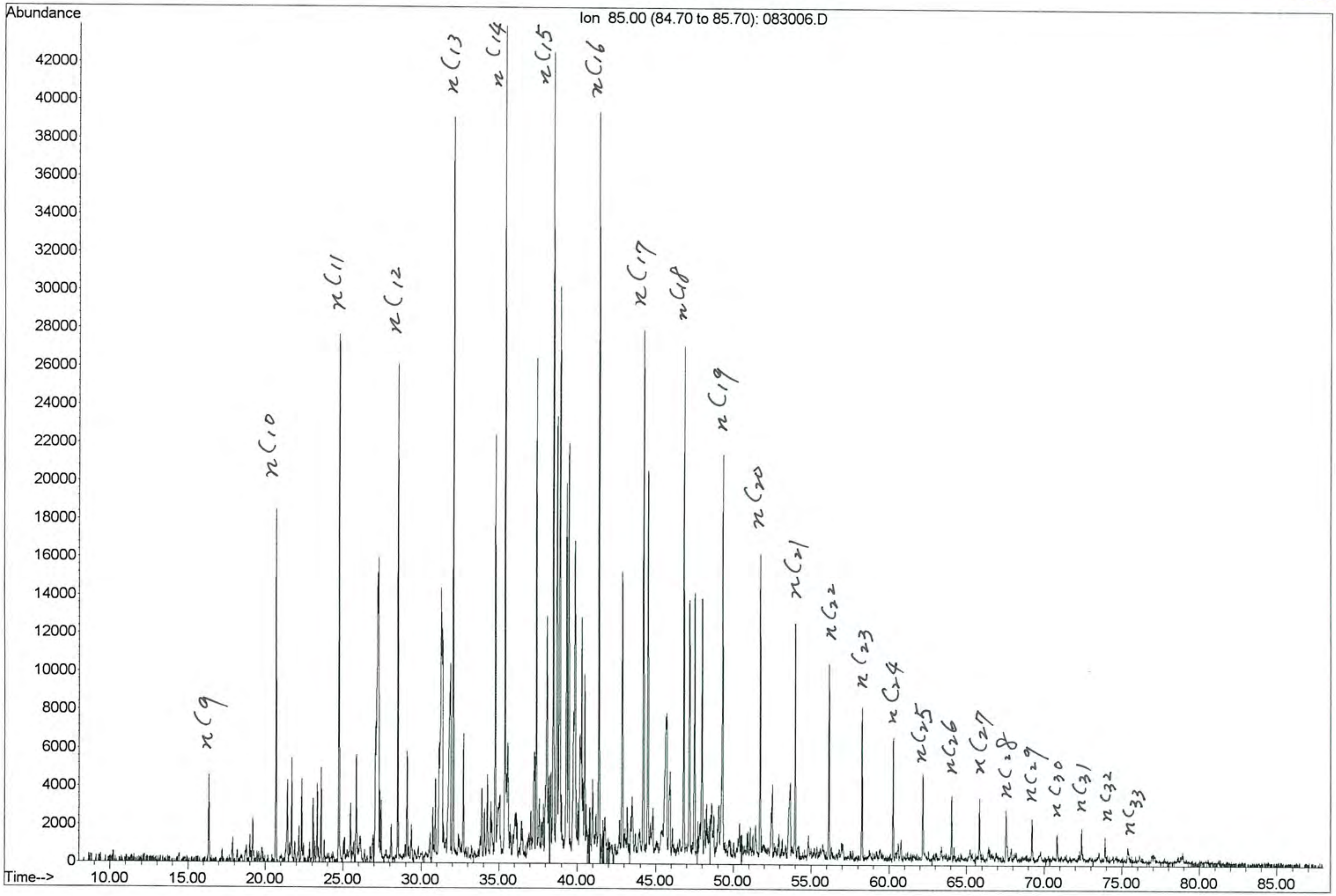
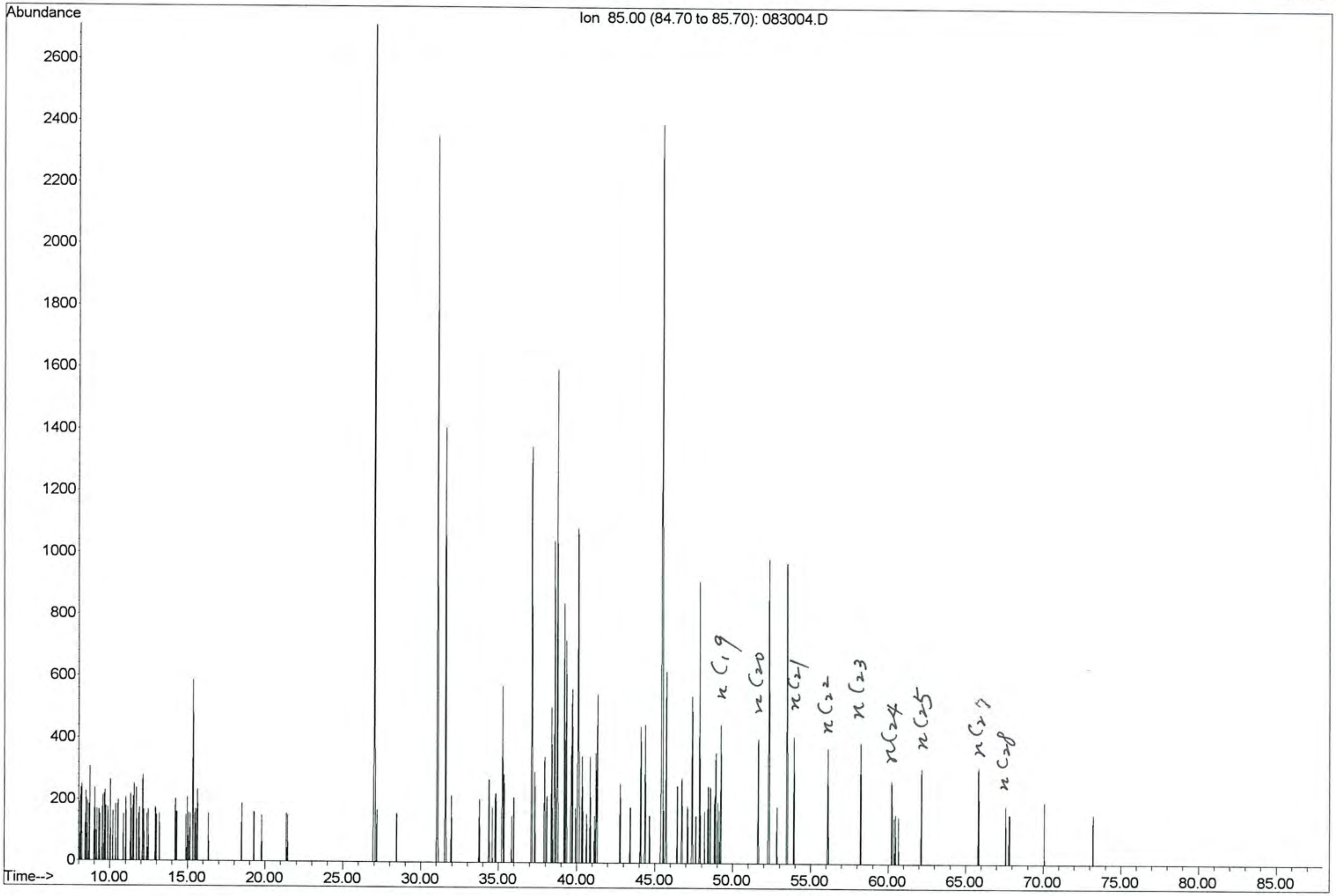
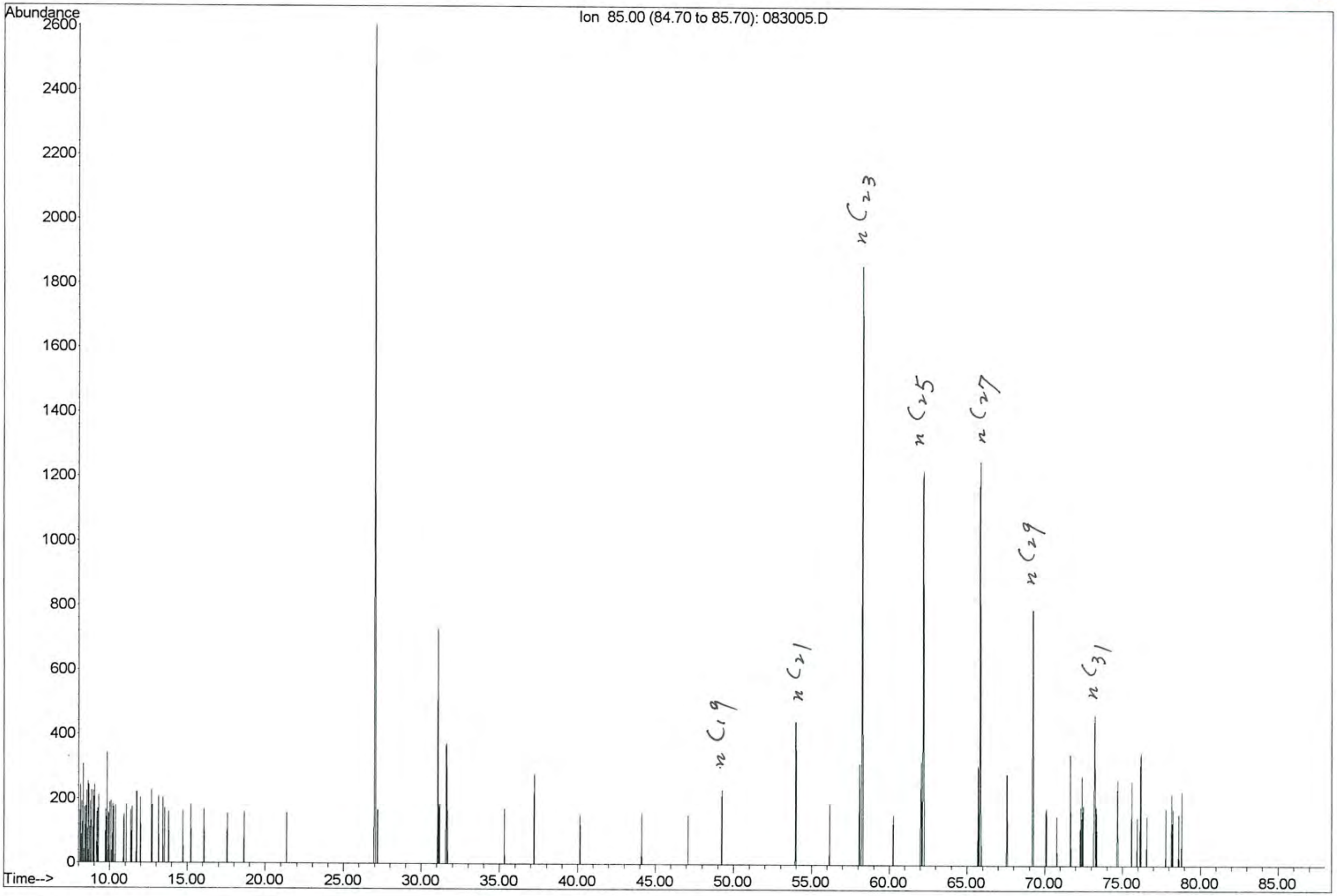
34011008050 (36920-1) soil extract (1:7)
MGP, Floyd Snider, QB SS5318, Vf=3ml



34011008054 (36920-5) soil extract
MGP, Floyd Snider, QB SS5318



34011008056 (36920-7) soil extract
MGP, Floyd Snider, QB SS5318



3-1-G (36921-3) soil extract (1:10)
Gas Works Park, Floyd Snider, QB SS5318, Vf=2ml

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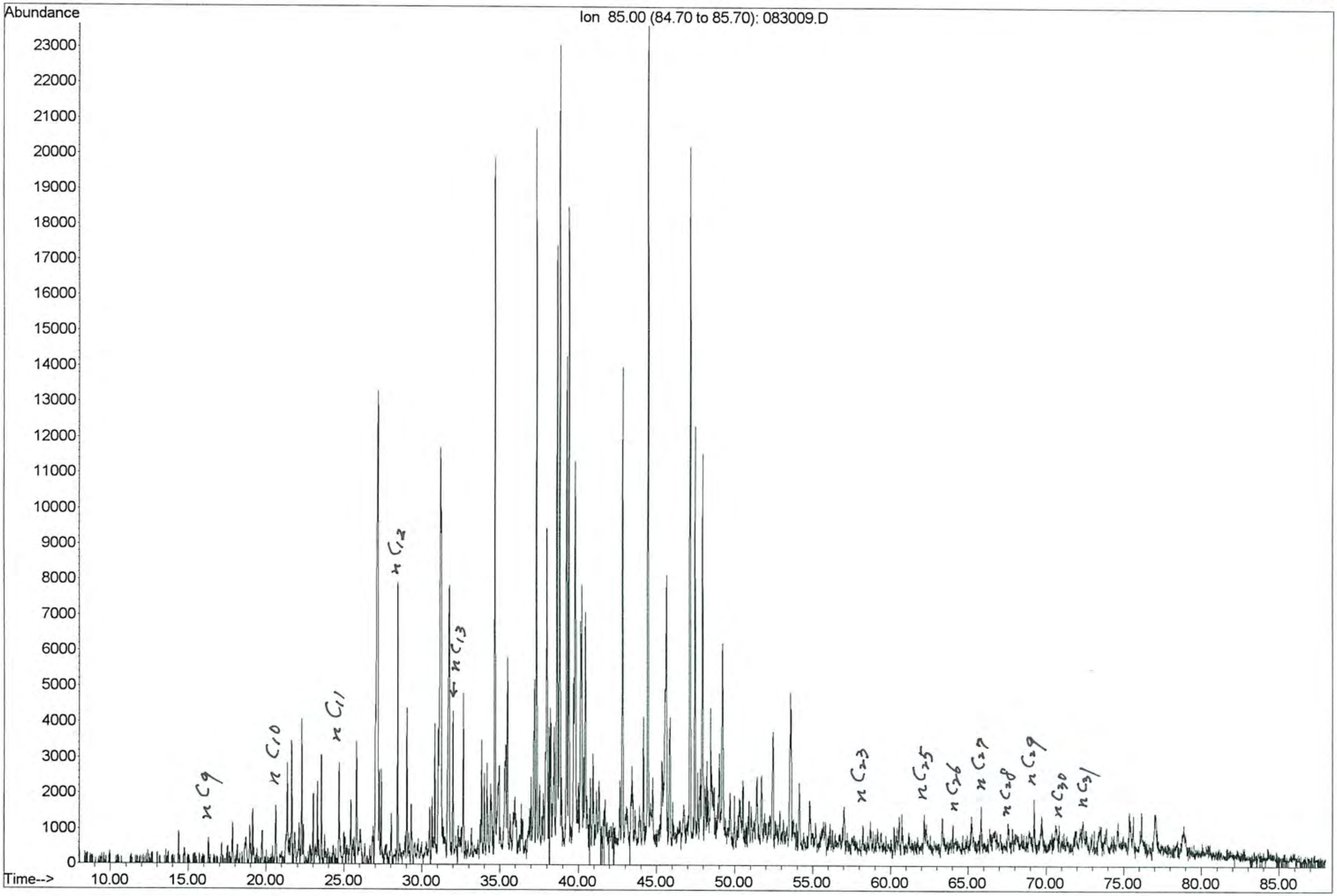
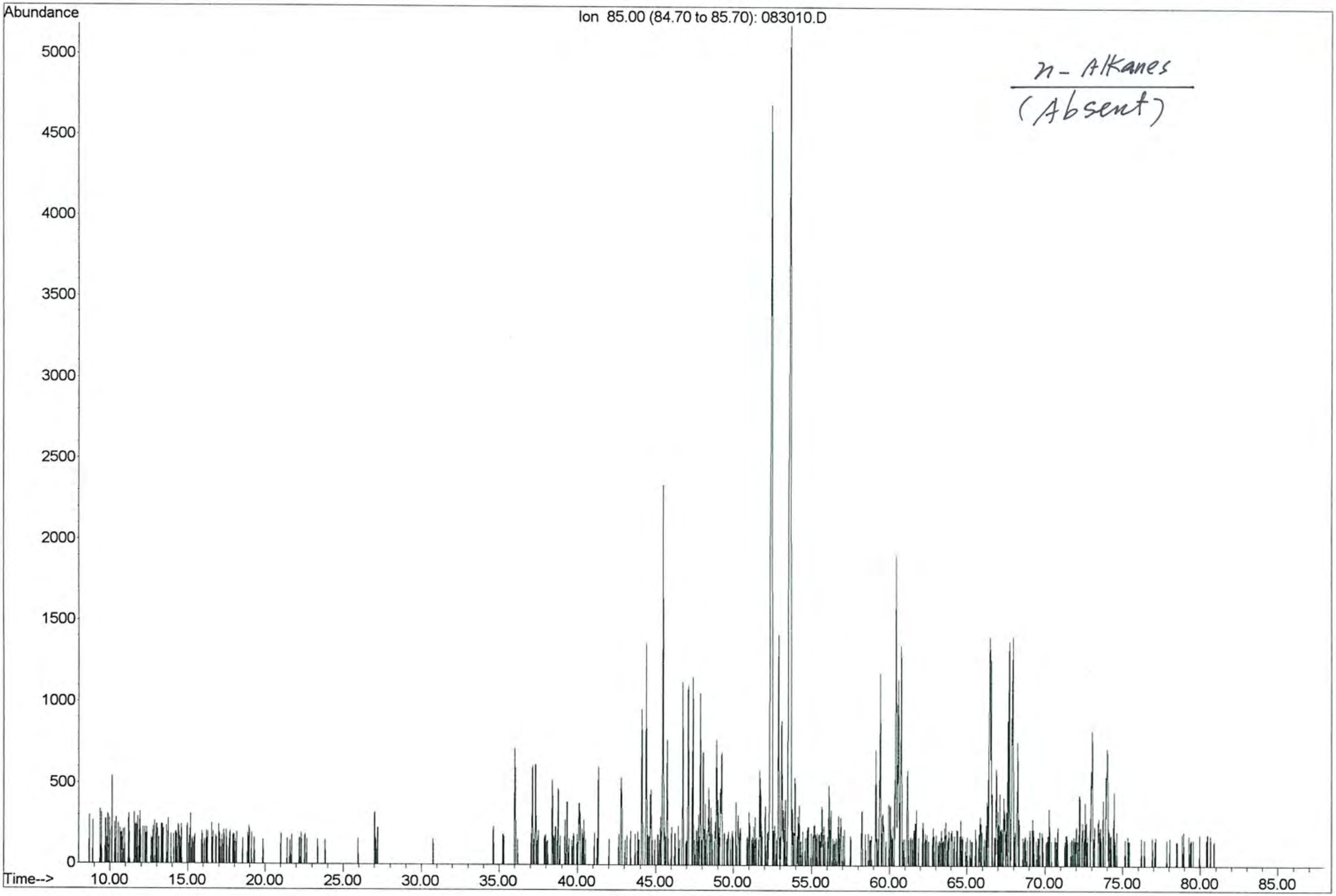
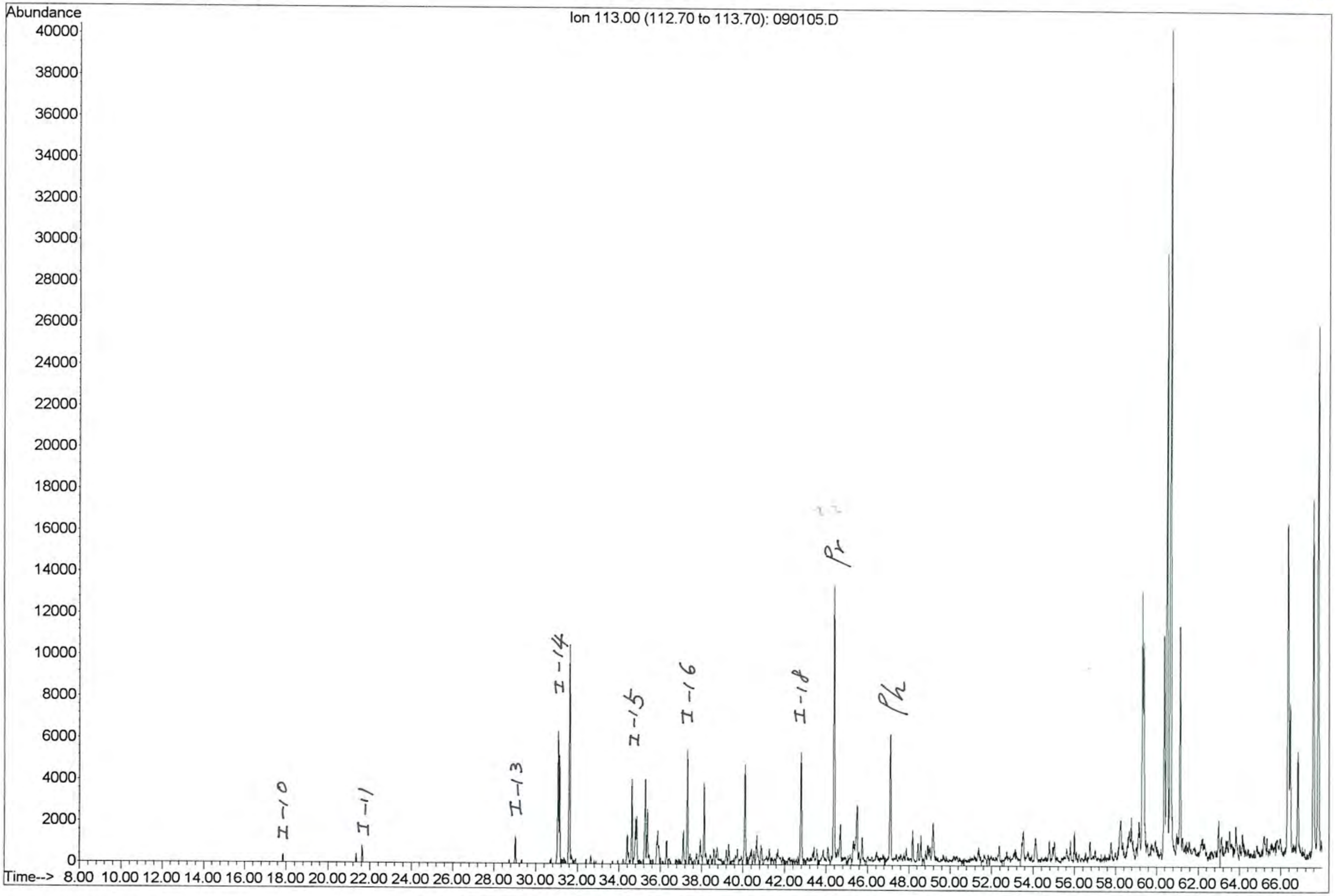


1-1G (36922-3) soil extract (1:12)
MGP, Floyd Snider, QB SS5318, Vf=3ml

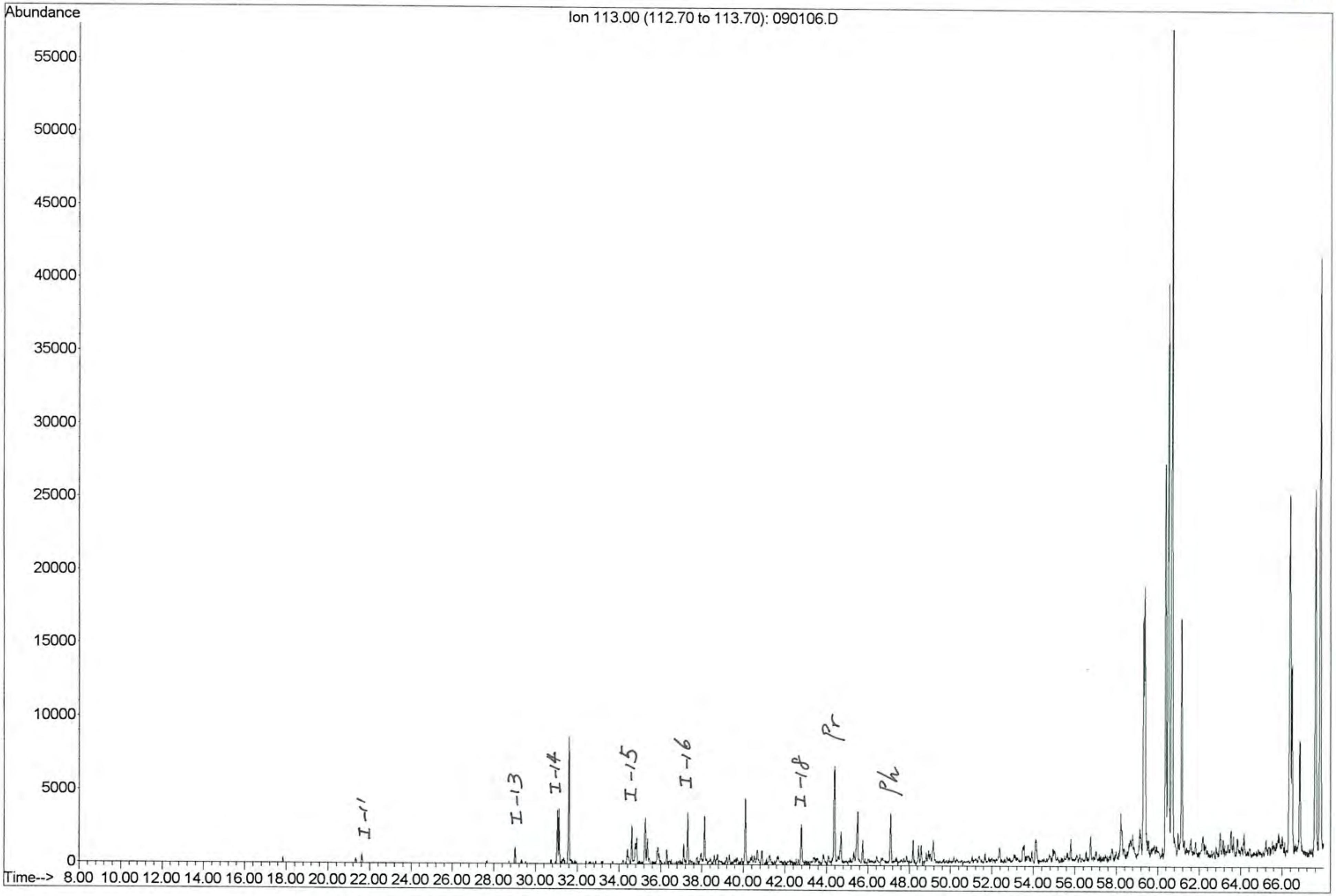


n- Alkanes
(Absent)

34011008001 (36917-1) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml

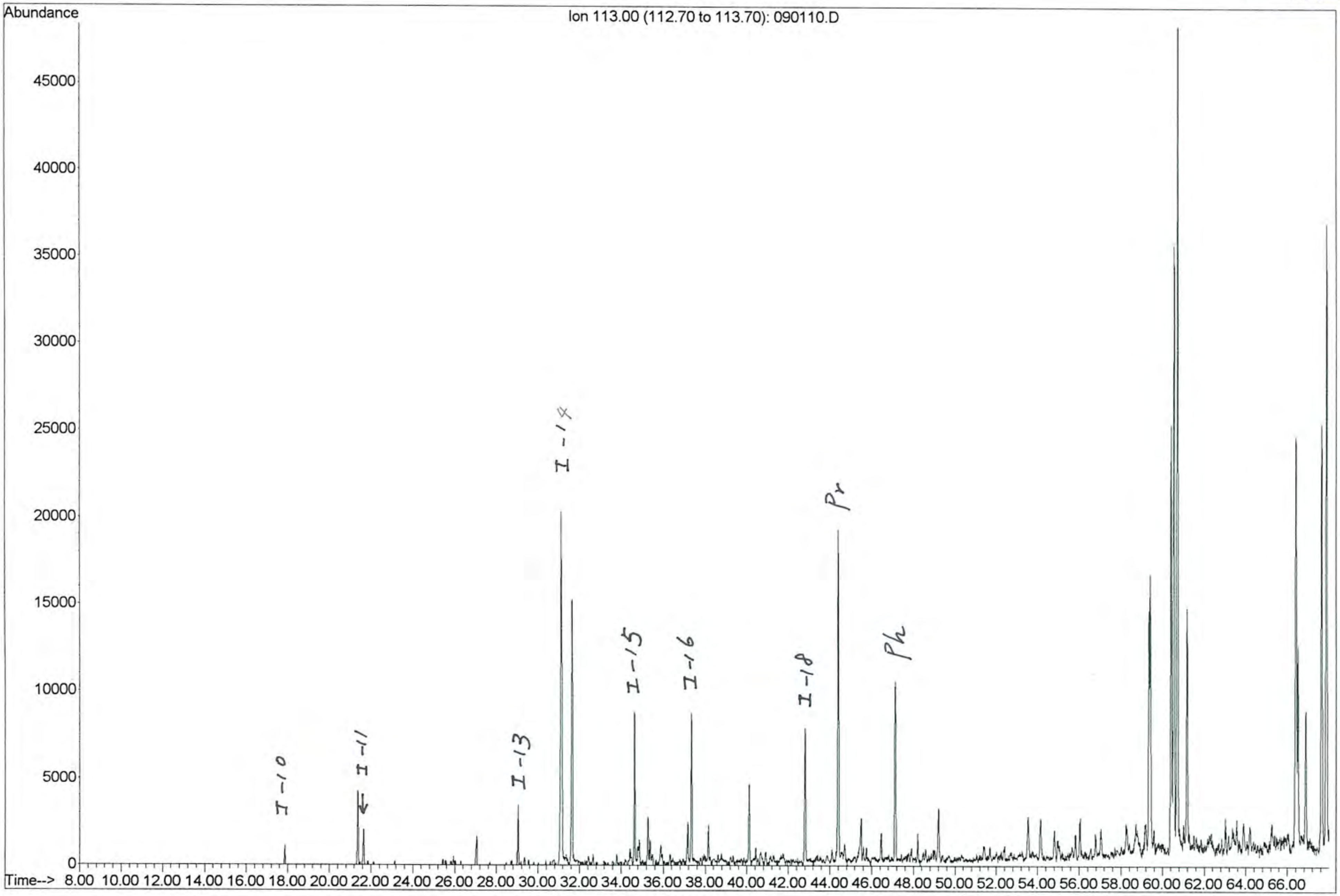


34011008011 (36917-11) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml

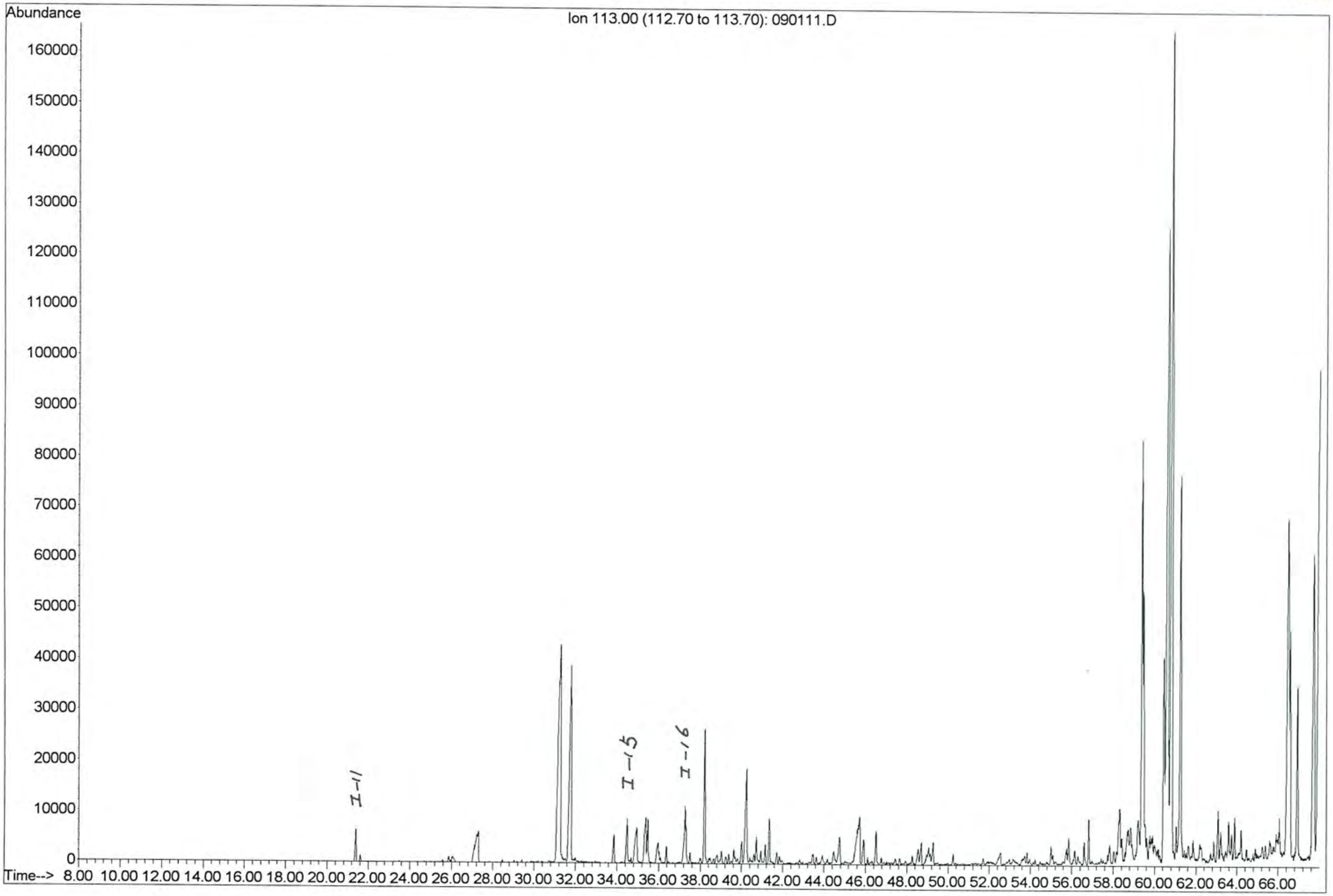


34011008017 (36918-1) soil extract (3:7)
MGP, Floyd Snider, QB SS5305, Vf=1ml

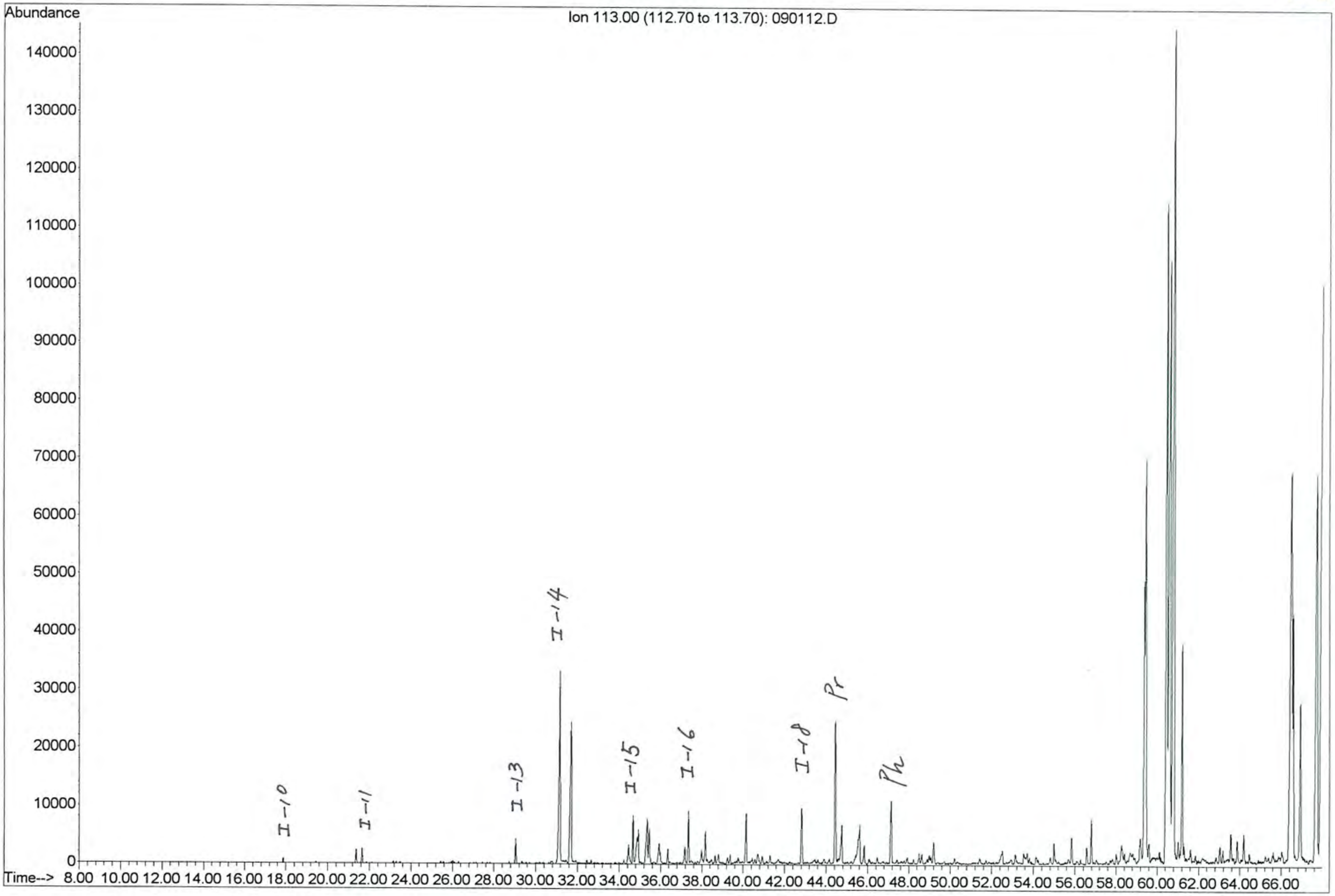
ZymaX FORENSICS



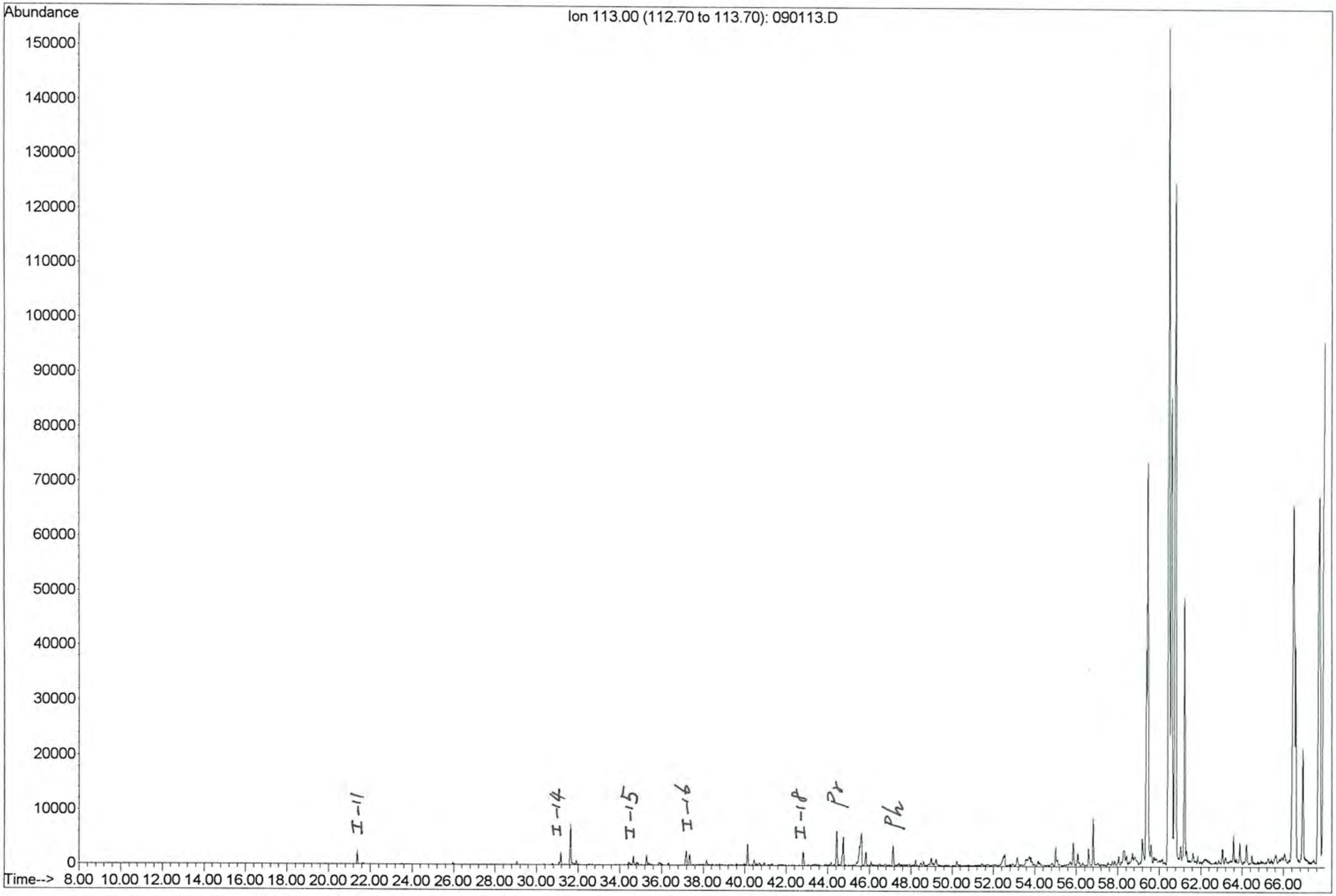
34011008020 (36918-4) soil extract (1:1.2)
MGP, Floyd Snider, QB SS5305, Vf=2ml



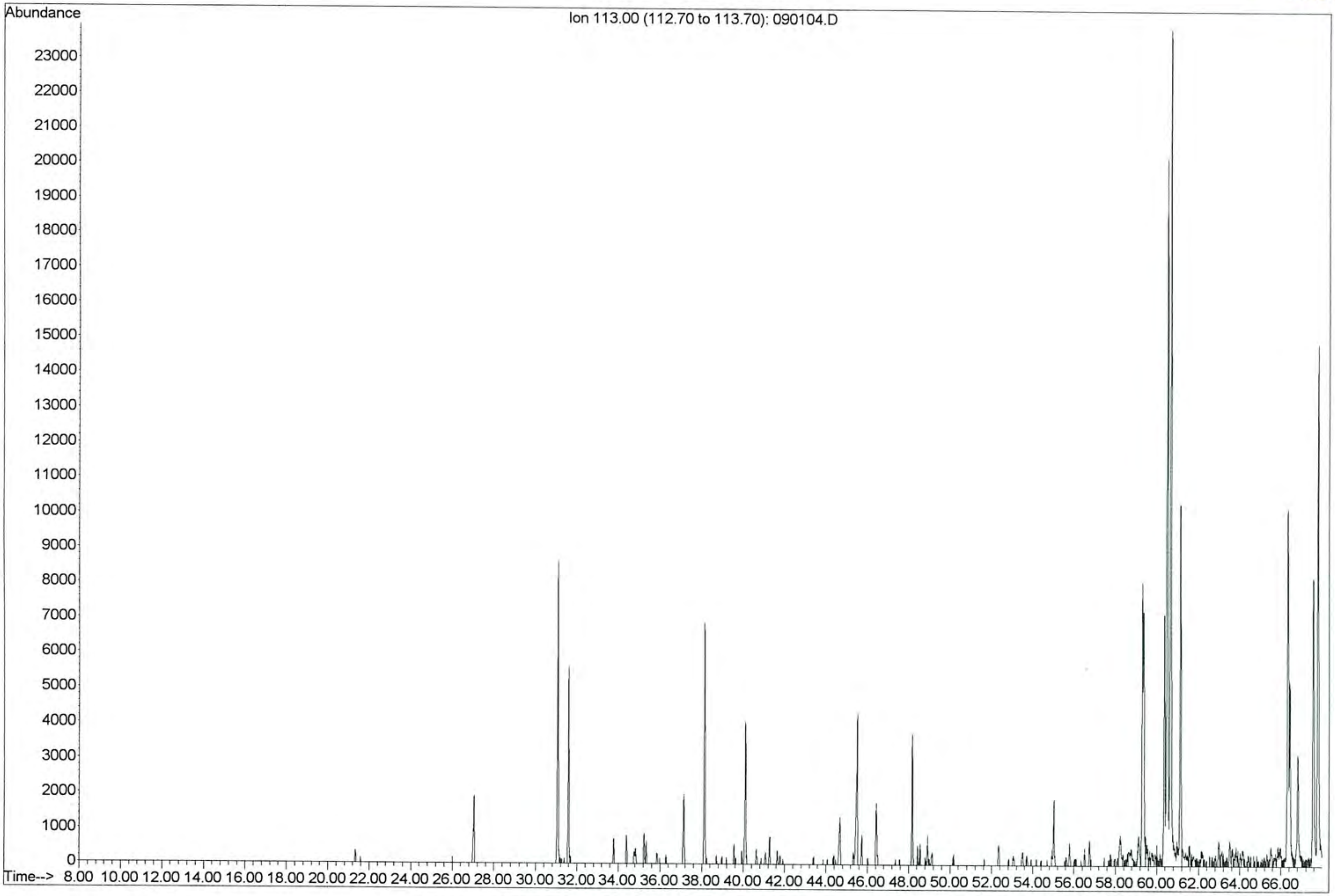
34011008022 (36918-6) soil extract (3:8)
MGP, Floyd Snider, QB SS5305, Vf=2ml



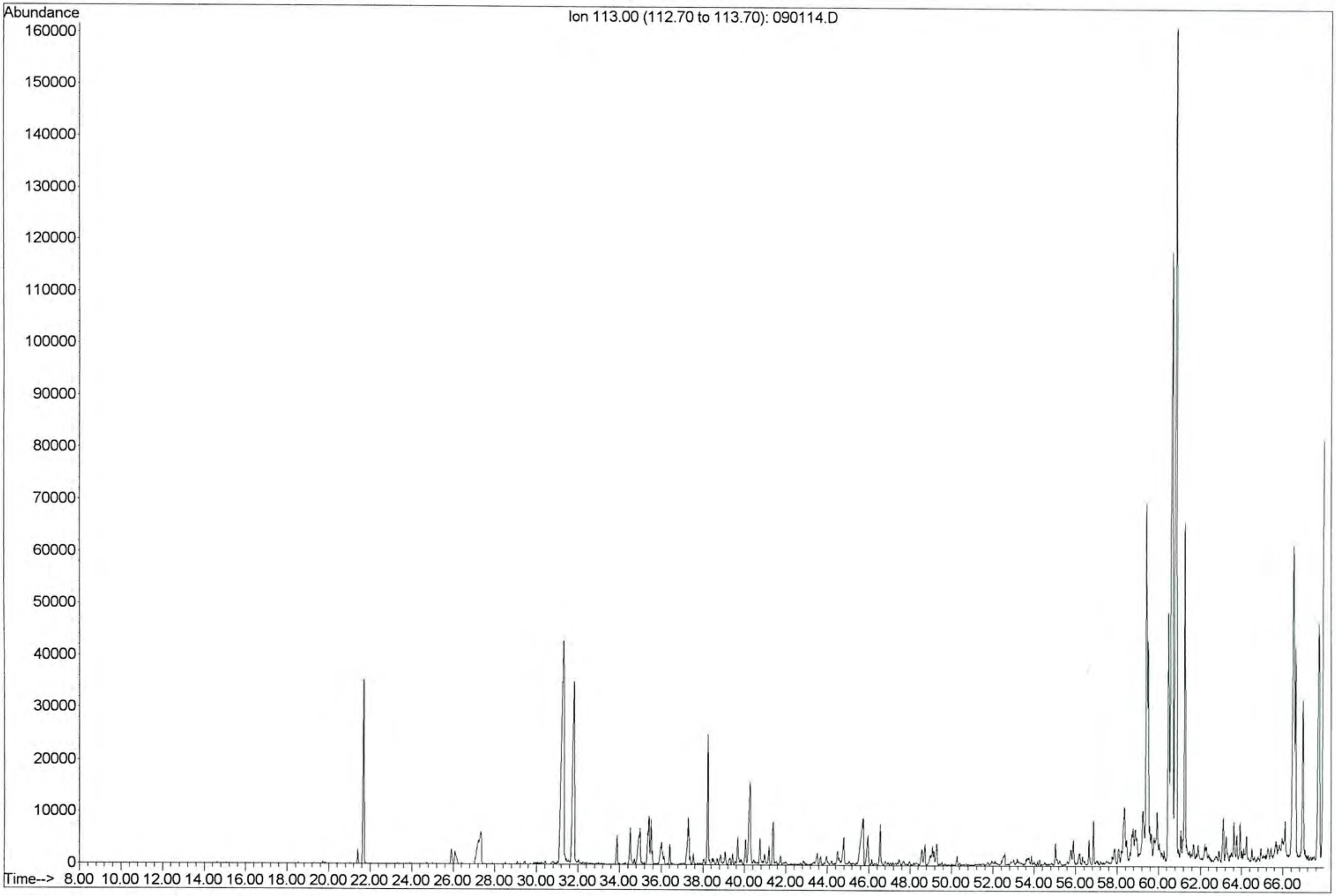
34011008028 (36918-12) soil extract (1:1))
MGP, Floyd Snider, QB SS5305, Vf=2ml



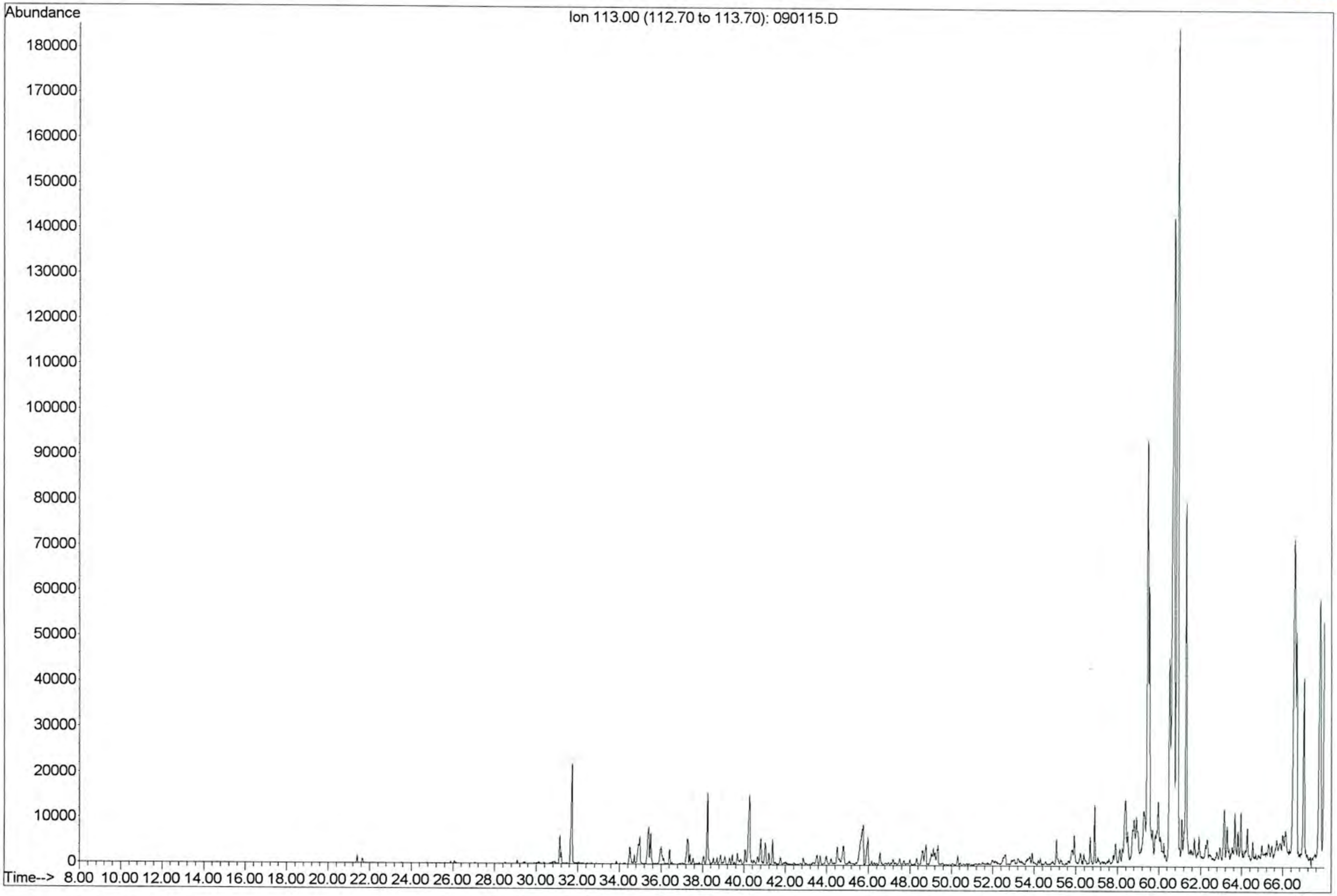
34011008030 (36918-14) soil extract
MGP, Floyd Snider, QB SS5305



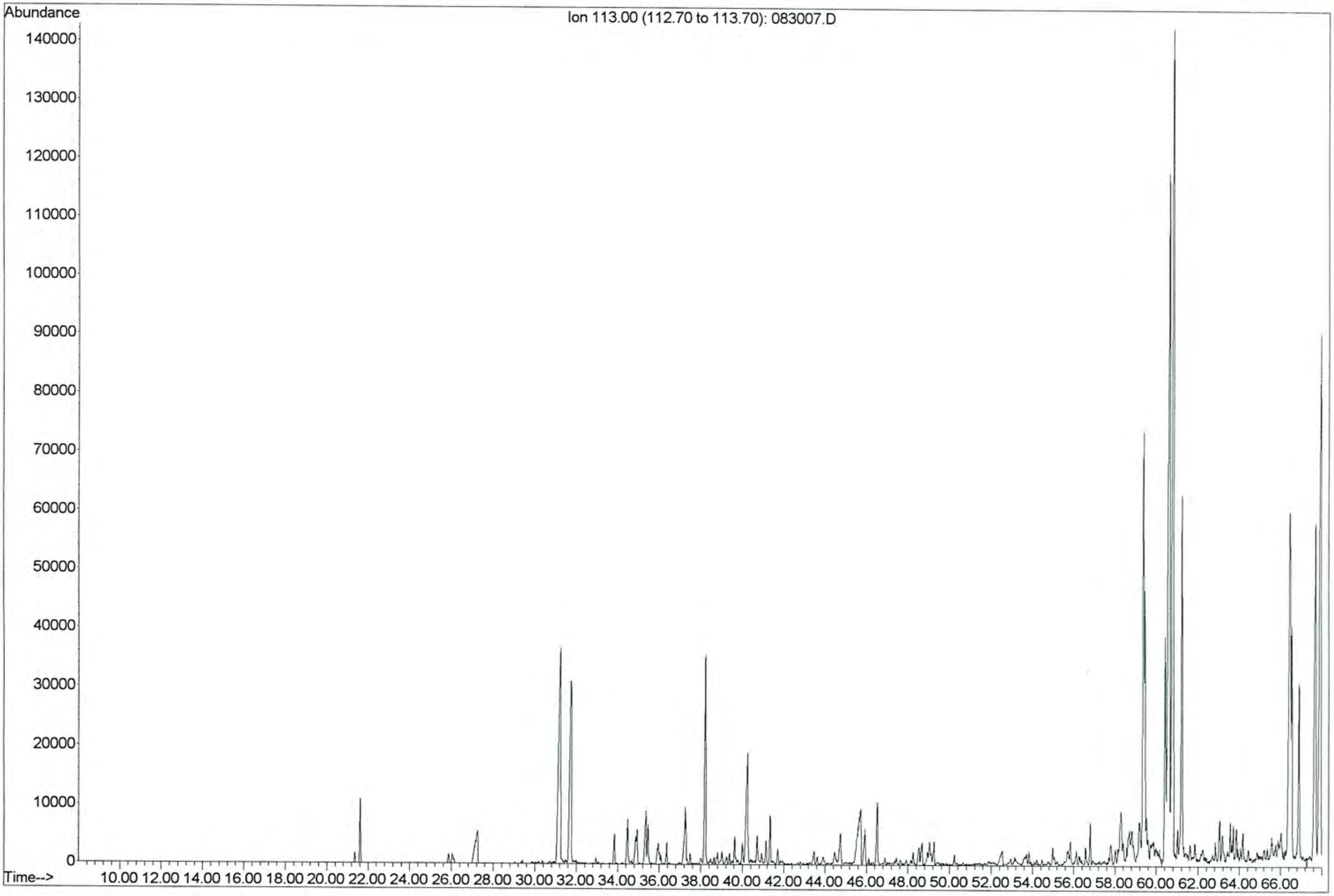
34011008032 (36918-16) soil ext (3.5:6.5)
MGP, Floyd Snider, QB SS5305, Vf=4ml



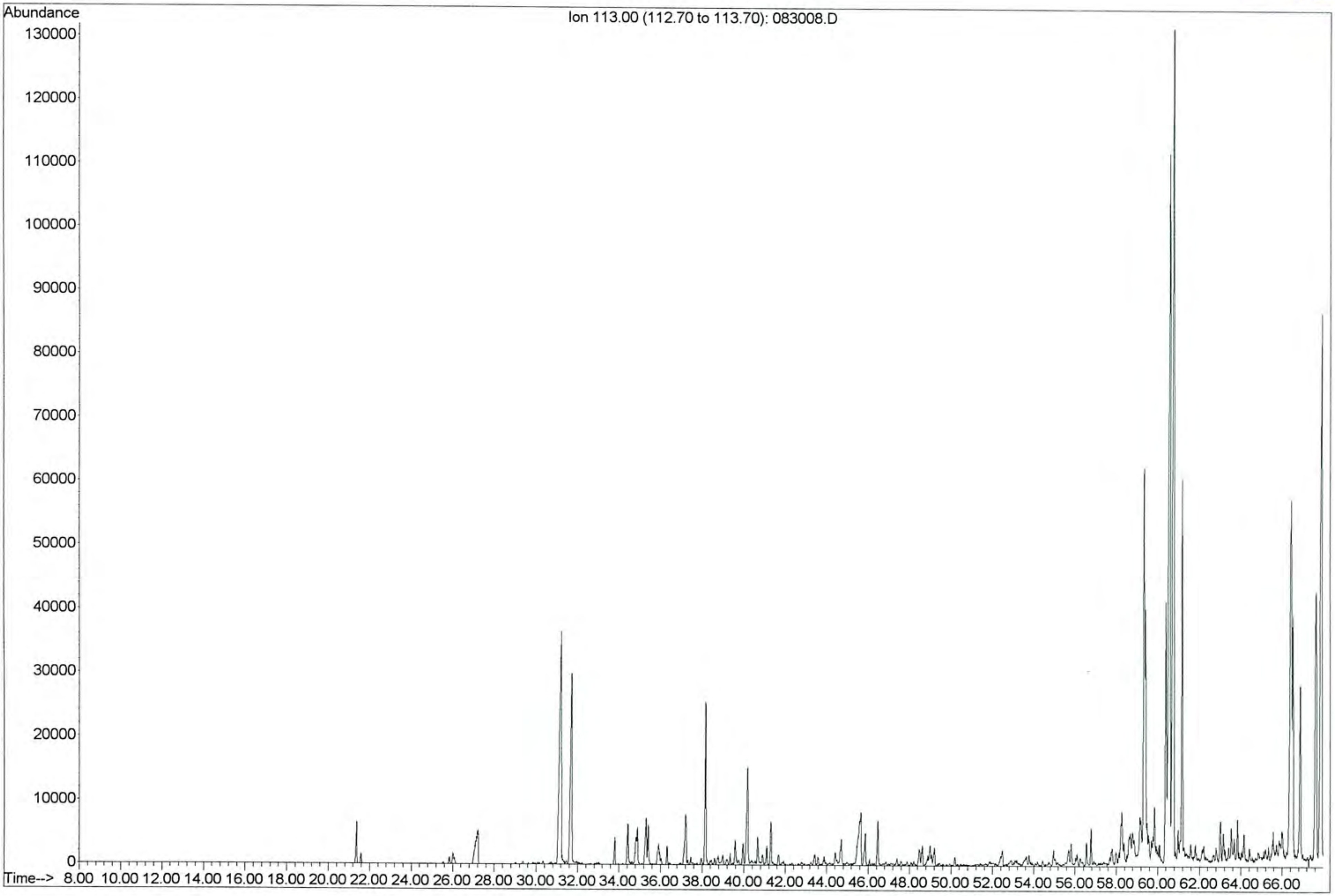
34011008035 (36918-19) soil ext (4:6)
MGP, Floyd Snider, QB SS5305, Vf=1ml



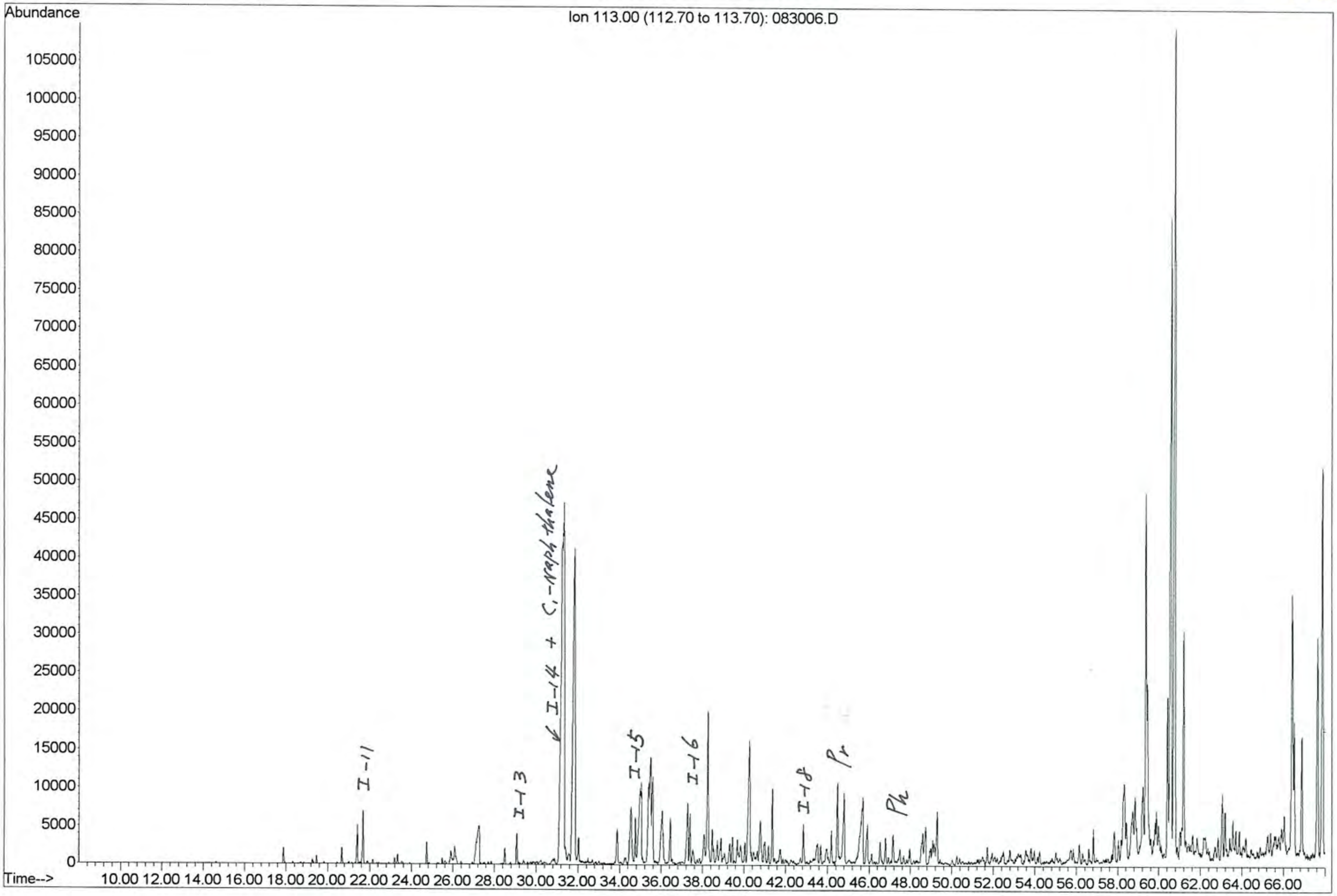
34011008040 (36919-4) soil extract (1:2)
MGP, Floyd Snider, QB SS5318



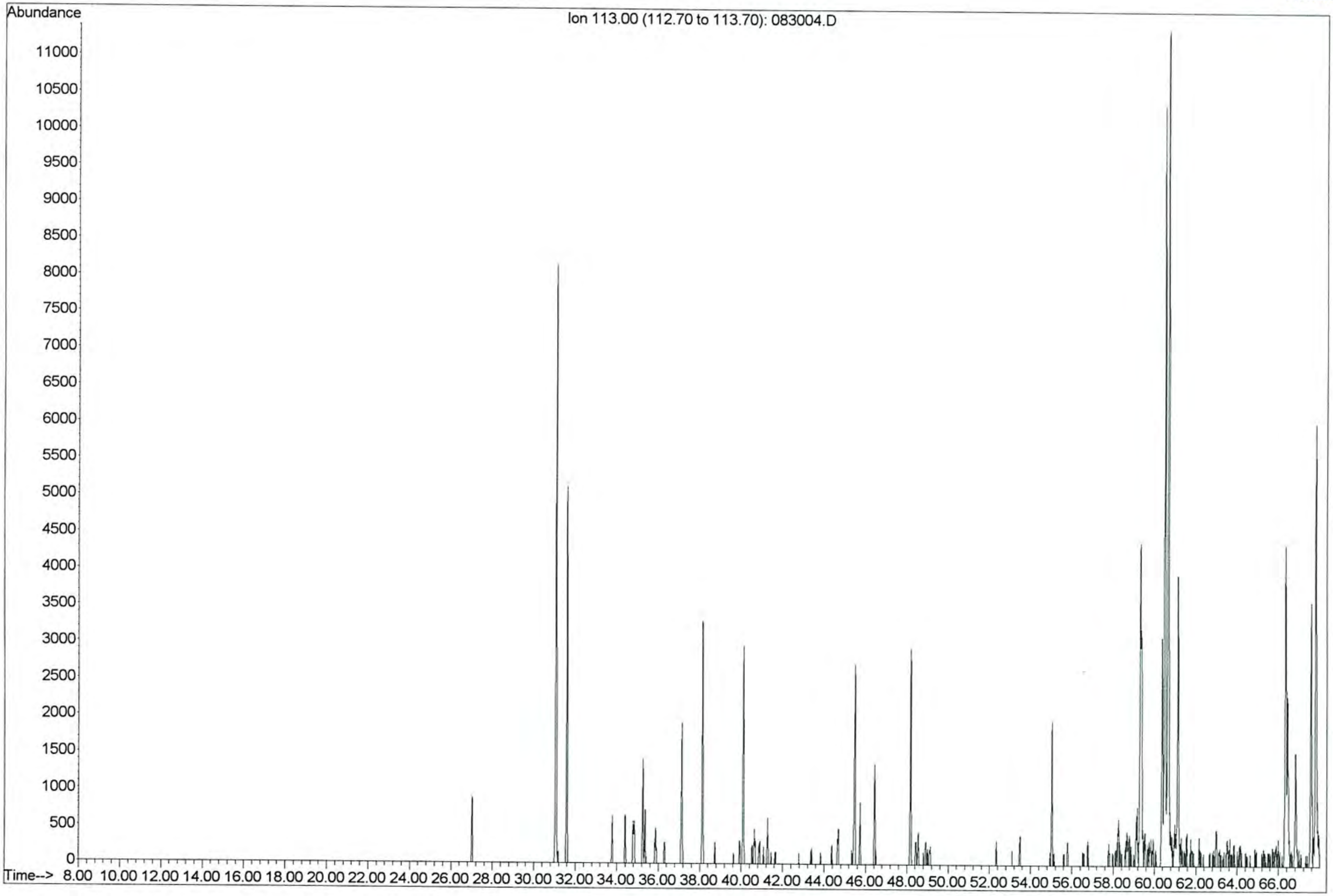
34011008043 (36919-7) soil extract (1:2)
MGP, Floyd Snider, QB SS5318, Vf=3ml



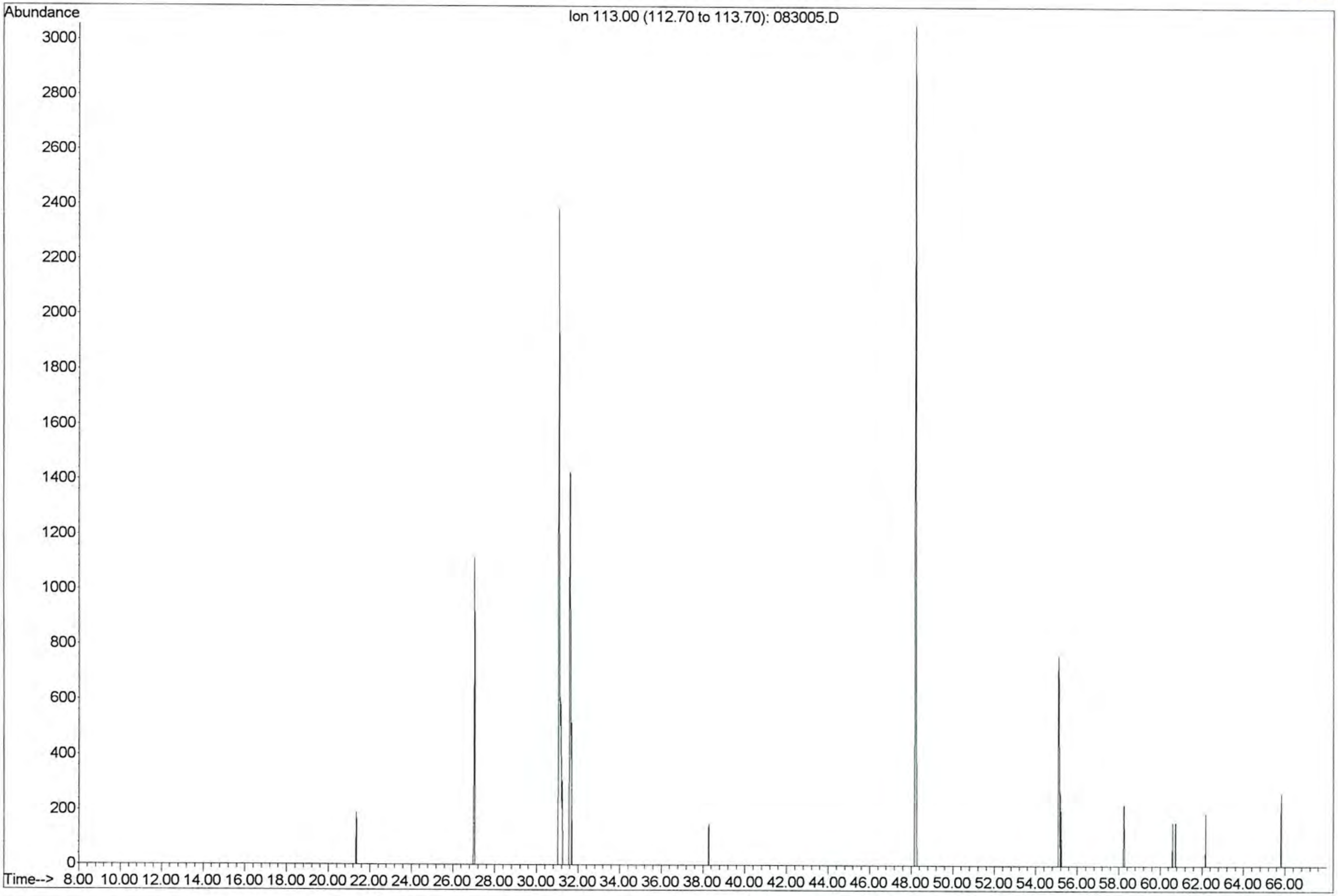
34011008050 (36920-1) soil extract (1:7)
MGP, Floyd Snider, QB SS5318, Vf=3ml



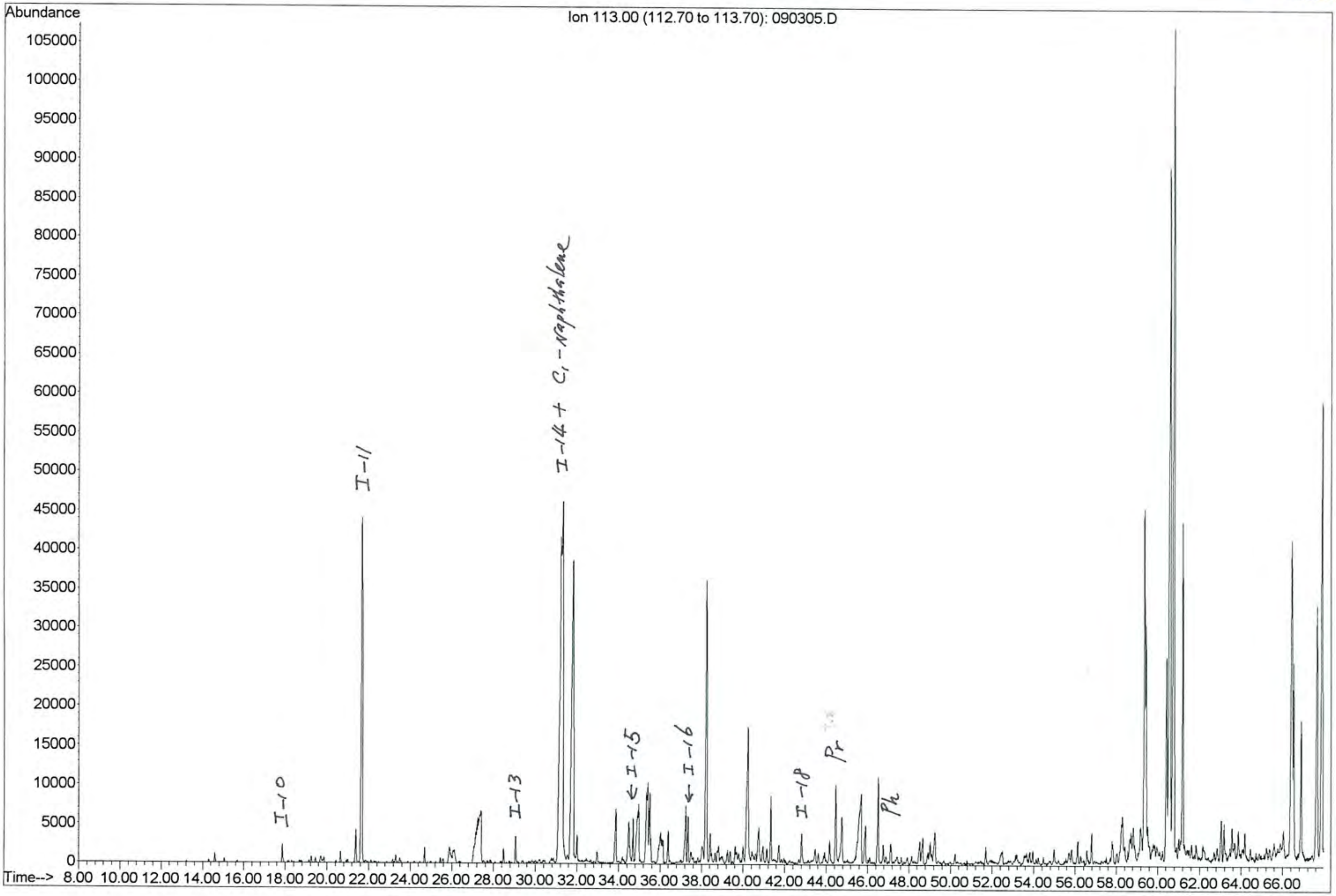
34011008054 (36920-5) soil extract
MGP, Floyd Snider, QB SS5318



