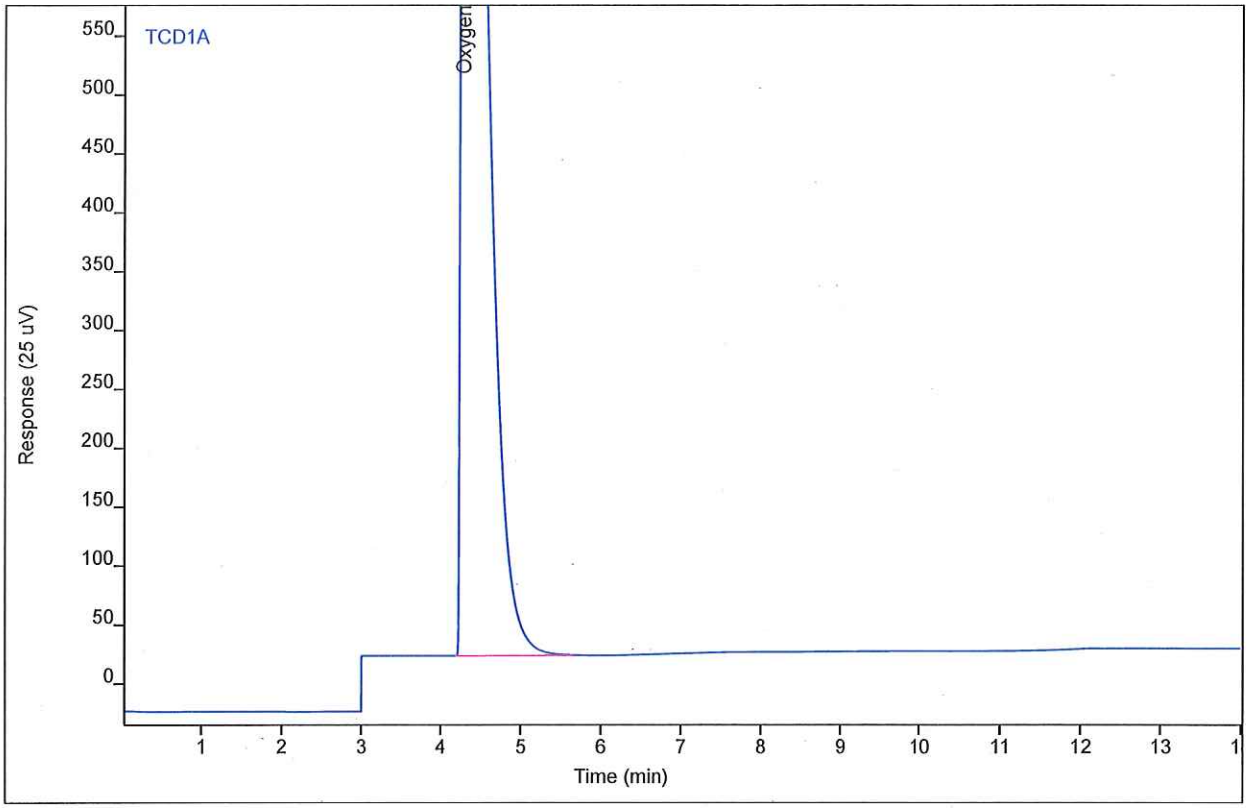


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.29	26216.3	1465.39	93.7509	1	93.7509	%

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

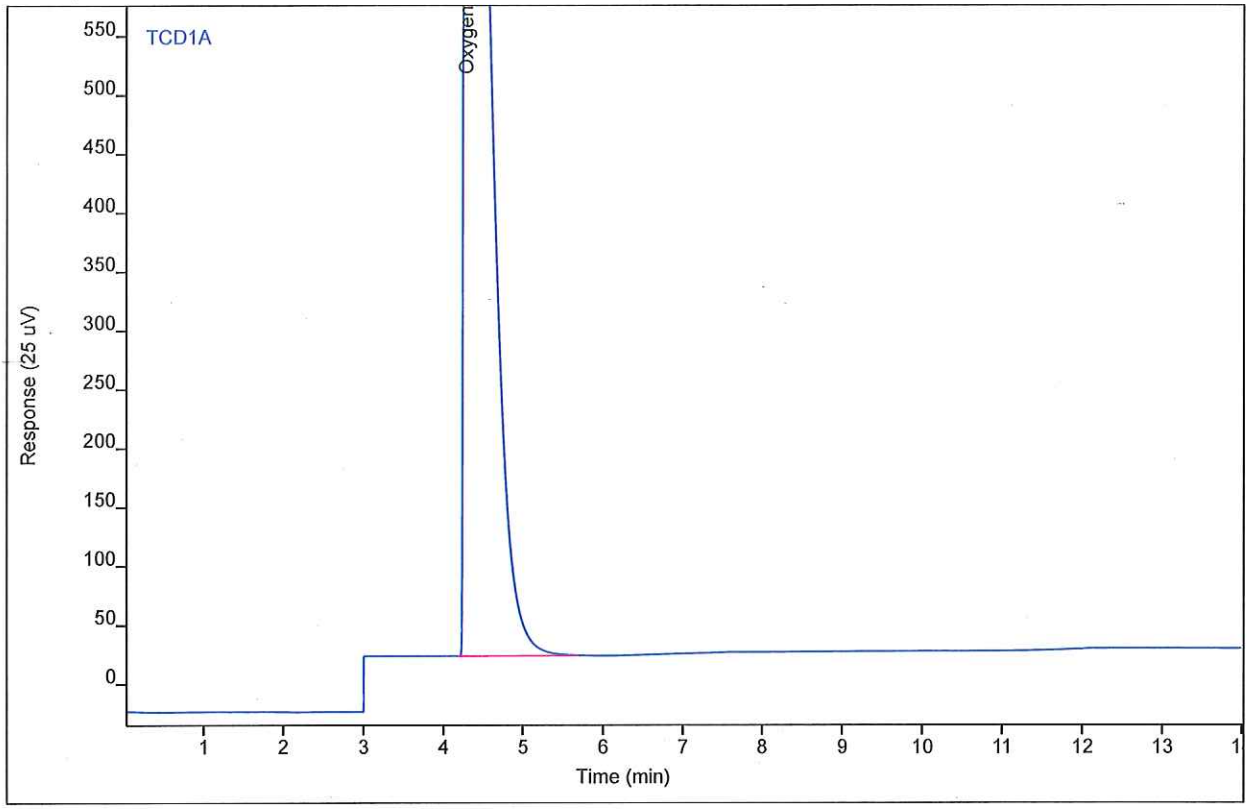


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.29	26088.9	1459.55	93.2950	1	93.2950	%

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

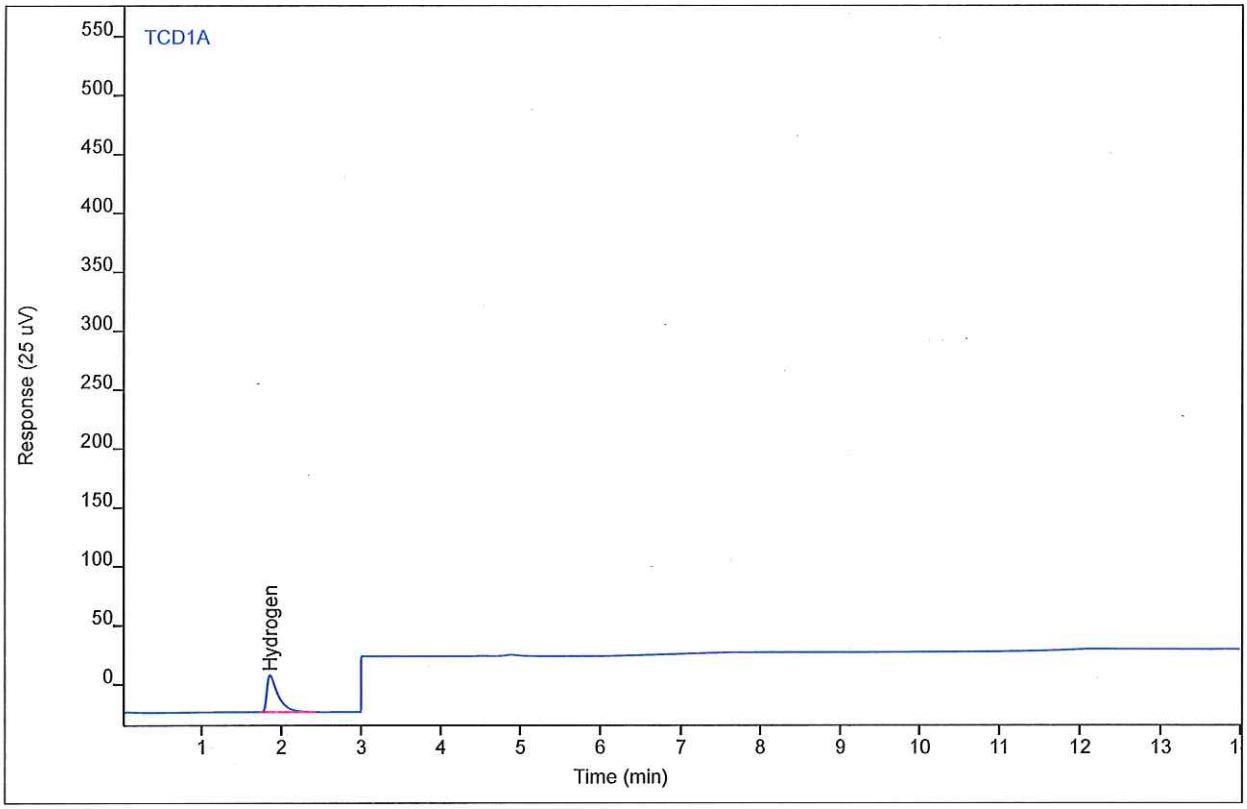


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.29	26142.7	1464.05	93.4876	1	93.4876	%

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

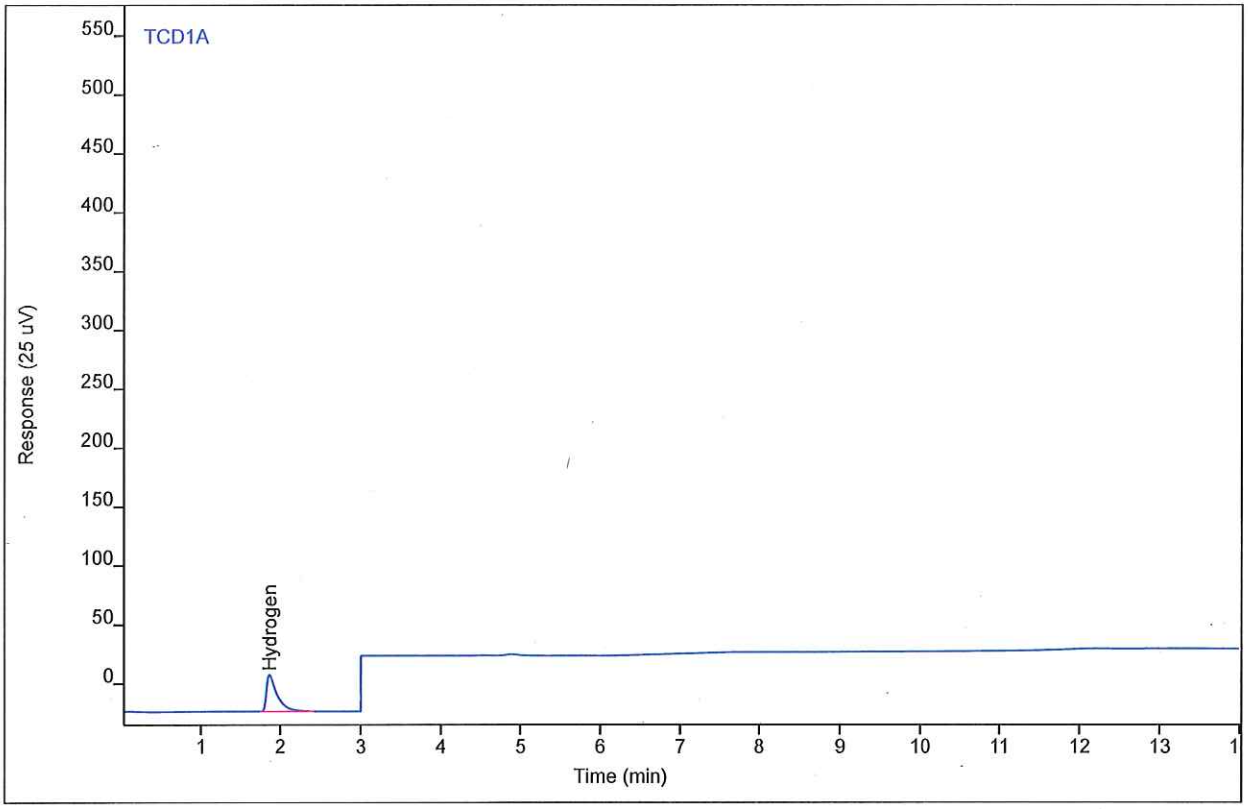


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.86	301.978	31.2546	30.1311	1	30.1311	%

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

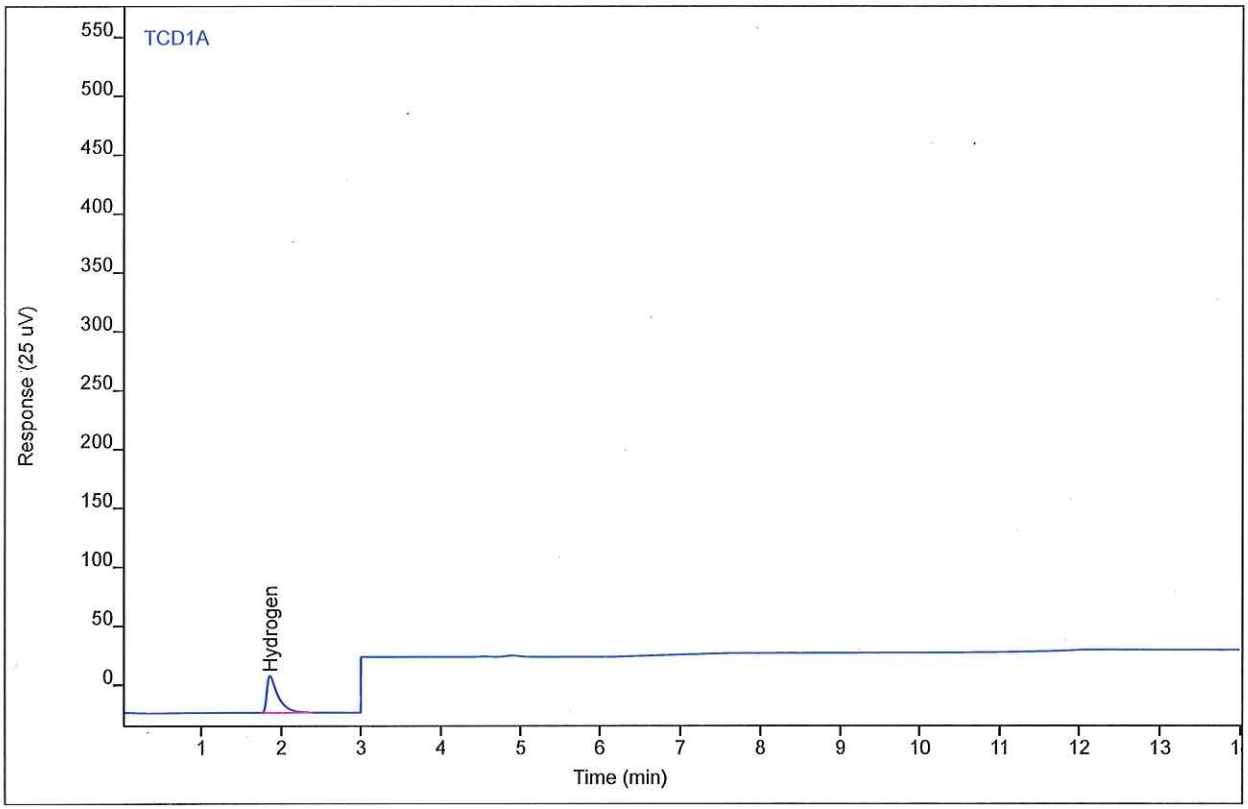


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.86	300.205	31.0667	29.9540	1	29.9540	%

