

TPH Reference Chromatograms [Chromeleon version]

Hill Labs
Hamilton, New Zealand
www.hill-labs.co.nz

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KBI: 30491v7

Summary Slide

- **Total Petroleum Hydrocarbons (TPH)**
- **How is the TPH test carried out?**
- **What does the test report?**
- **Compounds included may be;**
 - **Technical stuff - analysis**
 - **Contents**
 - **Products – Fuels & Lubricants**
 - **Laboratory Standards**

Total Petroleum Hydrocarbons (TPH)

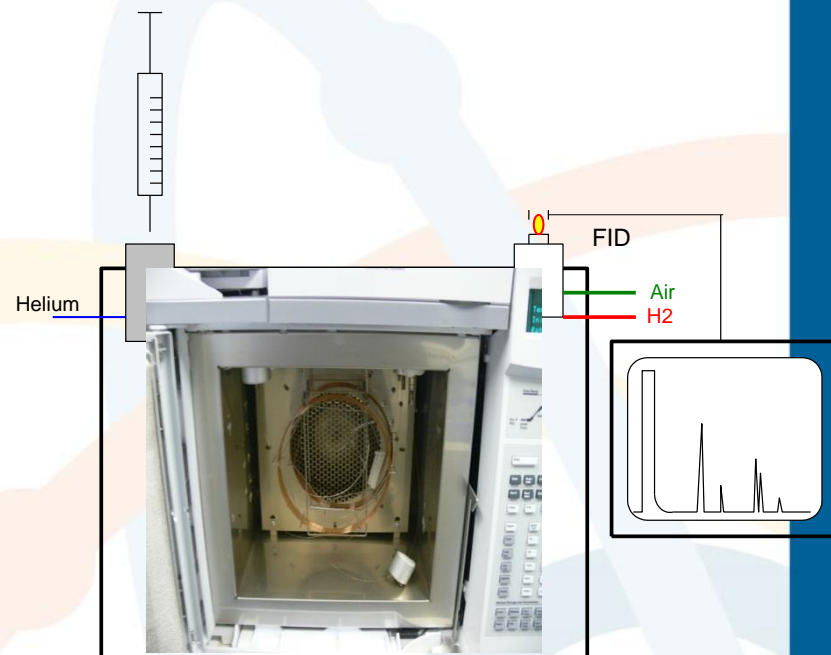
Although the abbreviation TPH is in widespread use for requesting laboratory tests, it is really a misnomer as;

- There is no test available which will determine “Total” ie ALL hydrocarbons
- It does not just determine “Petroleum” hydrocarbons
- Compounds other than “Hydrocarbons” may be included in the results

[Refer to Hill Laboratories Technote on Hydrocarbon Analysis for more information, www.hill-labs.co.nz]

How is the TPH test carried out?

- The sample is extracted or diluted with a ‘non-polar’ solvent (commonly hexane or dichloromethane),
 - the solution treated with silica (to remove polar compounds),
 - then analysed by gas chromatography with a flame ionisation detector (GC-FID),
 - using a non-polar stationary phase (so compounds elute in order of increasing boiling point)
- The GC is typically run using a temperature programme from 40-350C, so compounds with a wide range of boiling points can be determined. BUT, very volatile compounds (BP < n-heptane (C7), about 98C) nor more than C36 (n-hexatriacontane) are NOT usually included (ie it is not Total TPH!). Special methods can be used for these if necessary.
- The output from the detector is plotted to form a “Chromatogram”.



What does the test report?

All compounds which extract into the solvent used, are not removed by the silica, and pass through the GC column under the conditions used will be included.

Because much of this testing is for the petroleum industry, numerical results are reported in 'carbon bands', C7-C9 (petrol range), C10-C24 (diesel range) and C24-C36 (oil range), plus a total of these three.

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Because much of this testing is for the petroleum industry, numerical results are reported in 'carbon bands', C7-C9 (petrol range), C10-C24 (diesel range) and C24-C36 (oil range), plus a total of these three.

Compounds included may be;

- **Hydrocarbons;**
 - **petroleum** oil based hydrocarbons, such as natural gas, LPG, petrol, kerosene, jet fuel, diesel, fuel oils, bunker oils, lubricating oil, transformer oil, greases, asphalt, and bitumen
 - **natural** living sources, such as terpenes (eg rubber, pinene, limonene, camphor), phytane, pristane, squalane and squalene.
- **Other compounds;**
 - pesticides
 - plasticisers
 - solvents
 - surfactants
 - phenols
 - etc, etc

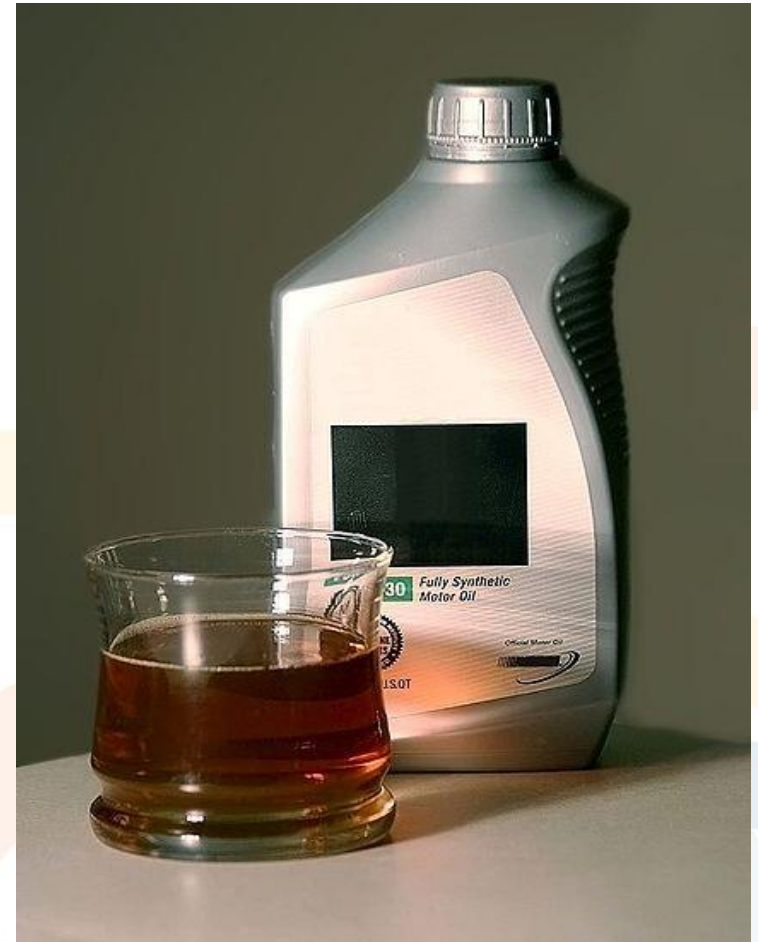
Technical stuff - analysis

- **Analysis by GC-FID**
- **Column**
 - **BPX5 Capillary Column (15m x 0.32mm ID x 0.25µm film thickness), P/N 065255**
 - *[NB: GC-MS is DB-XLB column, 20mx0.18mm]*
- **Temperature programme**
 - **35C for 1min**
 - **to 225C @ 60C/min**
 - **to 300C @ 50C/min**
 - **to 340C @ 40C/min, hold 2.3 min**

Products – Fuels & Lubricants



Old fuel pumps, Soviet Union, 1959

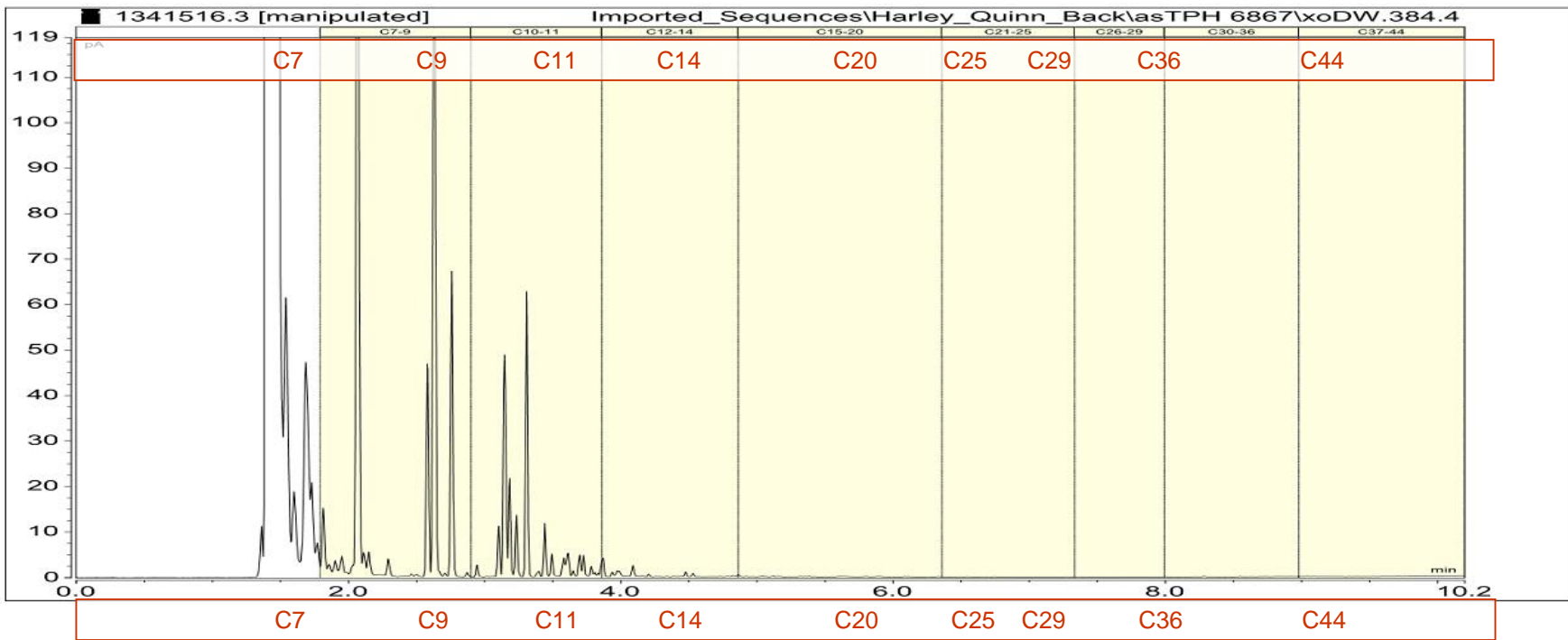


Petrol 91

1341516.3

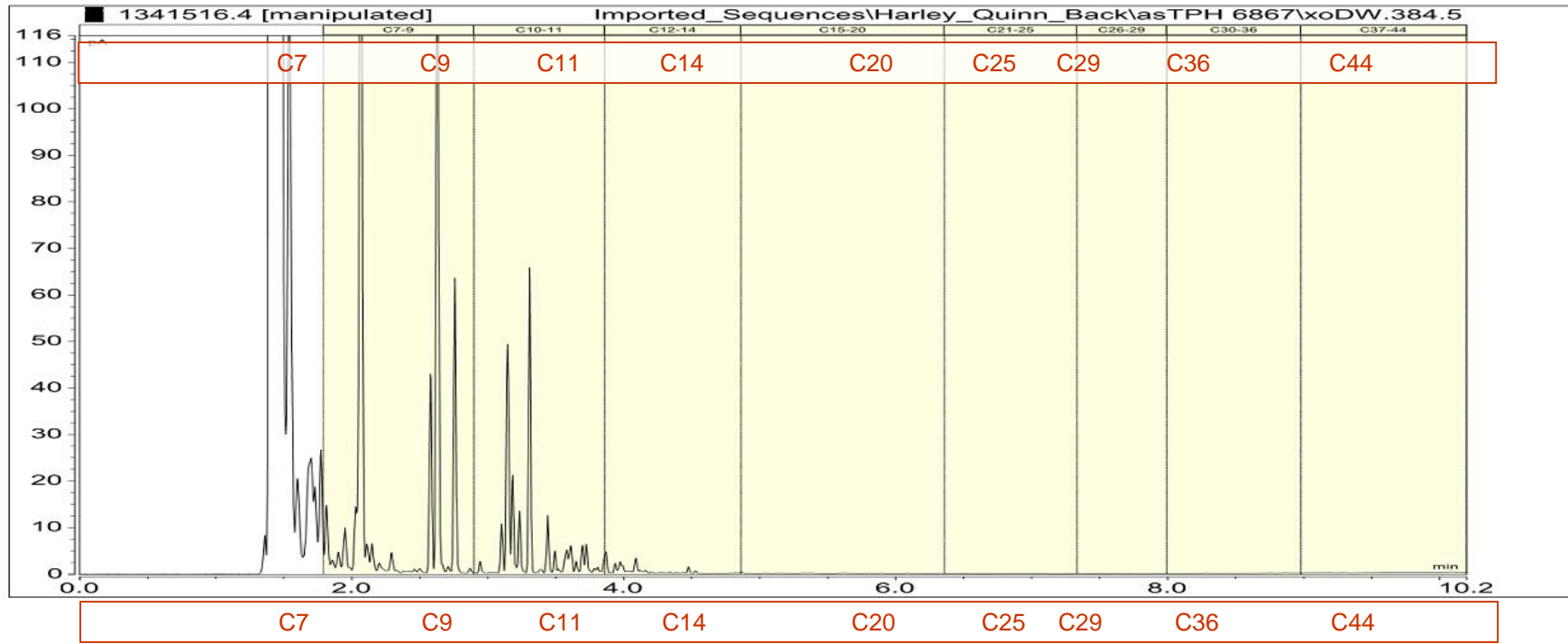
Petrol 91 (Challenge)