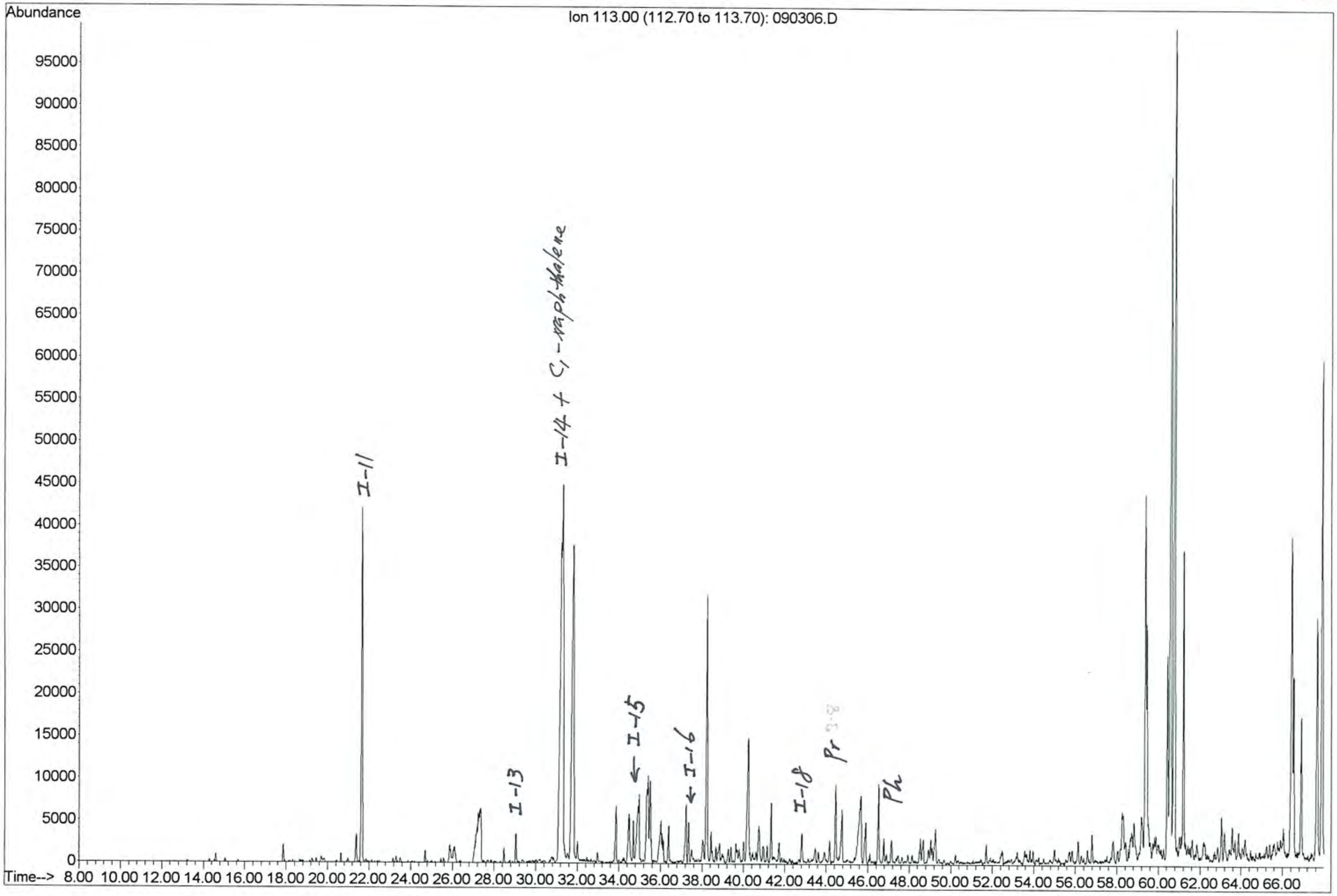
34011008056 (36920-7) soil extract
MGP, Floyd Snider, QB SS5318



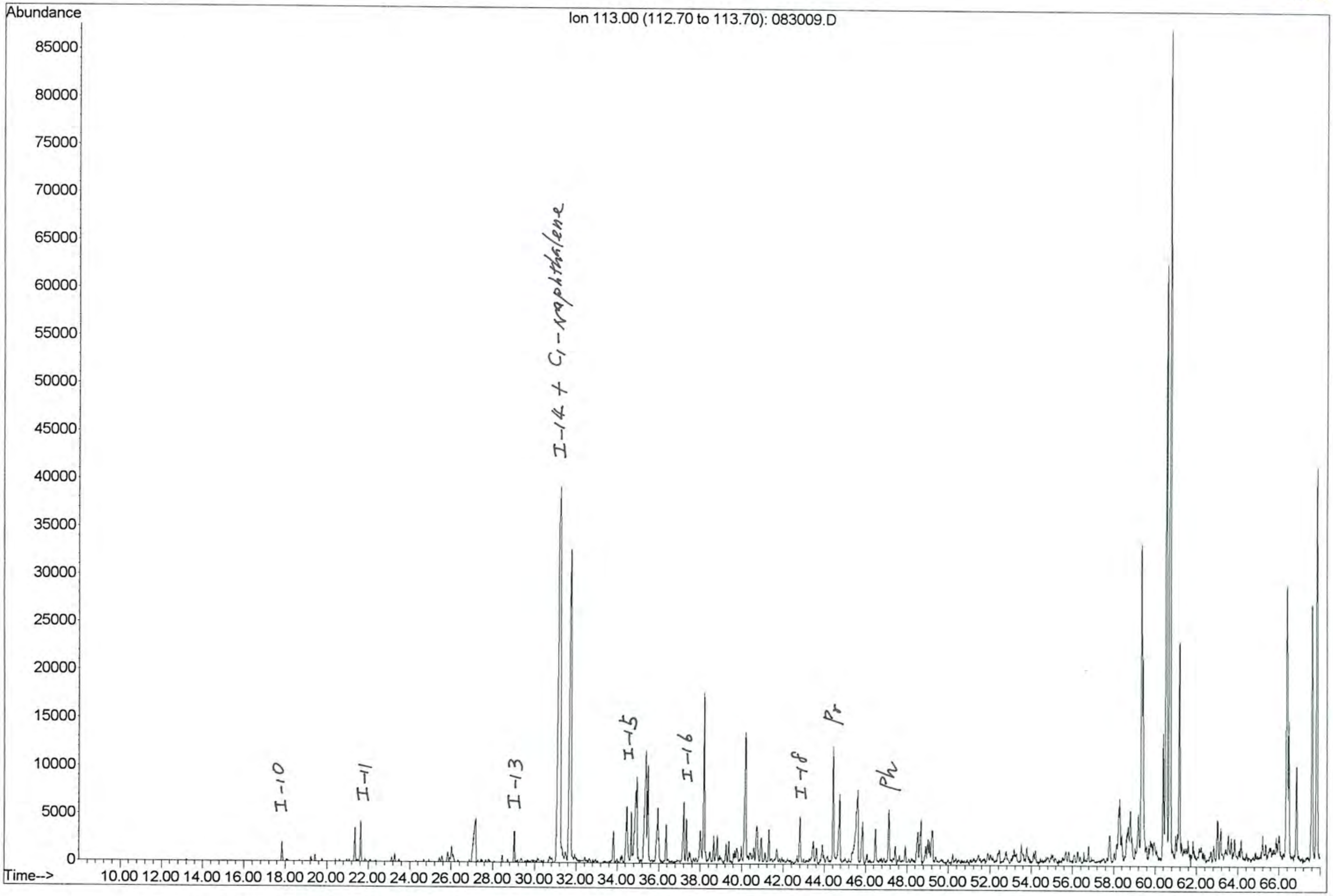
DW-4-FP (36921-1) Product x50
Gas Works Park, Floyd



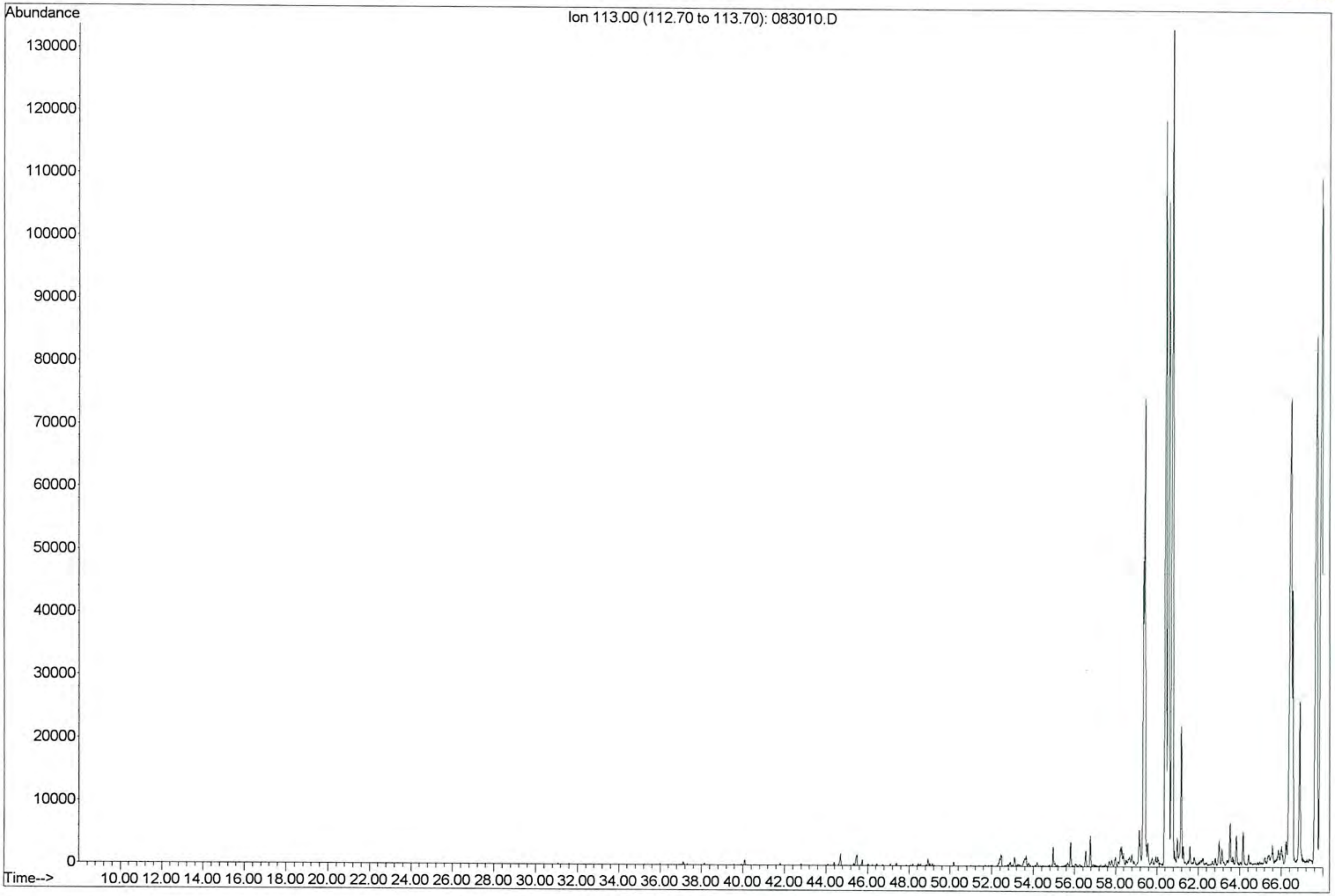
DW-5-FP (36921-2) Product x50
Gas Works Park, Floyd



3-1-G (36921-3) soil extract (1:10)
Gas Works Park, Floyd Snider, QB SS5318, Vf=2ml



1-1G (36922-3) soil extract (1:12)
MGP, Floyd Snider, QB SS5318, Vf=3ml

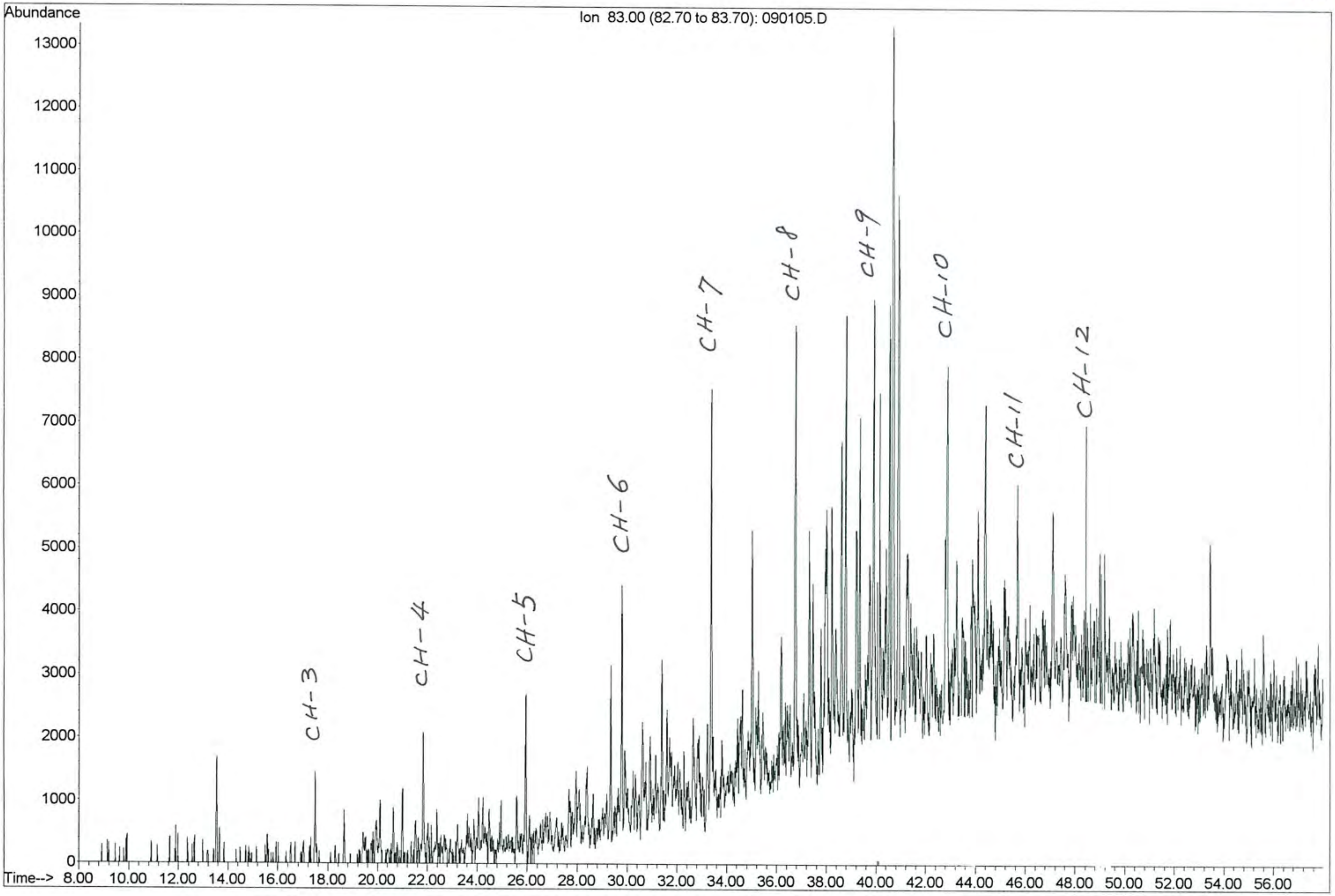


Table

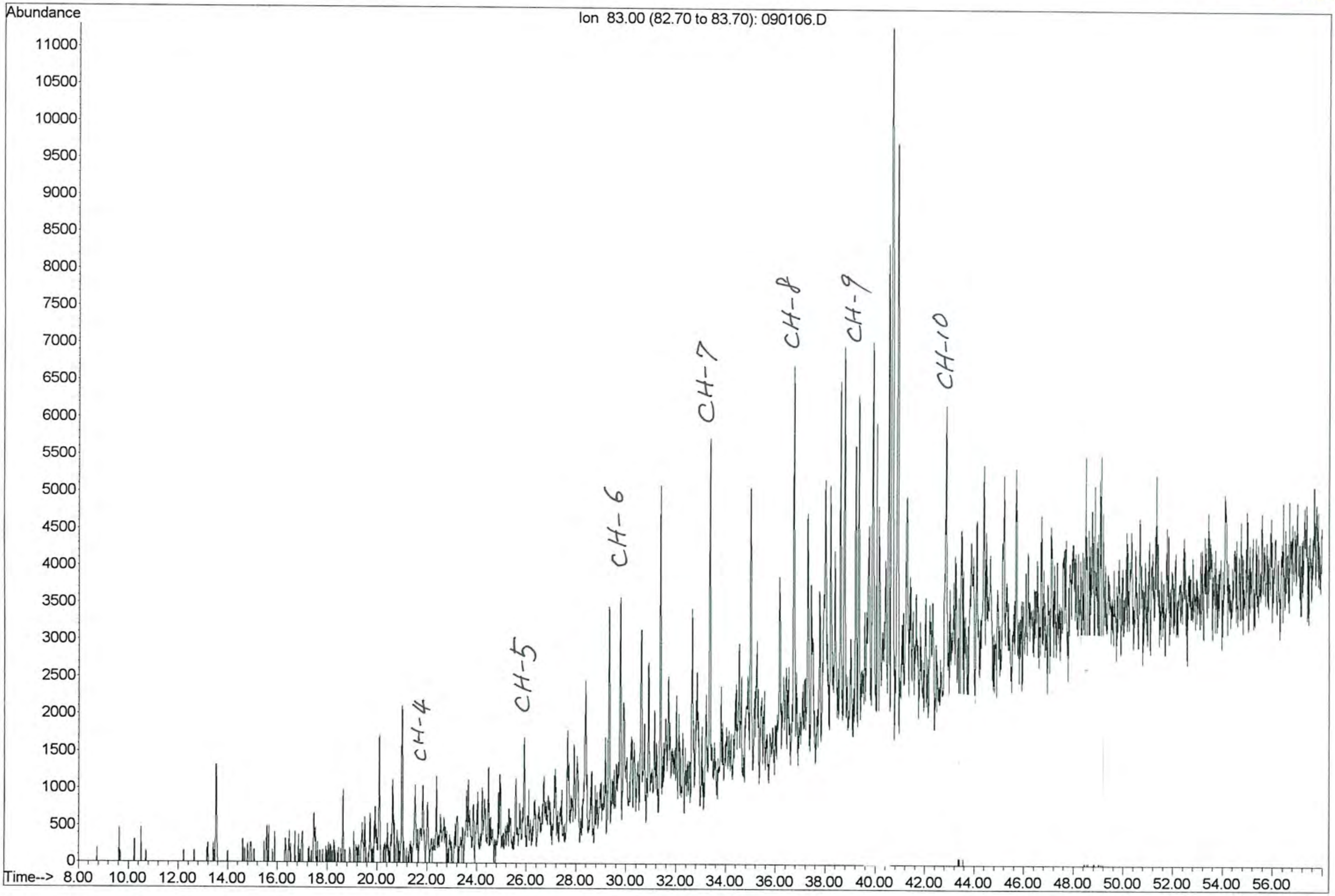
Key for Alkylcyclohexanes at m/z 83

Symbol	Detail
CH-1:	Methylcyclohexane
CH-2:	Ethylcyclohexane
CH-3:	Propylcylohexane
CH-4:	Butylcyclohexane
CH-5:	Pentylcyclohexane
CH-6:	Hexylcyclohexane
CH-7:	Heptylcyclohexane
CH-8:	Octylcyclohexane
CH-9:	Nonylcyclohexane
CH-10:	Decylcyclohexane
CH-11:	Undecylcyclohexane
CH-12:	Dodecylcyclohexane
CH-13:	Tridecylcyclohexane
CH-14:	Tetradecylcyclohexane

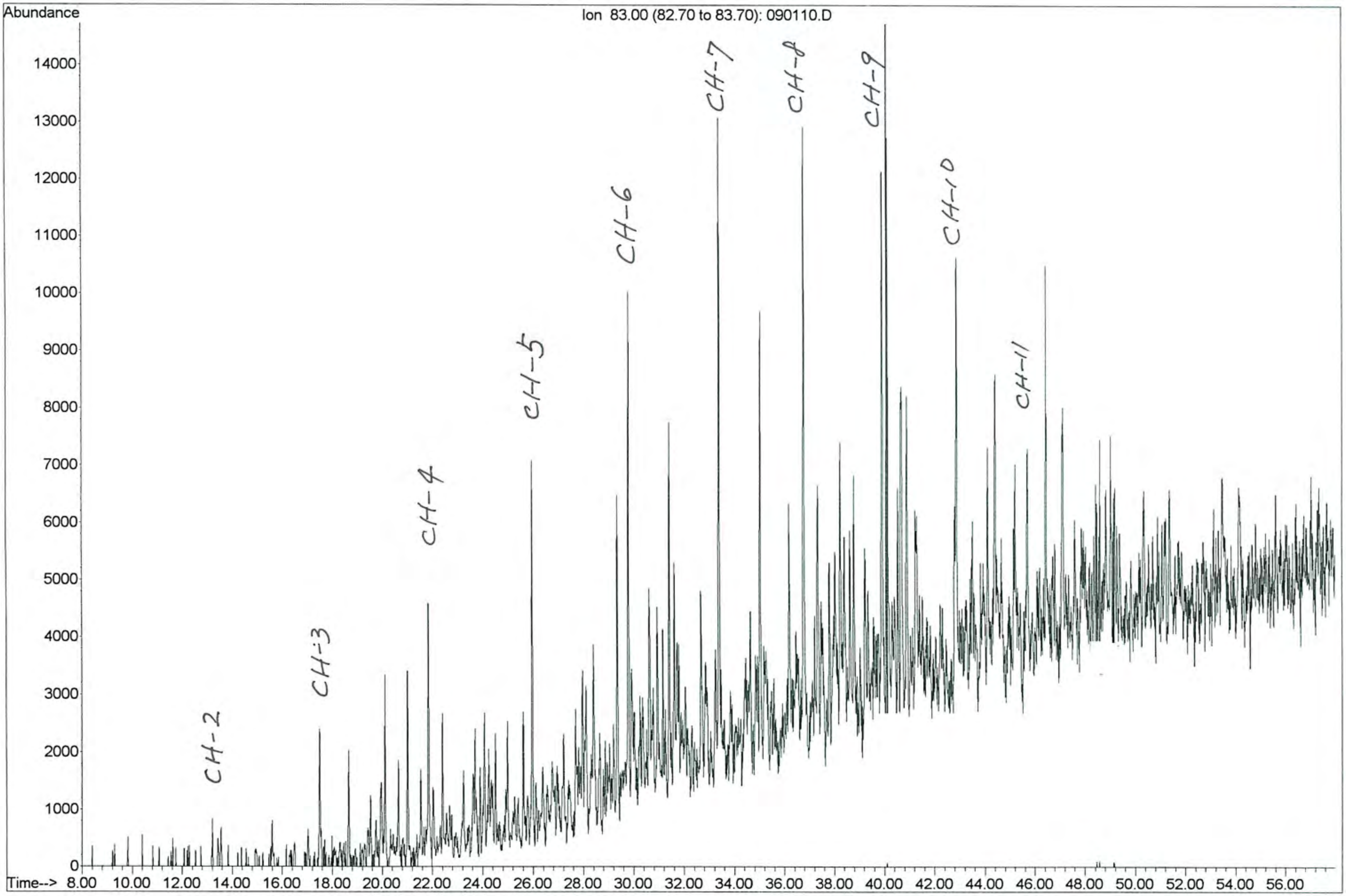
34011008001 (36917-1) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



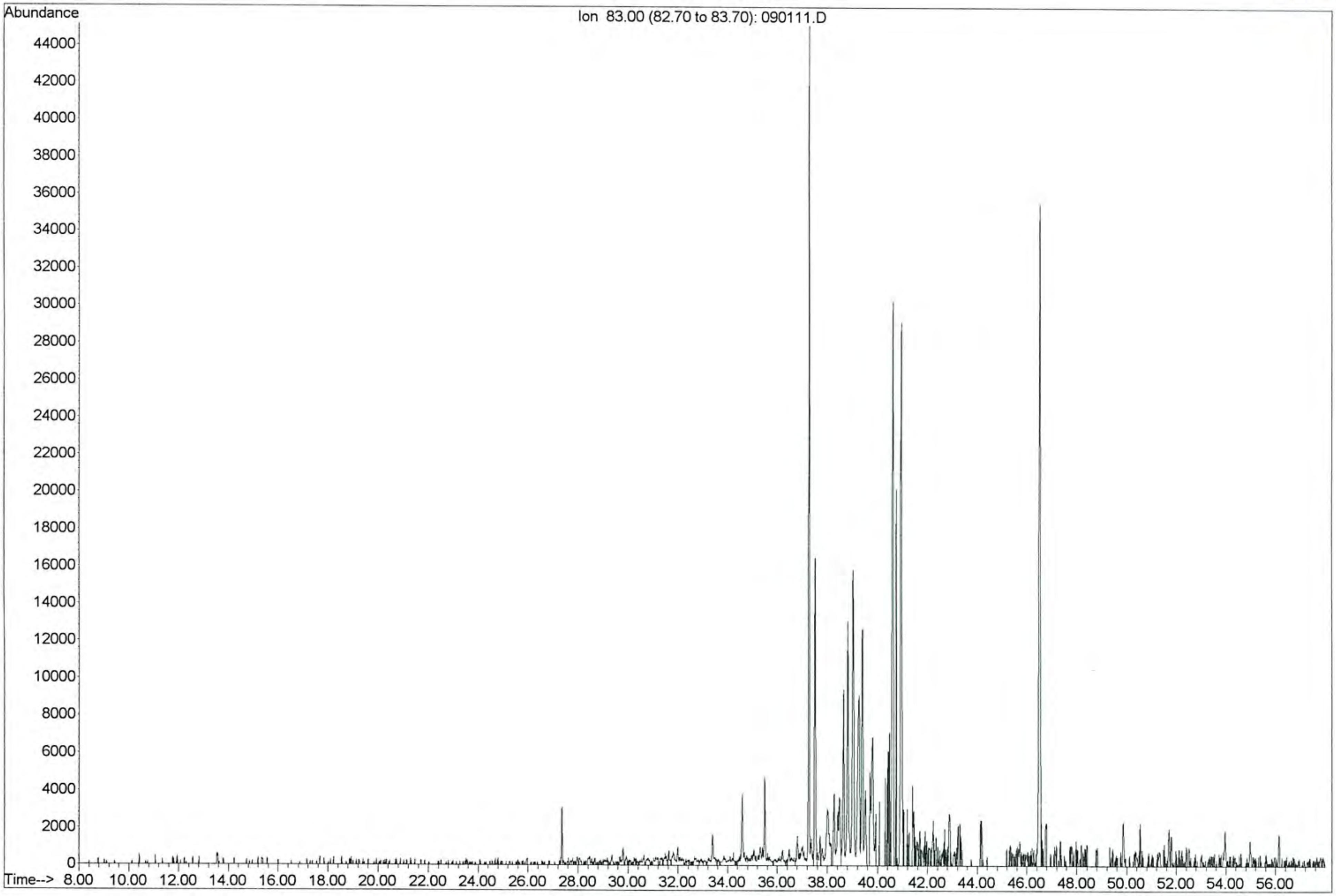
34011008011 (36917-11) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



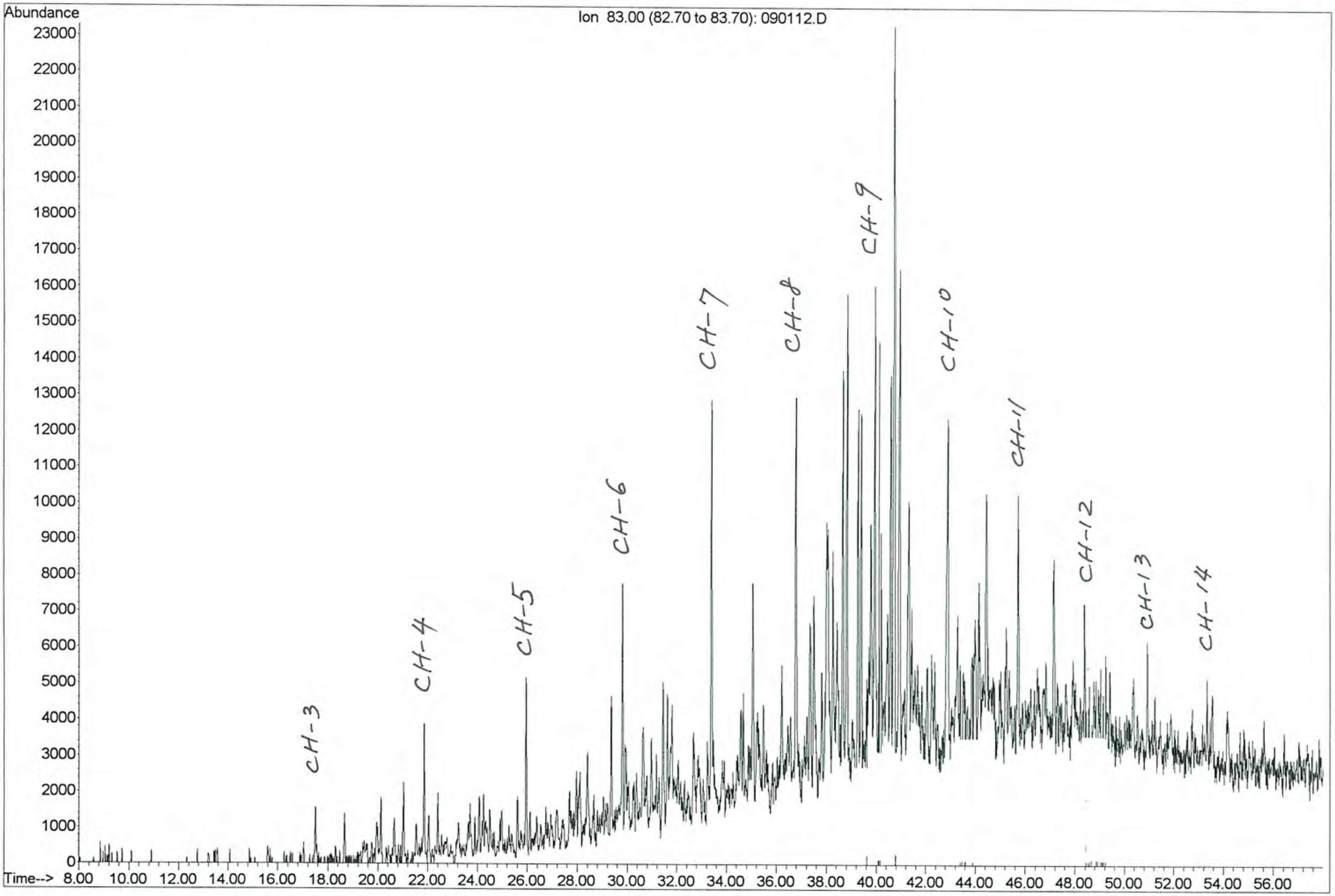
34011008017 (36918-1) soil extract (3:7)
MGP, Floyd Snider, QB SS5305, Vf=1ml



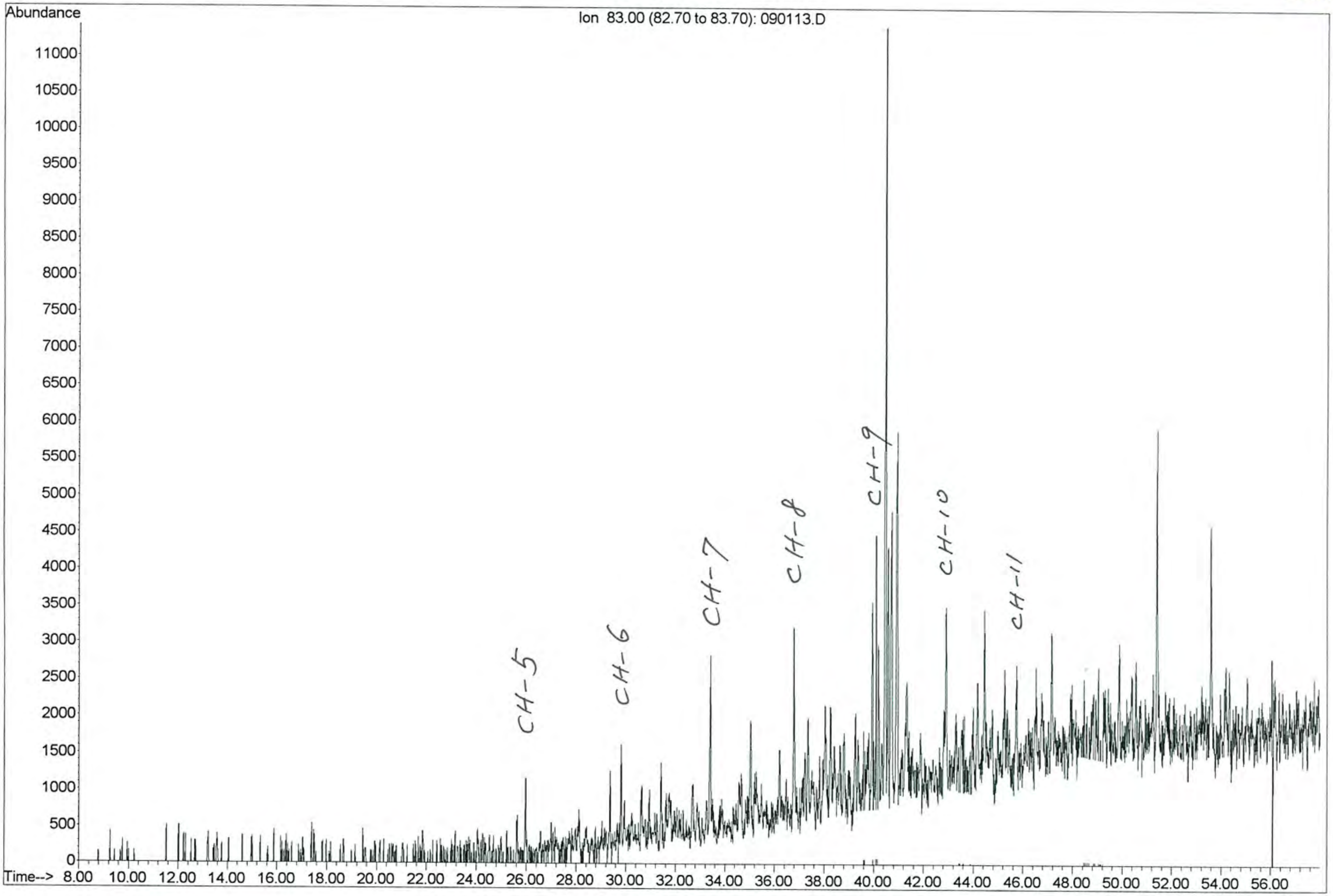
34011008020 (36918-4) soil extract (1:1.2)
MGP, Floyd Snider, QB SS5305, Vf=2ml



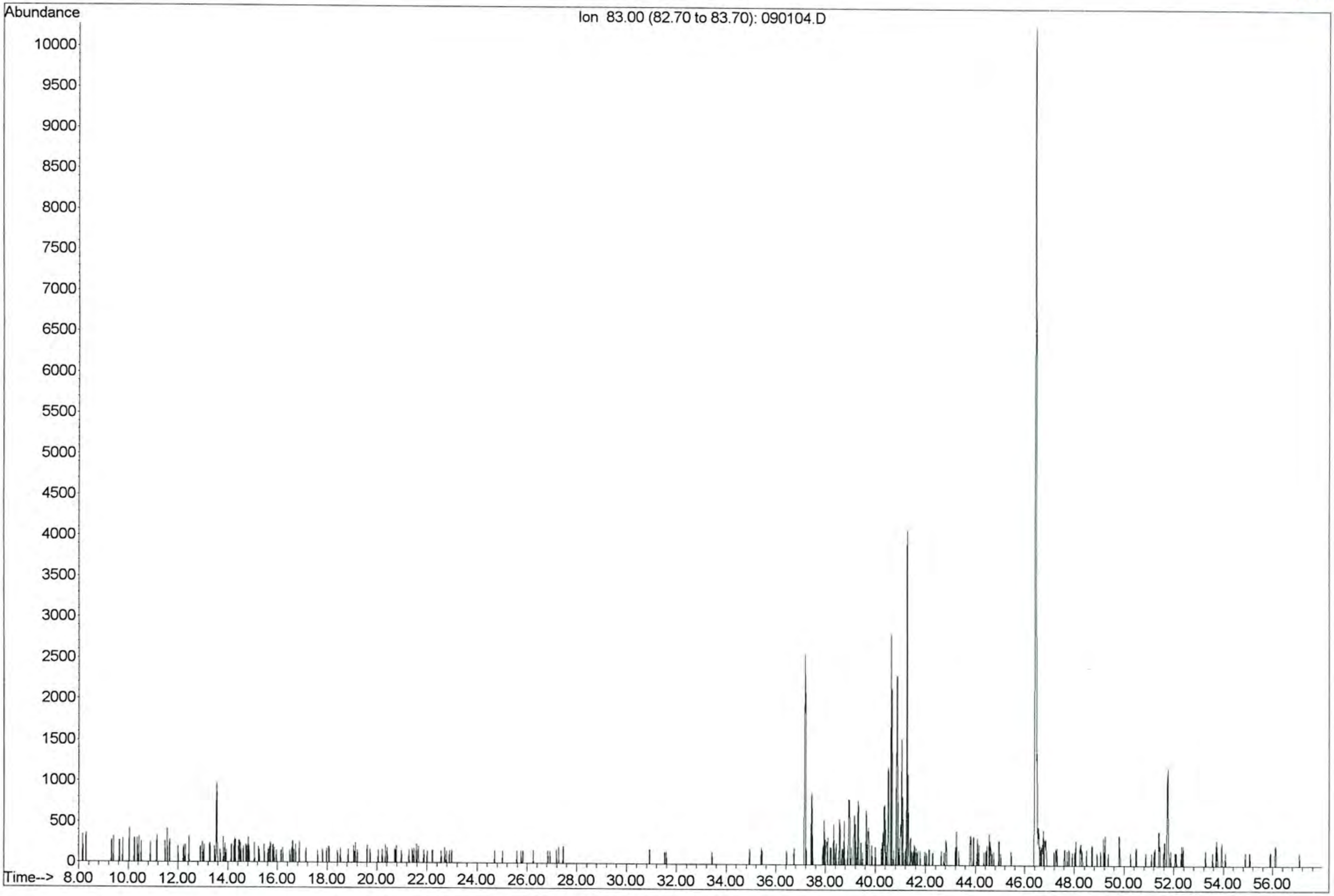
34011008022 (36918-6) soil extract (3:8)
MGP, Floyd Snider, QB SS5305, Vf=2ml



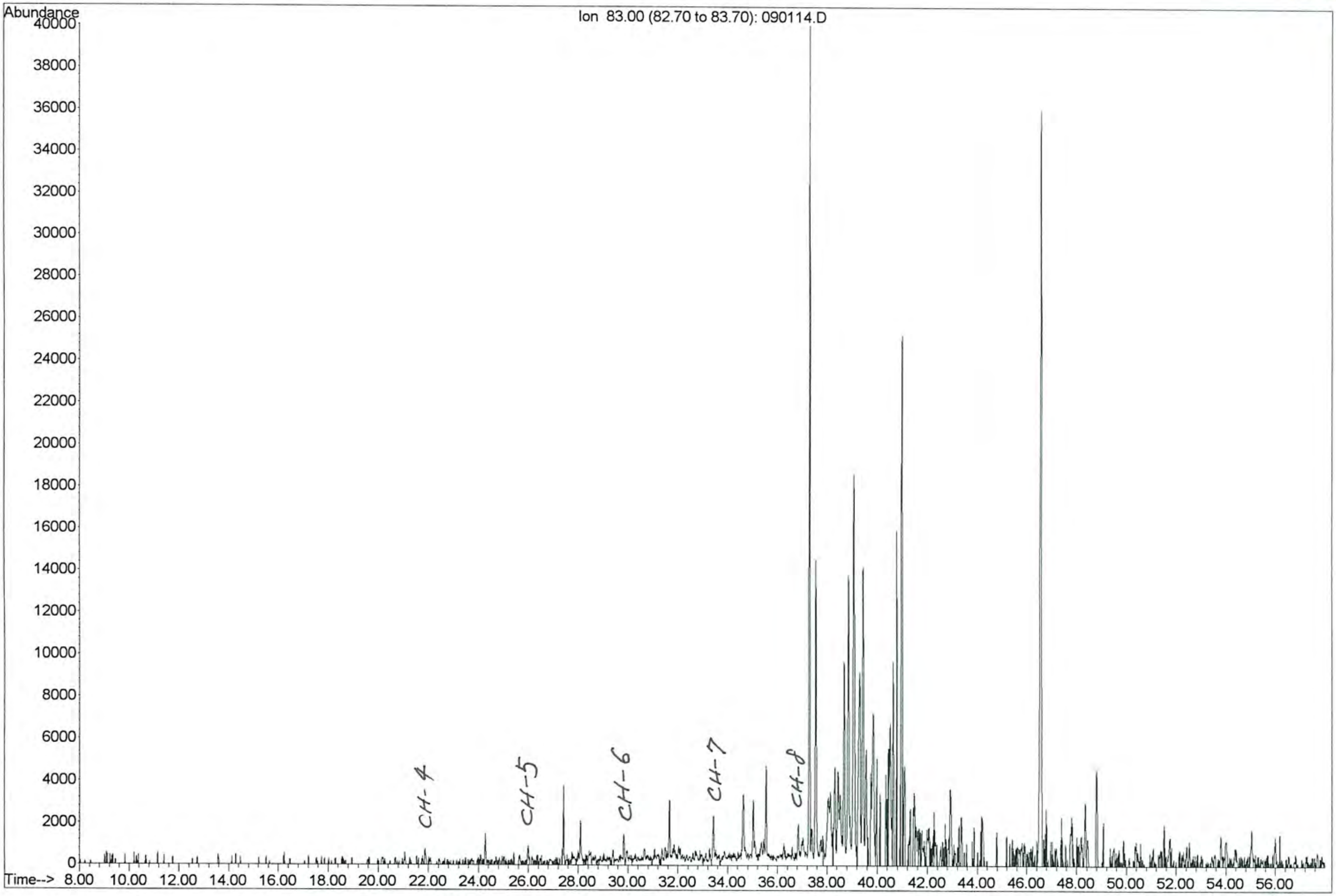
34011008028 (36918-12) soil extract (1:1))
MGP, Floyd Snider, QB SS5305, Vf=2ml



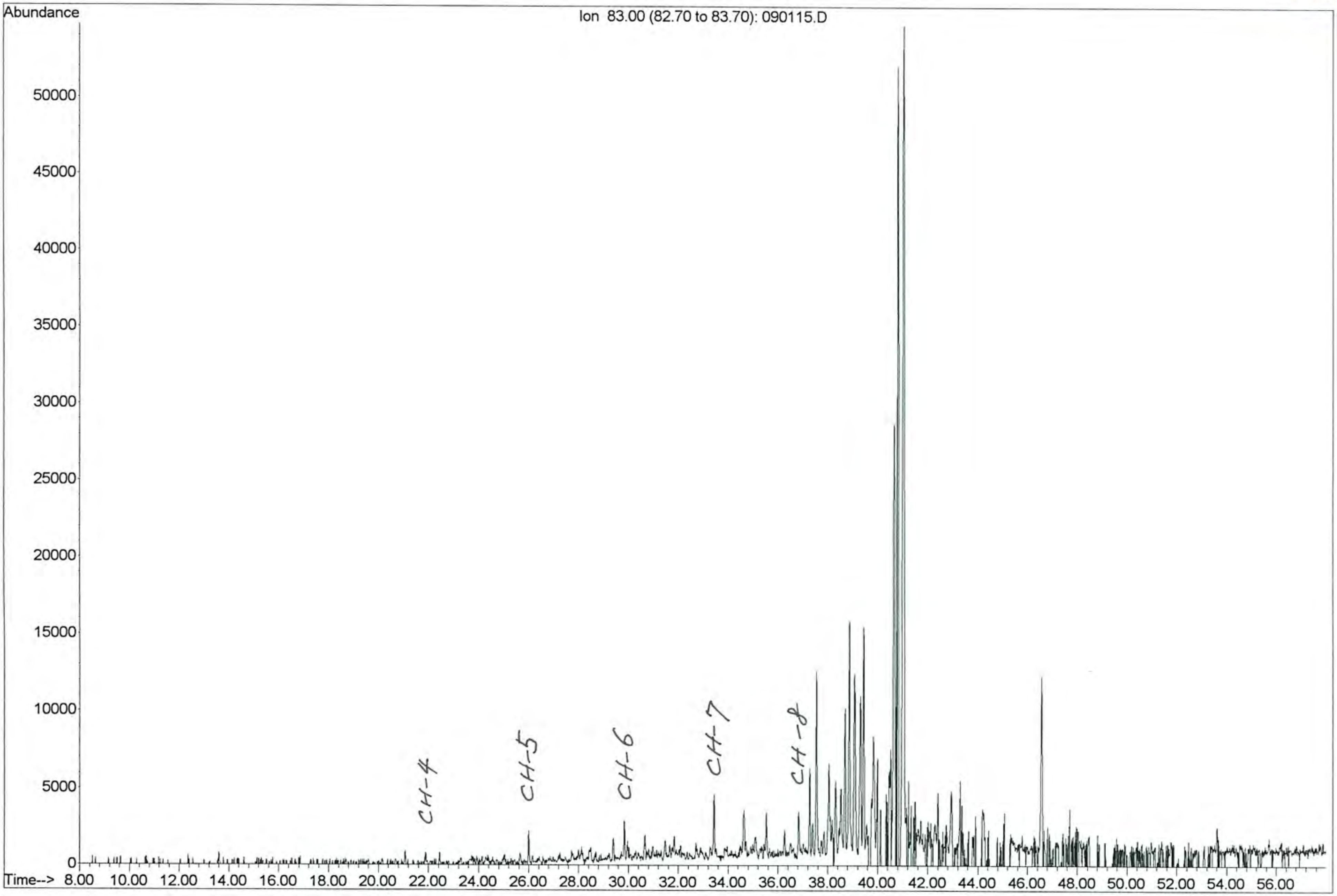
34011008030 (36918-14) soil extract
MGP, Floyd Snider, QB SS5305



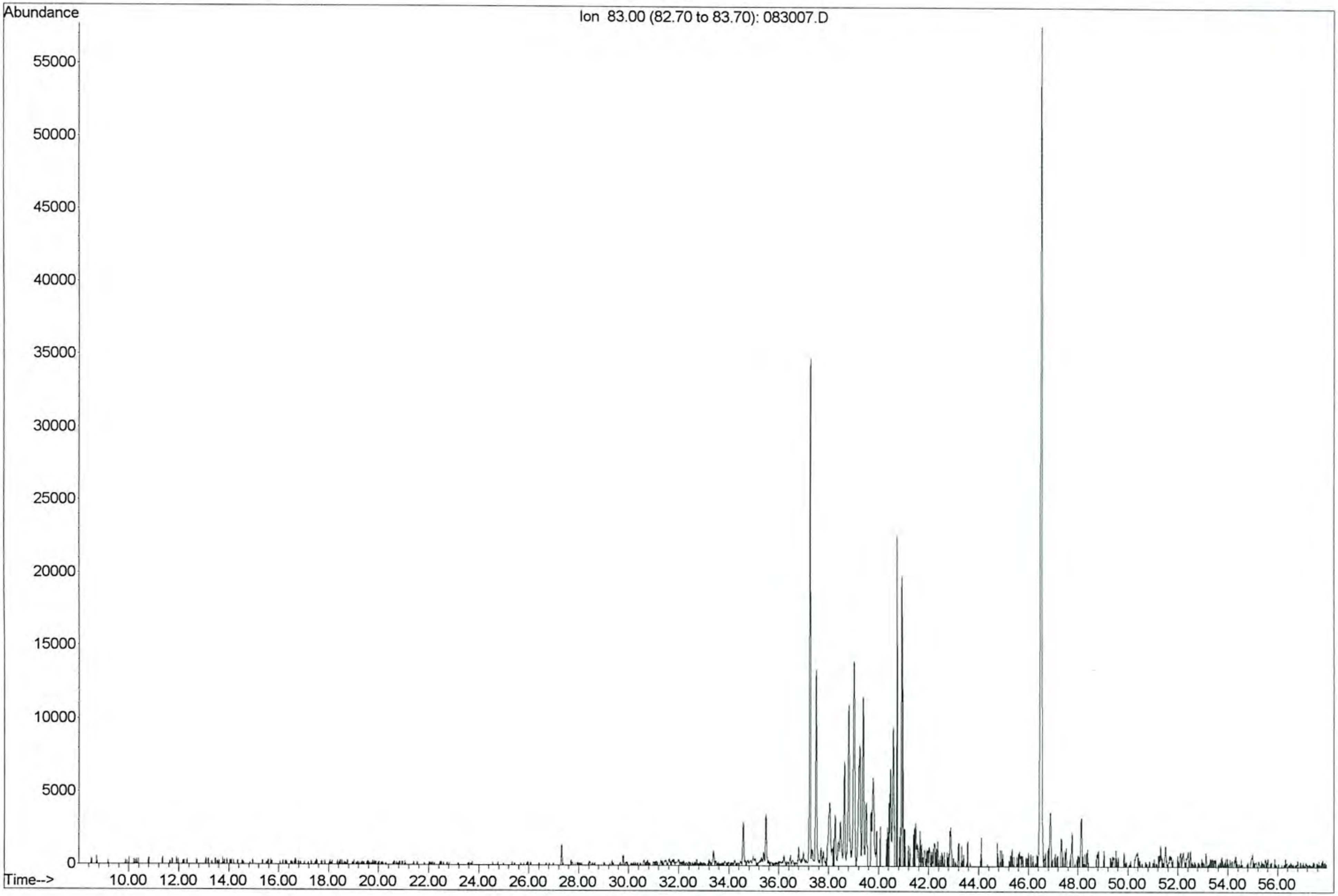
34011008032 (36918-16) soil ext (3.5:6.5)
MGP, Floyd Snider, QB SS5305, Vf=4ml



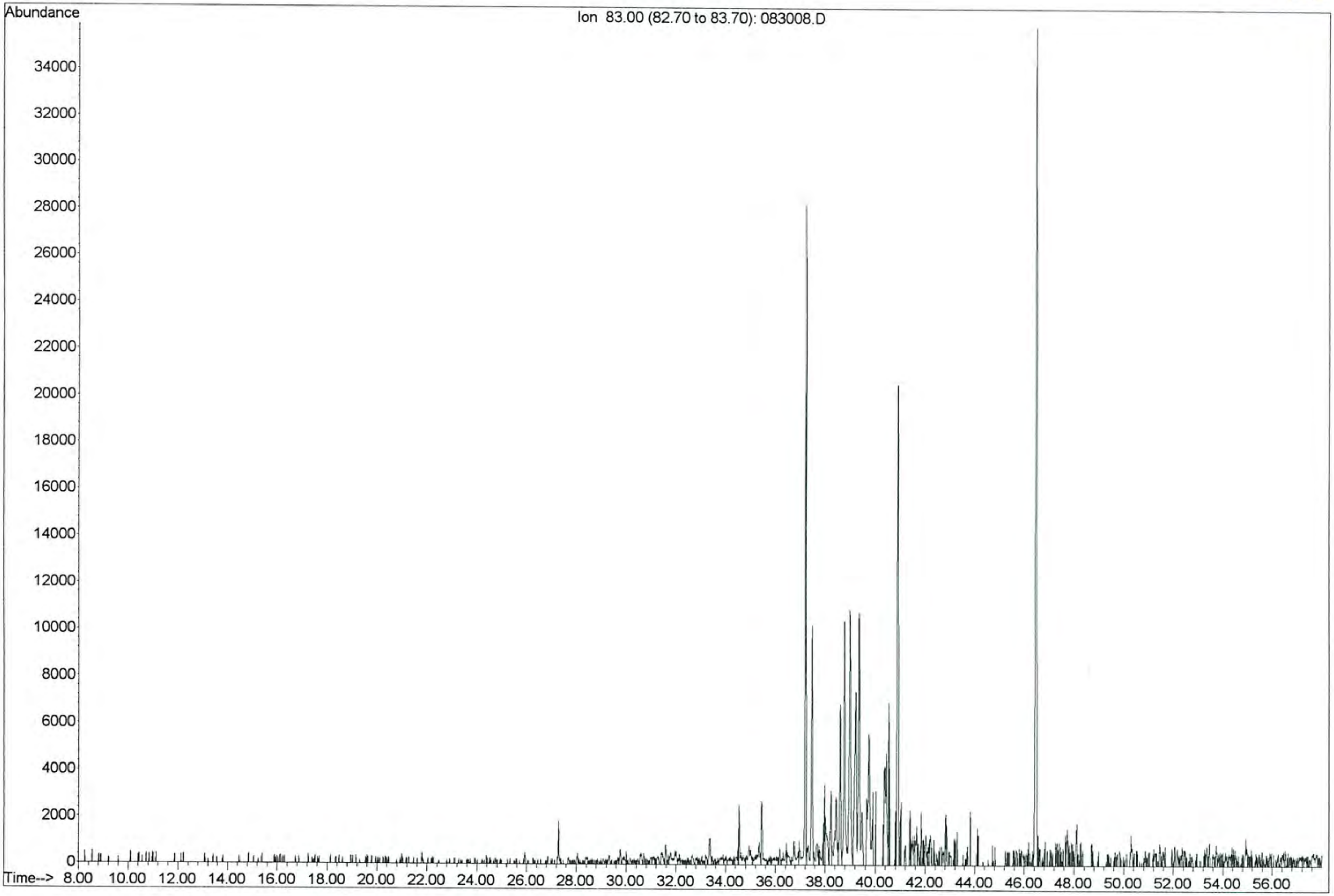
34011008035 (36918-19) soil ext (4:6)
MGP, Floyd Snider, QB SS5305, Vf=1ml



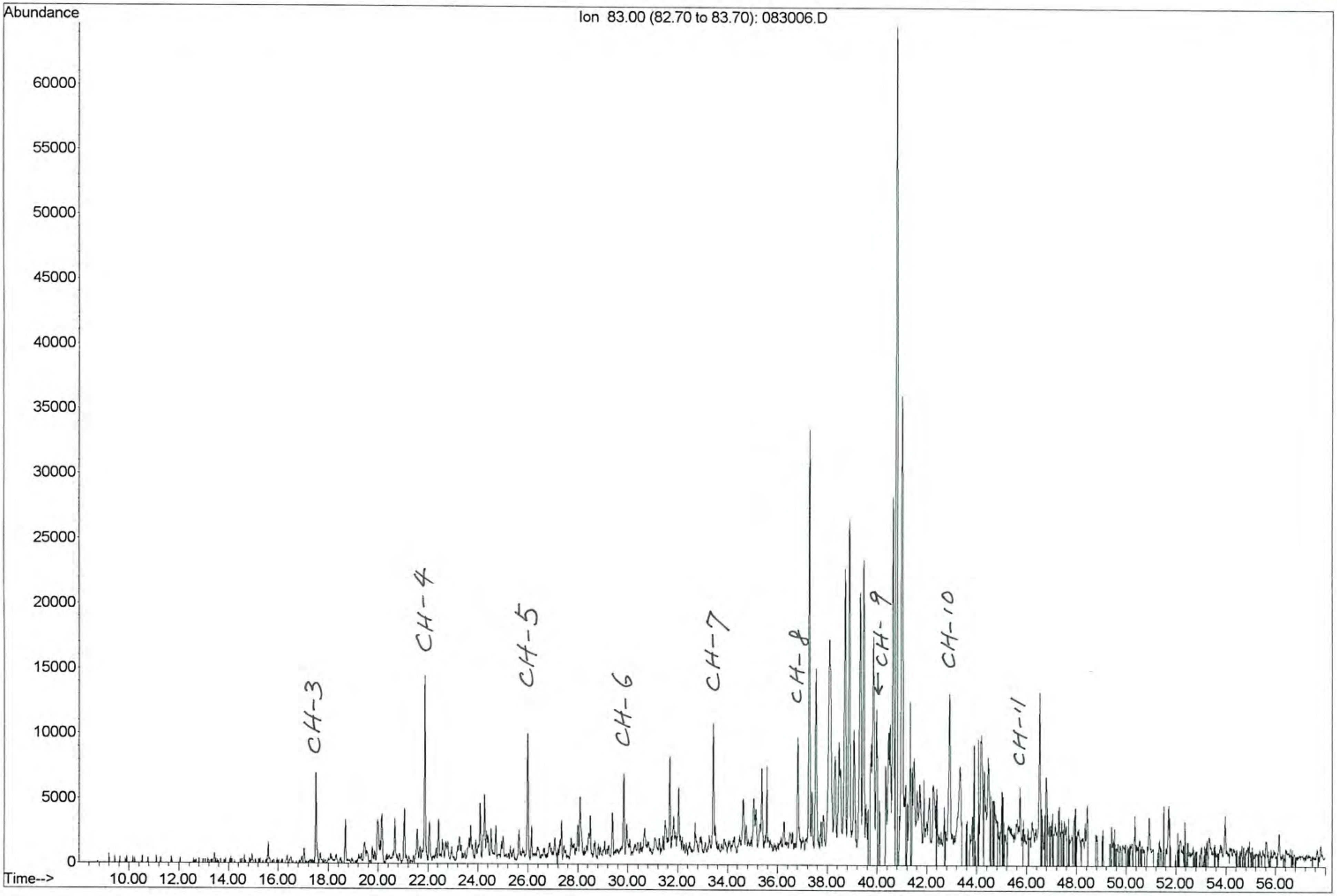
34011008040 (36919-4) soil extract (1:2)
MGP, Floyd Snider, QB SS5318



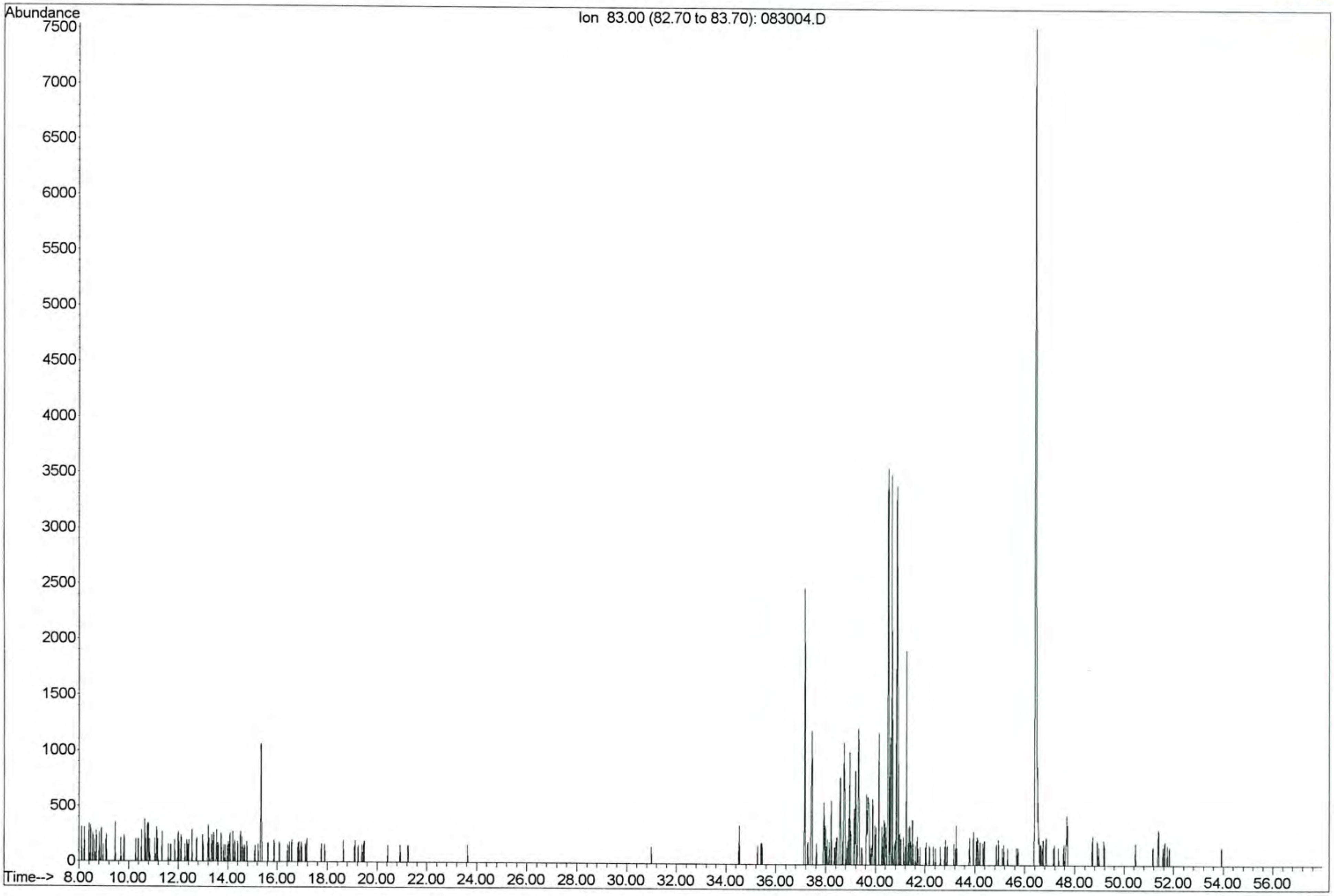
34011008043 (36919-7) soil extract (1:2)
MGP, Floyd Snider, QB SS5318, Vf=3ml



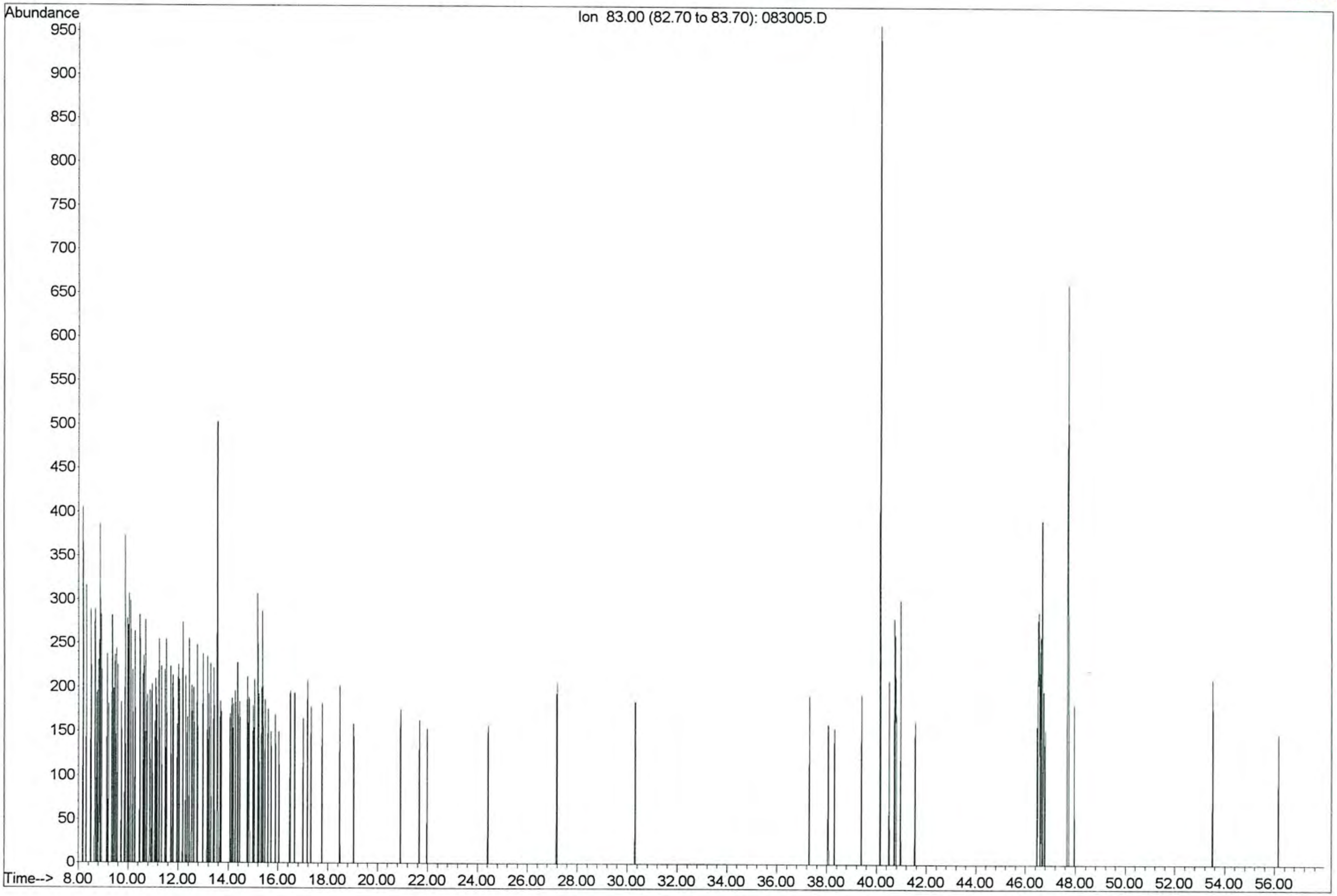
34011008050 (36920-1) soil extract (1:7)
MGP, Floyd Snider, QB SS5318, Vf=3ml



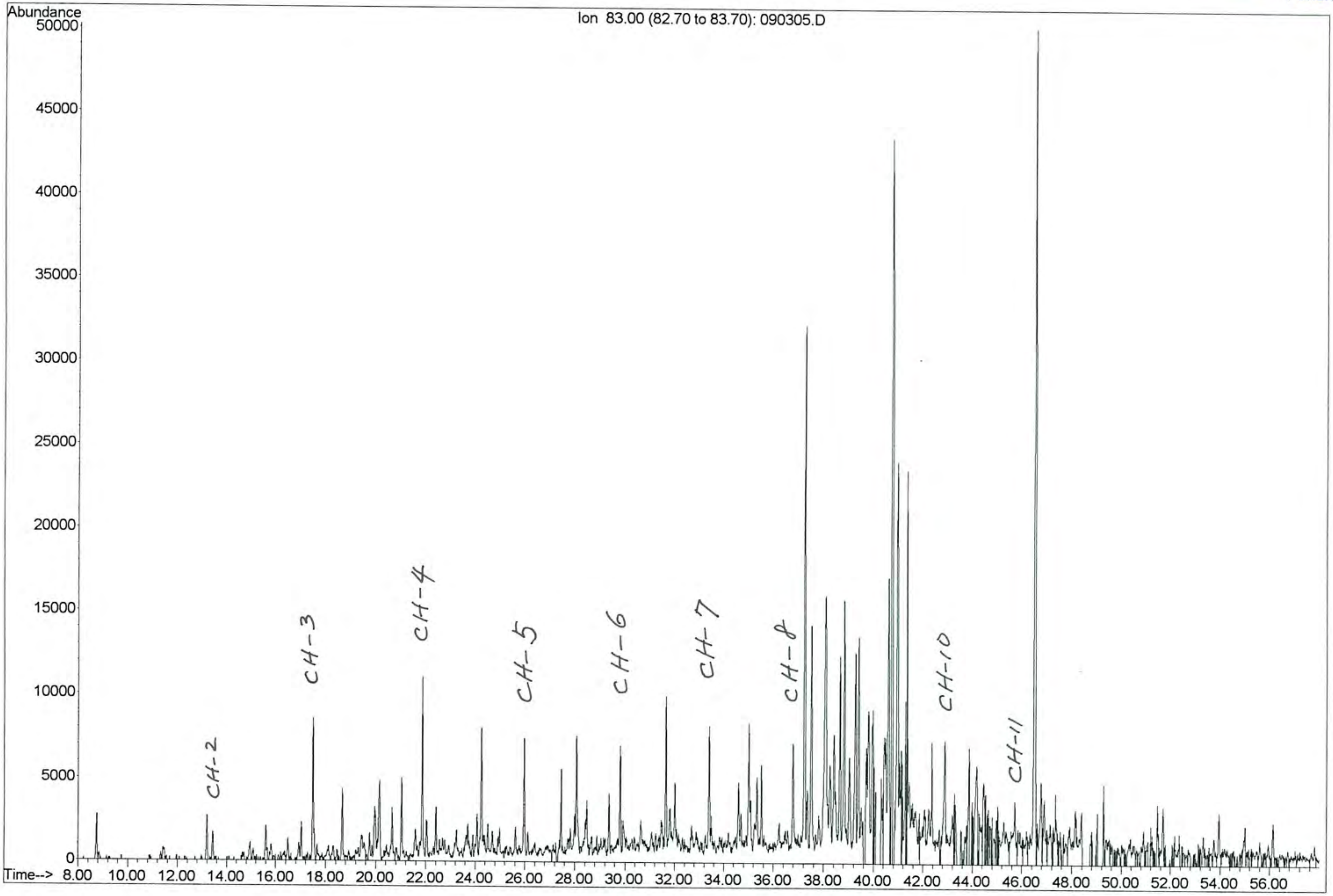
34011008054 (36920-5) soil extract
MGP, Floyd Snider, QB SS5318



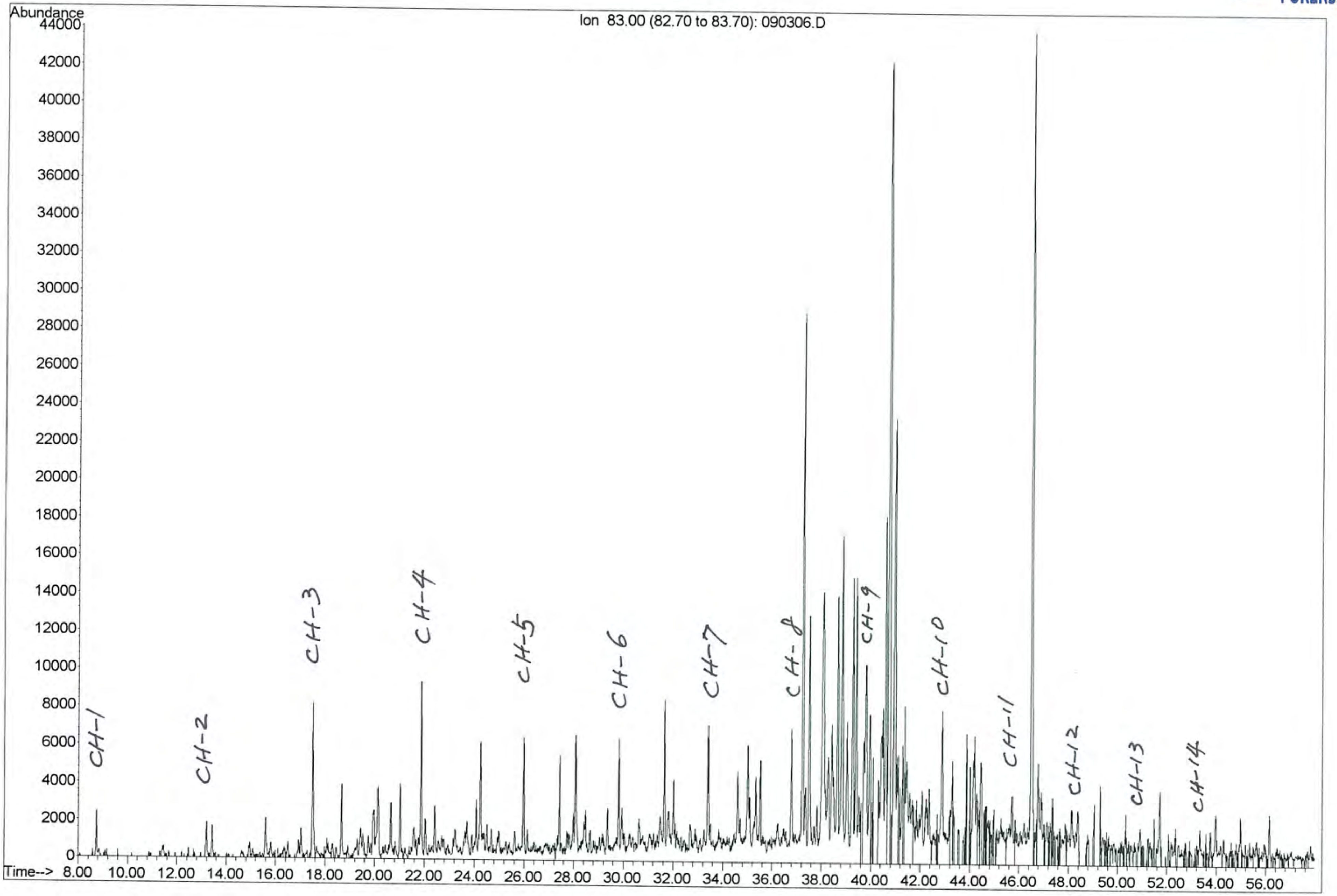
34011008056 (36920-7) soil extract
MGP, Floyd Snider, QB SS5318