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

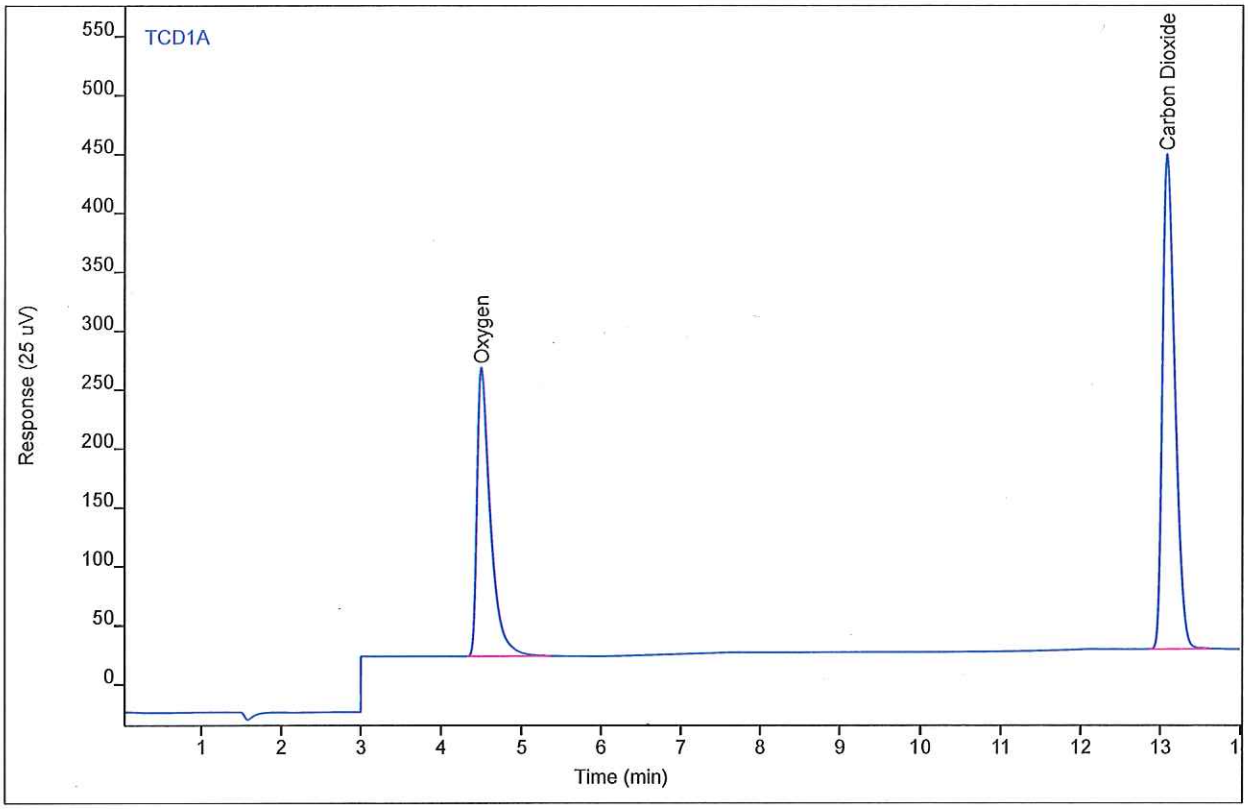


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.86	300.634	31.1949	29.9969	1	29.9969	%

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

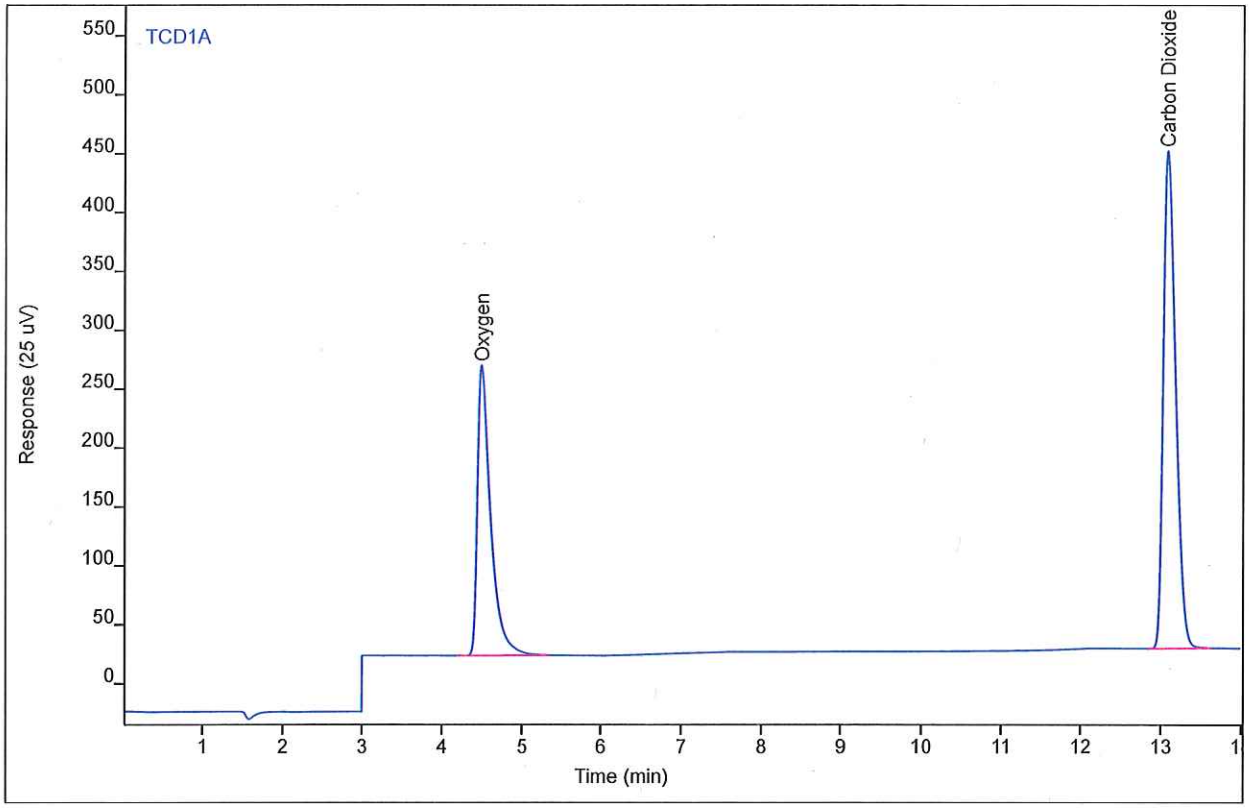


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.50	2819.65	244.859	10.0081	1	10.0081	%
Carbon Dioxide	MM	13.08	4452.30	419.837	9.99932	1	9.99932	%

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

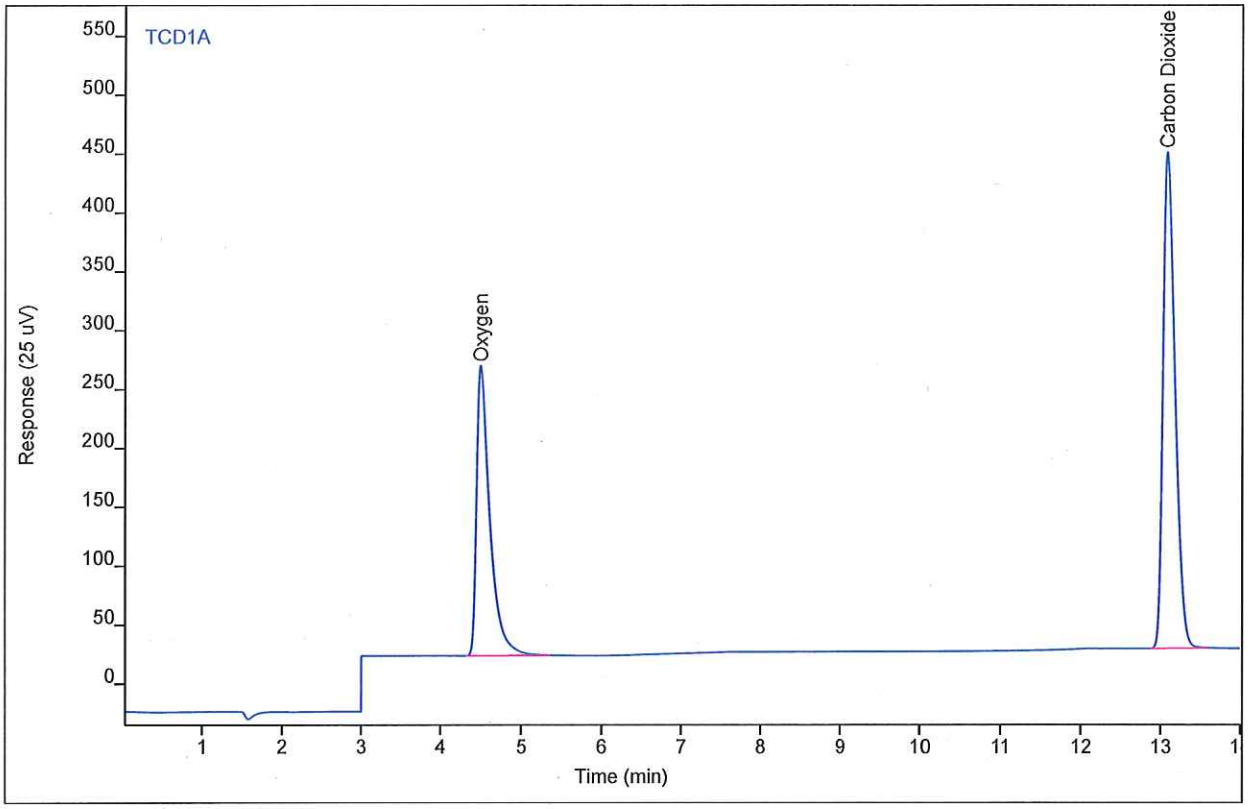


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.50	2835.93	246.125	10.0663	1	10.0663	%
Carbon Dioxide	MM	13.08	4486.46	422.657	10.0766	1	10.0766	%

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
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

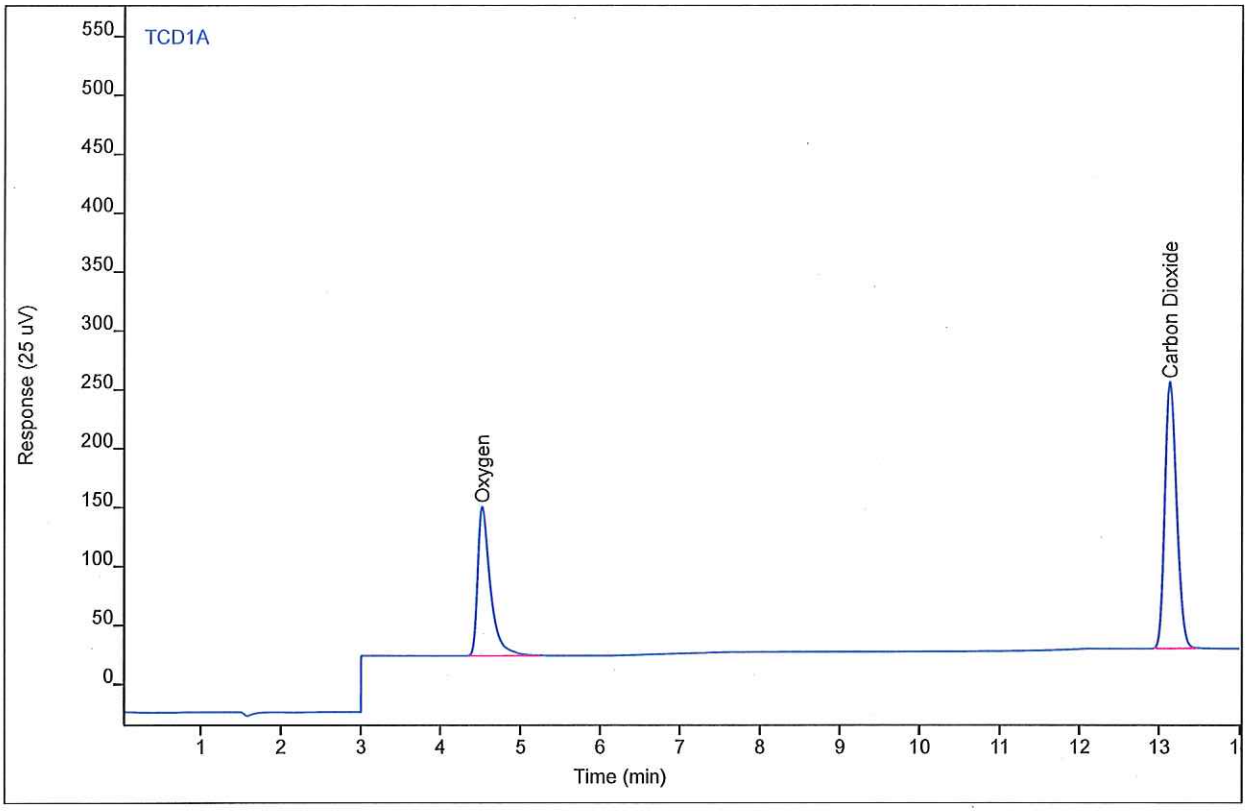


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.50	2831.35	246.058	10.0499	1	10.0499	%
Carbon Dioxide	MM	13.08	4473.10	421.476	10.0464	1	10.0464	%

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

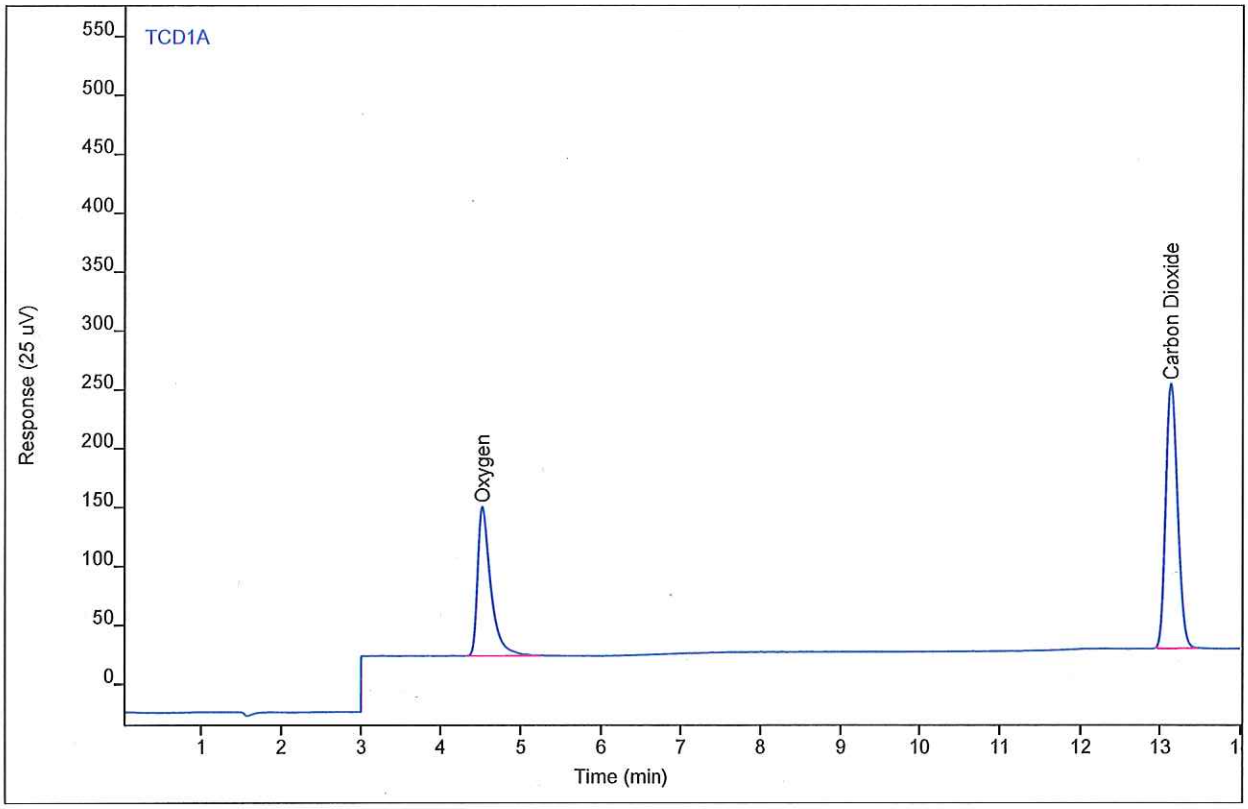


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.52	1428.93	126.312	5.03031	1	5.03031	%
Carbon Dioxide	BB	13.13	2260.64	225.950	5.04294	1	5.04294	%