Client Chromatogram for GC Scan



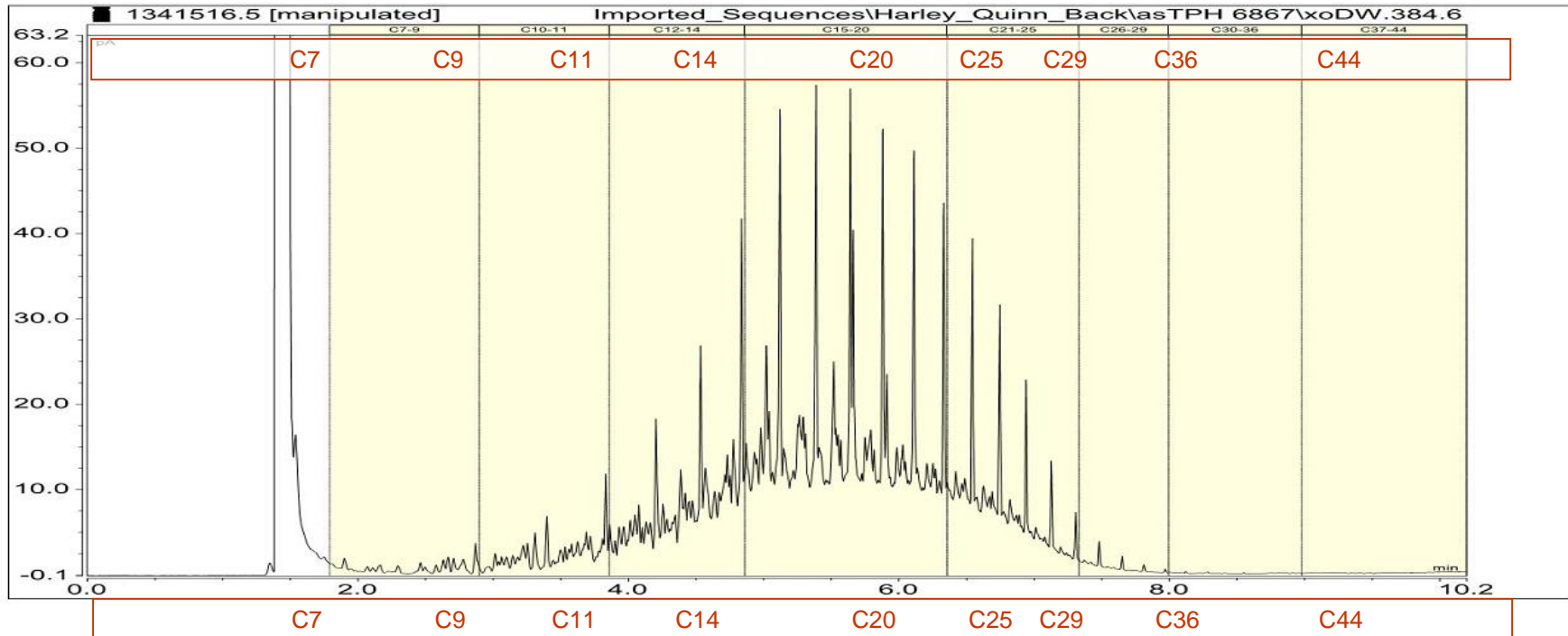
Petrol 95

1341516.4
Petrol 95 (Challenge)
Client Chromatogram for GC Scan



Diesel

1341516.5
Diesel (Challenge)
Client Chromatogram for GC Scan

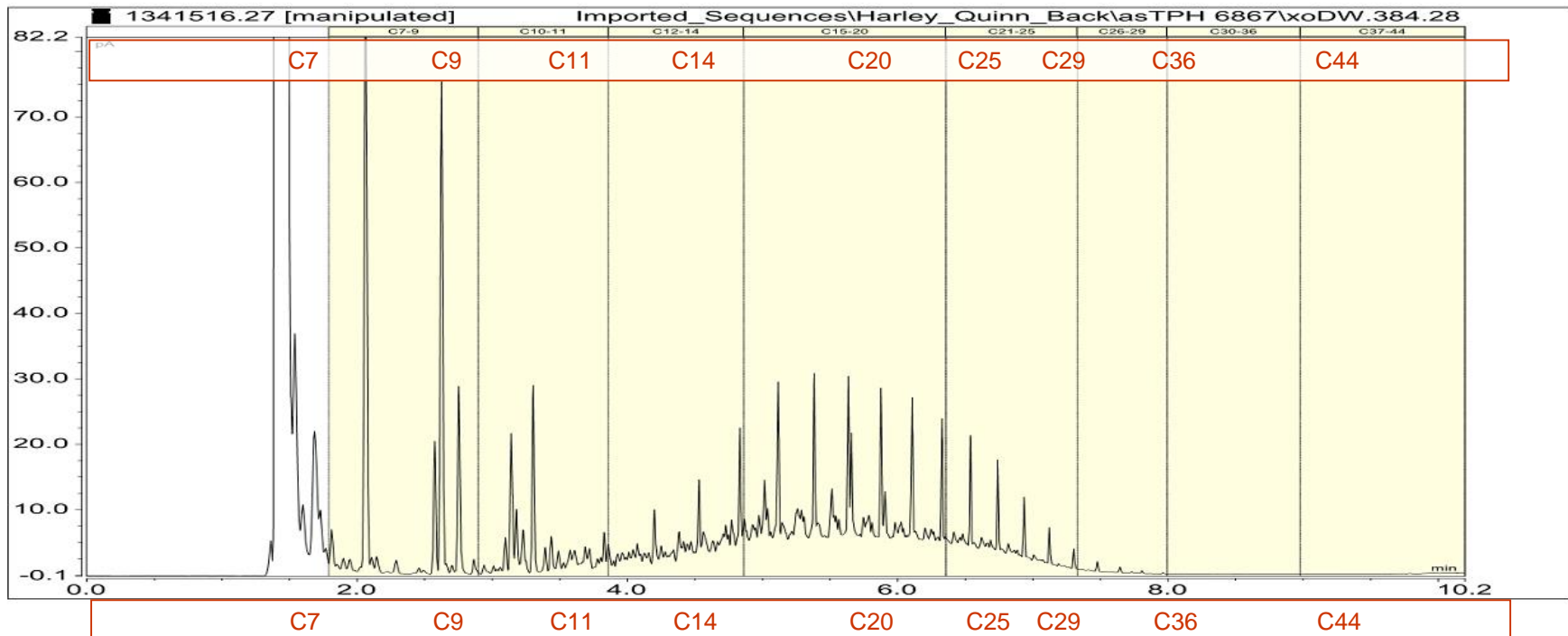


Petrol: Diesel 50:50

1341516.27

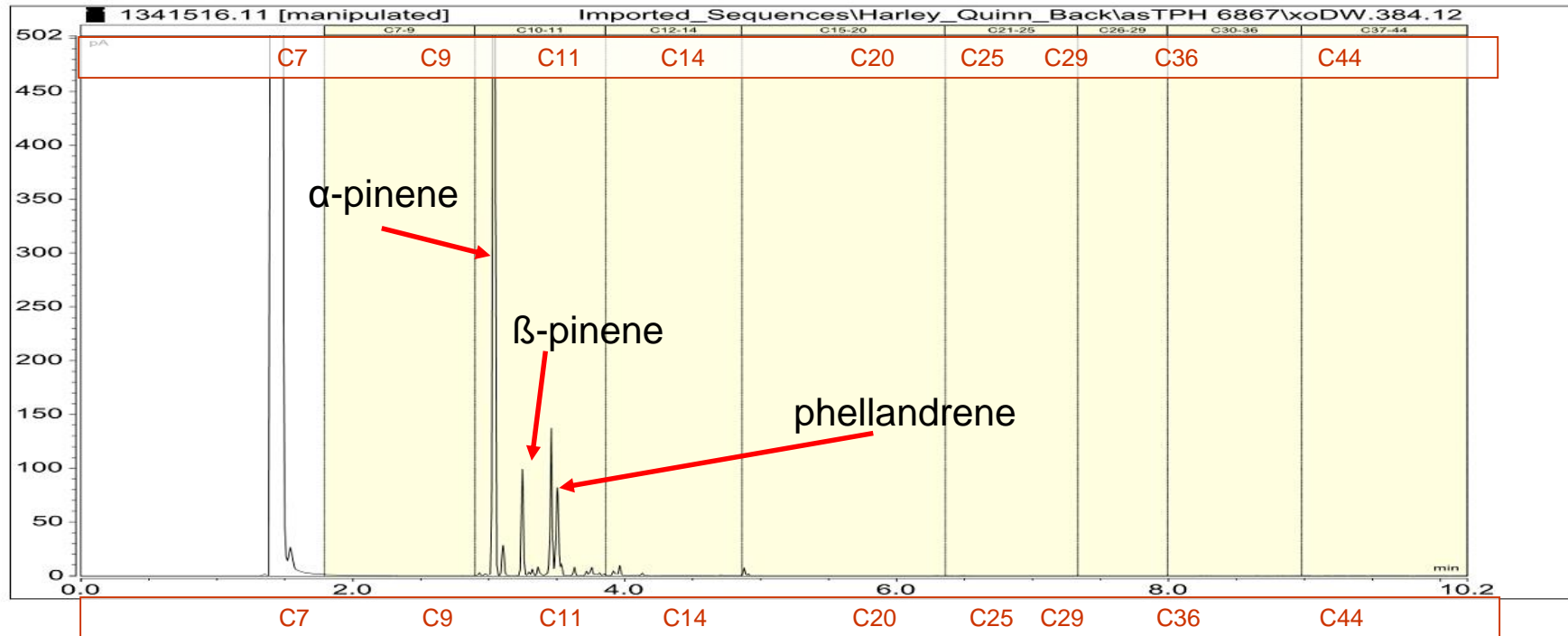
50:50 petrol:diesel

Client Chromatogram for GC Scan



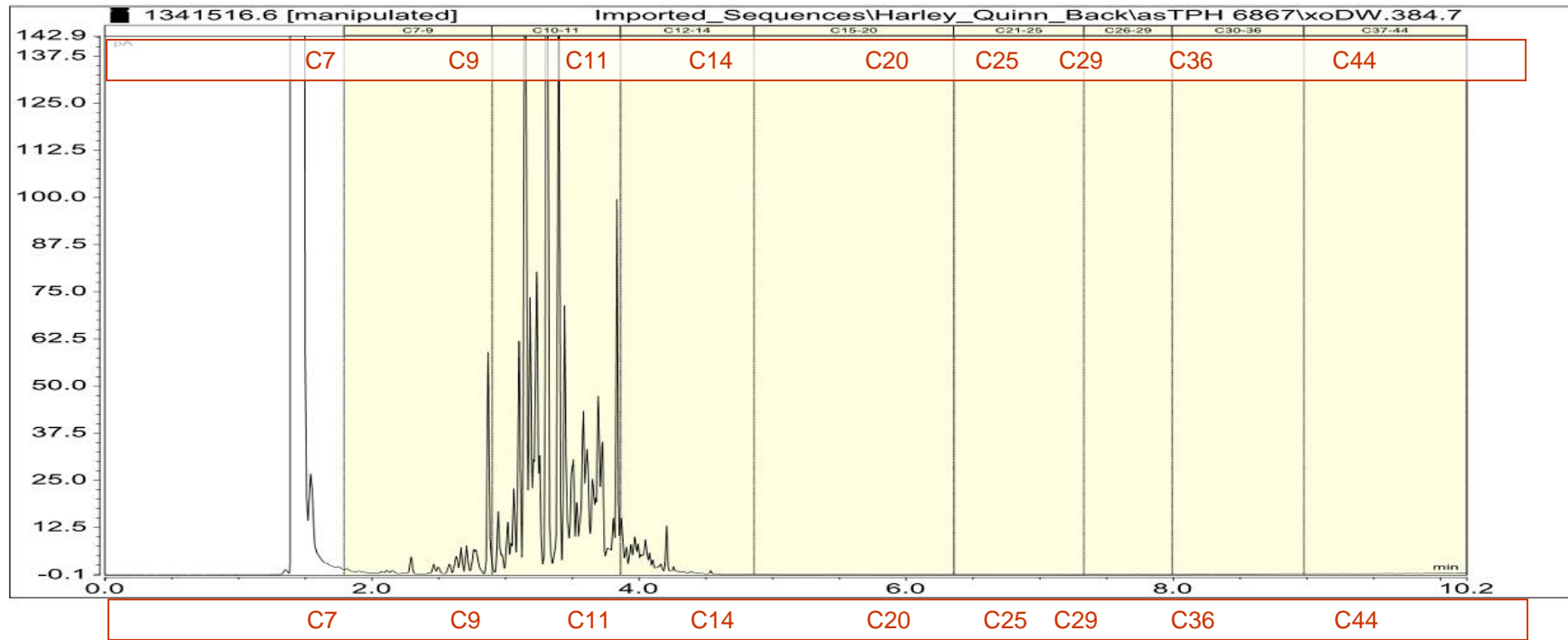
Gum Turpentine

1341516.11
Gum Turpentine
Client Chromatogram for GC Scan



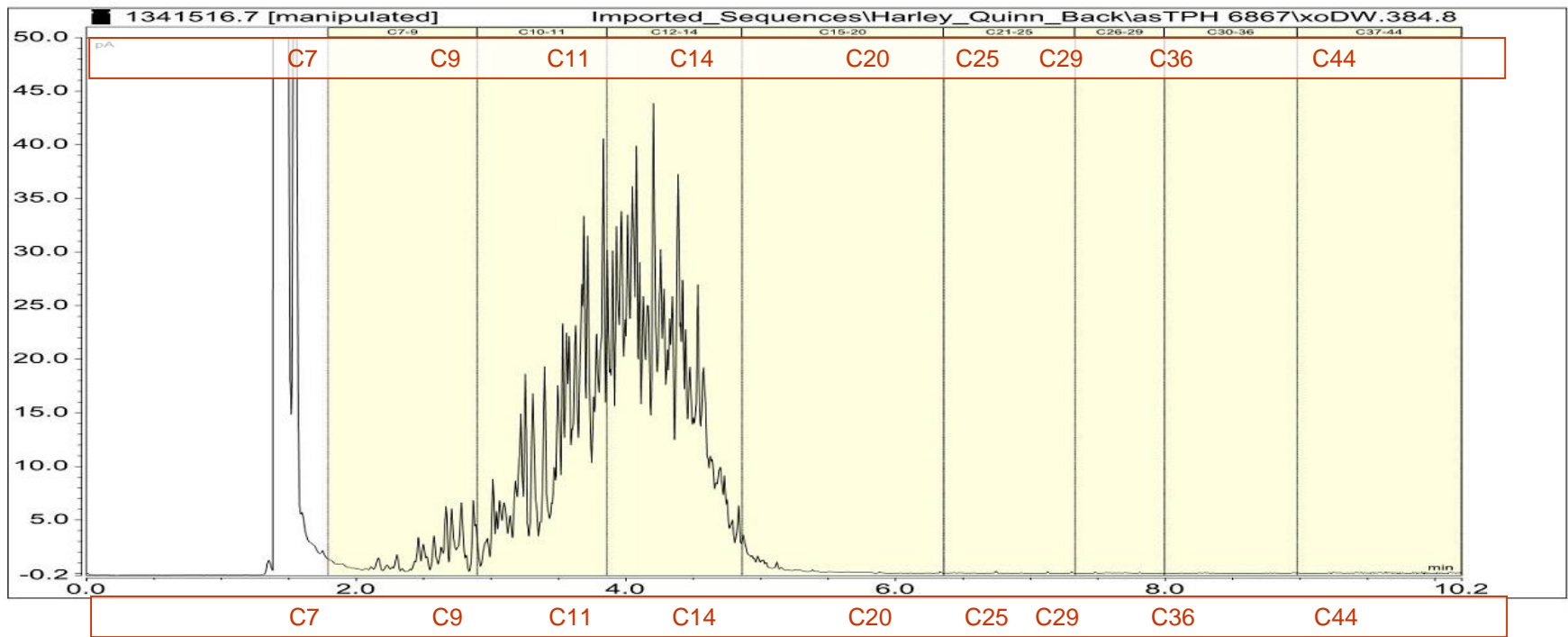
Mineral Turps

1341516.6
 Mineral Turps
 Client Chromatogram for GC Scan



Kerosene

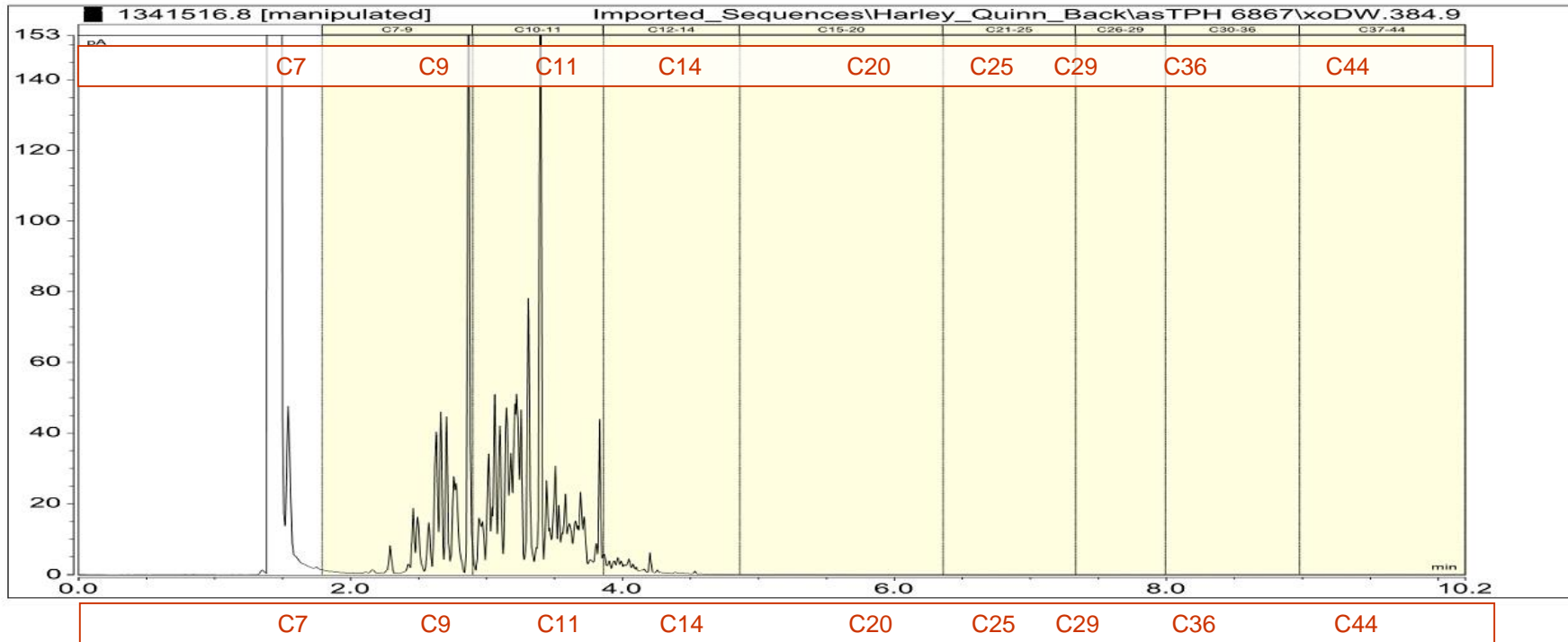
1341516.7
 Kerosene
 Client Chromatogram for GC Scan



Dry Cleaner (LAWS)

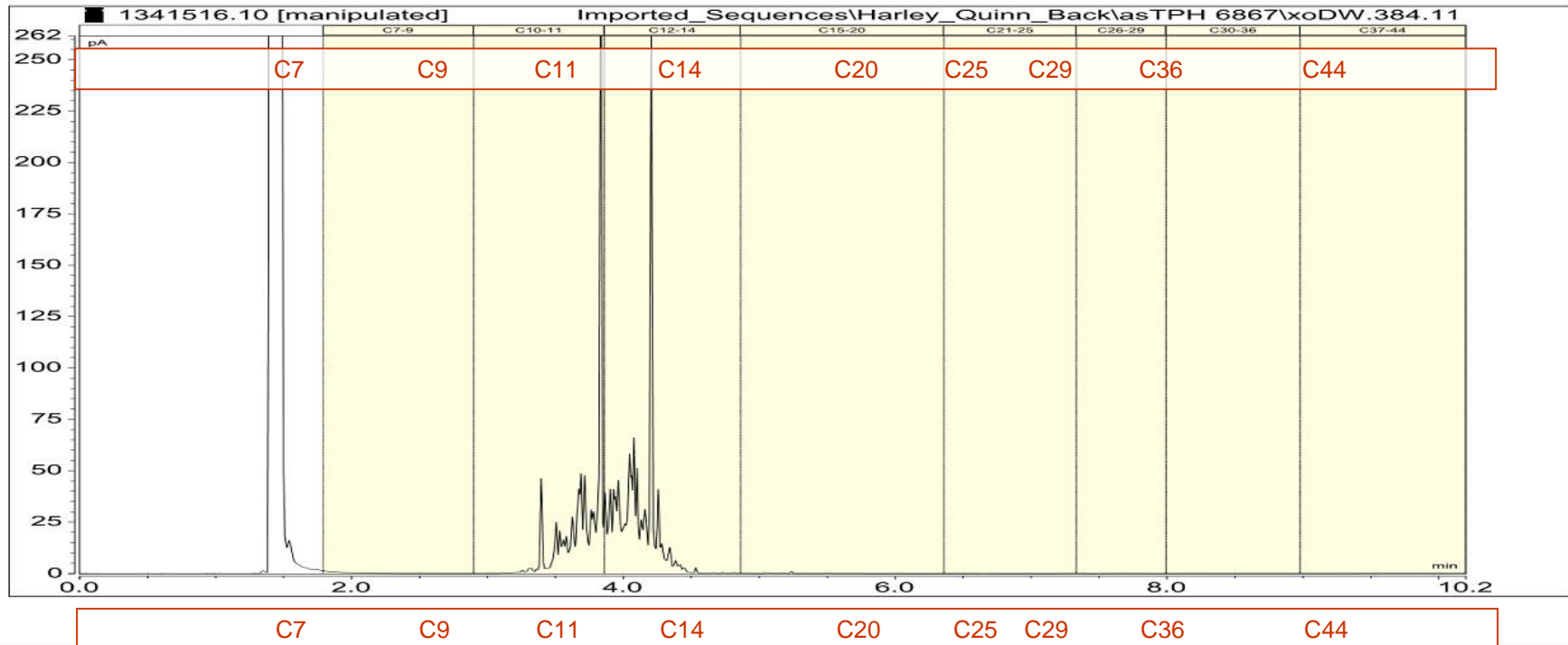
[Low Aromatic White Spirit]