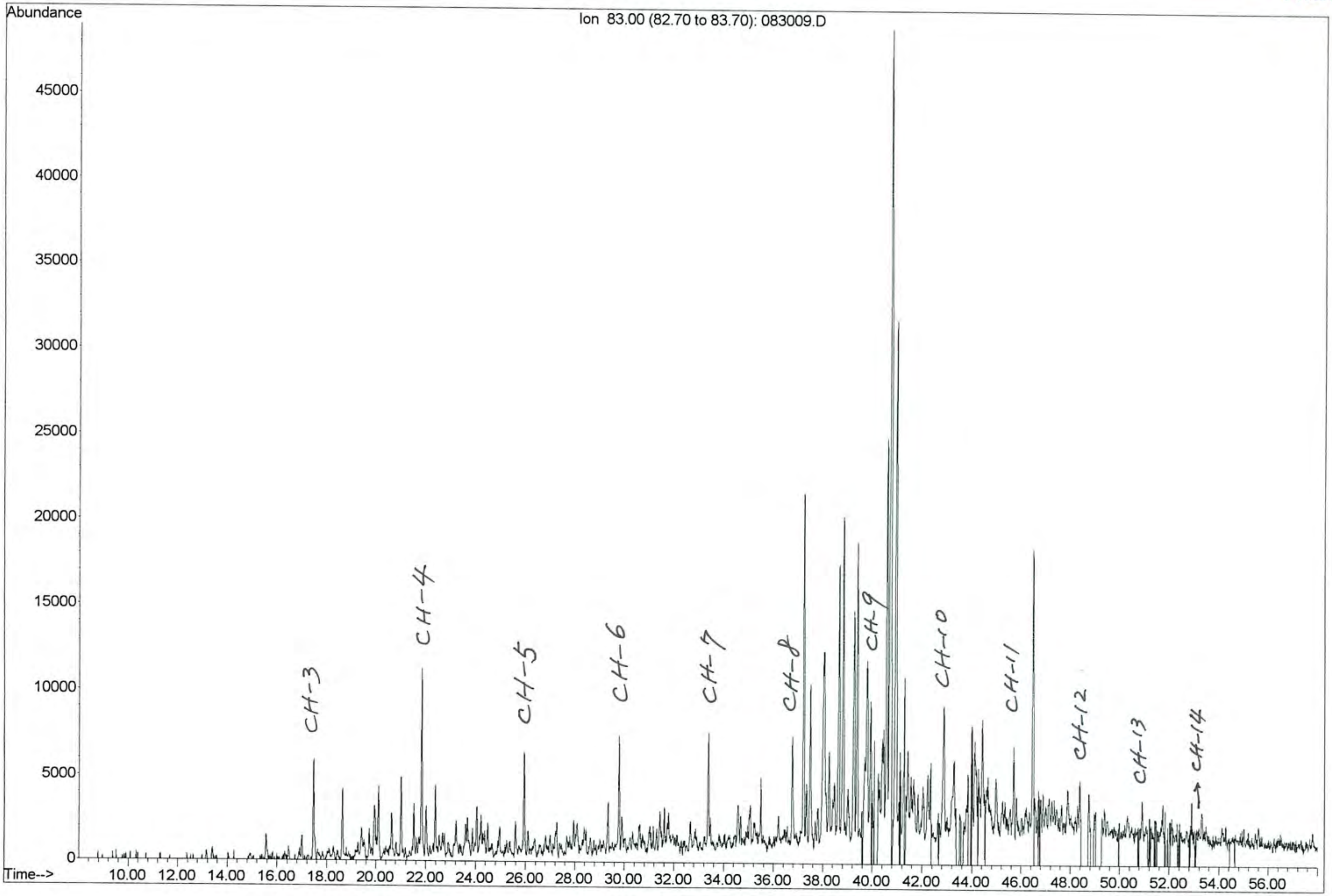
DW-4-FP (36921-1) Product x50
Gas Works Park, Floyd



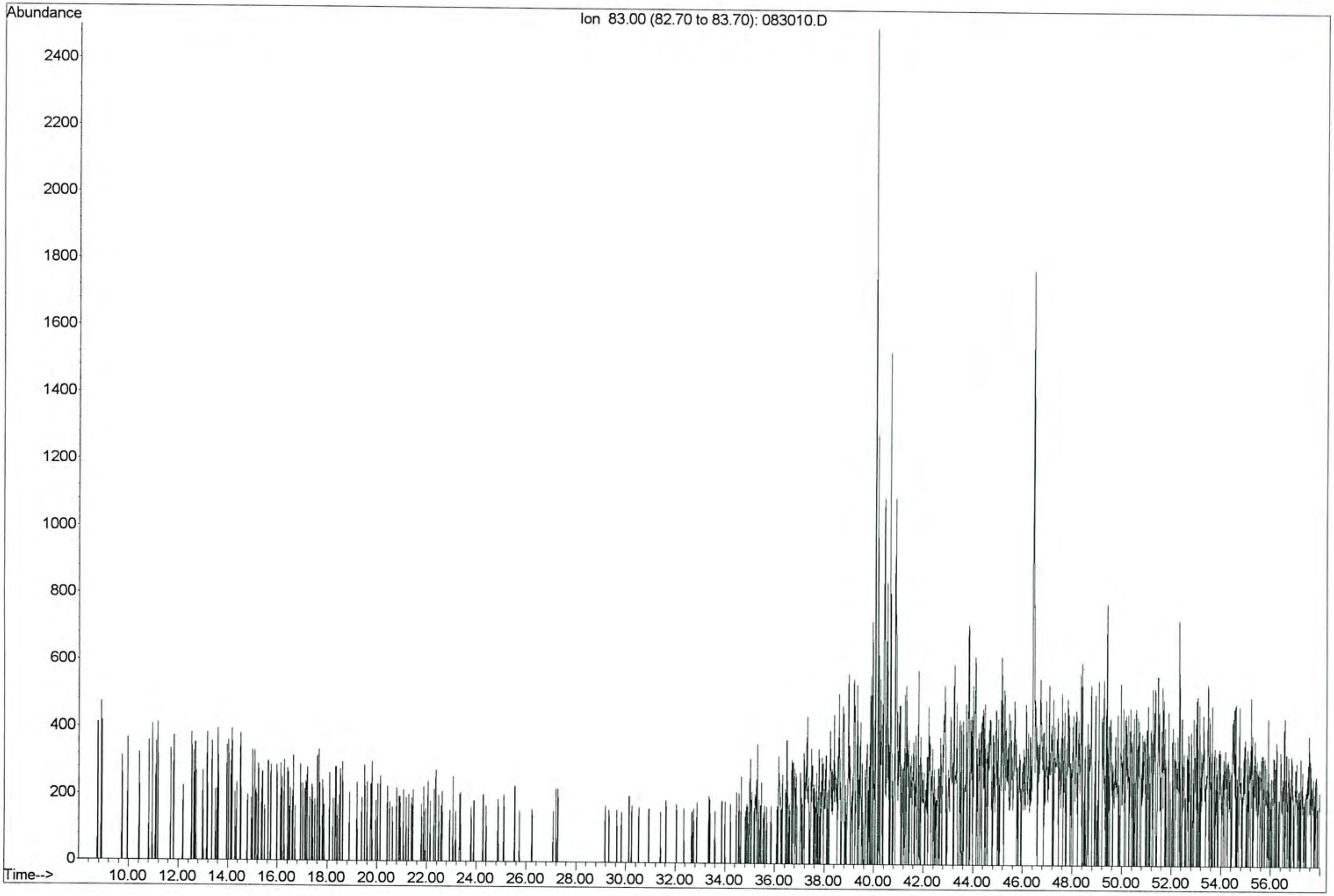
DW-5-FP (36921-2) Product x50
Gas Works Park, Floyd

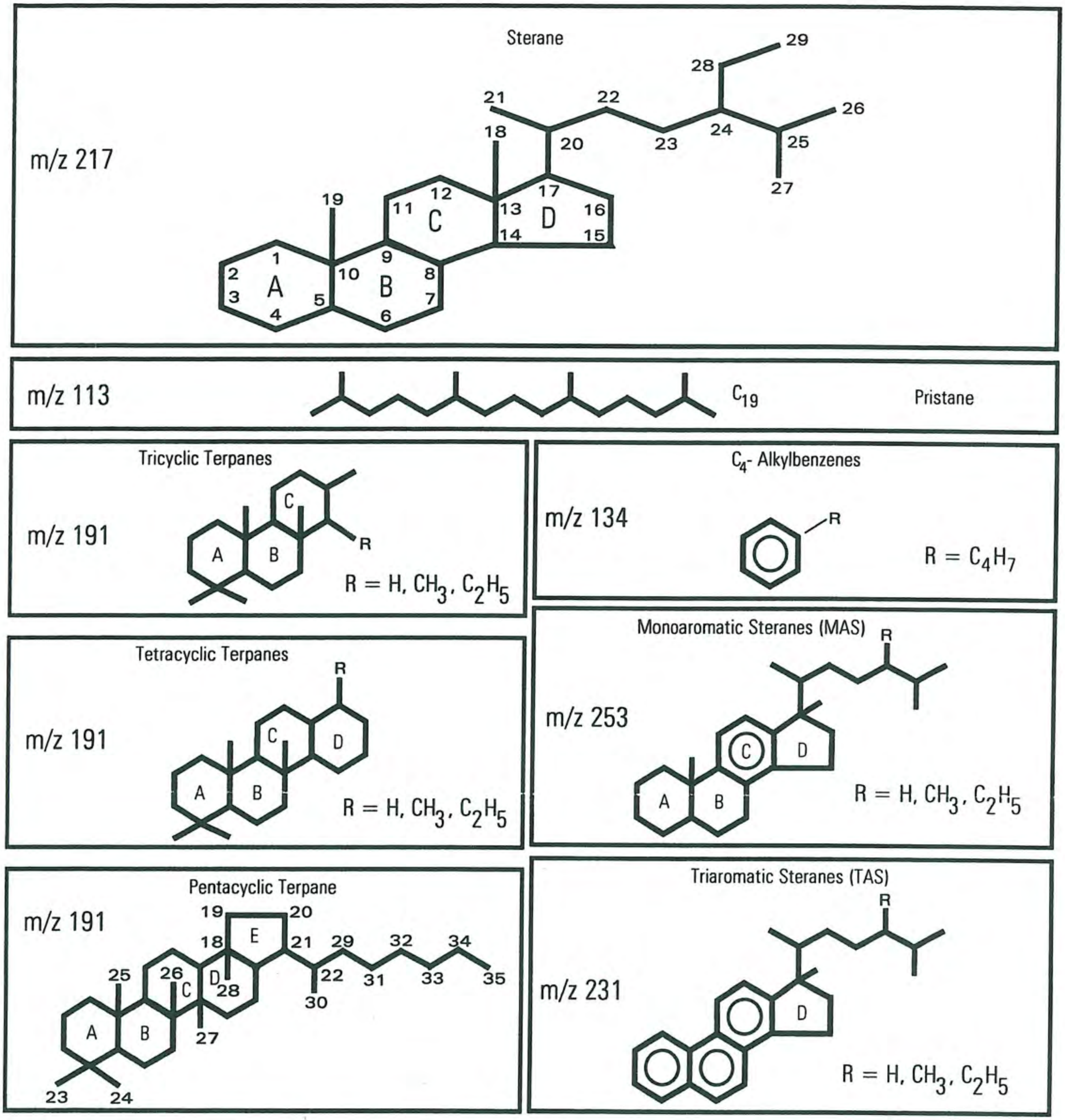


3-1-G (36921-3) soil extract (1:10)
Gas Works Park, Floyd Snider, QB SS5318, Vf=2ml



1-1G (36922-3) soil extract (1:12)
MGP, Floyd Snider, QB SS5318, Vf=3ml





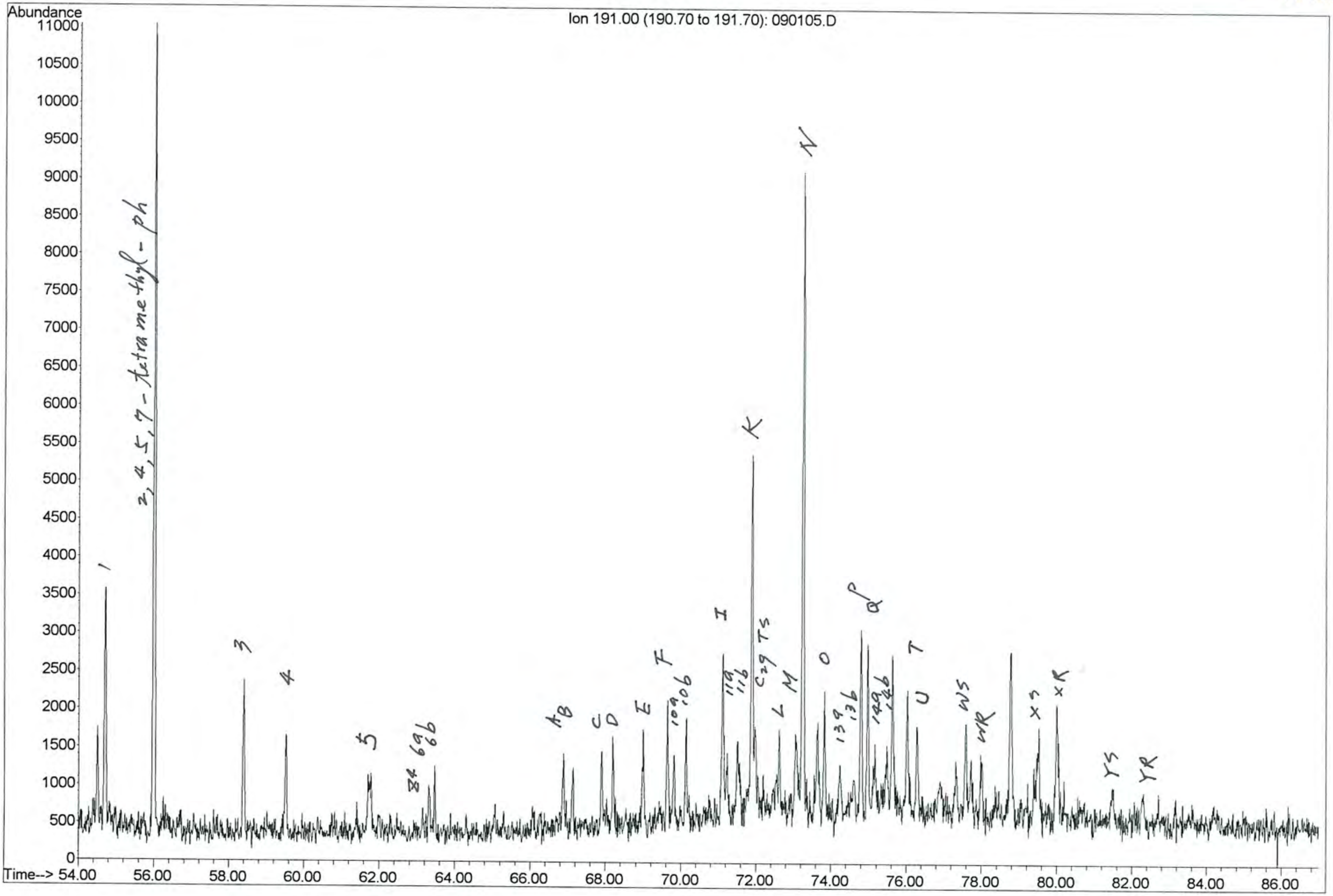
The compound structures of pristane, C_4-alkylbenzenes, sterane; terpanes; monoaromatic and triaromatic steranes

Table

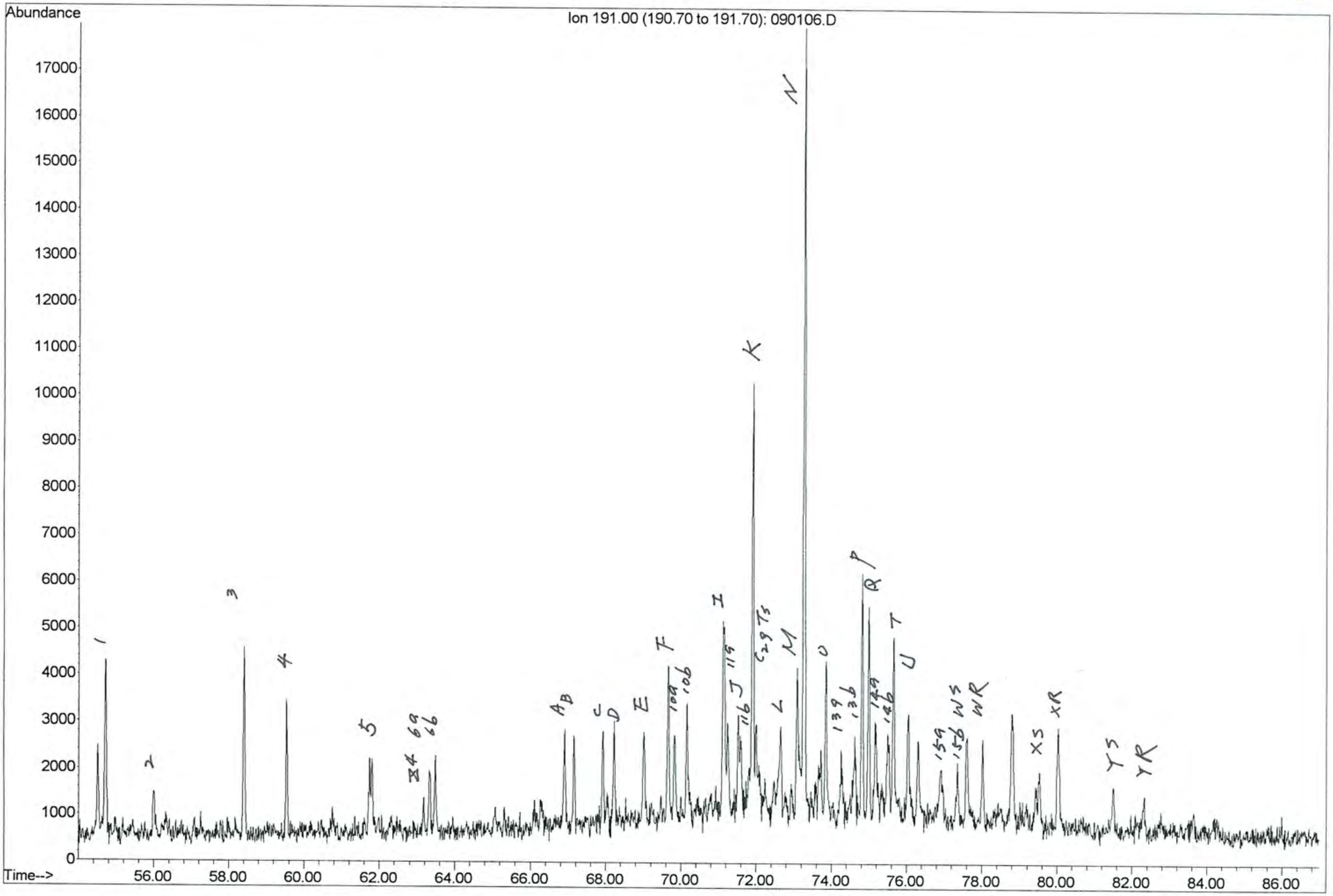
Key for Tricyclic, Tetracyclic, and Pentacyclic Terpanes Identification (m/z 191 mass chromatograms)

Code	Identity	Carbon #
0	C_{20}-Tricyclic Terpane	20
1	C_{21}-Tricyclic Terpane	21
2	C_{22}-Tricyclic Terpane	22
3	C_{23}-Tricyclic Terpane	23
4	C_{24}-Tricyclic Terpane	24
5	C_{25}-Tricyclic Terpane	25
Z4	C_{24}-Tetracyclic Terpane	24
6a	C_{26}-Tricyclic Terpane	26
6b	C_{26}-Tricyclic Terpane	26
7	C_{27}-Tricyclic Terpane	27
A	C_{28}-Tricyclic Terpane #1	28
B	C_{28}-Tricyclic Terpane #2	28
C	C_{29}-Tricyclic Terpane #1	29
D	C_{29}-Tricyclic Terpane #2	29
E	18α-22,29,30-Trisnorneohopane (Ts)	27
F	17α-22,29,30-Trisnorhopane (Tm)	27
G	17ß-22,29-30-Trisnorhopane	27
H	17α-23,28-Bisnorlupane	28
10a	C_{30}-Tricyclic Terpane #1	30
10b	C_{30}-Tricyclic Terpane #2	30
I	17α-28,30-Bisnorhopane	28
11a	C_{31}-Tricyclic Terpane #1	31
J	17α-25-Norhopane	29
11b	C_{31}-Tricyclic Terpane #2	31
K	17α,21ß-30-Norhopane	29
C_{29}Ts	18α-30-Norneohopane	29
C_{30}^{*}	17α-Diahopane	30
L	17ß-21α-30-Normoretane	29
Ma	18α-Oleanane	30
Mb	18ß-Oleanane	30
N	17α,21ß-Hopane	30
O	17ß,21α-Moretane	30
13a	C_{33}-Tricyclic Terpane #1	33
13b	C_{33}-Tricyclic Terpane #2	33
P	22S-17α,21ß-30-Homohopane	31
Q	22R-17α,21ß-30-Homohopane	31
R	Gammacerane	30
14a	C_{34}-Tricyclic Terpane #1	34
S	17ß,21α-Homomoretane	31
14b	C_{34}-Tricyclic Terpane #2	34
T	22S-17α,21ß-30-Bishomohopane	32
U	22R-17α,21ß-30-Bishomohopane	32
15a	C_{35}-Tricyclic Terpane #1	35
15b	C_{35}-Tricyclic Terpane #2	35
V	17ß,21α-C_{32}-Bishomomoretane	32
WS	22S-17α,21ß-30,31,32-Trishomohopane	33
WR	22R-17α,21ß-30,31,32-Trishomohopane	33
16a	C_{36}-Tricyclic Terpane #1	36
16b	C_{36}-Tricyclic Terpane #2	36
XS	22S-17α,21ß-30,31,32,33-Tetrahomohopane	34
XR	22R-17α,21ß-30,31,32,33-Tetrahomohopane	34
YS	22S-17α,21ß-30,31,32,33,34-Pentahomohopane	35
YR	22R-17α,21ß-30,31,32,33,34-Pentahomohopane	35

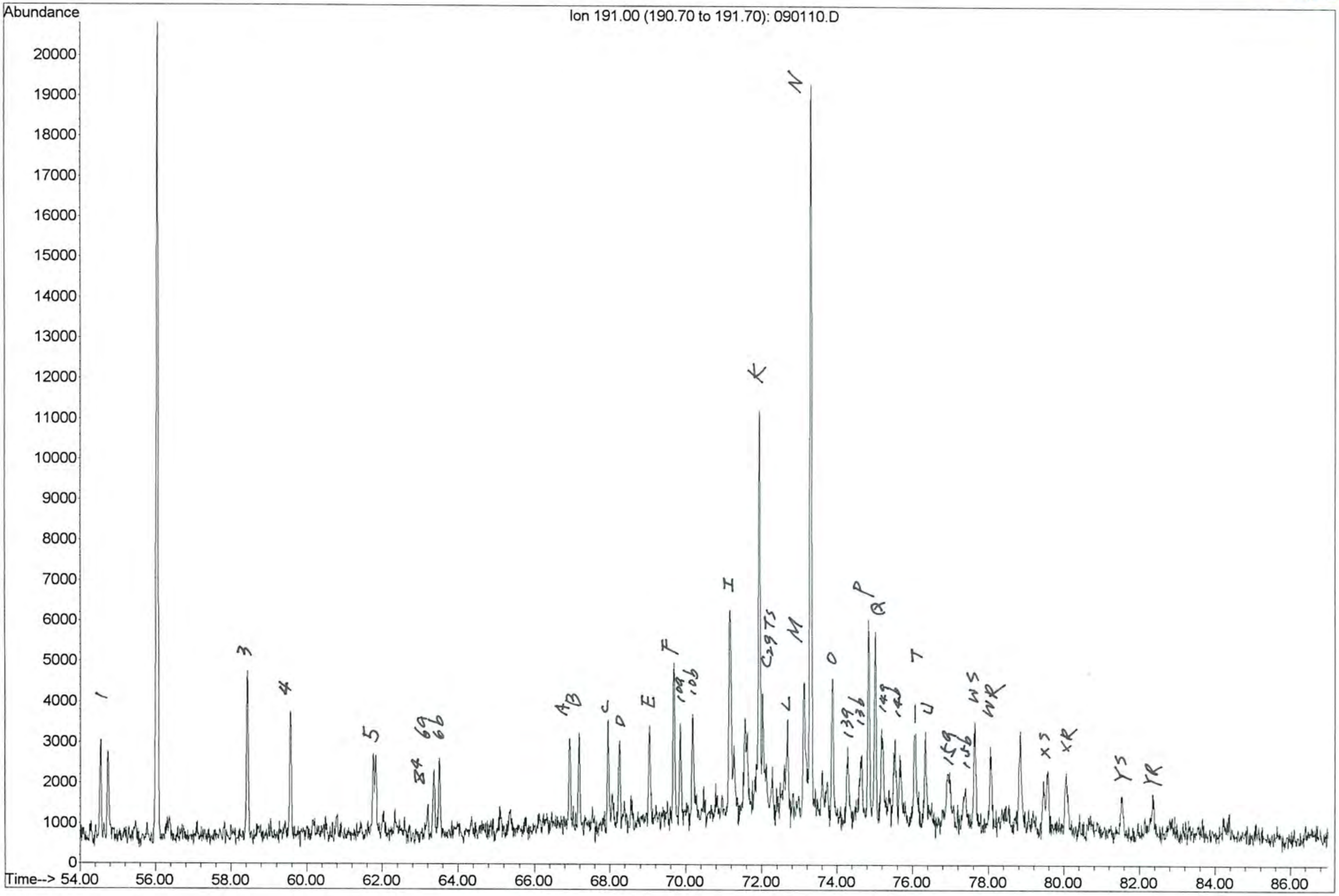
34011008001 (36917-1) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



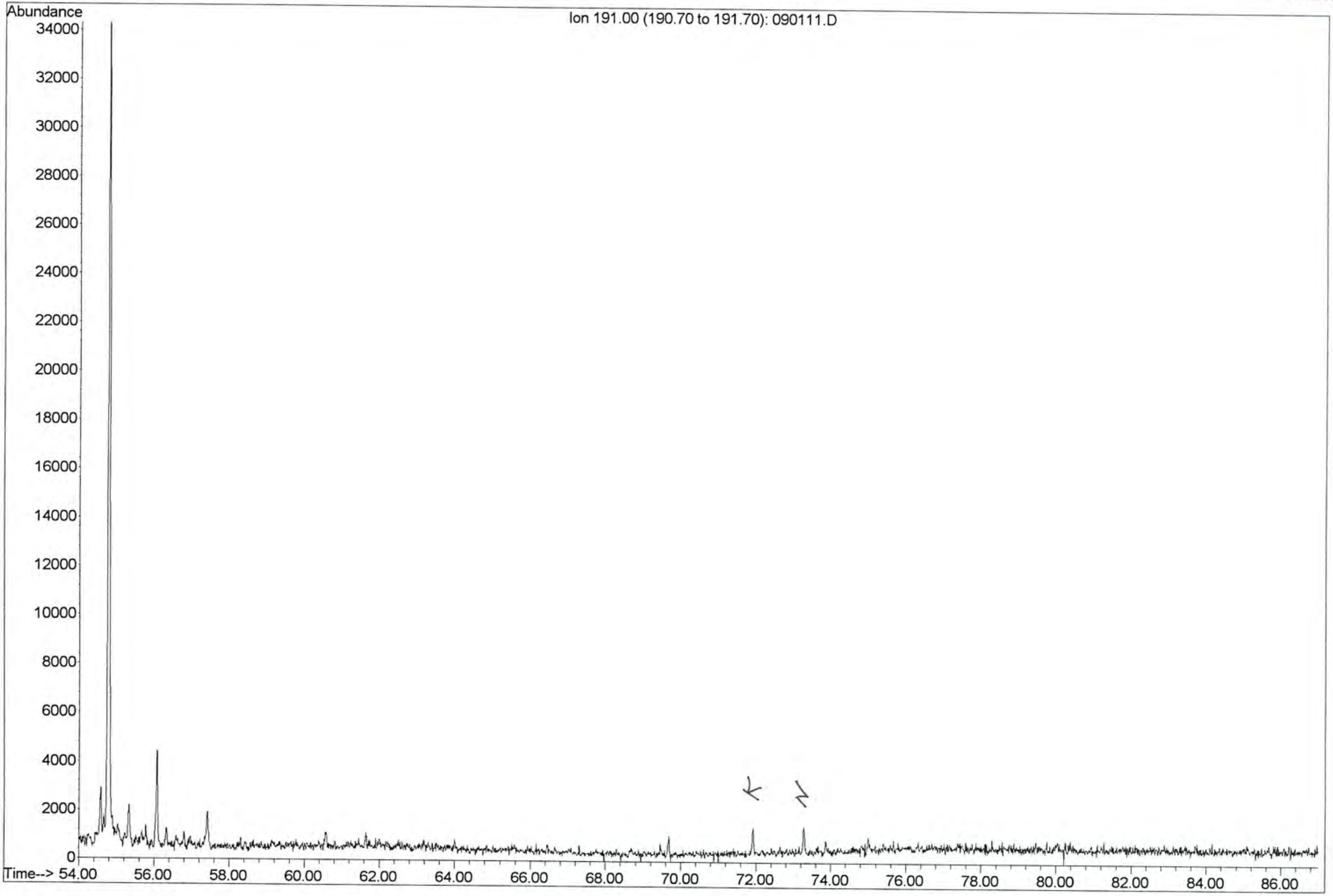
34011008011 (36917-11) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



34011008017 (36918-1) soil extract (3:7)
MGP, Floyd Snider, QB SS5305, Vf=1ml



34011008020 (36918-4) soil extract (1:1.2)
MGP, Floyd Snider, QB SS5305, Vf=2ml



34011008022 (36918-6) soil extract (3:8)
MGP, Floyd Snider, QB SS5305, Vf=2ml

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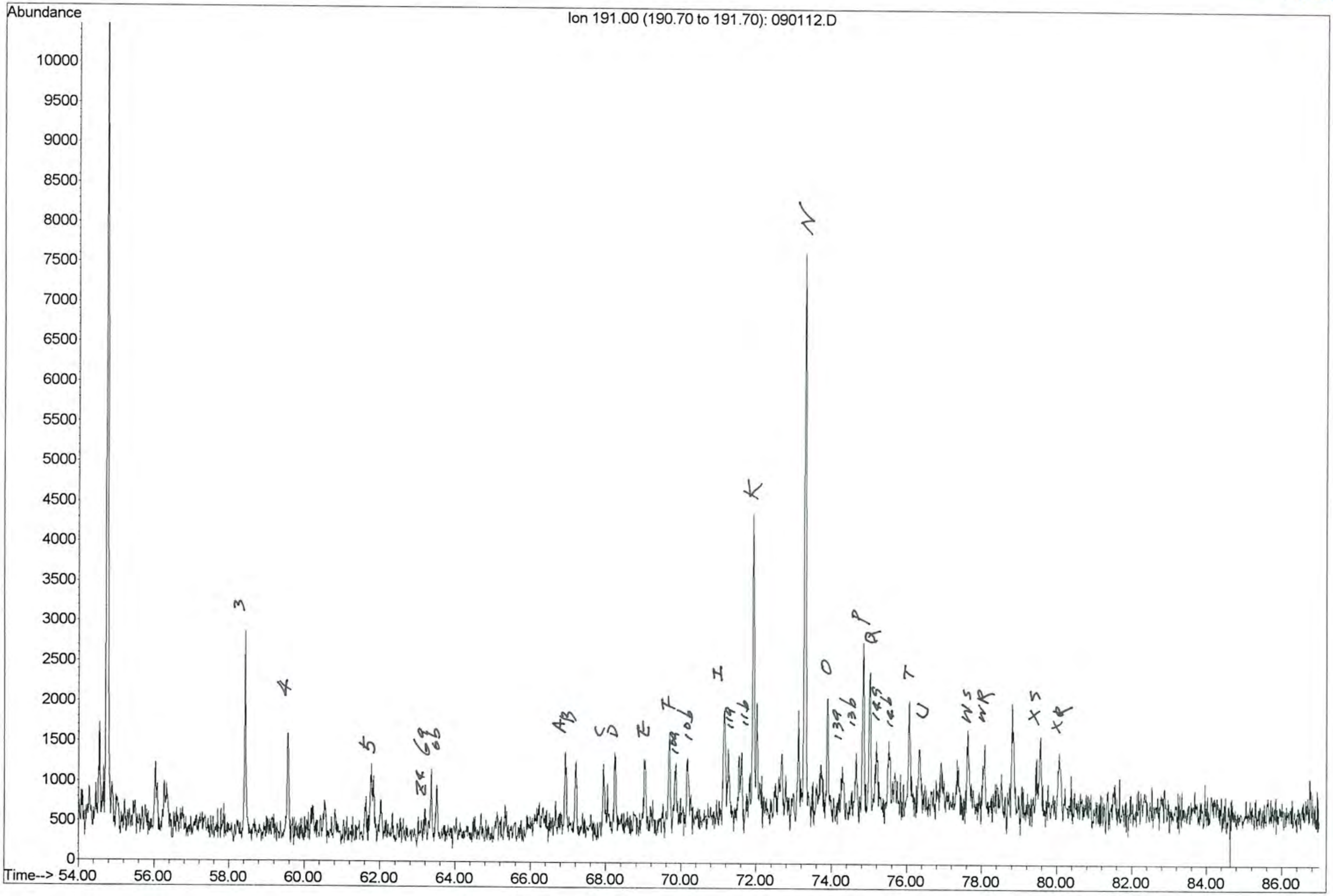
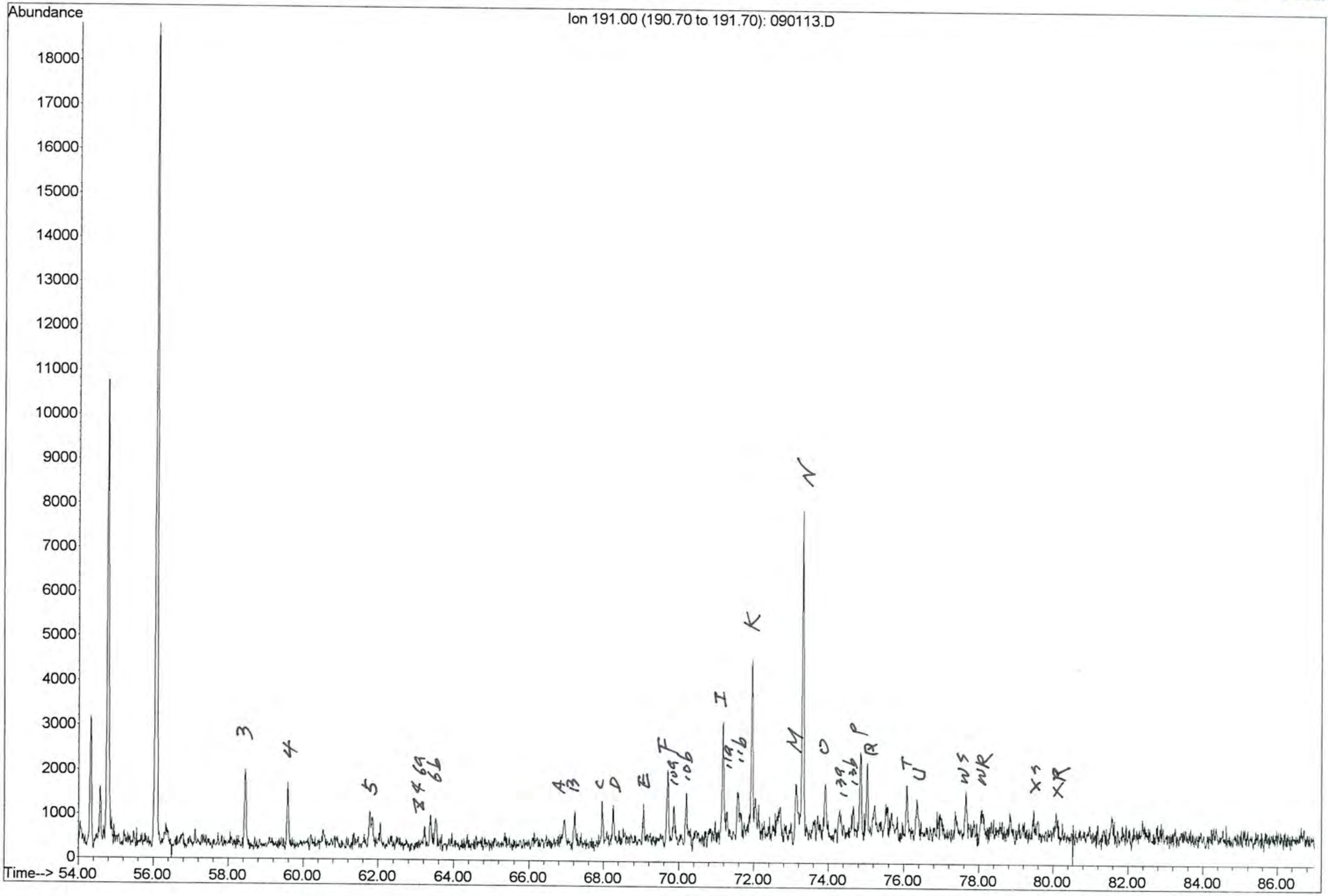
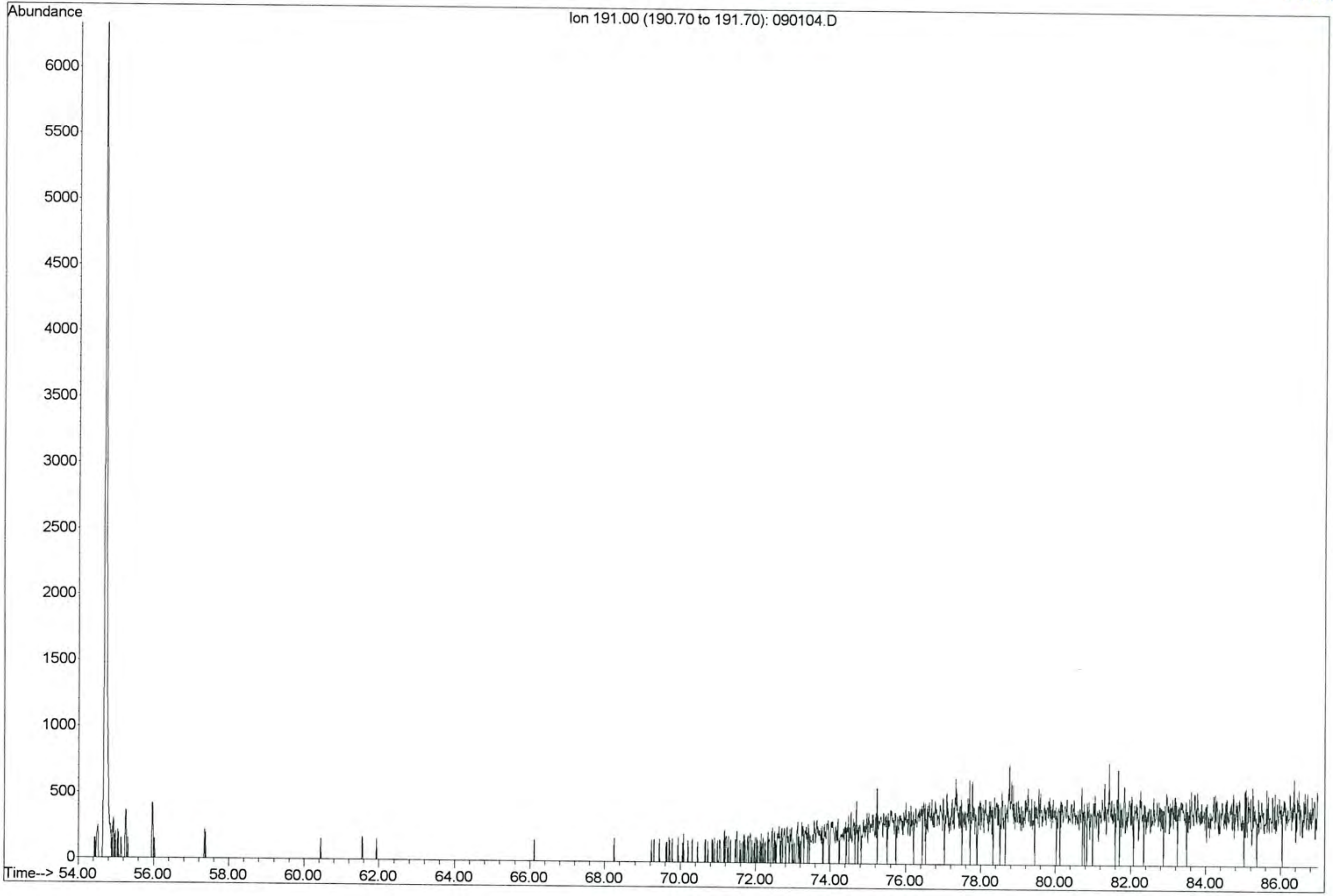


34011008028 (36918-12) soil extract (1:1))
MGP, Floyd Snider, QB SS5305, Vf=2ml

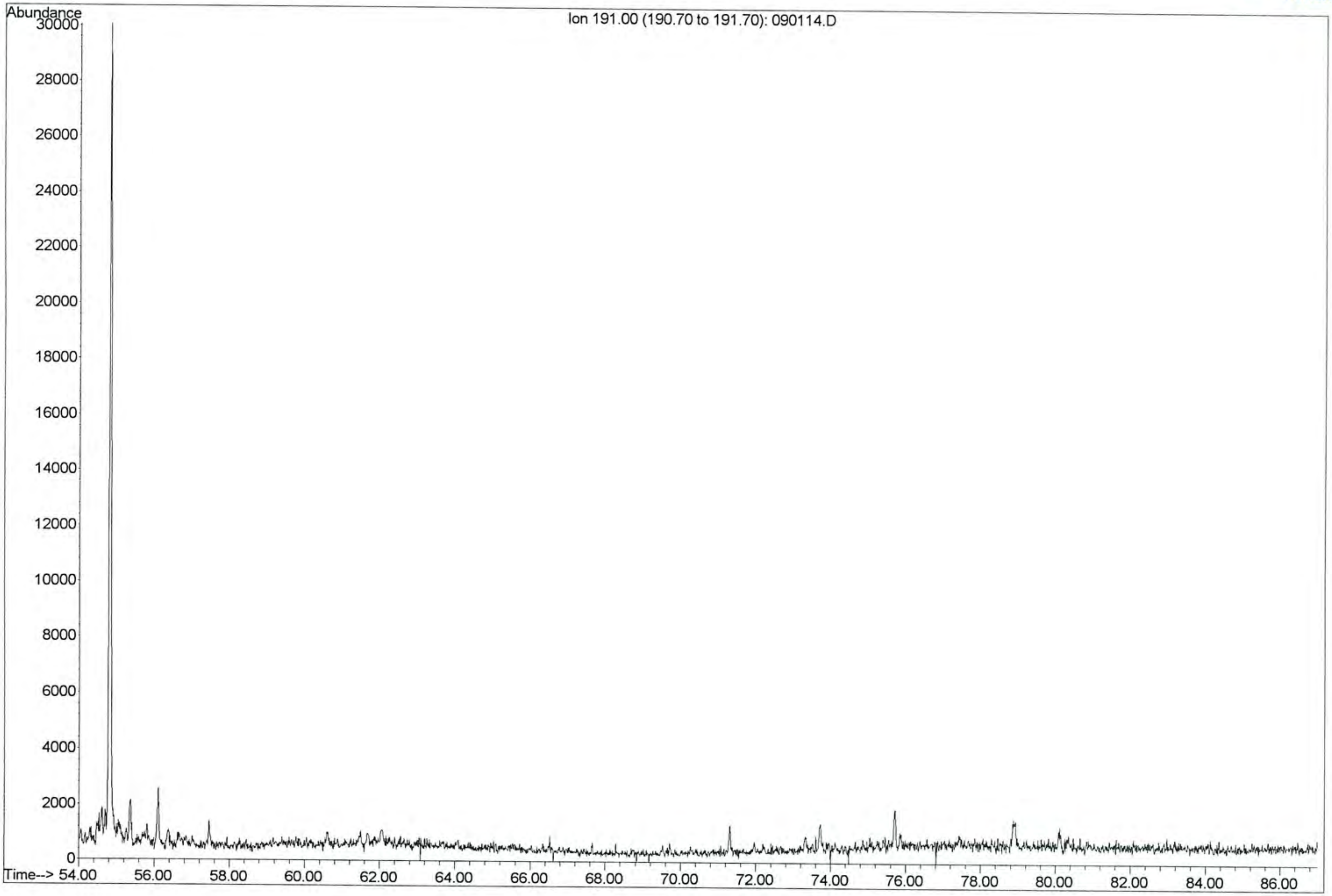
ZymaX FORENSICS



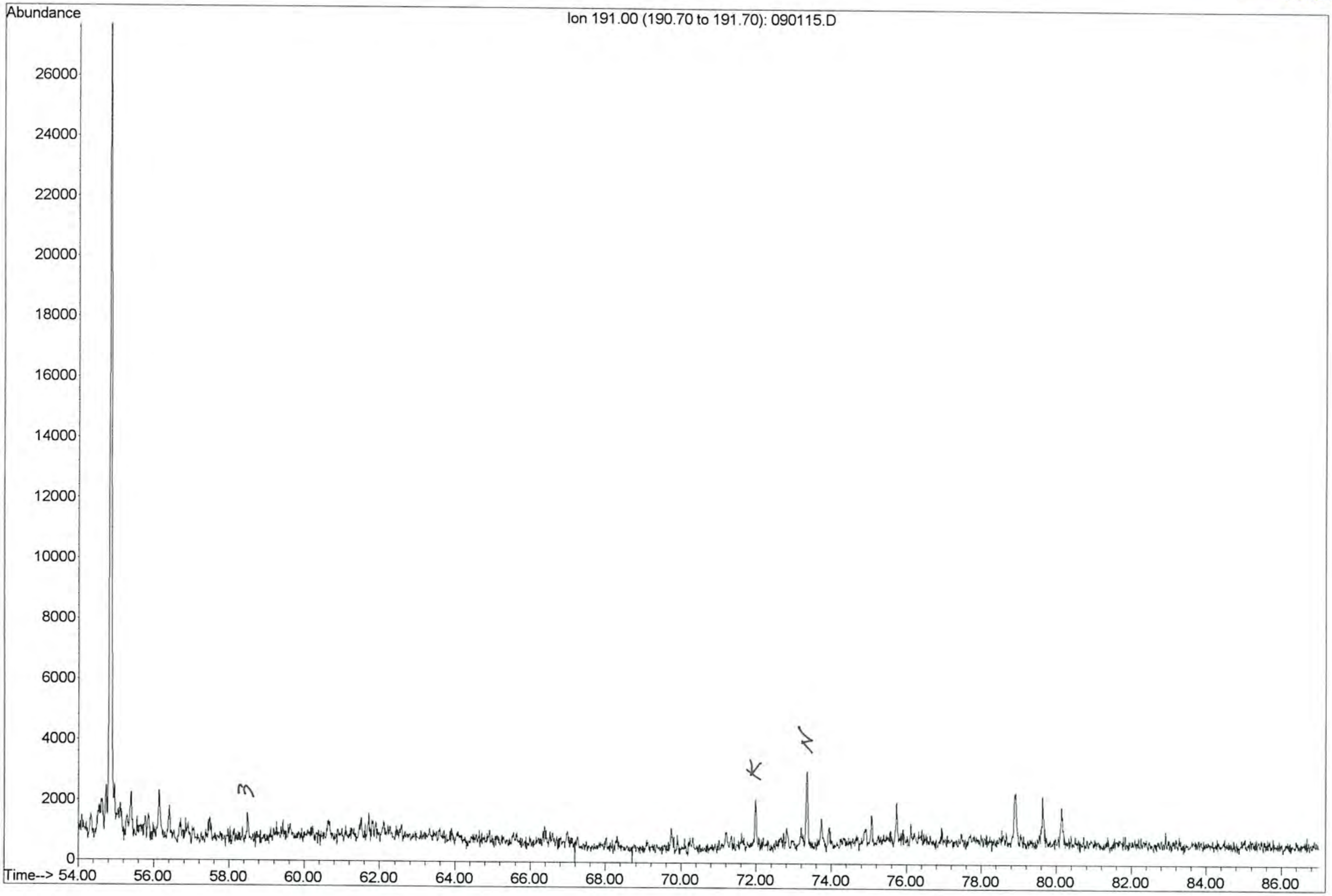
34011008030 (36918-14) soil extract
MGP, Floyd Snider, QB SS5305



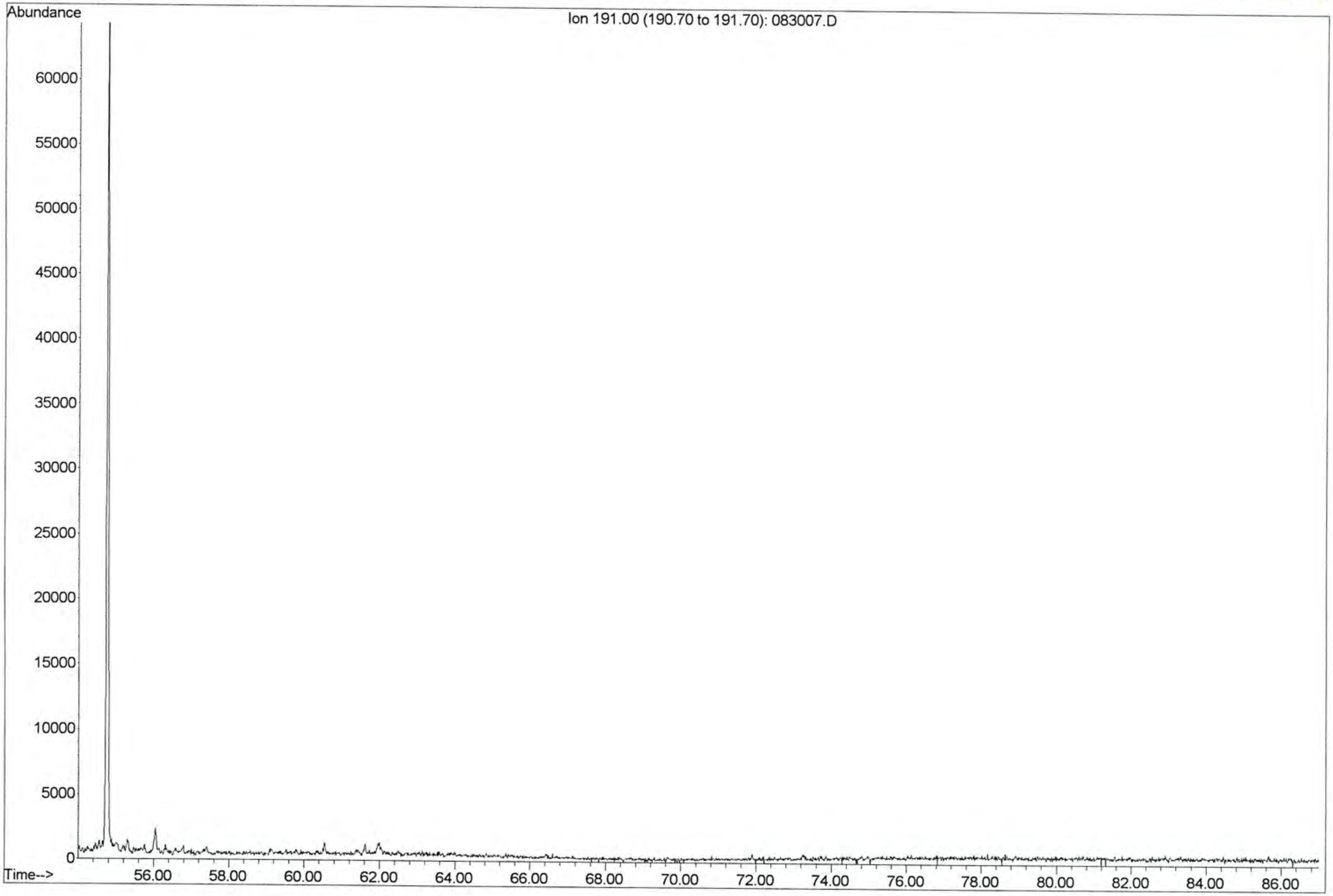
34011008032 (36918-16) soil ext (3.5:6.5)
MGP, Floyd Snider, QB SS5305, Vf=4ml



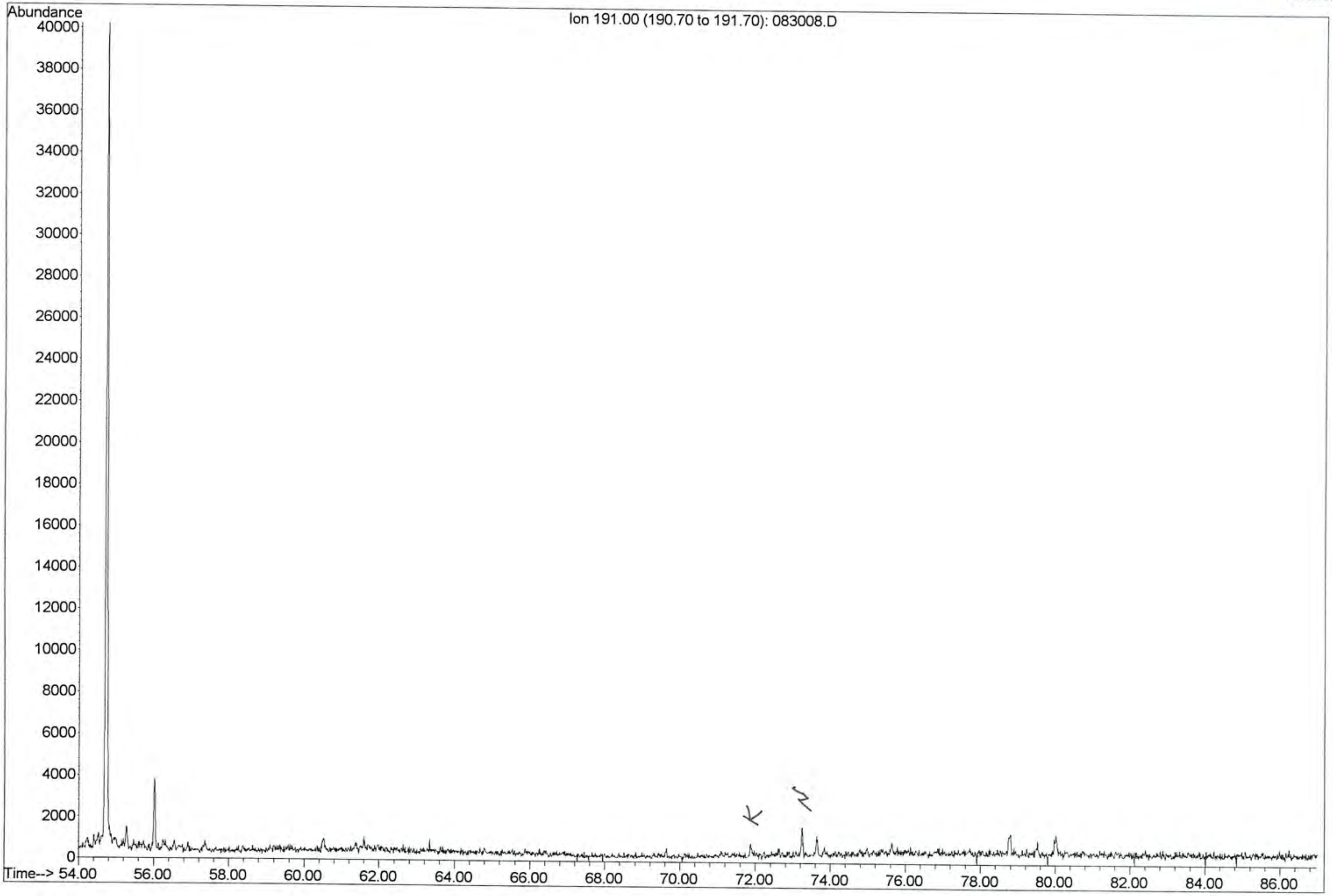
34011008035 (36918-19) soil ext (4:6)
MGP, Floyd Snider, QB SS5305, Vf=1ml



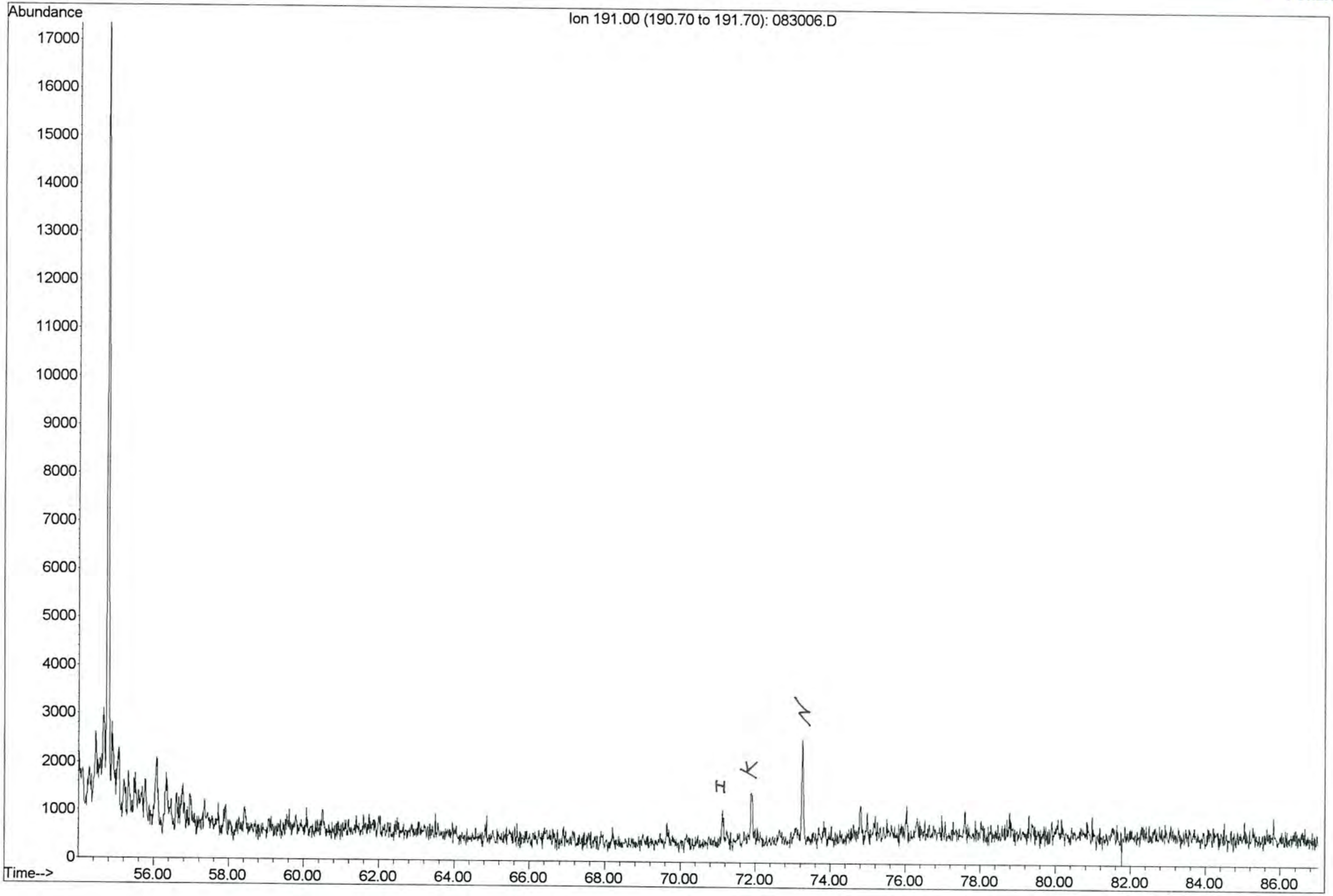
34011008040 (36919-4) soil extract (1:2)
MGP, Floyd Snider, QB SS5318



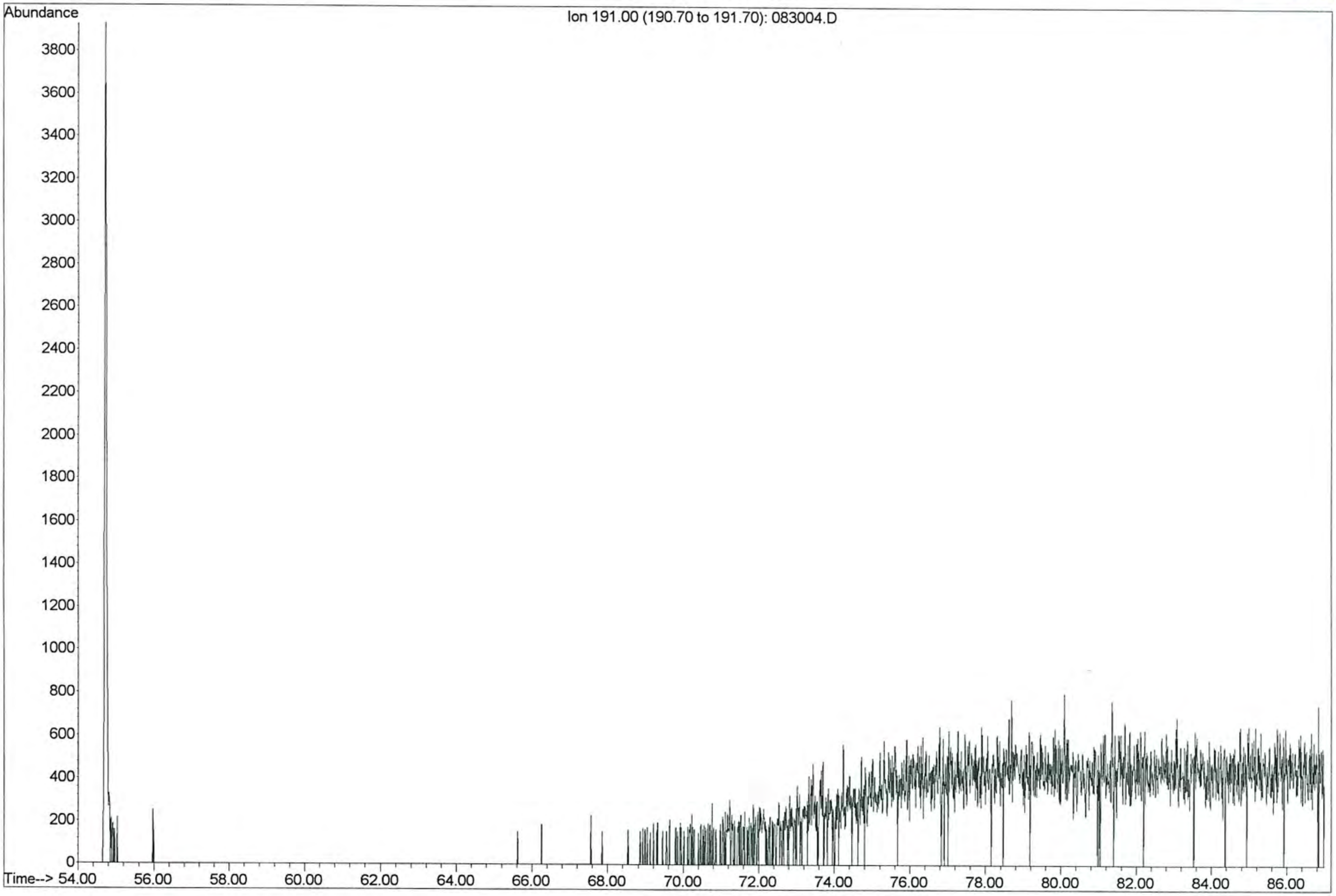
34011008043 (36919-7) soil extract (1:2)
MGP, Floyd Snider, QB SS5318, Vf=3ml



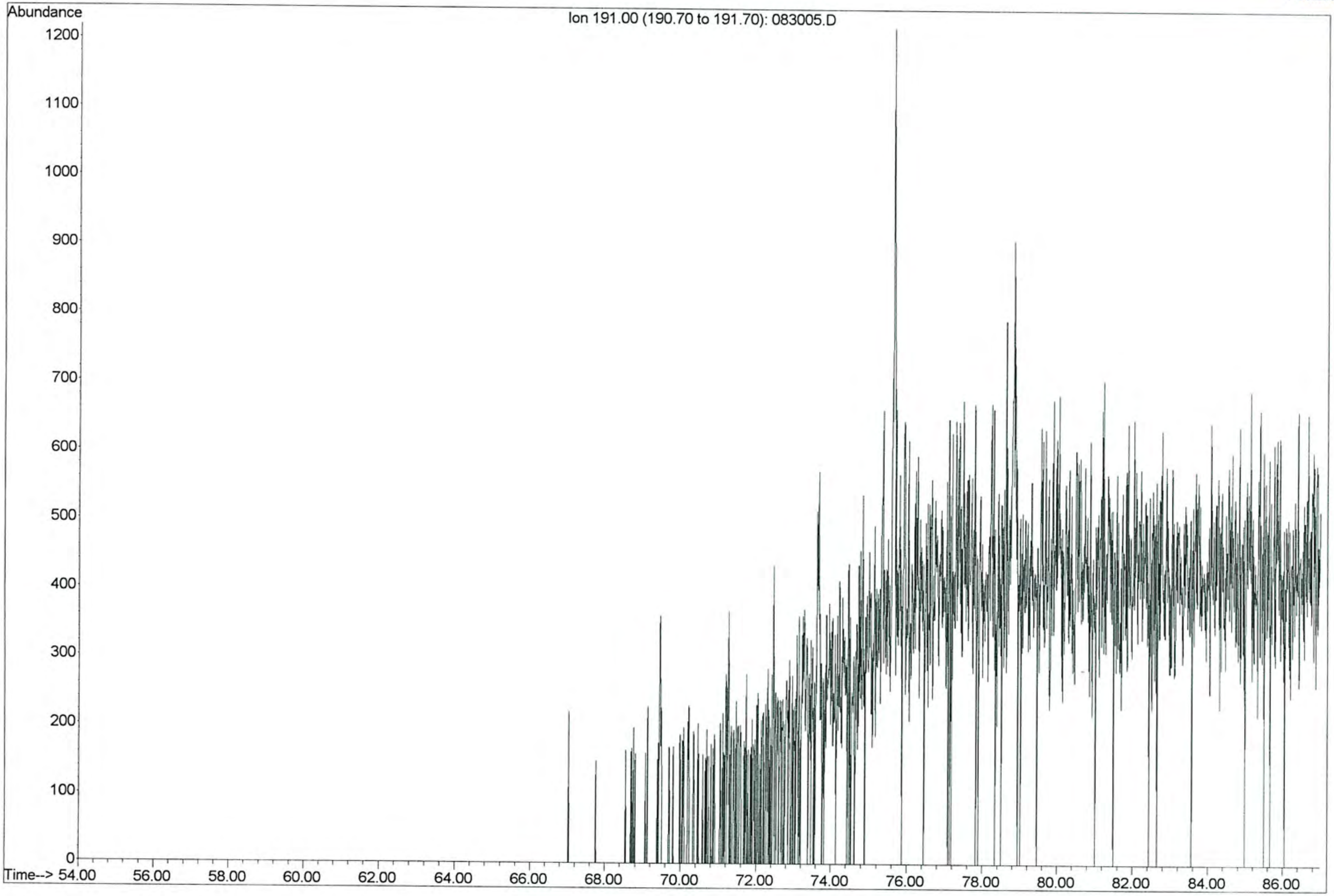
34011008050 (36920-1) soil extract (1:7)
MGP, Floyd Snider, QB SS5318, Vf=3ml



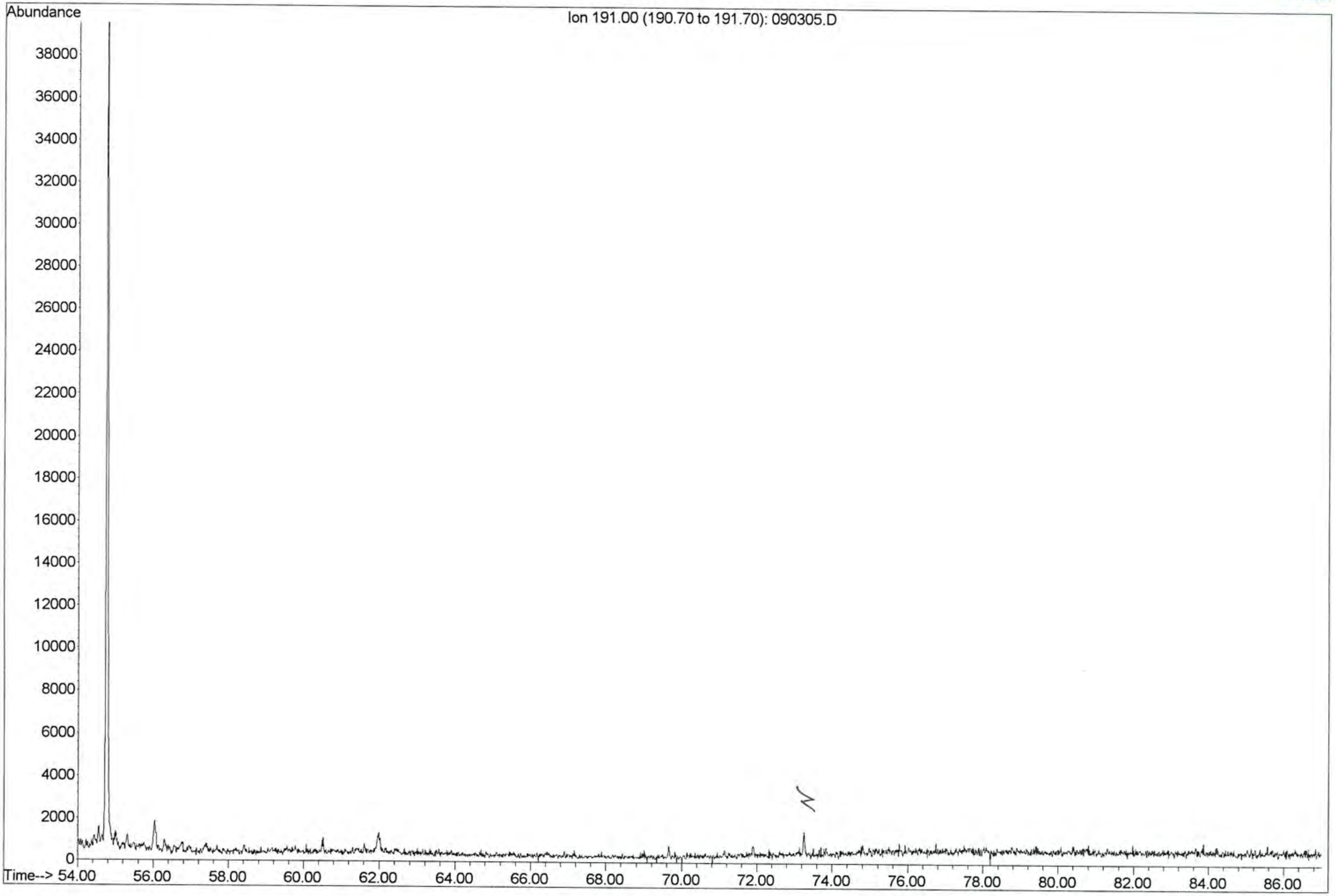
34011008054 (36920-5) soil extract
MGP, Floyd Snider, QB SS5318



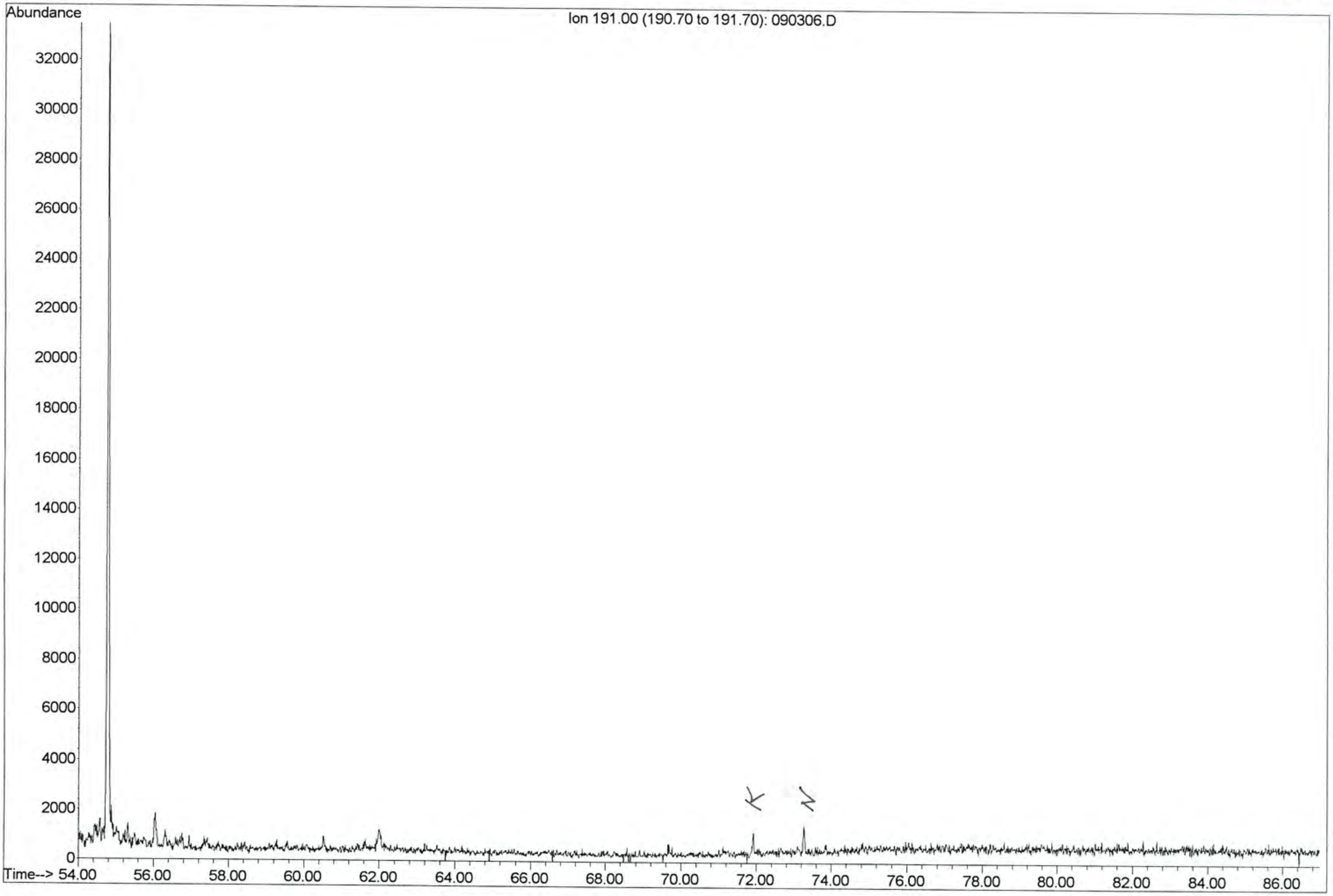
34011008056 (36920-7) soil extract
MGP, Floyd Snider, QB SS5318