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

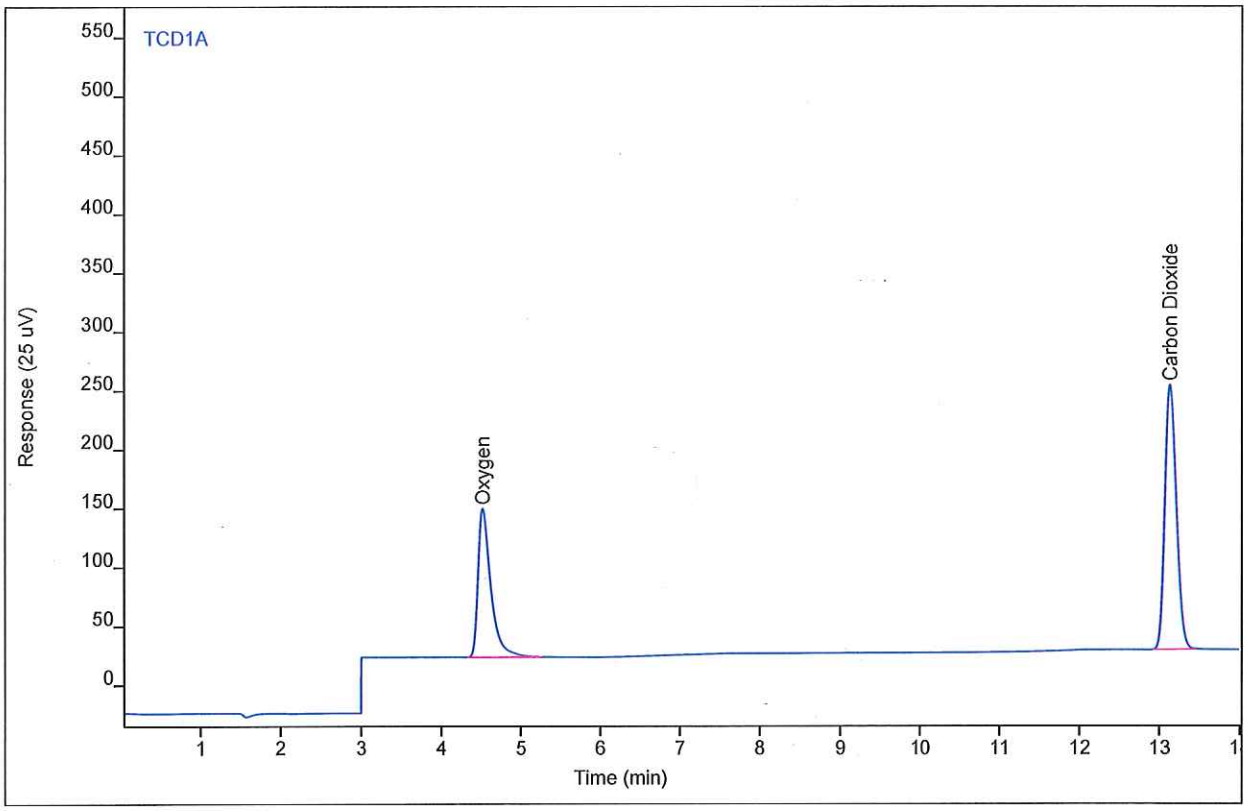


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.52	1425.79	126.378	5.01907	1	5.01907	%
Carbon Dioxide	BB	13.13	2252.43	224.516	5.02437	1	5.02437	%

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

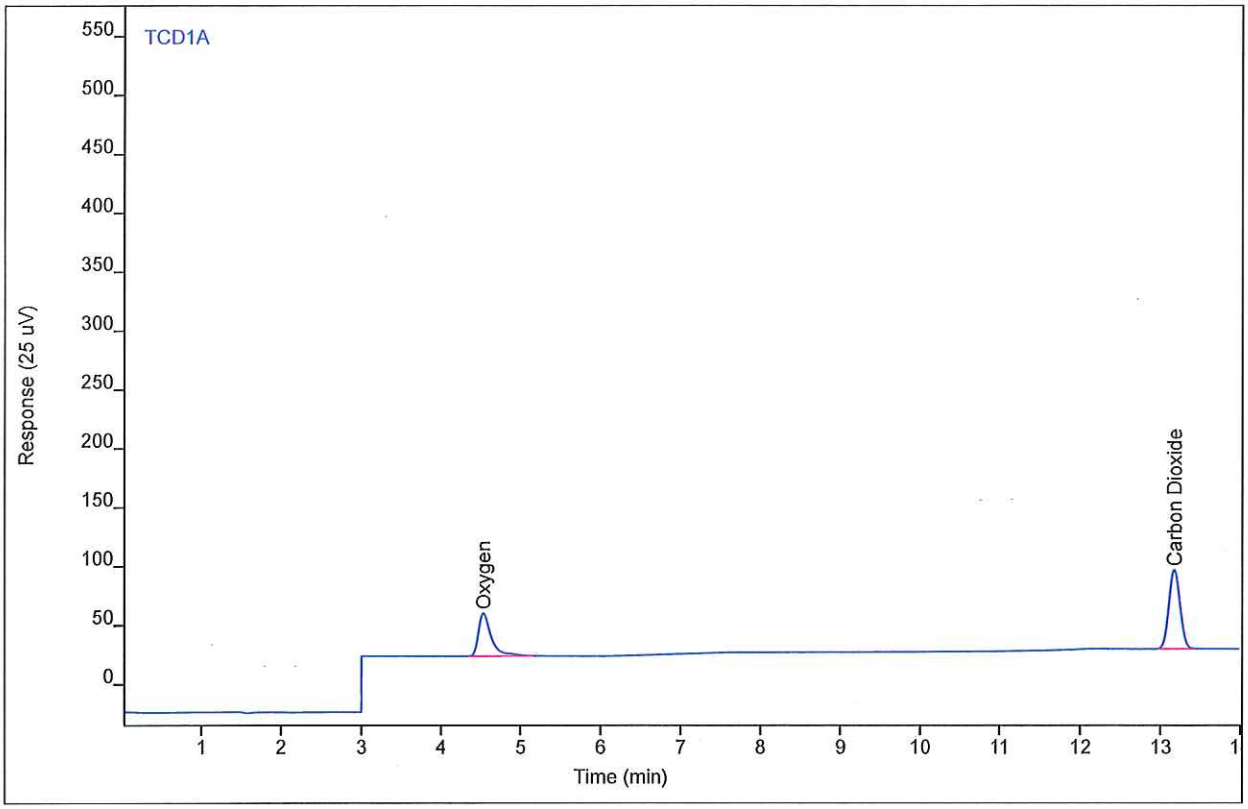


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB	4.52	1424.62	125.881	5.01487	1	5.01487	%
Carbon Dioxide	BB	13.13	2252.43	224.437	5.02438	1	5.02438	%

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

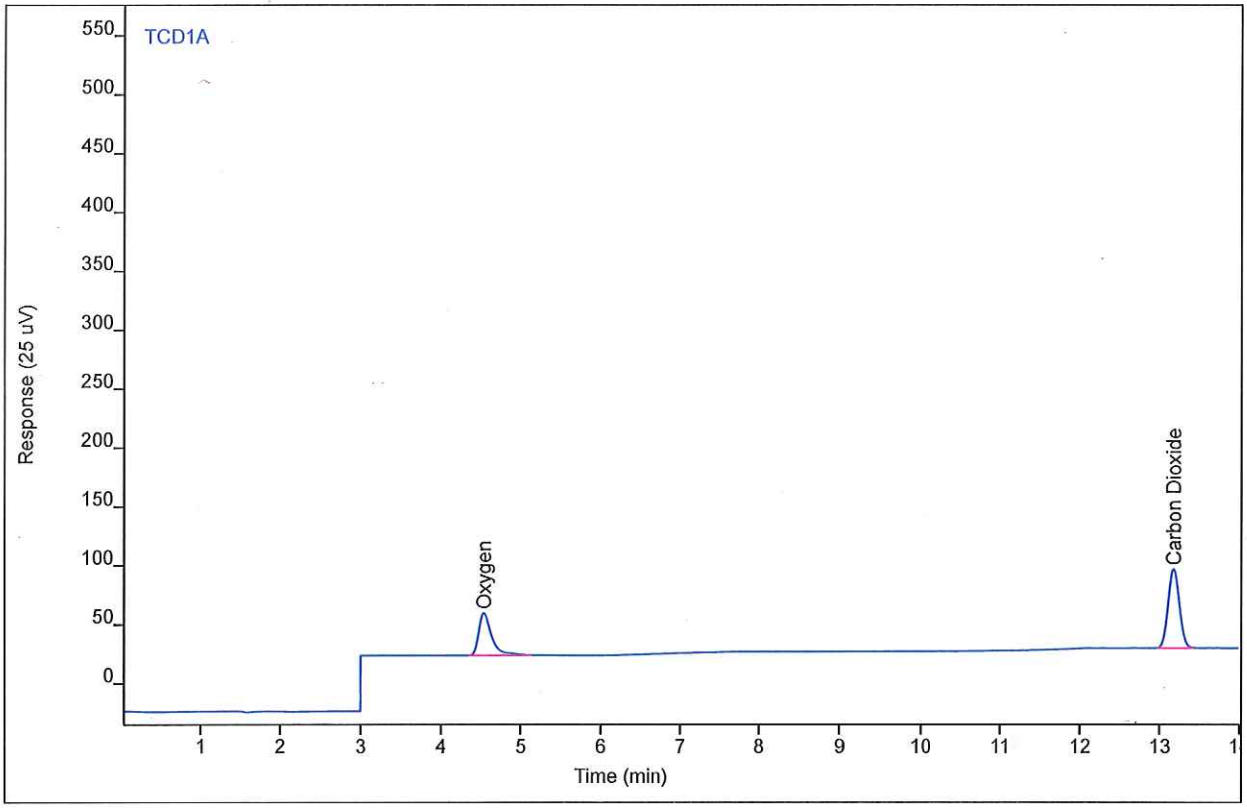


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB R	4.54	413.003	36.2668	1.39404	1	1.39404	%
Carbon Dioxide	BB	13.17	645.826	66.8852	1.39108	1	1.39108	%

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

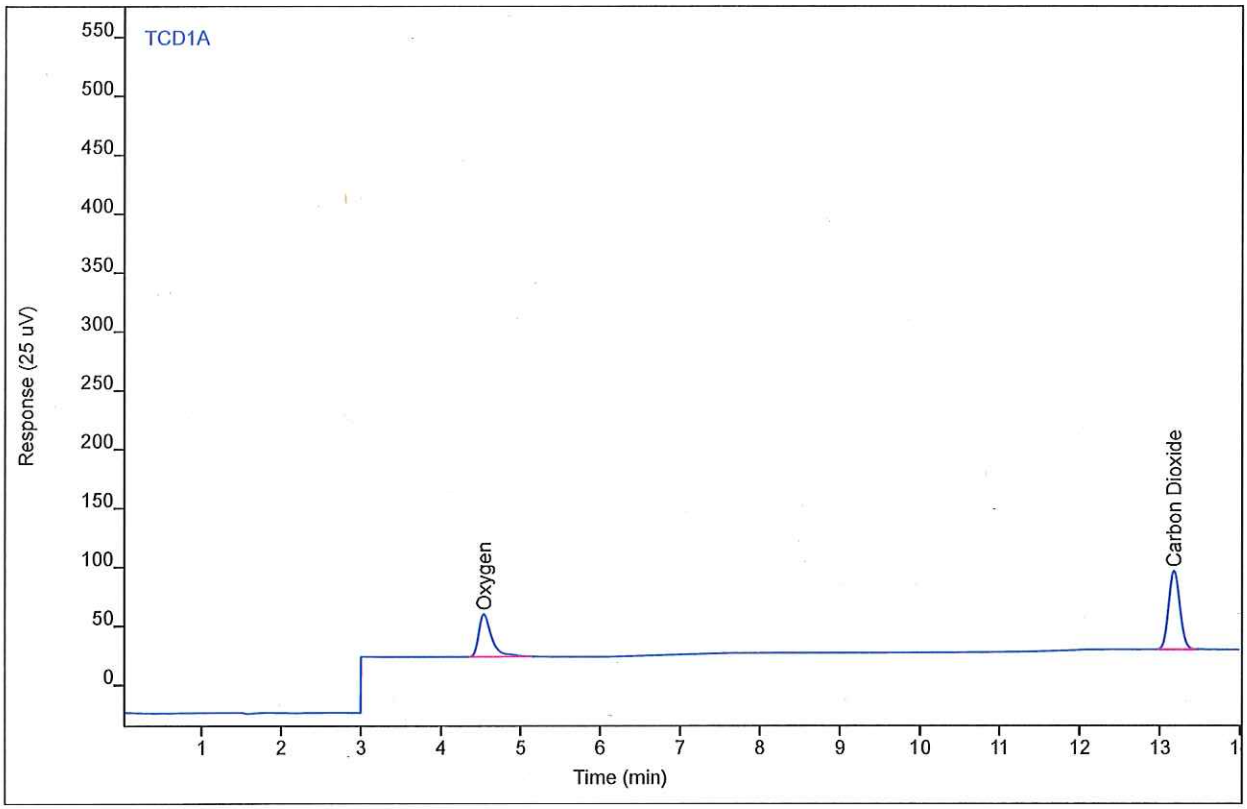


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB R	4.54	405.892	35.8930	1.36859	1	1.36859	%
Carbon Dioxide	BB	13.17	651.602	66.8818	1.40414	1	1.40414	%

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

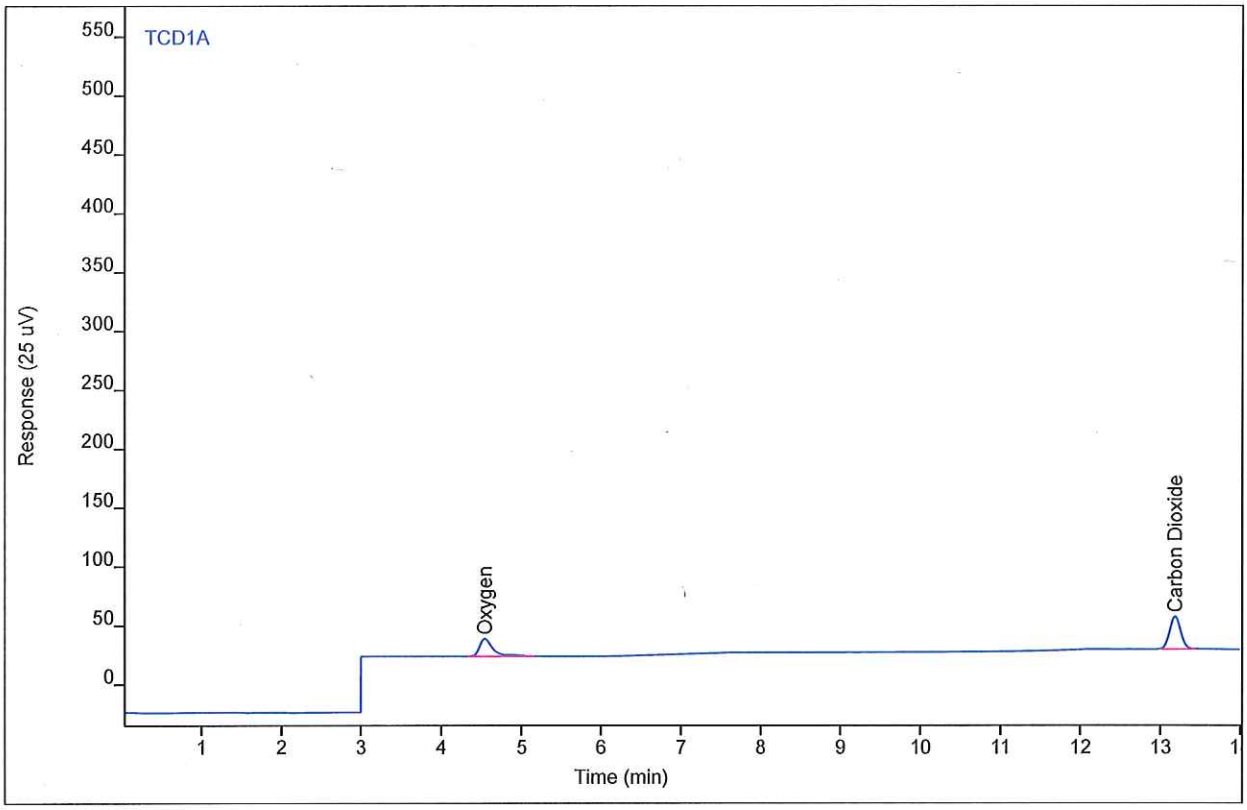


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	BB R	4.54	409.016	35.9957	1.37977	1	1.37977	%
Carbon Dioxide	BB	13.17	643.782	66.4107	1.38646	1	1.38646	%

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

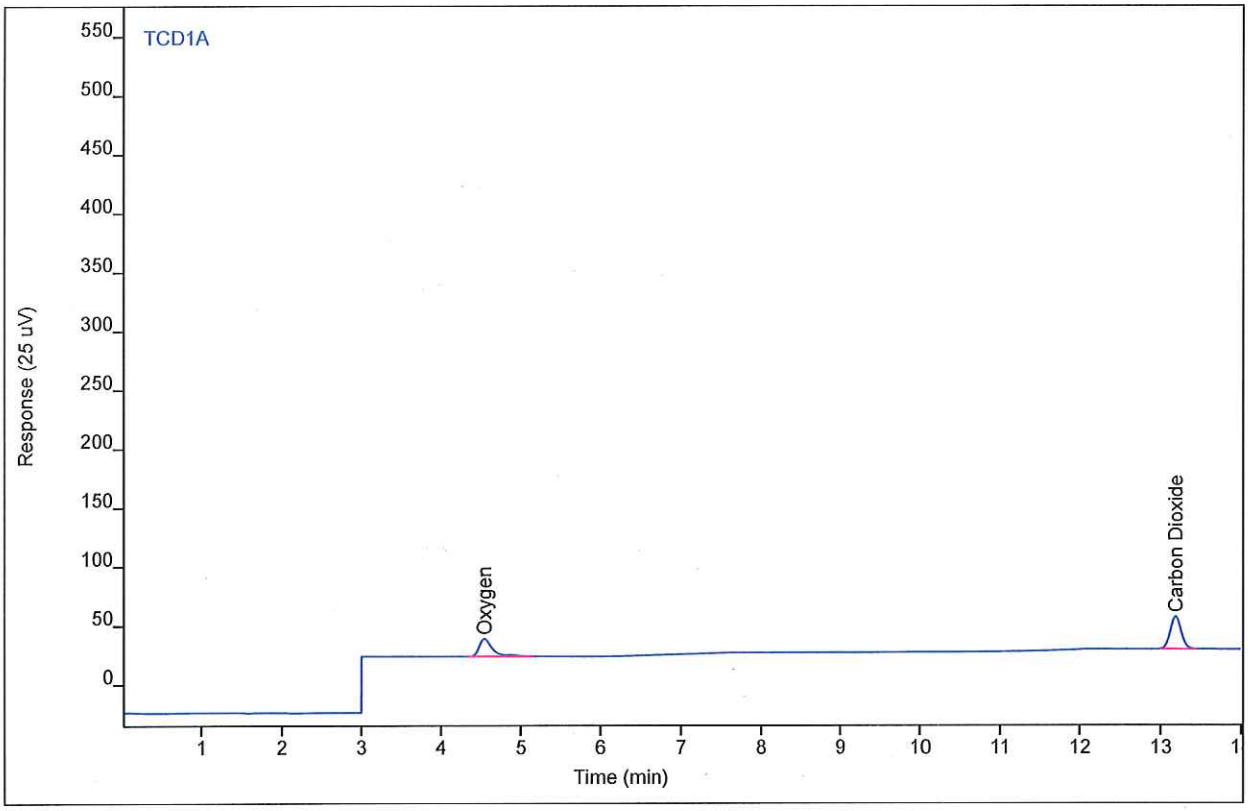


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	MM R	4.54	173.497	14.8950	0.53775	1	0.53775	%
Carbon Dioxide	BB	13.18	264.377	27.4602	0.52976	1	0.52976	%