1341516.8
Dry cleaner (LAWS)
Client Chromatogram for GC Scan



Citronella Oil

1341516.10
Citronella Oil
Client Chromatogram for GC Scan



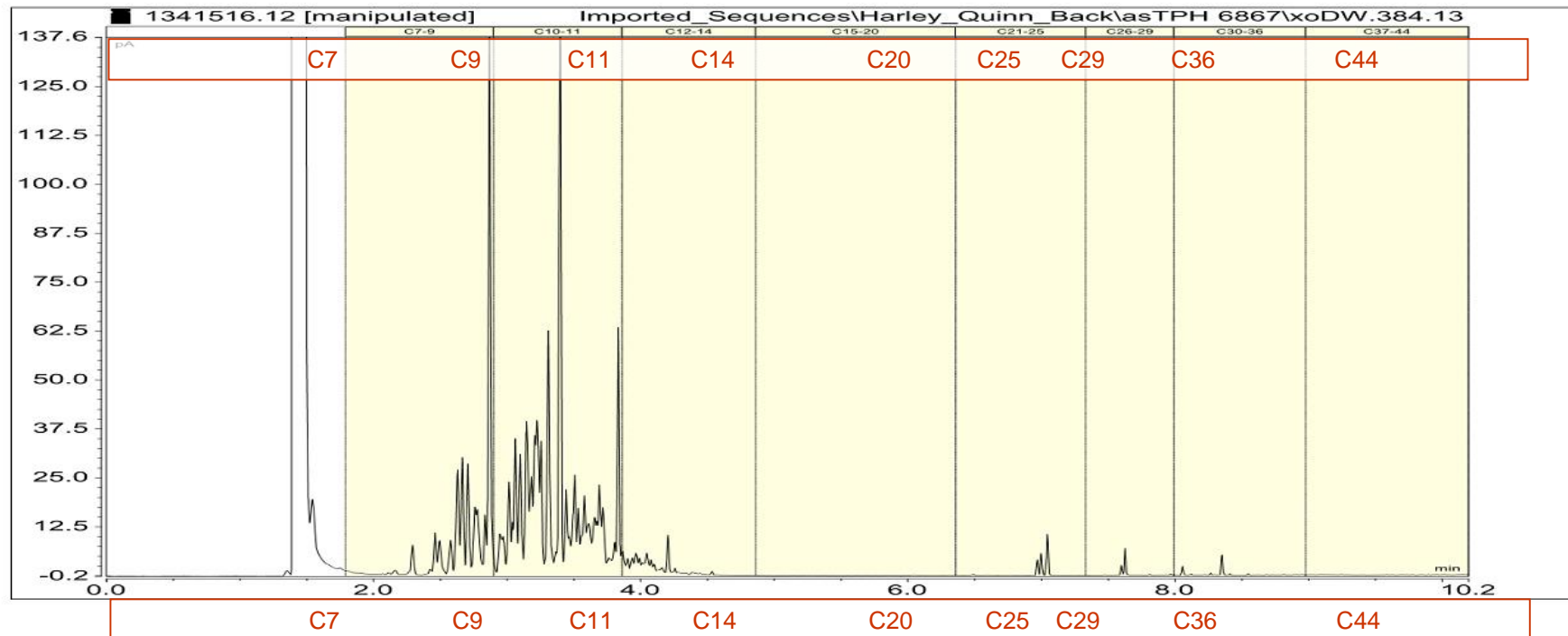
LOSP

Light Organic Solvent Preservative Timber Treatment

1341516.12

LOSP

Client Chromatogram for GC Scan

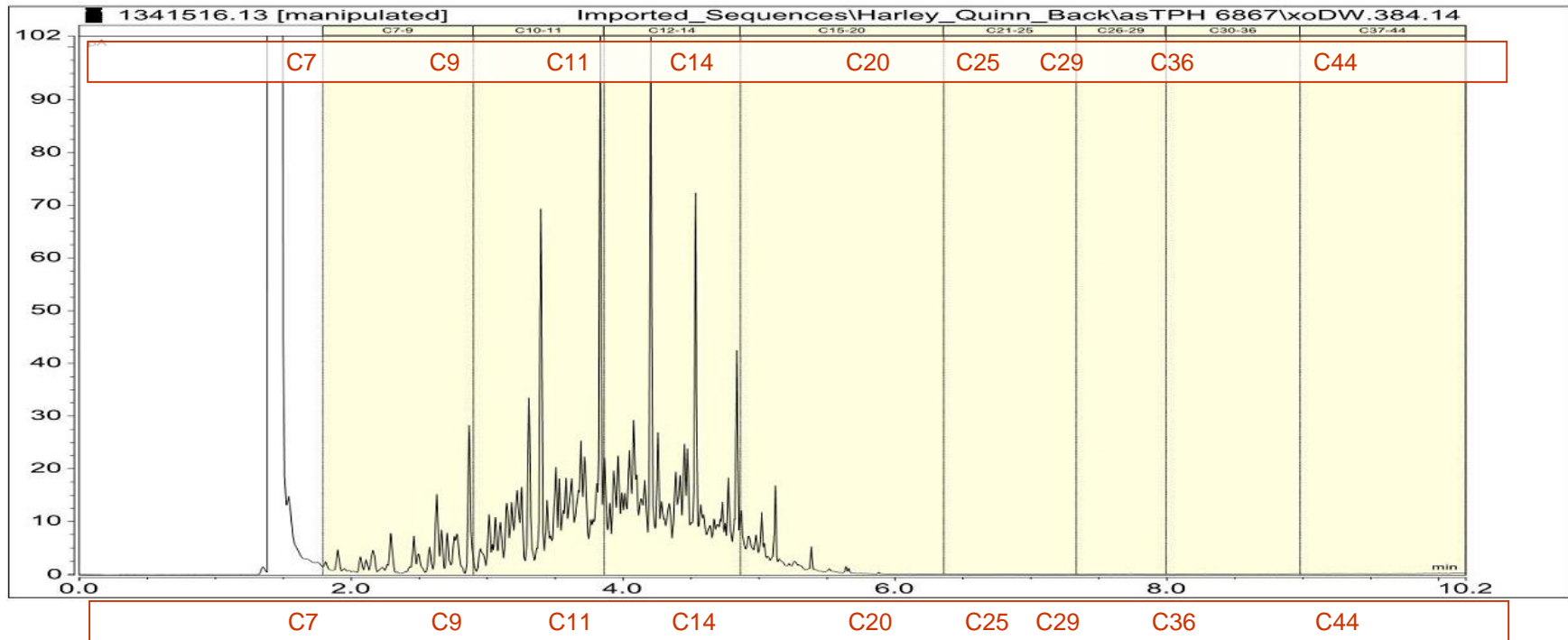


Jet A1

1341516.13

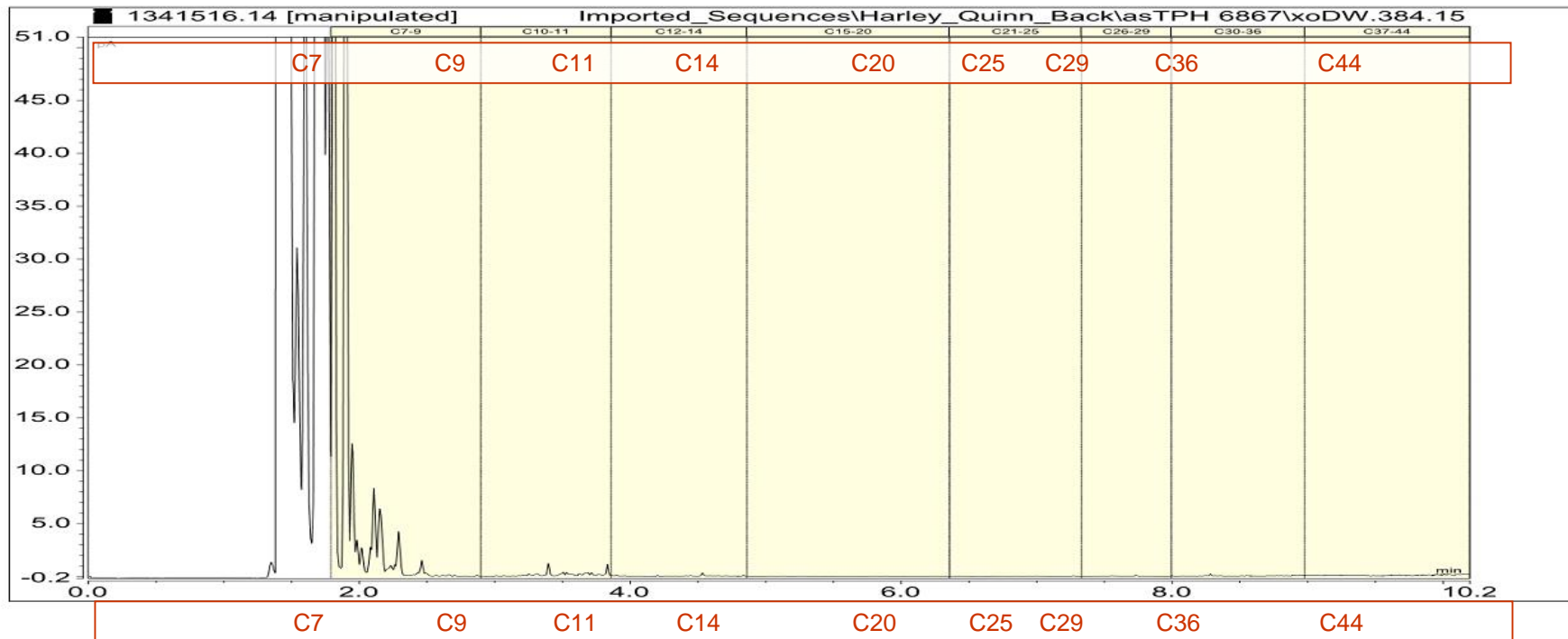
Jet A1

Client Chromatogram for GC Scan



Pegasol 1425

1341516.14
Pegasol 1425
Client Chromatogram for GC Scan

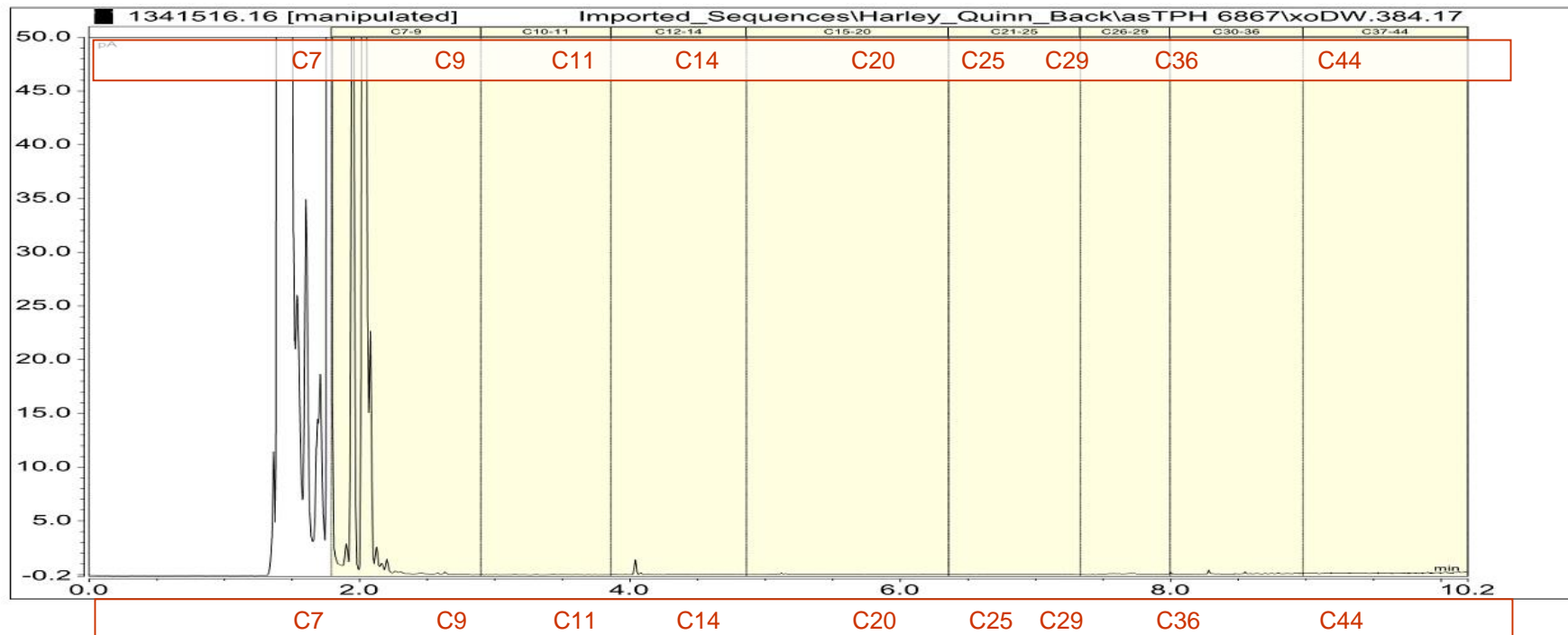


Avgas

1341516.16

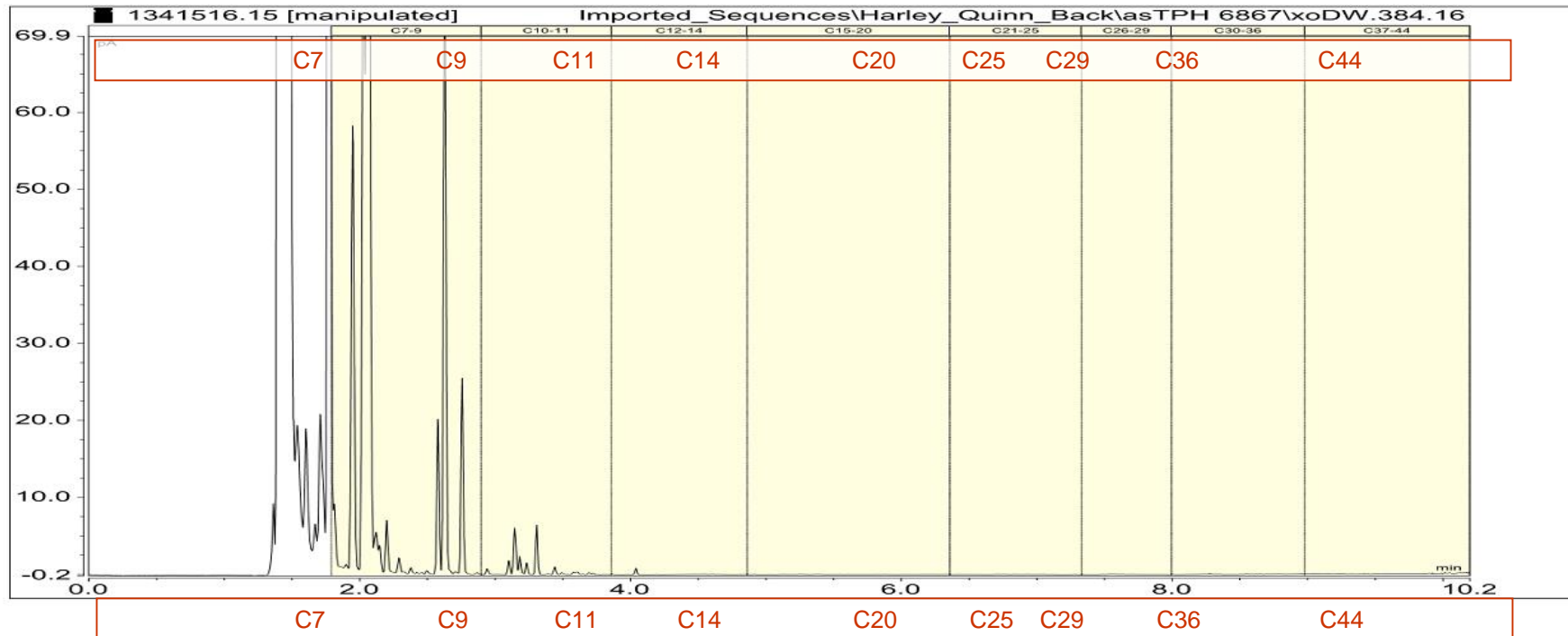
Avgas

Client Chromatogram for GC Scan



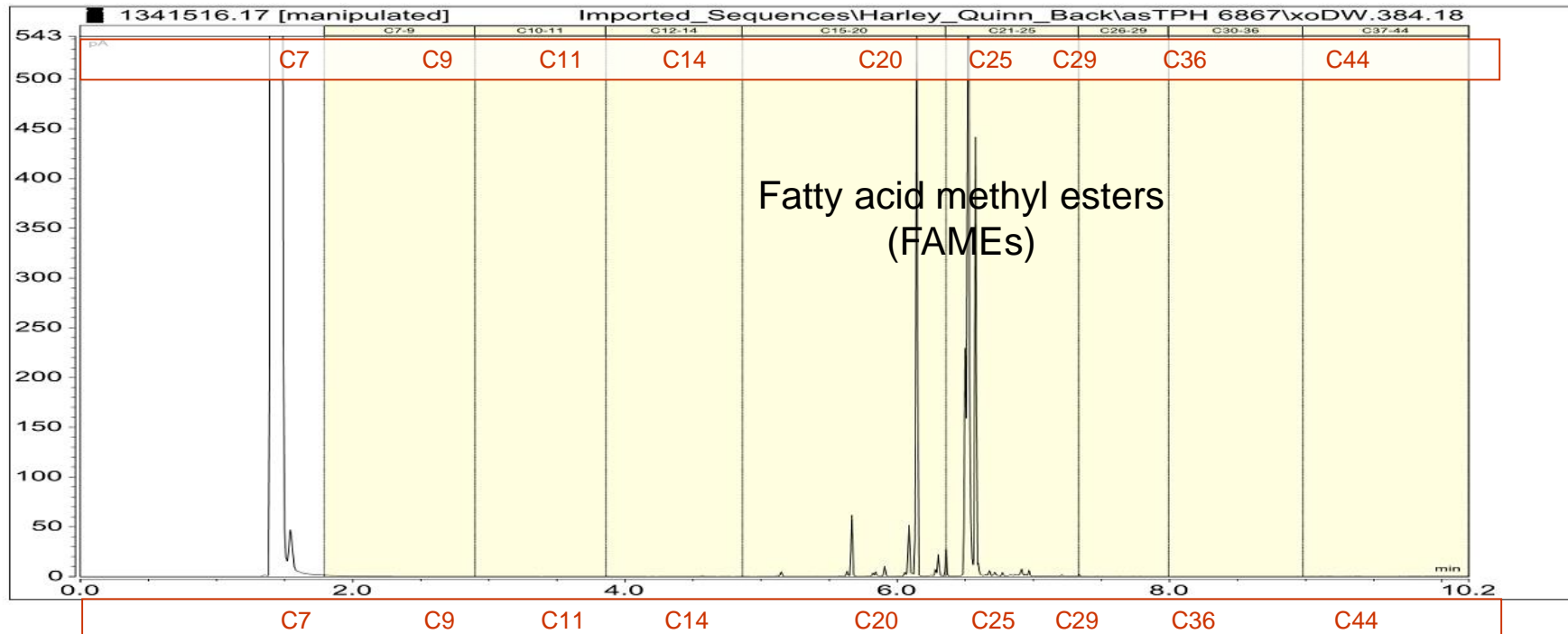
Avgas 100 LL

1341516.15
Avgas 100 LL
Client Chromatogram for GC Scan



Biodiesel

1341516.17
Biodiesel
Client Chromatogram for GC Scan

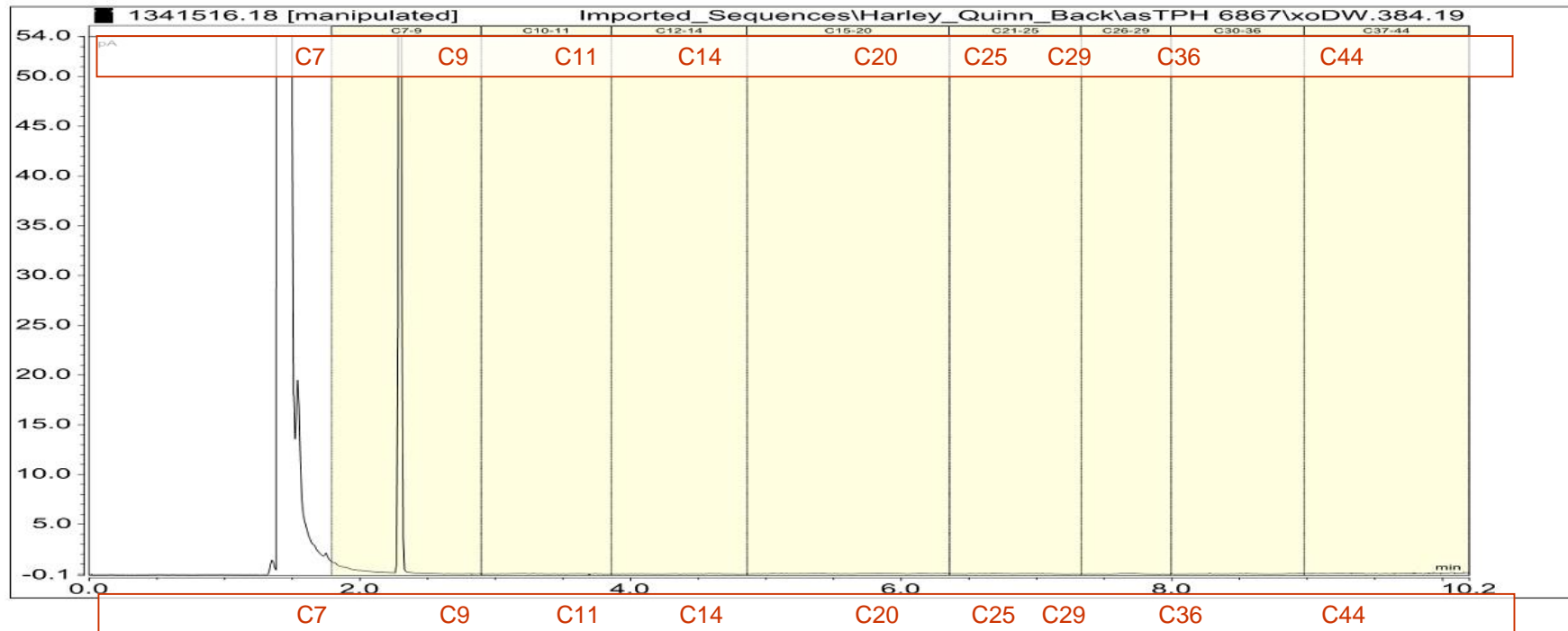


Perchloroethylene

1341516.18

Perchloroethylene

Client Chromatogram for GC Scan

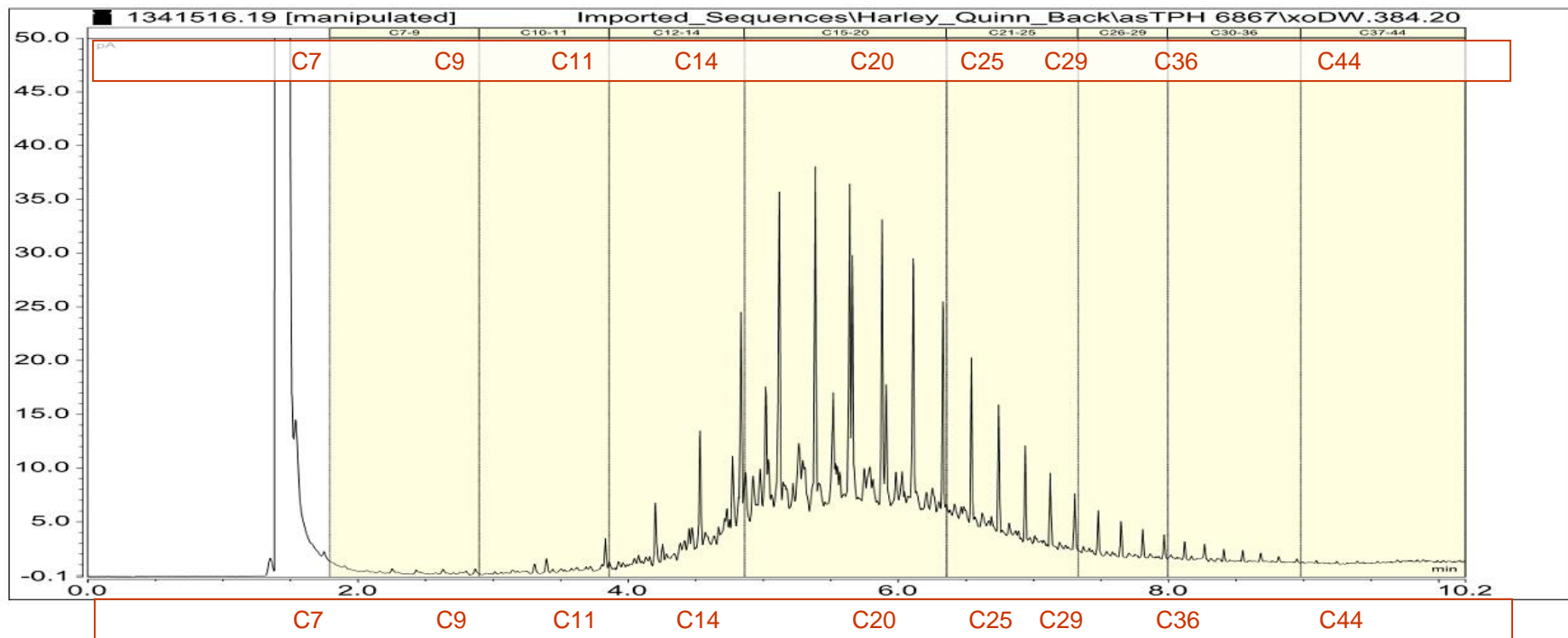


Light Fuel oil (LFO)

1341516.19

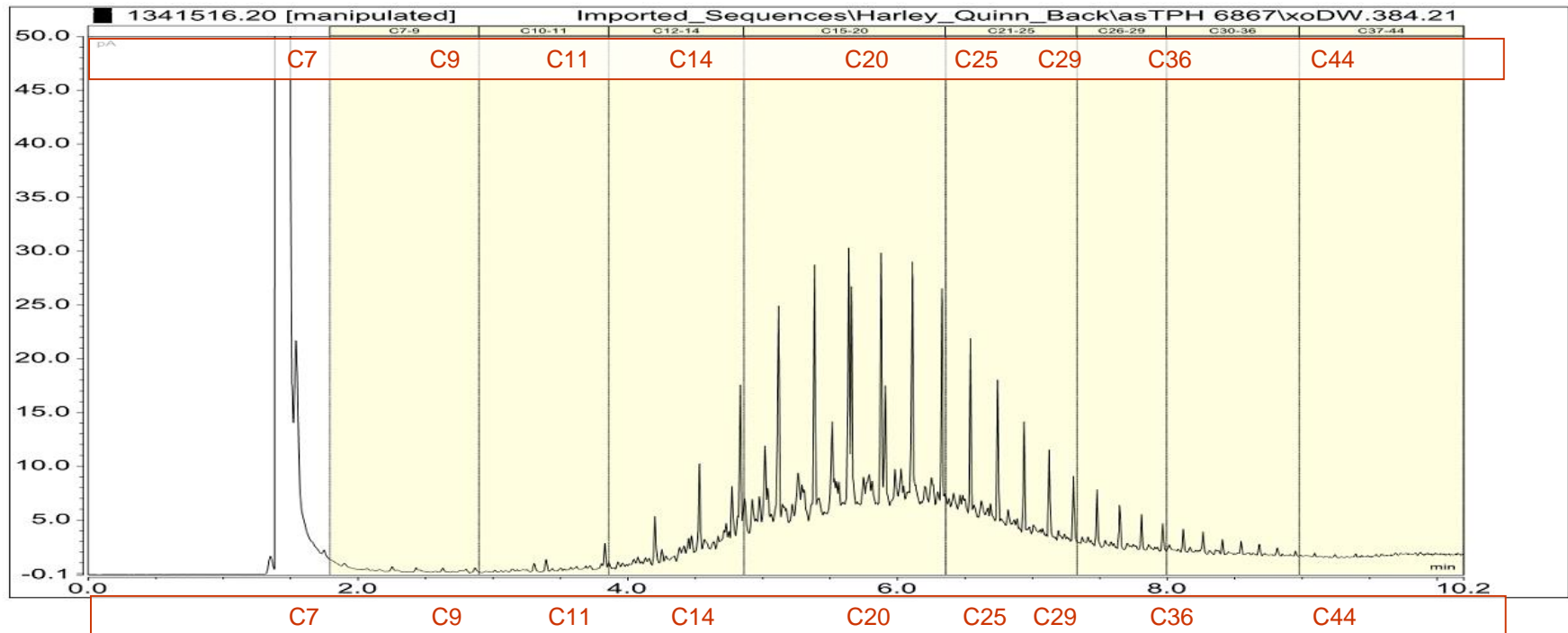
Light Fuel Oil (LFO)

Client Chromatogram for GC Scan



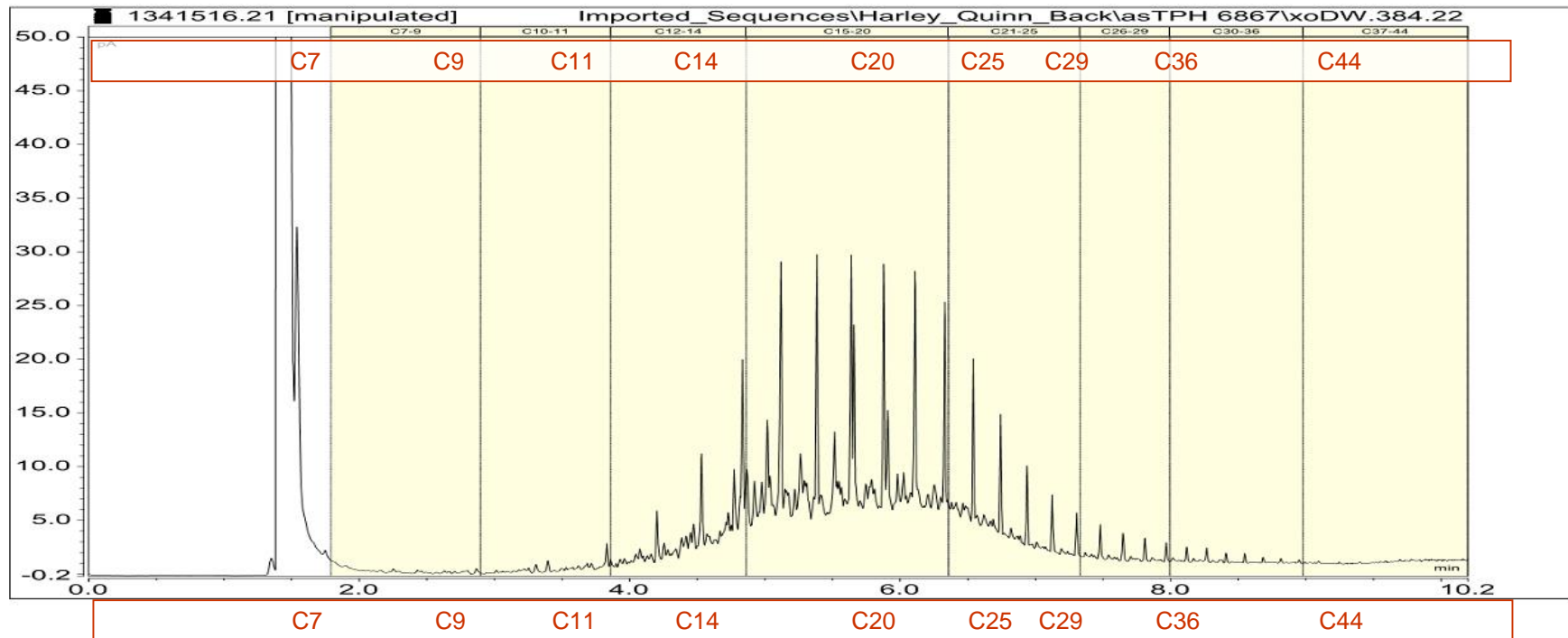
Medium Fuel Oil (MFO)