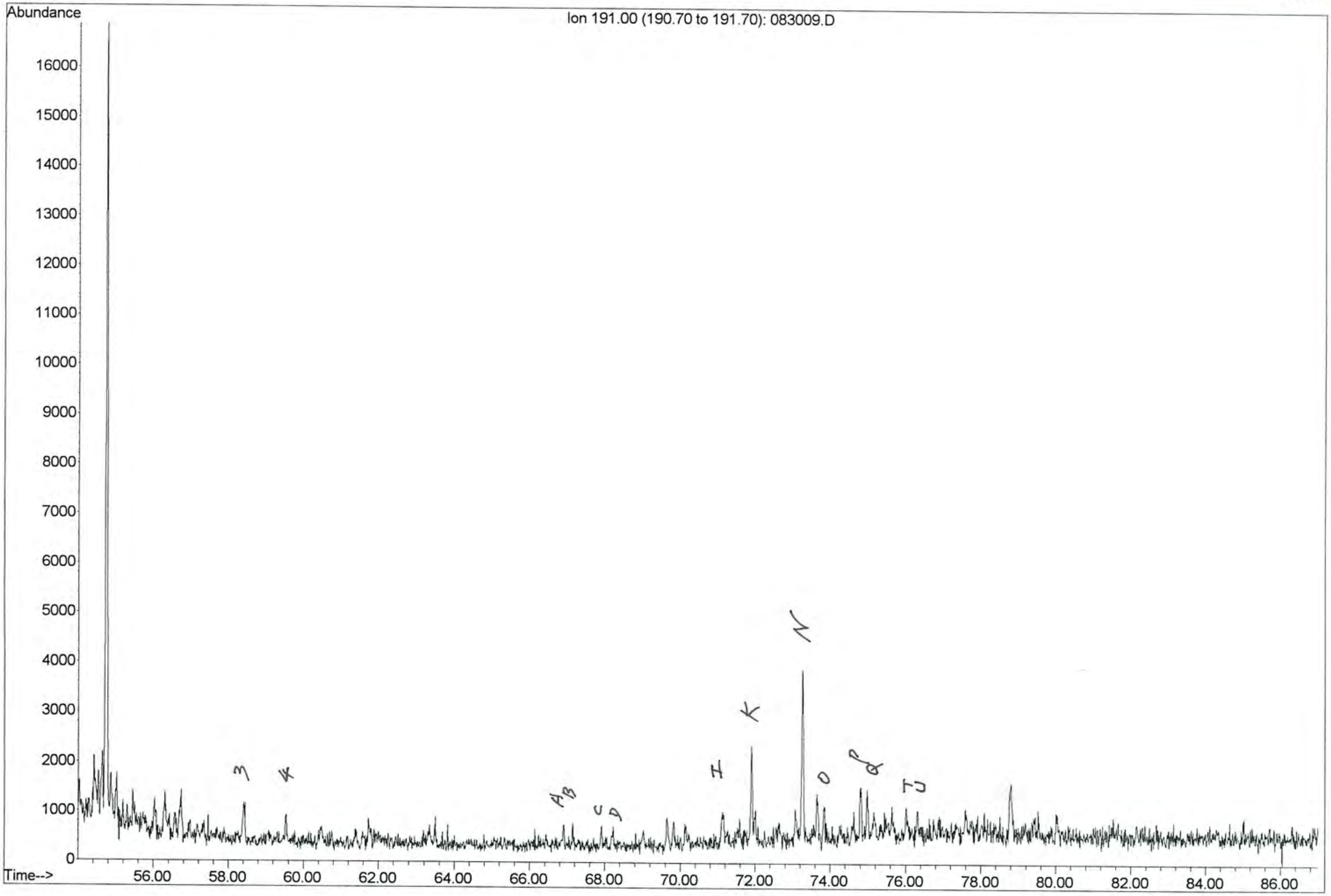
DW-4-FP (36921-1) Product x50
Gas Works Park, Floyd



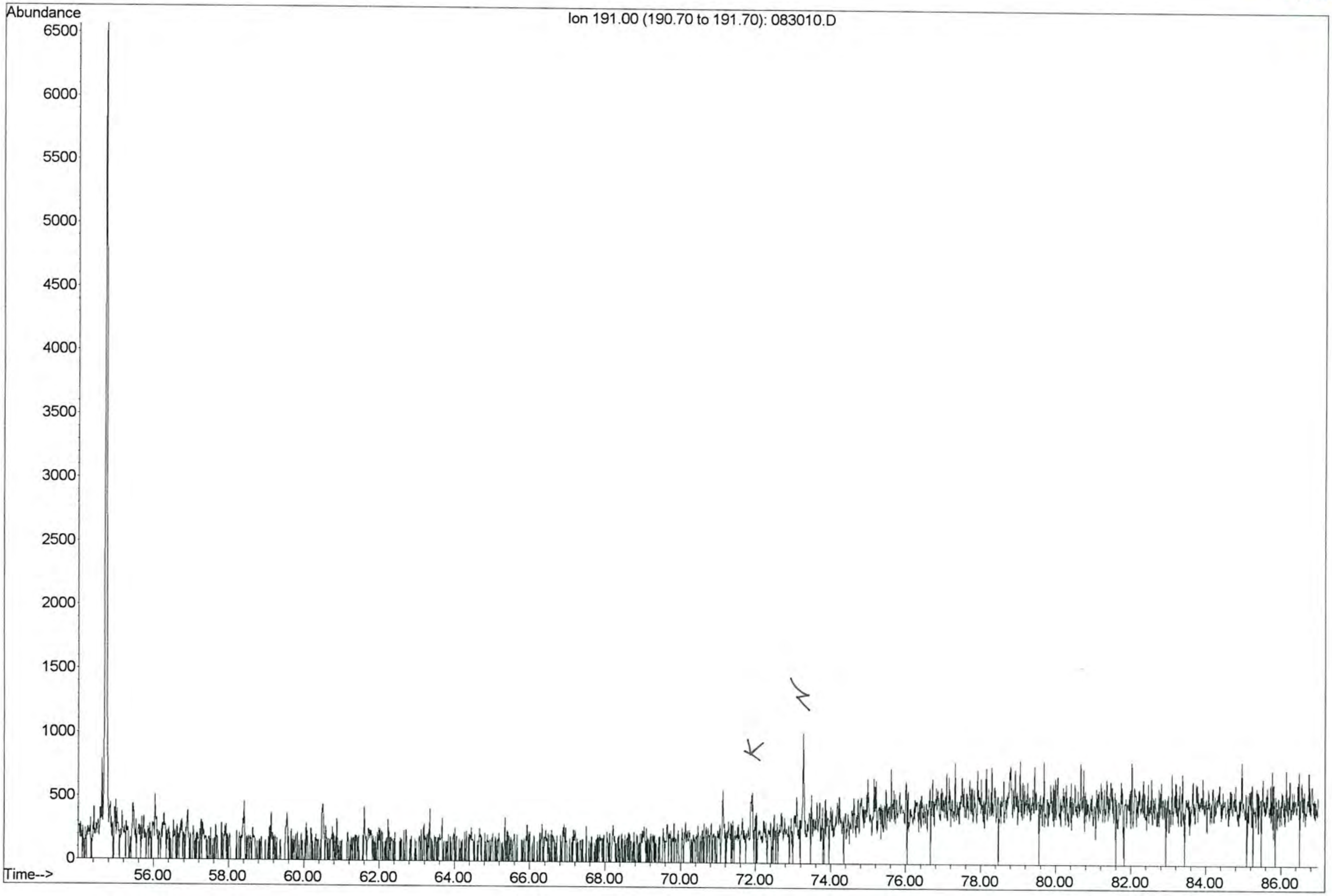
DW-5-FP (36921-2) Product x50
Gas Works Park, Floyd



3-1-G (36921-3) soil extract (1:10)
Gas Works Park, Floyd Snider, QB SS5318, Vf=2ml



1-1G (36922-3) soil extract (1:12)
MGP, Floyd Snider, QB SS5318, Vf=3ml

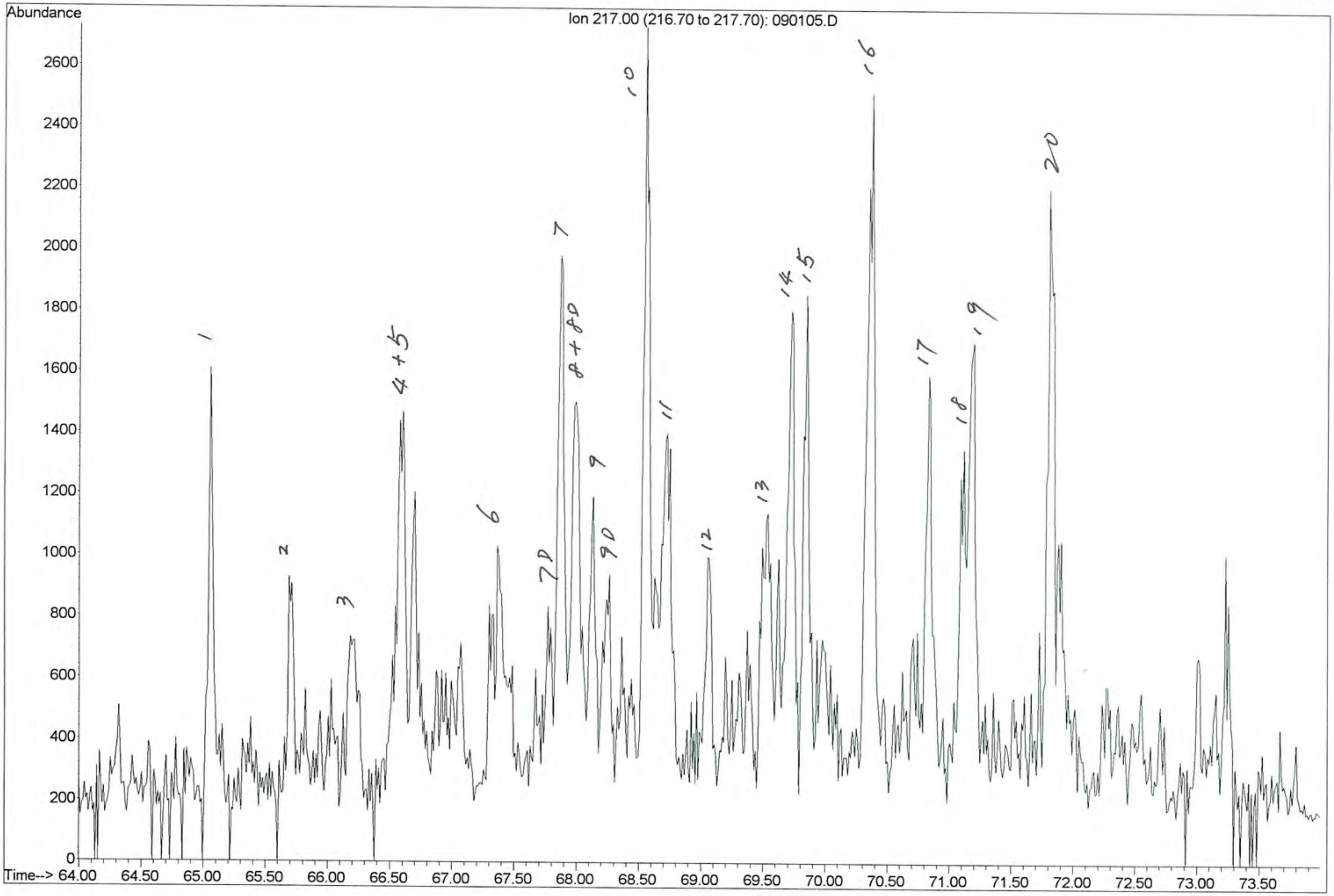


Table

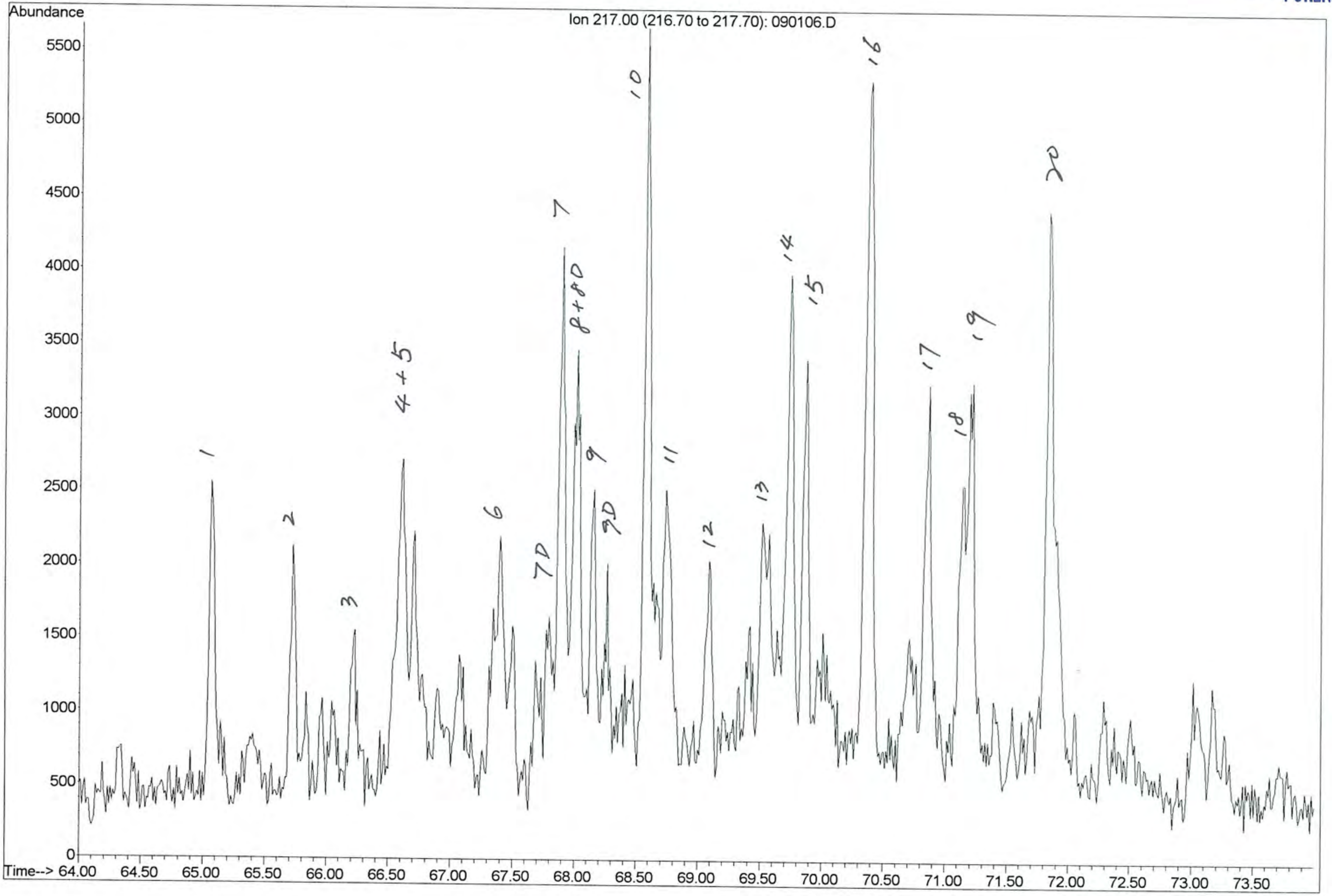
Key for Steranes Identification (m/z 217 Mass Chromatogram)

Code	Identity	Carbon #
1	13ß,17α-diacholestane (20S)	27
2	13ß,17α-diacholestane (20R)	27
3	13α,17ß-diacholestane (20S)	27
4	13α,17ß-diacholestane (20R)	27
5	24-methyl-13ß,17α-diacholestane (20S)	28
6	24-methyl-13ß,17α-diacholestane (20R)	28
7D	24-methyl-13α,17ß-diacholestane (20S)	28
7	14α,17α-cholestane (20S)	27
8D	24-ethyl-13ß,17α-diacholestane (20S)	29
8	14ß,17ß-cholestane (20R)	27
9	14ß,17ß-cholestane (20S)	27
9D	24-methyl-13α,17ß-diacholestane (20R)	28
10	14α,17α-cholestane (20R)	27
11	24-ethyl-13ß,17α-diacholestane (20R)	29
12	24-ethyl-13α,17ß-diacholestane (20S)	29
13	24-methyl-14α,17α-cholestane (20S)	28
14D	24-ethyl-13α,17ß-diacholestane (20R)	29
14	24-methyl-14ß,17ß-cholestane (20R)	28
15	24-methyl-14ß,17ß-cholestane (20S)	28
16	24-methyl-14α,17α-cholestane (20R)	28
17	24-ethyl-14α-cholestane (20S)	29
18	24-ethyl-14ß,17ß-cholestane (20R)	29
19	24-ethyl-14ß,17ß-cholestane (20S)	29
20	24-ethyl-14α,17α-cholestane (20R)	29
21A	24-n-Propylcholestane (20S)	30
21B	4-methyl-24-ethylcholestane (20S)	30
22A	4α-methyl-24-ethyl-14β,17β-cholestane(20S)	30
22B	24-n-propyl-14β,17β-cholestane (20S)	30
23A	4α-methyl-24-ethyl-14β,17β-cholestane(20R)	30
23B	24-n-propyl-14β,17β-cholestane (20R)	30
24A	4α-methyl-24-ethylcholestane(20R)	30
24B	24-n-propylcholestane (20R)	30

34011008001 (36917-1) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



34011008011 (36917-11) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



34011008017 (36918-1) soil extract (3:7)
MGP, Floyd Snider, QB SS5305, Vf=1ml

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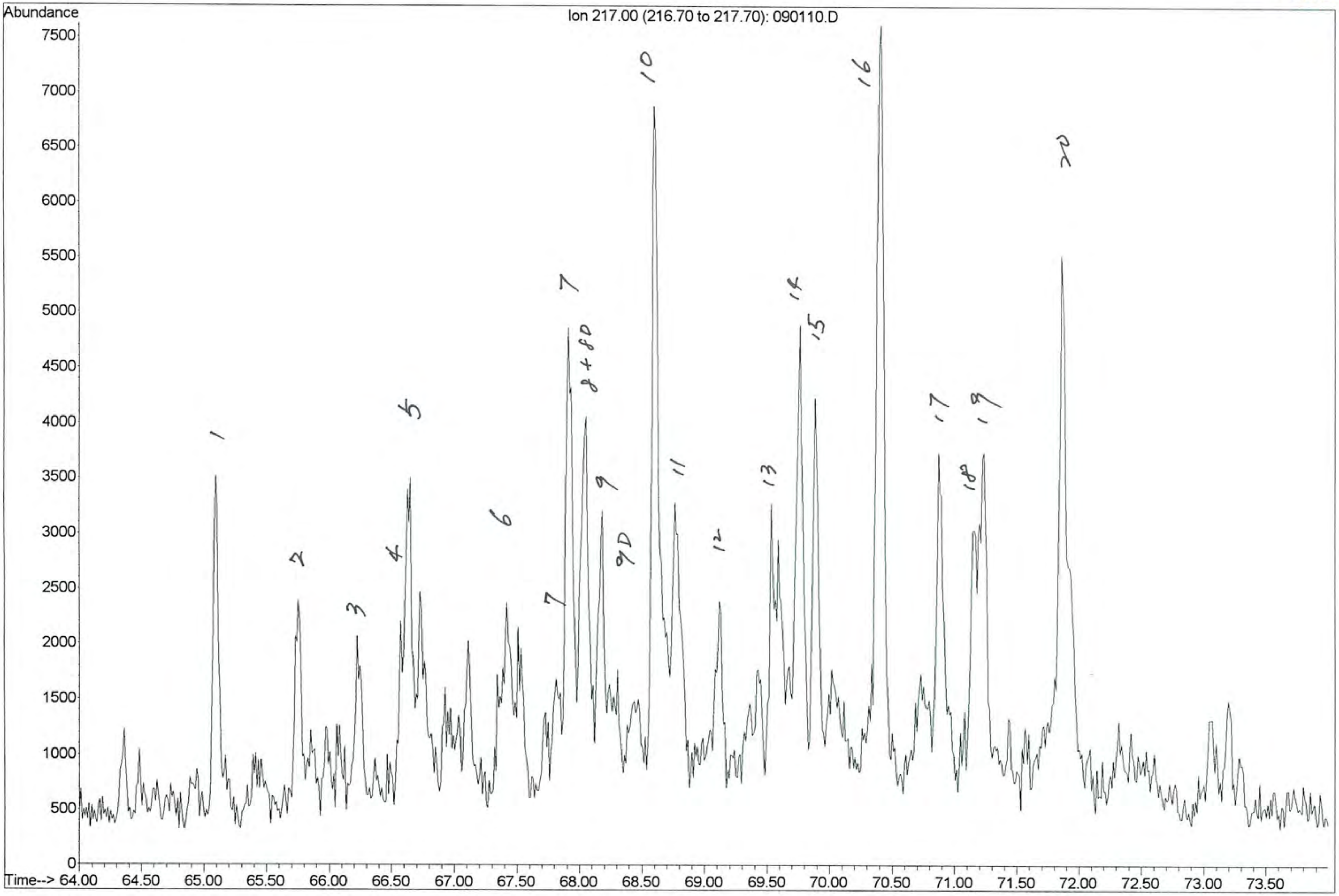
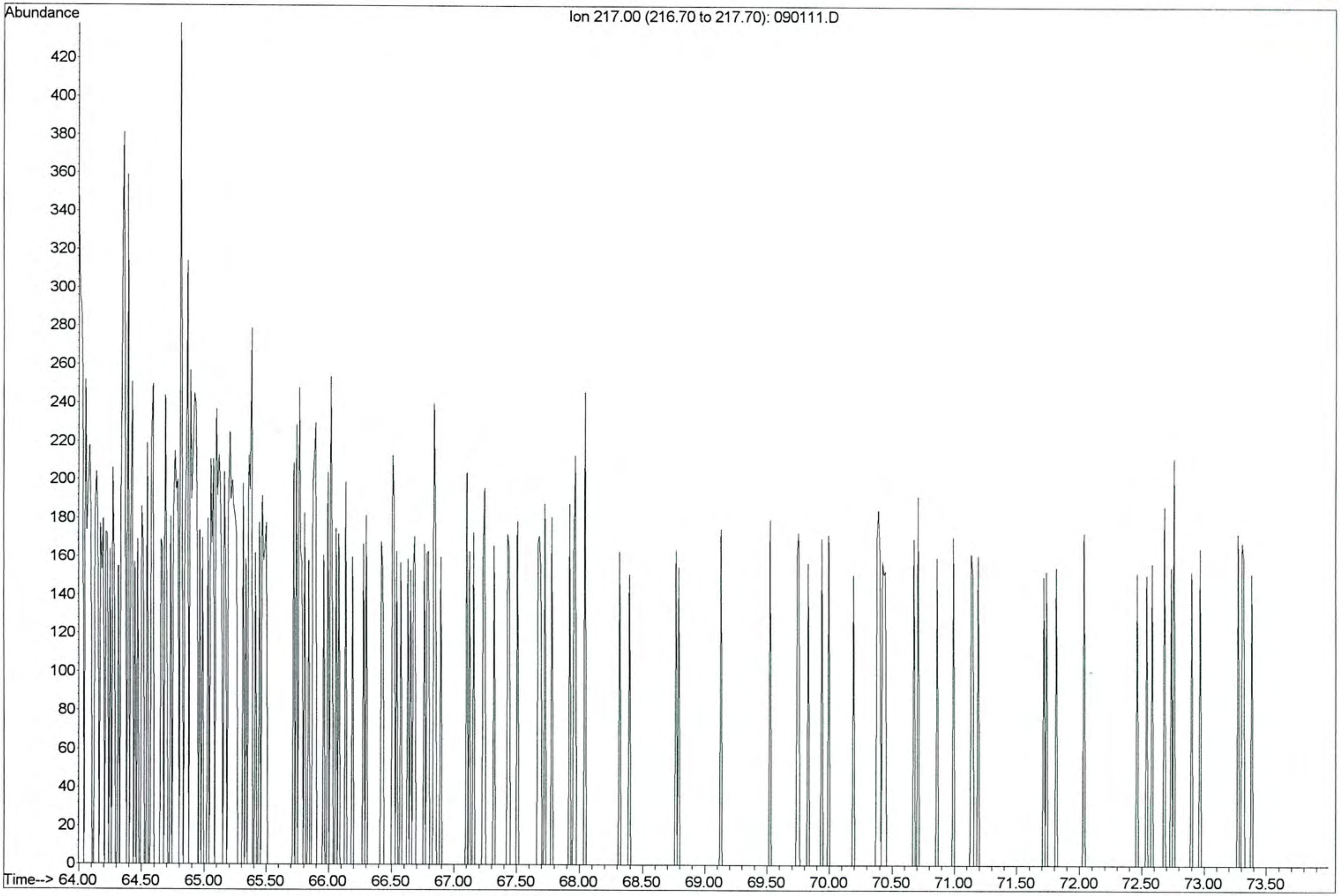
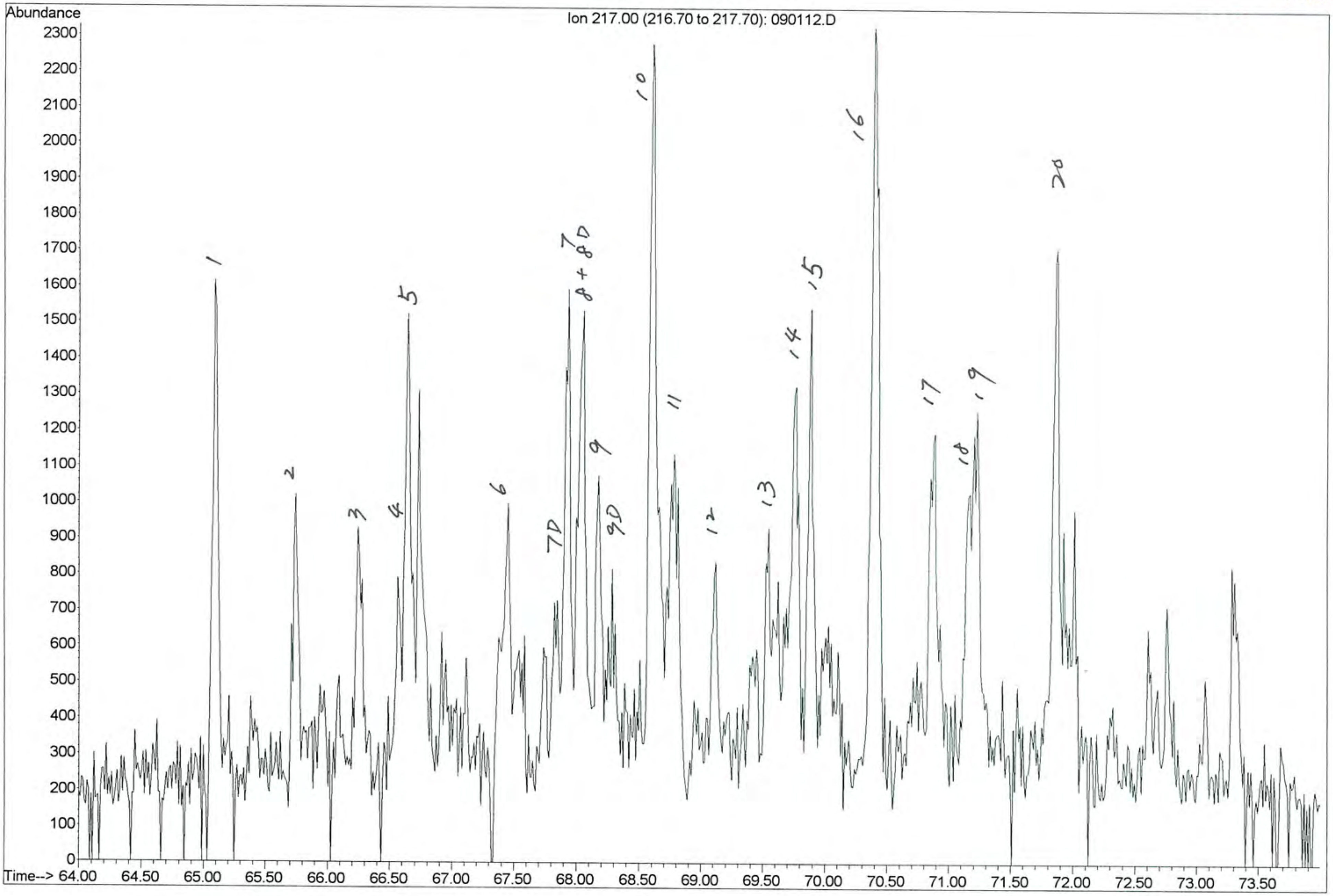


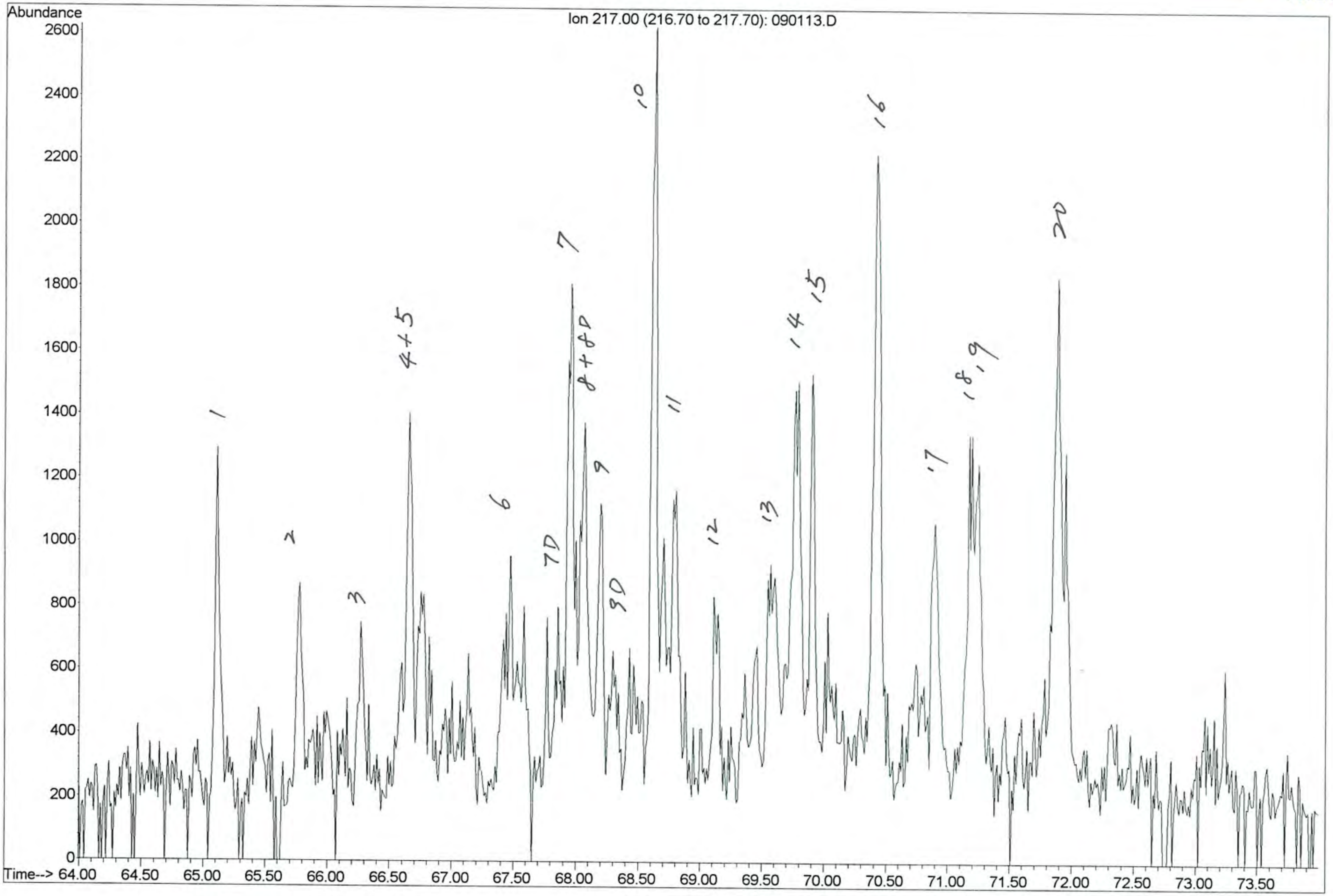
34011008020 (36918-4) soil extract (1:1.2)
MGP, Floyd Snider, QB SS5305, Vf=2ml



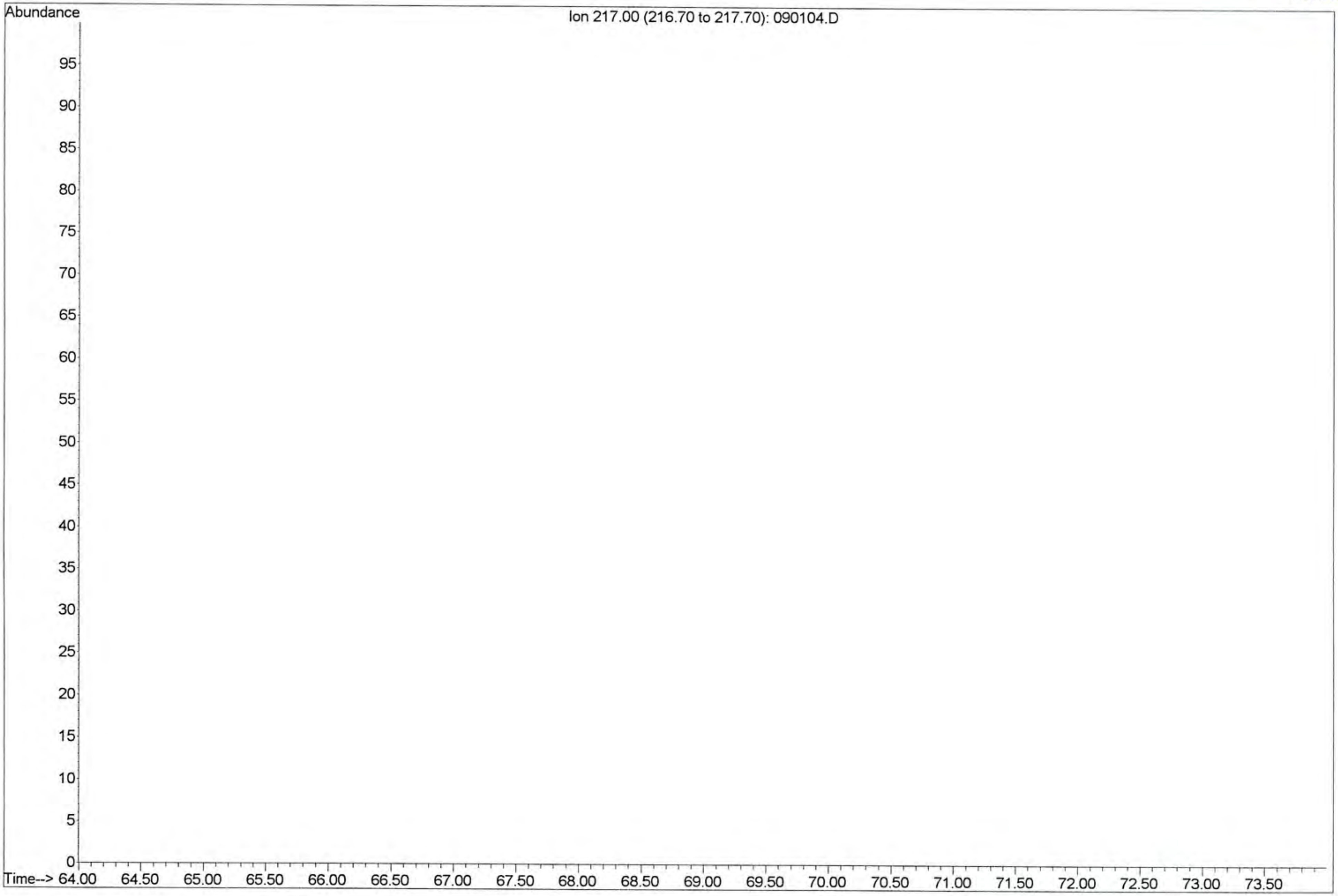
34011008022 (36918-6) soil extract (3:8)
MGP, Floyd Snider, QB SS5305, Vf=2ml



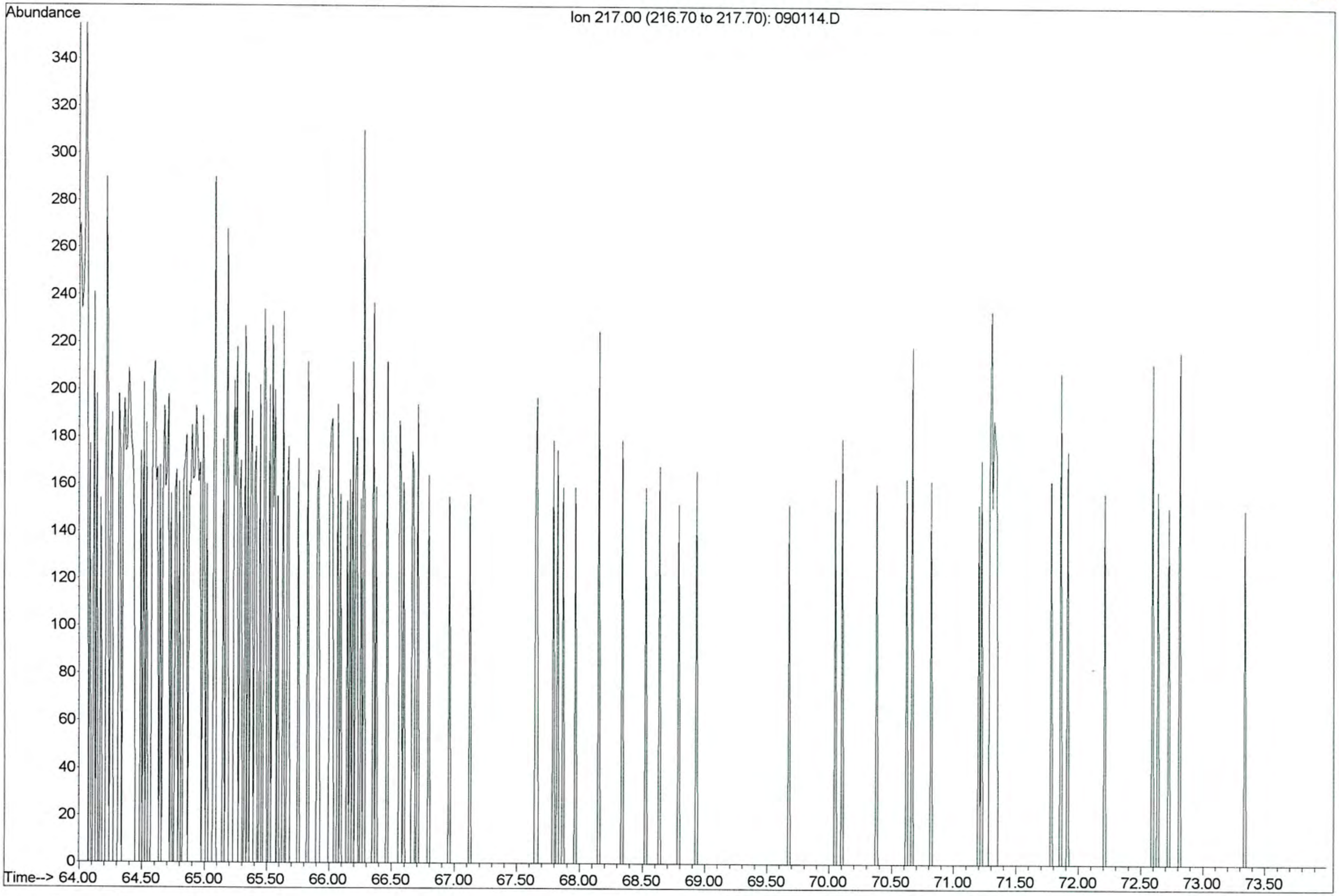
34011008028 (36918-12) soil extract (1:1))
MGP, Floyd Snider, QB SS5305, Vf=2ml



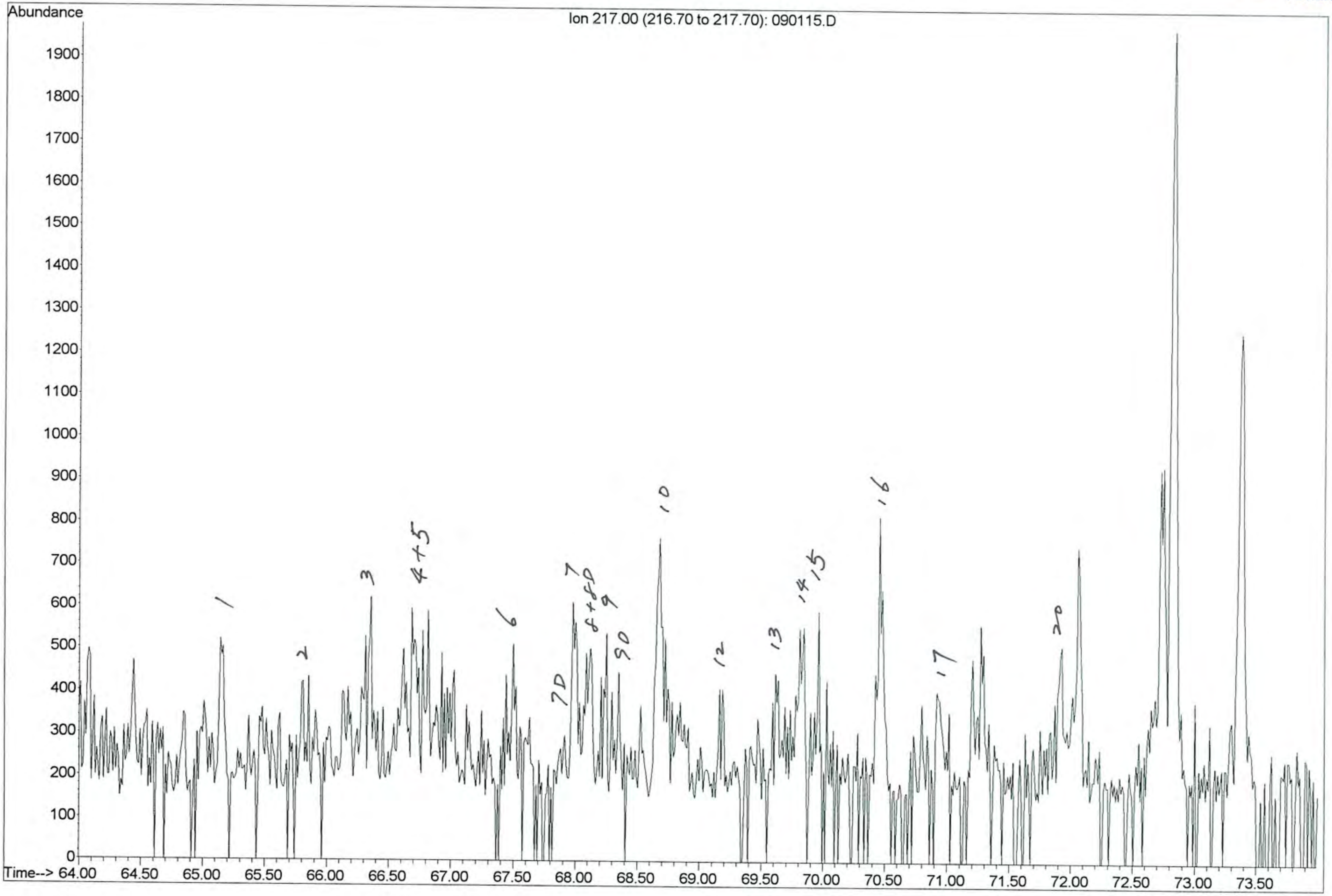
34011008030 (36918-14) soil extract
MGP, Floyd Snider, QB SS5305



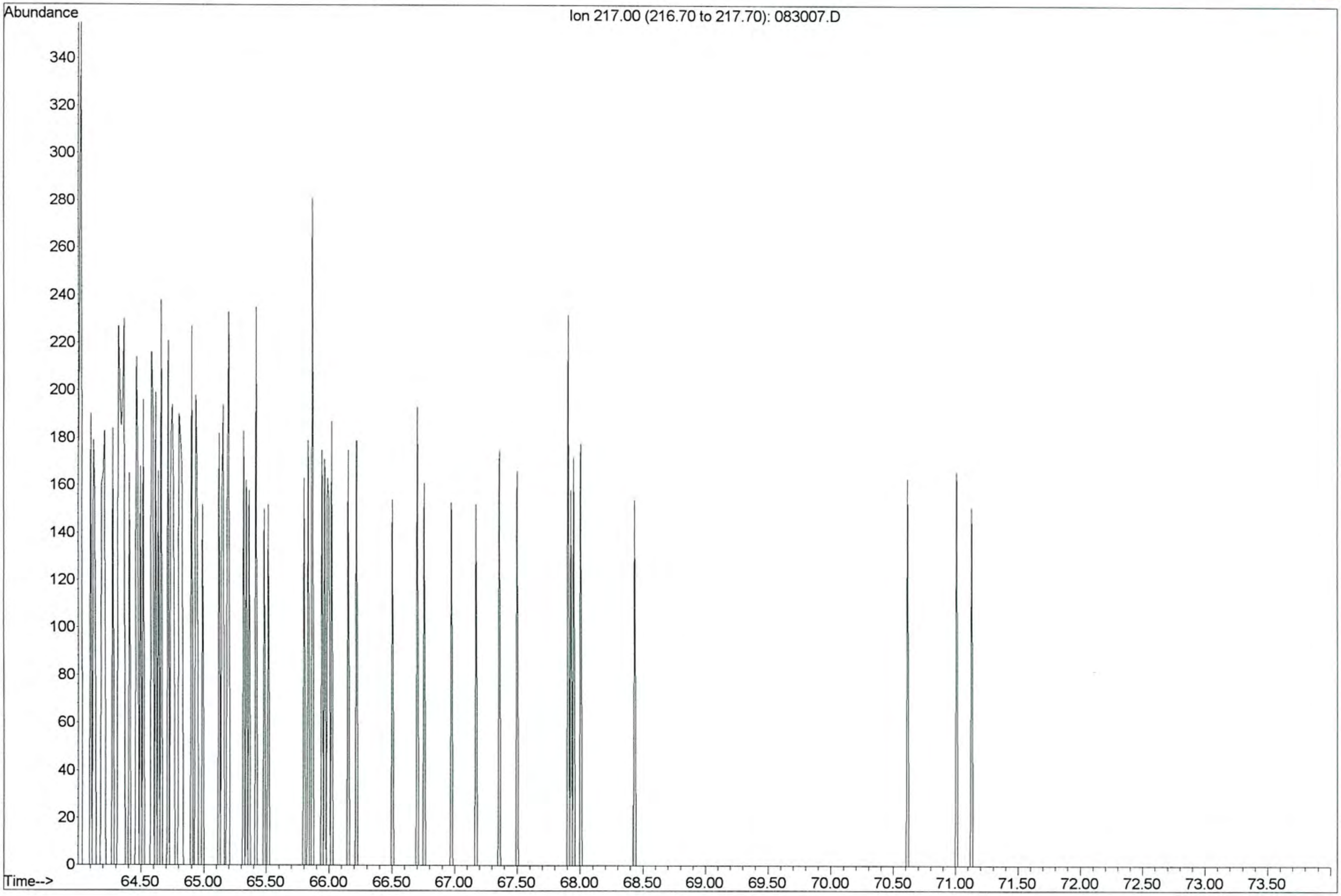
34011008032 (36918-16) soil ext (3.5:6.5)
MGP, Floyd Snider, QB SS5305, Vf=4ml



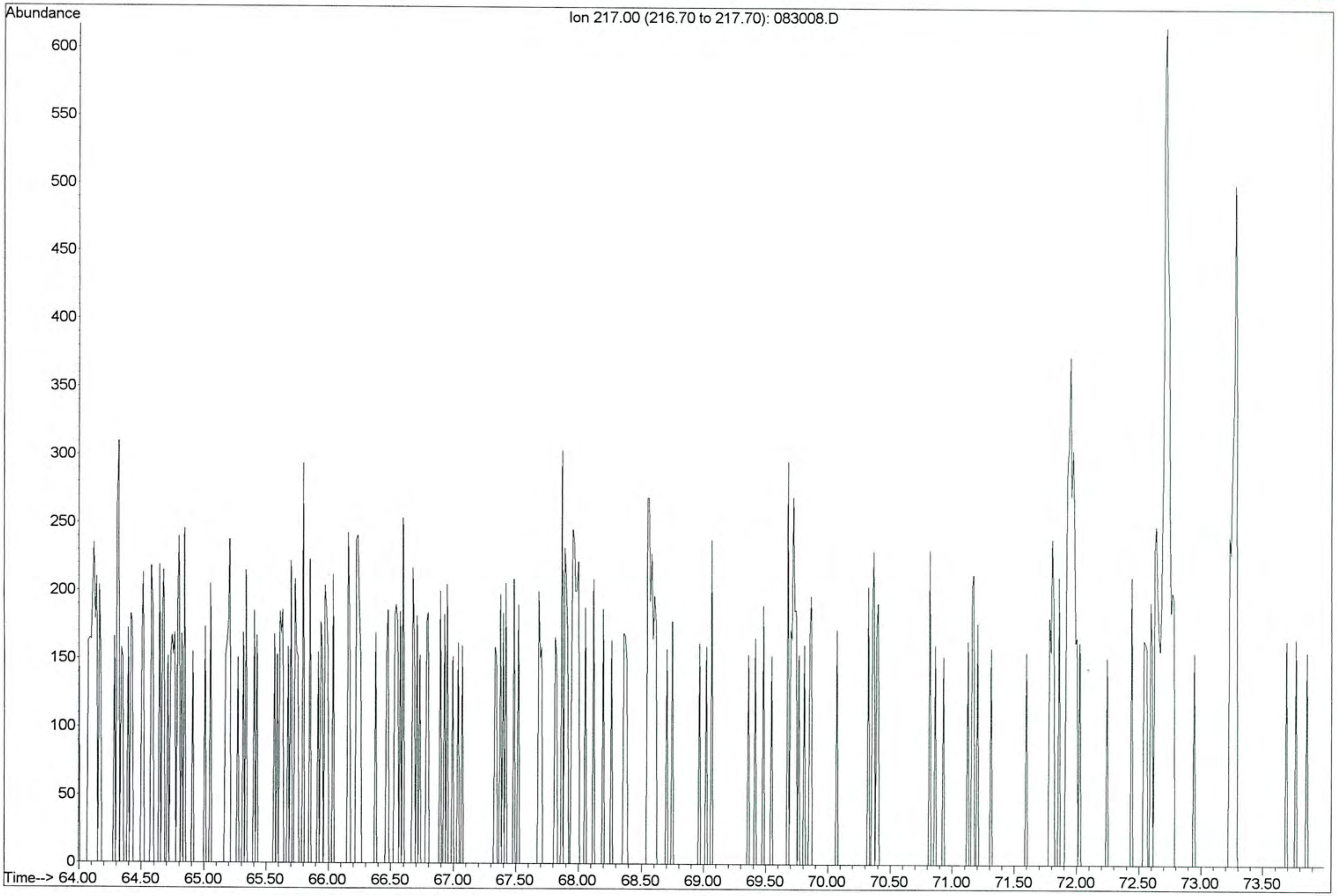
34011008035 (36918-19) soil ext (4:6)
MGP, Floyd Snider, QB SS5305, Vf=1ml



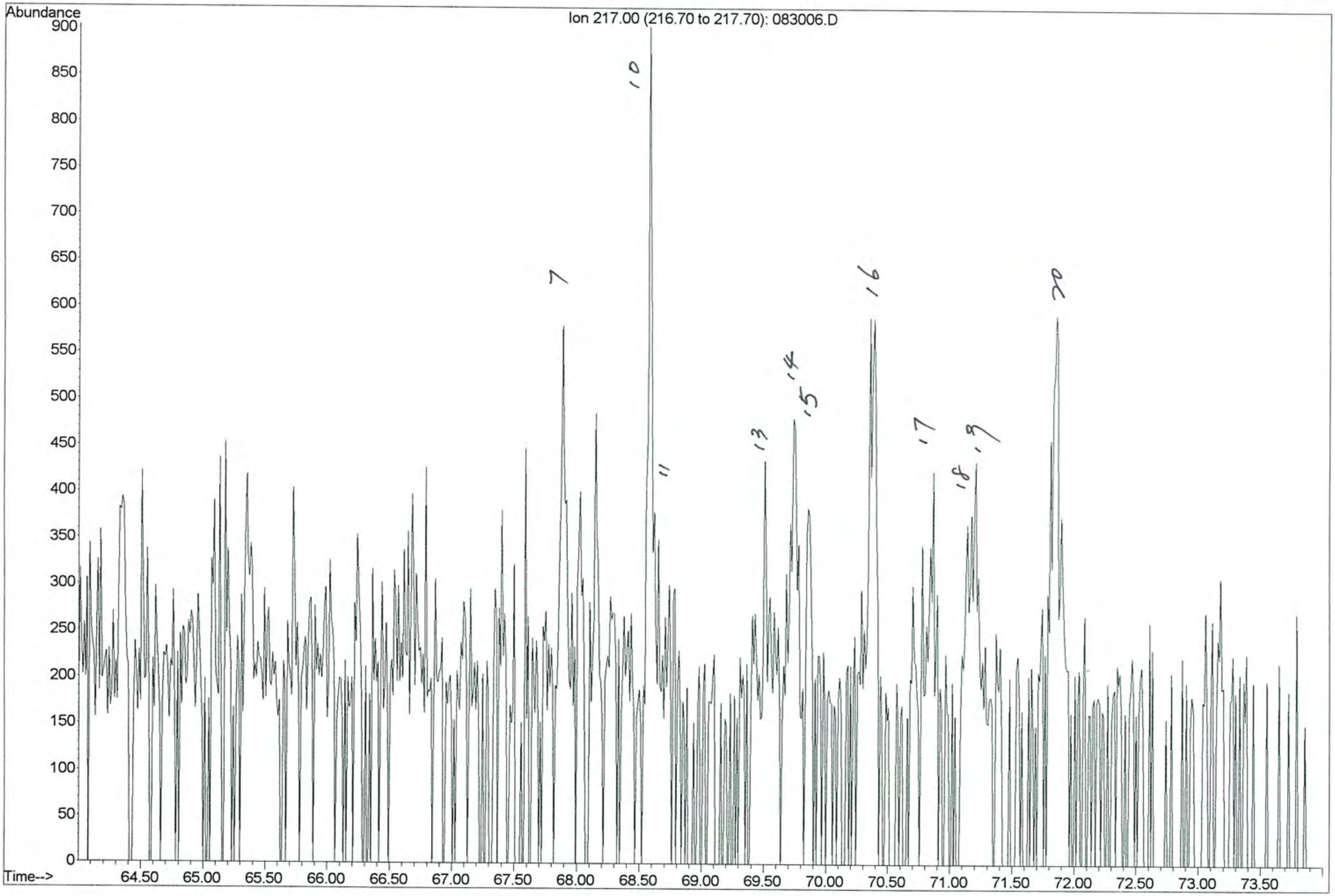
34011008040 (36919-4) soil extract (1:2)
MGP, Floyd Snider, QB SS5318



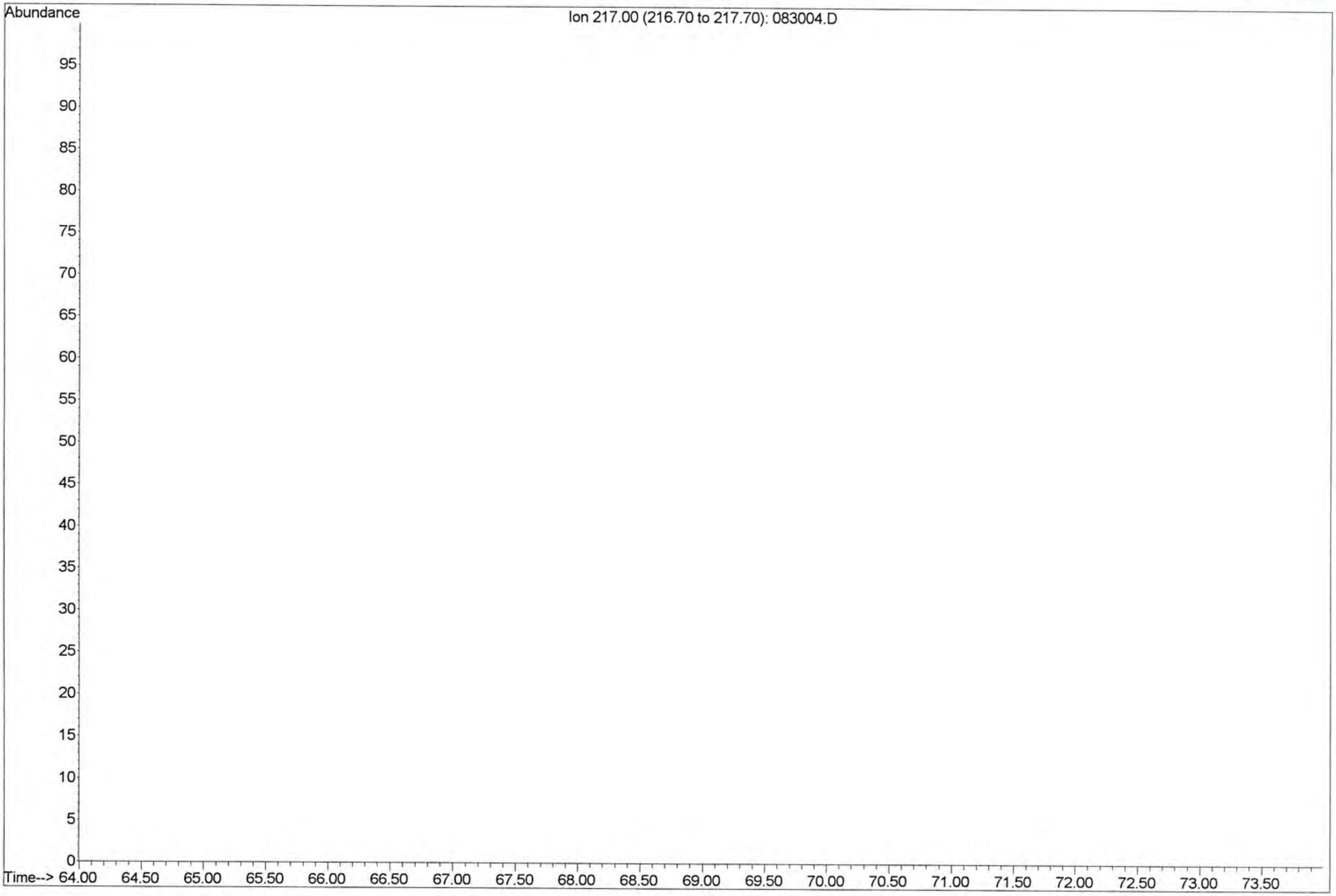
34011008043 (36919-7) soil extract (1:2)
MGP, Floyd Snider, QB SS5318, Vf=3ml



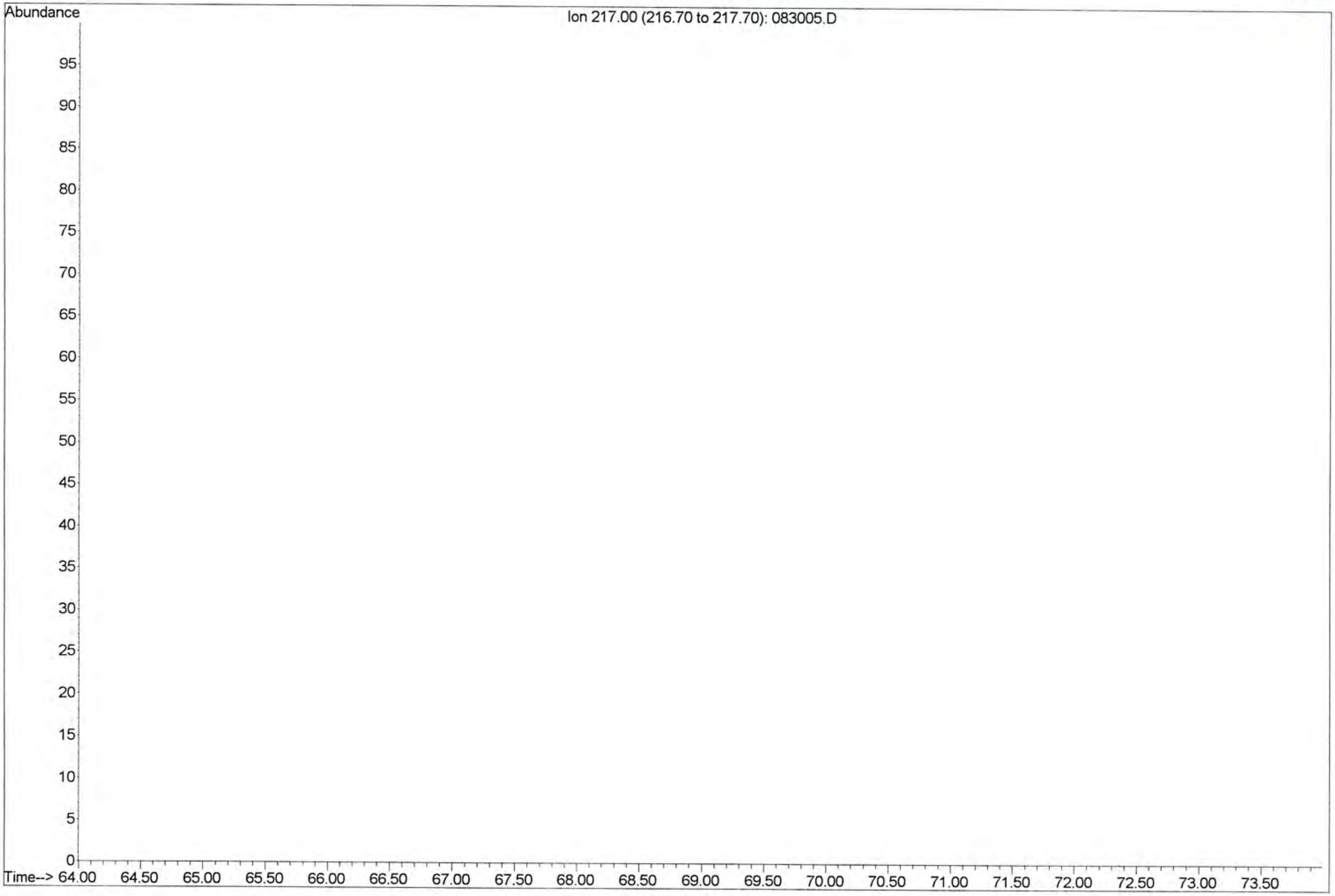
34011008050 (36920-1) soil extract (1:7)
MGP, Floyd Snider, QB SS5318, Vf=3ml



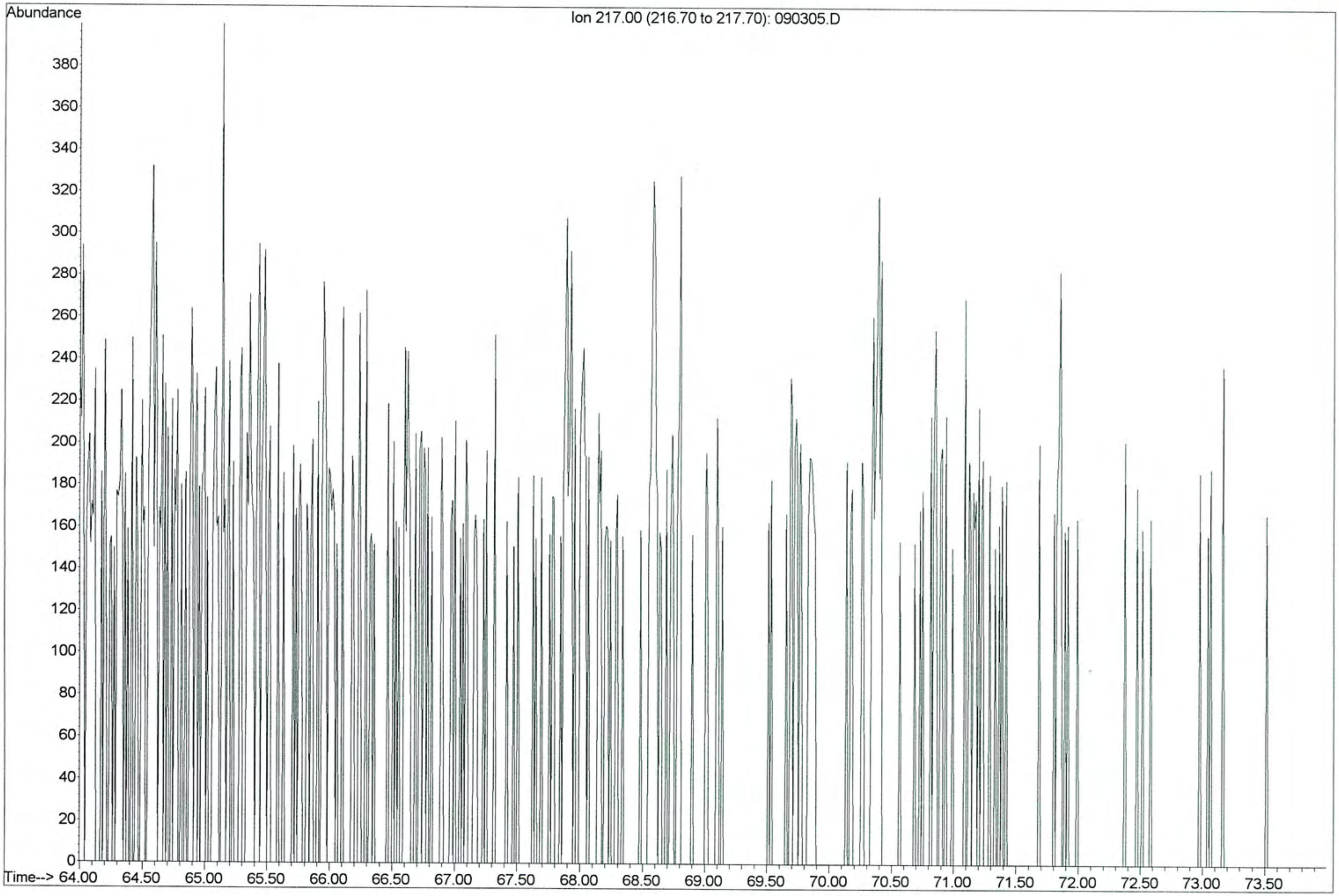
34011008054 (36920-5) soil extract
MGP, Floyd Snider, QB SS5318



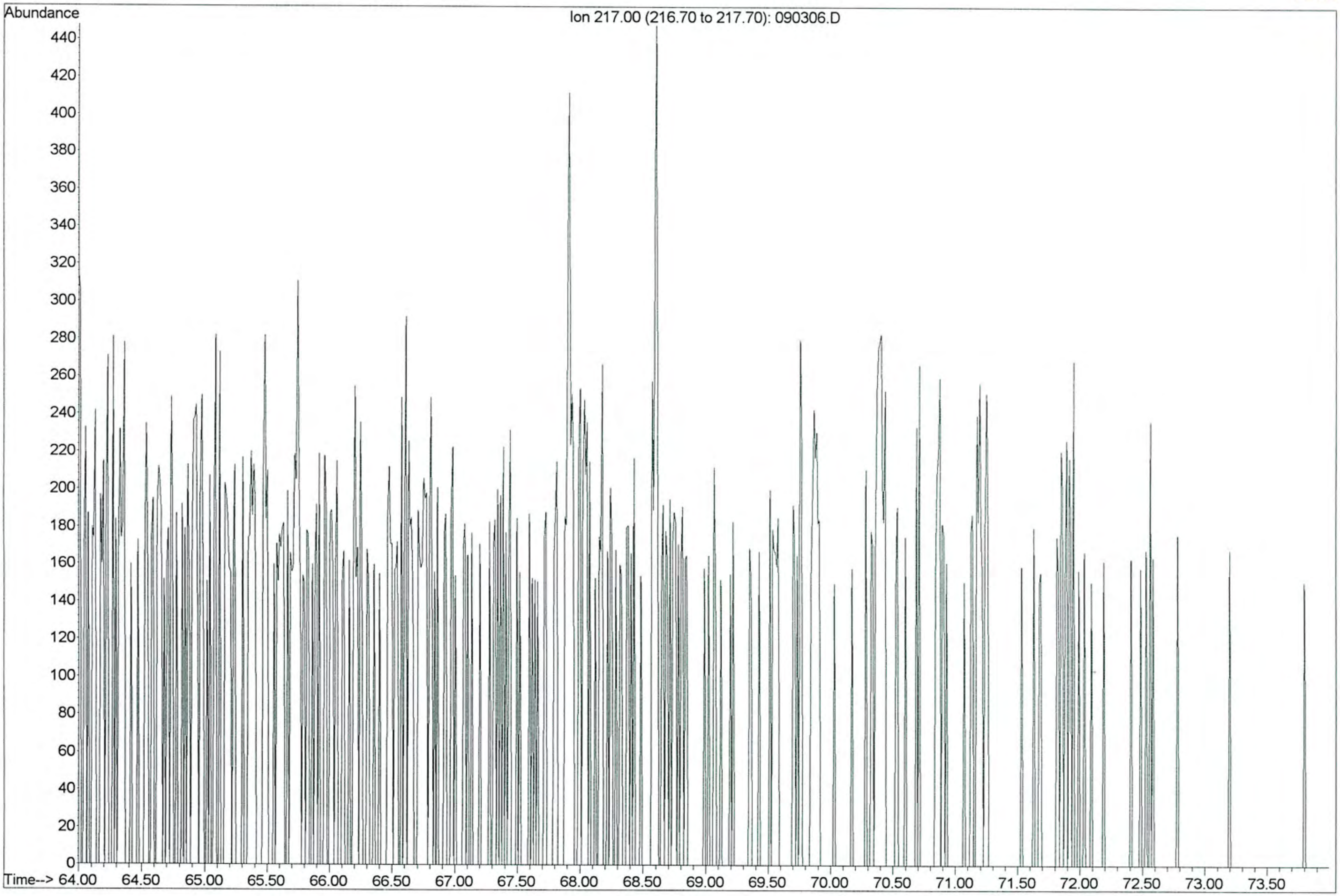
34011008056 (36920-7) soil extract
MGP, Floyd Snider, QB SS5318



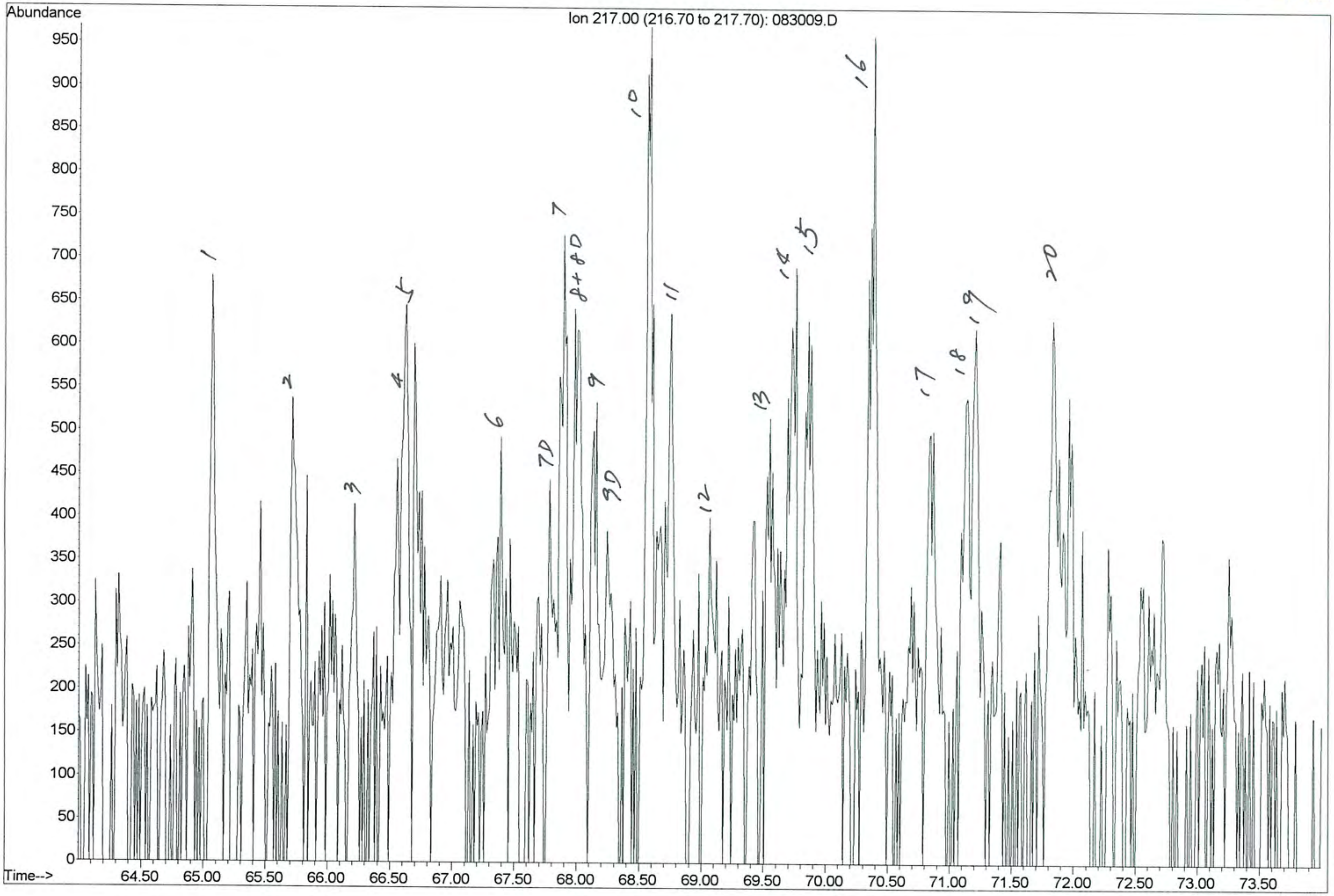
DW-4-FP (36921-1) Product x50
Gas Works Park, Floyd