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

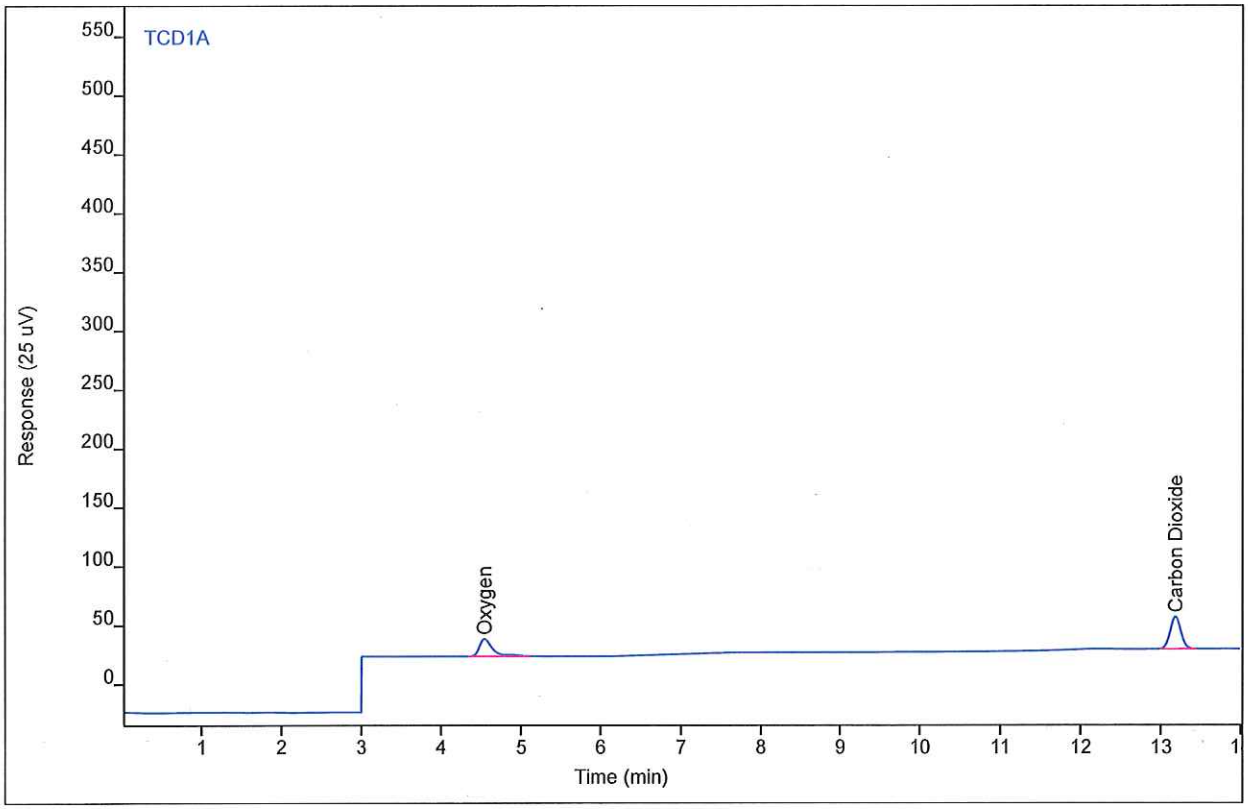


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	MM R	4.54	172.909	14.9106	0.53593	1	0.53593	%
Carbon Dioxide	BB	13.18	264.328	27.4332	0.52966	1	0.52966	%

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

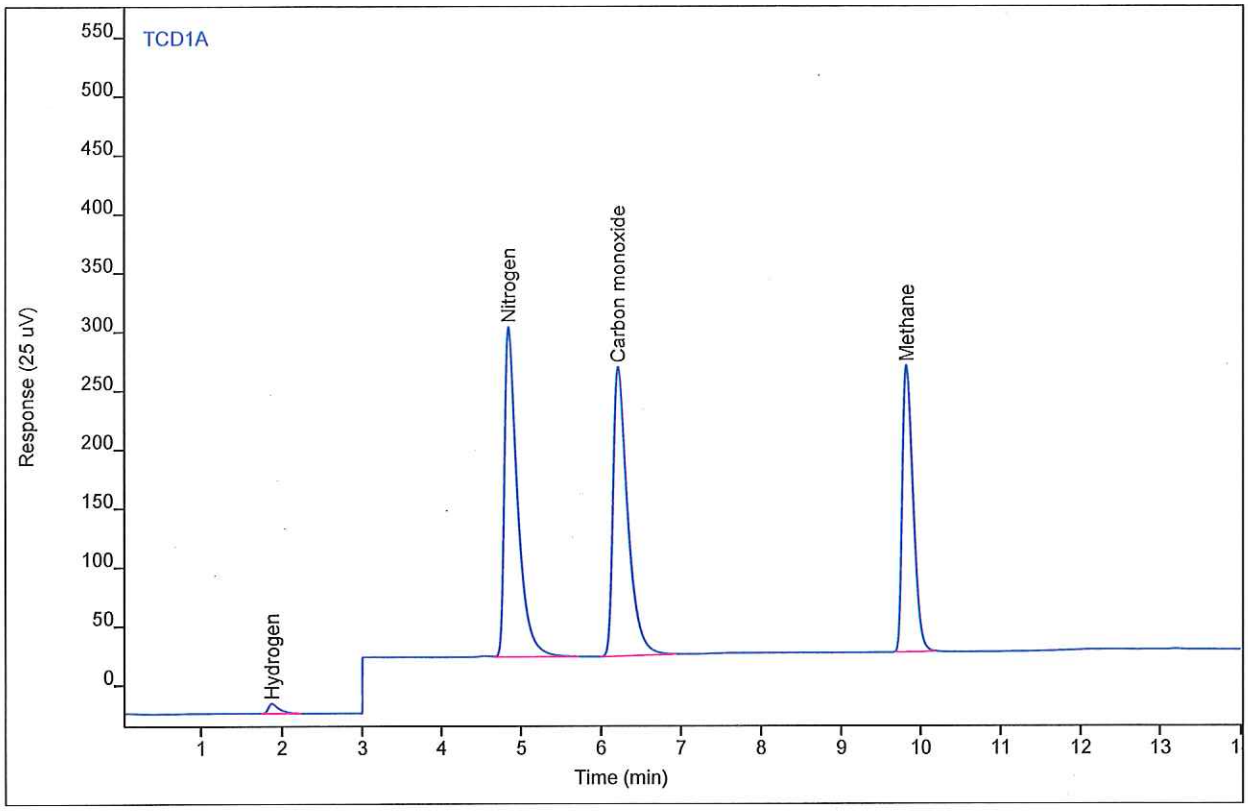


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Oxygen	MM R	4.54	170.827	14.7673	0.52948	1	0.52948	%
Carbon Dioxide	BB	13.18	262.262	27.3092	0.52552	1	0.52552	%

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

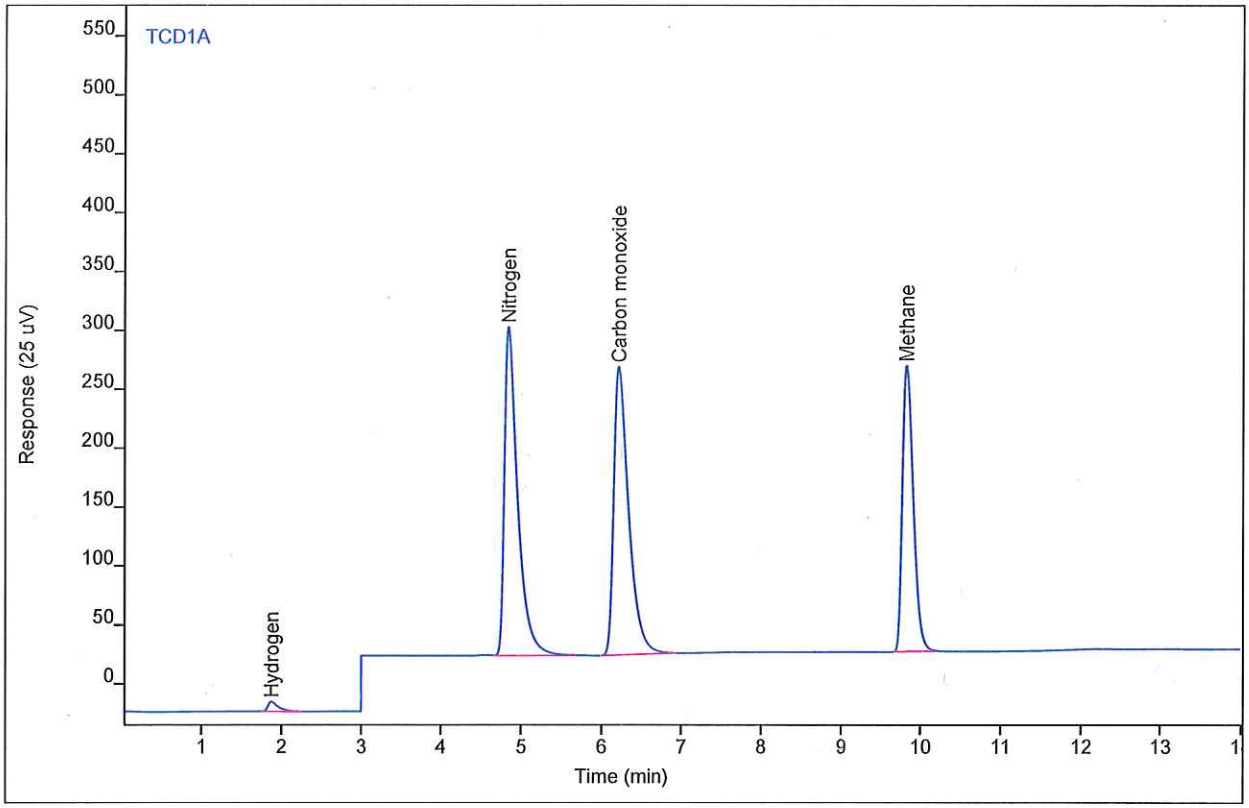


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	75.9483	8.29744	7.55043	1	7.55043	%
Nitrogen	VB	4.84	3253.80	279.959	10.0890	1	10.0890	%
Carbon monoxide	MM	6.21	3229.76	245.543	10.1521	1	10.1521	%
Methane	BB	9.83	2212.24	242.820	7.88319	1	7.88319	%

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

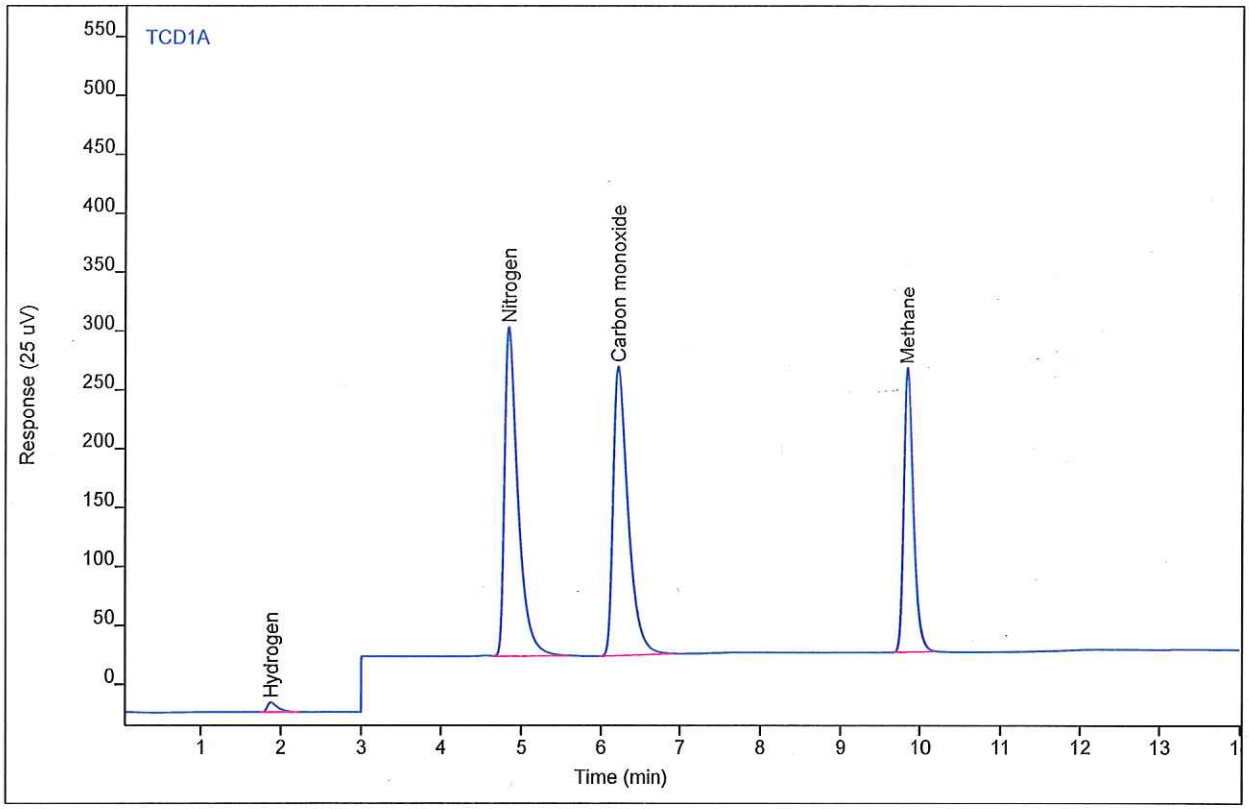


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	76.3980	8.31680	7.59536	1	7.59536	%
Nitrogen	VB	4.84	3241.38	278.937	10.0502	1	10.0502	%
Carbon monoxide	MM	6.21	3221.61	244.840	10.1264	1	10.1264	%
Methane	BB	9.83	2207.06	242.514	7.86468	1	7.86468	%

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

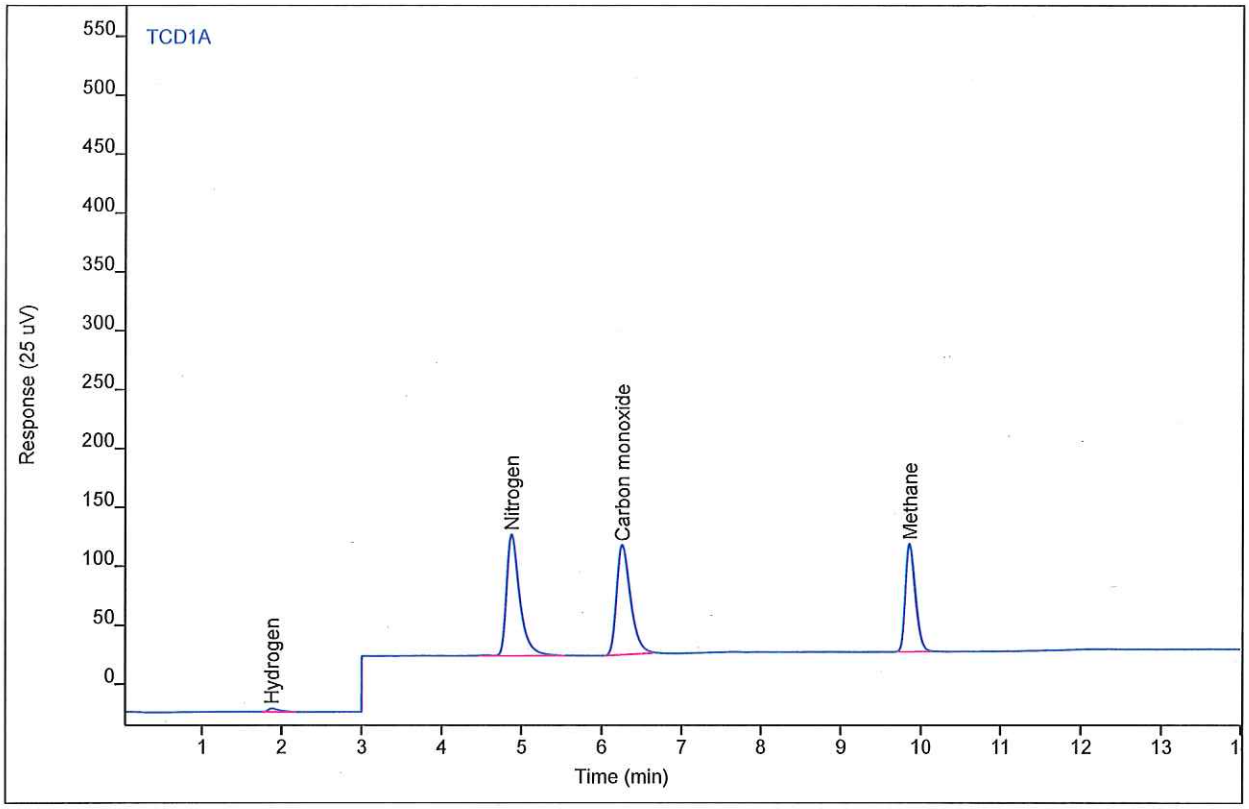


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	75.4004	8.23677	7.49570	1	7.49570	%
Nitrogen	VB	4.84	3241.27	279.283	10.0498	1	10.0498	%
Carbon monoxide	MM	6.21	3229.13	245.546	10.1501	1	10.1501	%
Methane	BB	9.83	2209.95	241.058	7.87503	1	7.87503	%