1341516.20
 Medium Fuel Oil (MFO)
 Client Chromatogram for GC Scan



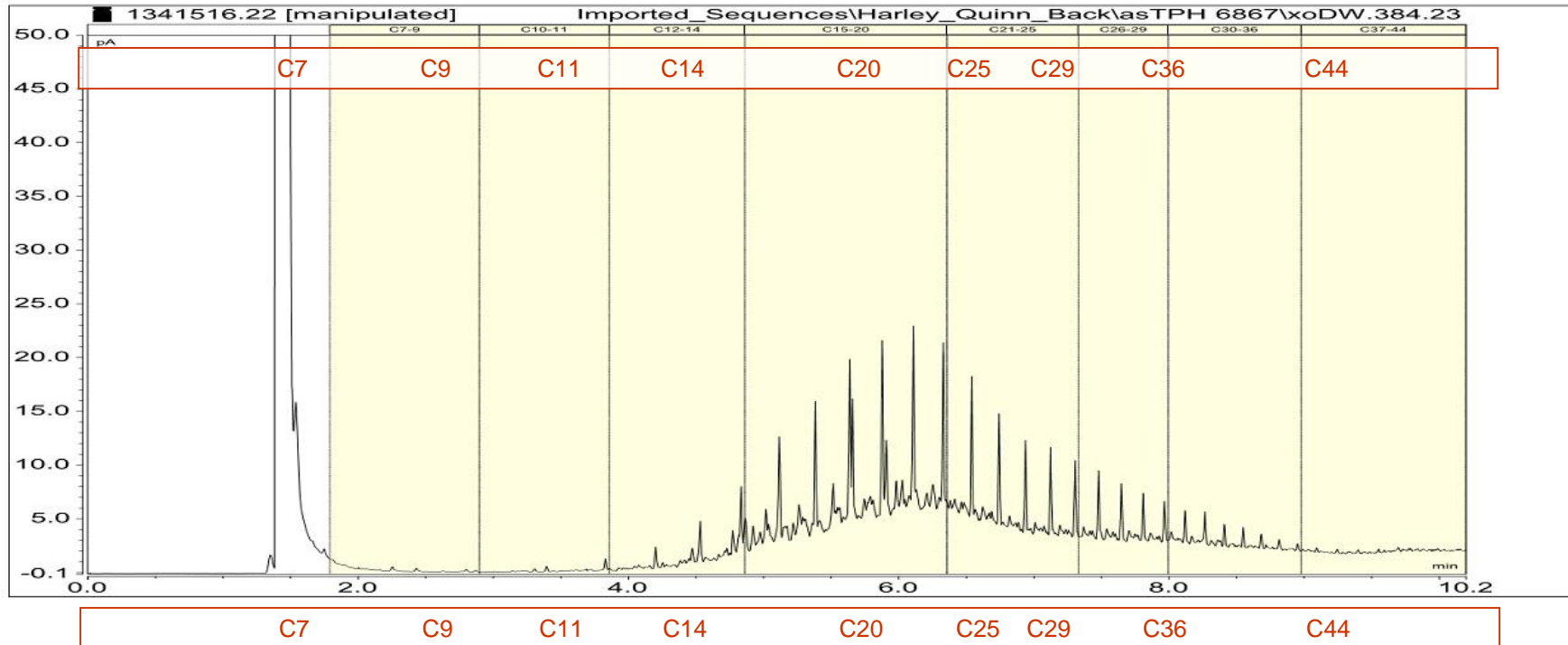
Heavy Fuel Oil (HFO)