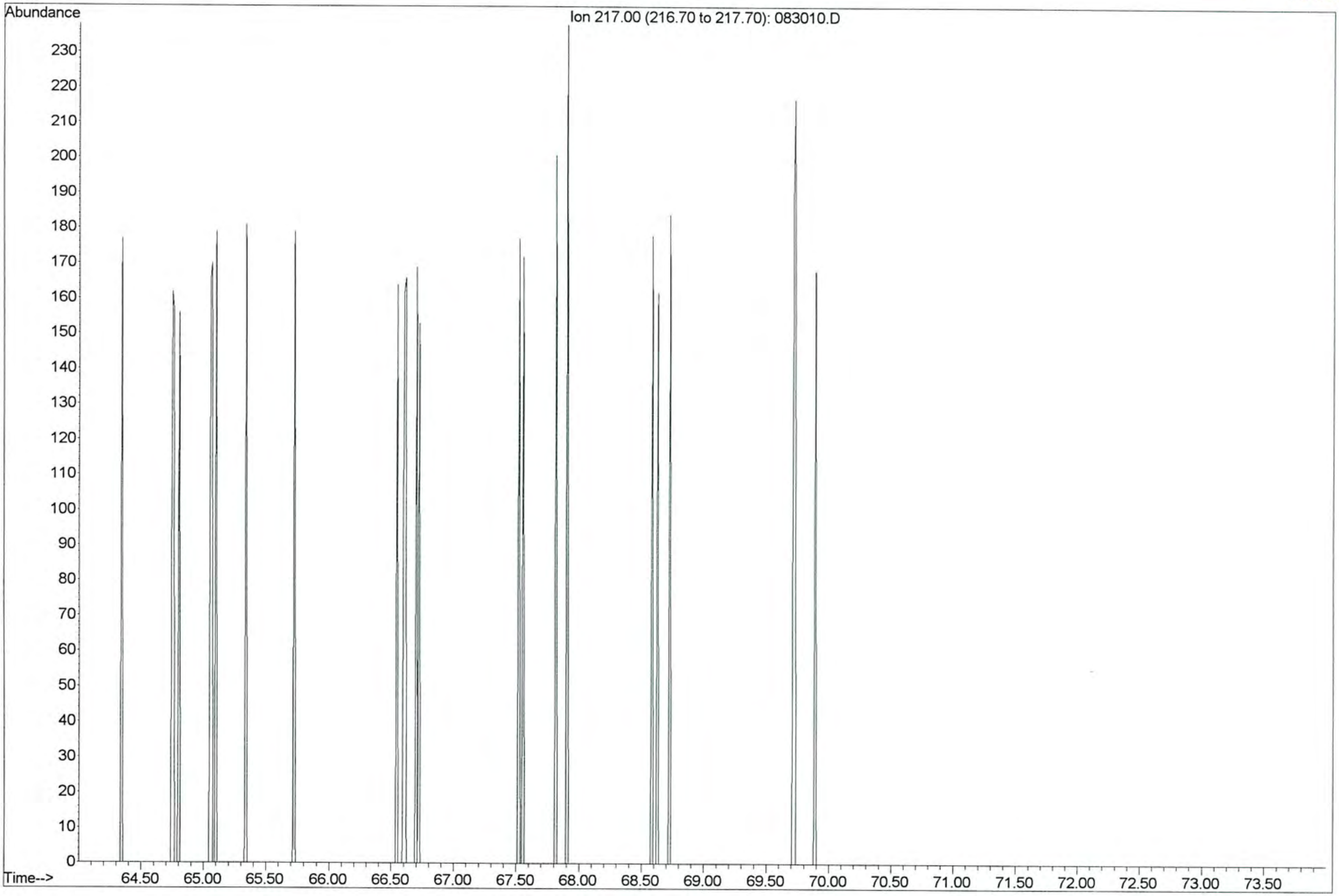
DW-5-FP (36921-2) Product x50
Gas Works Park, Floyd



3-1-G (36921-3) soil extract (1:10)
Gas Works Park, Floyd Snider, QB SS5318, Vf=2ml



1-1G (36922-3) soil extract (1:12)
MGP, Floyd Snider, QB SS5318, Vf=3ml

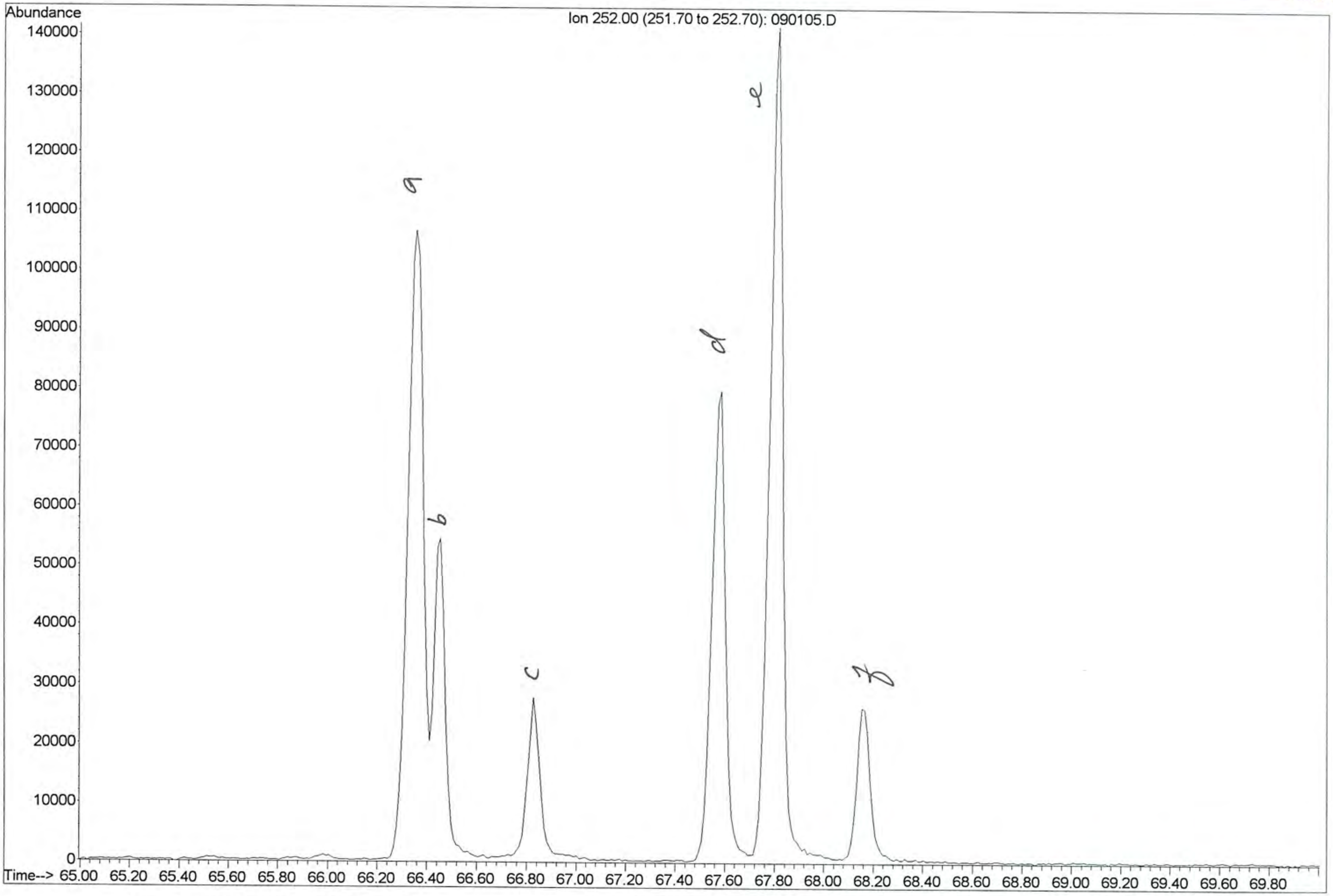


Table

Key for Identification for Six Pyrogenic PAH (m/z 252)

Peak No.	Identity
a	Benzo(B)fluoranthene
b	Benzo(K)fluoranthene
c	Benzo(A)fluoranthene
d	Benzo(E)pyrene
e	Benzo(A)pyrene
f	Perylene

34011008001 (36917-1) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml



34011008011 (36917-11) soil extract (1:2)
MGP, Floyd Snider, QB SS5305, Vf=1ml

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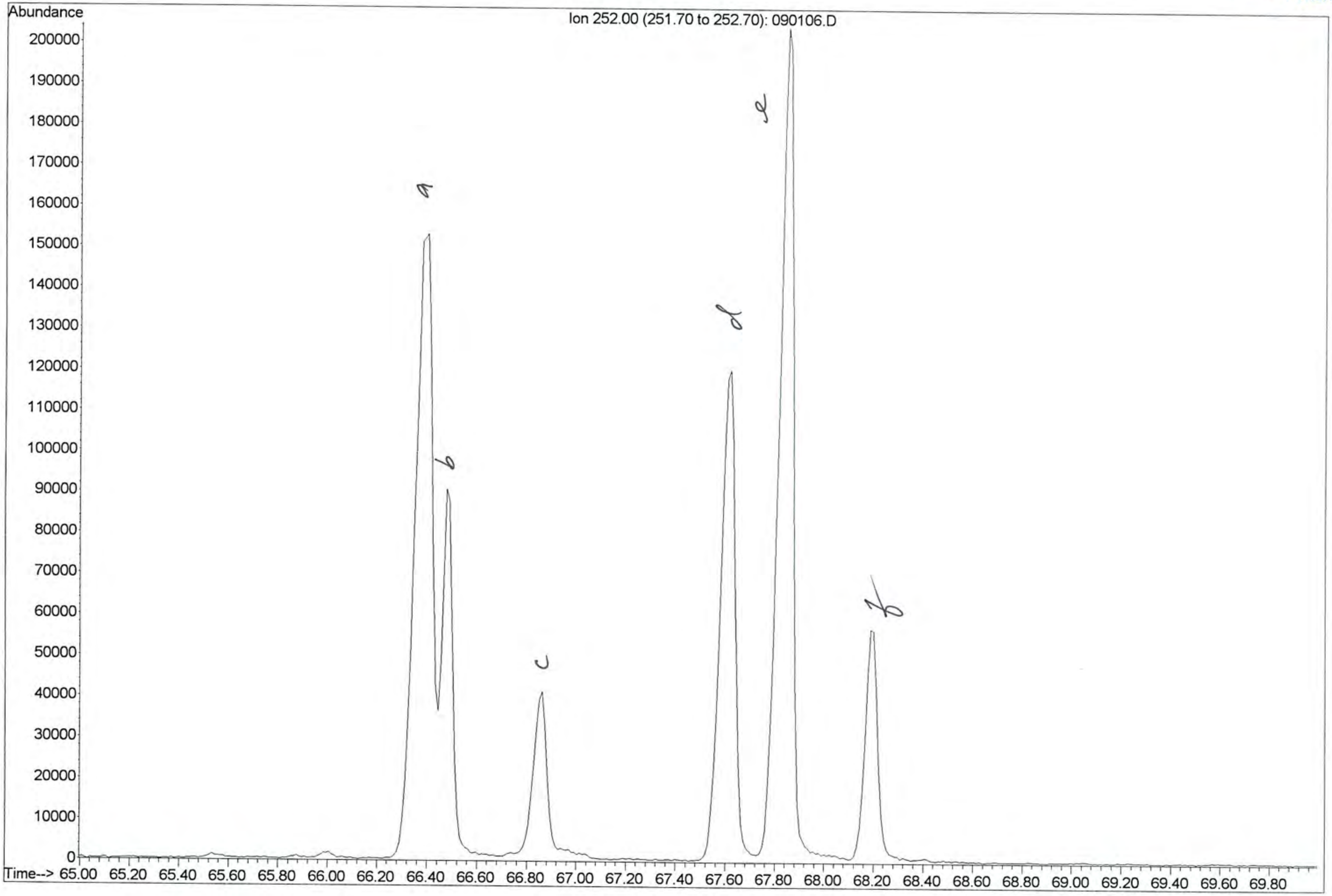
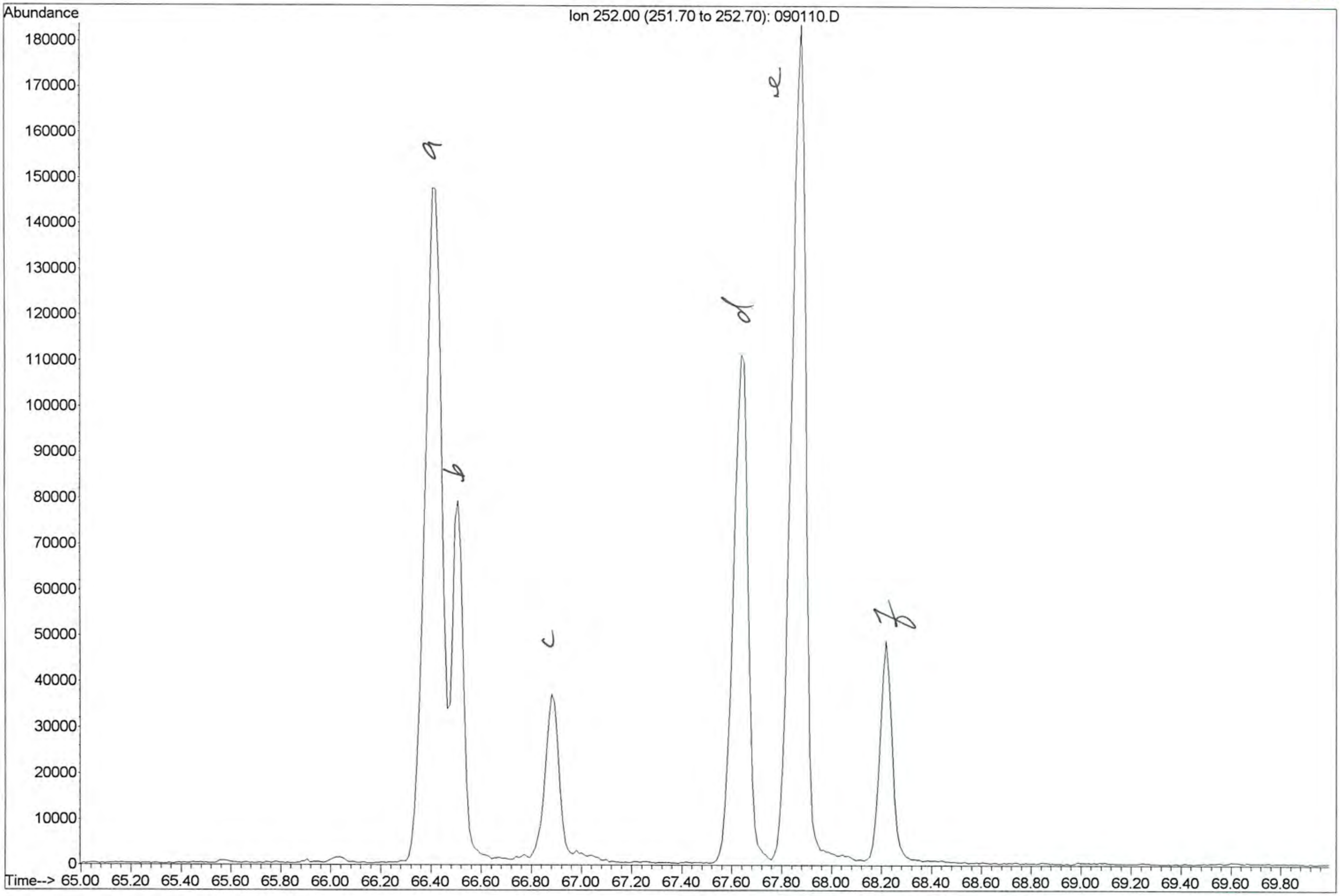
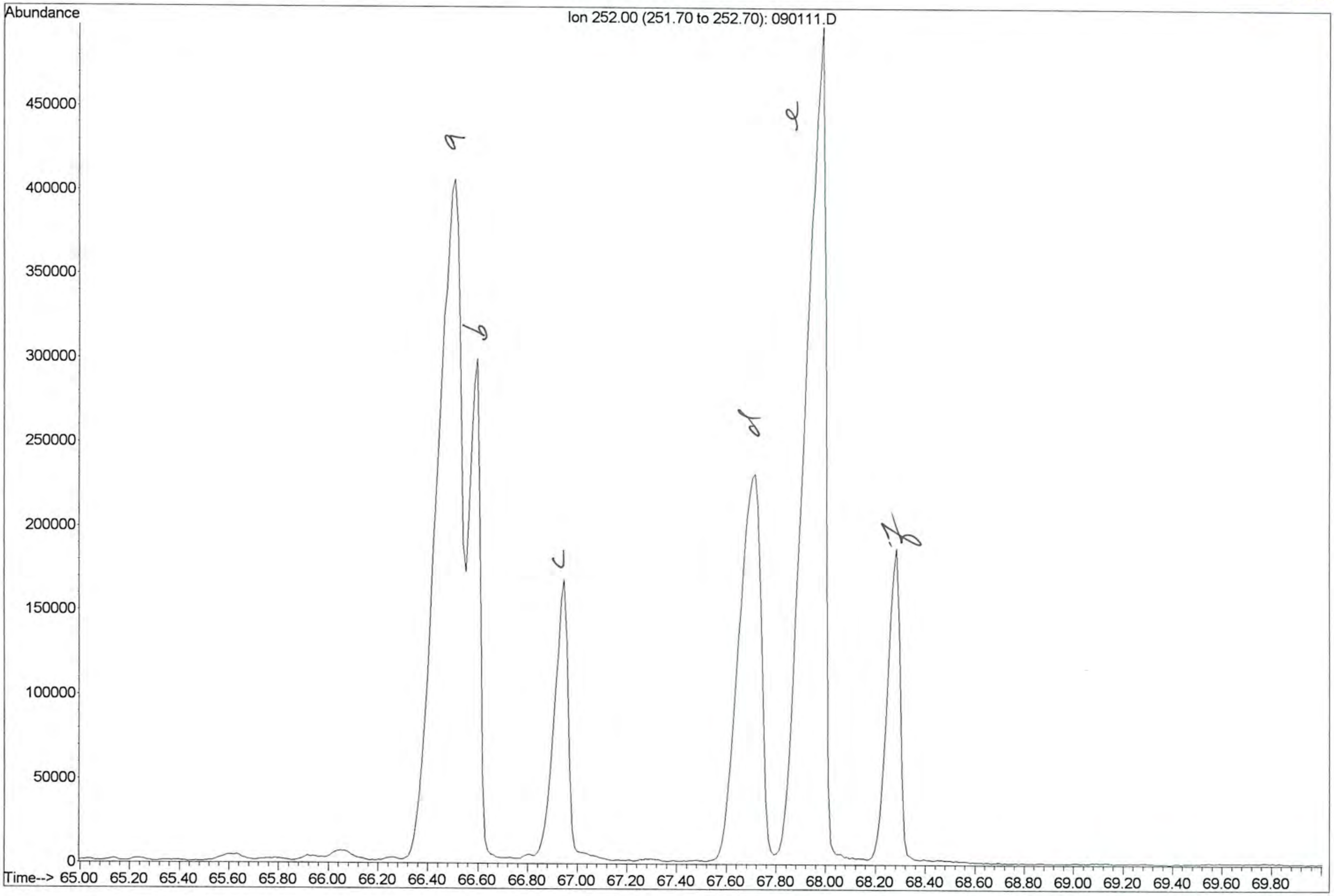


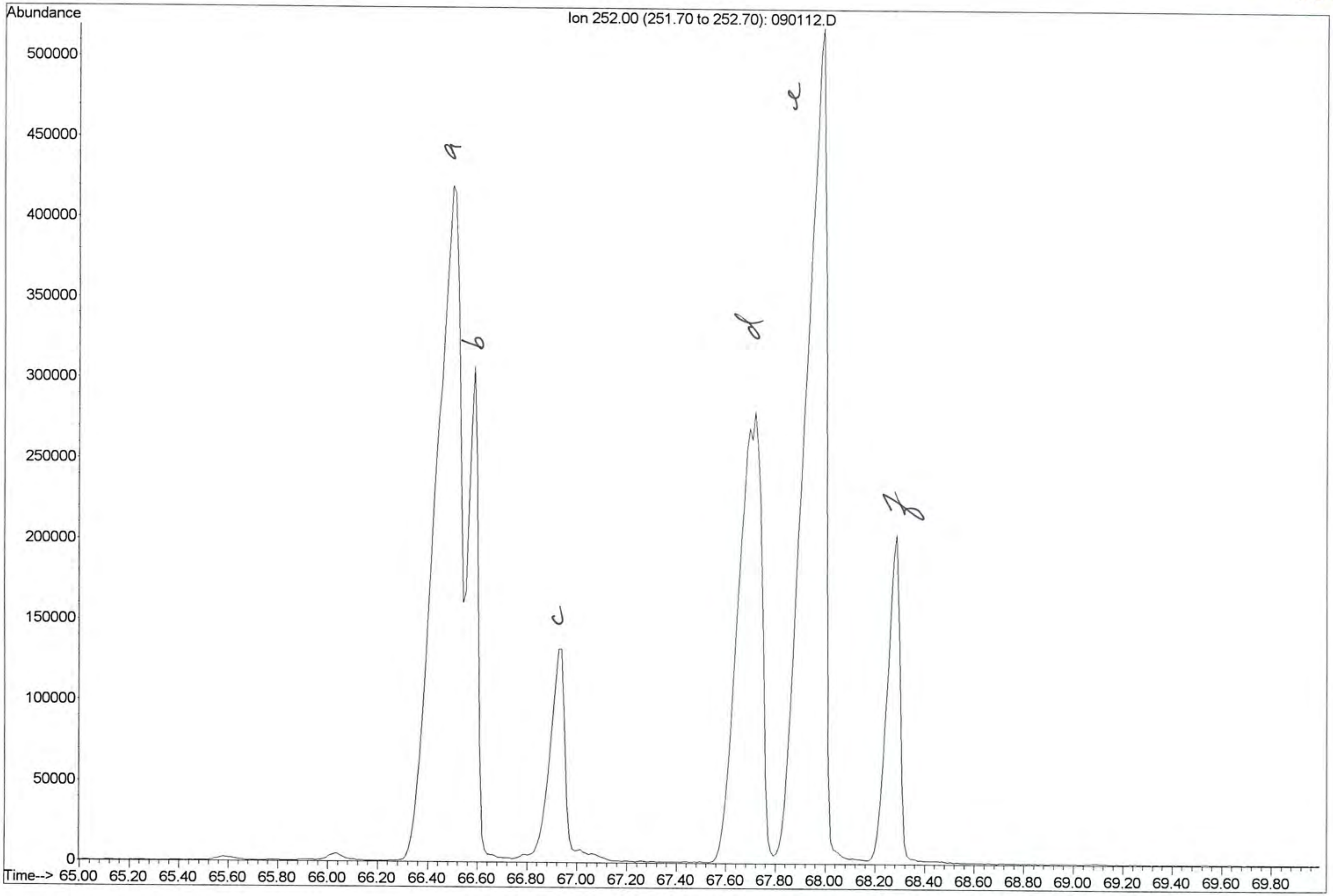
34011008017 (36918-1) soil extract (3:7)
MGP, Floyd Snider, QB SS5305, Vf=1ml



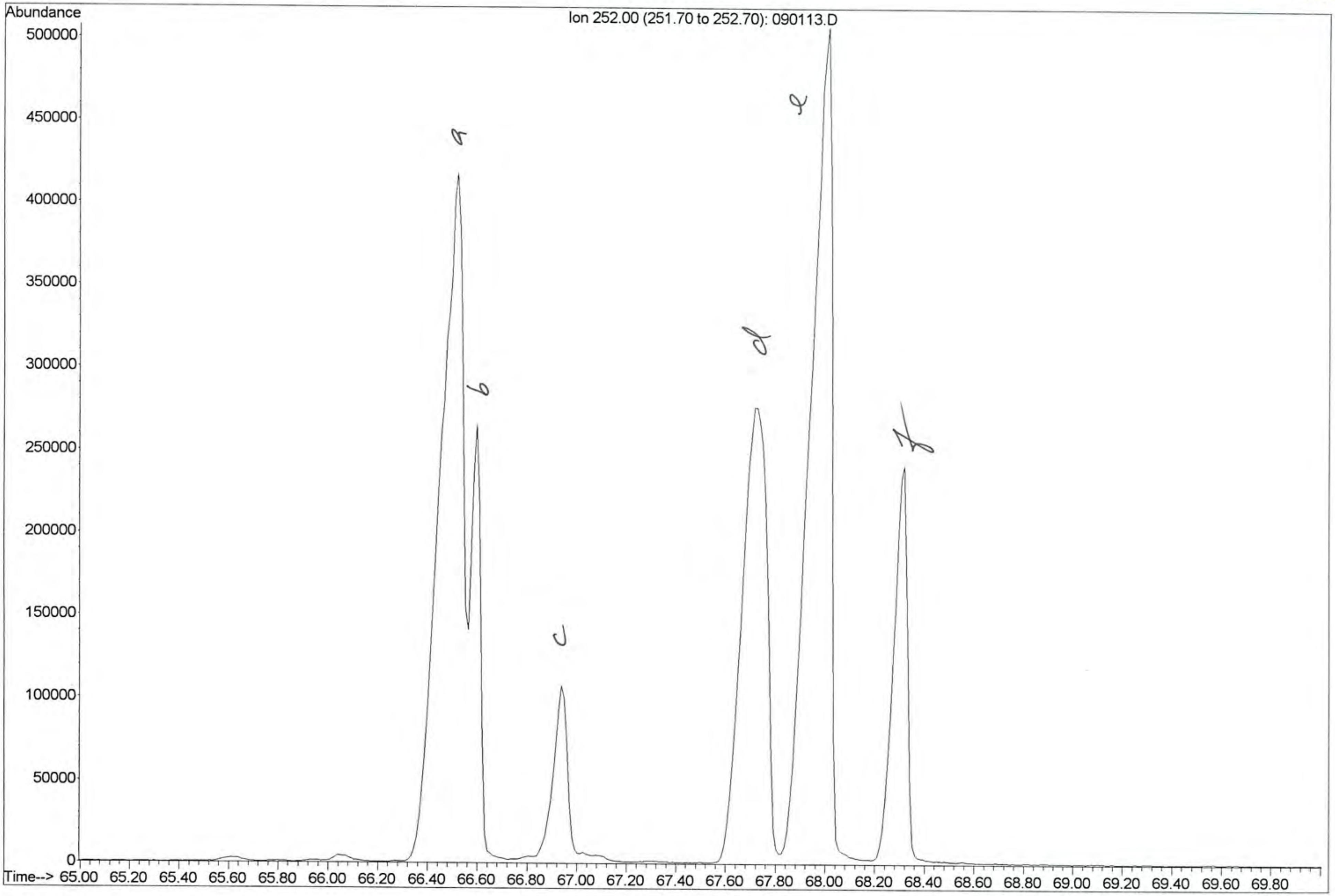
34011008020 (36918-4) soil extract (1:1.2)
MGP, Floyd Snider, QB SS5305, Vf=2ml



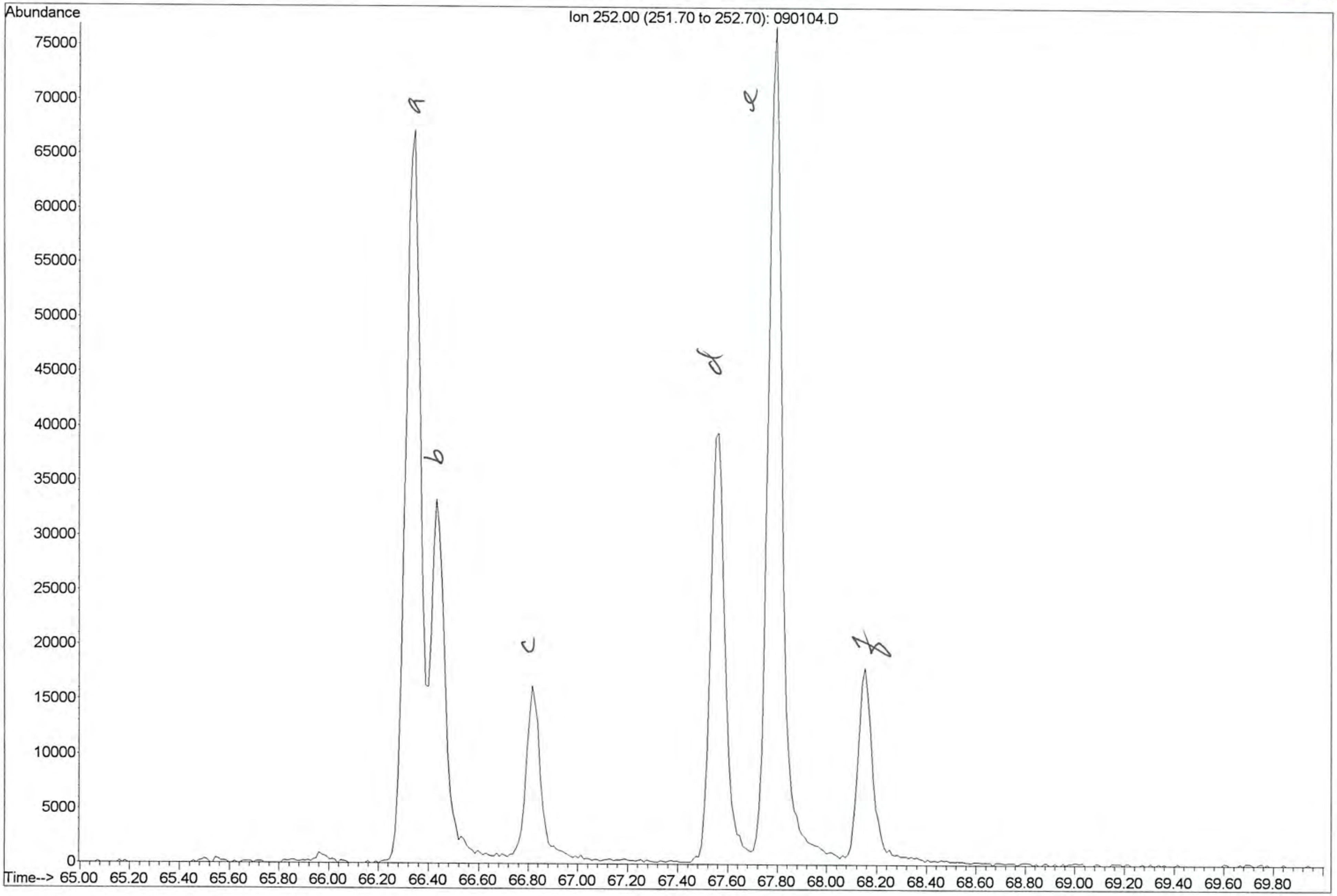
34011008022 (36918-6) soil extract (3:8)
MGP, Floyd Snider, QB SS5305, Vf=2ml



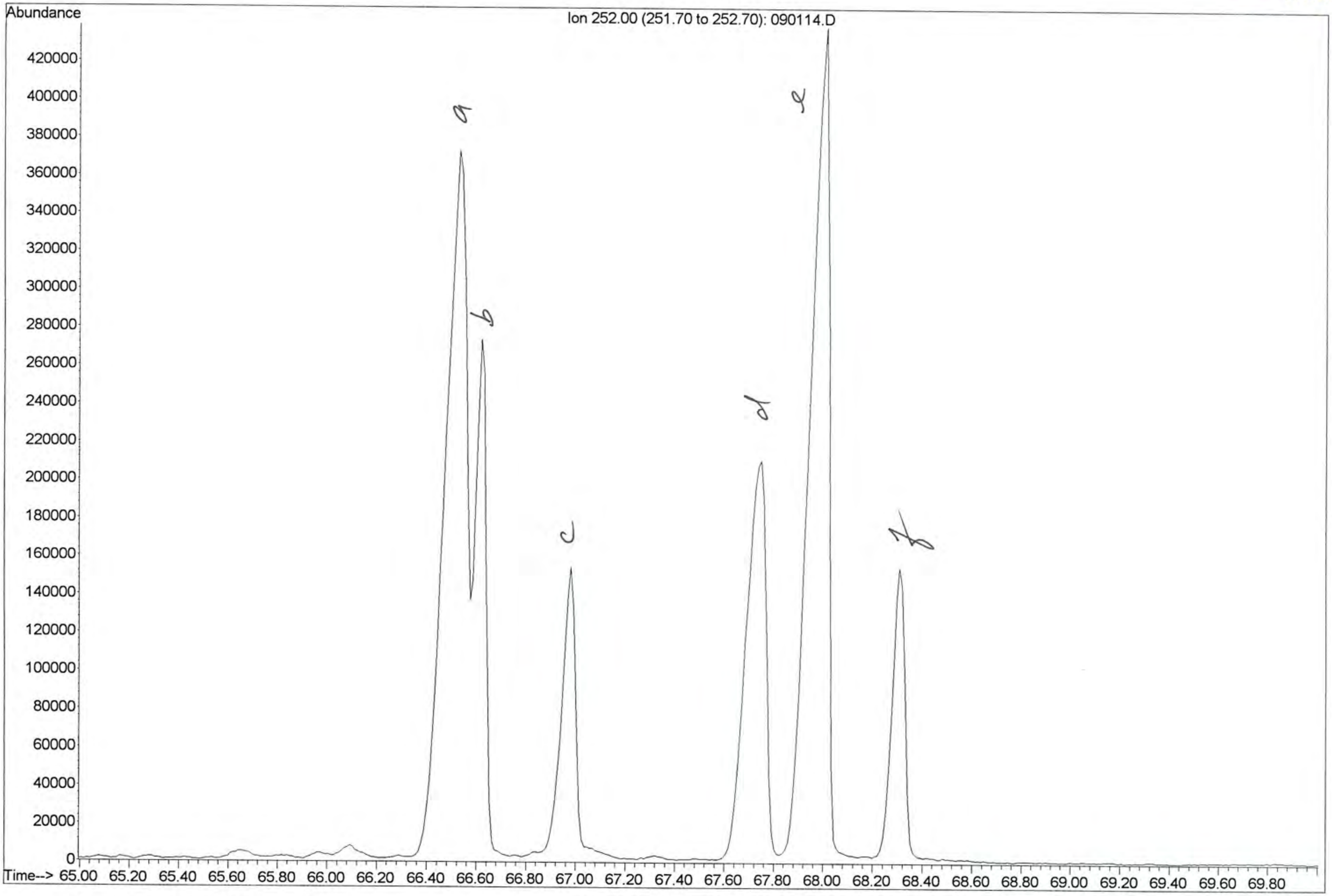
34011008028 (36918-12) soil extract (1:1))
MGP, Floyd Snider, QB SS5305, Vf=2ml



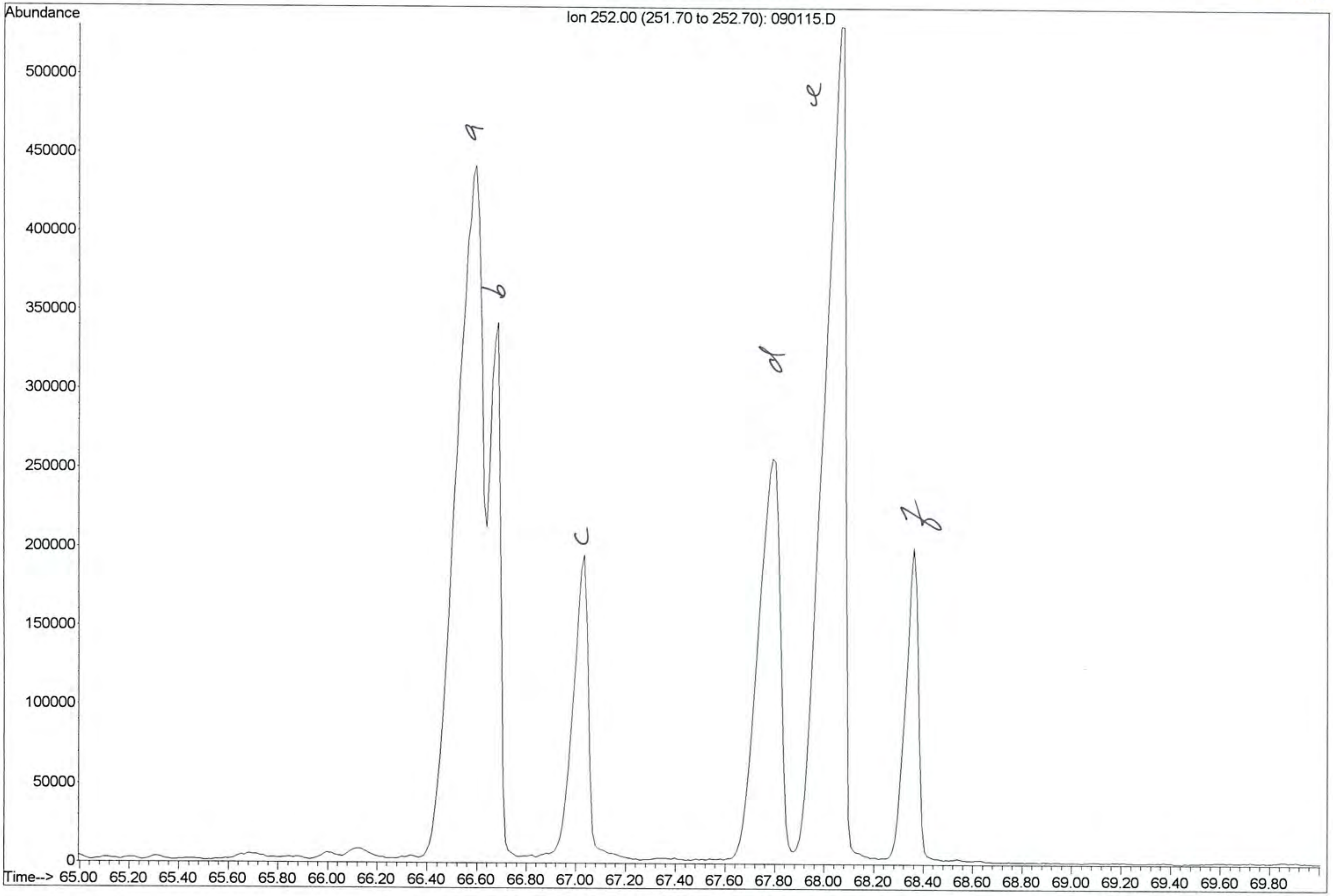
34011008030 (36918-14) soil extract
MGP, Floyd Snider, QB SS5305



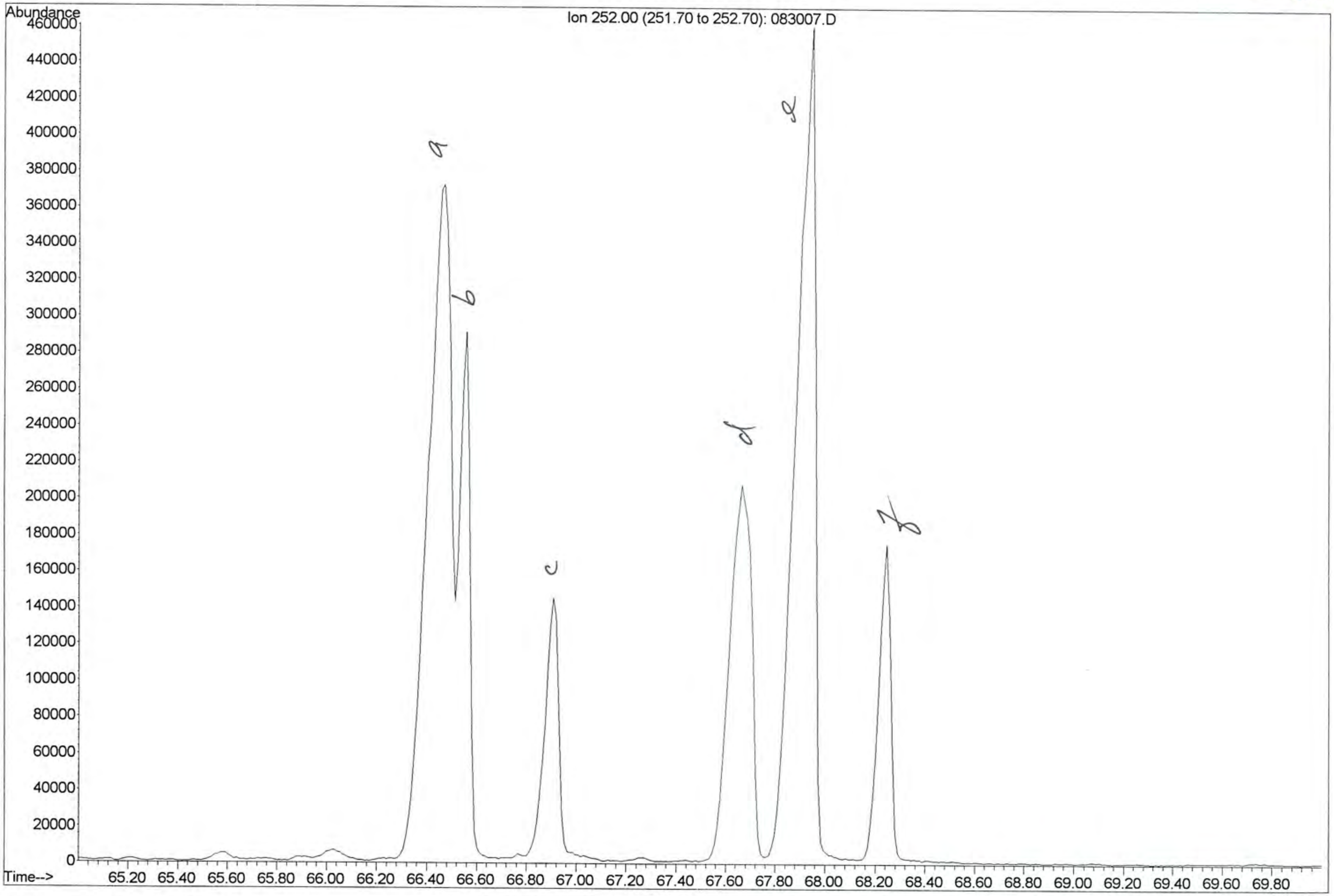
34011008032 (36918-16) soil ext (3.5:6.5)
MGP, Floyd Snider, QB SS5305, Vf=4ml



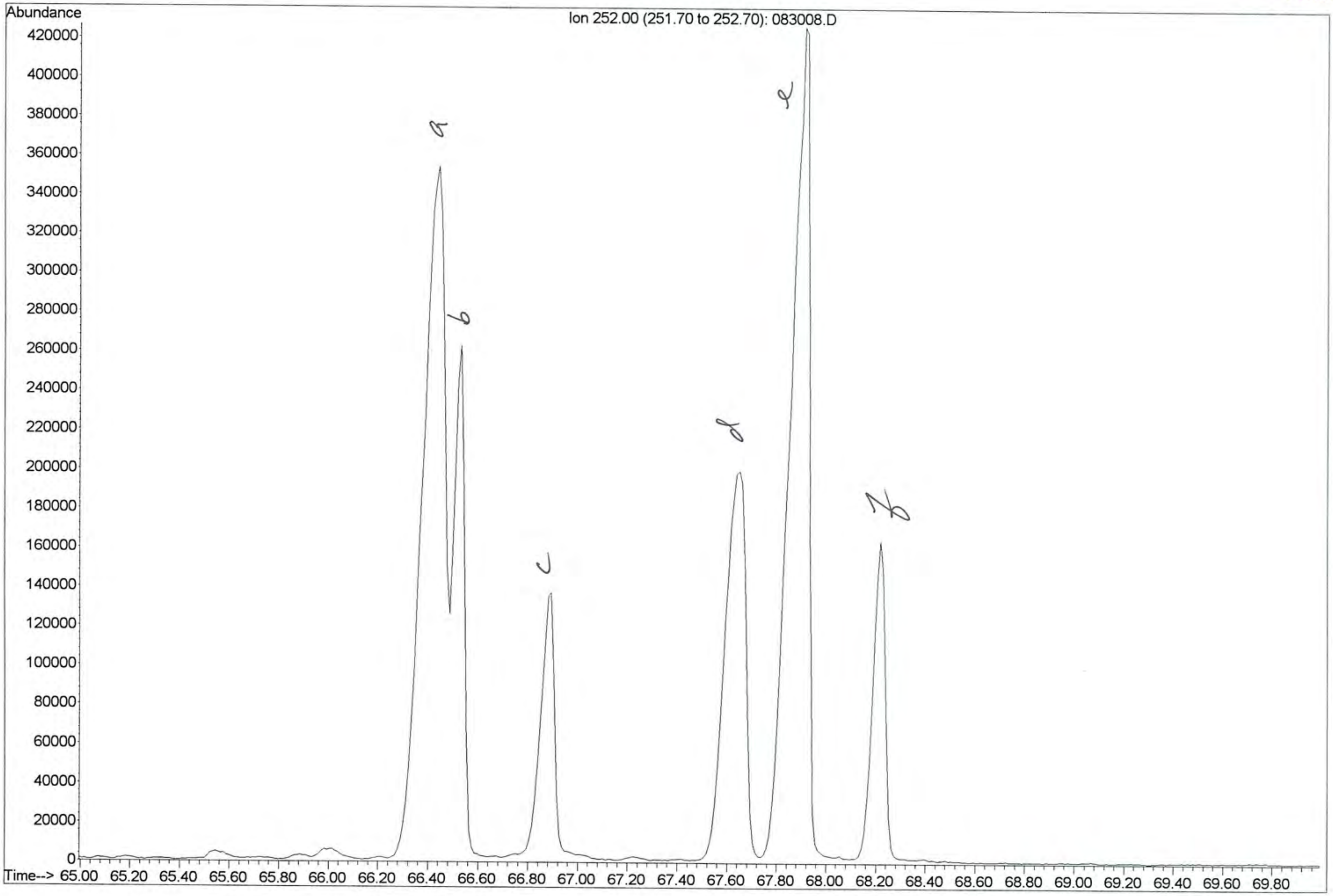
34011008035 (36918-19) soil ext (4:6)
MGP, Floyd Snider, QB SS5305, Vf=1ml



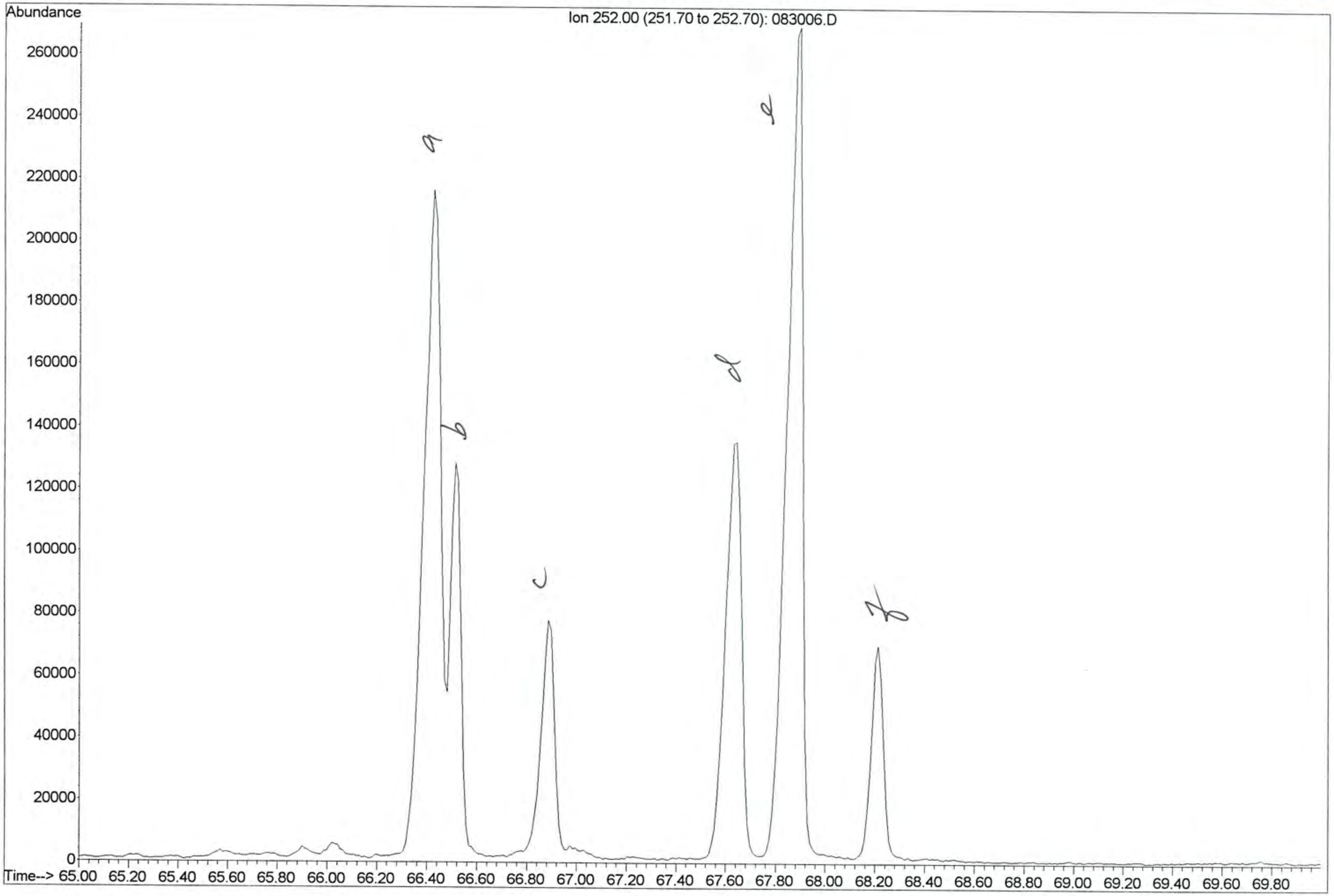
34011008040 (36919-4) soil extract (1:2)
MGP, Floyd Snider, QB SS5318



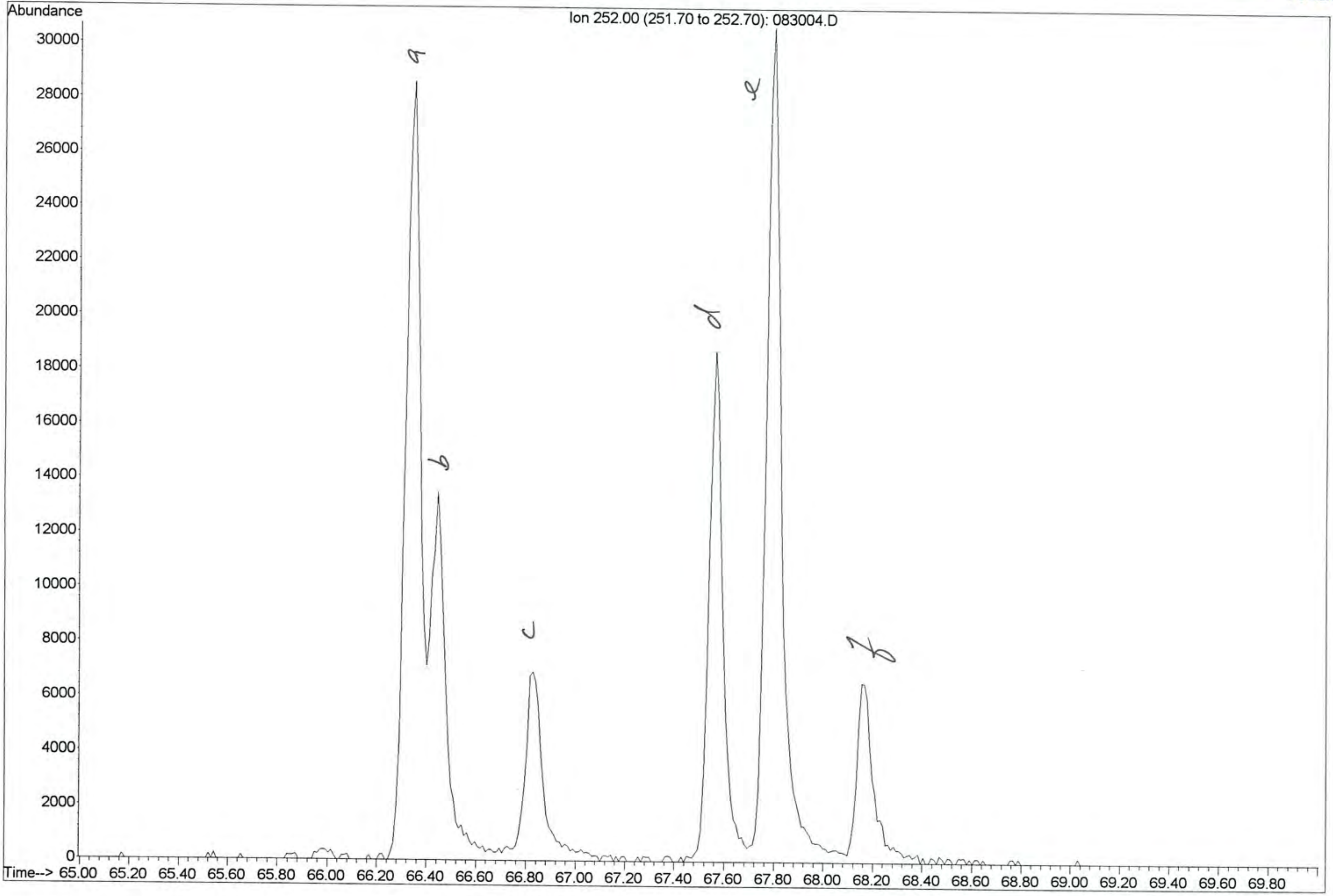
34011008043 (36919-7) soil extract (1:2)
MGP, Floyd Snider, QB SS5318, Vf=3ml



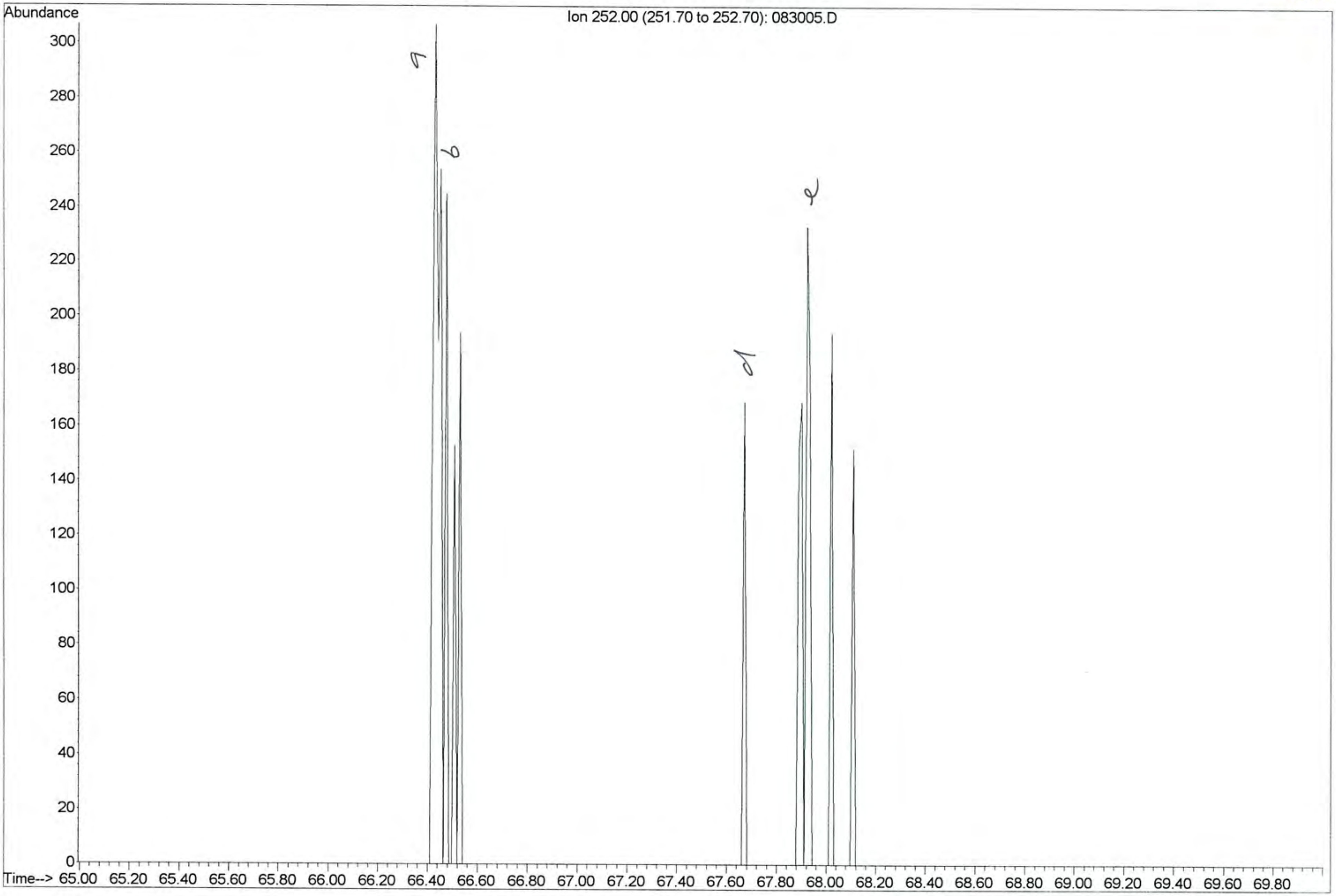
34011008050 (36920-1) soil extract (1:7)
MGP, Floyd Snider, QB SS5318, Vf=3ml



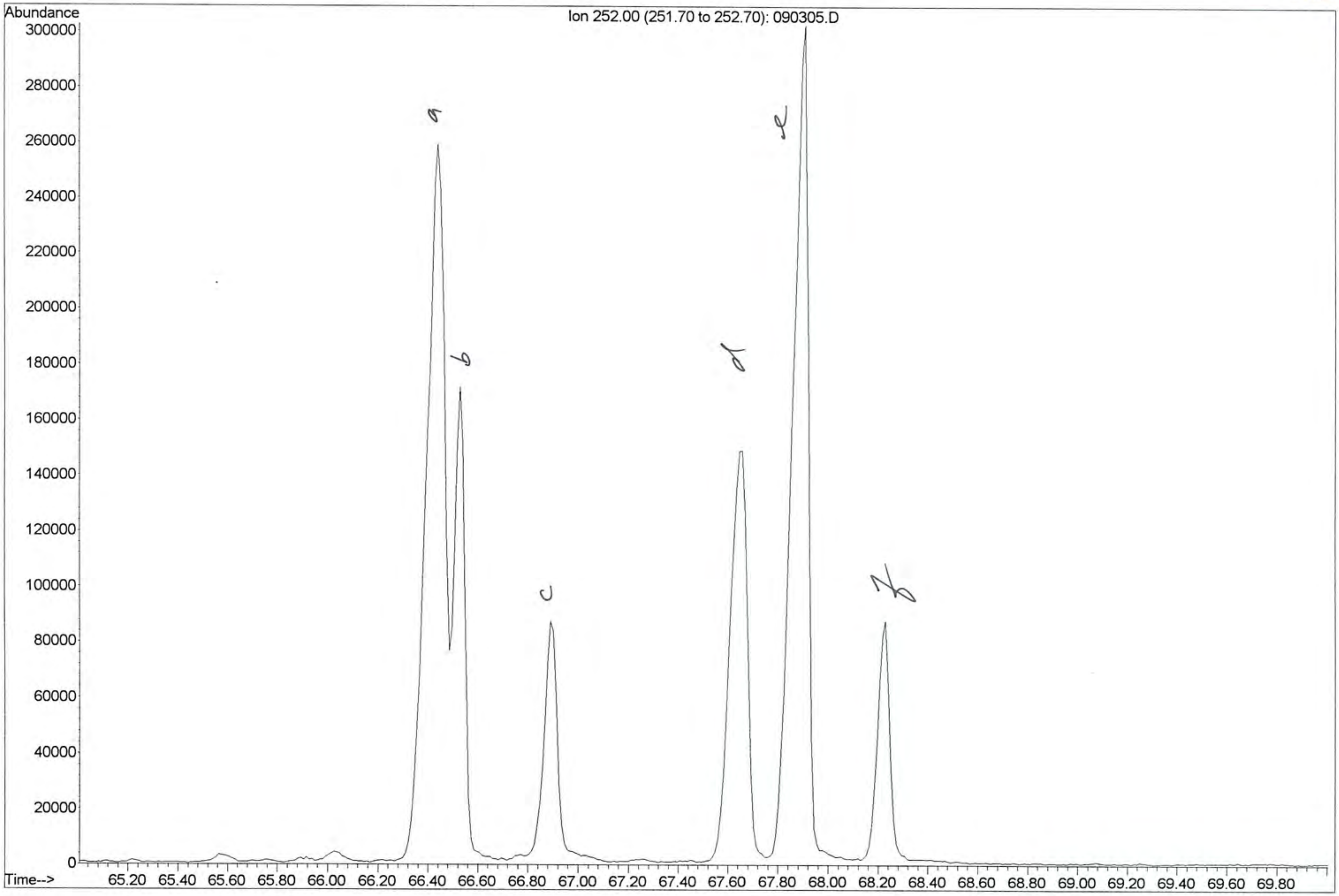
34011008054 (36920-5) soil extract
MGP, Floyd Snider, QB SS5318



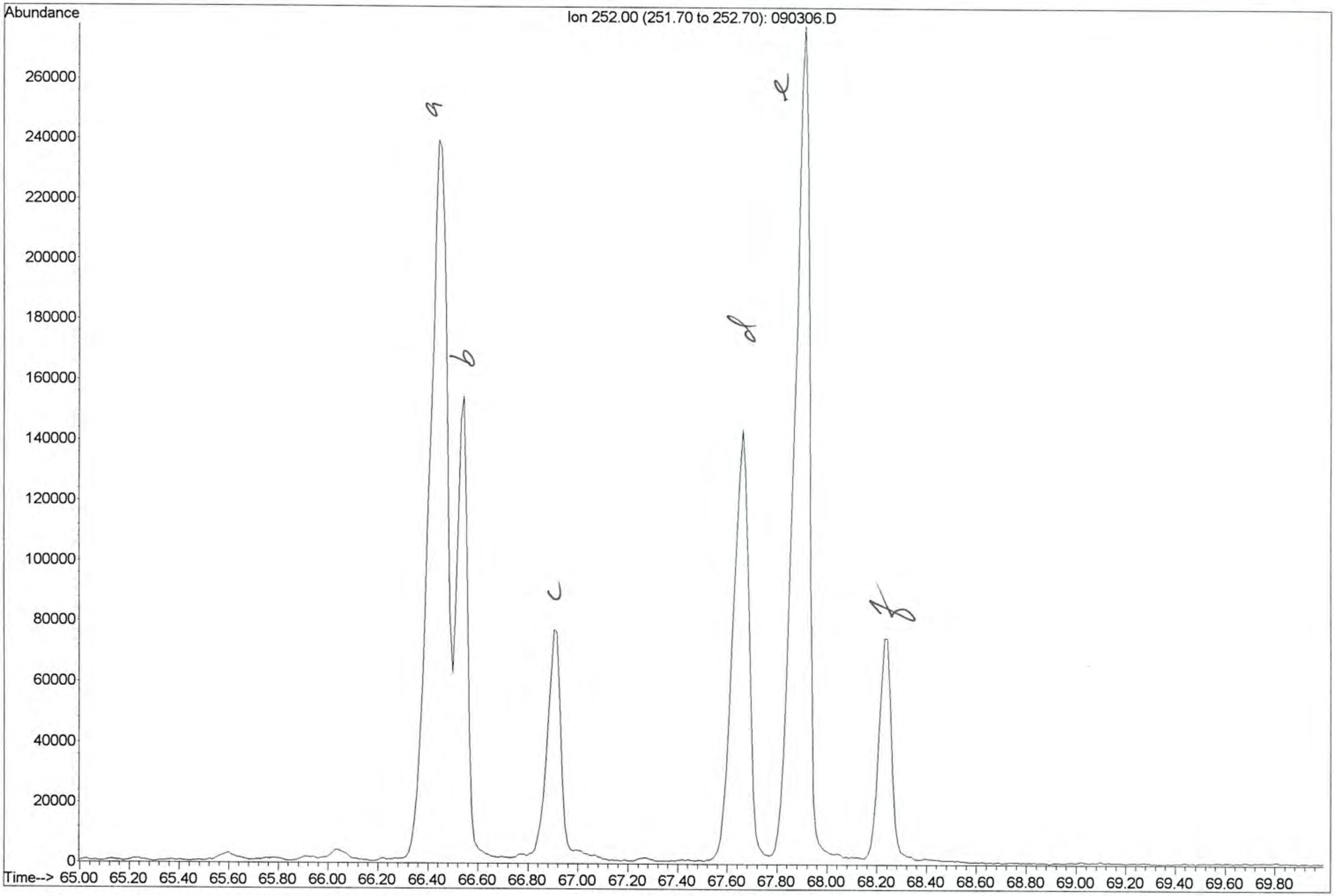
34011008056 (36920-7) soil extract
MGP, Floyd Snider, QB SS5318



DW-4-FP (36921-1) Product x50
Gas Works Park, Floyd



DW-5-FP (36921-2) Product x50
Gas Works Park, Floyd



3-1-G (36921-3) soil extract (1:10)
Gas Works Park, Floyd Snider, QB SS5318, Vf=2ml

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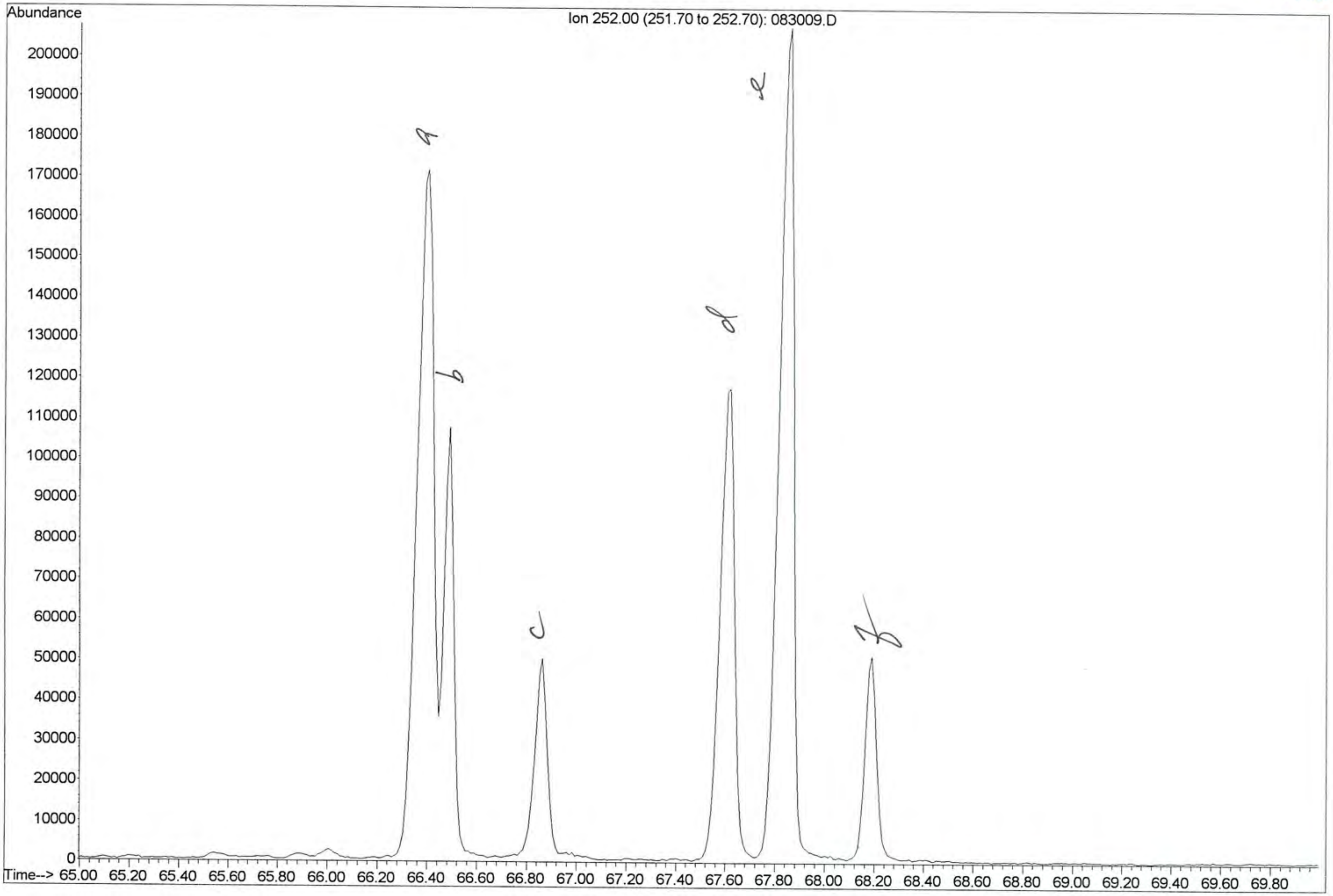
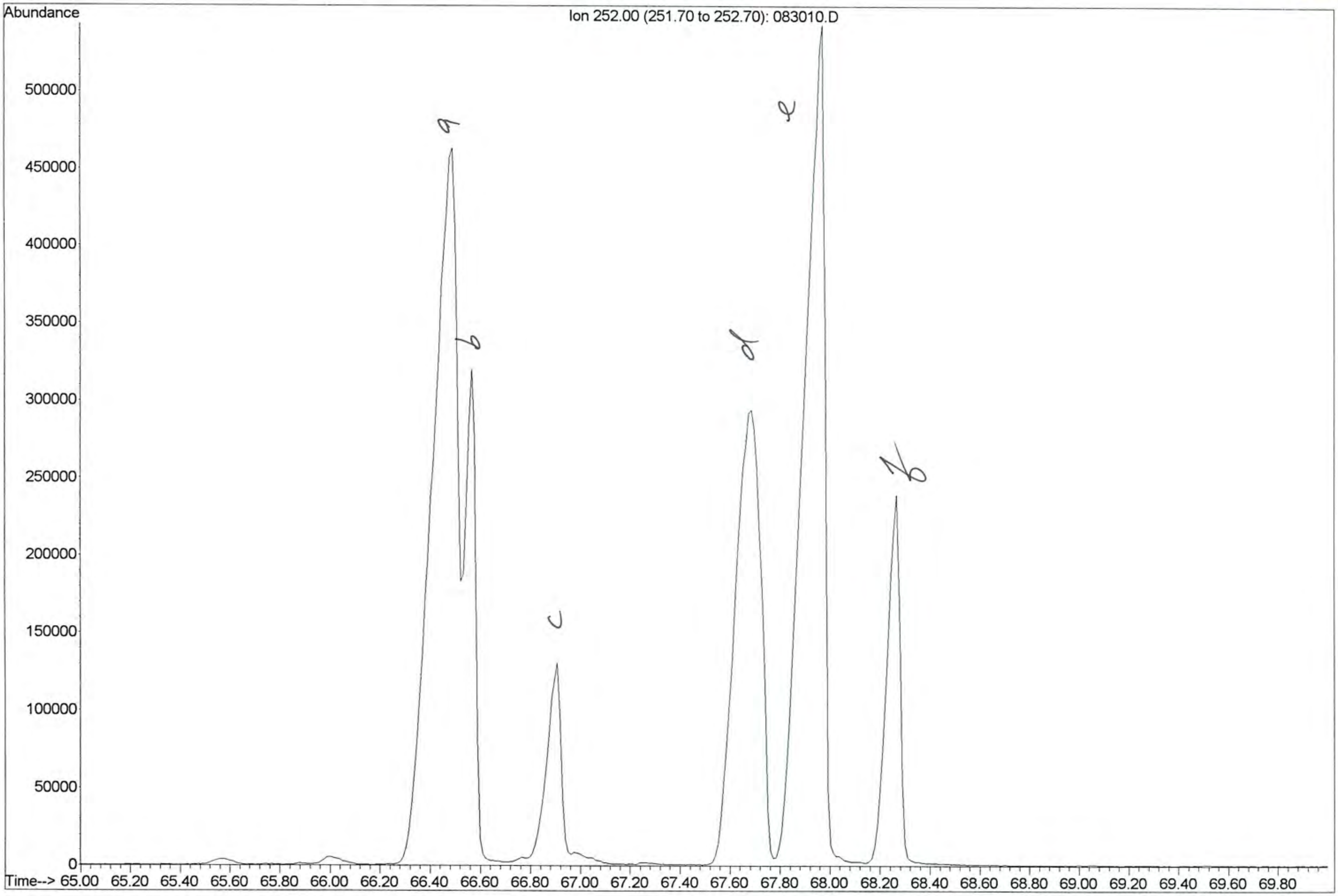


1-1G (36922-3) soil extract (1:12)
MGP, Floyd Snider, QB SS5318, Vf=3ml



Table

Key for Aromatic Compounds Identification in Bar Diagram

AB:	C_3-C_6 Alkylbenzenes
NAPH:	C_0-C_4 Naphthalenes
FL:	C_0-C_4 Fluorenes
BP:	C_0-C_2 BP Biphenyl/Dibenzofuran
PHEN:	C_0-C_4 Phenanthrenes
PY:	C_0-C_4 Pyrenes/Fluoranthenes
CHR:	C_0-C_4 Chrysenes
BT:	C_1-C_5 Benzothiophenes
DBT:	C_0-C_4 Dibenzothiophenes
NBT:	C_0-C_4 Naphthobenzothiophenes
MAS:	Monoaromatic Steranes
TAS:	Triaromatic Steranes