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

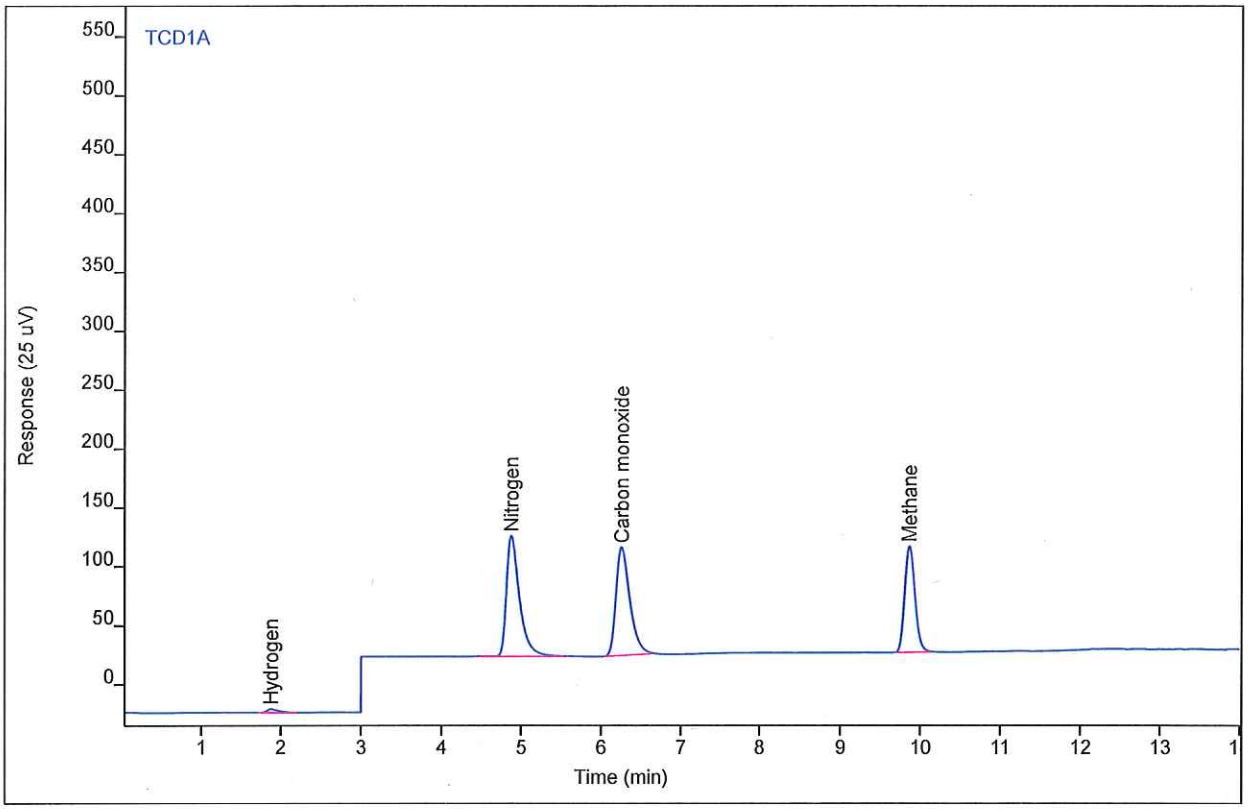


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	28.6519	2.99091	2.82546	1	2.82546	%
Nitrogen	BB	4.88	1173.21	102.835	3.59156	1	3.59156	%
Carbon monoxide	BB	6.26	1130.68	92.8537	3.54147	1	3.54147	%
Methane	BB	9.86	795.768	91.2777	2.82468	1	2.82468	%

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

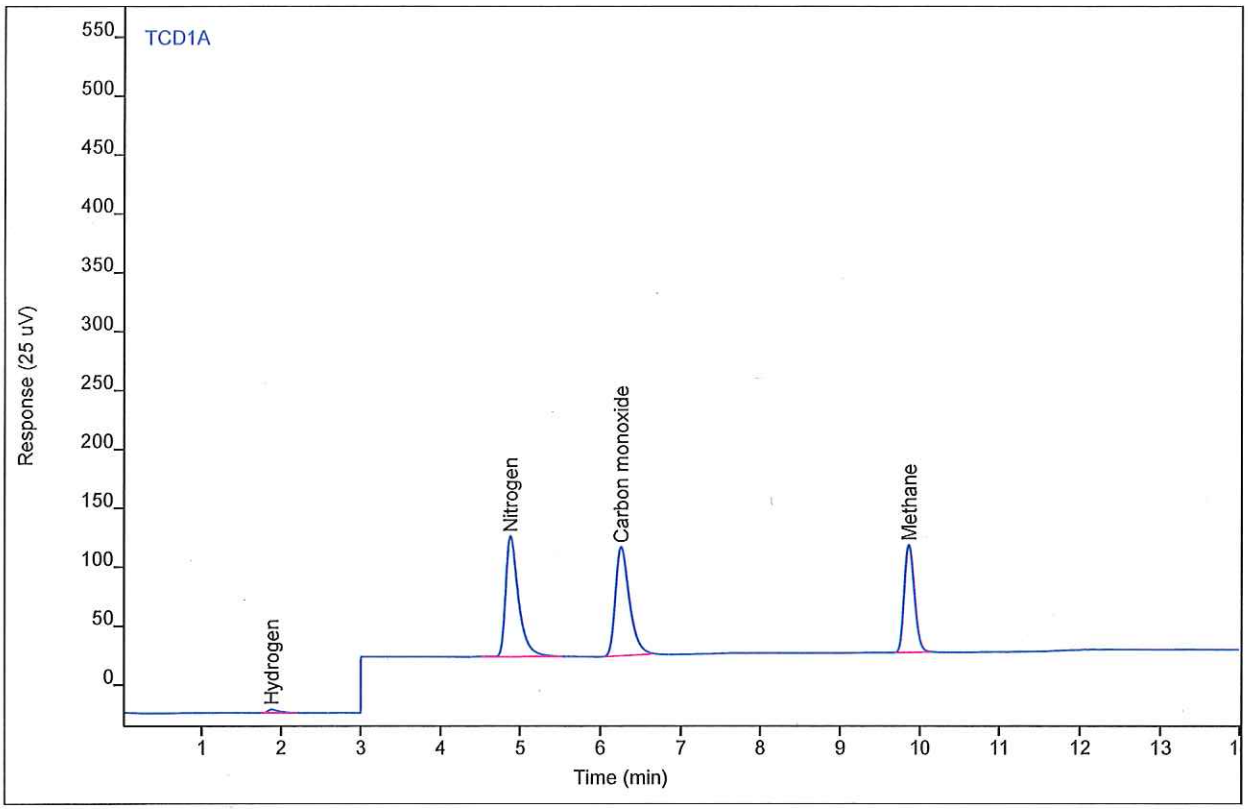


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	28.0610	2.97272	2.76643	1	2.76643	%
Nitrogen	BB	4.88	1166.32	102.180	3.57005	1	3.57005	%
Carbon monoxide	BB	6.26	1111.96	91.7782	3.48253	1	3.48253	%
Methane	BB	9.86	785.804	89.9478	2.78909	1	2.78909	%

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

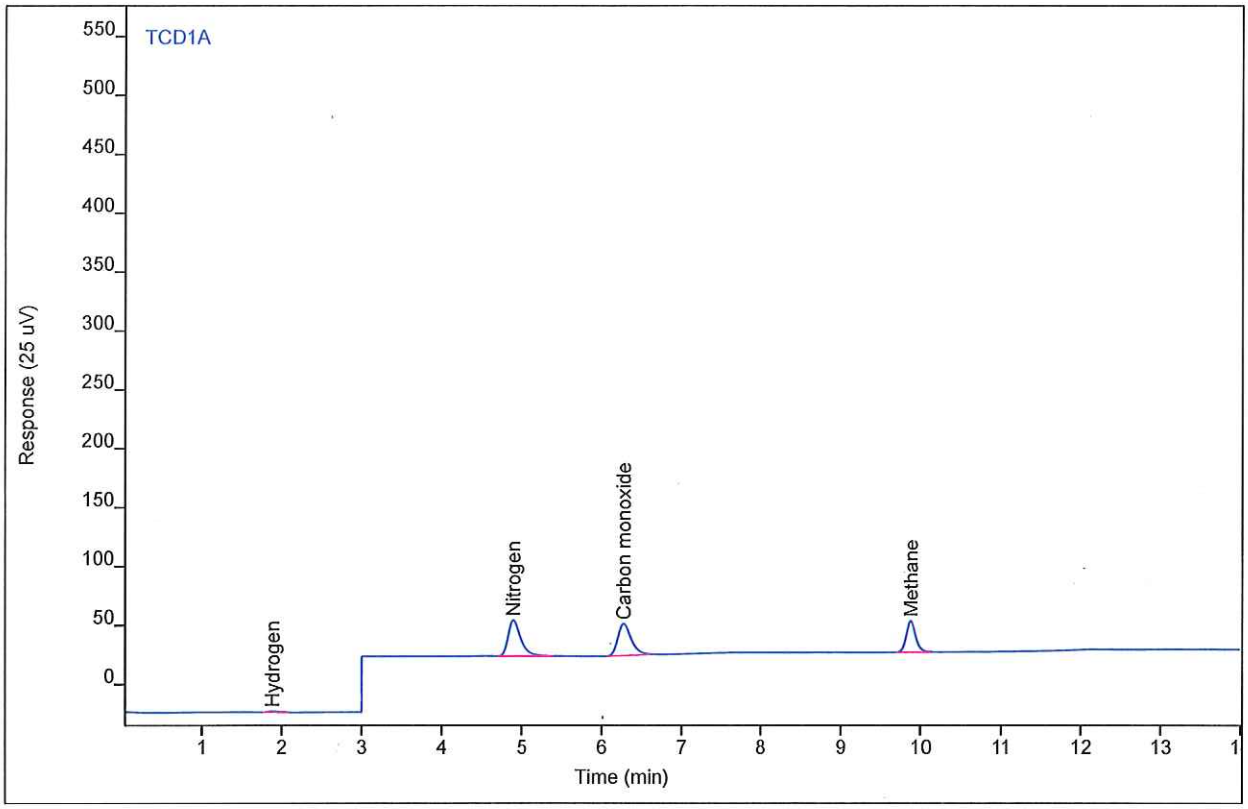


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	BB	1.88	28.5071	3.01138	2.81099	1	2.81099	%
Nitrogen	BB	4.88	1164.44	102.073	3.56418	1	3.56418	%
Carbon monoxide	BB	6.26	1118.59	92.1577	3.50340	1	3.50340	%
Methane	BB	9.86	793.173	91.0586	2.81541	1	2.81541	%

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

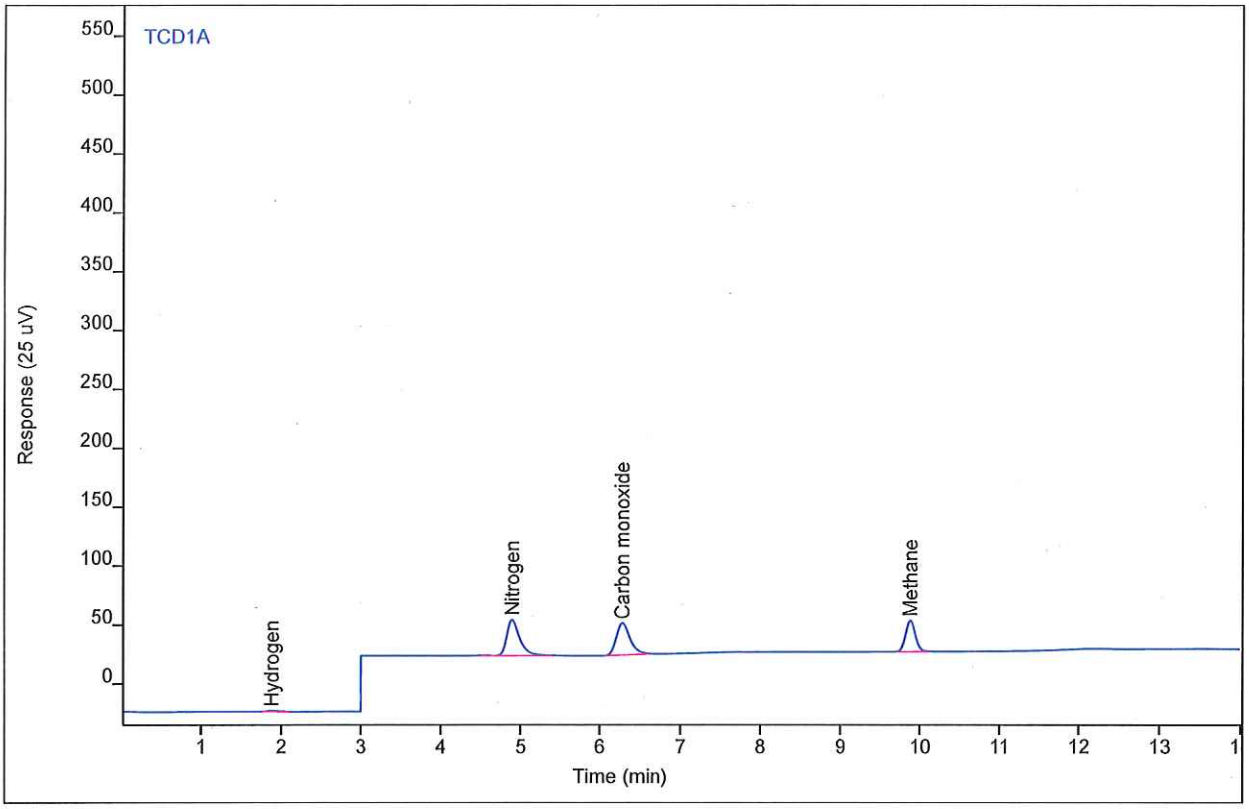


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	8.50511	0.88954	0.81276	1	0.81276	%
Nitrogen	BB	4.90	341.481	30.3389	0.99420	1	0.99420	%
Carbon monoxide	BB	6.28	316.361	26.9290	0.97696	1	0.97696	%
Methane	BB	9.88	226.924	26.4825	0.79322	1	0.79322	%

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

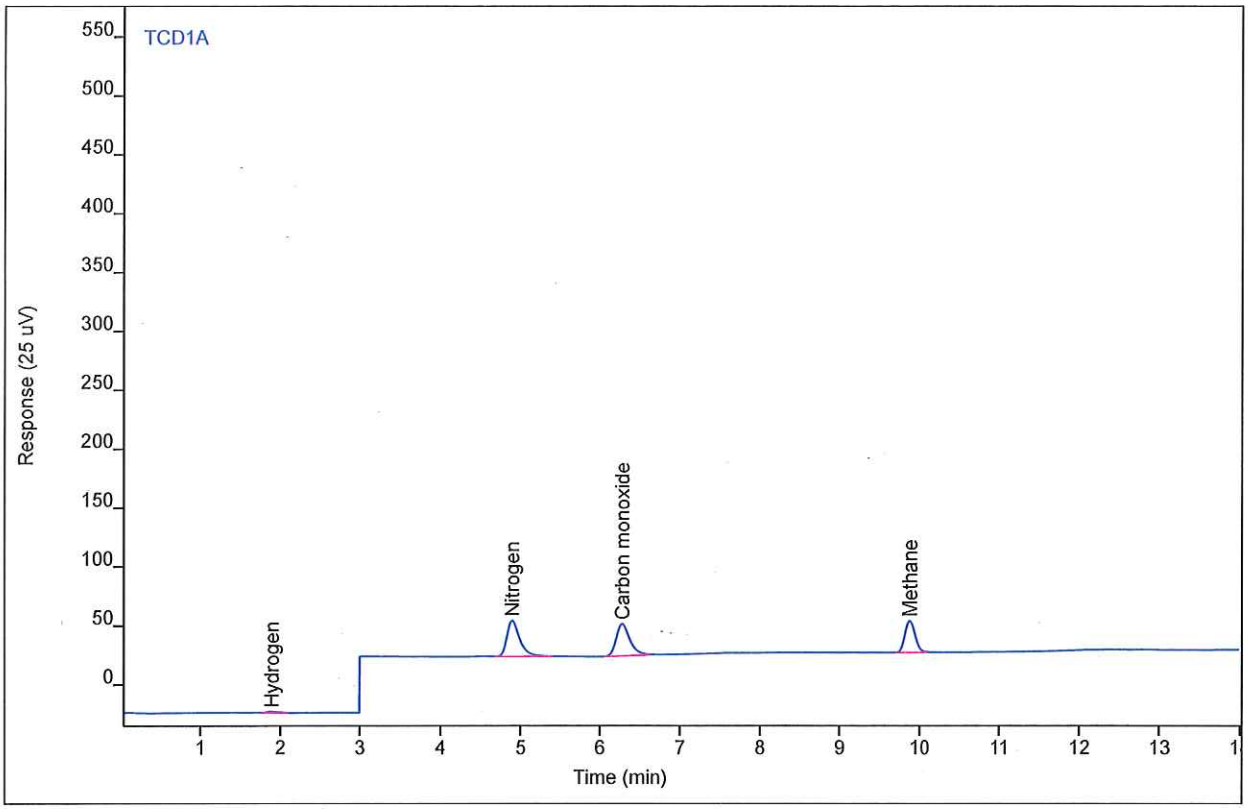


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.88	8.52784	0.88596	0.81503	1	0.81503	%
Nitrogen	BB	4.90	342.667	30.3278	0.99790	1	0.99790	%
Carbon monoxide	BB	6.28	317.586	26.9631	0.98081	1	0.98081	%
Methane	BB	9.88	225.817	26.3520	0.78926	1	0.78926	%