1341516.21
 Heavy Fuel Oil (HFO)
 Client Chromatogram for GC Scan



Heavy Bunker Fuel Oil

1341516.22
 Heavy Bunker Fuel Oil (HBFO)
 Client Chromatogram for GC Scan

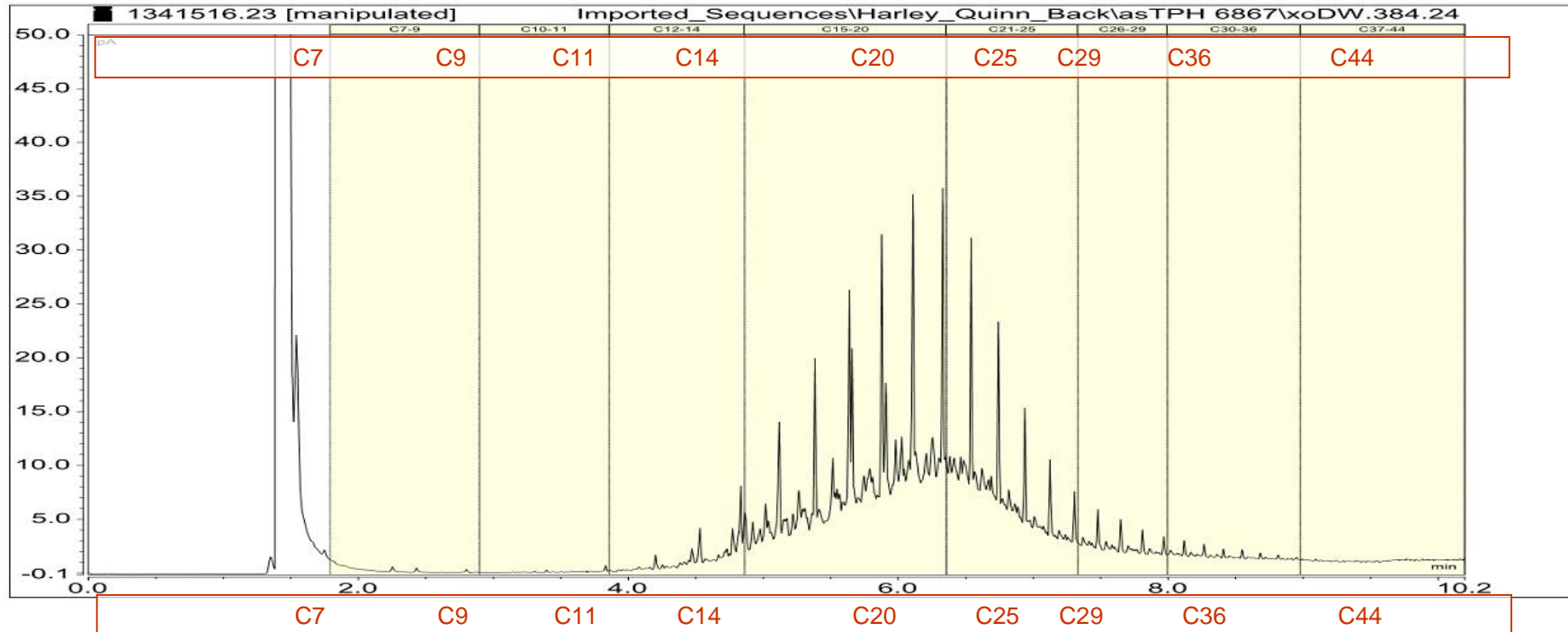


Tiwai Point Fuel Oil

1341516.23

Tiwai Point Fuel Oil

Client Chromatogram for GC Scan

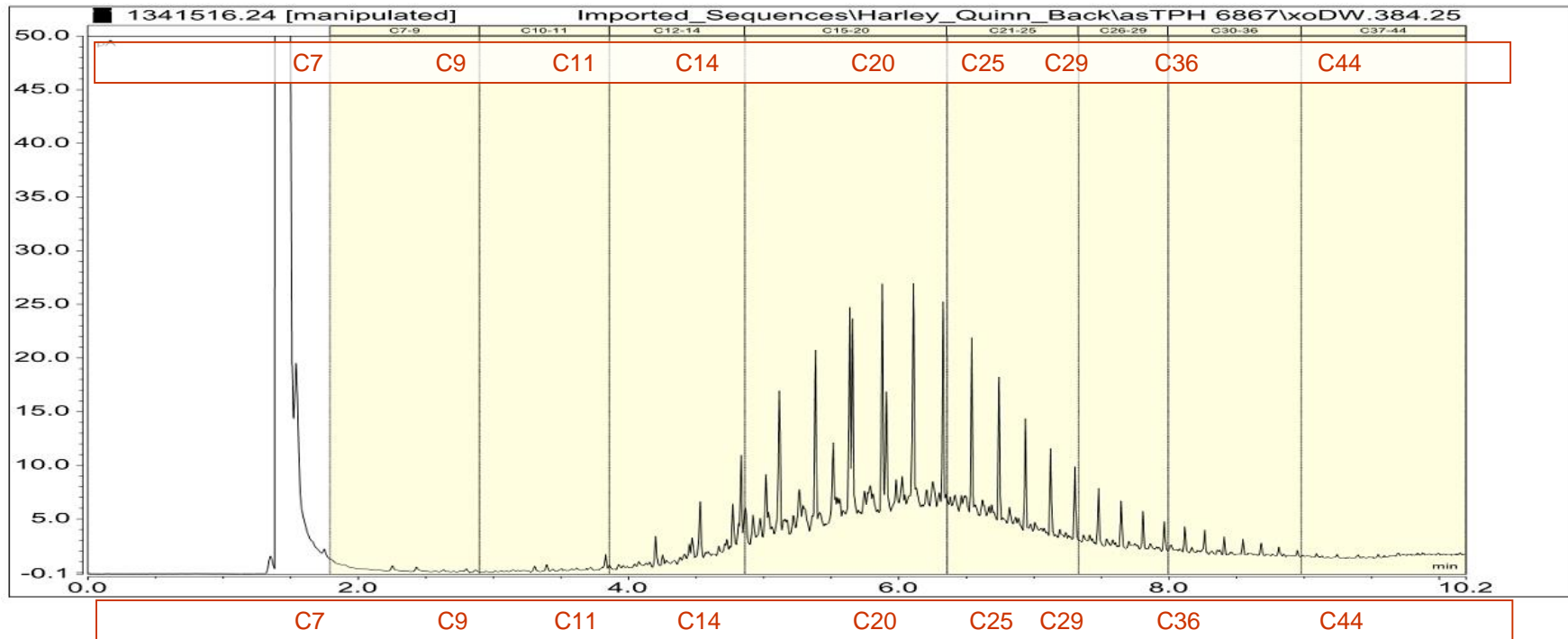


Crude Oil

1341516.24

Crude Oil

Client Chromatogram for GC Scan

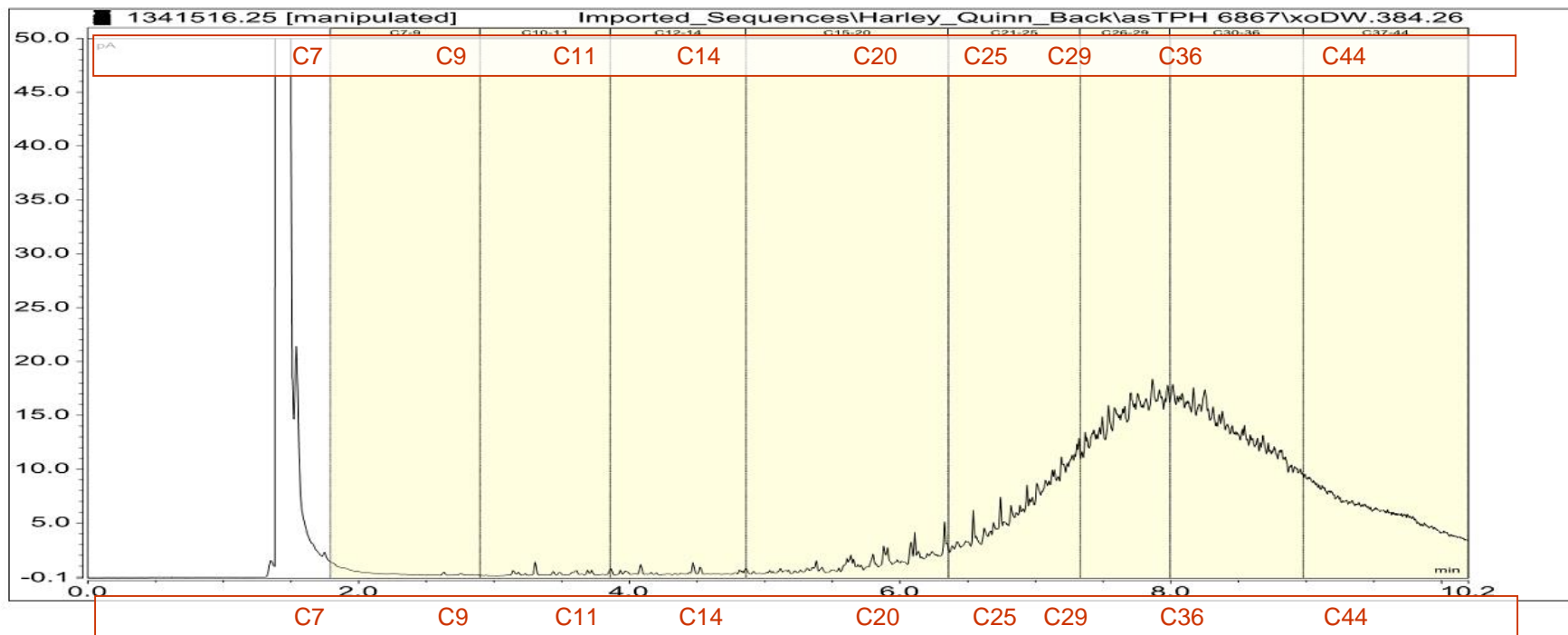


Used car lubricating oil

1341516.25

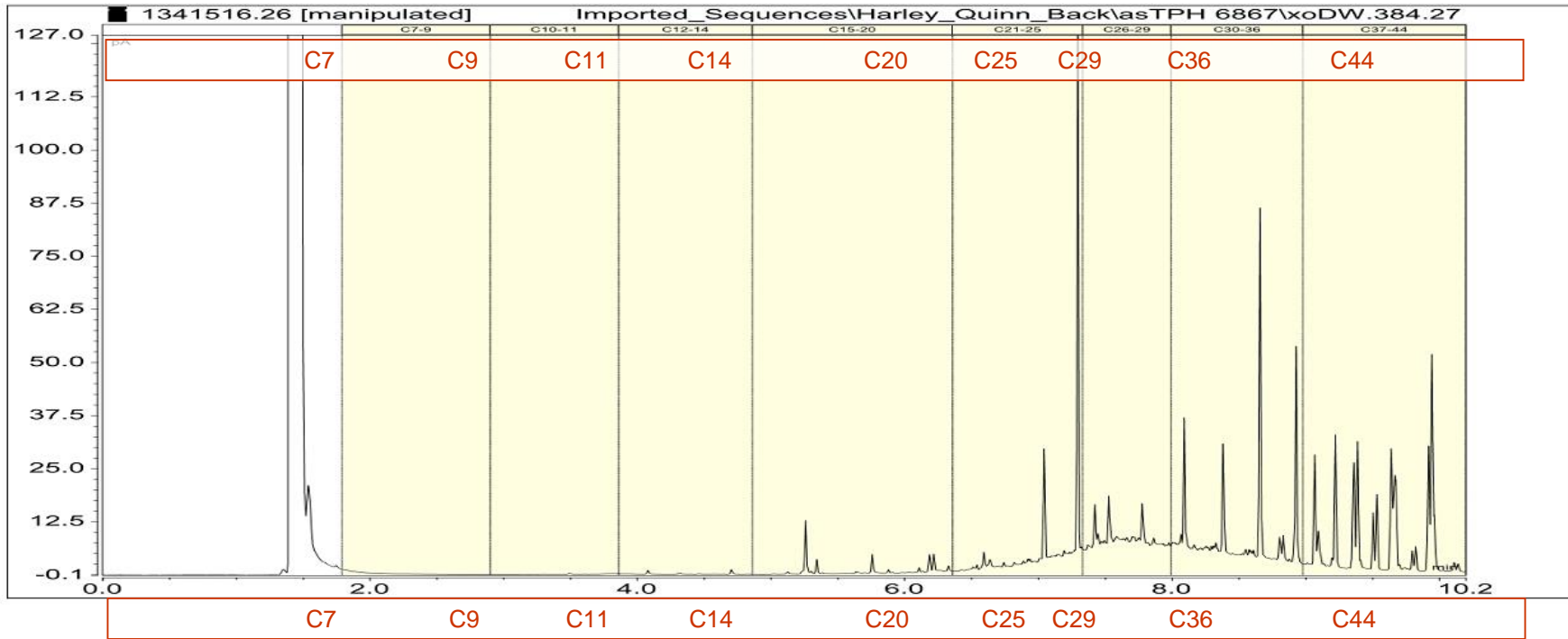
Used Car Oil

Client Chromatogram for GC Scan



Quakerol Rolling Oil

1341516.26
 Quakerol Rolling Oil
 Client Chromatogram for GC Scan



Laboratory Standards

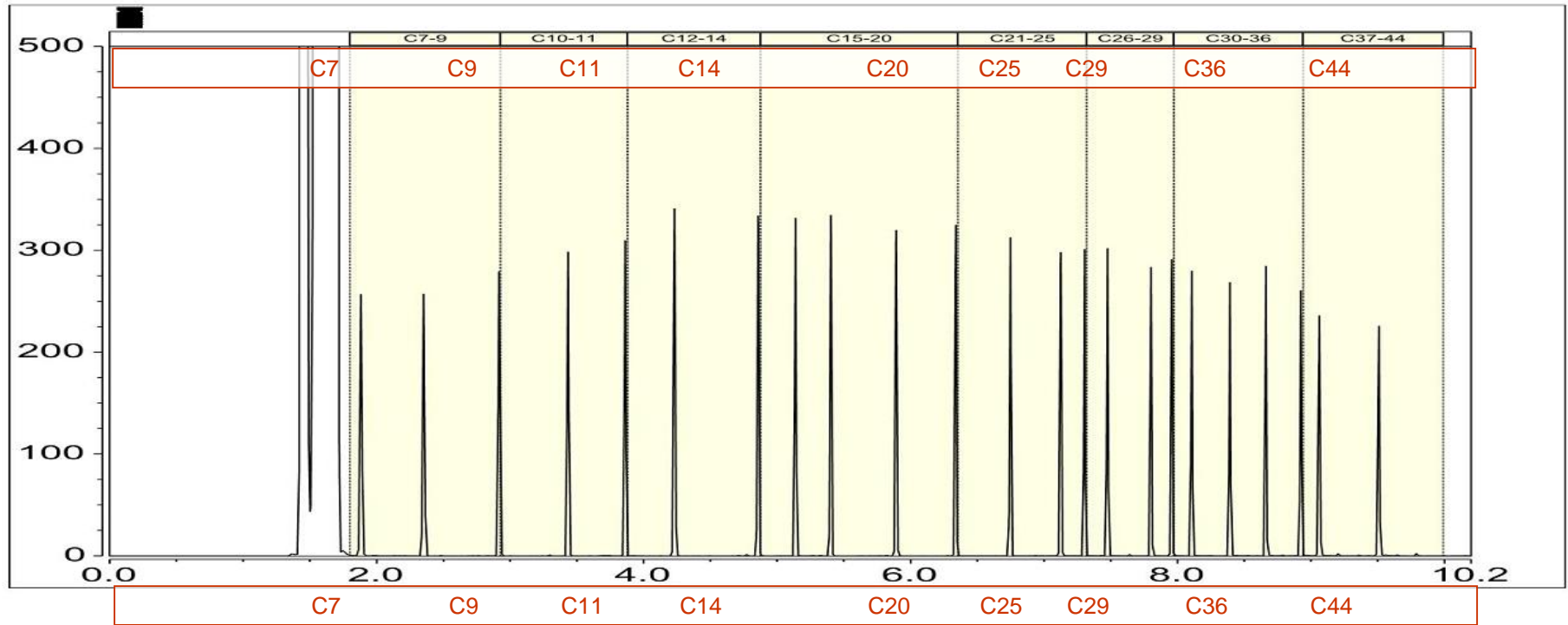


TPH Calibrating Standard

1341516.1

Hydrocarbon calibrating standard

Client Chromatogram for TPH by FID

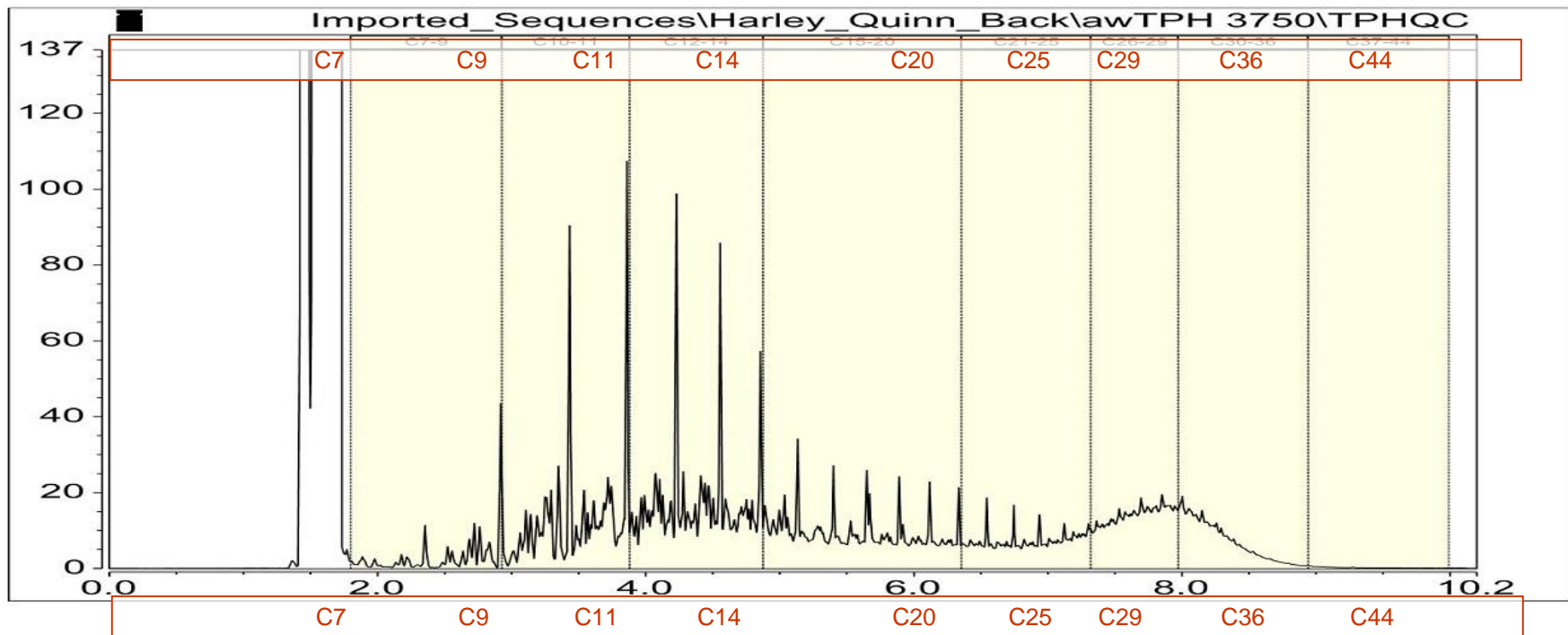


Laboratory TPH QC Sample

1341516.2

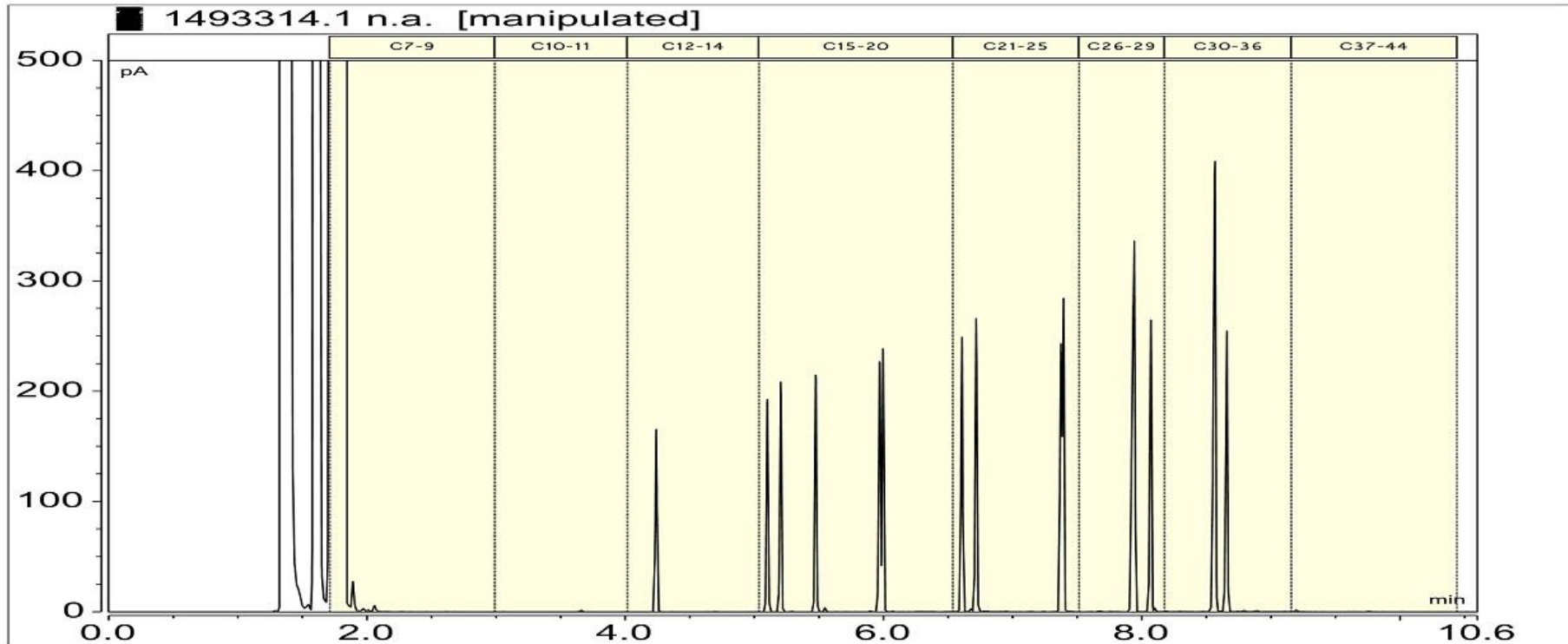
TPH Qc sample

Client Chromatogram for TPH by FID



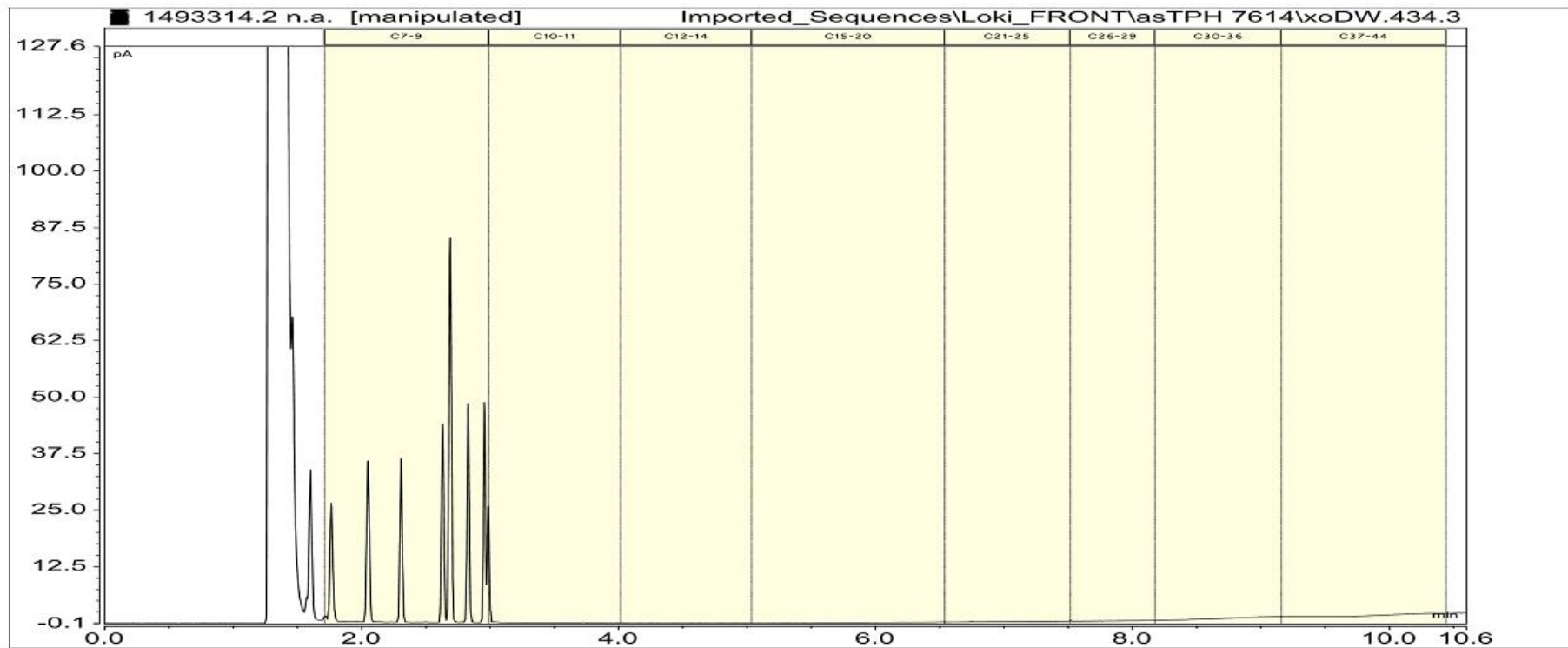
PAH Lab Standards

1493314.1
PAH reference standard (100ppm)
Client Chromatogram for GC Scan



BTEX Lab Standards

1493314.2
BTEX reference standard (50ppm)
Client Chromatogram for GC Scan

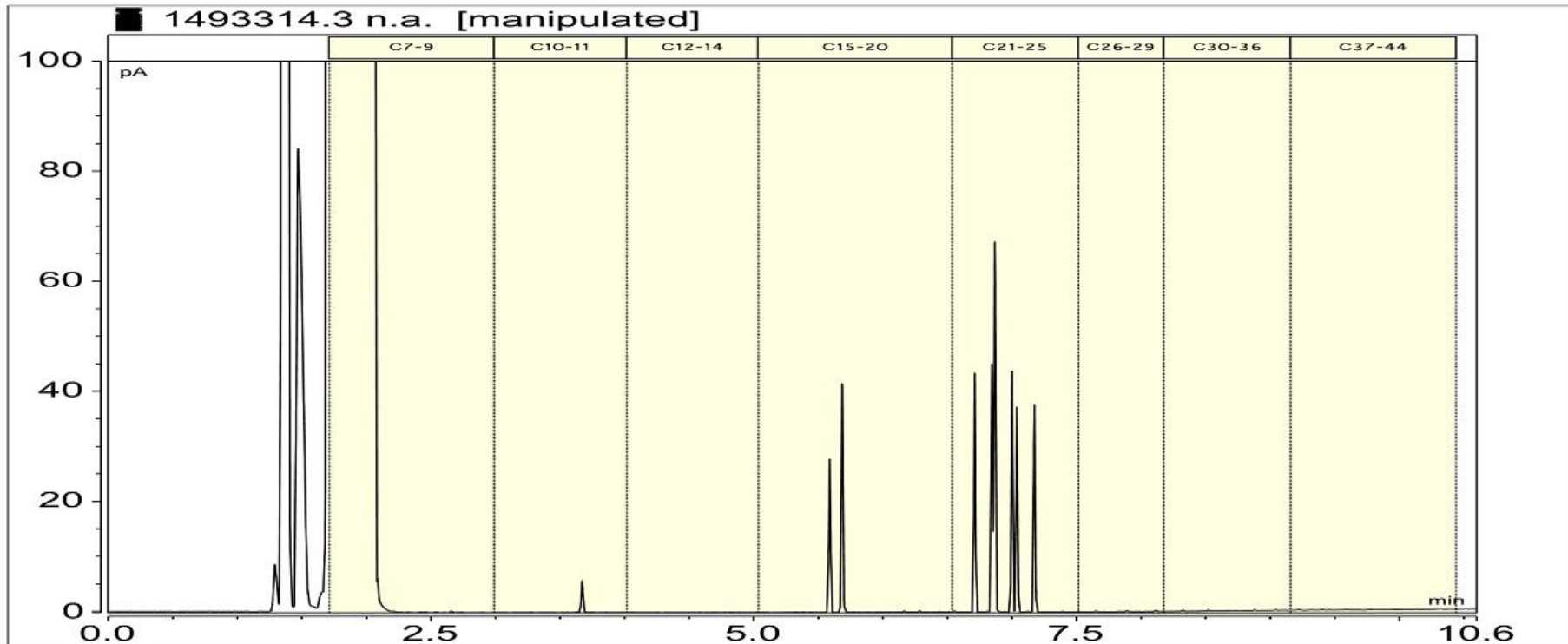


DDT Lab Standards

1493314.3

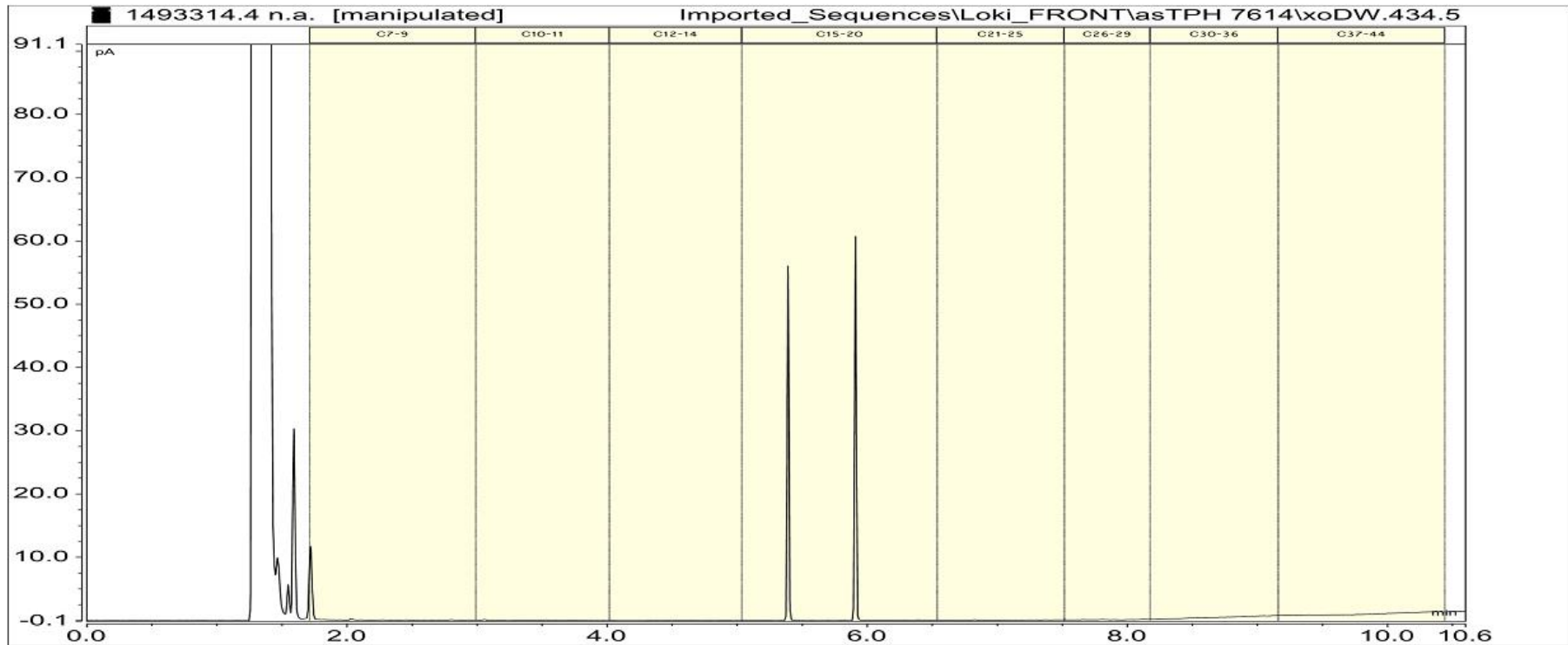
DDT reference standard (20ppm)