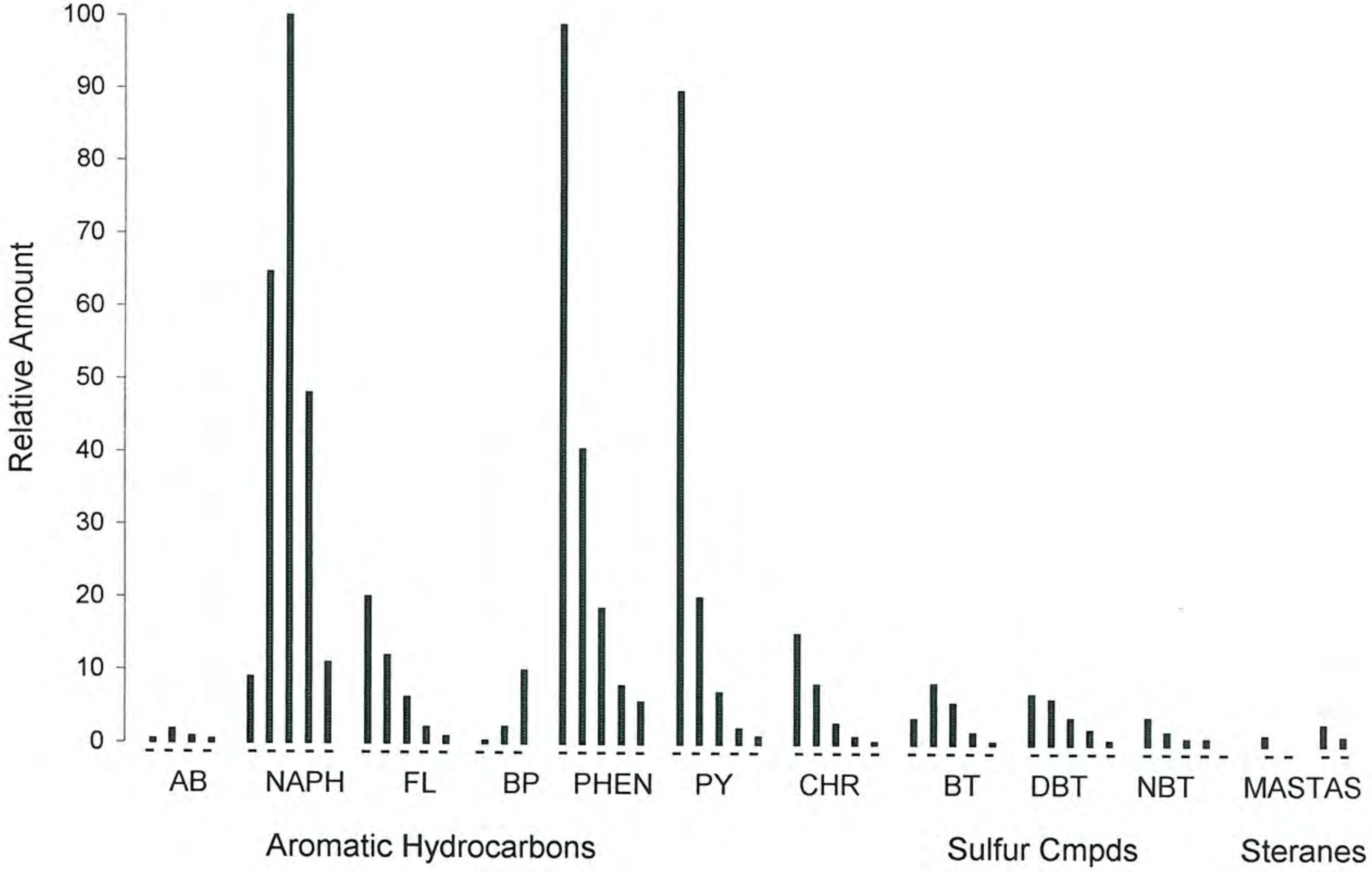
Table

Key for Identifying Aromatic Hydrocarbons at Various m/z Units

No.	m/z	Compound
1	120	C_3-alkylbenzenes
2	134	C_4-alkylbenzenes
3	148	C_5-alkylbenzenes
4	162	C_6-alkylbenzenes
5	128	C_0-naphthalene
6	142	C_1-naphthalenes
7	156	C_2-naphthalenes
8	170	C_3-naphthalenes
9	184	C_4-naphthalenes
10	166	C_0-fluorene
11	180	C_1-fluorenes
12	194	C_2-fluorenes
13	208	C_3-fluorenes
14	222	C_4-fluorenes
15	154	C_0-biphenyl
16	168	C_1-biphenyls + dibenzofuran
17	182	C_2-biphenyls + C_1-dibenzofuran
18	178	C_0-phenanthrene
19	192	C_1-phenanthrenes
20	206	C_2-phenanthrenes
21	220	C_3-phenanthrenes
22	234	C_4-phenanthrenes
23	202	C_0-pyrene/fluoranthene
24	216	C_1-pyrenes/fluoranthenes
25	230	C_2-pyrenes/fluoranthenes
26	244	C_3-pyrenes/fluoranthenes
27	258	C_4-pyrenes/fluoranthenes
28	228	C_0-chrysene
29	242	C_1-chrysenes
30	256	C_2-chrysenes
31	270	C_3-chrysenes
32	284	C_4-chrysenes
33	148	C_1-benzothiophenes
34	162	C_2-benzothiophenes
35	176	C_3-benzothiophenes
36	190	C_4-benzothiophenes
37	204	C_5-benzothiophenes
28	184	C_0-dibenzothiophene
39	198	C_1-dibenzothiophenes
40	212	C_2-dibenzothiophenes
41	226	C_3-dibenzothiophenes
42	240	C_4-dibenzothiophenes
43	234	C_0-naphthobenzothiophene
44	248	C_1-naphthobenzothiophenes
45	262	C_2-naphthobenzothiophenes
46	276	C_3-naphthobenzothiophenes
47	290	C_4-naphthobenzothiophenes
48	253	Monoaromatic steranes
49	267	Monoaromatic steranes
50	239	Monoaromatic steranes
51	231	Triaromatic steranes
52	245	Triaromatic steranes

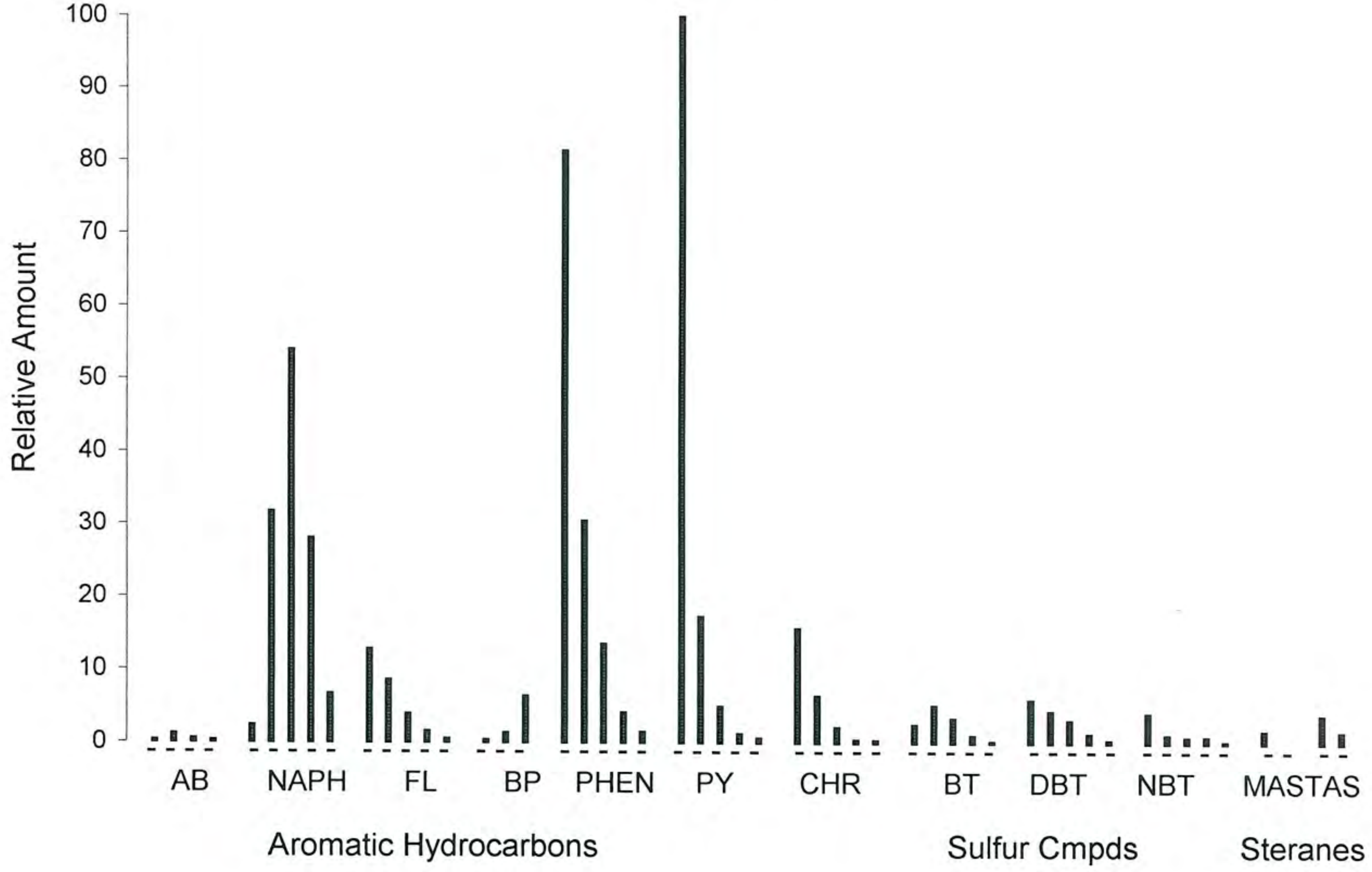
Aromatic Hydrocarbon Distribution

34011008001



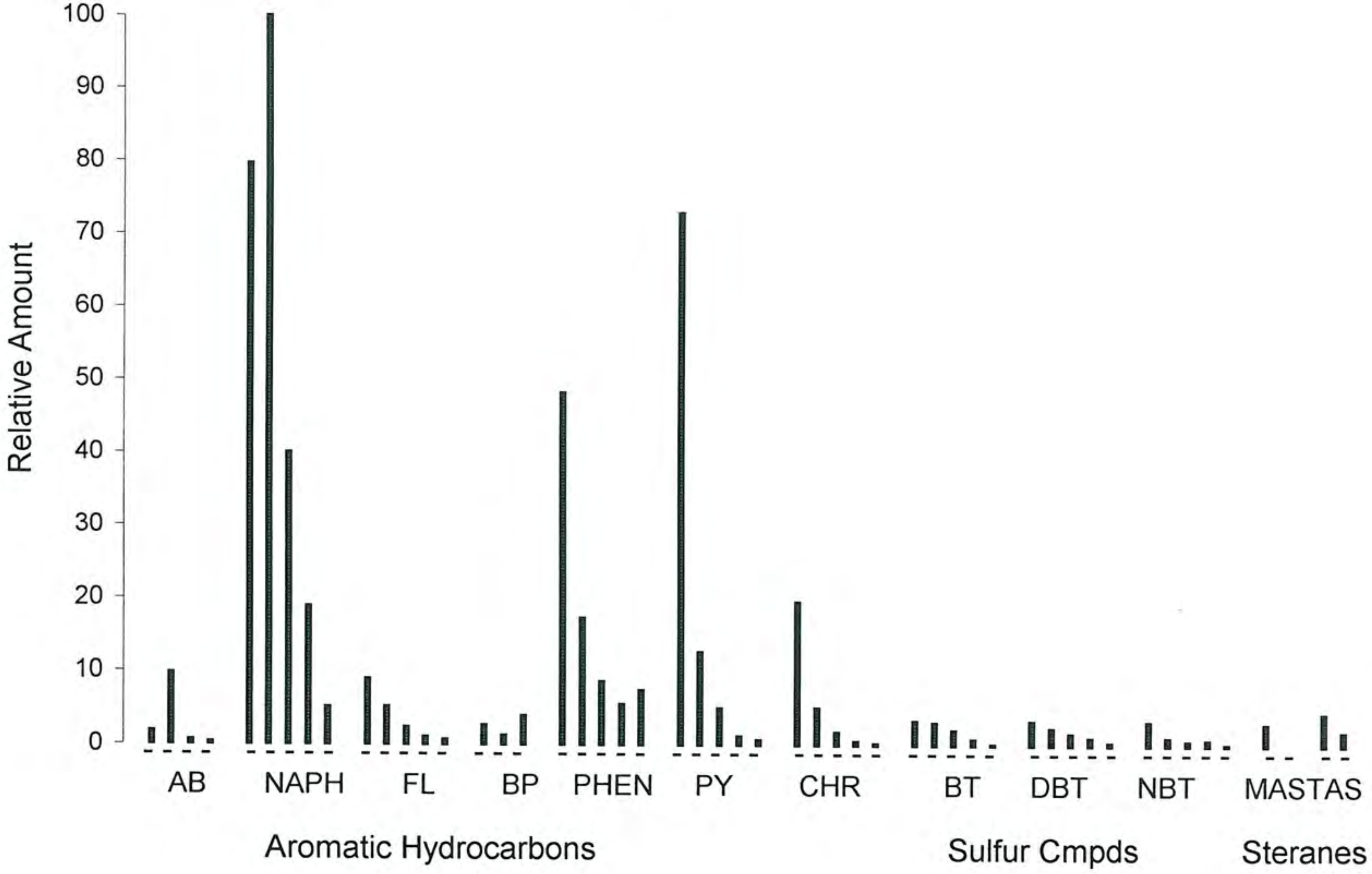
Aromatic Hydrocarbon Distribution

34011008011



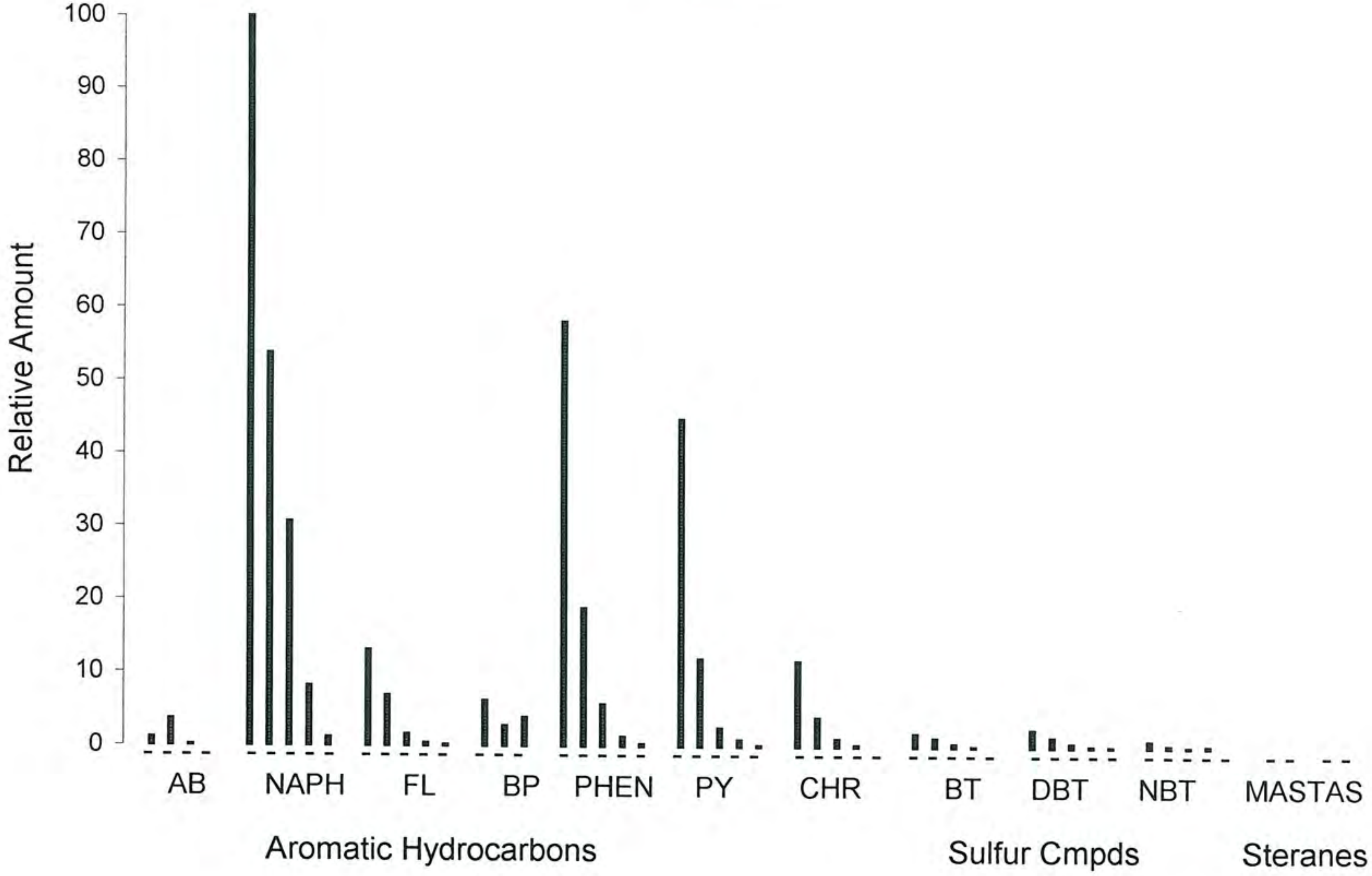
Aromatic Hydrocarbon Distribution

34011008017



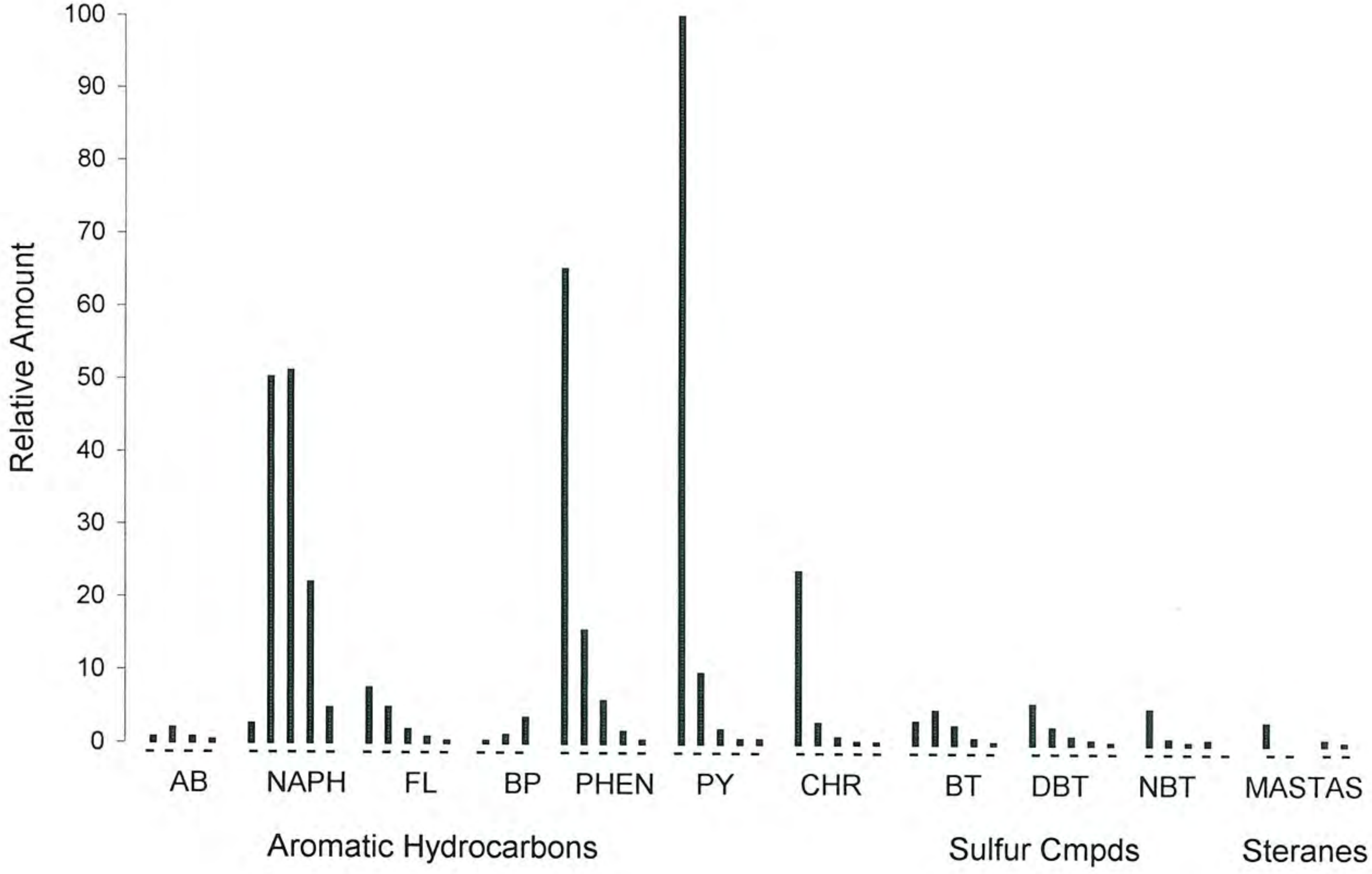
Aromatic Hydrocarbon Distribution

34011008020



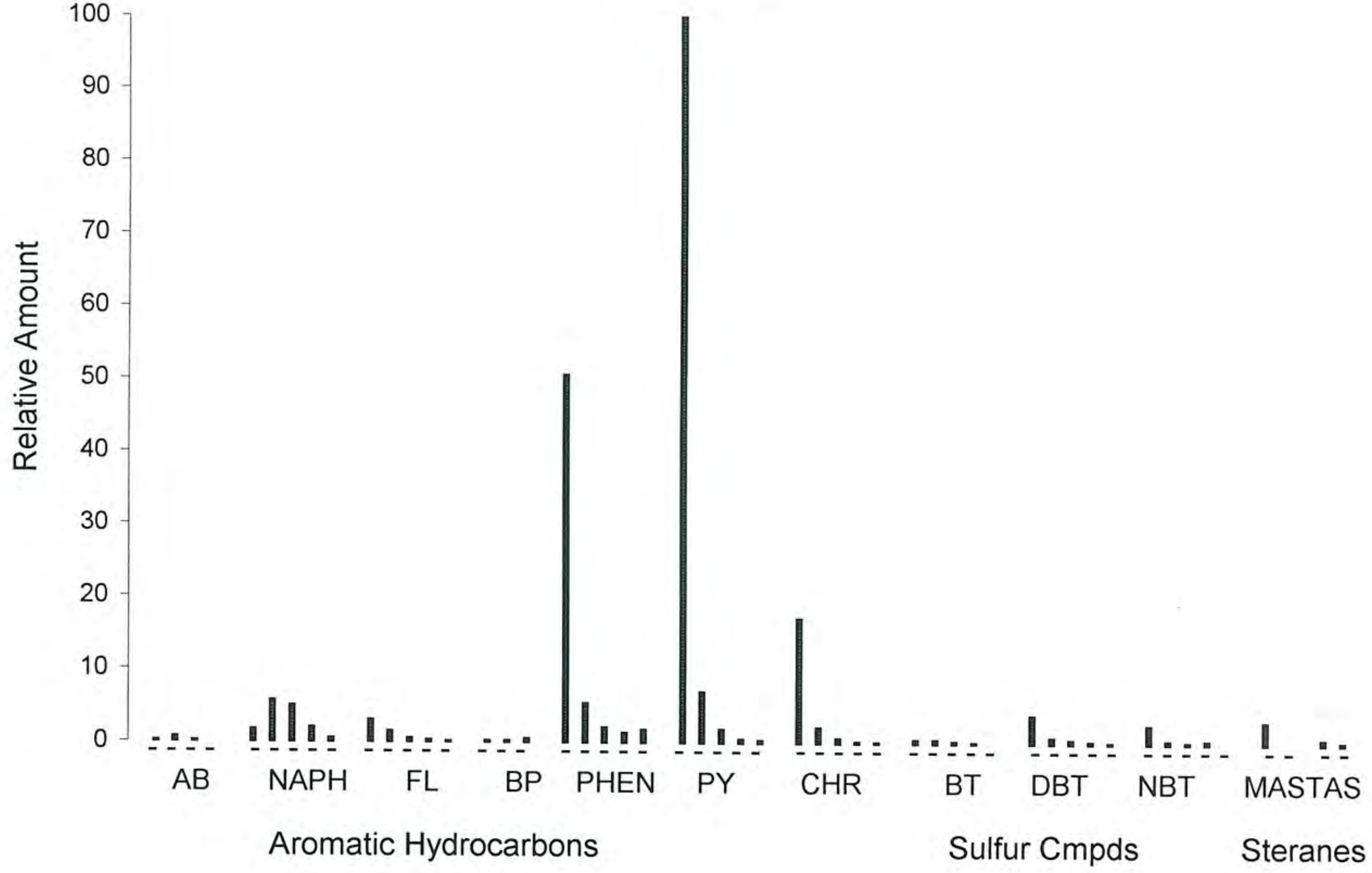
Aromatic Hydrocarbon Distribution

34011008022



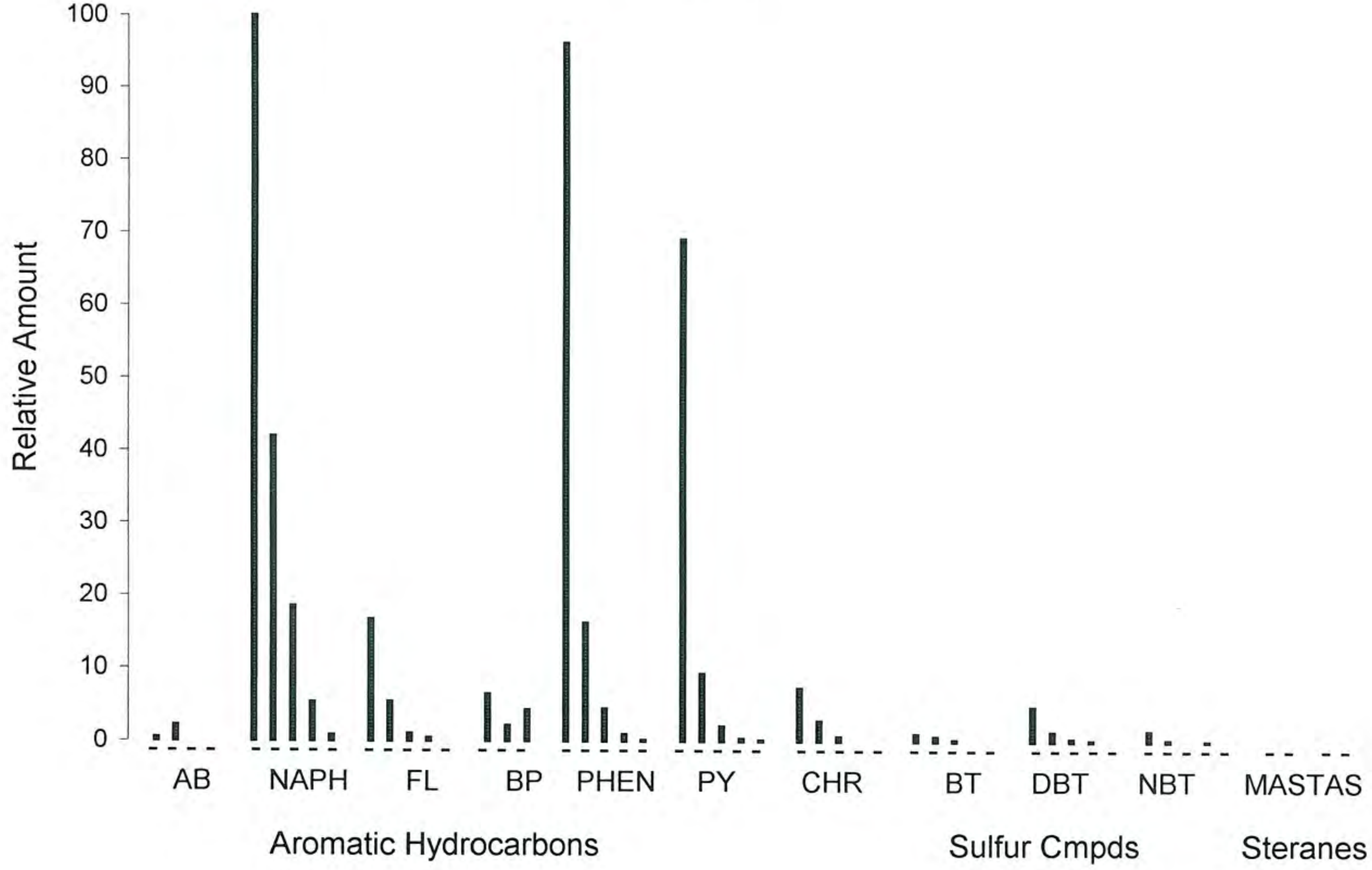
Aromatic Hydrocarbon Distribution

34011008028



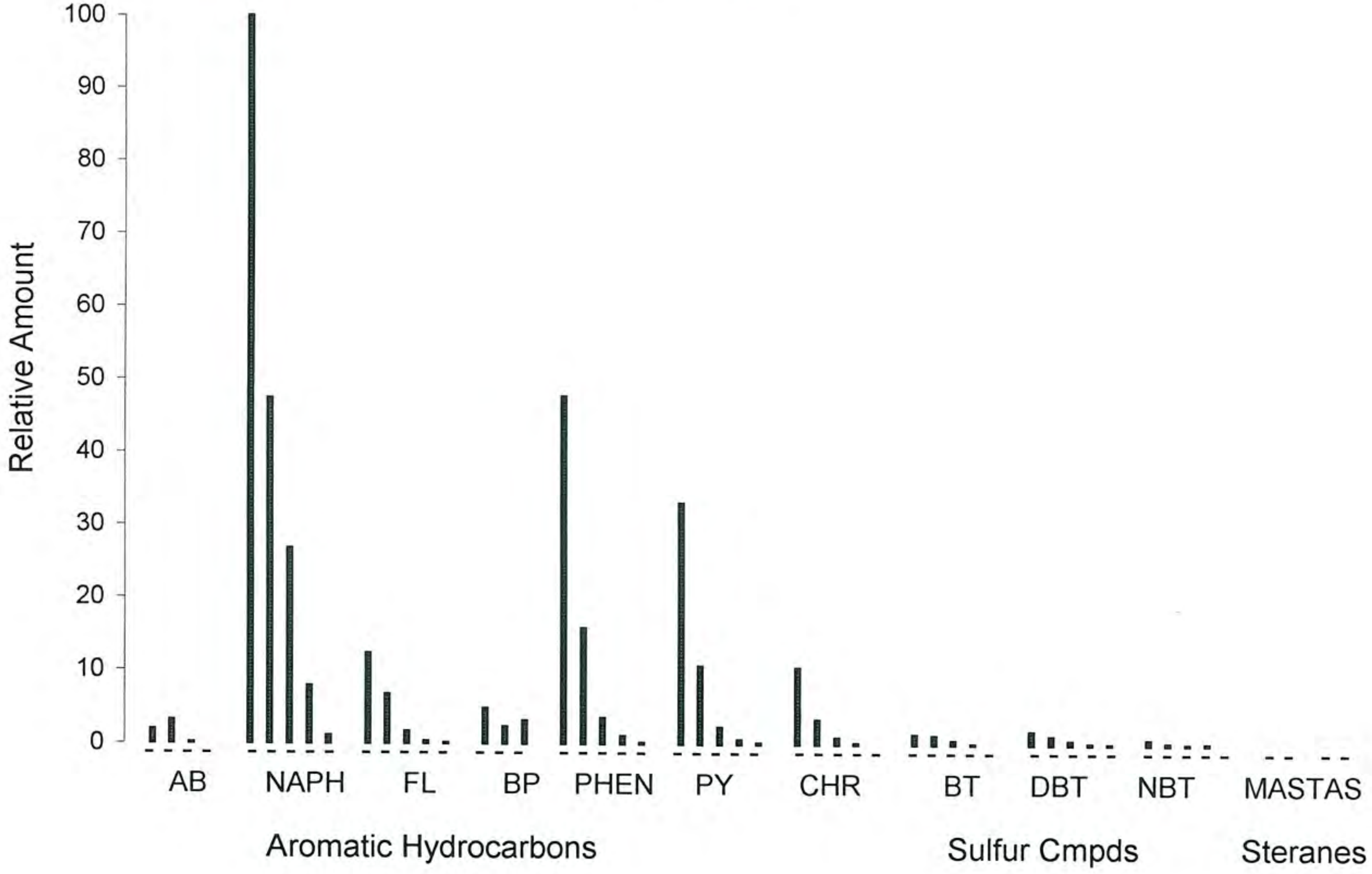
Aromatic Hydrocarbon Distribution

34011008030



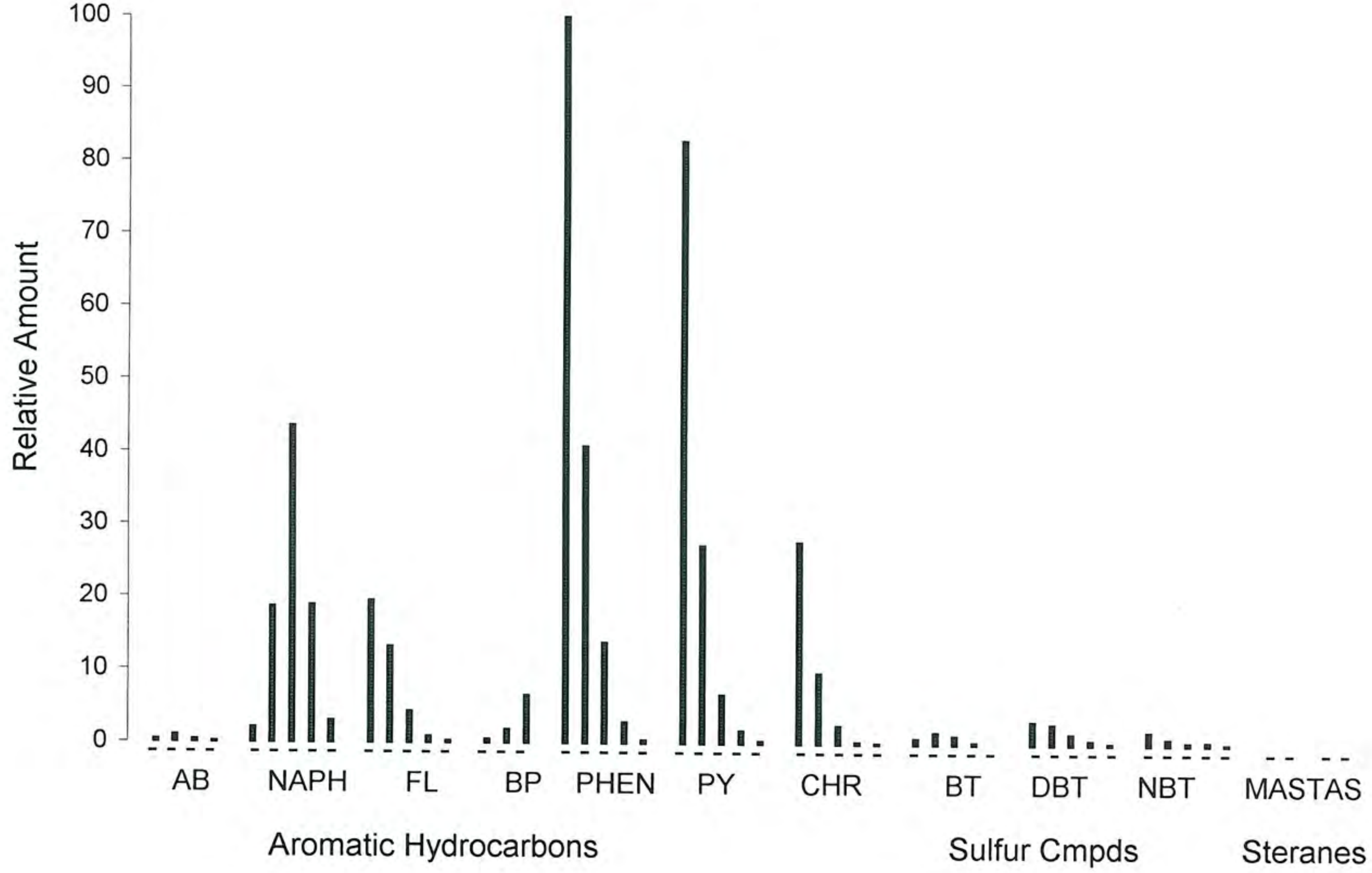
Aromatic Hydrocarbon Distribution

34011008032



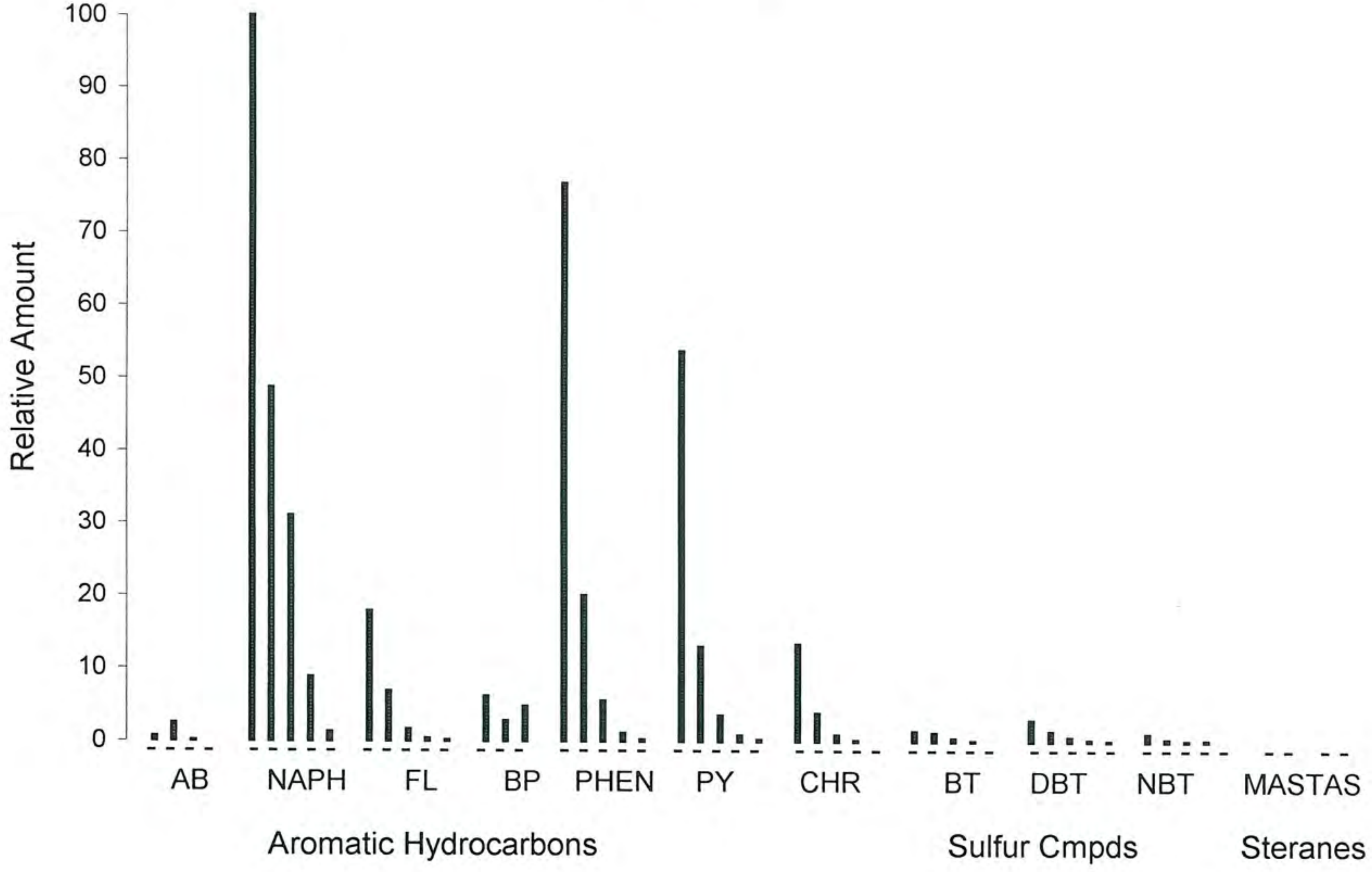
Aromatic Hydrocarbon Distribution

34011008035



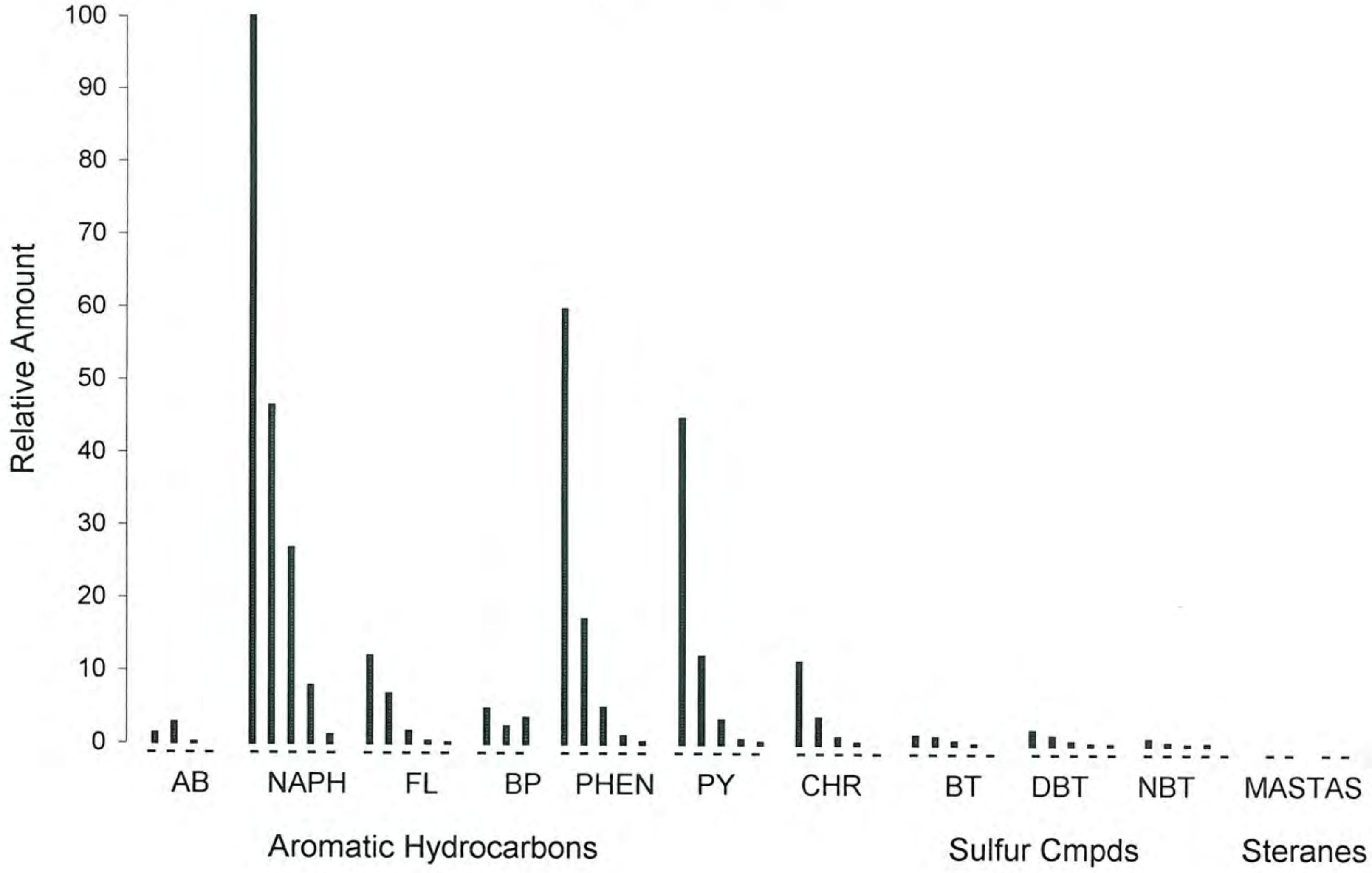
Aromatic Hydrocarbon Distribution

34011008040



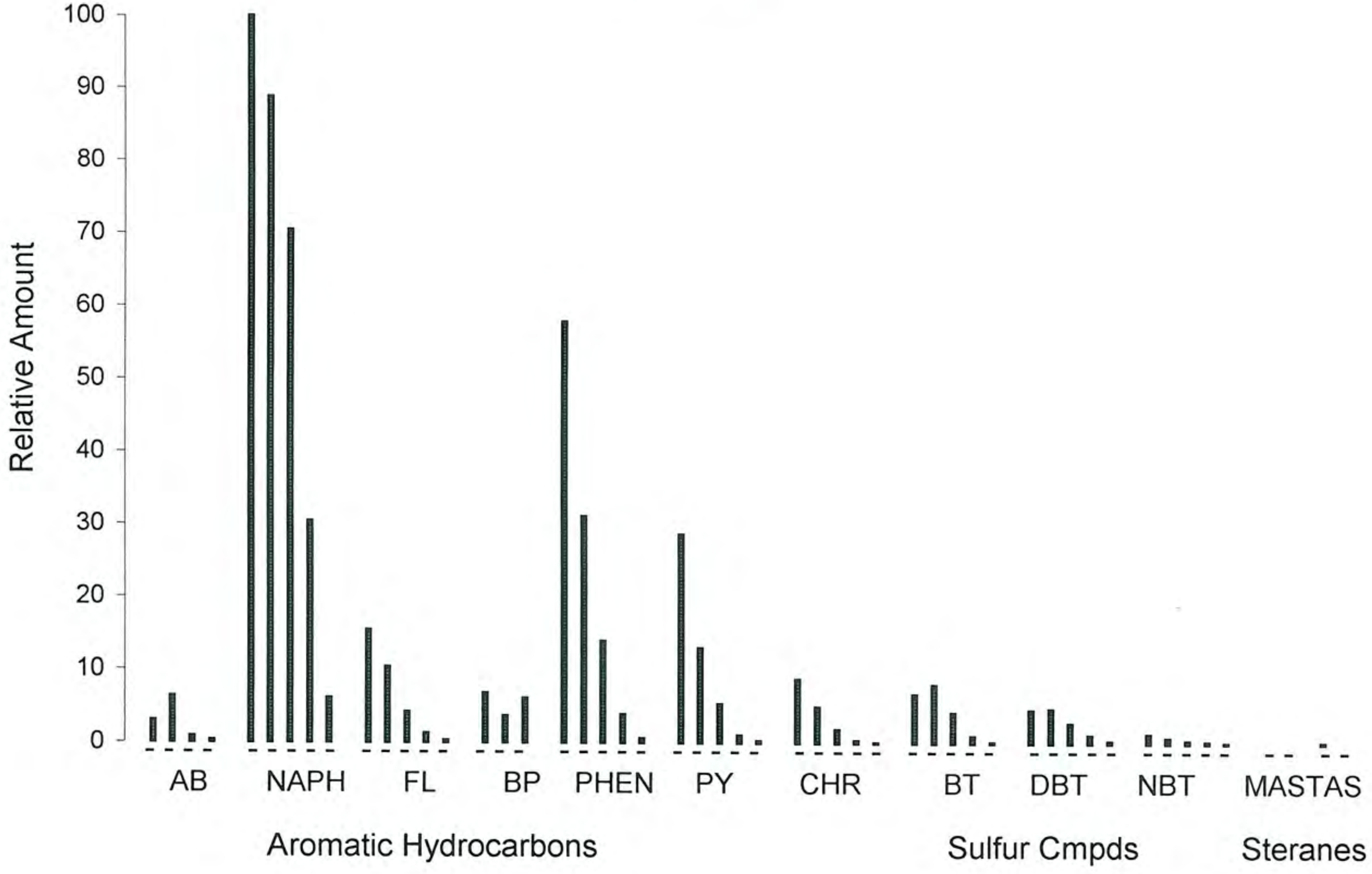
Aromatic Hydrocarbon Distribution

34011008043



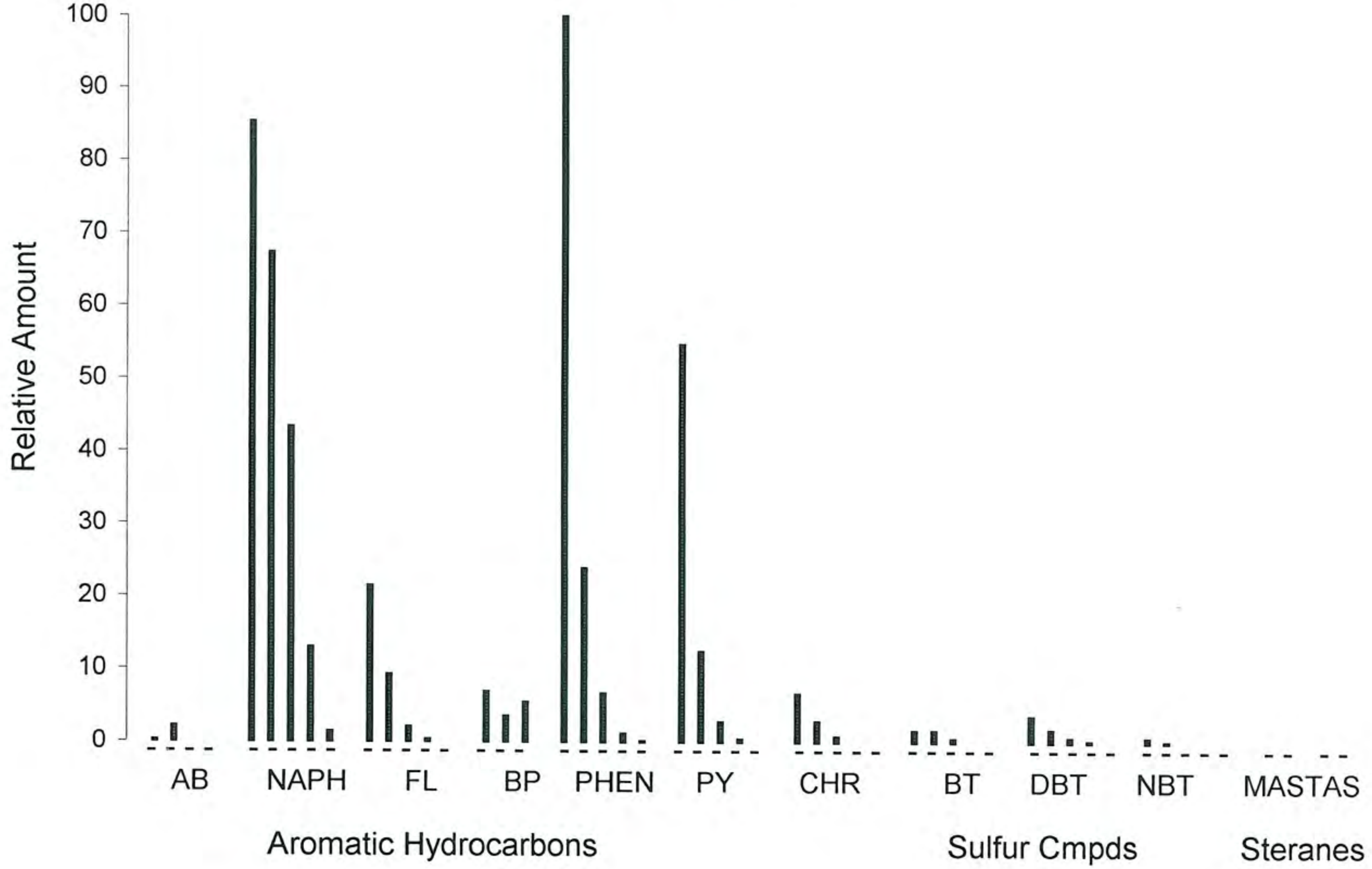
Aromatic Hydrocarbon Distribution

34011008050



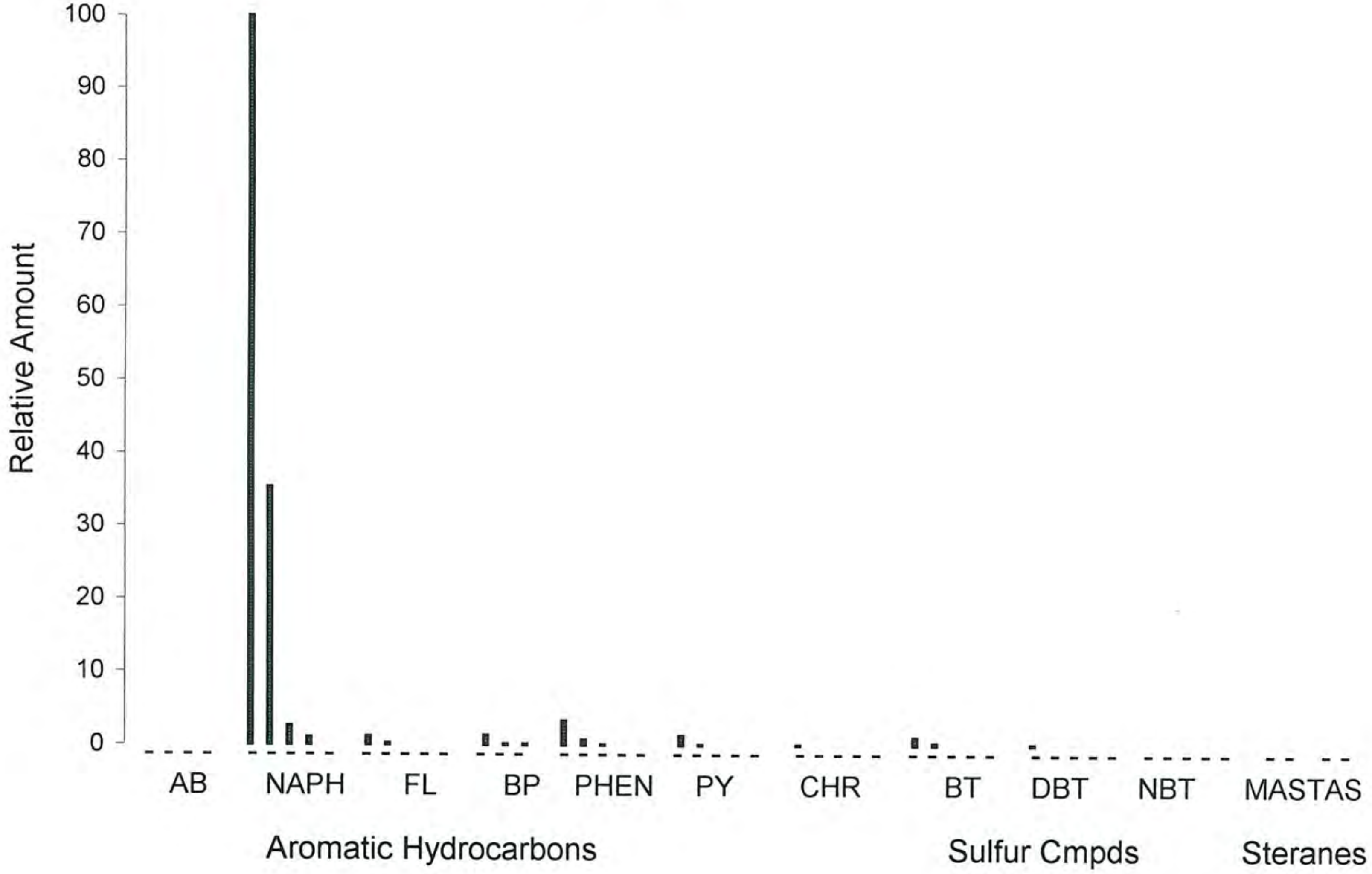
Aromatic Hydrocarbon Distribution

34011008054



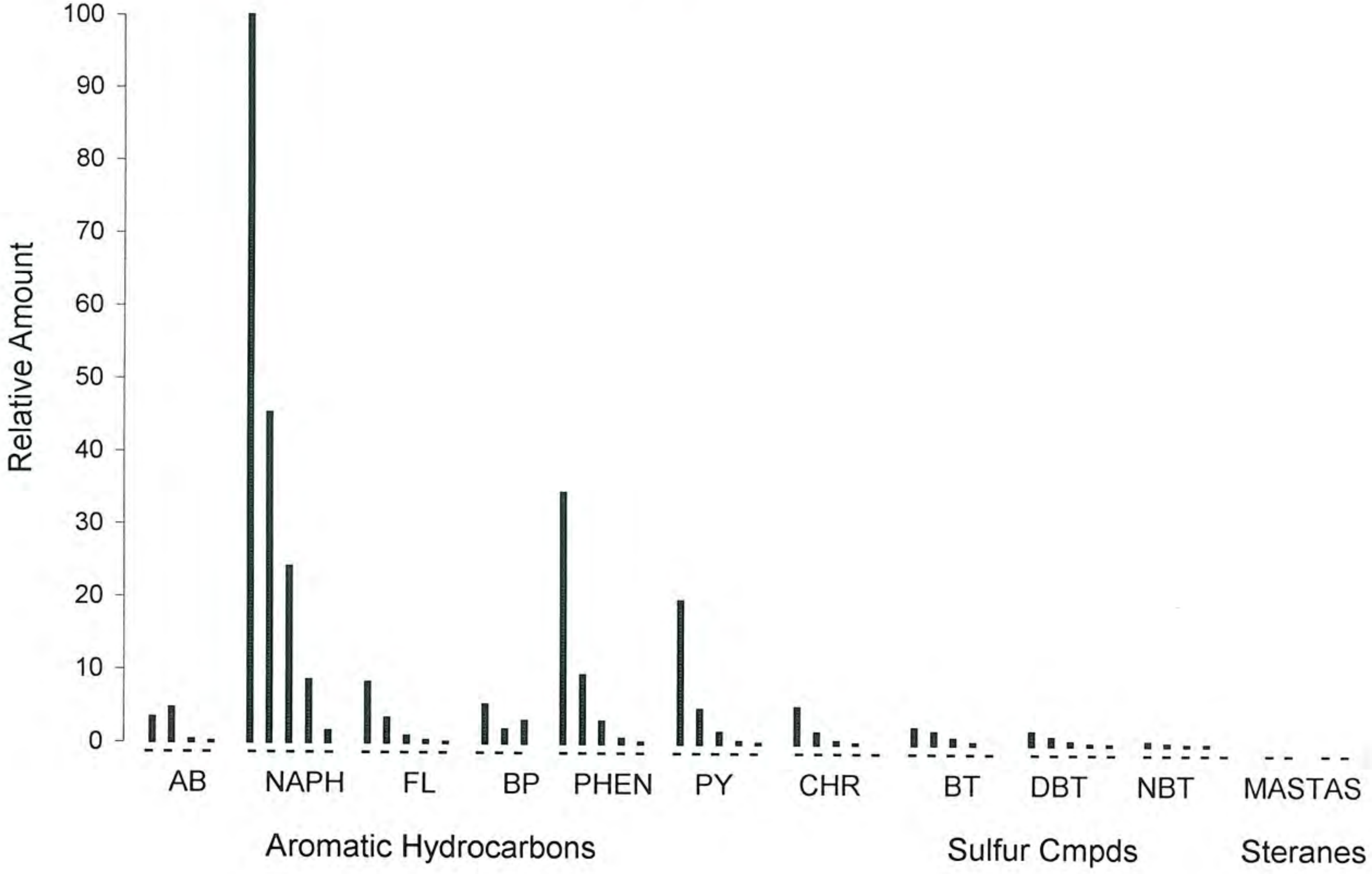
Aromatic Hydrocarbon Distribution

34011008056



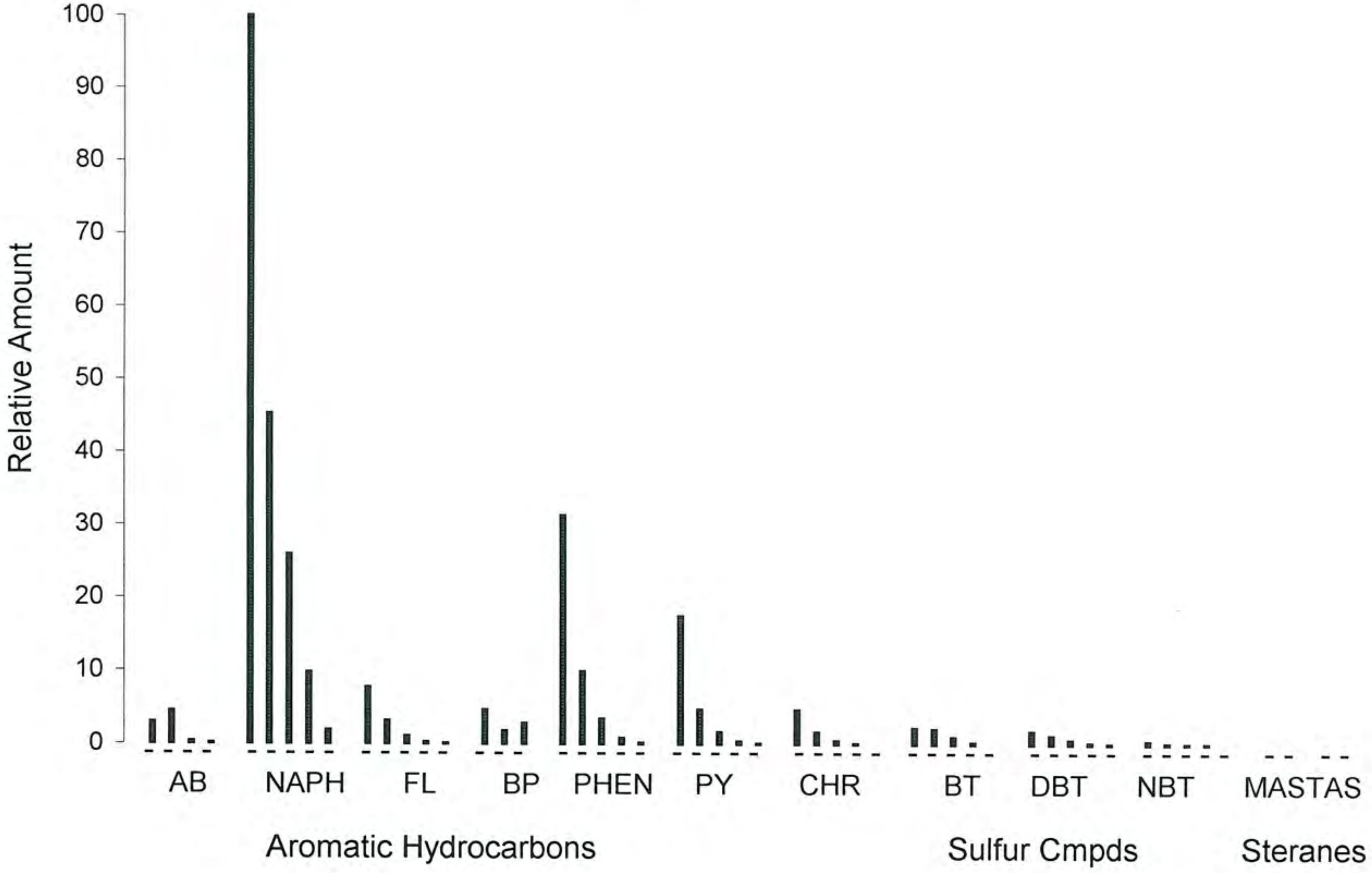
Aromatic Hydrocarbon Distribution

DW-4-FP



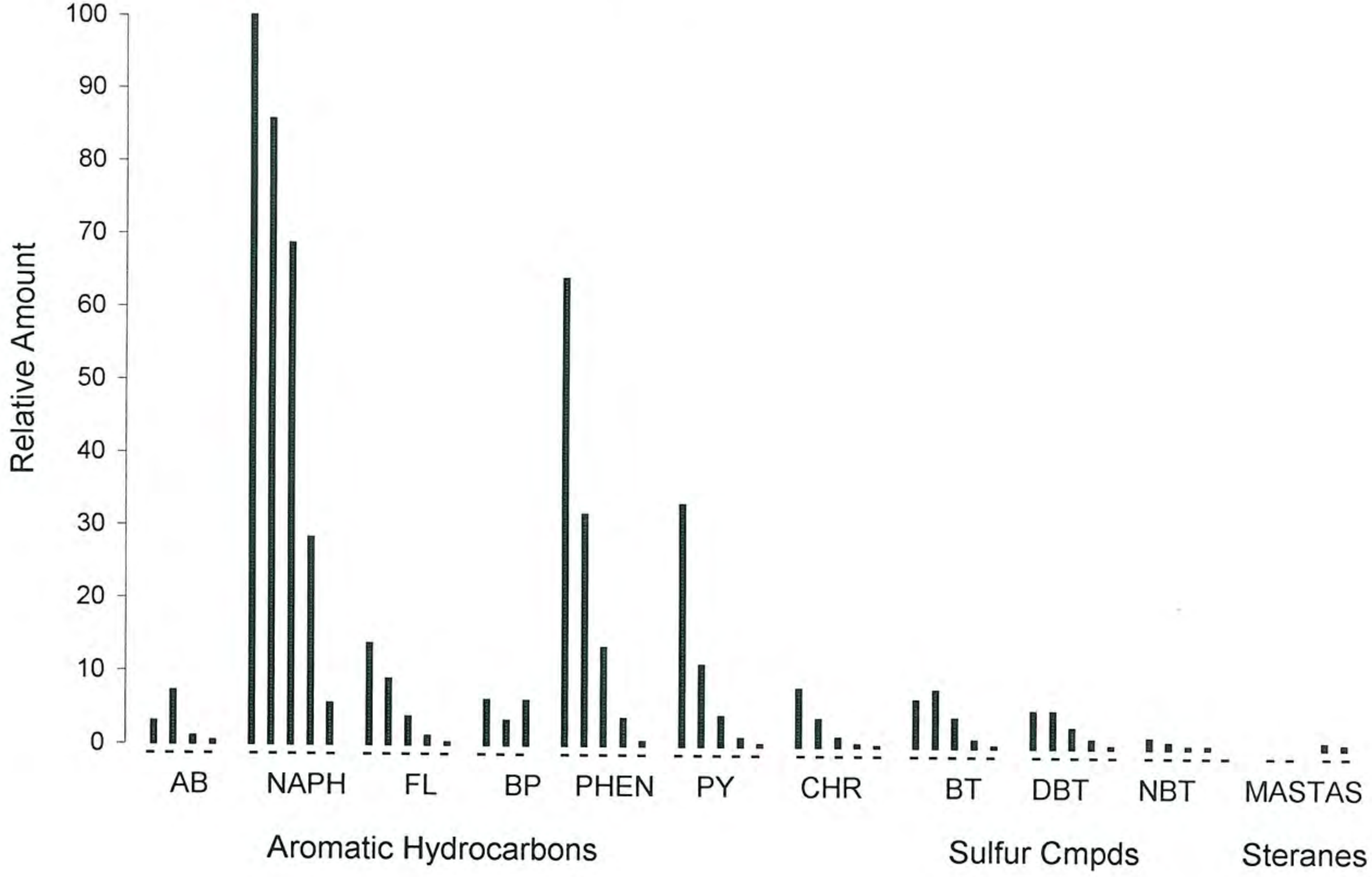
Aromatic Hydrocarbon Distribution

DW-5-FP



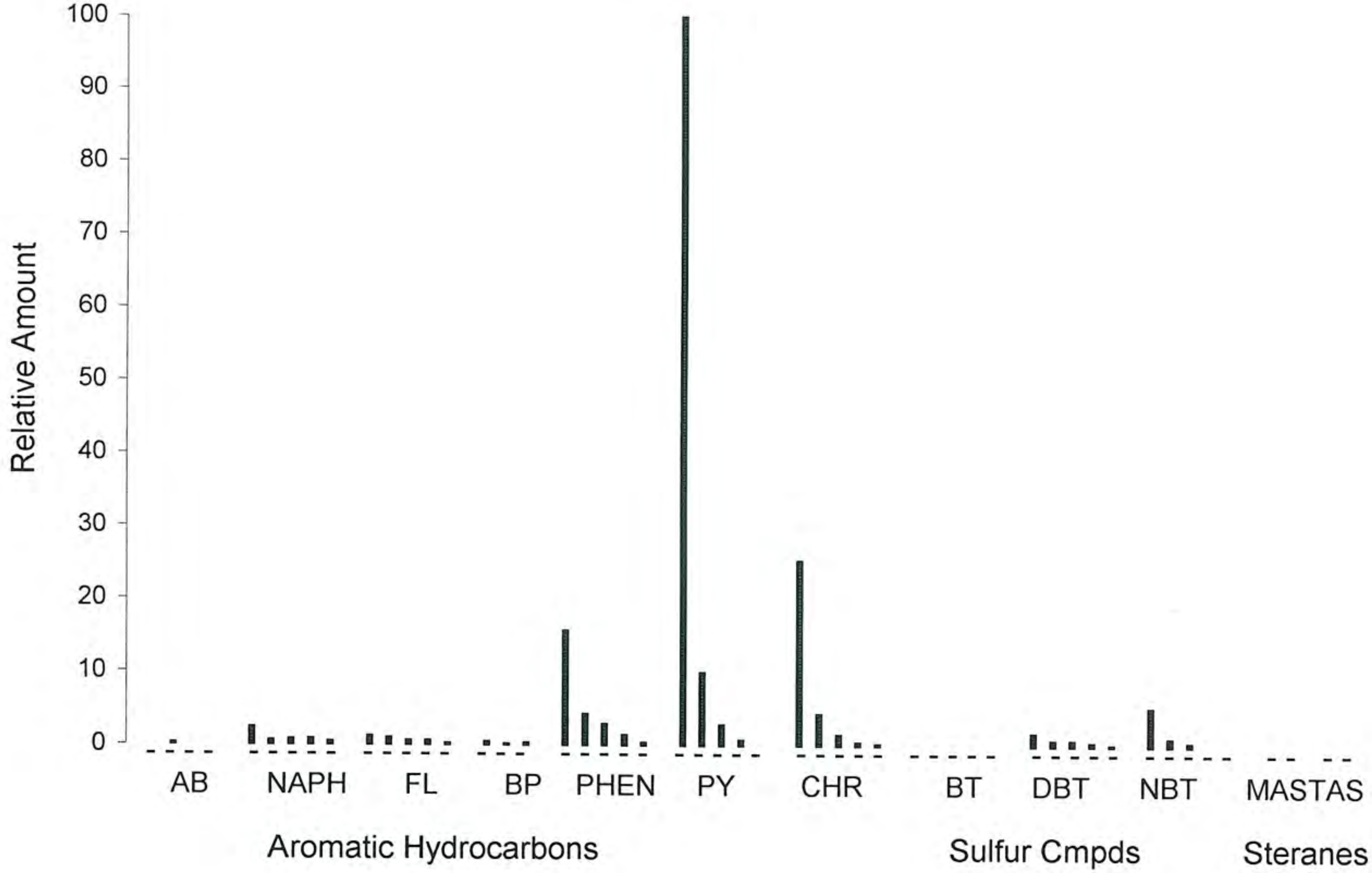
Aromatic Hydrocarbon Distribution

3-1-G



Aromatic Hydrocarbon Distribution

1-1G



SUB-ATTACHMENT 2D-4.2

NAPL Investigation Sediment Core Logs

Seattle Law Department
Gas Works Park

Chemical Forensics Sampling Report

Appendix B
NAPL Investigation 2004 Sediment Core Logs

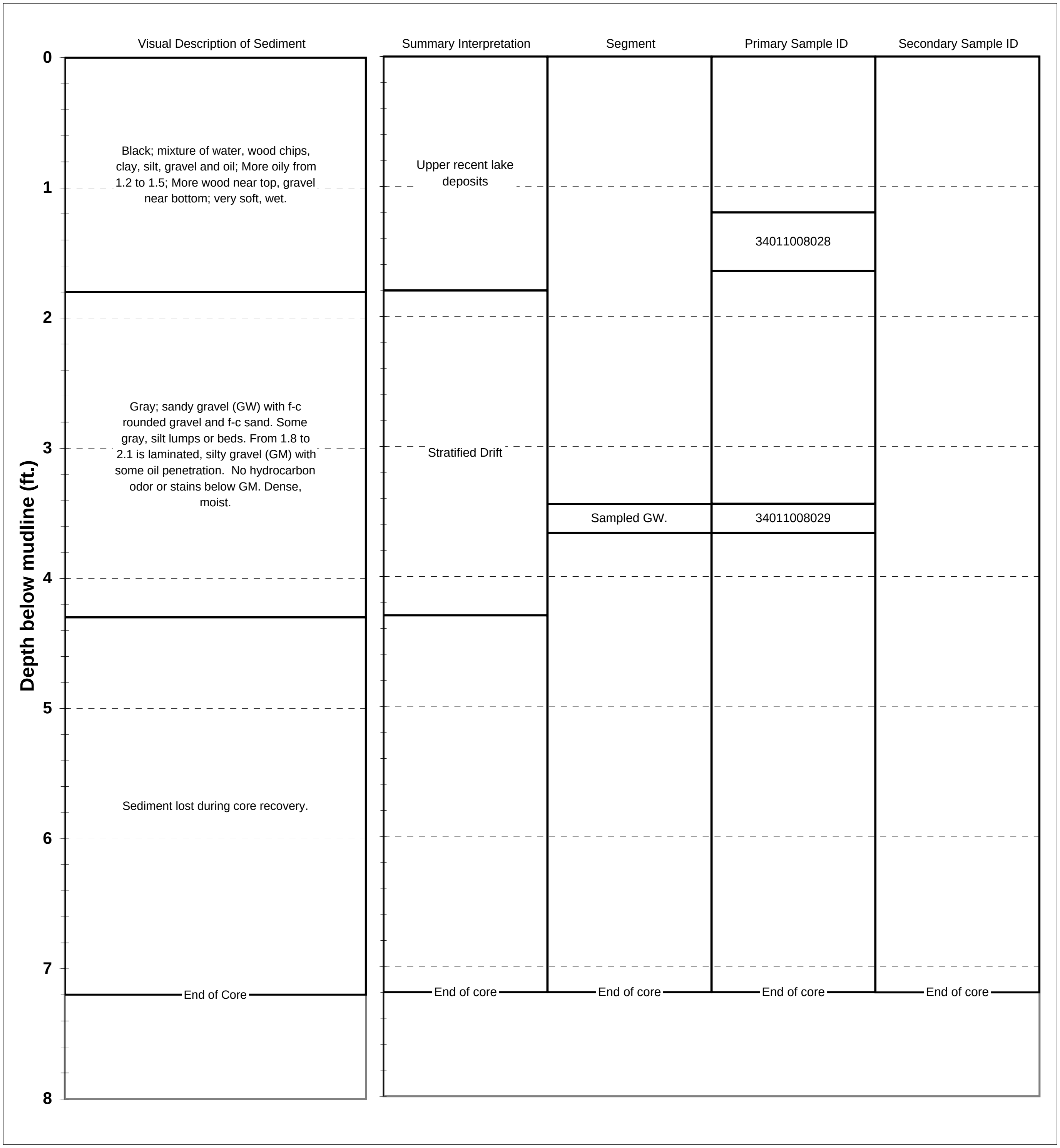
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **1--1**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 7.2 ft
Mudline elevation: 8.7 **ft (Corps lake datum)** **Percent recovery (on-deck):** 74%

	Core collection	Laboratory processing
Date:	8/11/2004	Aug. 11, 2004
Time:	13:40	15:00

Field Log: J. LaManna
Summary Log: J. LaManna



Black; mixture of water, wood chips, clay, silt, gravel and oil; More oily from 1.2 to 1.5; More wood near top, gravel near bottom; very soft, wet.

Gray; sandy gravel (GW) with f-c rounded gravel and f-c sand. Some gray, silt lumps or beds. From 1.8 to 2.1 is laminated, silty gravel (GM) with some oil penetration. No hydrocarbon odor or stains below GM. Dense, moist.

Sediment lost during core recovery.