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

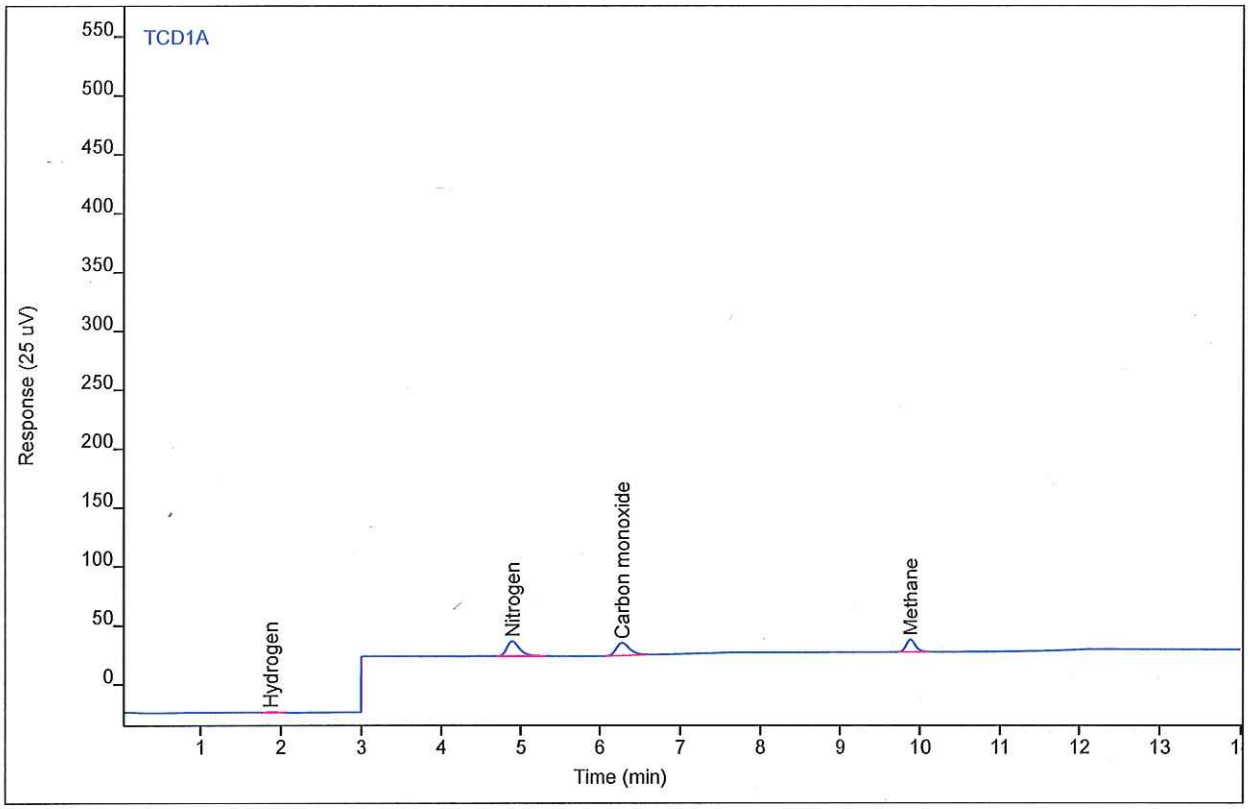


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	8.26287	0.86397	0.78856	1	0.78856	%
Nitrogen	VB	4.90	341.873	30.3285	0.99542	1	0.99542	%
Carbon monoxide	BB	6.28	319.033	27.0845	0.98537	1	0.98537	%
Methane	BB	9.88	227.192	26.5915	0.79417	1	0.79417	%

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

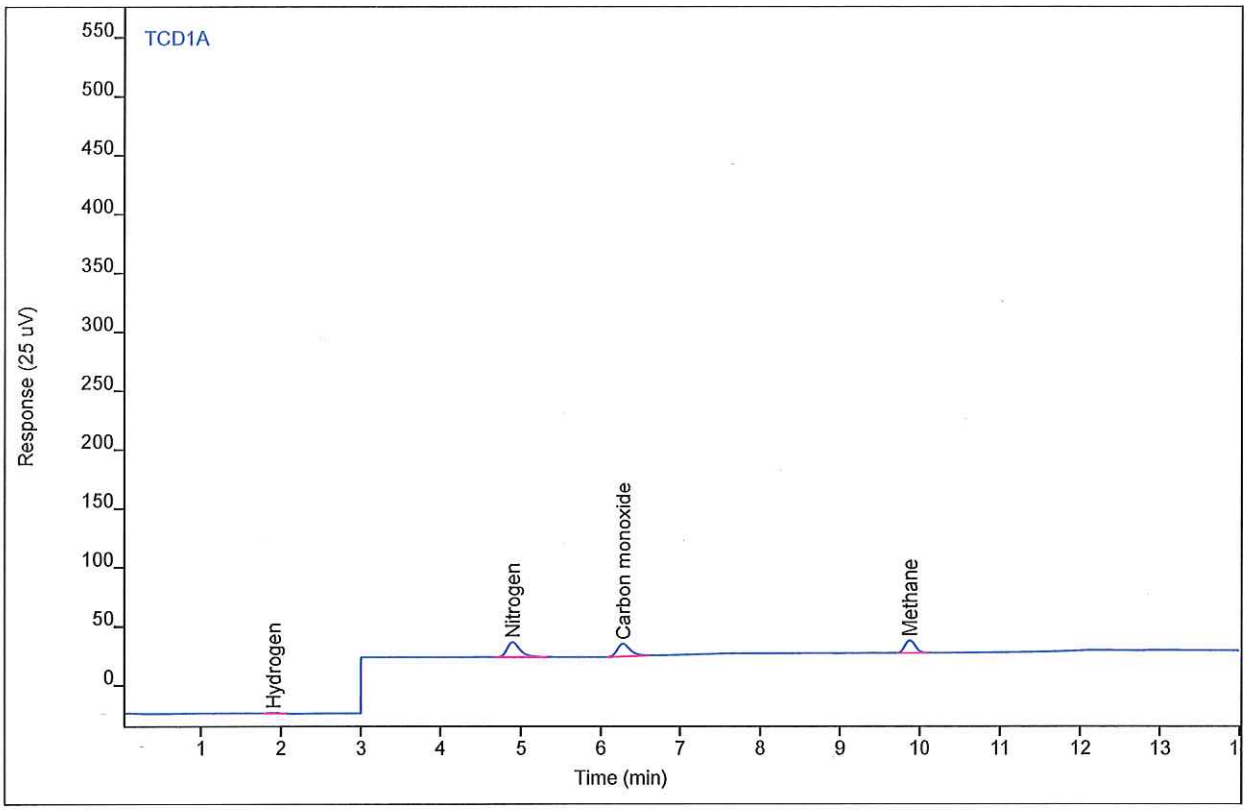


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.88	3.38828	0.38222	0.30248	1	0.30248	%
Nitrogen	BB	4.90	141.123	12.6570	0.37034	1	0.37034	%
Carbon monoxide	BB	6.28	124.686	10.7331	0.37364	1	0.37364	%
Methane	BB	9.88	90.2059	10.5159	0.30523	1	0.30523	%

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

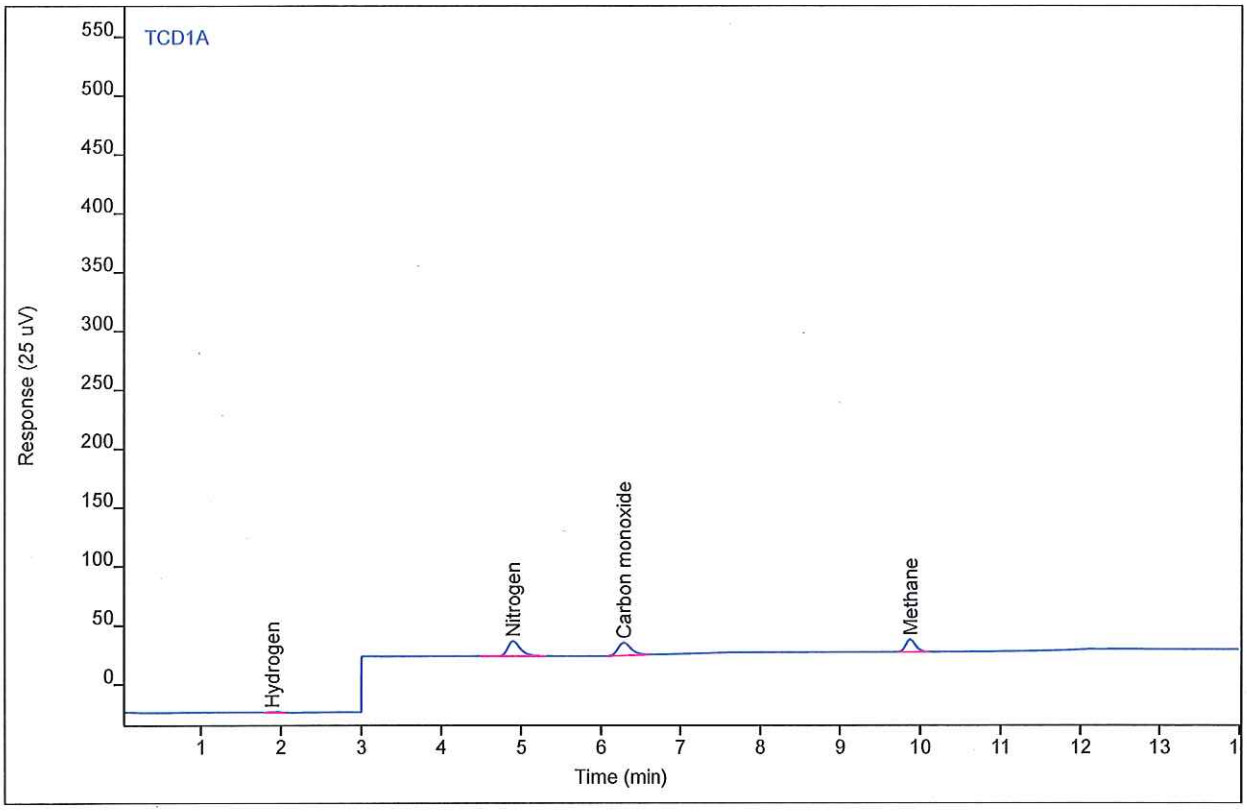


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.91	3.50202	0.38980	0.31295	1	0.31295	%
Nitrogen	BB	4.90	142.085	12.6254	0.37287	1	0.37287	%
Carbon monoxide	BB	6.29	125.419	10.7224	0.37584	1	0.37584	%
Methane	BB	9.88	89.7667	10.5543	0.30375	1	0.30375	%

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
Operator	Justin Guenzler	Printed	4/17/2015 7:15 AM

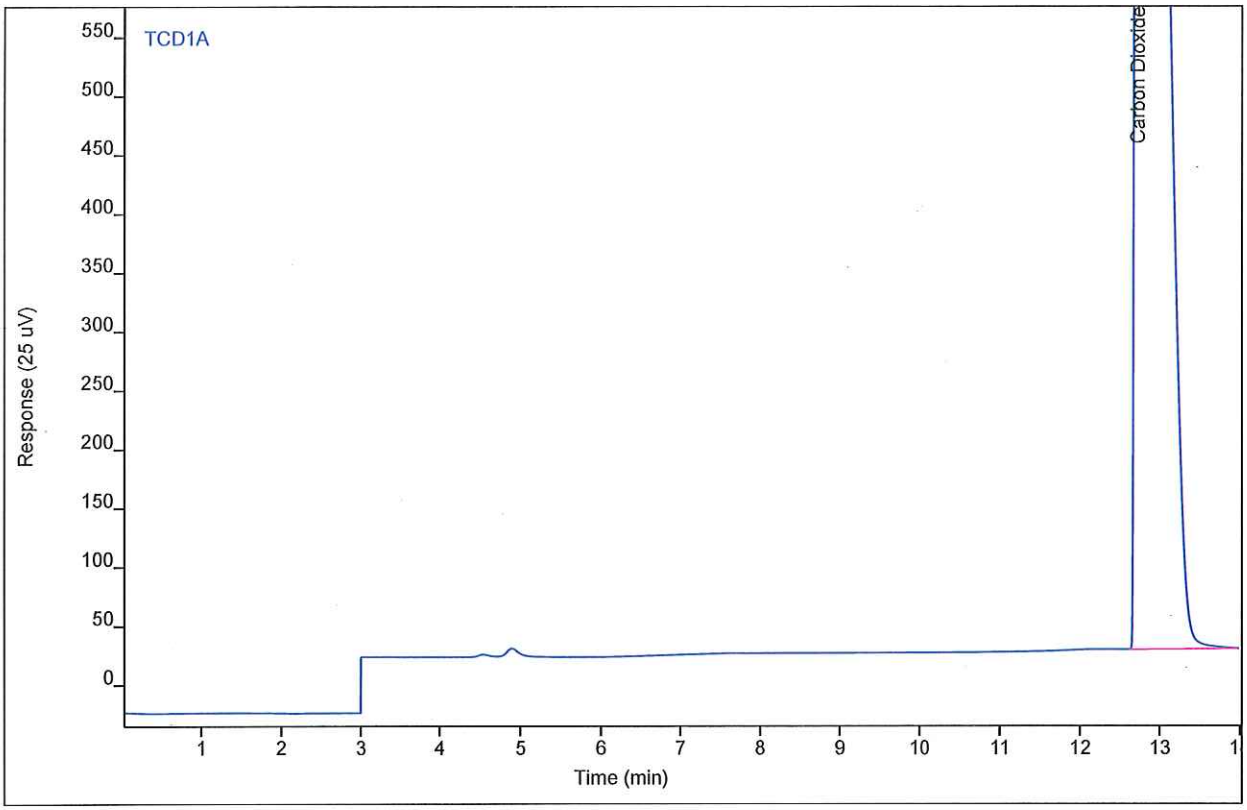


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Hydrogen	MM	1.89	3.46306	0.38870	0.30916	1	0.30916	%
Nitrogen	BB	4.90	143.325	12.6508	0.37612	1	0.37612	%
Carbon monoxide	BB	6.29	125.385	10.7889	0.37574	1	0.37574	%
Methane	BB	9.88	90.8219	10.5619	0.30732	1	0.30732	%