Client Chromatogram for GC Scan



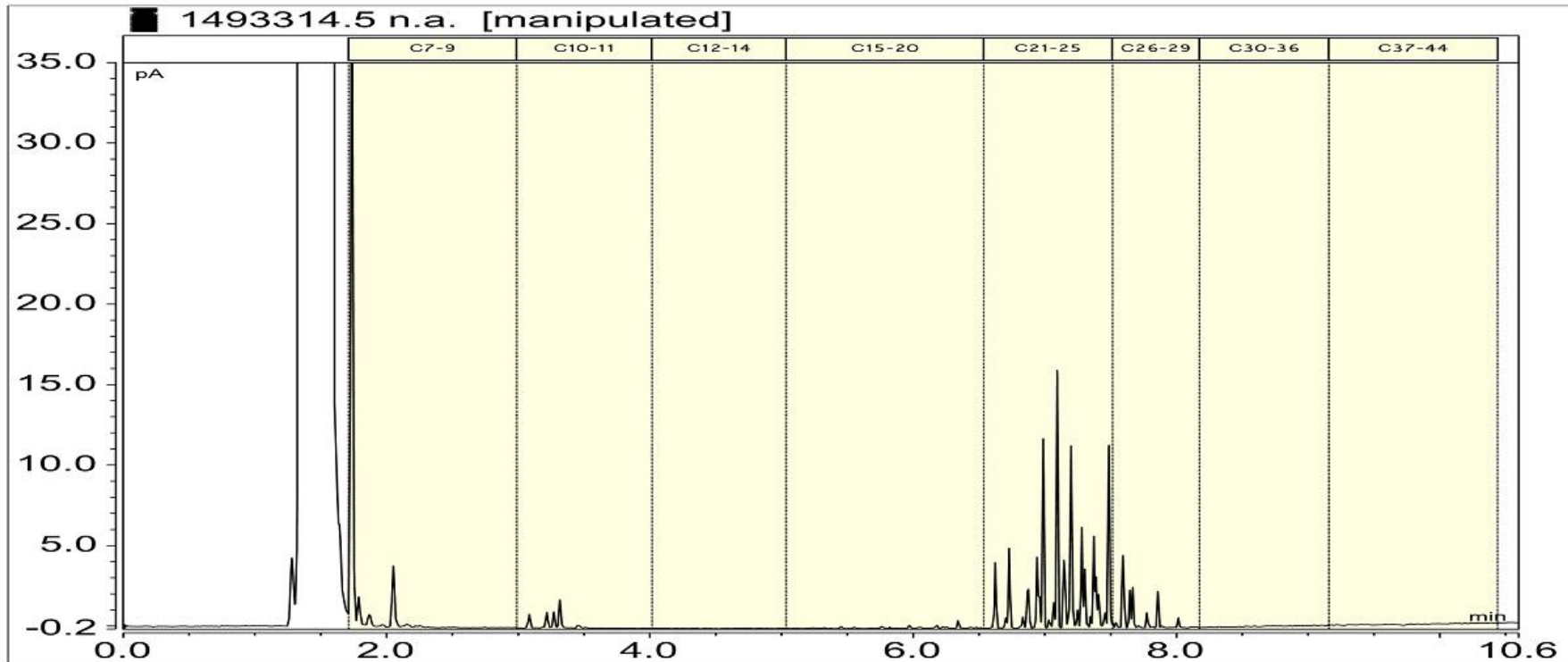
PCP/TCP Lab Standard

1493314.4
PCP reference standard (100ppm)
Client Chromatogram for GC Scan



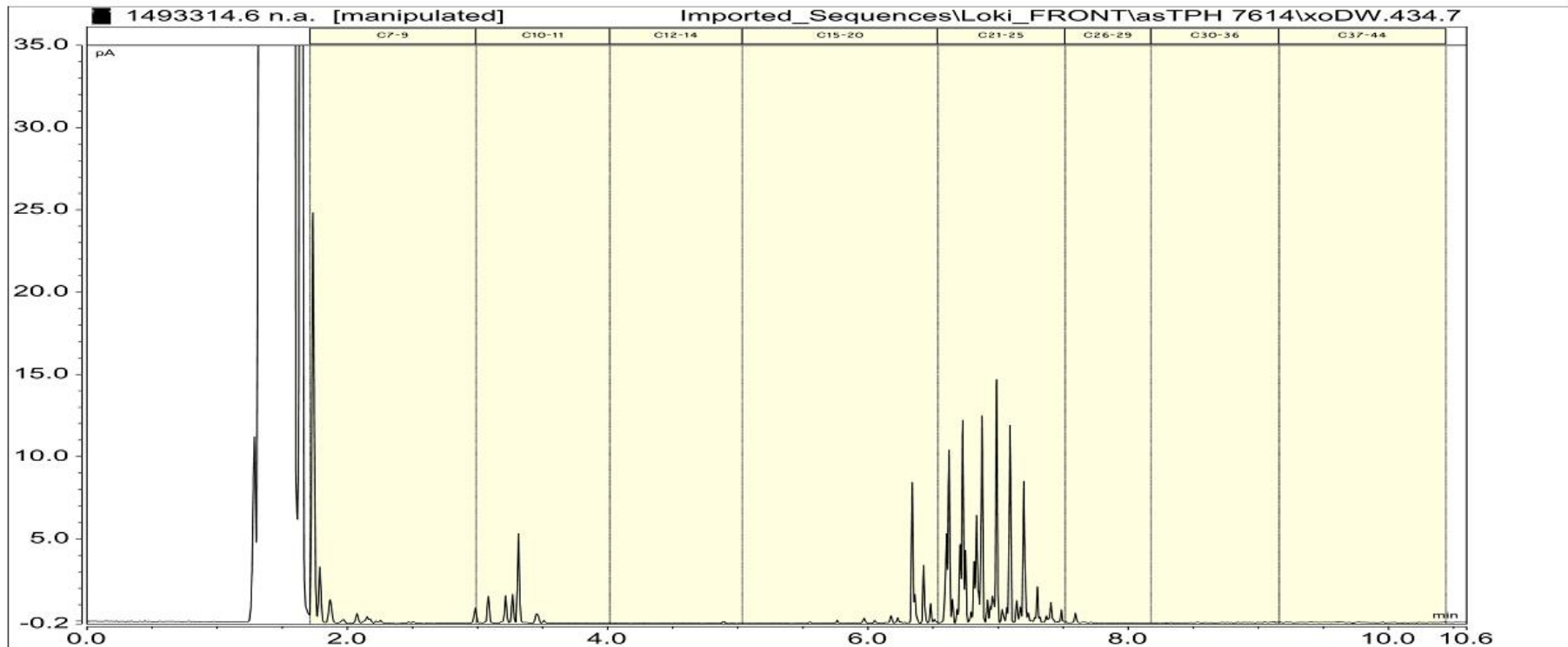
PCB - Arochlor 1260

1493314.5
Arochlor1260 (PCB reference standard) (100ppm)
Client Chromatogram for GC Scan



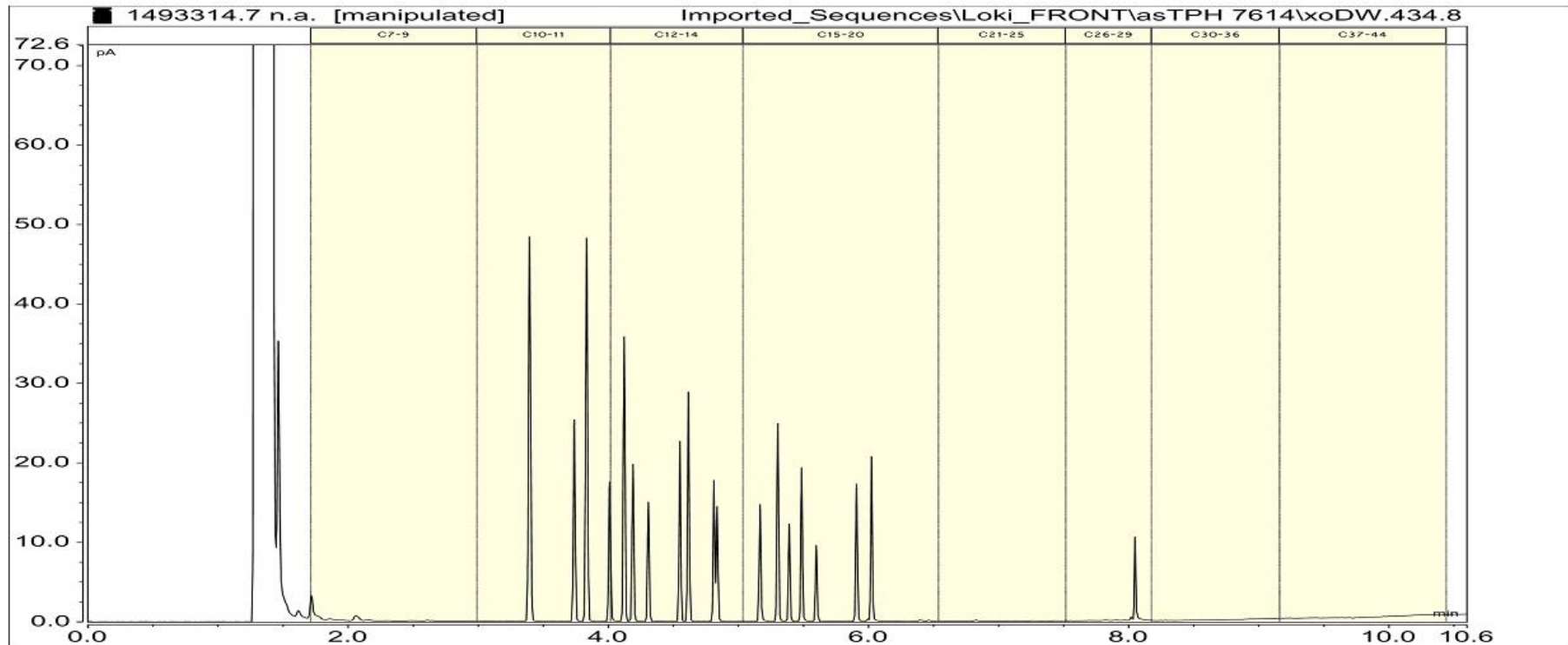
PCB - Arochlor 1254

1493314.6
Arochlor1254 (PCB reference standard) (100ppm)
Client Chromatogram for GC Scan



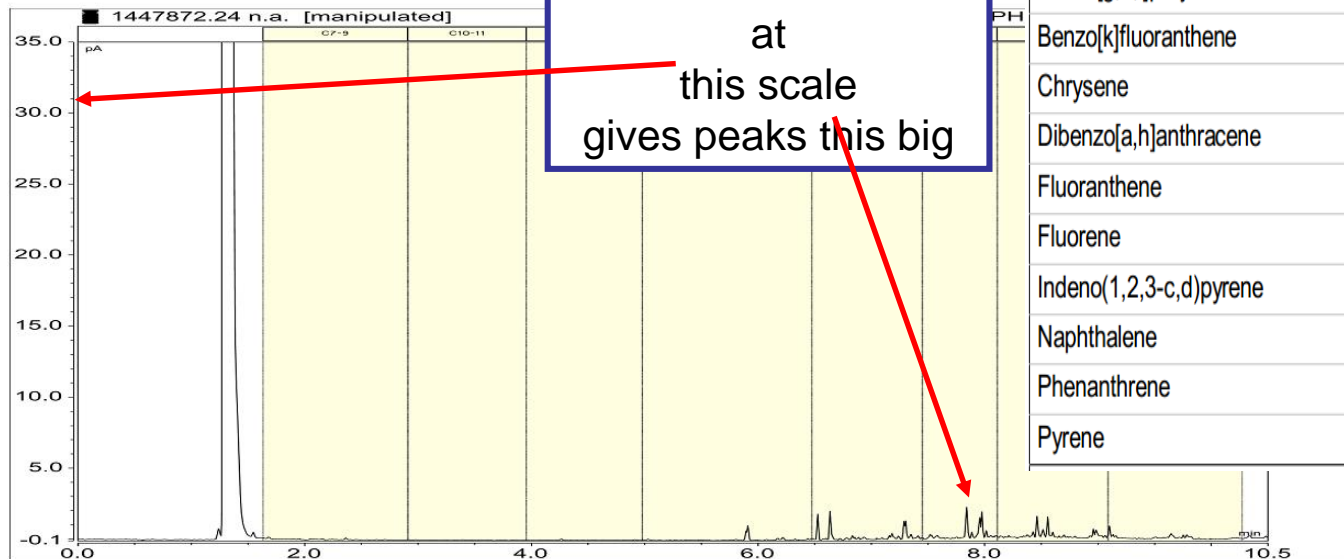
Phenols Lab Standard

1493314.7
Phenol reference standard (20ppm)
Client Chromatogram for GC Scan



PAH vs Chromatogram

1447872.24
 N125_2 03-Jul-2015
 Client Chromatogram for TPH by FID



This level of PAH
 at
 this scale
 gives peaks this big

Polycyclic Aromatic Hydrocarbons	mg/kg dry wt
Acenaphthene	0.04
Acenaphthylene	0.13
Anthracene	0.22
Benzo[a]anthracene	1.34
Benzo[a]pyrene (BAP)	1.89
Benzo[b]fluoranthene + Benzo[j]fluoranthene	2.1
Benzo[g,h,i]perylene	1.43
Benzo[k]fluoranthene	0.83
Chrysene	1.24
Dibenzo[a,h]anthracene	0.24
Fluoranthene	2.3
Fluorene	0.06
Indeno(1,2,3-c,d)pyrene	1.44
Naphthalene	< 0.16
Phenanthrene	0.87
Pyrene	2.7

Samples

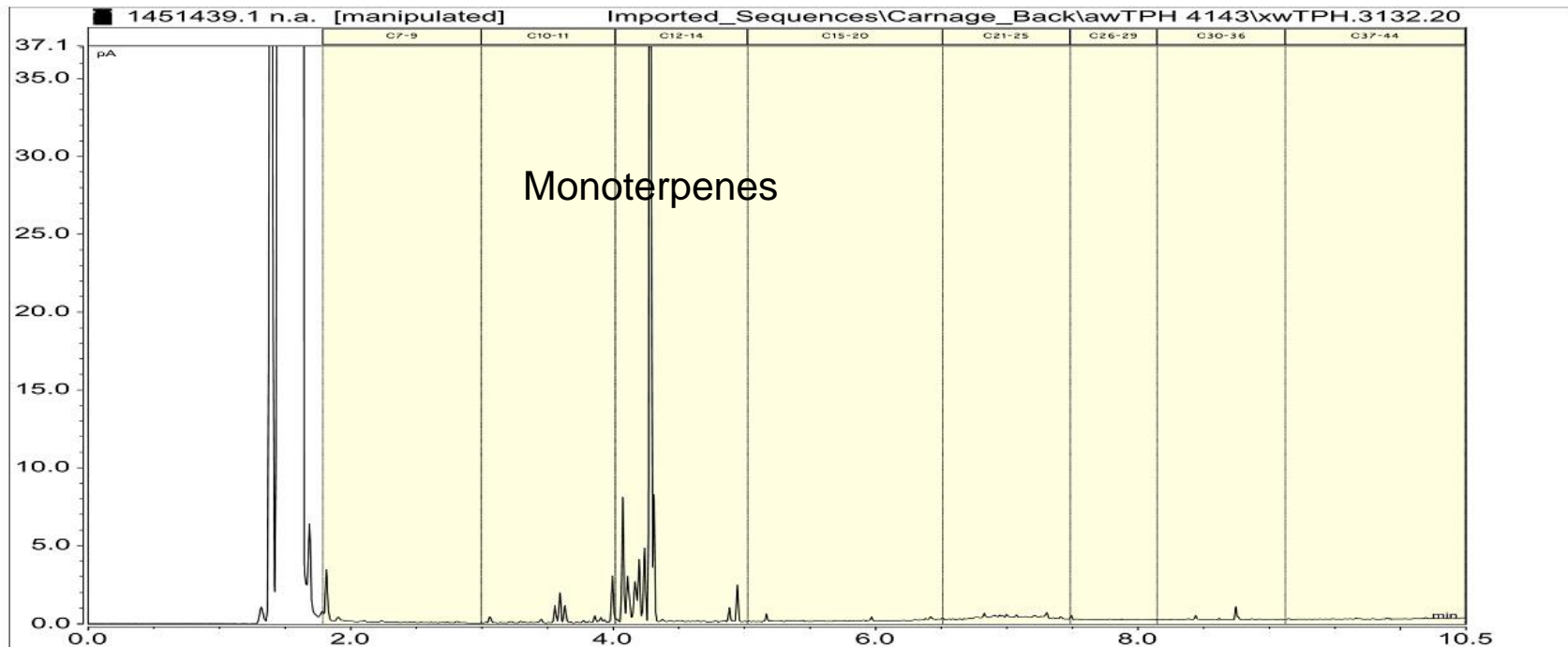


1451439.1 Stormwater

1451439.1

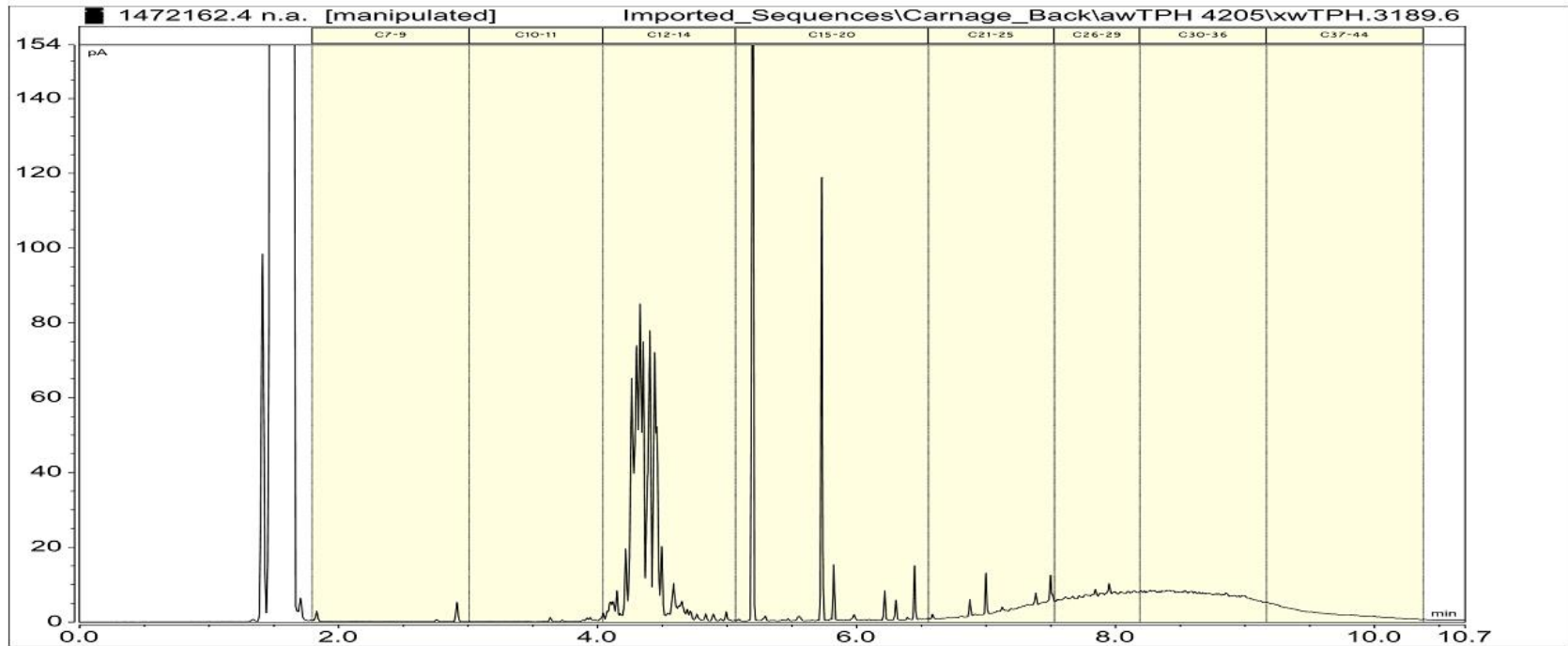
Lawter Stormwater 16-Jul-2015 12:05 pm

Client Chromatogram for TPH by FID



Alexandra Fire Stormwater

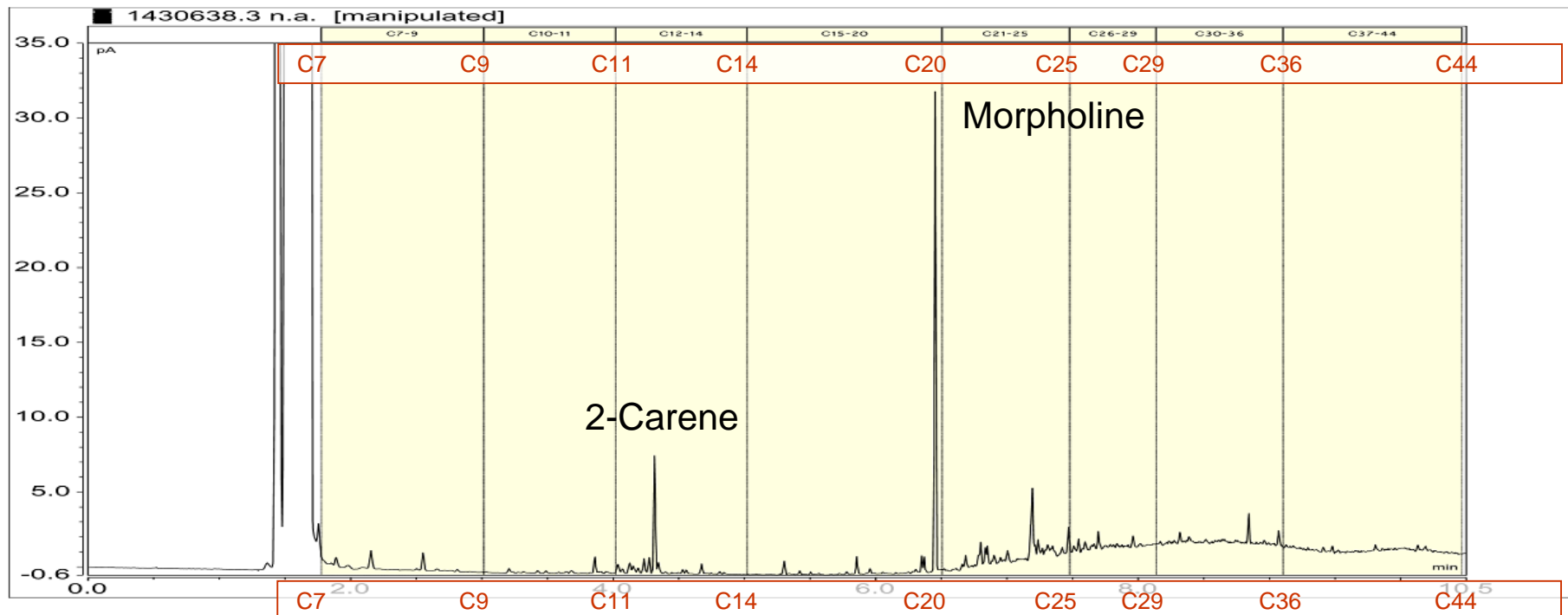
1472162.4
Surface Water East of Building
Client Chromatogram for TPH by FID



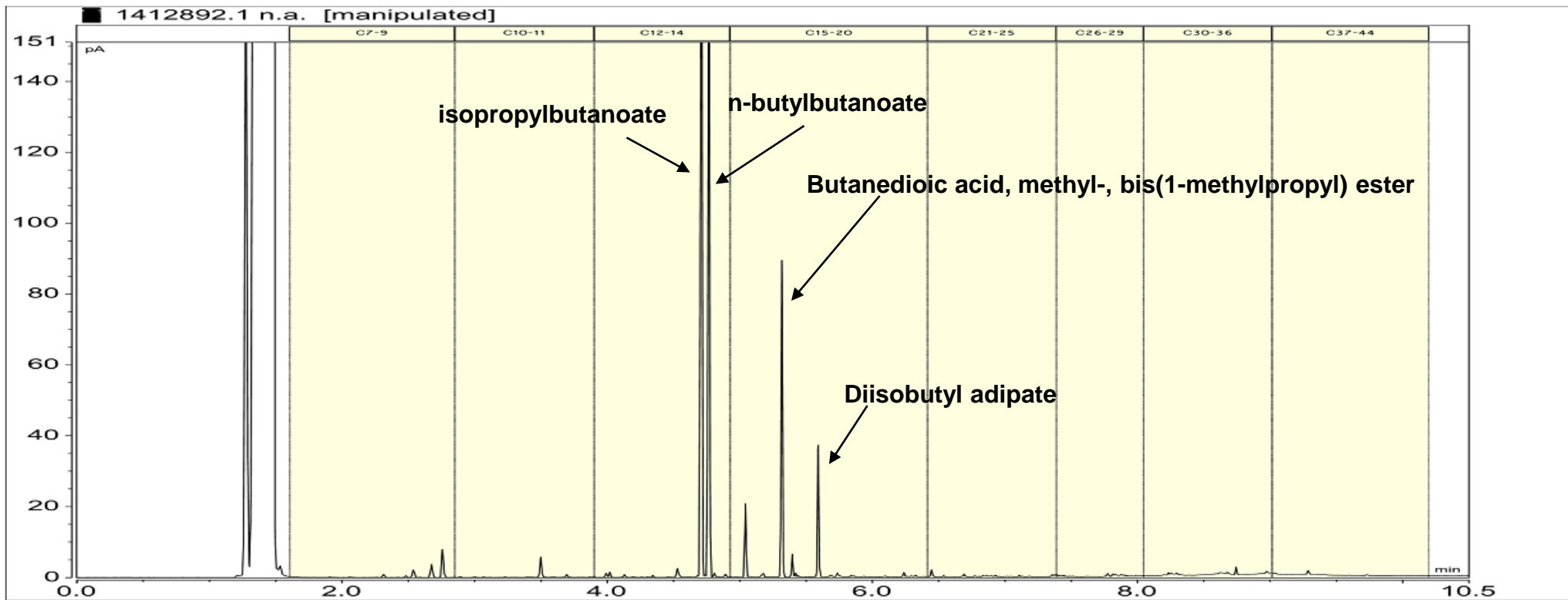
1430638.3

Morpholine used as corrosion inhibitor, in boilers and perhaps with antisapstain formulations

1430638.3
SLY MH9 23-May-2015 2:35 pm
Client Chromatogram for TPH by FID



Solvents ex Roof Tile manufacturing

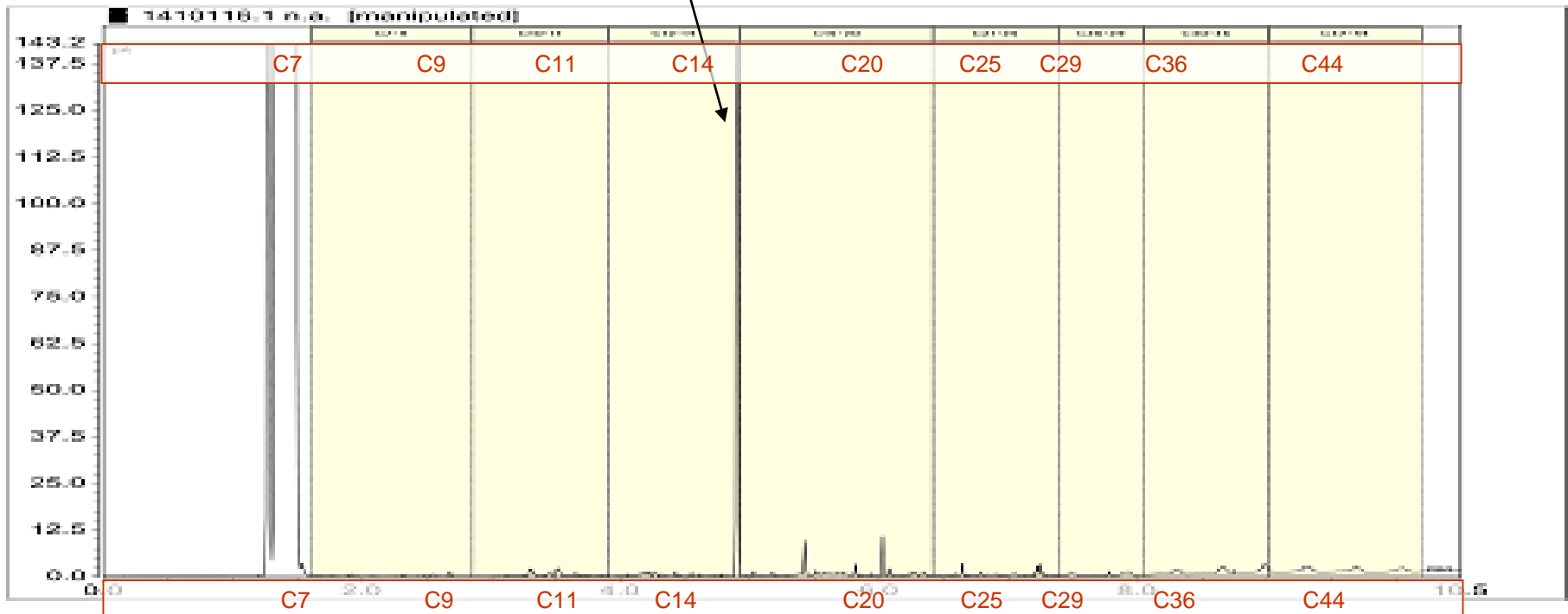


1410116.1 TW – Paint manufacturer

The decynediol derivative, 2,4,7,9-tetramethyl-5-decyne-4,7-diol (TMDD), is produced and used in large quantities, primarily as an industrial defoaming non-ionic surfactant under the trade name Surfynol 104, including in dye and printing ink formulations. Other uses include the production of polyethylene glycol ether surfactants, and in adhesive formulations (Air Products and Chemicals 2002, HSDB 2002, Musselman & Chander 2002, USDA 2009, US EPA 2002, US EPA 2011).