Confidential and Privileged: Prepared in Preparation for Litigation

Core Summary Log

Project: North Lake Union Sediment Survey **Station:** 1--2

Project No: COS-NAPL.T5

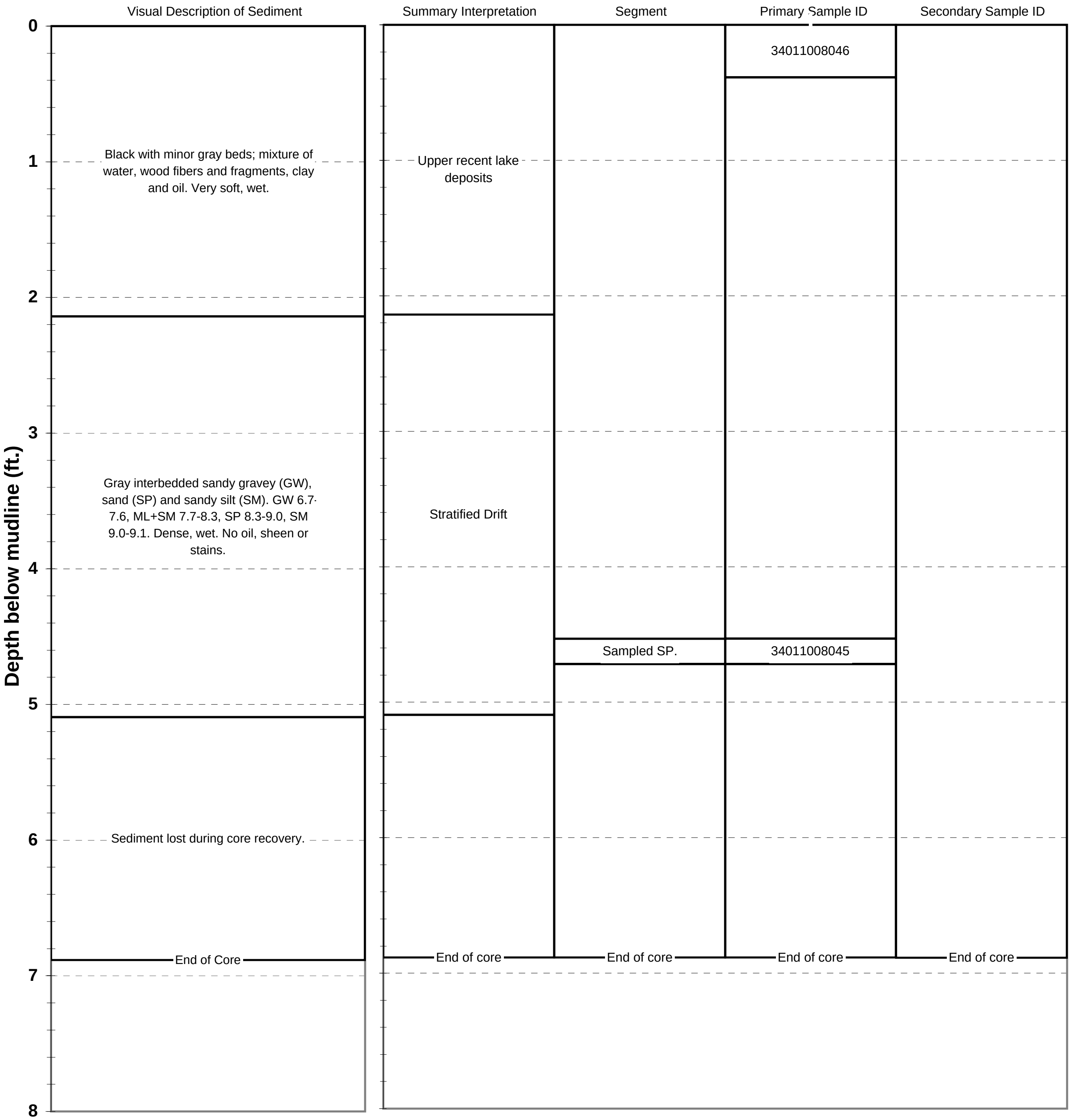
Maximum depth of retained sediment: 6.9 ft

Mudline elevation: -10.8 **ft (Corps lake datum)** **Percent recovery (on-deck):** 70%

	Core collection	**Laboratory processing**
Date:	8/12/2004	Aug. 12, 2004
Time:	10:35	14:40

Field Log: J. LaManna

Summary Log: J. LaManna



Black with minor gray beds; mixture of water, wood fibers and fragments, clay and oil. Very soft, wet.

Gray interbedded sandy gravey (GW), sand (SP) and sandy silt (SM). GW 6.7-7.6, ML+SM 7.7-8.3, SP 8.3-9.0, SM 9.0-9.1. Dense, wet. No oil, sheen or stains.

Sediment lost during core recovery.

End of Core

Upper recent lake deposits

Stratified Drift

End of core

Sampled SP.

End of core

34011008046

34011008045

End of core

End of core

Confidential and Privileged: Prepared in Preparation for Litigation

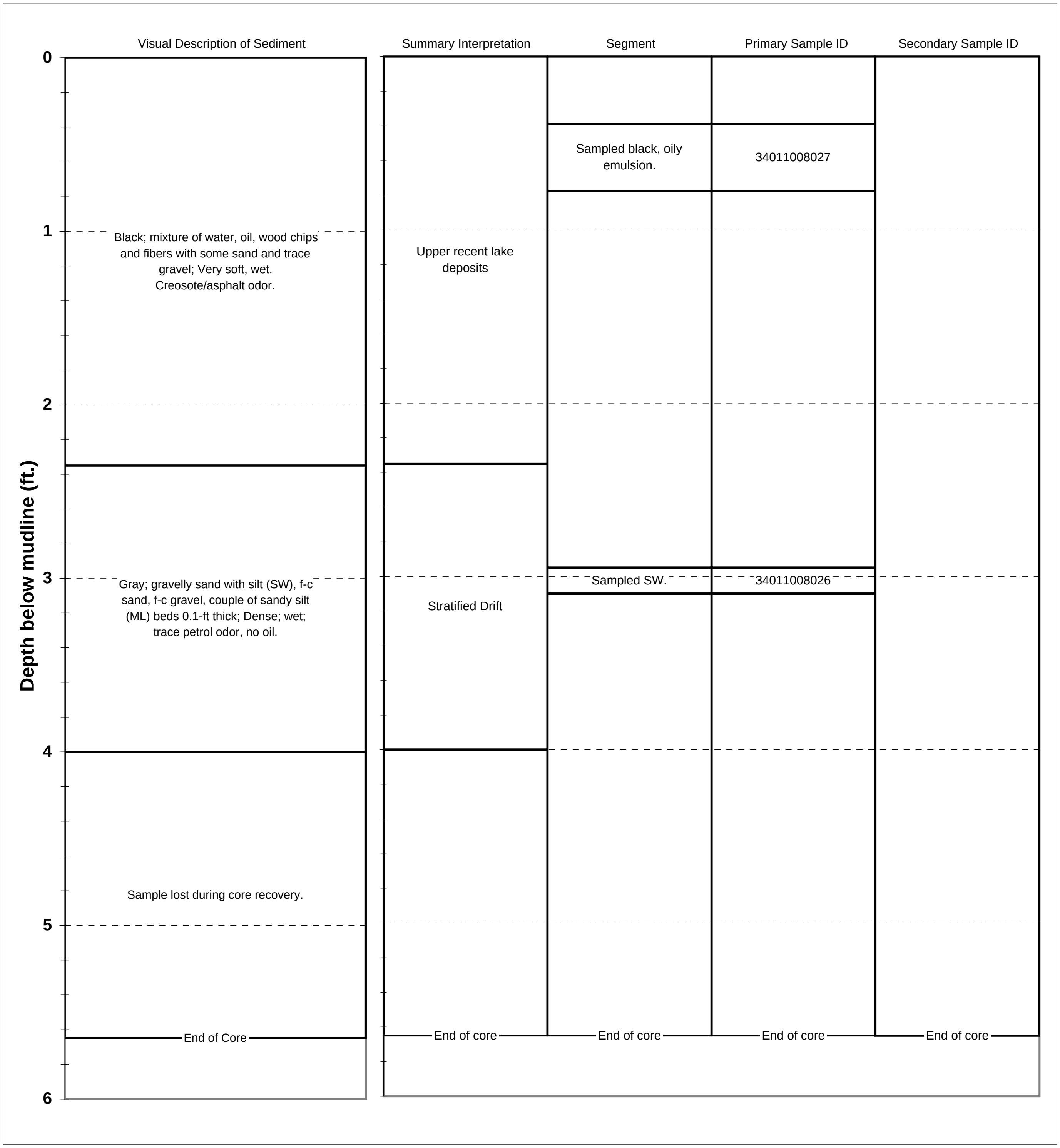
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **1--3**
Project No: COS-NAPL.T3

Maximum depth of retained sediment: 5.7 ft
Mudline elevation: 20.9 **ft (Corps lake datum)** **Percent recovery (on-deck):** 74%

	Core collection	Laboratory processing
Date:	8/11/2004	Aug. 11, 2004
Time:	12:35	14:45

Field Log: J. LaManna
Summary Log: J. LaManna



Black; mixture of water, oil, wood chips and fibers with some sand and trace gravel; Very soft, wet. Creosote/asphalt odor.

Gray; gravelly sand with silt (SW), f-c sand, f-c gravel, couple of sandy silt (ML) beds 0.1-ft thick; Dense; wet; trace petrol odor, no oil.

Sample lost during core recovery.

Upper recent lake deposits

Stratified Drift

Sampled black, oily emulsion. 34011008027

Sampled SW. 34011008026

Confidential and Privileged: Prepared in Preparation for Litigation

Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **2-1 Rep 2**

Project No: COS-NAPL.T5

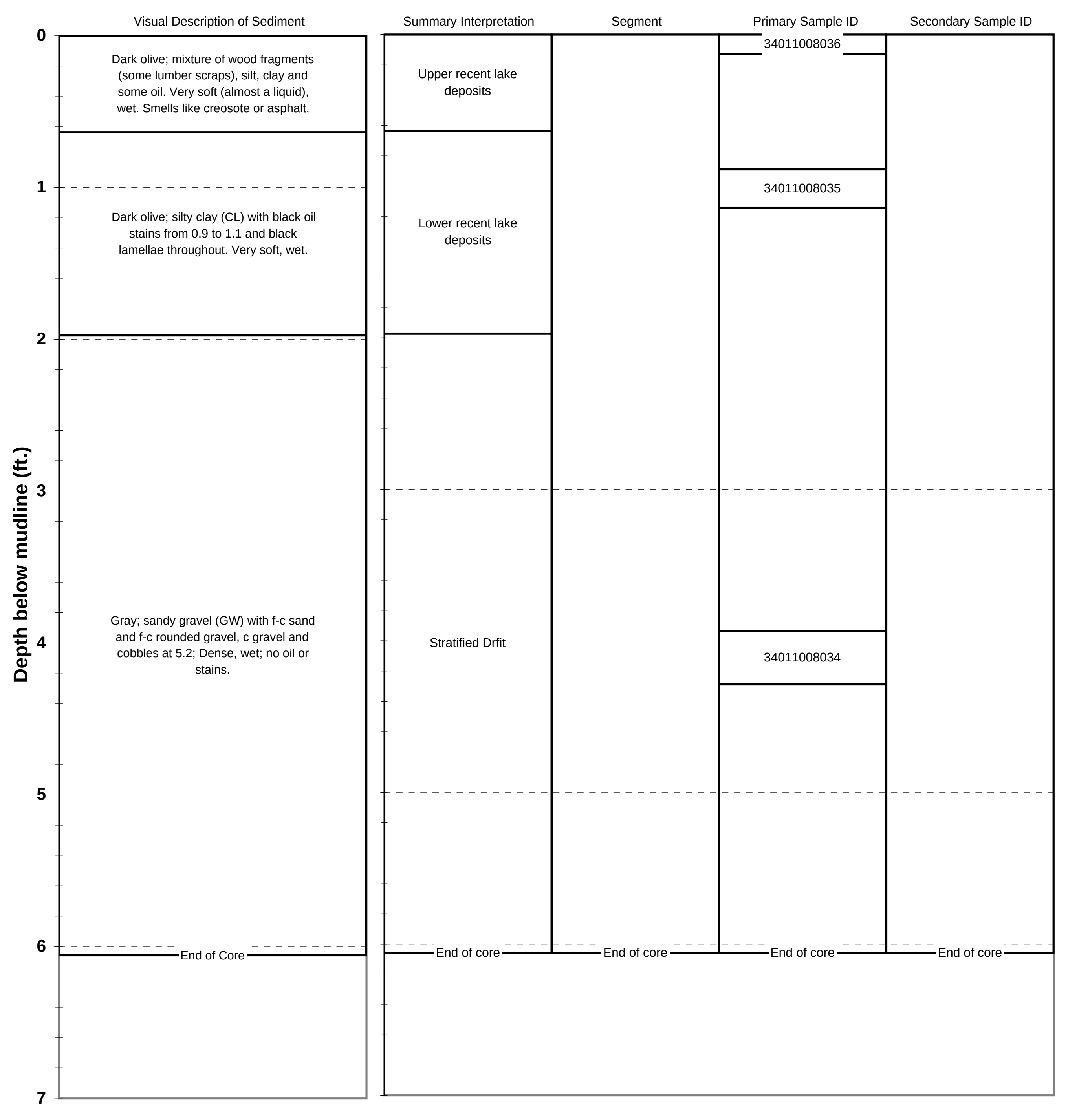
Maximum depth of retained sediment: 6.1 ft

Mudline elevation: -12.7 **ft (Corps lake datum)** **Percent recovery (on-deck):** 58%

	Core collection	Laboratory processing
Date:	8/11/2004	Aug. 11, 2004
Time:	17:00	18:00

Field Log: J. LaManna

Summary Log: J. LaManna



Dark olive; mixture of wood fragments (some lumber scraps), silt, clay and some oil. Very soft (almost a liquid), wet. Smells like creosote or asphalt.

Dark olive; silty clay (CL) with black oil stains from 0.9 to 1.1 and black lamellae throughout. Very soft, wet.

Gray; sandy gravel (GW) with f-c sand and f-c rounded gravel, c gravel and cobbles at 5.2; Dense, wet; no oil or stains.

Upper recent lake deposits

Lower recent lake deposits

Stratified Drfit

Confidential and Privileged: Prepared in Preparation for Litigation

File name: 2-1 Rep 2
Summary Core Log

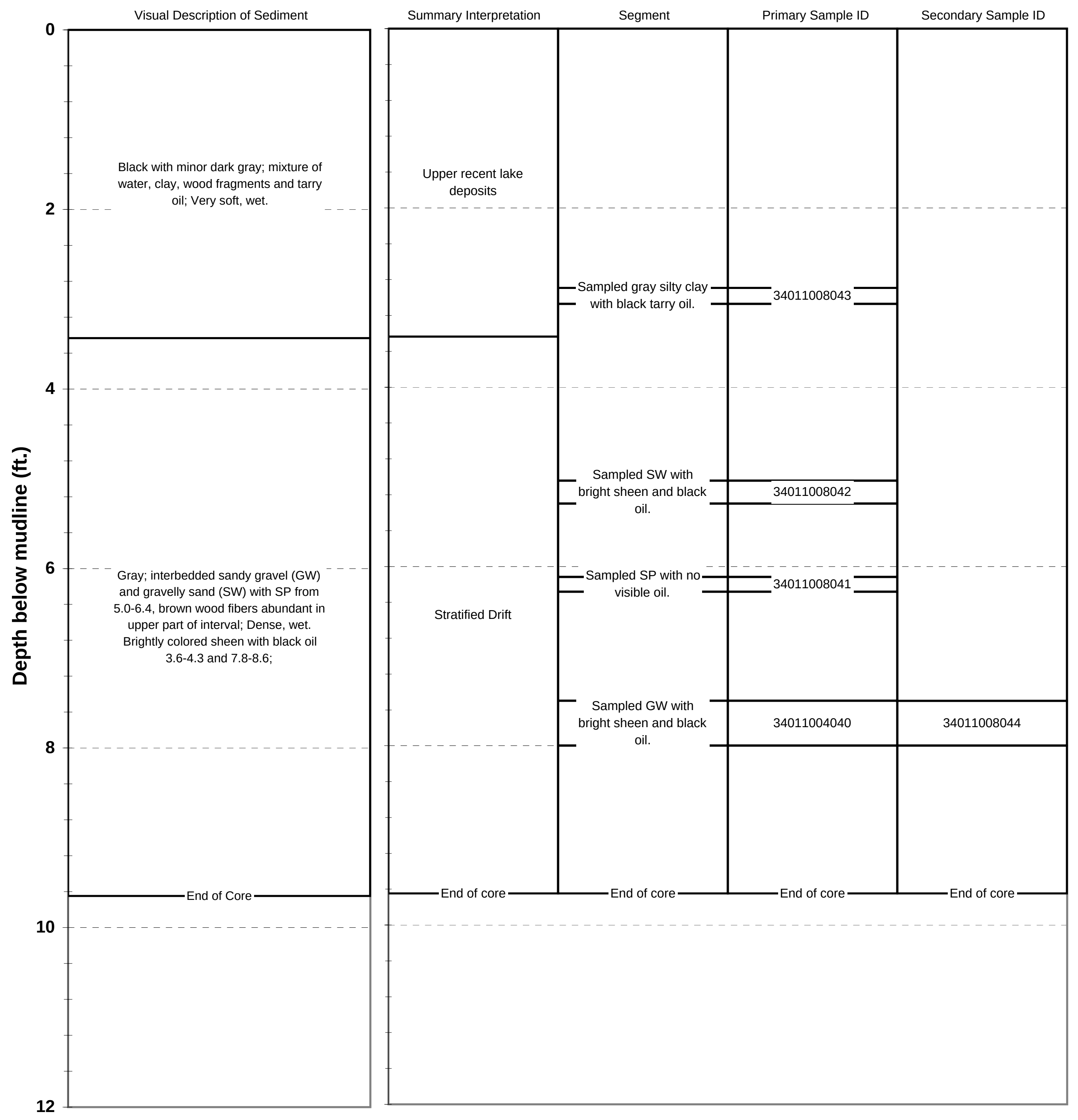
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **2-2 A**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 9.7 ft
Mudline elevation: -17.0 **ft (Corps lake datum)** **Percent recovery (on-deck):** 72%

	Core collection	Laboratory processing
Date:	8/12/2004	Aug. 12, 2004
Time:	9:00	12:00

Field Log: J. LaManna
Summary Log: J. LaManna



Black with minor dark gray; mixture of water, clay, wood fragments and tarry oil; Very soft, wet.

Gray; interbedded sandy gravel (GW) and gravelly sand (SW) with SP from 5.0-6.4, brown wood fibers abundant in upper part of interval; Dense, wet. Brightly colored sheen with black oil 3.6-4.3 and 7.8-8.6;

Upper recent lake deposits

Stratified Drift

Sampled gray silty clay with black tarry oil. 34011008043

Sampled SW with bright sheen and black oil. 34011008042

Sampled SP with no visible oil. 34011008041

Sampled GW with bright sheen and black oil. 34011004040 34011008044

Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **2--2**

Project No: COS-NAPL.T3

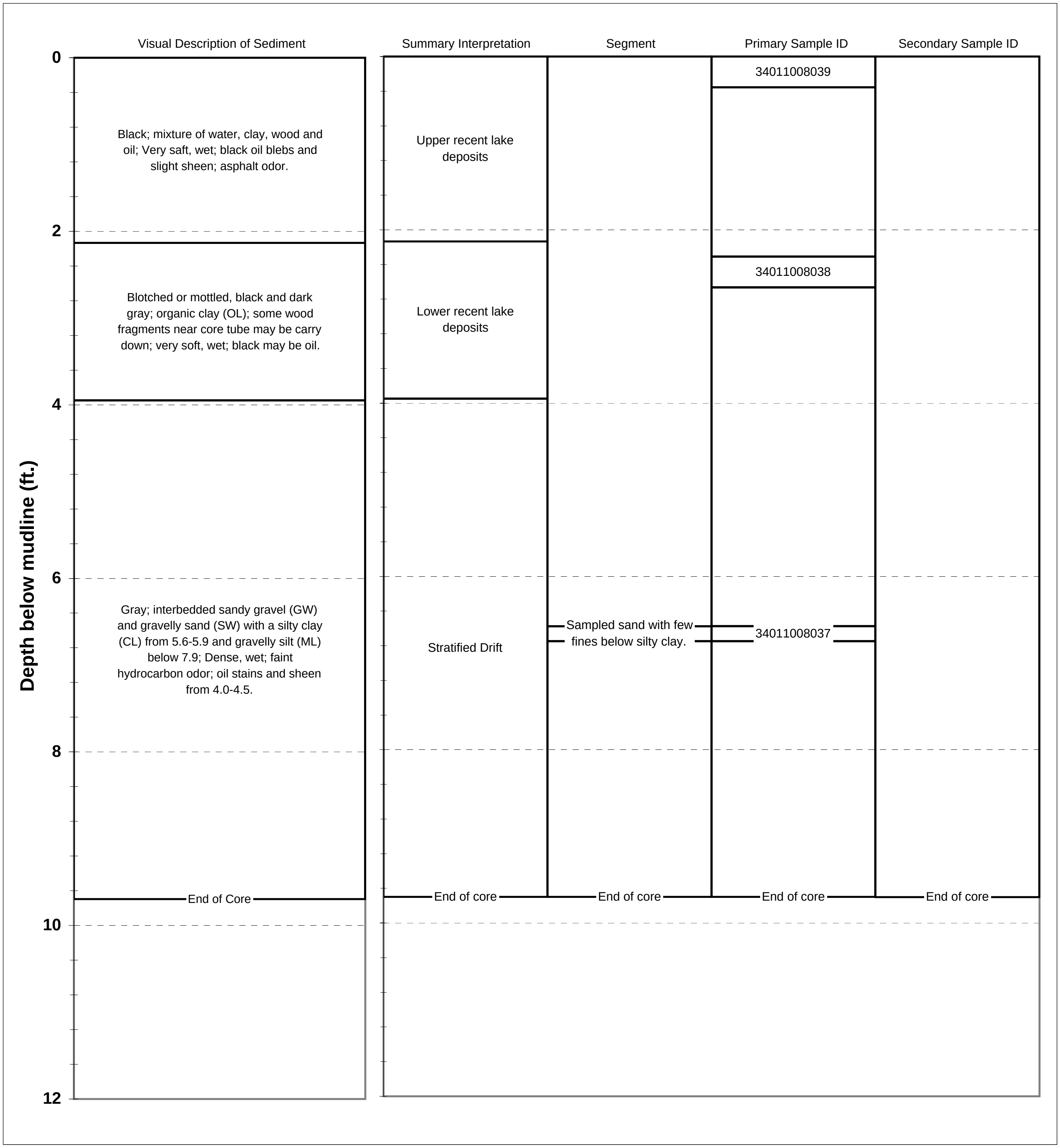
Maximum depth of retained sediment: 9.7 ft

Mudline elevation: -14.3 **ft (Corps lake datum)** **Percent recovery (on-deck):** 82%

	Core collection	**Laboratory processing**
Date:	8/12/2004	Aug. 12, 2004
Time:	9:33	11:00

Field Log: J. LaManna

Summary Log: J. LaManna



Black; mixture of water, clay, wood and oil; Very saft, wet; black oil blebs and slight sheen; asphalt odor.

Blotched or mottled, black and dark gray; organic clay (OL); some wood fragments near core tube may be carry down; very soft, wet; black may be oil.

Gray; interbedded sandy gravel (GW) and gravelly sand (SW) with a silty clay (CL) from 5.6-5.9 and gravelly silt (ML) below 7.9; Dense, wet; faint hydrocarbon odor; oil stains and sheen from 4.0-4.5.

Sampled sand with few fines below silty clay.

Confidential and Privileged: Prepared in Preparation for Litigation

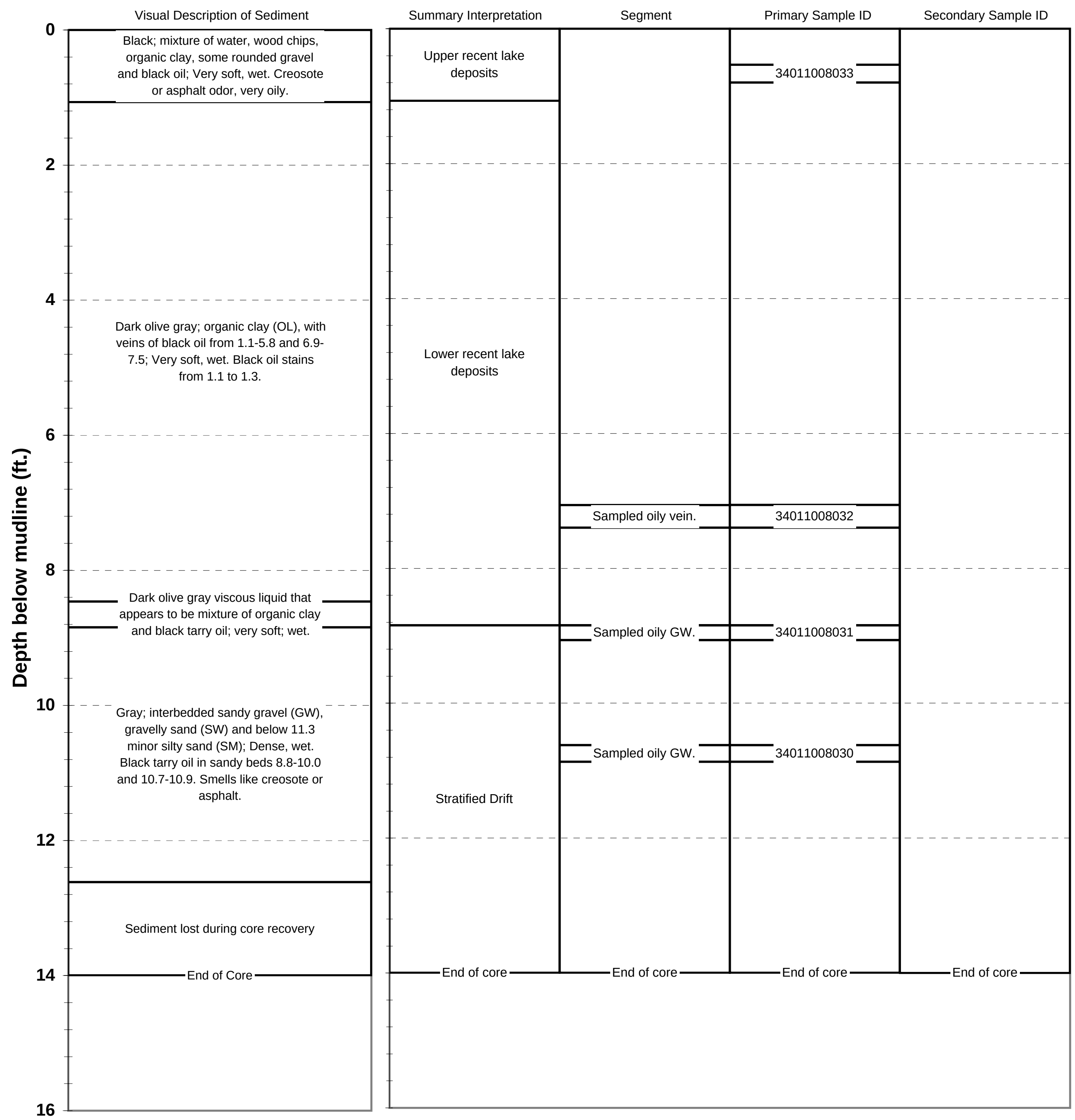
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **3-3 Rep 3**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 14.0 ft
Mudline elevation: -18.6 **ft (Corps lake datum)** **Percent recovery (on-deck):** 72%

	Core collection	**Laboratory processing**
Date:	8/11/2004	Aug. 11, 2004.
Time:	15:07	16:30

Field Log: J. LaManna
Summary Log: J. LaManna



Visual Description of Sediment

Black; mixture of water, wood chips, organic clay, some rounded gravel and black oil; Very soft, wet. Creosote or asphalt odor, very oily.

Dark olive gray; organic clay (OL), with veins of black oil from 1.1-5.8 and 6.9-7.5; Very soft, wet. Black oil stains from 1.1 to 1.3.

Dark olive gray viscous liquid that appears to be mixture of organic clay and black tarry oil; very soft; wet.

Gray; interbedded sandy gravel (GW), gravelly sand (SW) and below 11.3 minor silty sand (SM); Dense, wet. Black tarry oil in sandy beds 8.8-10.0 and 10.7-10.9. Smells like creosote or asphalt.

Sediment lost during core recovery

End of Core

Summary Interpretation

Upper recent lake deposits

Lower recent lake deposits

Stratified Drift

End of core

Segment

Sampled oily vein.

Sampled oily GW.

Sampled oily GW.

End of core

Primary Sample ID

34011008033

34011008032

34011008031

34011008030

End of core

Secondary Sample ID

End of core

Confidential and Privileged: Prepared in Preparation for Litigation

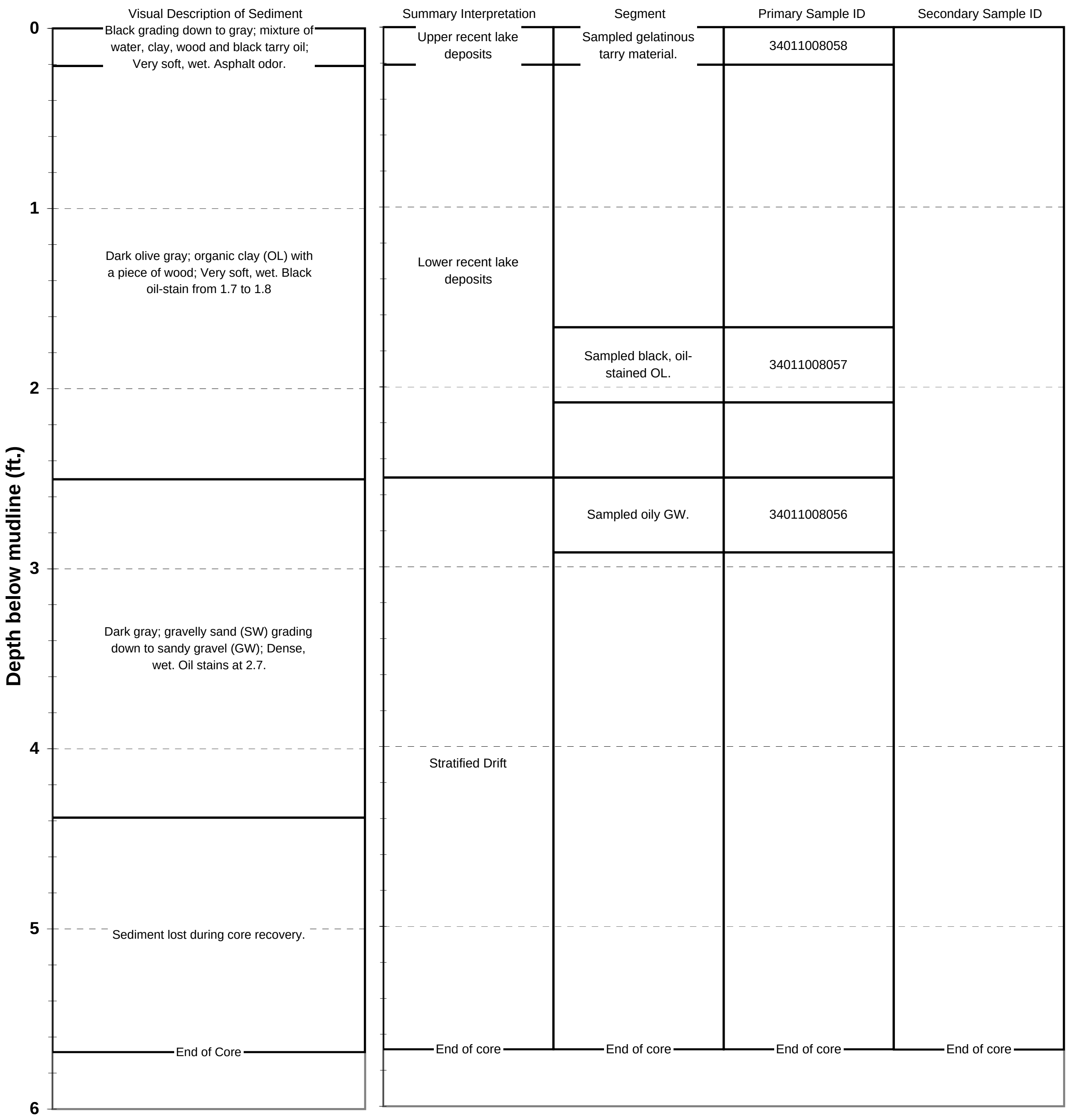
File name: 3-3 Rep 3
Summary Core Log

Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **3-5 Rep 2**
Project No: COS-NAPL.T5
Maximum depth of retained sediment: 5.7 ft
Mudline elevation: 20.9 **ft (Corps lake datum)** **Percent recovery (on-deck):** 29%

	Core collection	**Laboratory processing**
Date:	8/13/2004	Aug. 13, 2004
Time:	17:30	13:45

Field Log: J. LaManna
Summary Log: J. LaManna



Visual Description of Sediment

Black grading down to gray; mixture of water, clay, wood and black tarry oil; Very soft, wet. Asphalt odor.

Dark olive gray; organic clay (OL) with a piece of wood; Very soft, wet. Black oil-stain from 1.7 to 1.8

Dark gray; gravelly sand (SW) grading down to sandy gravel (GW); Dense, wet. Oil stains at 2.7.

Sediment lost during core recovery.

End of Core

Summary Interpretation

Upper recent lake deposits

Lower recent lake deposits

Stratified Drift

End of core

Segment	Primary Sample ID	Secondary Sample ID
Sampled gelatinous tarry material.	34011008058	
Sampled black, oil-stained OL.	34011008057	
Sampled oily GW.	34011008056	
End of core	End of core	End of core

Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **3--1**

Project No: COS-NAPL.T5

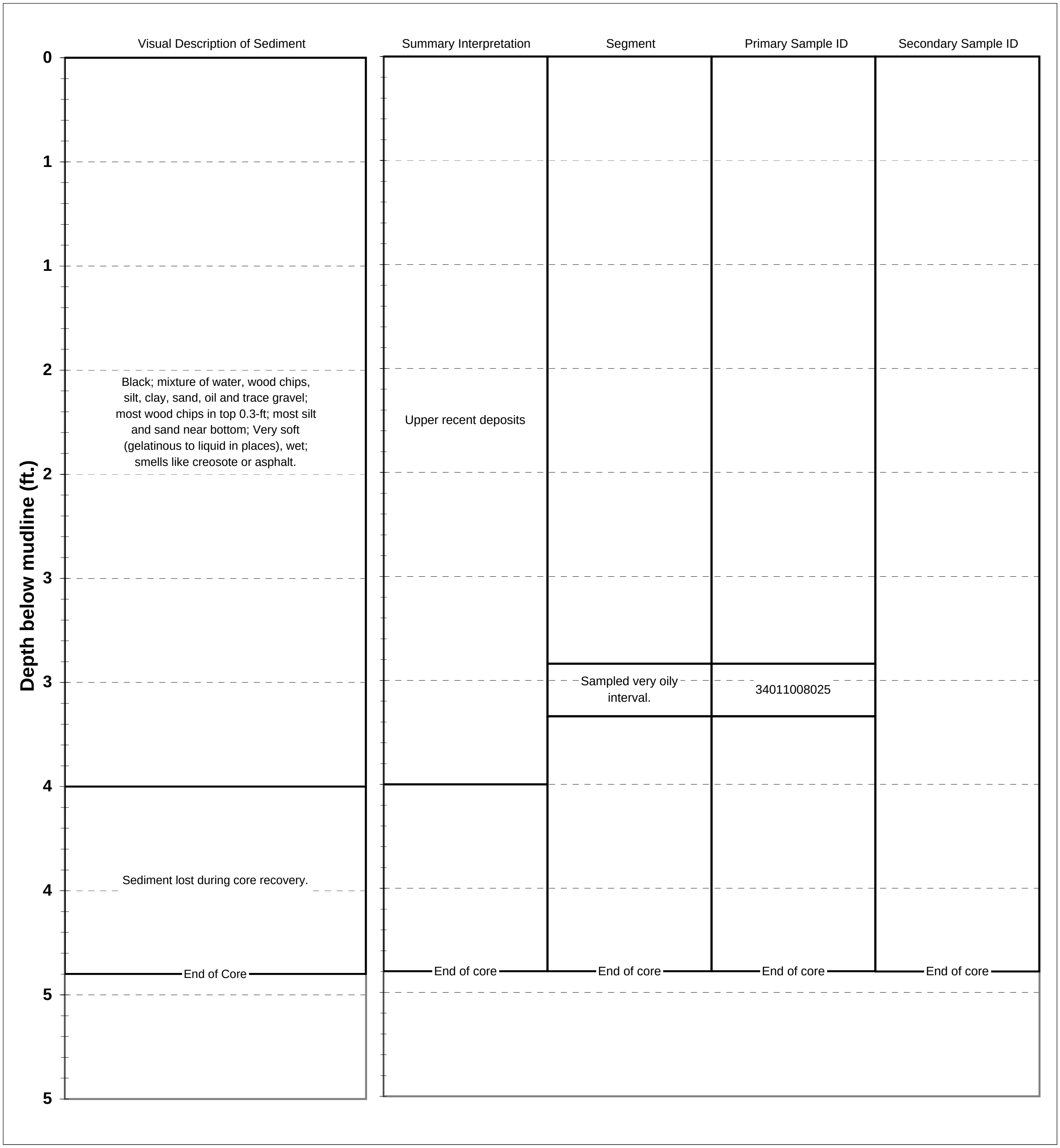
Maximum depth of retained sediment: 4.4 ft

Mudline elevation: -3.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 82%

	Core collection	**Laboratory processing**
Date:	8/11/2004	Aug. 11, 2004
Time:	10:42	14:00

Field Log: J. LaManna

Summary Log: J. LaManna



Black; mixture of water, wood chips, silt, clay, sand, oil and trace gravel; most wood chips in top 0.3-ft; most silt and sand near bottom; Very soft (gelatinous to liquid in places), wet; smells like creosote or asphalt.

Sediment lost during core recovery.

Upper recent deposits

Sampled very oily interval.

34011008025

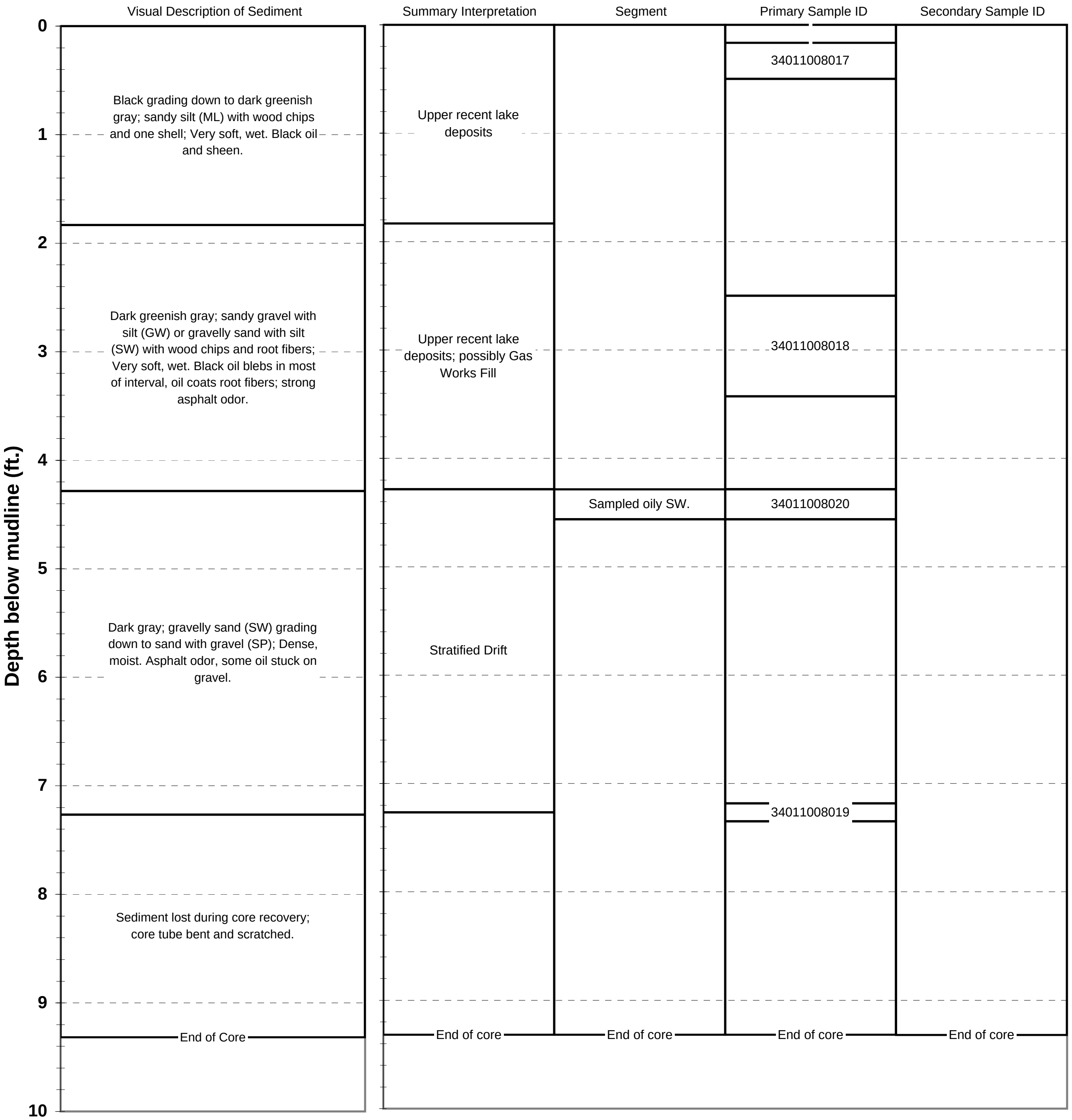
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **3--2**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 9.3 ft
Mudline elevation: 20.9 **ft (Corps lake datum)** **Percent recovery (on-deck):** 69%

	Core collection	Laboratory processing
Date:	8/11/2004	Aug. 11, 2004
Time:	8:30	11:00

Field Log: J. LaManna
Summary Log: J. LaManna



Visual Description of Sediment

Black grading down to dark greenish gray; sandy silt (ML) with wood chips and one shell; Very soft, wet. Black oil and sheen.

Dark greenish gray; sandy gravel with silt (GW) or gravelly sand with silt (SW) with wood chips and root fibers; Very soft, wet. Black oil blebs in most of interval, oil coats root fibers; strong asphalt odor.

Dark gray; gravelly sand (SW) grading down to sand with gravel (SP); Dense, moist. Asphalt odor, some oil stuck on gravel.

Sediment lost during core recovery; core tube bent and scratched.

End of Core

Summary Interpretation

Upper recent lake deposits

Upper recent lake deposits; possibly Gas Works Fill

Stratified Drift

End of core

Segment

Sampled oily SW.

End of core

Primary Sample ID

34011008017

34011008018

34011008020

34011008019

End of core

Secondary Sample ID

End of core

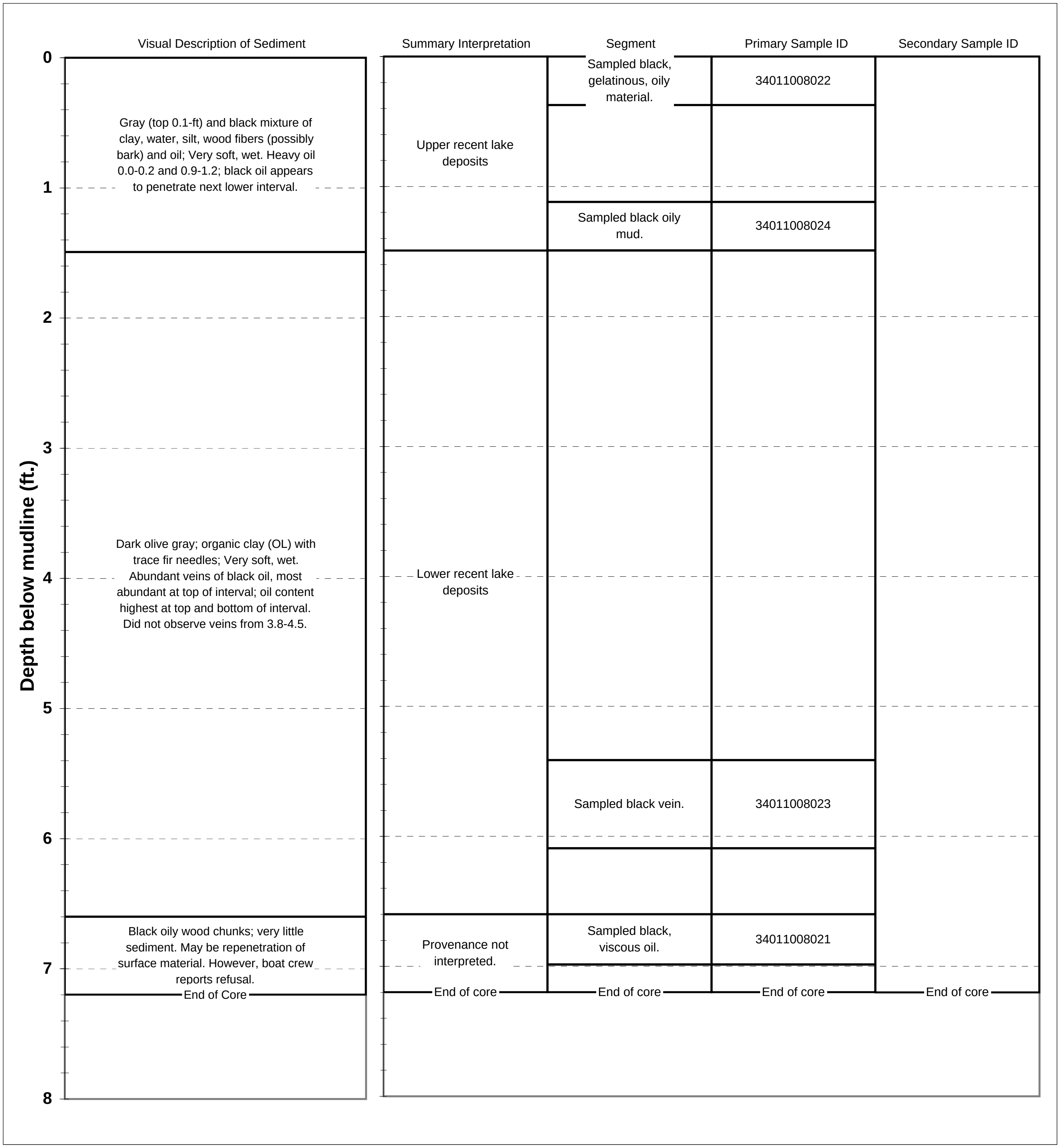
Confidential and Privileged: Prepared in Preparation for Litigation

Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **3--3**
Project No: COS-NAPL.T5
Maximum depth of retained sediment: 7.2 ft
Mudline elevation: -18.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 71%

	Core collection	Laboratory processing
Date:	8/11/2004	Aug. 11, 2004
Time:	9:40	13:00

Field Log: J. LaManna
Summary Log: J. LaManna



Gray (top 0.1-ft) and black mixture of clay, water, silt, wood fibers (possibly bark) and oil; Very soft, wet. Heavy oil 0.0-0.2 and 0.9-1.2; black oil appears to penetrate next lower interval.

Dark olive gray; organic clay (OL) with trace fir needles; Very soft, wet. Abundant veins of black oil, most abundant at top of interval; oil content highest at top and bottom of interval. Did not observe veins from 3.8-4.5.

Black oily wood chunks; very little sediment. May be repenetration of surface material. However, boat crew reports refusal.

Upper recent lake deposits

Lower recent lake deposits

Provenance not interpreted.

Sampled black, gelatinous, oily material.	34011008022
Sampled black oily mud.	34011008024
Sampled black vein.	34011008023
Sampled black, viscous oil.	34011008021

Confidential and Privileged: Prepared in Preparation for Litigation

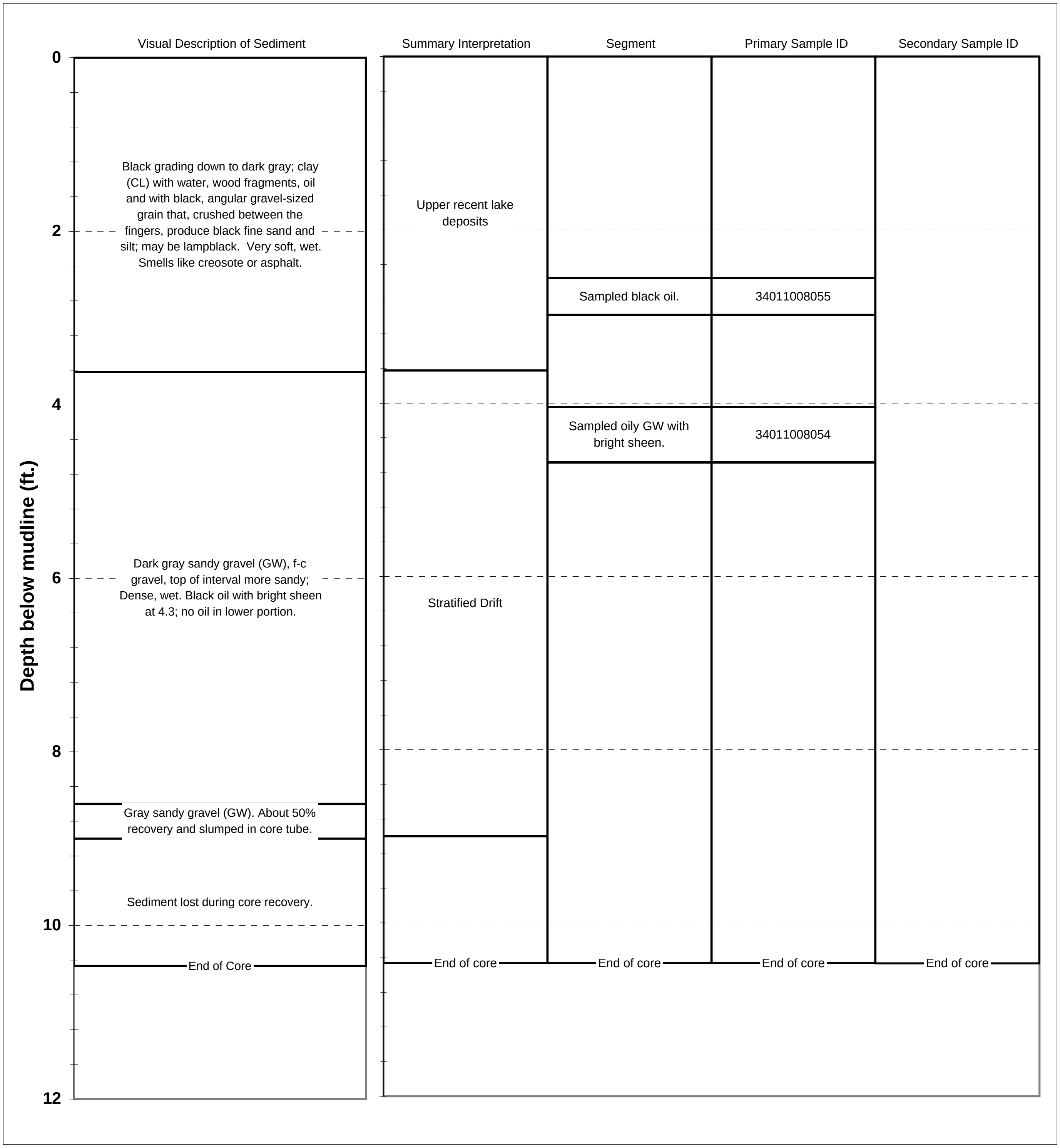
Core Summary Log

Project: North Lake Union Sediment Survey
Station: 3--4
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 10.5 ft
Mudline elevation: -13.8 **ft (Corps lake datum)**
Percent recovery (on-deck): 59%

	Core collection	**Laboratory processing**
Date:	8/12/2004	Aug. 13, 2004
Time:	15:32	12:30

Field Log: J. LaManna
Summary Log: J. LaManna



Black grading down to dark gray; clay (CL) with water, wood fragments, oil and with black, angular gravel-sized grain that, crushed between the fingers, produce black fine sand and silt; may be lampblack. Very soft, wet. Smells like creosote or asphalt.

Dark gray sandy gravel (GW), f-c gravel, top of interval more sandy; Dense, wet. Black oil with bright sheen at 4.3; no oil in lower portion.

Gray sandy gravel (GW). About 50% recovery and slumped in core tube.

Sediment lost during core recovery.

Upper recent lake deposits

Stratified Drift

Sampled black oil. 34011008055

Sampled oily GW with bright sheen. 34011008054

Confidential and Privileged: Prepared in Preparation for Litigation

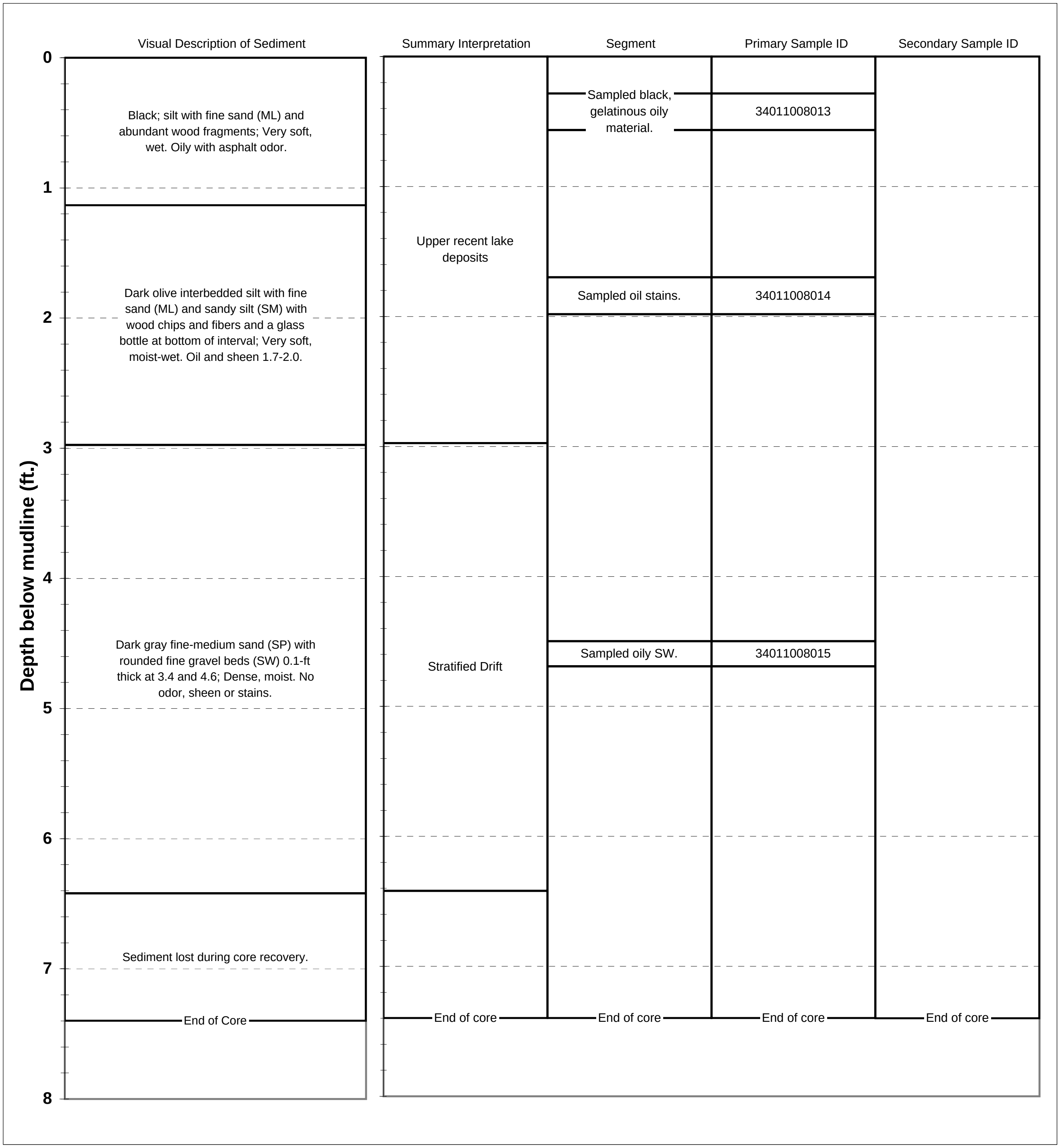
Core Summary Log

Project: North Lake Union Sediment Survey
Station: **4-1 A**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 7.4 ft
Mudline elevation: -3.7 **ft (Corps lake datum)**
Percent recovery (on-deck): 84%

	Core collection	**Laboratory processing**
Date:	8/10/2004	Aug. 10, 2004
Time:	15:40	18:30

Field Log: J. LaManna
Summary Log: J. LaManna



Depth (ft)	Visual Description of Sediment
0–1.1	Black; silt with fine sand (ML) and abundant wood fragments; Very soft, wet. Oily with asphalt odor.
1.1–3.0	Dark olive interbedded silt with fine sand (ML) and sandy silt (SM) with wood chips and fibers and a glass bottle at bottom of interval; Very soft, moist-wet. Oil and sheen 1.7-2.0.
3.0–6.4	Dark gray fine-medium sand (SP) with rounded fine gravel beds (SW) 0.1-ft thick at 3.4 and 4.6; Dense, moist. No odor, sheen or stains.
6.4–7.4	Sediment lost during core recovery.

Depth (ft)	Summary Interpretation
0–3.0	Upper recent lake deposits
3.0–6.4	Stratified Drift

Segment	Primary Sample ID
Sampled black, gelatinous oily material.	34011008013
Sampled oil stains.	34011008014
Sampled oily SW.	34011008015

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File name: 4-1 A
Summary Core Log

Core Summary Log

Project: North Lake Union Sediment Survey

Station: **4-2 Rep 1**

Project No: COS-NAPL.T5

Maximum depth of retained sediment: 1.8 ft

Mudline elevation: -15.4 **ft (Corps lake datum)**

Percent recovery (on-deck): 32%

	Core collection	Laboratory processing
Date:	8/10/2004	Aug. 10, 2004
Time:	16:48	19:00

Field Log: J. LaManna

Summary Log: J. LaManna

Depth below mudline (ft.)

0
0
0
1
1
1
1
1
2
2
2

Visual Description of Sediment	Summary Interpretation	Segment	Primary Sample ID	Secondary Sample ID
Black; silty fine sand (SM) or sandy silt (ML), with clay and abundant wood chips; verysoft, wet. Oily with asphalt odor.	Upper recent lake deposits	Sampled black gelatinous oily material.	34011008016	
Sediment lost during core recovery.				
End of Core	End of core	End of core	End of core	End of core

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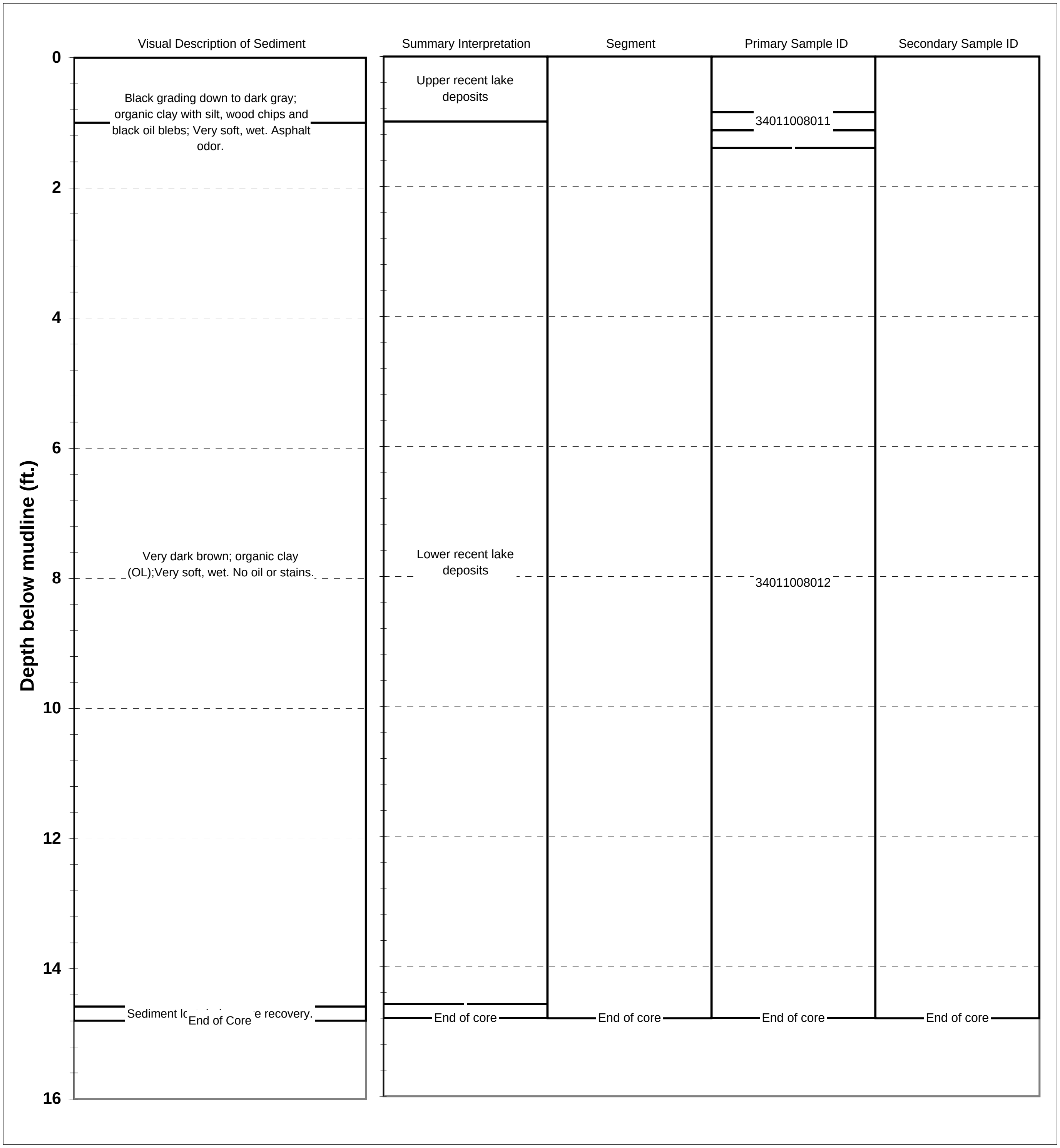
Core Summary Log

Project: North Lake Union Sediment Survey
Project No: COS-NAPL.T5
Station: **4-3 Rep 1**

Maximum depth of retained sediment: 14.8 ft
Mudline elevation: -19.6 **ft (Corps lake datum)**
Percent recovery (on-deck): 86%

	Core collection	**Laboratory processing**
Date:	8/10/2004	Aug. 10, 2004
Time:	14:20	17:00

Field Log: J. LaManna
Summary Log: J. LaManna


Black grading down to dark gray; organic clay with silt, wood chips and black oil blebs; Very soft, wet. Asphalt odor.

Very dark brown; organic clay (OL);Very soft, wet. No oil or stains.

Sediment lo e recovery.

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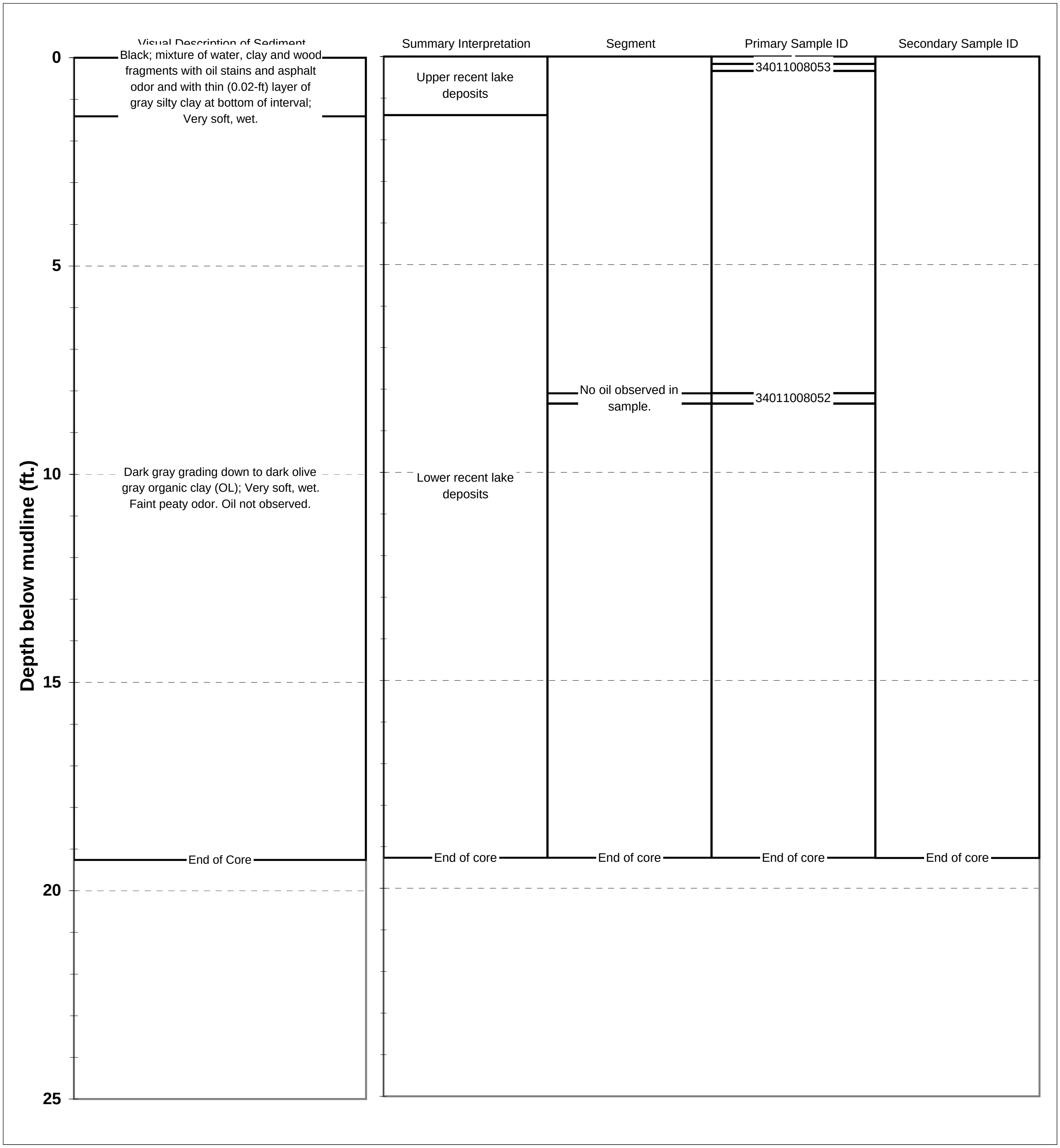
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **4--4**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 19.3 ft
Mudline elevation: -19.6 **ft (Corps lake datum)** **Percent recovery (on-deck):** 69%

	Core collection	**Laboratory processing**
Date:	8/13/2004	Aug. 13, 2004
Time:	14:18	11:45

Field Log: J. LaManna
Summary Log: J. LaManna



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Core Summary Log

Project: North Lake Union Sediment Survey

Station: **5-1**

Project No: COS-NAPL.T5

Maximum depth of retained sediment: 10.6 ft

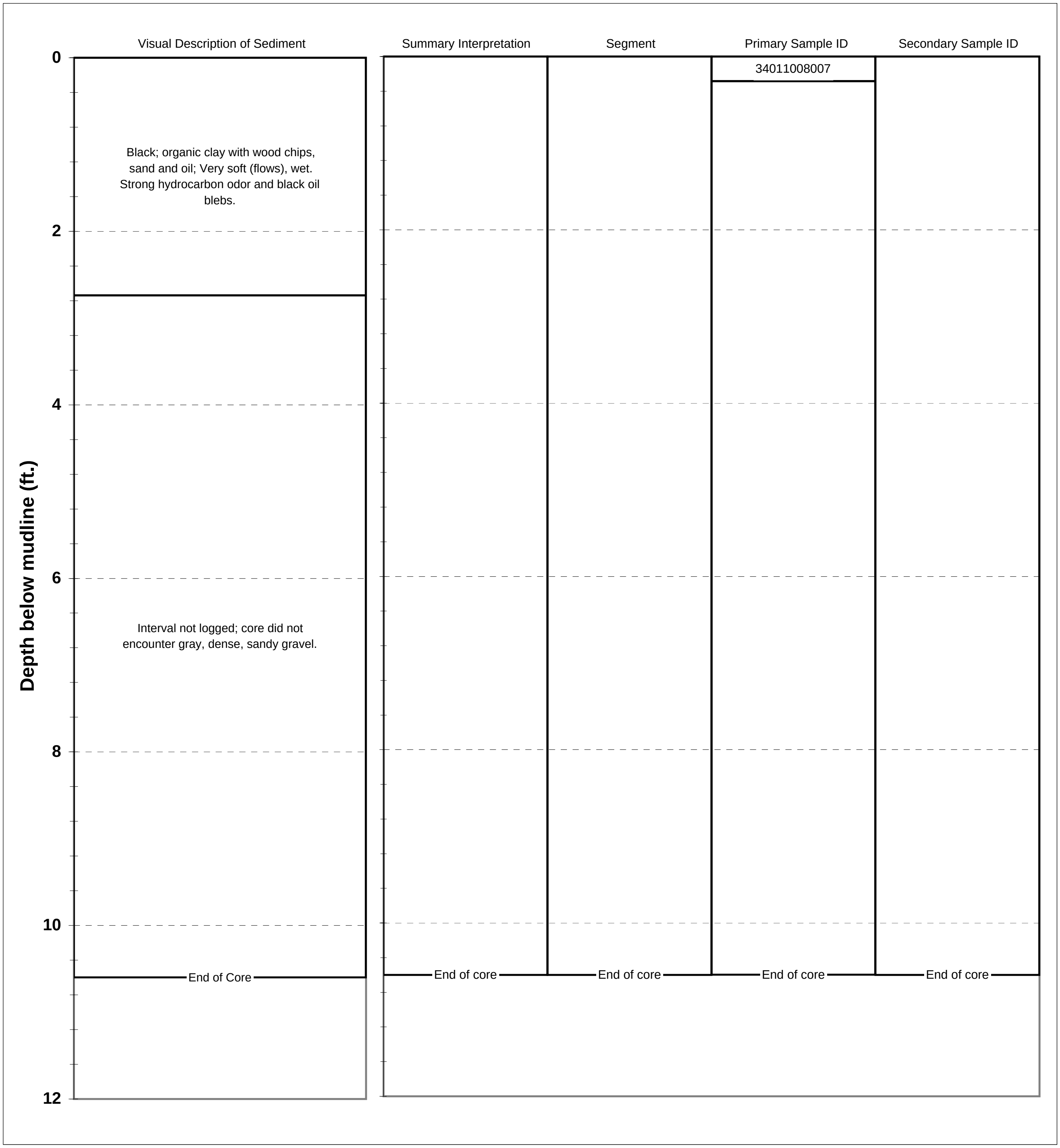
Mudline elevation: -18.6 **ft (Corps lake datum)**

Percent recovery (on-deck): 79%

	Core collection	**Laboratory processing**
Date:	8/10/2004	Aug. 10, 2004
Time:	9:00	15:00

Field Log: J. LaManna

Summary Log: J. LaManna



Black; organic clay with wood chips, sand and oil; Very soft (flows), wet. Strong hydrocarbon odor and black oil blebs.

Interval not logged; core did not encounter gray, dense, sandy gravel.

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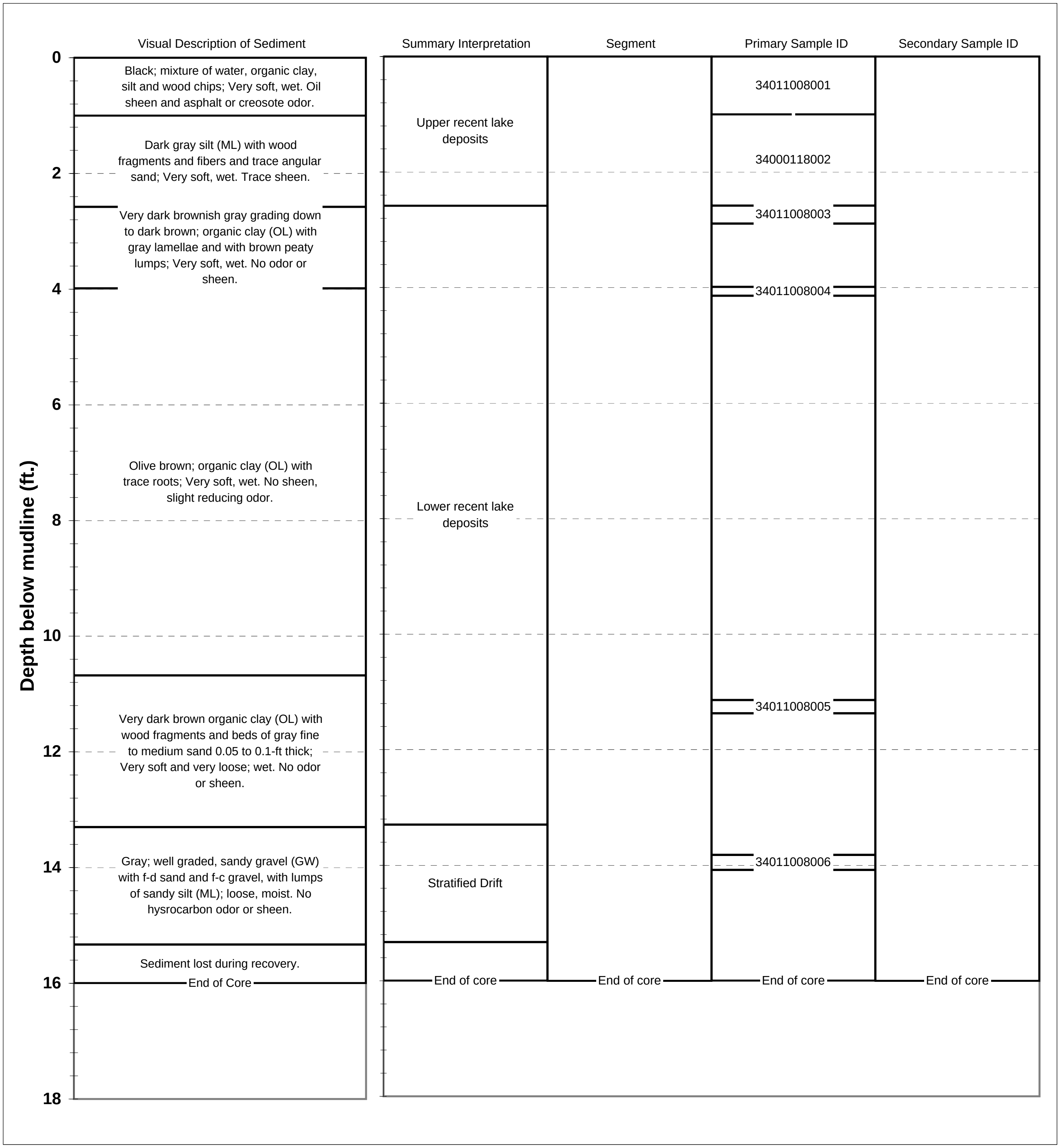
Core Summary Log

Project: North Lake Union Sediment Survey
Station: 5-1 Rep 2
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 16.0 ft
Mudline elevation: -18.1 **ft (Corps lake datum)**
Percent recovery (on-deck): 68%

	Core collection	Laboratory processing
Date:	8/10/2004	Aug. 10, 2004
Time:	9:38	13:30

Field Log: J. LaManna
Summary Log: J. LaManna



Visual Description of Sediment

Black; mixture of water, organic clay, silt and wood chips; Very soft, wet. Oil sheen and asphalt or creosote odor.