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

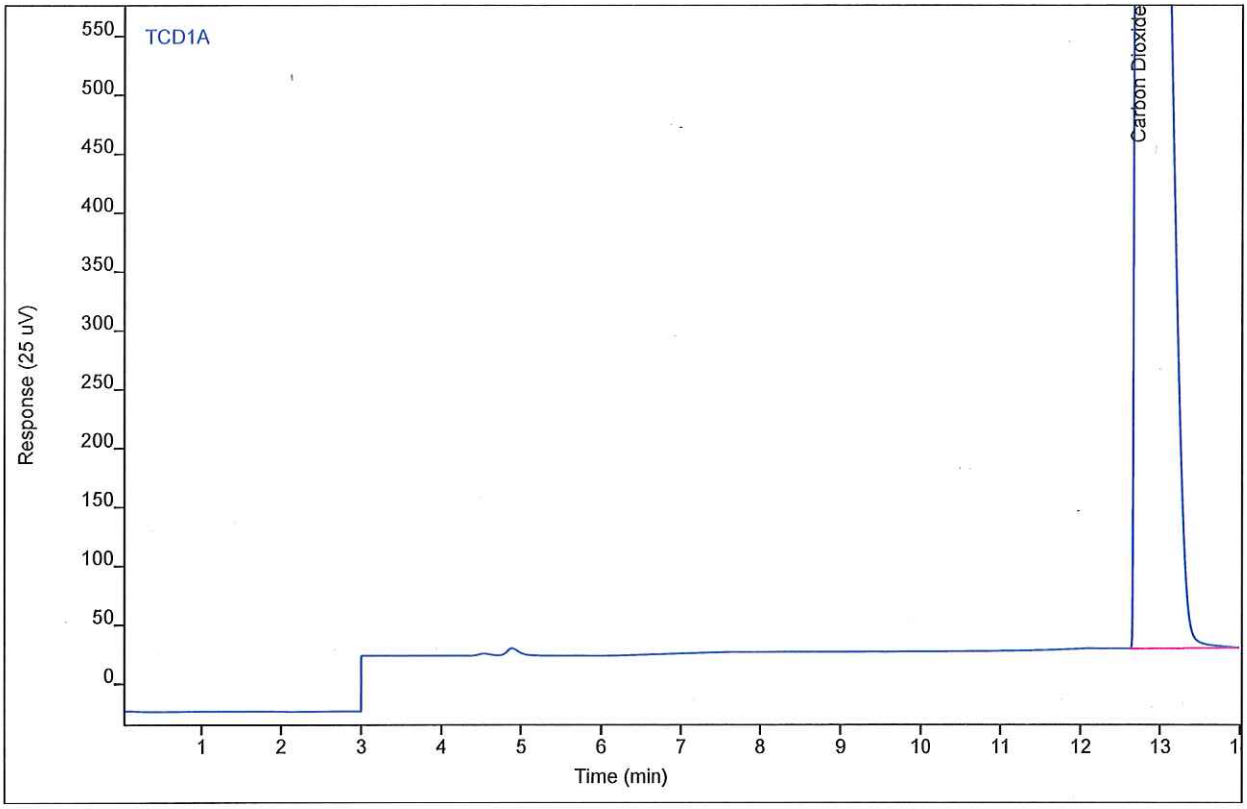


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon Dioxide	MM	12.72	40964.5	2054.92	92.5707	1	92.5707	%

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

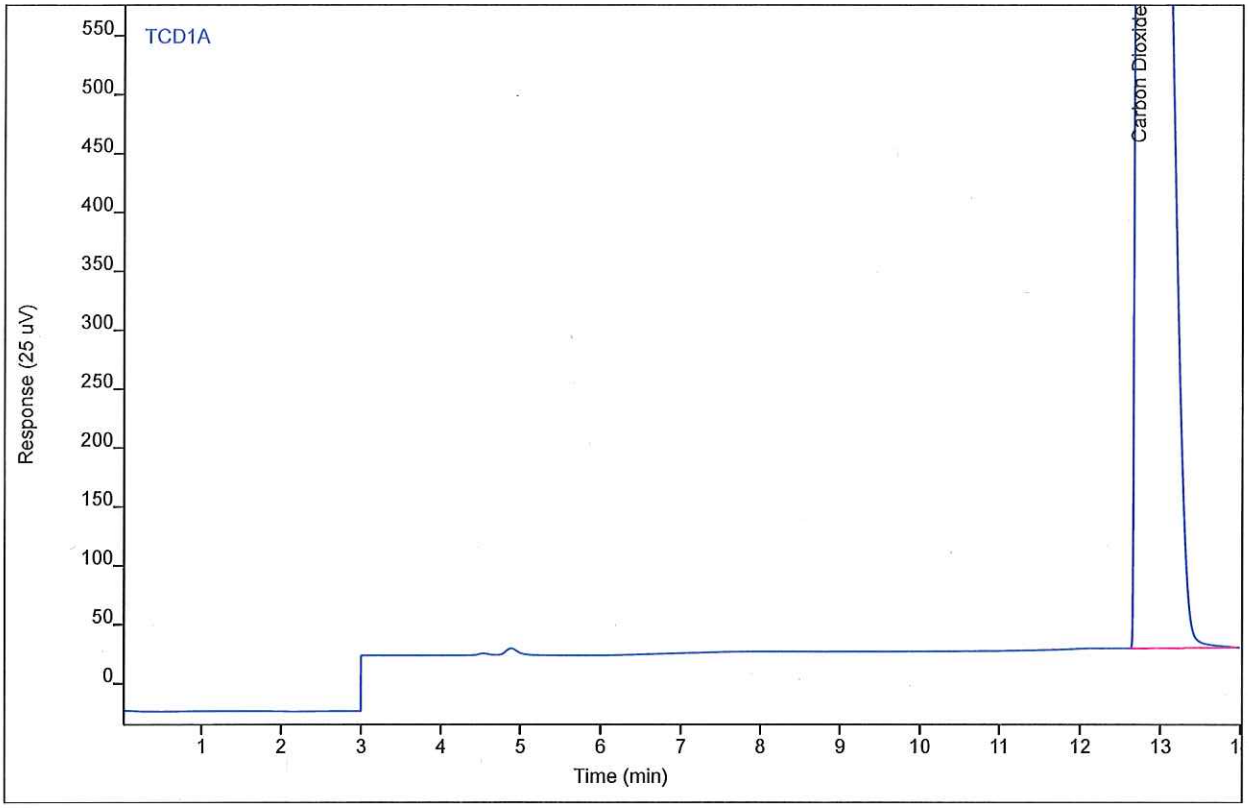


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon Dioxide	MM	12.72	41097.6	2060.12	92.8718	1	92.8718	%

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

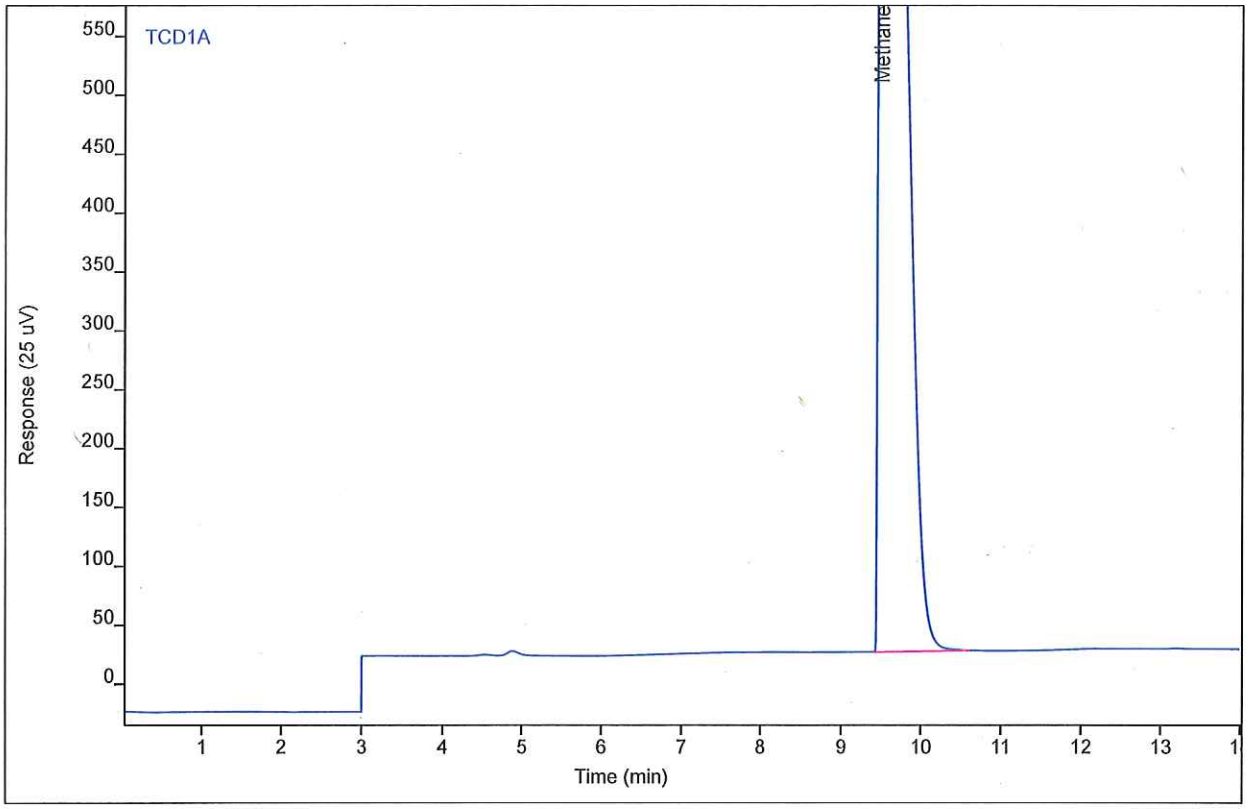


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon Dioxide	MM	12.72	41051.6	2057.94	92.7677	1	92.7677	%

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

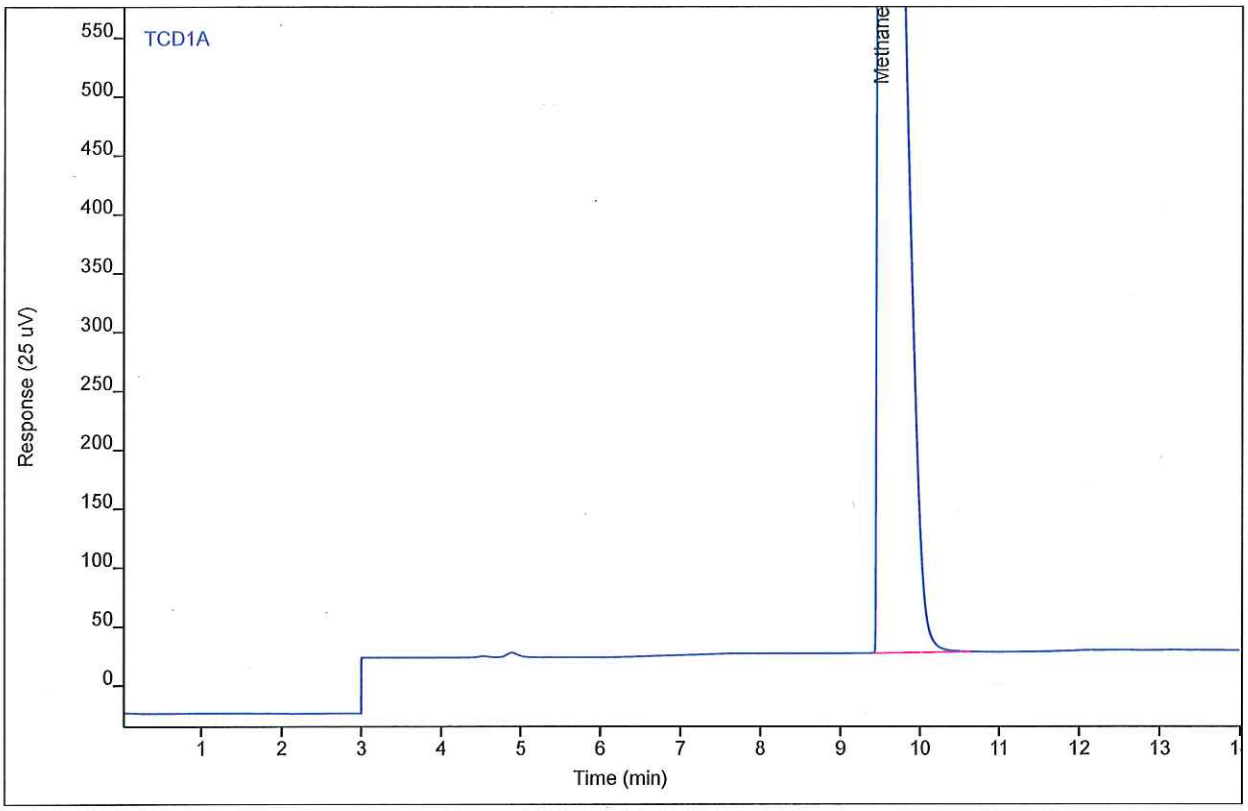


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Methane	MM	9.51	26924.5	1562.80	96.1358	1	96.1358	%

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

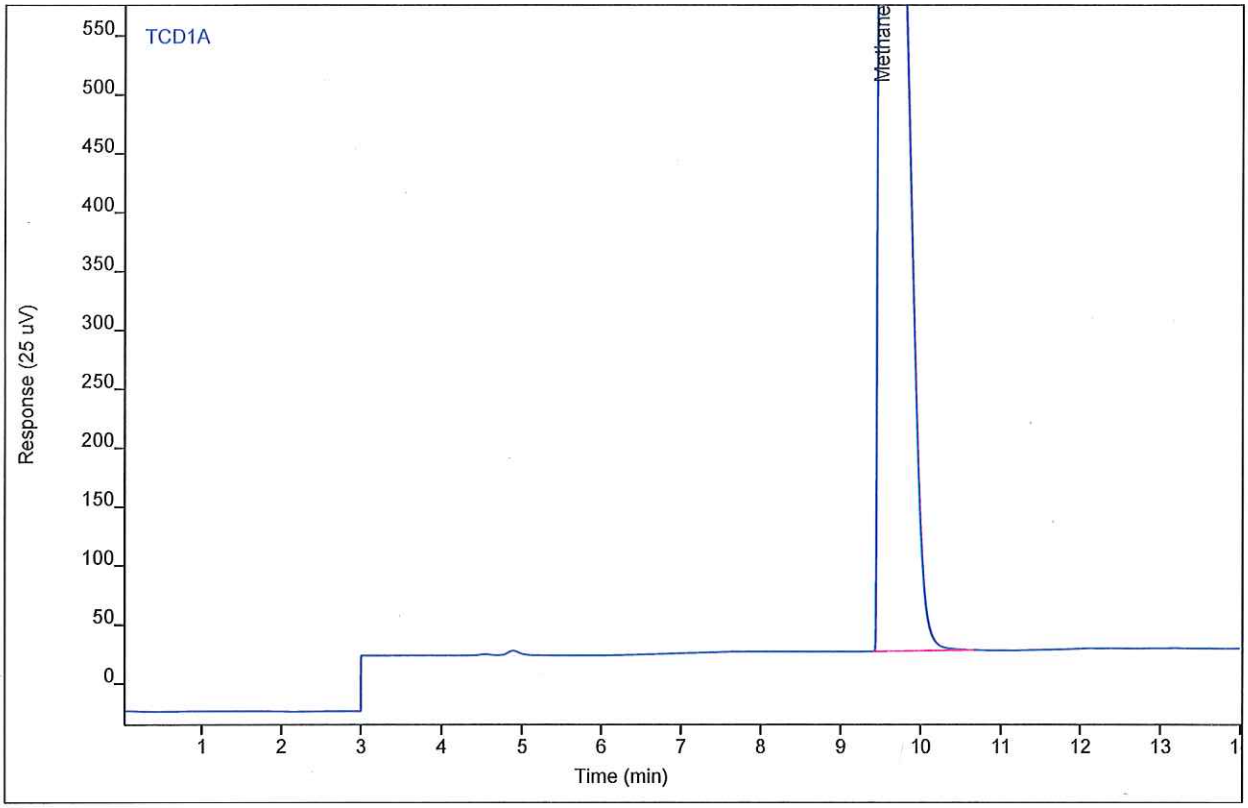


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Methane	MM	9.51	27007.9	1561.74	96.4337	1	96.4337	%

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

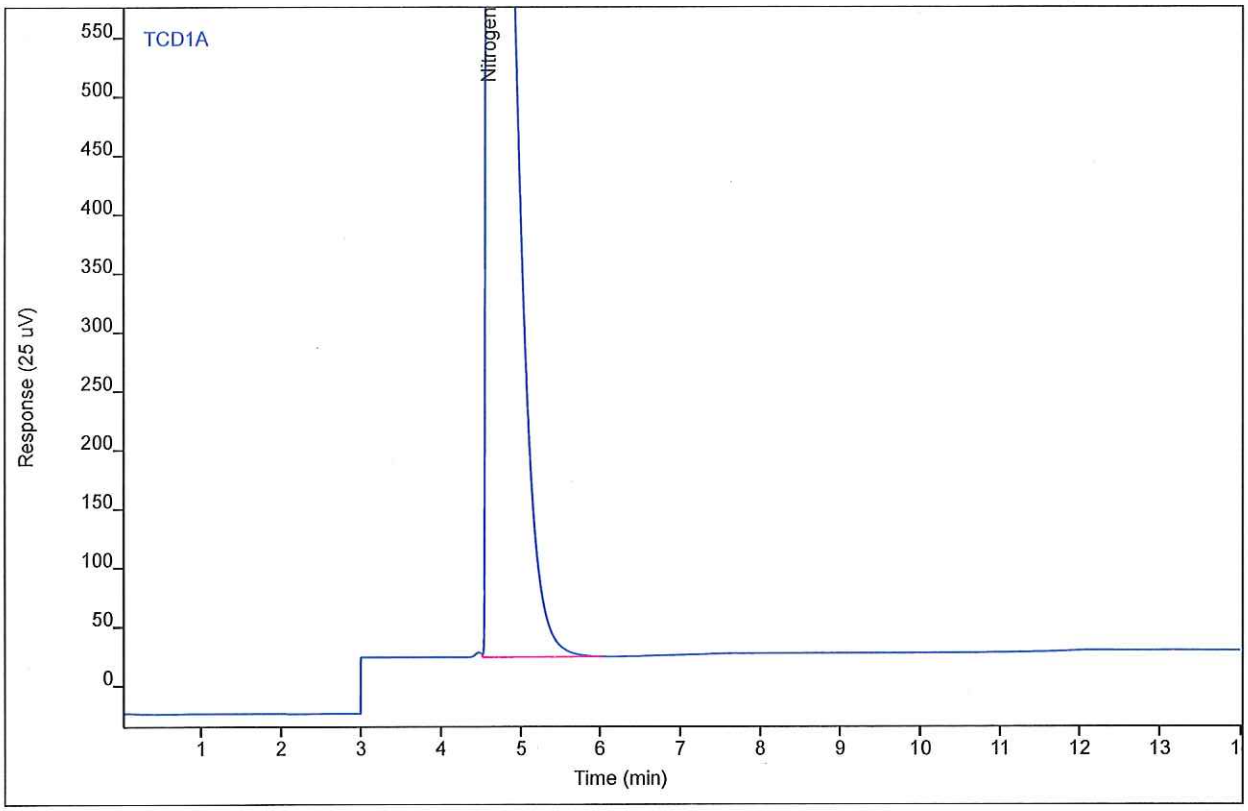


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Methane	MM	9.51	26875.2	1555.55	95.9599	1	95.9599	%