[ex <http://www.greenpeace.org/international/Global/international/publications/toxics/Water%202012/TechnicalReport-08->

1410116.1
TW1 07-Apr-2015 10:30 am
Client Chromatogram for TPH by FID



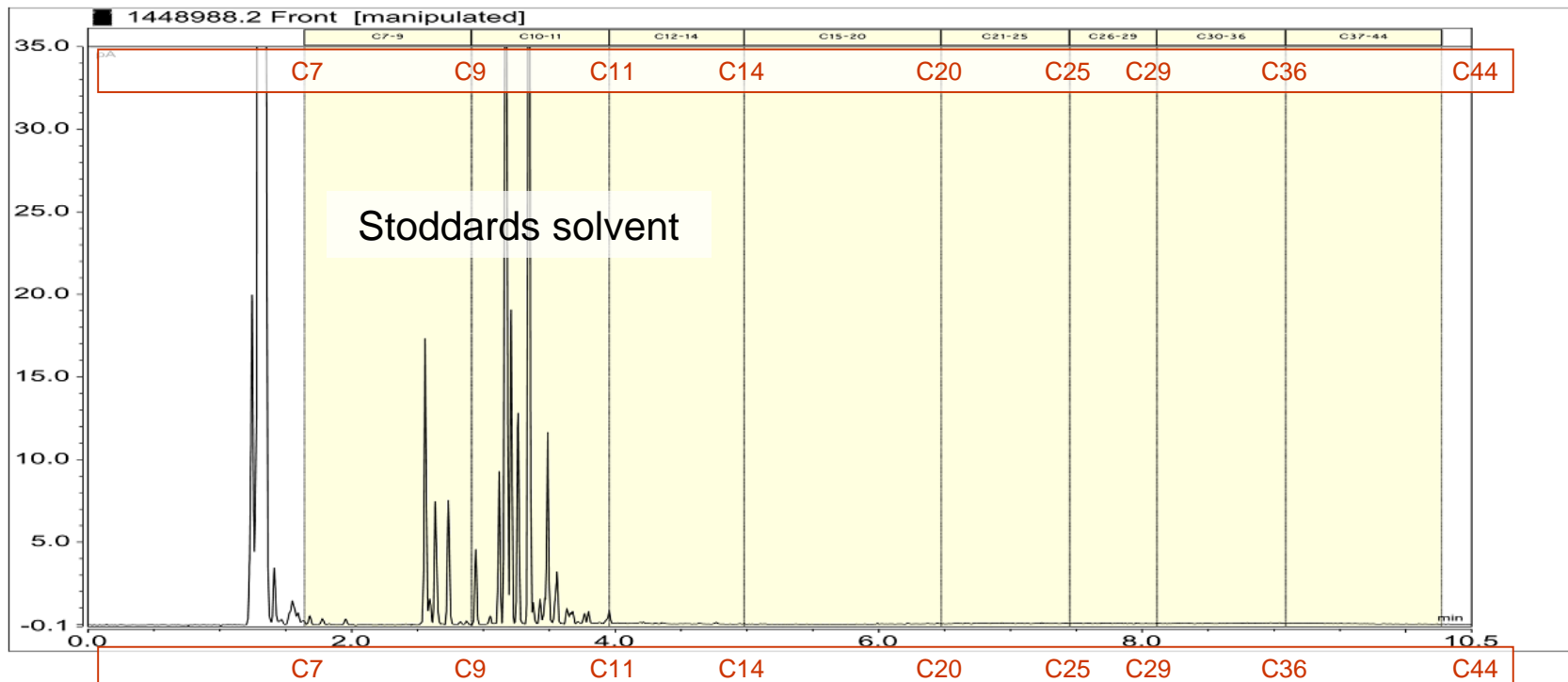
1448988.2 Stoddards Solvent

Glass company, air quality sample

1448988.2

Effect (909) 07-Jul-2015

Total Petroleum Hydrocarbon Chromatograms for Air Quality Sample

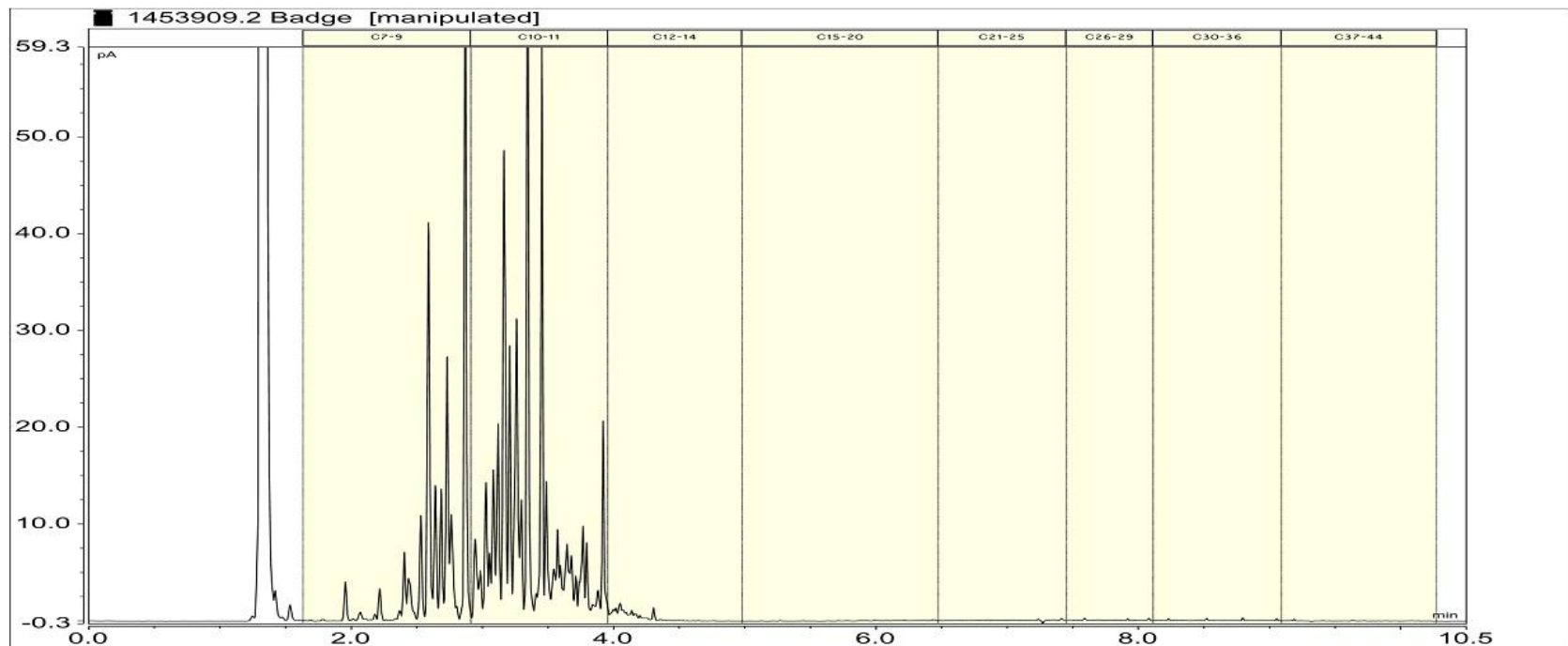


1453909.1 Air badge - Stoddards

1453909.2

06:50-14:45 22-Jul-2015

Total Petroleum Hydrocarbon Chromatograms for Air Quality Sample

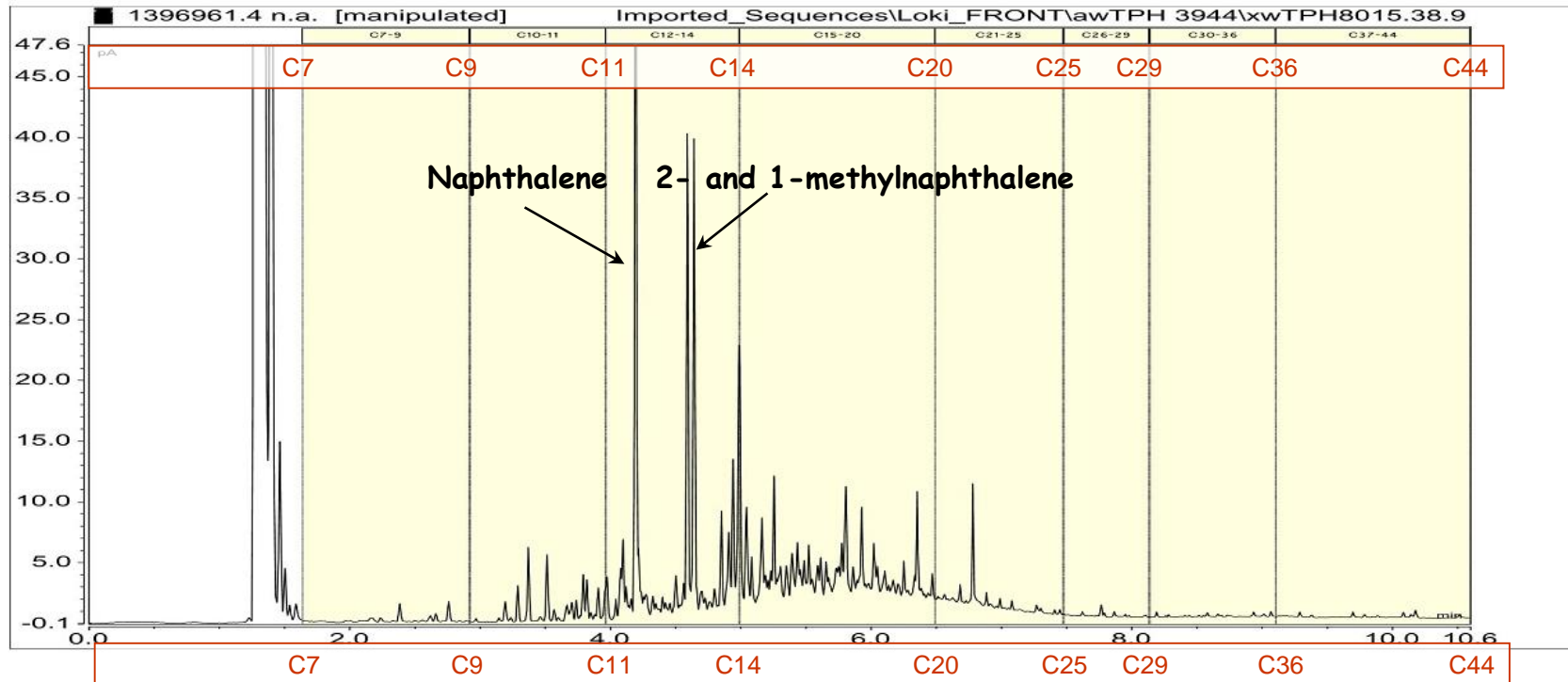


1396961.4 GW

1396961.4

MB3A 11-Mar-2015

Client Chromatogram for TPH by FID

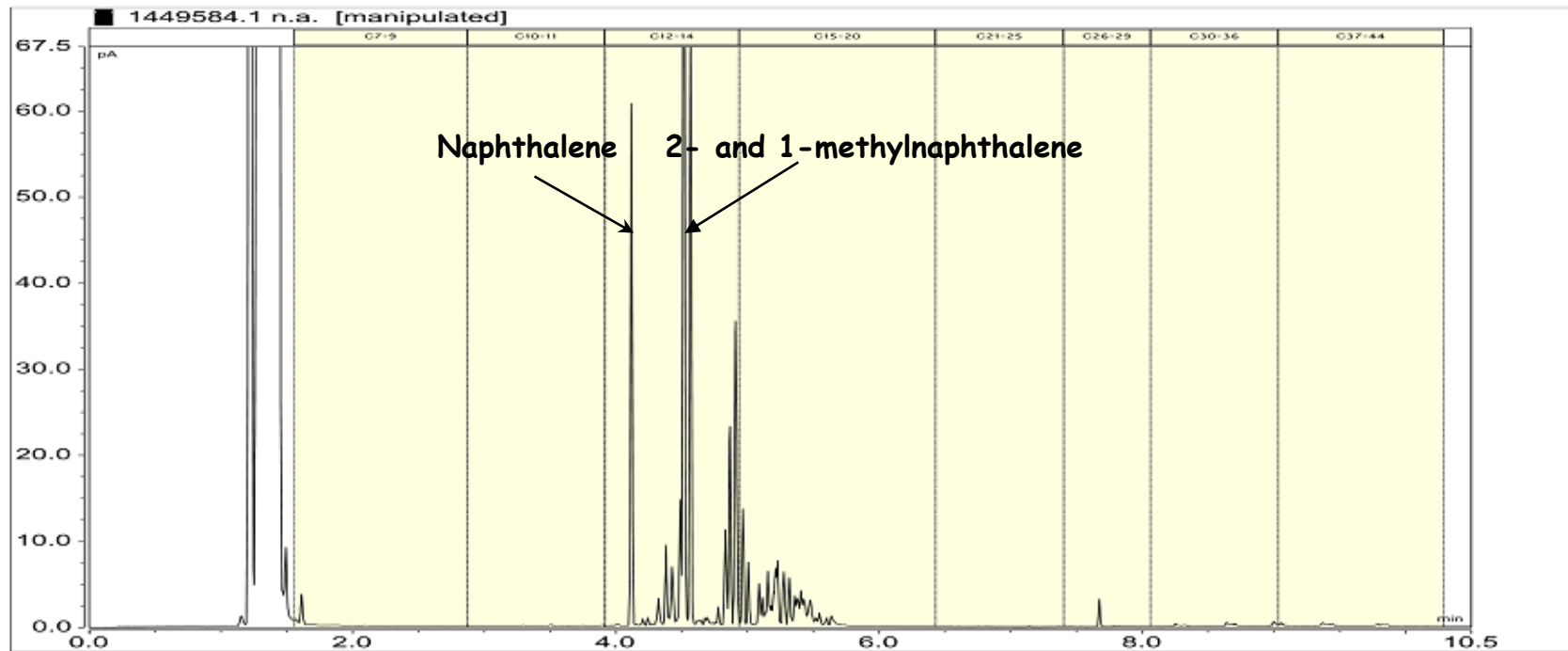


1449584.1 Water tank

1449584.1

Tank

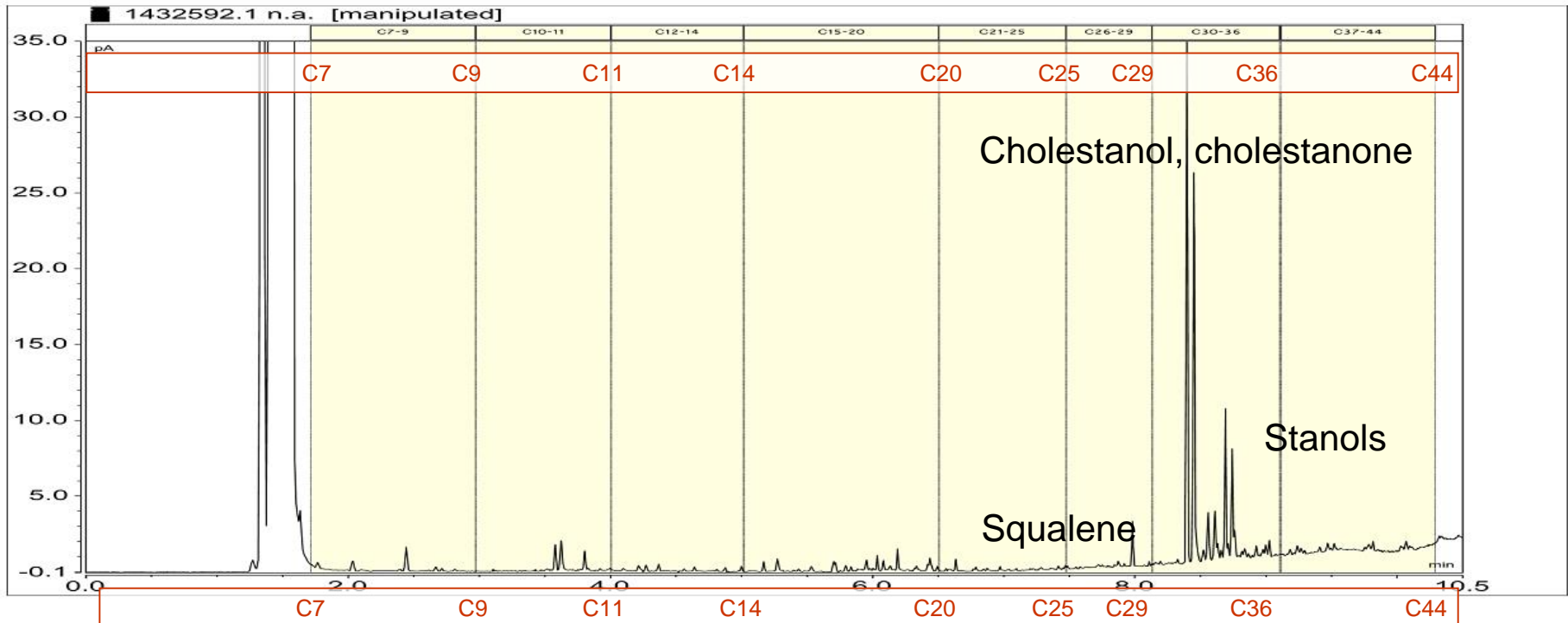
Client Chromatogram for TPH by FID



1432592.1

Trade waste pump station with a major sewage component

1432592.1
 South Yard Pump Station
 Client Chromatogram for TPH by FID



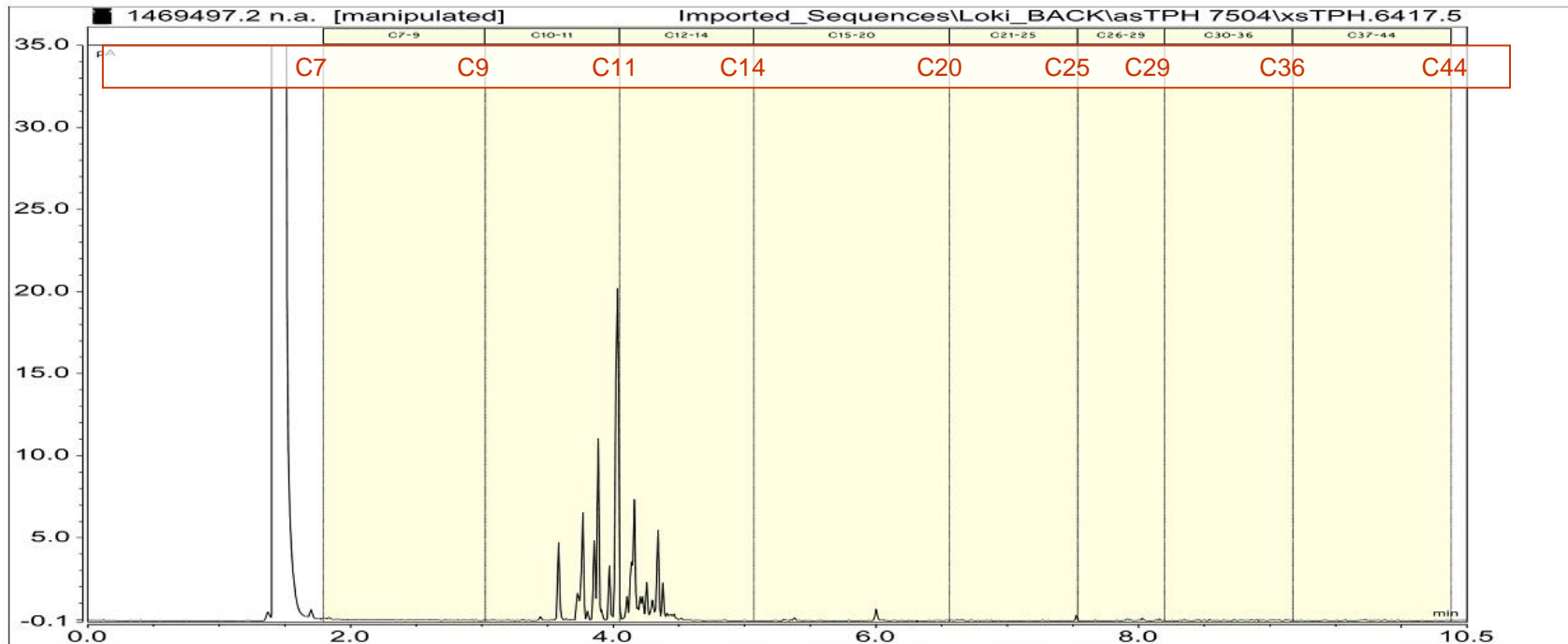
1469497.2

Solvent wash from orange stained concrete
?Kerosene

1469497.2