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

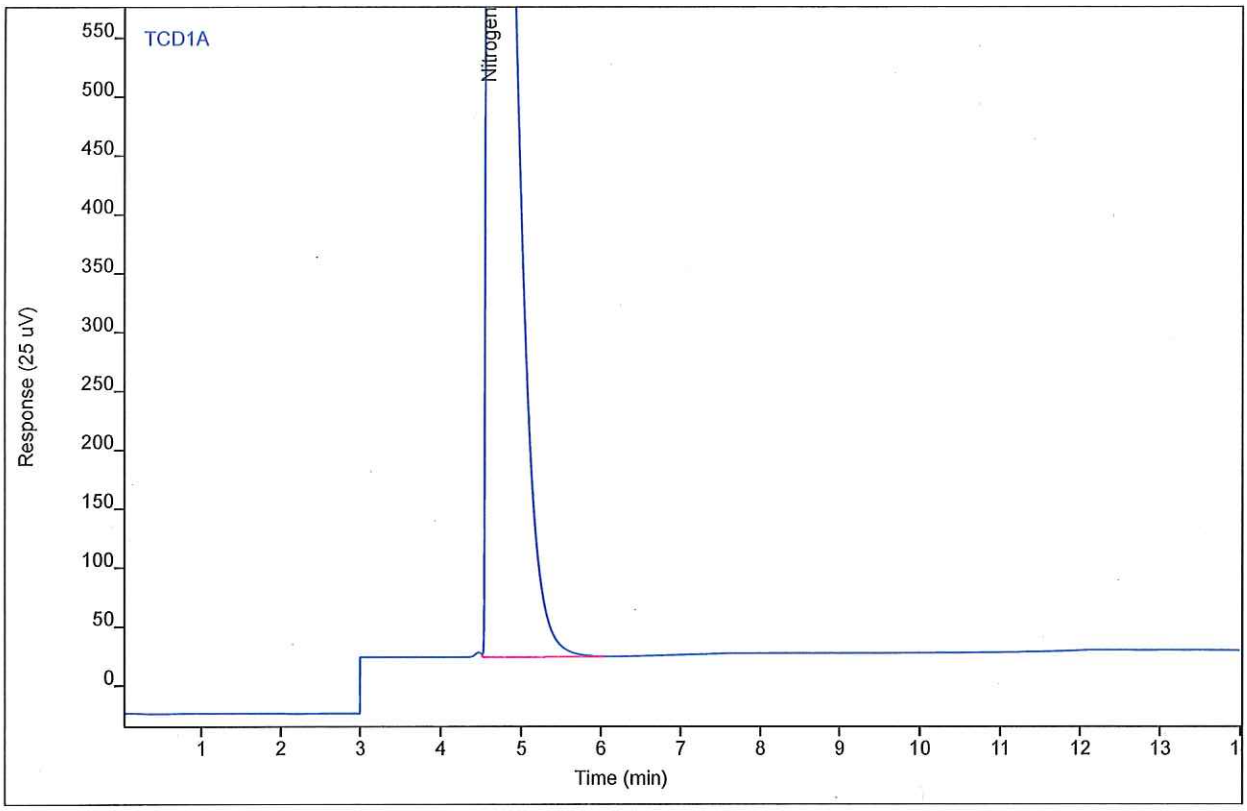


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Nitrogen	VB	4.59	29381.3	1548.91	91.6813	1	91.6813	%

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

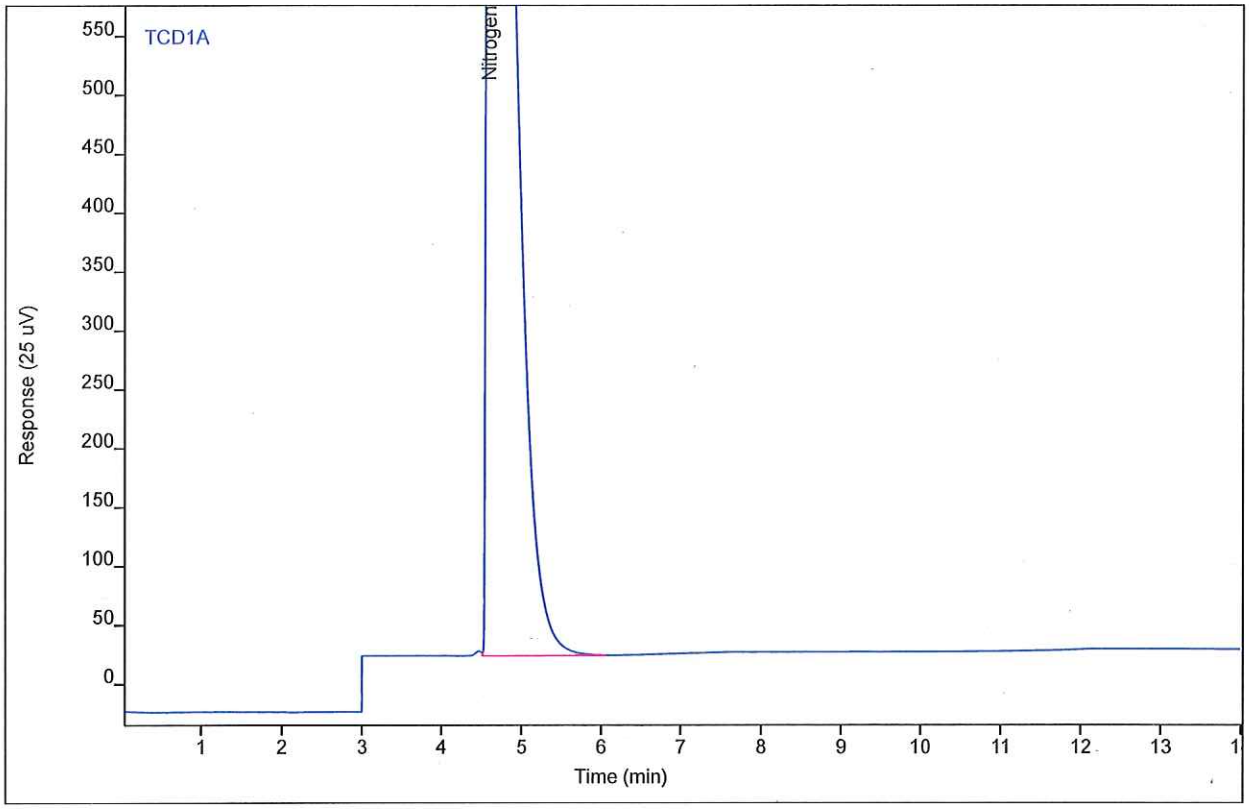


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Nitrogen	VB	4.60	29377.8	1547.66	91.6706	1	91.6706	%

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

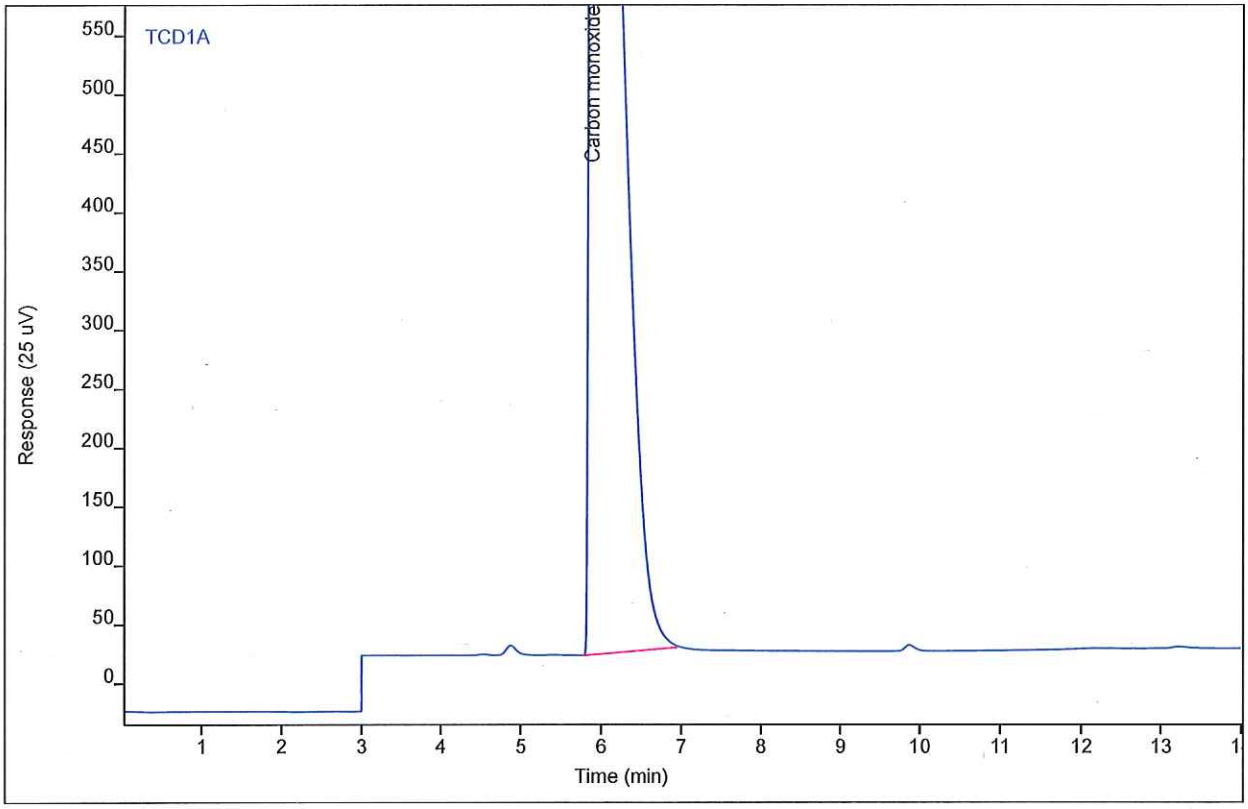


Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Nitrogen	VB	4.59	29317.1	1546.16	91.4811	1	91.4811	%

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



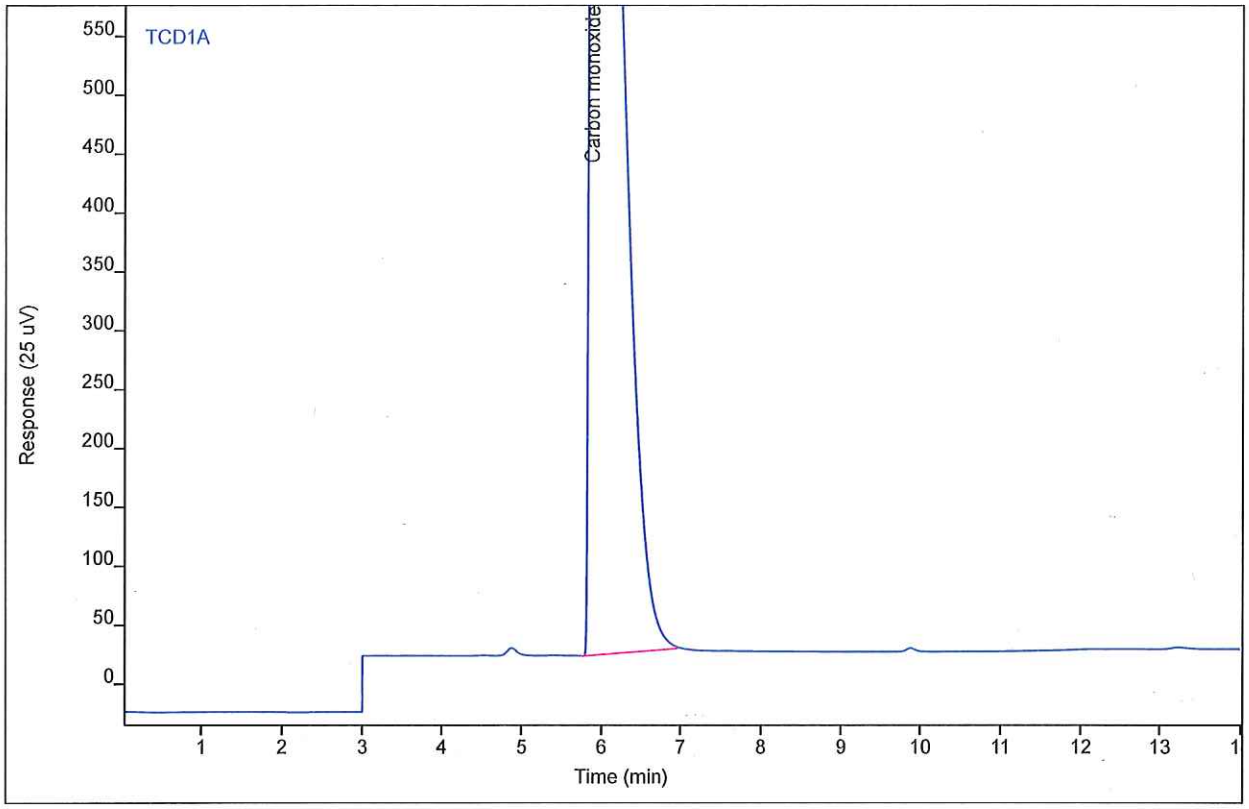
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon monoxide	BB	5.88	29570.8	1288.01	93.1074	1	93.1074	%

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



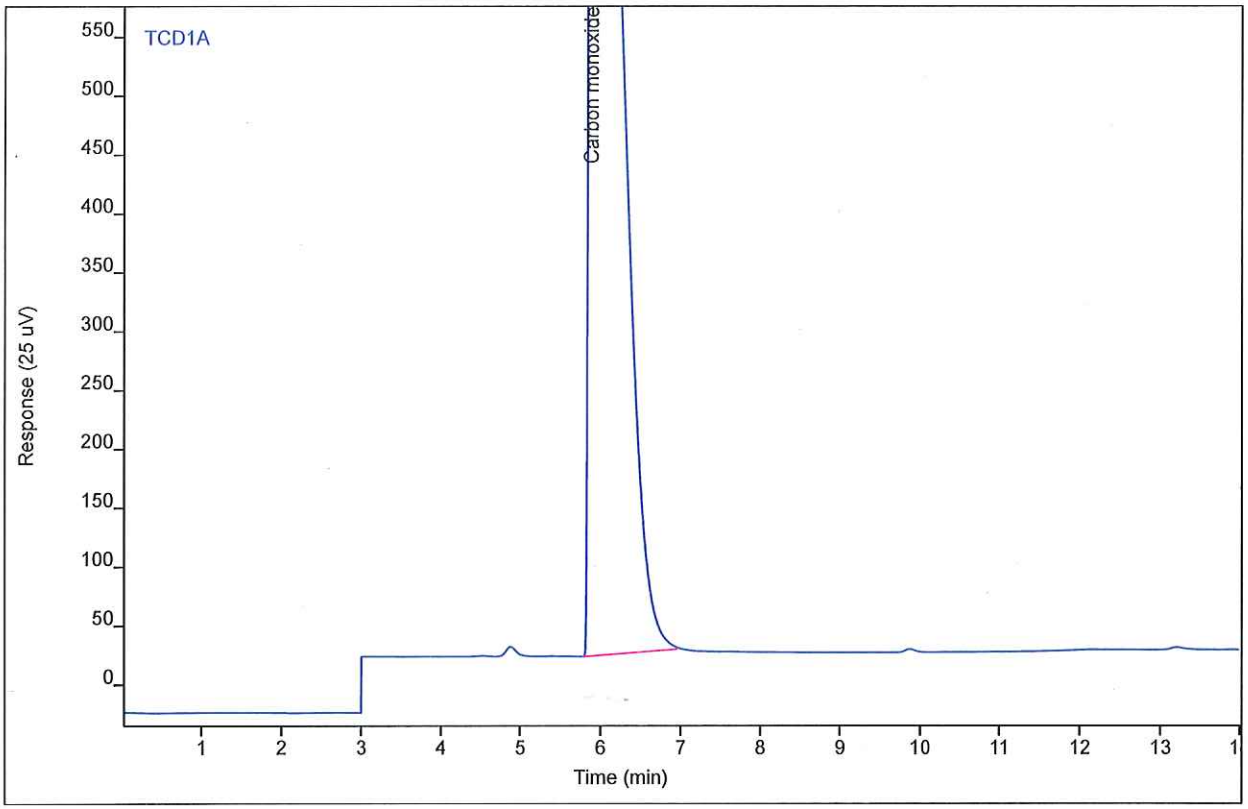
Compound	Type	RT	Area	Height	Amount	DF	SampAmt	Unit
Carbon monoxide	BB	5.88	29718.9	1291.26	93.5739	1	93.5739	%

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.