SS002 (0.1) 31-Aug-2015 2:30 pm

Client Chromatogram for TPH by FID

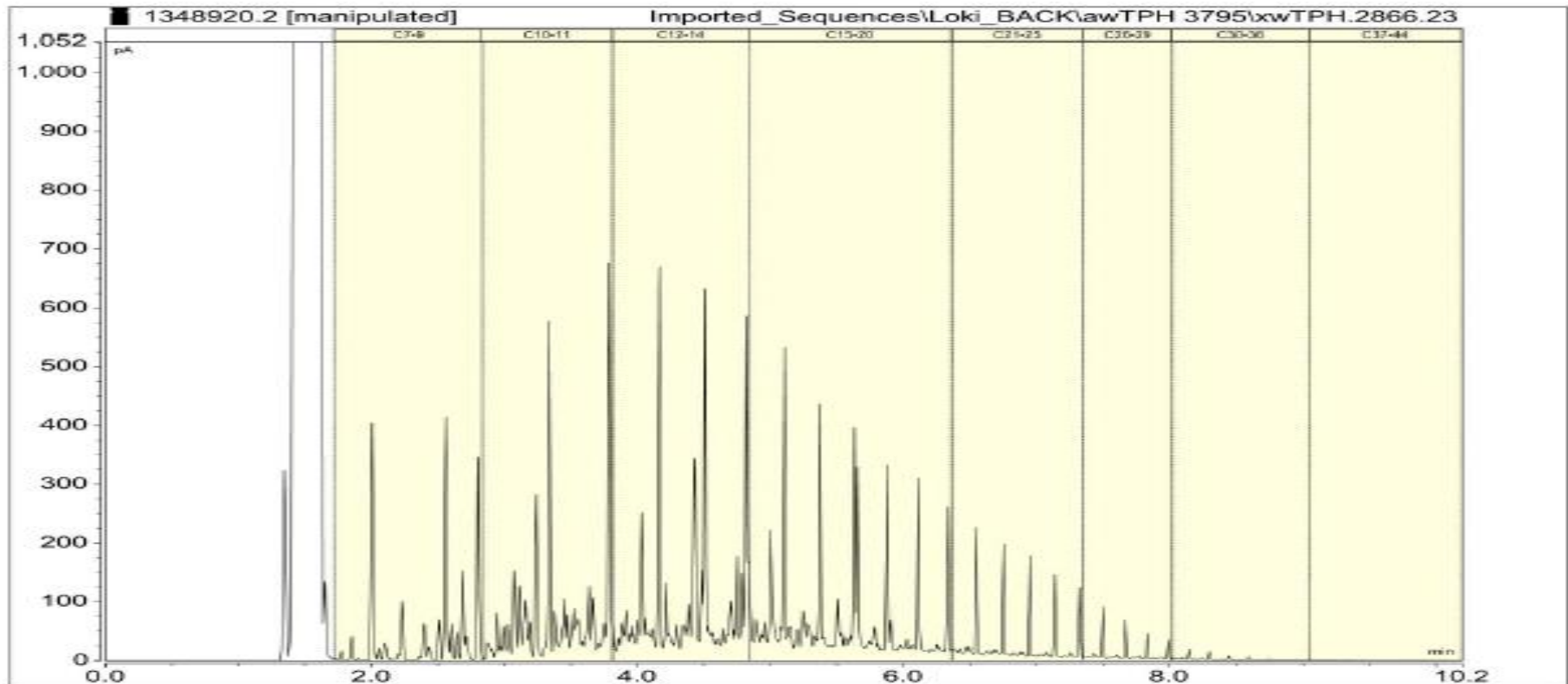


Produced water

1348920.2

Produced Water Temp:30.7°C 06-Nov-2014 9:15 am

Client Chromatogram for TPH by FID

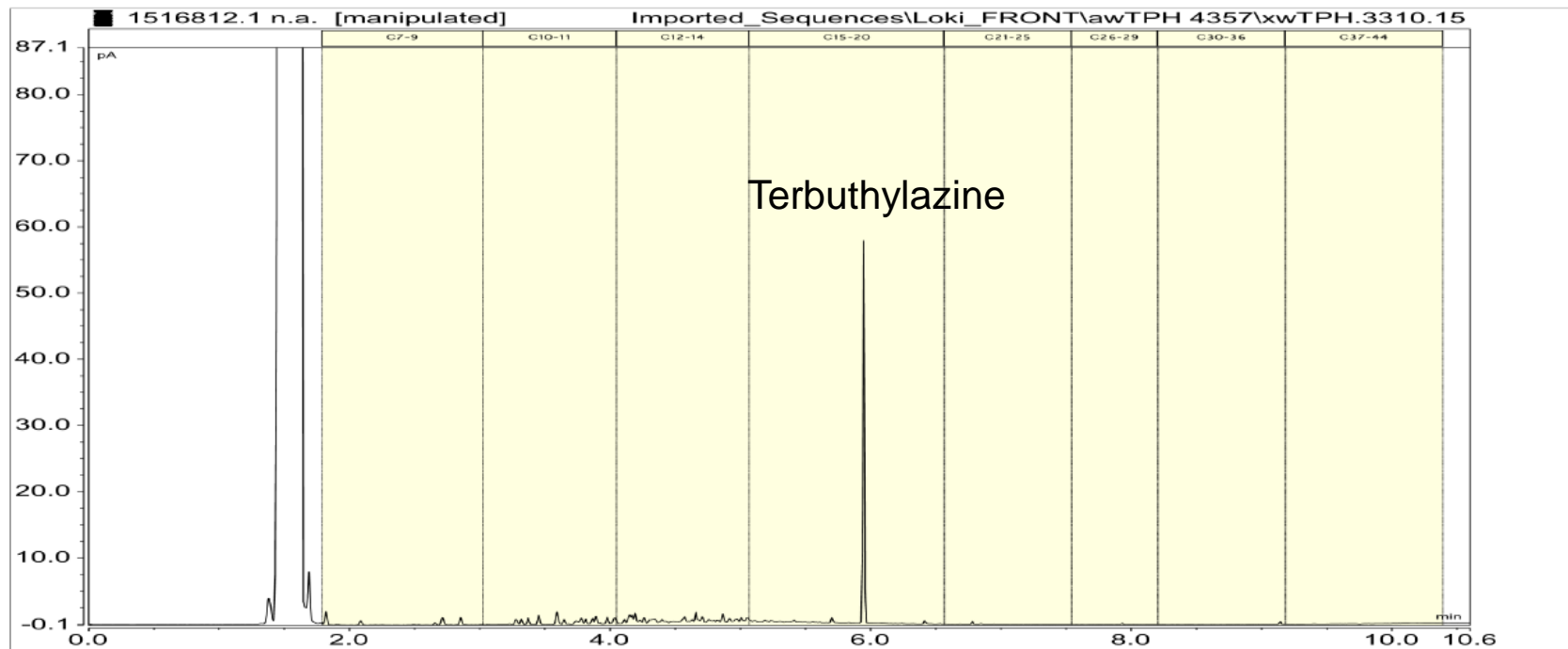


1516812.1 Terbutylazine

1516812.1

Truck Fill 16-Dec-2015 9:00 am

Client Chromatogram for TPH by FID

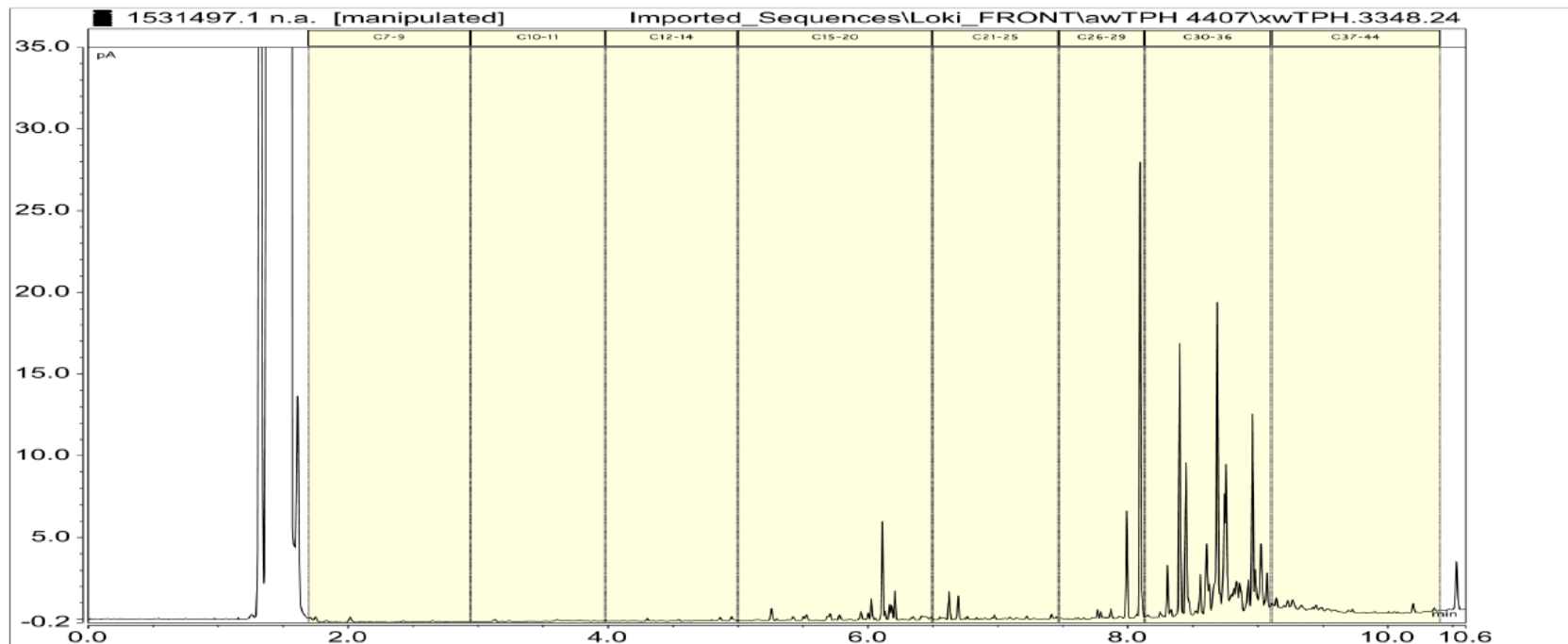


Animal Auctioneers

1531497.1

Sump 29-Jan-2016 9:45 am

Client Chromatogram for TPH by FID

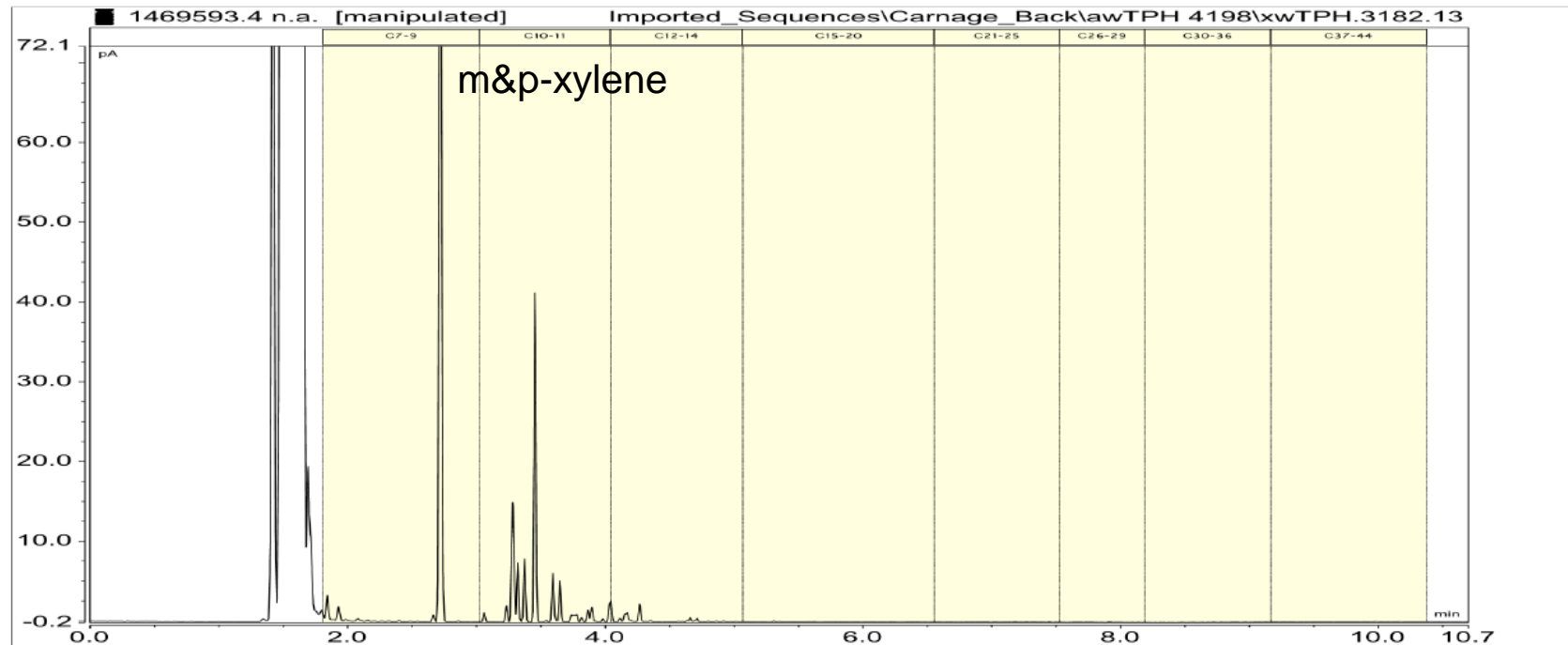


1469593.4 m&p-xylene

1469593.4

CXM_A_MW26 29-Aug-2015 12:00 pm

Client Chromatogram for TPH by FID

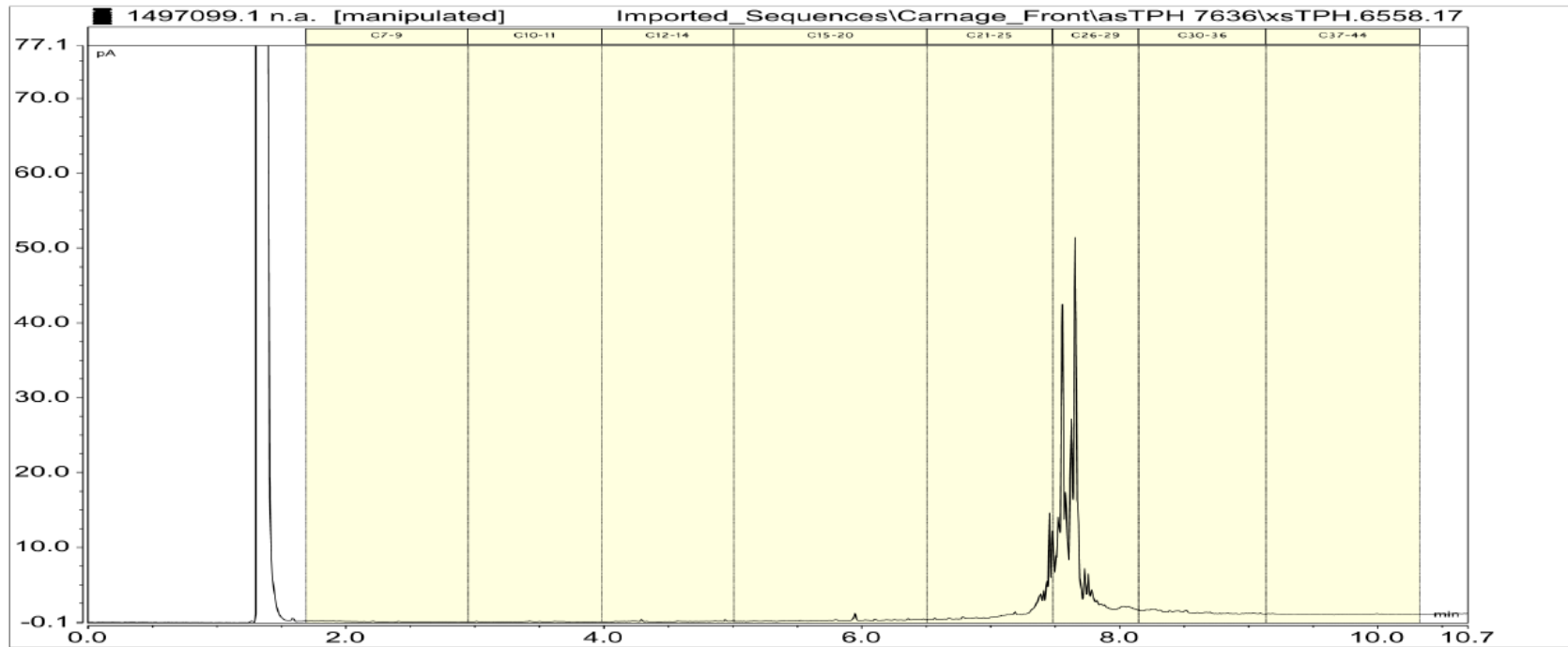


1497099.1 Phthalates

1497099.1

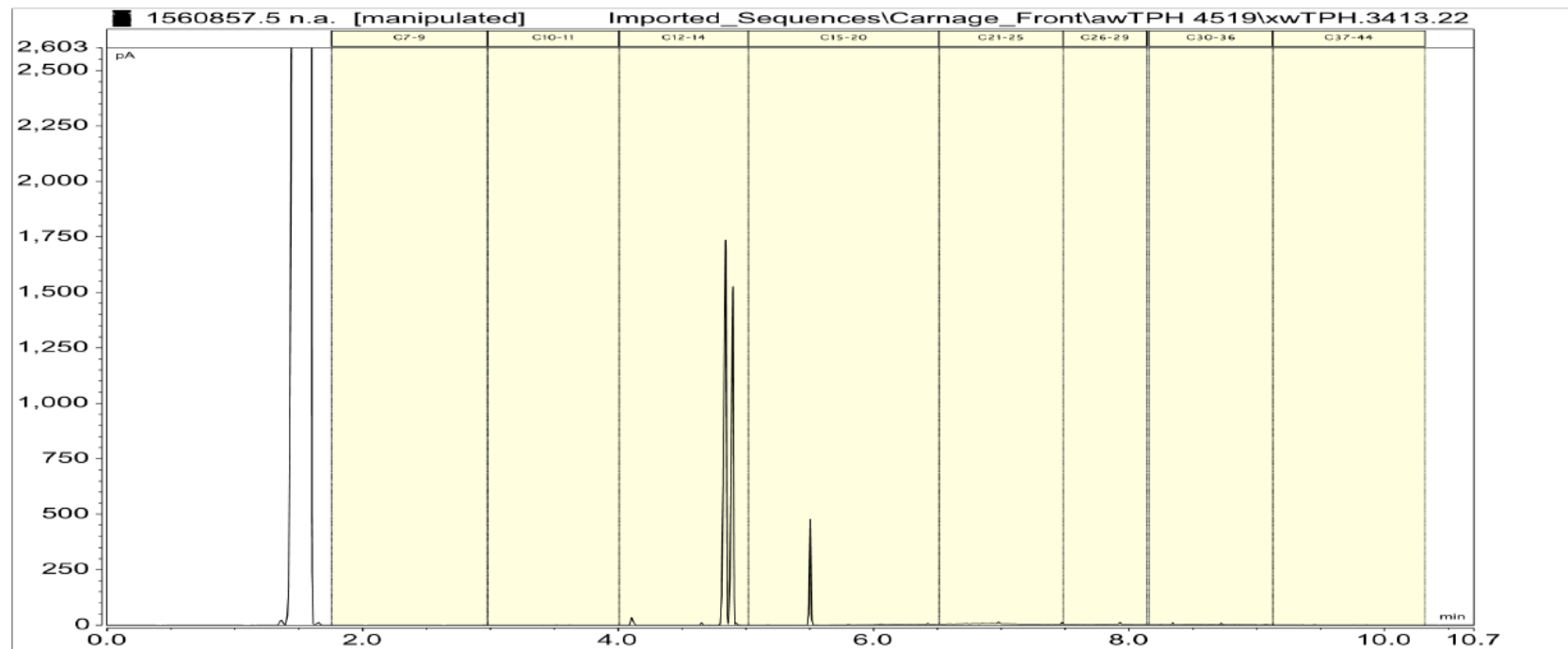
STO_50_0.6 04-Nov-2015

Client Chromatogram for TPH by FID



Paint factory discharge to SW

1560857.5
AS001/29316 [Aqueous layer]
Client Chromatogram for TPH by FID

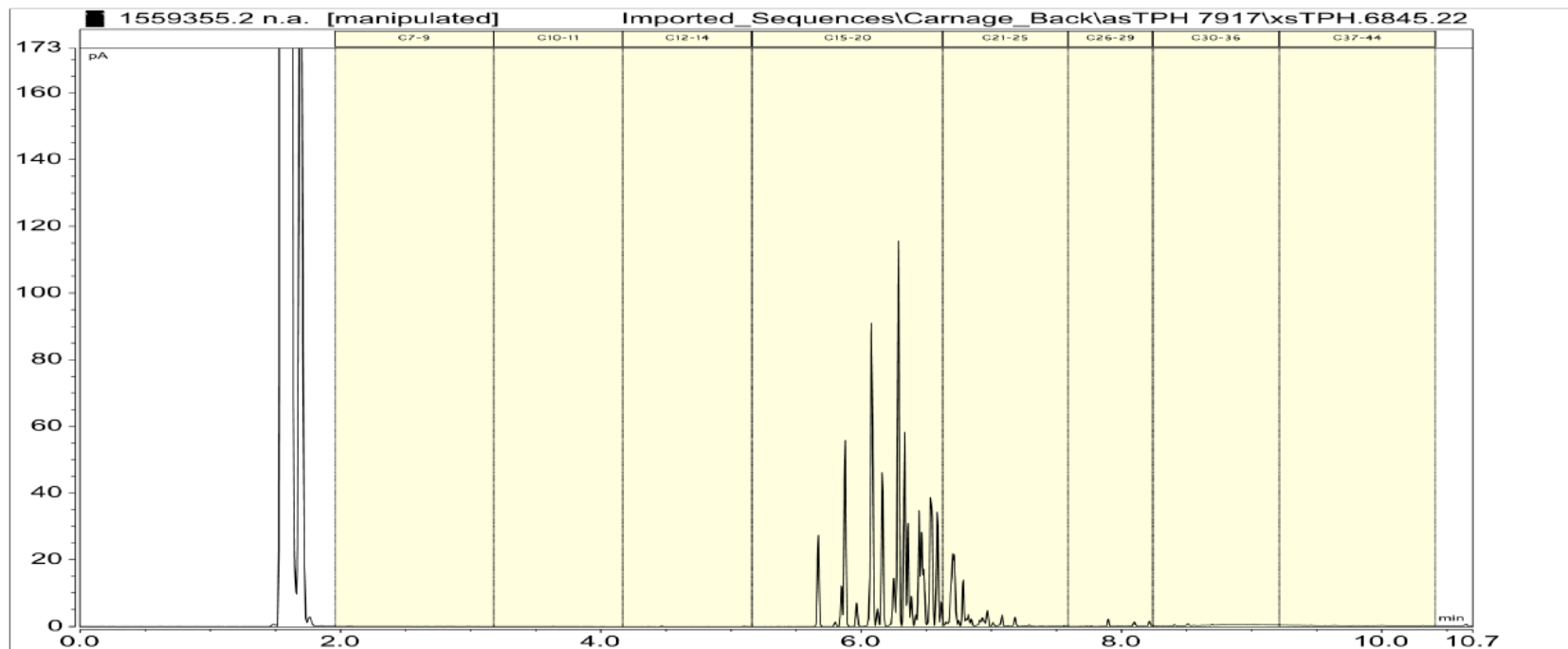


Soil PCBs

1559355.2

Bells Pit 30-Mar-2016 12:45 pm

Client Chromatogram for TPH by FID



Coal Tar

2942176.14
HSS 9/3 30-Mar-2022
Client Chromatogram for TPH by FID