Dark gray silt (ML) with wood fragments and fibers and trace angular sand; Very soft, wet. Trace sheen.

Very dark brownish gray grading down to dark brown; organic clay (OL) with gray lamellae and with brown peaty lumps; Very soft, wet. No odor or sheen.

Olive brown; organic clay (OL) with trace roots; Very soft, wet. No sheen, slight reducing odor.

Very dark brown organic clay (OL) with wood fragments and beds of gray fine to medium sand 0.05 to 0.1-ft thick; Very soft and very loose; wet. No odor or sheen.

Gray; well graded, sandy gravel (GW) with f-d sand and f-c gravel, with lumps of sandy silt (ML); loose, moist. No hysrocarbon odor or sheen.

Sediment lost during recovery.

End of Core

Summary Interpretation

Upper recent lake deposits

Lower recent lake deposits

Stratified Drift

End of core

Segment

End of core

Primary Sample ID

34011008001

34000118002

34011008003

34011008004

34011008005

34011008006

End of core

Secondary Sample ID

End of core

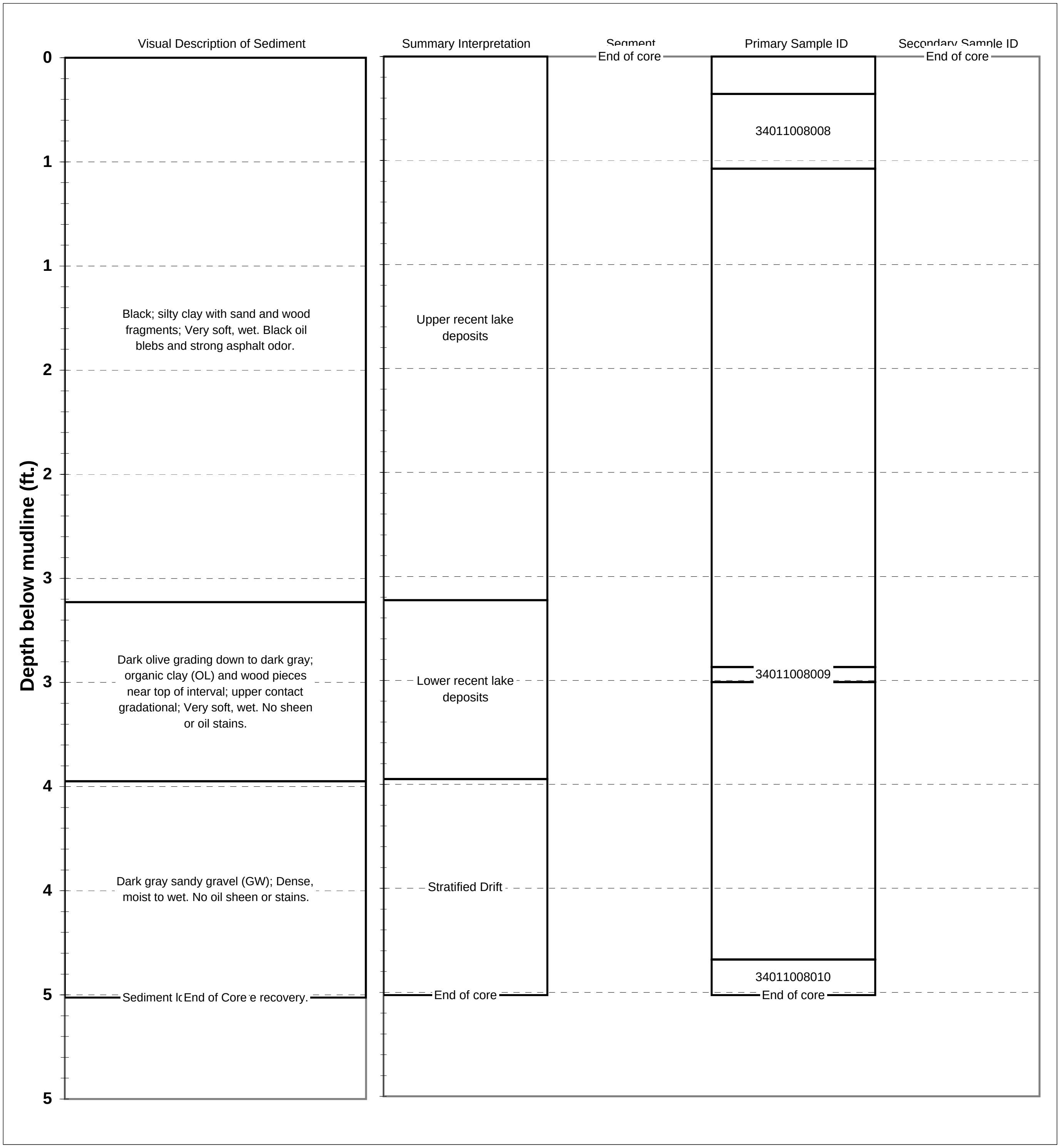
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **5-3 Rep 3**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: #DIV/0! ft
Mudline elevation: -14.2 **ft (Corps lake datum)** **Percent recovery (on-deck):** 70%

	Core collection	**Laboratory processing**
Date:	8/10/2004	Aug. 10, 2004
Time:	12:40	16:00

Field Log: J. LaManna
Summary Log: J. LaManna



Black; silty clay with sand and wood fragments; Very soft, wet. Black oil blebs and strong asphalt odor.

Dark olive grading down to dark gray; organic clay (OL) and wood pieces near top of interval; upper contact gradational; Very soft, wet. No sheen or oil stains.

Dark gray sandy gravel (GW); Dense, moist to wet. No oil sheen or stains.

Upper recent lake deposits

Lower recent lake deposits

Stratified Drift

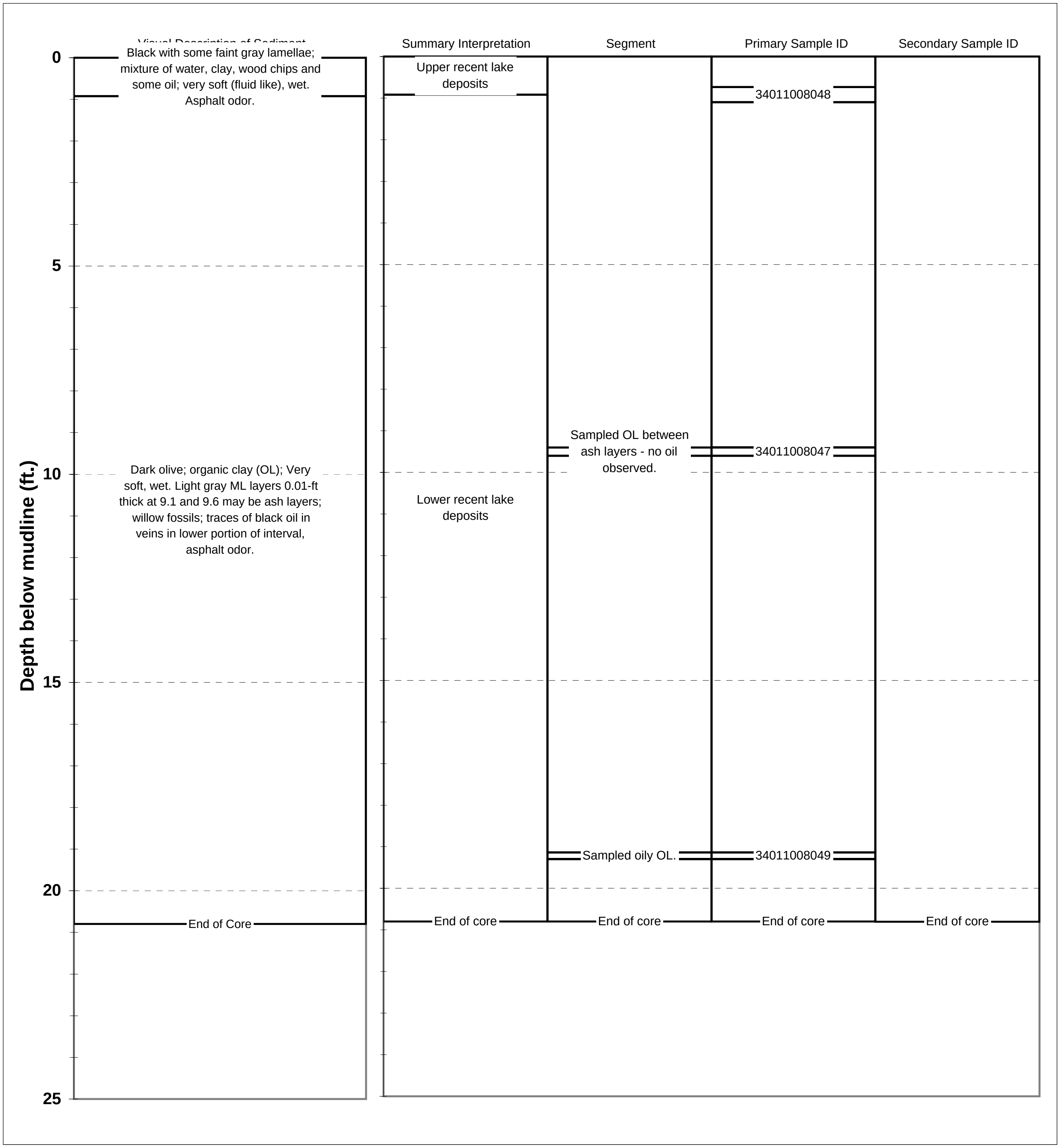
Core Summary Log

Project: North Lake Union Sediment Survey **Station:** **5--2**
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 20.8 ft
Mudline elevation: -20.1 **ft (Corps lake datum)** **Percent recovery (on-deck):** 78%

	Core collection	Laboratory processing
Date:	8/12/2004	Aug. 12, 2004
Time:	11:30	15:45

Field Log: J. LaManna
Summary Log: J. LaManna



Black with some faint gray lamellae; mixture of water, clay, wood chips and some oil; very soft (fluid like), wet. Asphalt odor.

Dark olive; organic clay (OL); Very soft, wet. Light gray ML layers 0.01-ft thick at 9.1 and 9.6 may be ash layers; willow fossils; traces of black oil in veins in lower portion of interval, asphalt odor.

Upper recent lake deposits

Lower recent lake deposits

Sampled OL between ash layers - no oil observed.

Sampled oily OL.

34011008048

34011008047

34011008049

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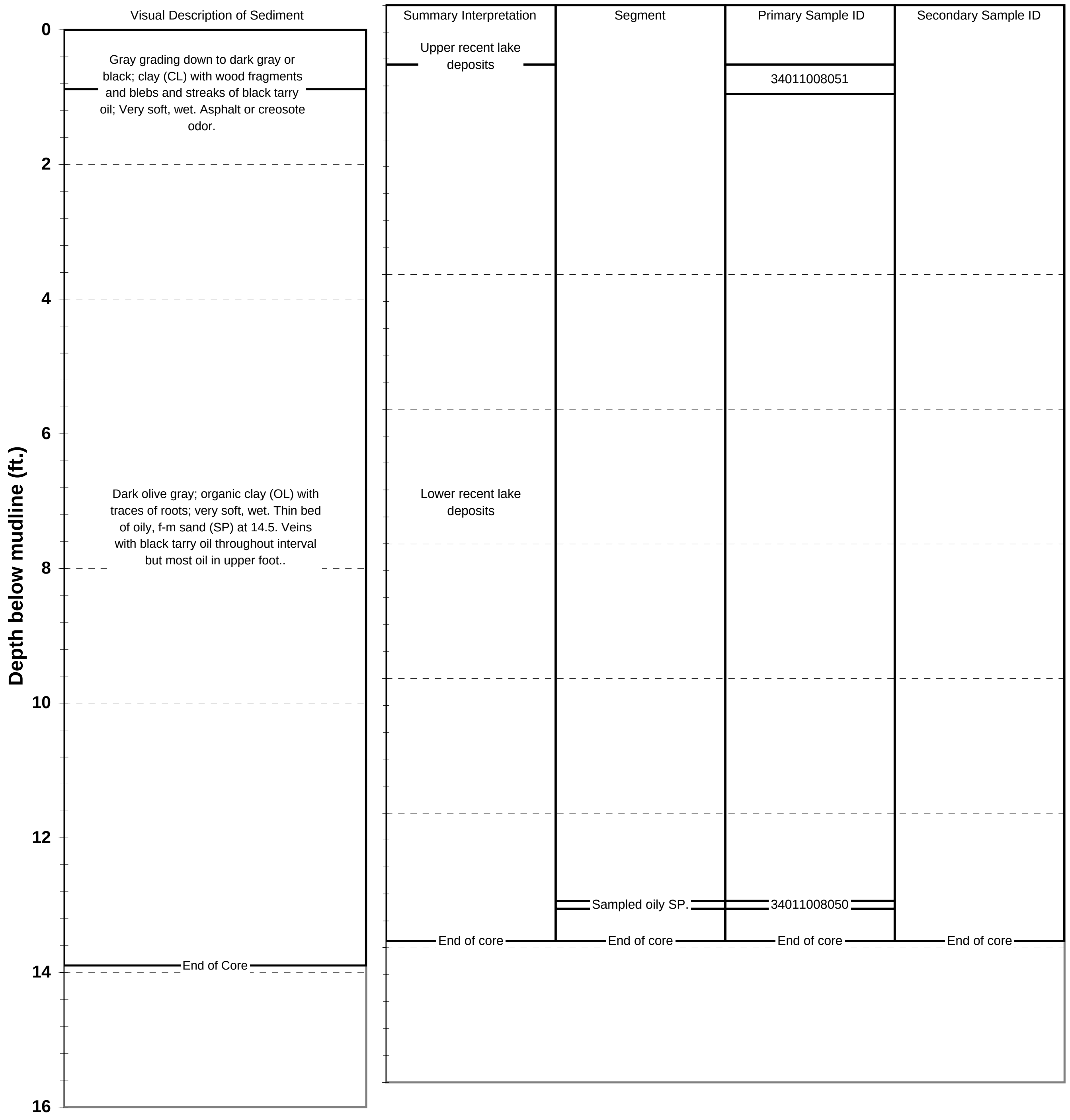
Core Summary Log

Project: North Lake Union Sediment Survey
Station: 5--4
Project No: COS-NAPL.T5

Maximum depth of retained sediment: 13.9 ft
Mudline elevation: -19.1 **ft (Corps lake datum)**
Percent recovery (on-deck): 76%

	Core collection	**Laboratory processing**
Date:	8/12/2004	Aug. 13, 2004
Time:	13:15	10:30

Field Log: J. LaManna
Summary Log: J. LaManna



Gray grading down to dark gray or black; clay (CL) with wood fragments and blebs and streaks of black tarry oil; Very soft, wet. Asphalt or creosote odor.

Dark olive gray; organic clay (OL) with traces of roots; very soft, wet. Thin bed of oily, f-m sand (SP) at 14.5. Veins with black tarry oil throughout interval but most oil in upper foot..

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SUB-ATTACHMENT 2D-4.3

RI/FS 2005 Sediment Core Logs

Seattle Law Department
Gas Works Park

Chemical Forensics Sampling Report

Appendix C
RI/FS 2005 Sediment Core Logs

DRAFT

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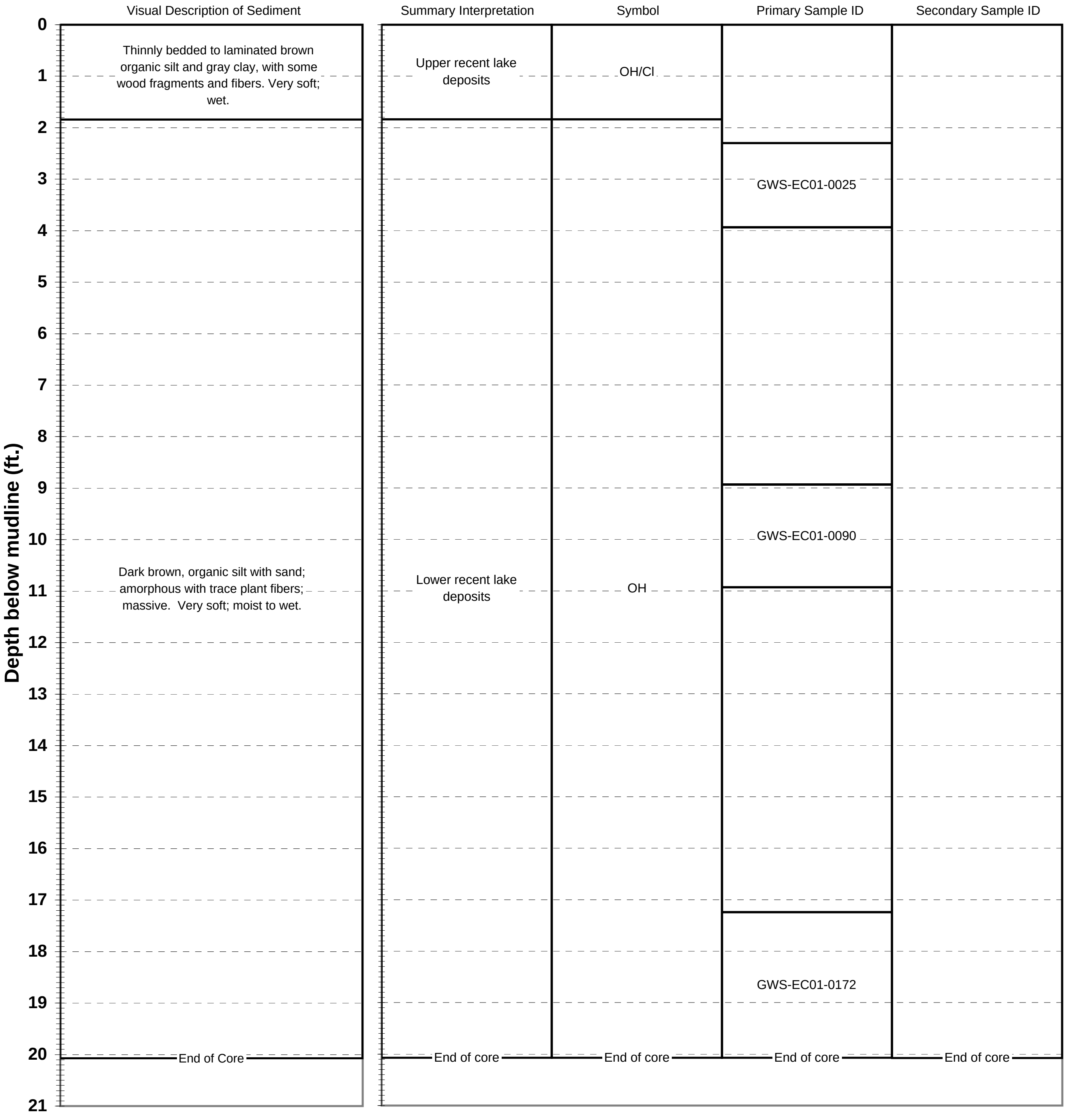
Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC01**
Project No: 3400542.002
Maximum depth of retained sediment: 20.1 ft
Mudline elevation: -19.9 **ft (Corps lake datum)** **Percent recovery (on-deck):** 76%

	Core collection	**Laboratory processing**	**Position:**	N238271	E1269512	(NAD83 SPC WAN)
Date:	5/18/2005	5/18/2005	**Field Log:**	John LaManna		
Time:	13:01	0:00	**Summary Log:**	John LaManna		

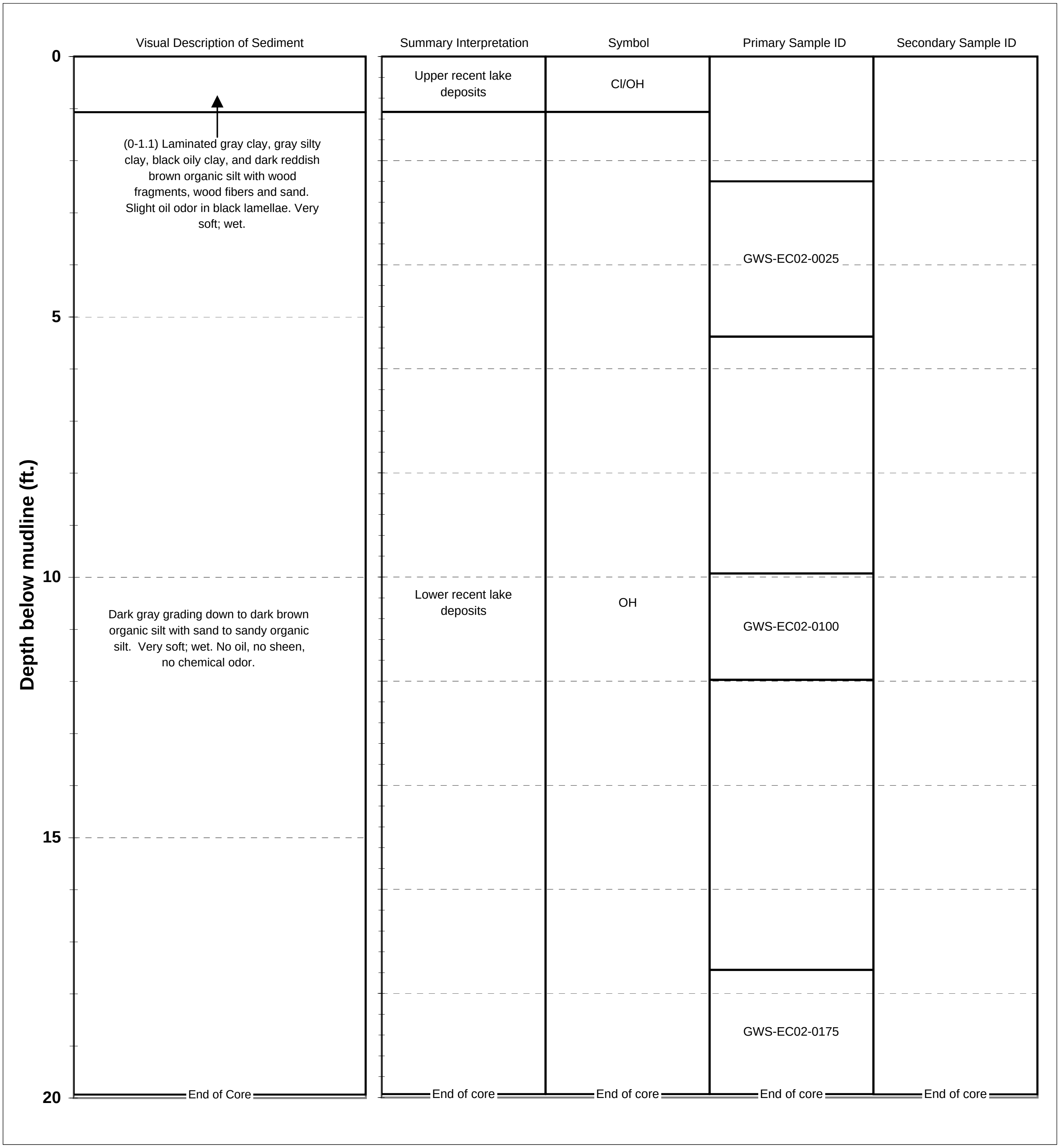


Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC02**
Project No: 3400542.002
Maximum depth of retained sediment: 19.9 ft
Mudline elevation: -20.3 **ft (Corps lake datum)** **Percent recovery (on-deck):** 61%

	Core collection	**Laboratory processing**				
Date:	5/19/2005	5/19/2005	**Position:**	N238520	E1269647	(NAD83 SPC WAN)
Time:	8:41	0:00				

Field Log: John LaManna
Summary Log: John LaManna



(0-1.1) Laminated gray clay, gray silty clay, black oily clay, and dark reddish brown organic silt with wood fragments, wood fibers and sand. Slight oil odor in black lamellae. Very soft; wet.

Dark gray grading down to dark brown organic silt with sand to sandy organic silt. Very soft; wet. No oil, no sheen, no chemical odor.

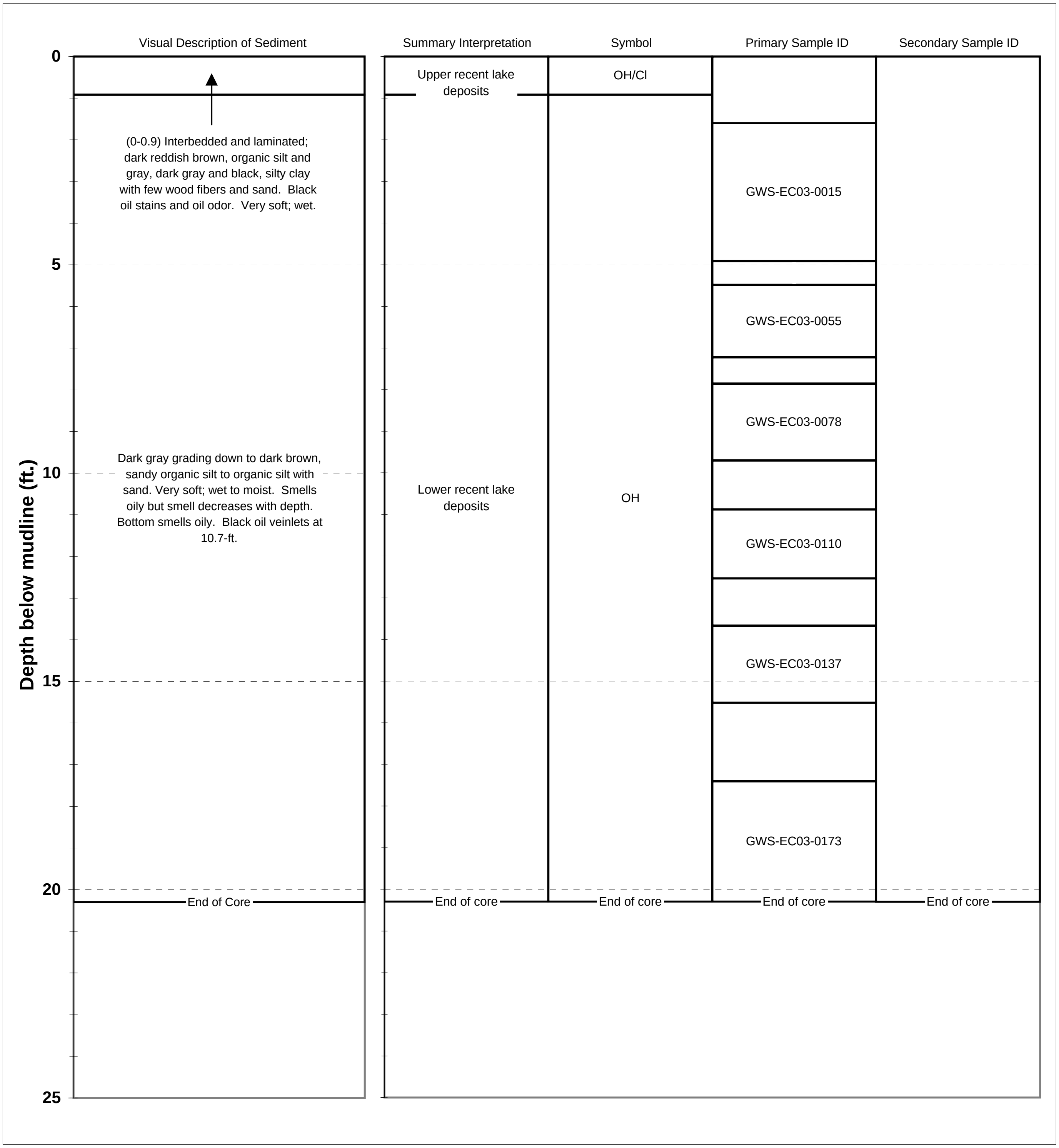
Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC03**
Project No: 3400542.002

Maximum depth of retained sediment: 20.3 ft
Mudline elevation: -19.9 **ft (Corps lake datum)** **Percent recovery (on-deck):** 70%

	Core collection	Laboratory processing
Date:	5/19/2005	5/19/2005
Time:	10:28	0:00

Position: N238690 E1269515 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



(0-0.9) Interbedded and laminated; dark reddish brown, organic silt and gray, dark gray and black, silty clay with few wood fibers and sand. Black oil stains and oil odor. Very soft; wet.

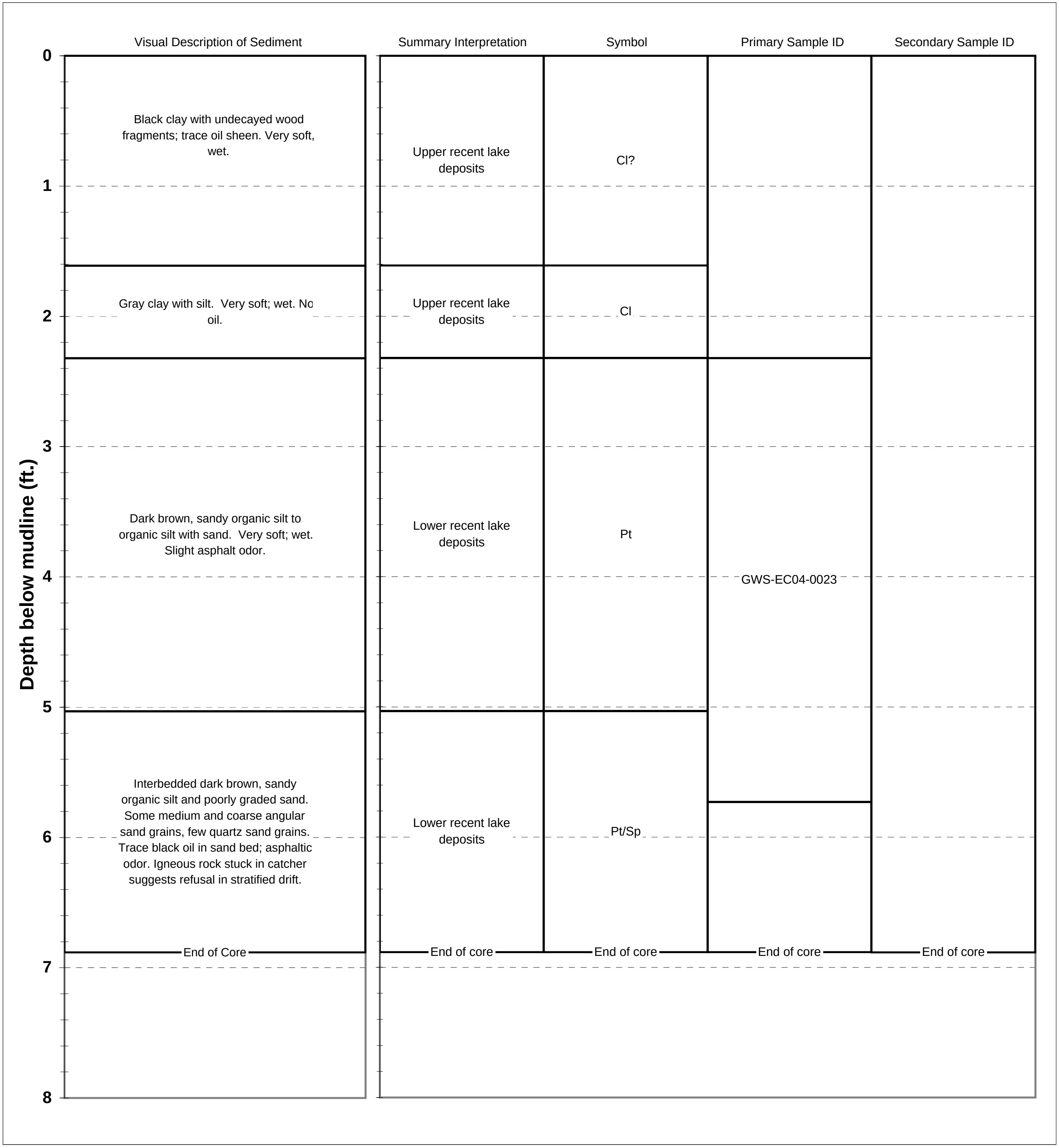
Dark gray grading down to dark brown, sandy organic silt to organic silt with sand. Very soft; wet to moist. Smells oily but smell decreases with depth. Bottom smells oily. Black oil veinlets at 10.7-ft.

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC04**
Project No: 3400542.002
Maximum depth of retained sediment: 6.9 ft
Mudline elevation: -19.1 **ft (Corps lake datum)** **Percent recovery (on-deck):** 51%

	Core collection	Laboratory processing
Date:	5/17/2005	5/17/2005
Time:	10:30	0:00

Position: N238646 E1269721 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



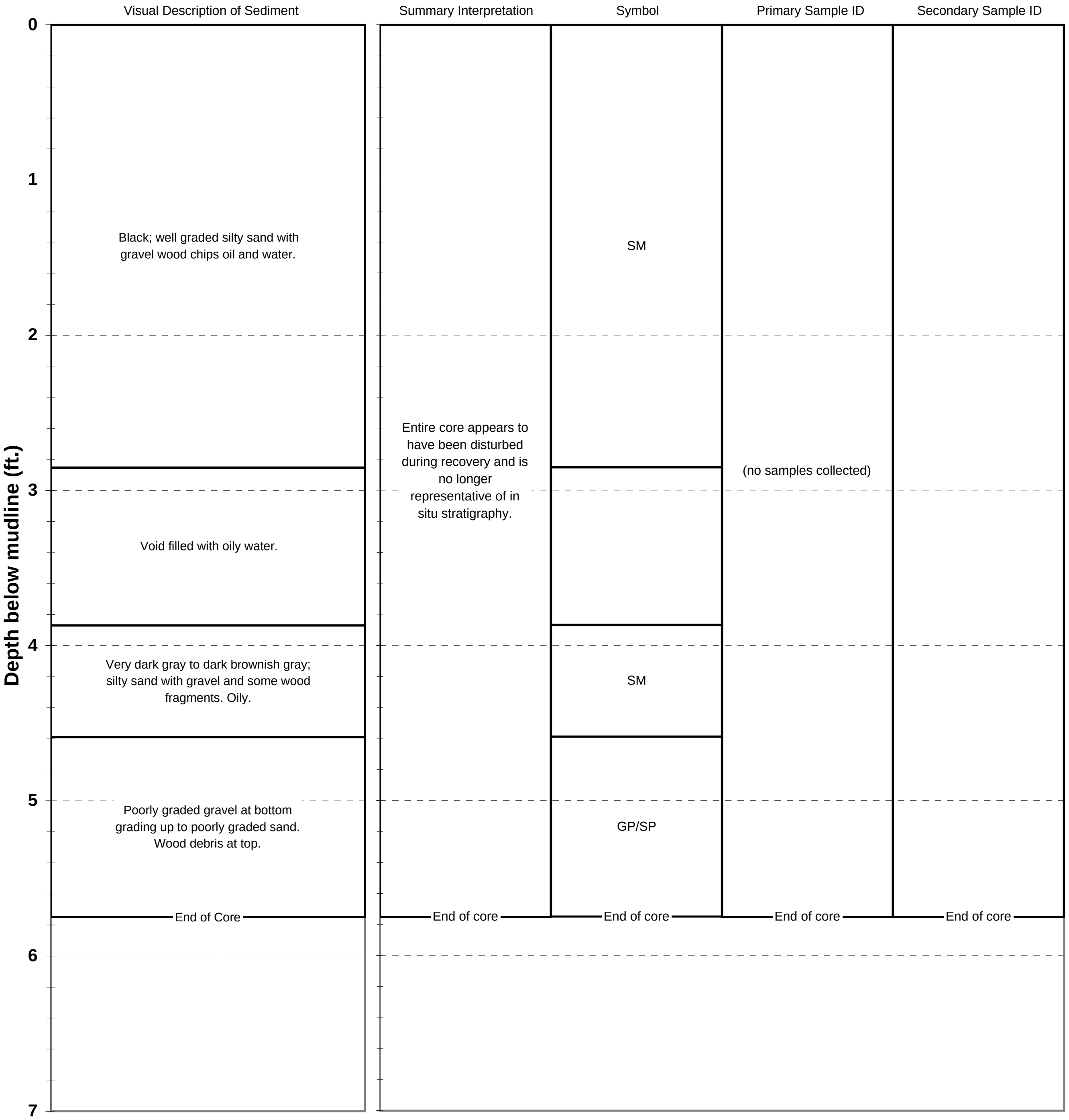
Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Black clay with undecayed wood fragments; trace oil sheen. Very soft, wet.	Upper recent lake deposits	Cl?		
Gray clay with silt. Very soft; wet. No oil.	Upper recent lake deposits	Cl		
Dark brown, sandy organic silt to organic silt with sand. Very soft; wet. Slight asphalt odor.	Lower recent lake deposits	Pt	GWS-EC04-0023	
Interbedded dark brown, sandy organic silt and poorly graded sand. Some medium and coarse angular sand grains, few quartz sand grains. Trace black oil in sand bed; asphaltic odor. Igneous rock stuck in catcher suggests refusal in stratified drift.	Lower recent lake deposits	Pt/Sp		
End of Core	End of core	End of core	End of core	End of core

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC05**
Project No: 3400542.002

Maximum depth of retained sediment: 5.7 ft
Mudline elevation: -7.7 **ft (Corps lake datum)** **Percent recovery (on-deck):** 75%

	Core collection	**Laboratory processing**				
			Position:	N238693	E1269888	(NAD83 SPC WAN)
Date:	5/16/2005	5/16/2005	**Field Log:**	John LaManna		
Time:	13:10	0:00	**Summary Log:**	John LaManna		



Black; well graded silty sand with gravel wood chips oil and water.

Void filled with oily water.

Very dark gray to dark brownish gray; silty sand with gravel and some wood fragments. Oily.

Poorly graded gravel at bottom grading up to poorly graded sand. Wood debris at top.

Entire core appears to have been disturbed during recovery and is no longer representative of in situ stratigraphy.

(no samples collected)

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC05R4**
Project No: 3400542.002
Maximum depth of retained sediment: 7.7 ft
Mudline elevation: -10.2 **ft (Corps lake datum)** **Percent recovery (on-deck):** 58%

	Core collection	Laboratory processing
Date:	5/20/2005	5/20/2005
Time:	12:50	0:00

Position: N238680 E1269868 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna

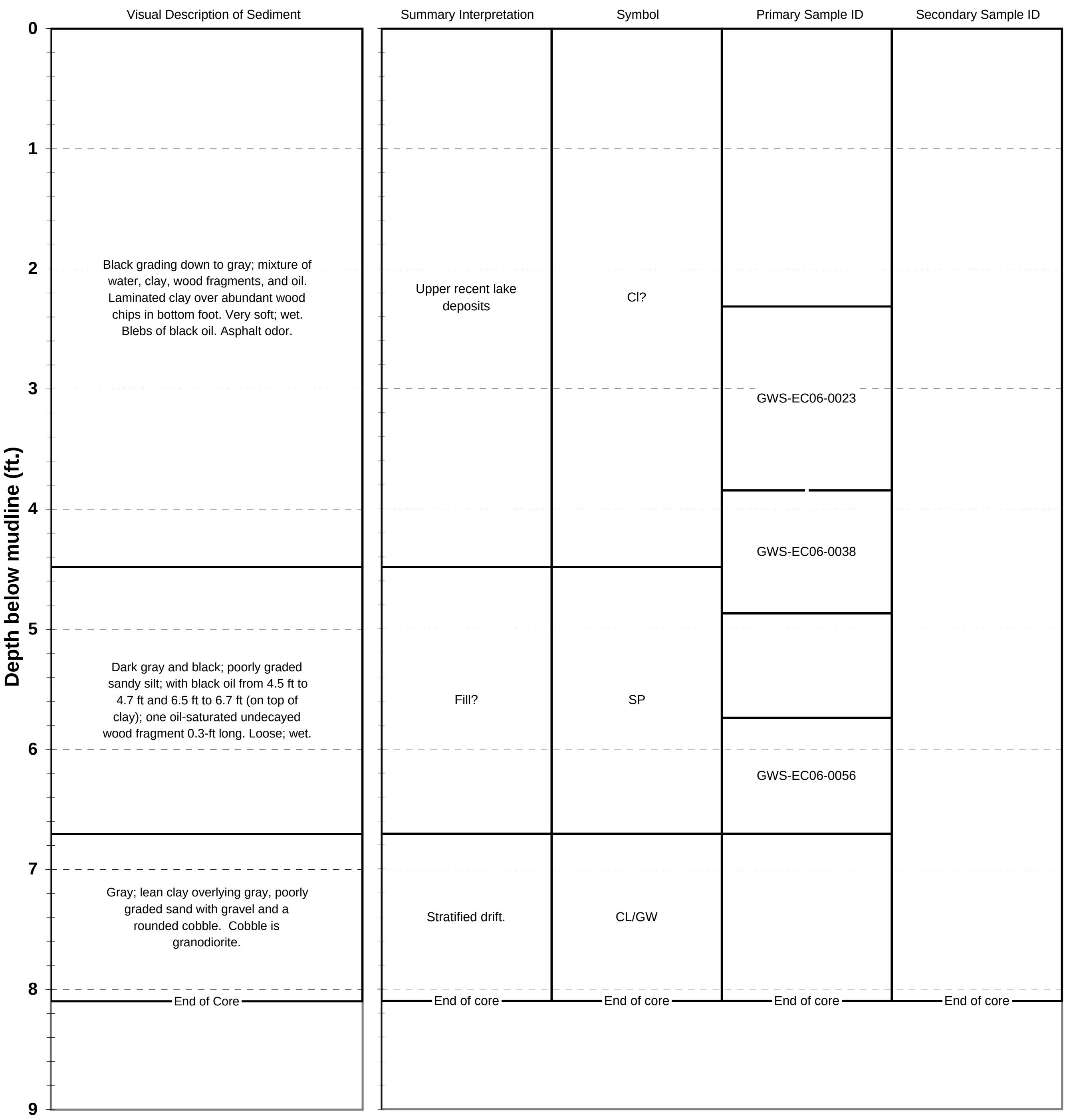
Depth below mudline (ft.)

Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Dark gray slurry of water, clay, silt, wood chips and oil. Asphalt odor.	Upper recent lake deposits	Cl?	(no samples collected)	
Black mixture of clay, water, oil, wood fragments and sand. Gelatinous.		Cl?		
Dark reddish brown, organic silt. Very soft; wet. Gelatinous.	Lower recent lake deposits	OH		
Gray; silty gravel. Very loose; wet.	Weathered stratified drift.	GM		
Gray; sandy silt with gravel and some interbeds of silty fine sand. Dense; moist to wet. No oil.	Stratified drift: possibly glacially overridden.	SM		
Gray; poorly graded fine sand, <20% gravel, rounded, <5% silt. Dense. No oil.		SP		
Gray; silty fine sand. Dense; moist to wet. No oil.		SM		
End of Core	End of core	End of core	End of core	End of core

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC06**
Project No: 3400542.002
Maximum depth of retained sediment: 8.1 ft
Mudline elevation: -11.8 **ft (Corps lake datum)** **Percent recovery (on-deck):** 71%

	Core collection	**Laboratory processing**			
			Position:	N238765	E1269800 (NAD83 SPC WAN)
Date:	5/16/2005	5/16/2005	**Field Log:**	John LaManna	
Time:	11:16	0:00	**Summary Log:**	John LaManna	



Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Black grading down to gray; mixture of water, clay, wood fragments, and oil. Laminated clay over abundant wood chips in bottom foot. Very soft; wet. Blebs of black oil. Asphalt odor.	Upper recent lake deposits	Cl?	GWS-EC06-0023 GWS-EC06-0038	
Dark gray and black; poorly graded sandy silt; with black oil from 4.5 ft to 4.7 ft and 6.5 ft to 6.7 ft (on top of clay); one oil-saturated undecayed wood fragment 0.3-ft long. Loose; wet.	Fill?	SP	GWS-EC06-0056	
Gray; lean clay overlying gray, poorly graded sand with gravel and a rounded cobble. Cobble is granodiorite.	Stratified drift.	CL/GW		
End of Core	End of core	End of core	End of core	End of core

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC07**
Project No: 3400542.002
Maximum depth of retained sediment: 7.7 ft
Mudline elevation: -2.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 84%

	Core collection	Laboratory processing				
Date:	5/16/2005	5/16/2005	**Position:**	N239035	E1269642	(NAD83 SPC WAN)
Time:	10:07	0:00	**Field Log:**	John LaManna		
			Summary Log:	John LaManna		

Depth below mudline (ft.): 0 1 2 3 4 5 6 7 8 9

Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Black; emulsion of water, wood fragments, oil and sand. Gelatinous to semi-solid. Very soft; wet. Asphalt odor.	Upper recent lake deposit	(NA)		
Very dark olive brown; silty sand. Trace wood fragments, possible brick fragments. Thin bed of black grit at 10.6. Oily. Very loose; wet.	Fill	GW	GWS-EC07-0013	
Black; silty sand, at bottom of interval, fine to coase gravel; trace wood fragments and glass. Blebs of black oil.	Fill or disturbed lake deposit mixed with debris	OL?	GWS-EC07-0034	
Gray; beds of clay, over poorly graded sand, over gravel with sand, over silty sand. Medium dense; wet. Some oil sheen on sand bed.	Stratified drift	CL/SP/GW/SM	GWS-EC07-0046 GWS-EC07-0056	
End of Core	End of core	End of core	End of core	End of core

Core Summary Log

Project: Gas Works Sediment-Western Study Area

Station: GWS-EC07DUP

Project No: 3400542.002

Maximum depth of retained sediment: 8.0 ft

Mudline elevation: -1.6 **ft (Corps lake datum)**

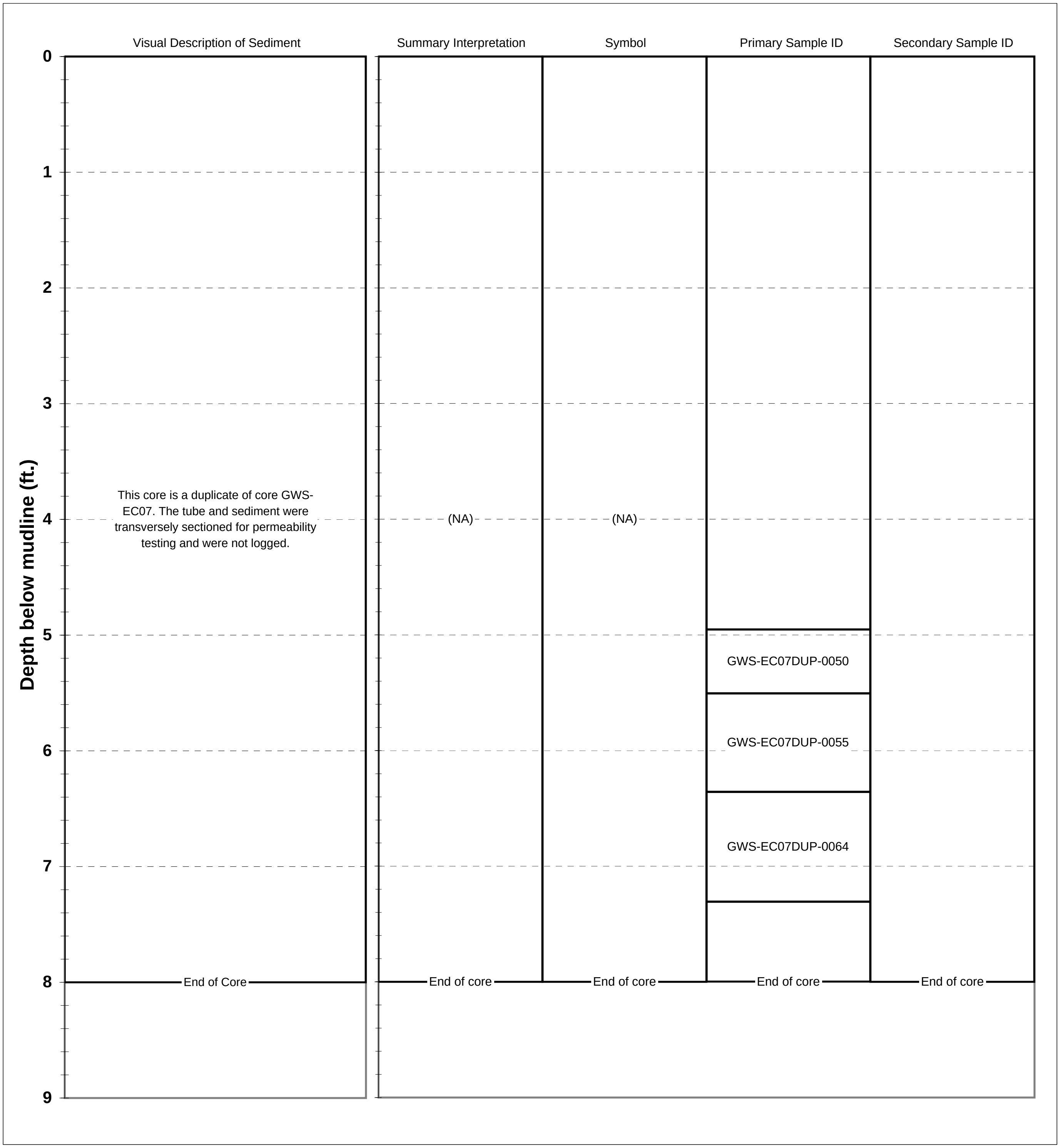
Percent recovery (on-deck): 78%

	Core collection	**Laboratory processing**
Date:	5/16/2005	5/16/2005
Time:	14:36	0:00

Position: N239033 E1269643 (NAD83 SPC WAN)

Field Log: John LaManna

Summary Log: John LaManna



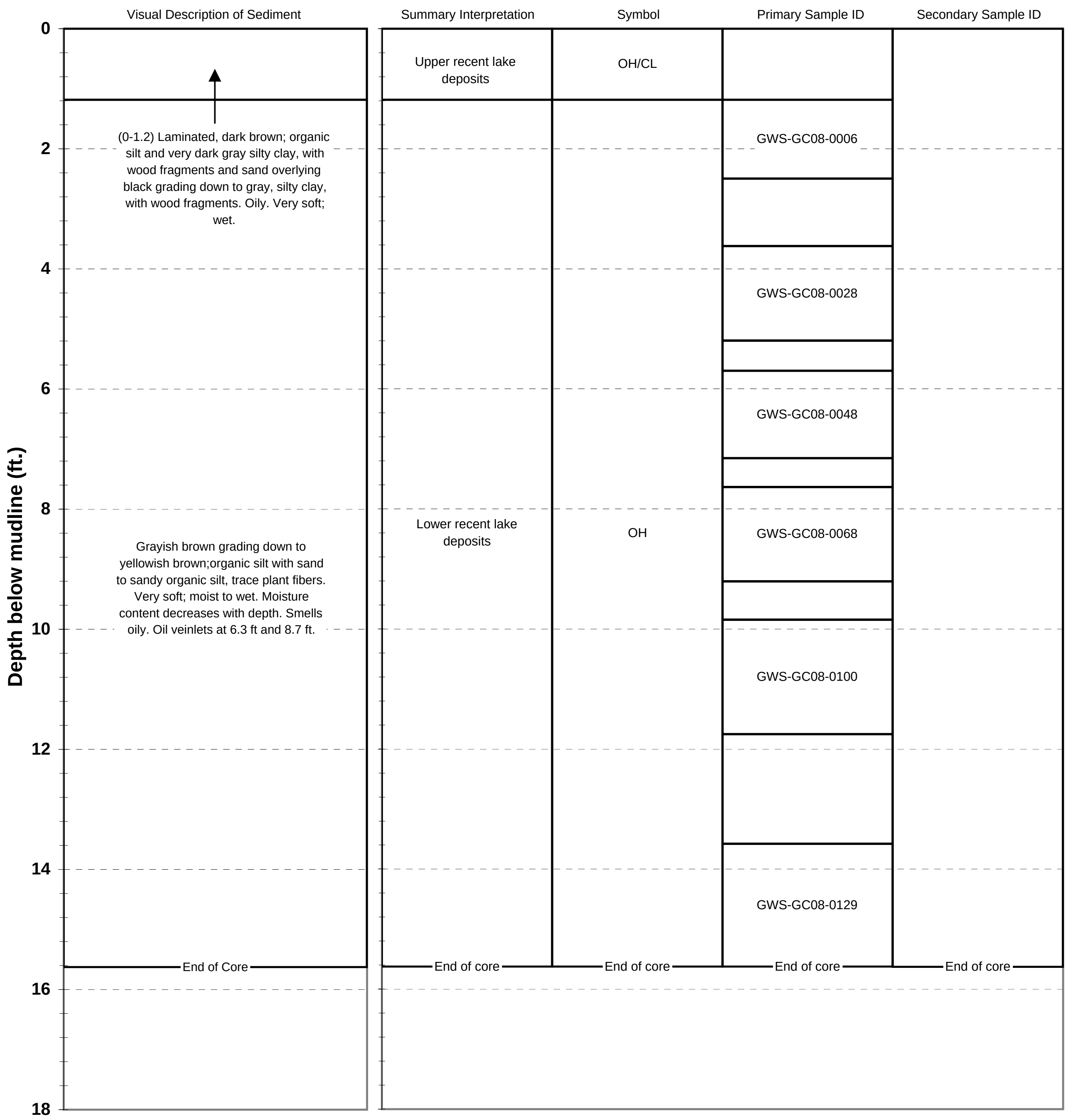
This core is a duplicate of core GWS-EC07. The tube and sediment were transversely sectioned for permeability testing and were not logged.

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC08**
Project No: 3400542.002

Maximum depth of retained sediment: 15.6 ft
Mudline elevation: -19.8 **ft (Corps lake datum)** **Percent recovery (on-deck):** 85%

	Core collection	**Laboratory processing**				
Date:	5/16/2005	5/16/2005	**Position:**	N238894	E1269444	(NAD83 SPC WAN)
Time:	13:54	0:00	**Field Log:**	John LaManna		
			Summary Log:	John LaManna		



(0-1.2) Laminated, dark brown; organic silt and very dark gray silty clay, with wood fragments and sand overlying black grading down to gray, silty clay, with wood fragments. Oily. Very soft; wet.

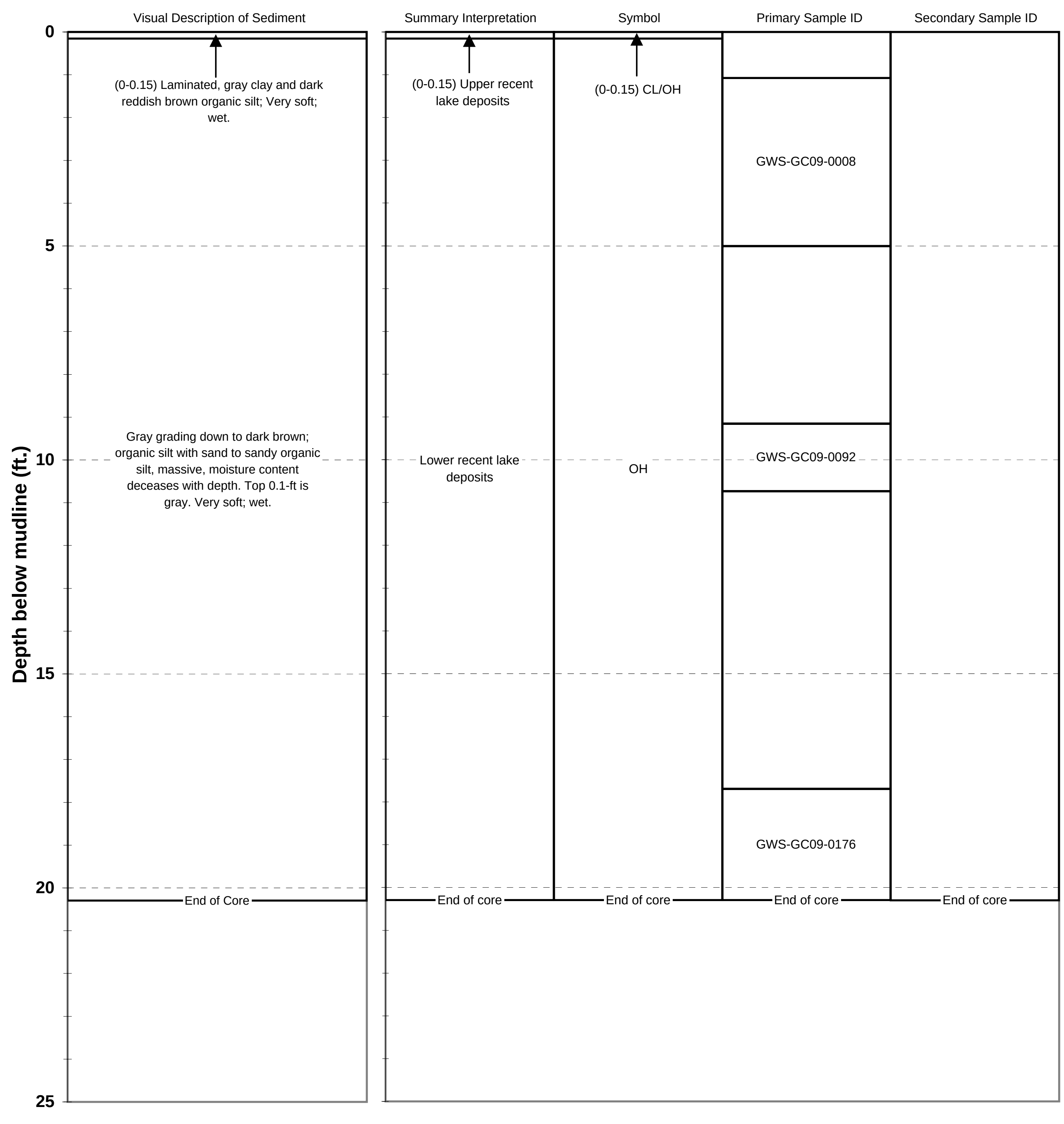
Grayish brown grading down to yellowish brown;organic silt with sand to sandy organic silt, trace plant fibers. Very soft; moist to wet. Moisture content decreases with depth. Smells oily. Oil veinlets at 6.3 ft and 8.7 ft.

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC09**
Project No: 3400542.002

Maximum depth of retained sediment: 20.3 ft
Mudline elevation: -19.6 **ft (Corps lake datum)** **Percent recovery (on-deck):** 76%

	Core collection	**Laboratory processing**				
Date:	5/19/2005	5/19/2005	**Position:**	N238842	E1269353	(NAD83 SPC WAN)
Time:	11:06	0:00	**Field Log:**	John LaManna		
			Summary Log:	John LaManna		



Core Summary Log

Project: Gas Works Sediment-Western Study Area

Station: **GWS-EC09DUP/EC24**

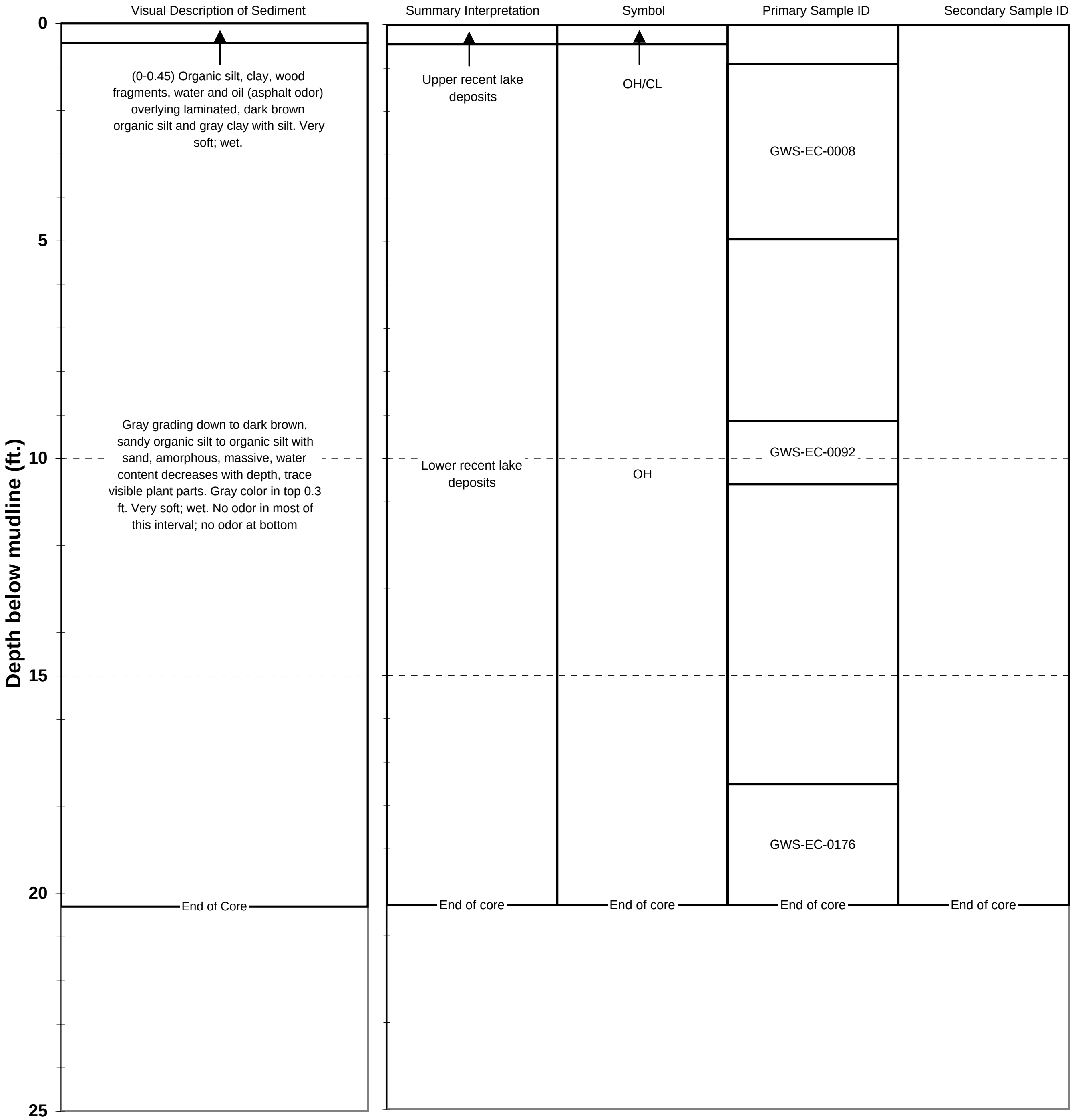
Project No: 3400542.002

Maximum depth of retained sediment: 20.3 ft

Mudline elevation: -19.7 **ft (Corps lake datum)**

Percent recovery (on-deck): 77%

	Core collection	**Laboratory processing**				
			Position:	N238845	E1269353	(NAD83 SPC WAN)
Date:	5/20/2005	5/20/2005	**Field Log:**	John LaManna		
Time:	10:35	0:00	**Summary Log:**	John LaManna		



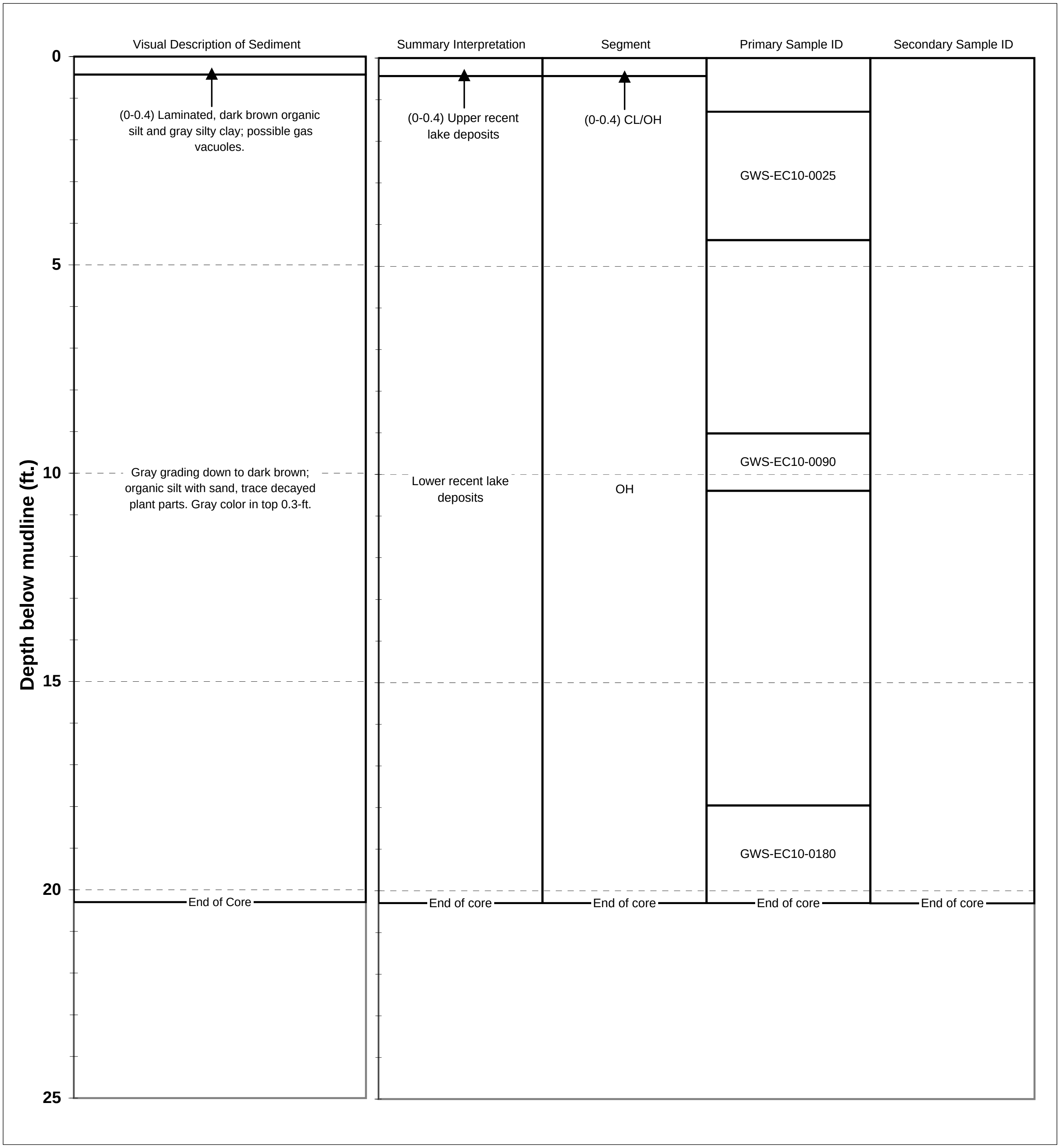
(0-0.45) Organic silt, clay, wood fragments, water and oil (asphalt odor) overlying laminated, dark brown organic silt and gray clay with silt. Very soft; wet.

Gray grading down to dark brown, sandy organic silt to organic silt with sand, amorphous, massive, water content decreases with depth, trace visible plant parts. Gray color in top 0.3 ft. Very soft; wet. No odor in most of this interval; no odor at bottom

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC10**
Project No: 3400542.002
Maximum depth of retained sediment: 20.3 ft
Mudline elevation: -19.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 82%

	Core collection	**Laboratory processing**	**Position:**	N238540	E1269116	(NAD83 SPC WAN)
Date:	5/18/2005	5/18/2005	**Field Log:**	John LaManna		
Time:	13:55	0:00	**Summary Log:**	John LaManna		



(0-0.4) Laminated, dark brown organic silt and gray silty clay; possible gas vacuoles.

Gray grading down to dark brown; organic silt with sand, trace decayed plant parts. Gray color in top 0.3-ft.

(0-0.4) Upper recent lake deposits

Lower recent lake deposits

(0-0.4) CL/OH

OH

GWS-EC10-0025

GWS-EC10-0090

GWS-EC10-0180

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC11**
Project No: 3400542.002

Maximum depth of retained sediment: 8.8 ft
Mudline elevation: 19.3 **ft (Corps lake datum)** **Percent recovery (on-deck):** 69%

	Core collection	Laboratory processing			
			Position:	N239263	E1269530 (NAD83 SPC WAN)
Date:	5/16/2005	5/16/2005	**Field Log:**	John LaManna	
Time:	9:15	0:00	**Summary Log:**	John LaManna	

Depth below mudline (ft.)

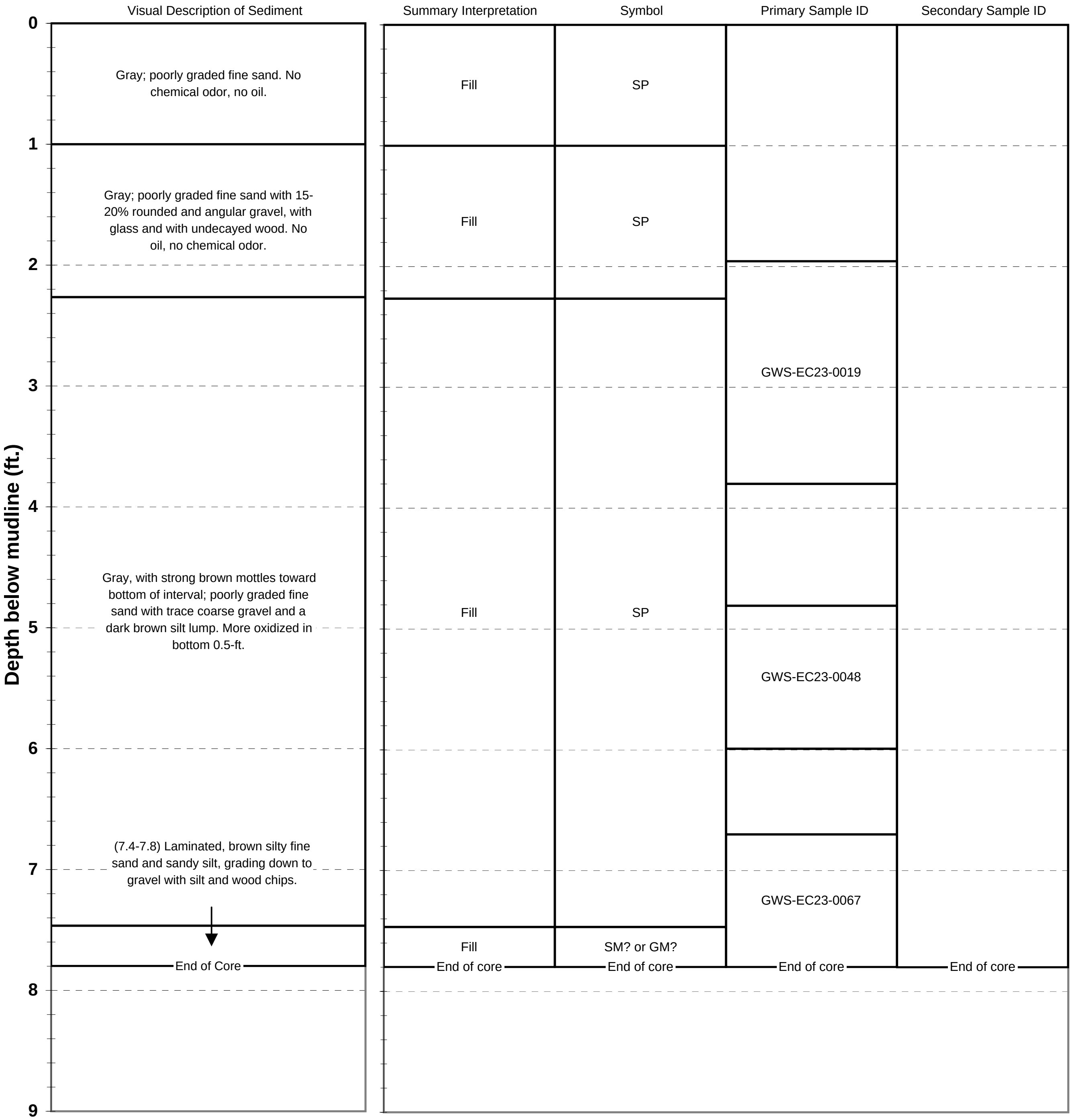
Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Dark gray poorly graded sand with gravel overlying dark gray silty sand with gravel; trace porceline, wood and glass fragments. No chemical odor.	Fill	SP/SM		
Dark grayish brown, poorly-graded, fine sand with trace rounded gravel and trace coarse sand, a lump of organics or decayed wood; fine gravel size lump of tarry sand with asphalt odor.	Fill	SP	GWS-EC11-0019	
			GWS-EC11-0048	
			GWS-EC11-0067	
Dark brown silt; over 0.1 ft of dark brown wood fragments.	Fill	ML		
End of Core	End of core	End of core	End of core	End of core

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC11Dup/EC-23**
Project No: 3400542.002
Maximum depth of retained sediment: 7.8 ft
Mudline elevation: 19.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 68%

	Core collection	**Laboratory processing**
Date:	5/17/2005	5/17/2005
Time:	12:56	0:00

Position: N239262 E1269530 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Gray; poorly graded fine sand. No chemical odor, no oil.	Fill	SP		
Gray; poorly graded fine sand with 15-20% rounded and angular gravel, with glass and with undecayed wood. No oil, no chemical odor.	Fill	SP		
Gray, with strong brown mottles toward bottom of interval; poorly graded fine sand with trace coarse gravel and a dark brown silt lump. More oxidized in bottom 0.5-ft. (7.4-7.8) Laminated, brown silty fine sand and sandy silt, grading down to gravel with silt and wood chips.	Fill	SP	GWS-EC23-0019 GWS-EC23-0048 GWS-EC23-0067	
	Fill	SM? or GM?		
End of Core	End of core	End of core	End of core	End of core

Core Summary Log

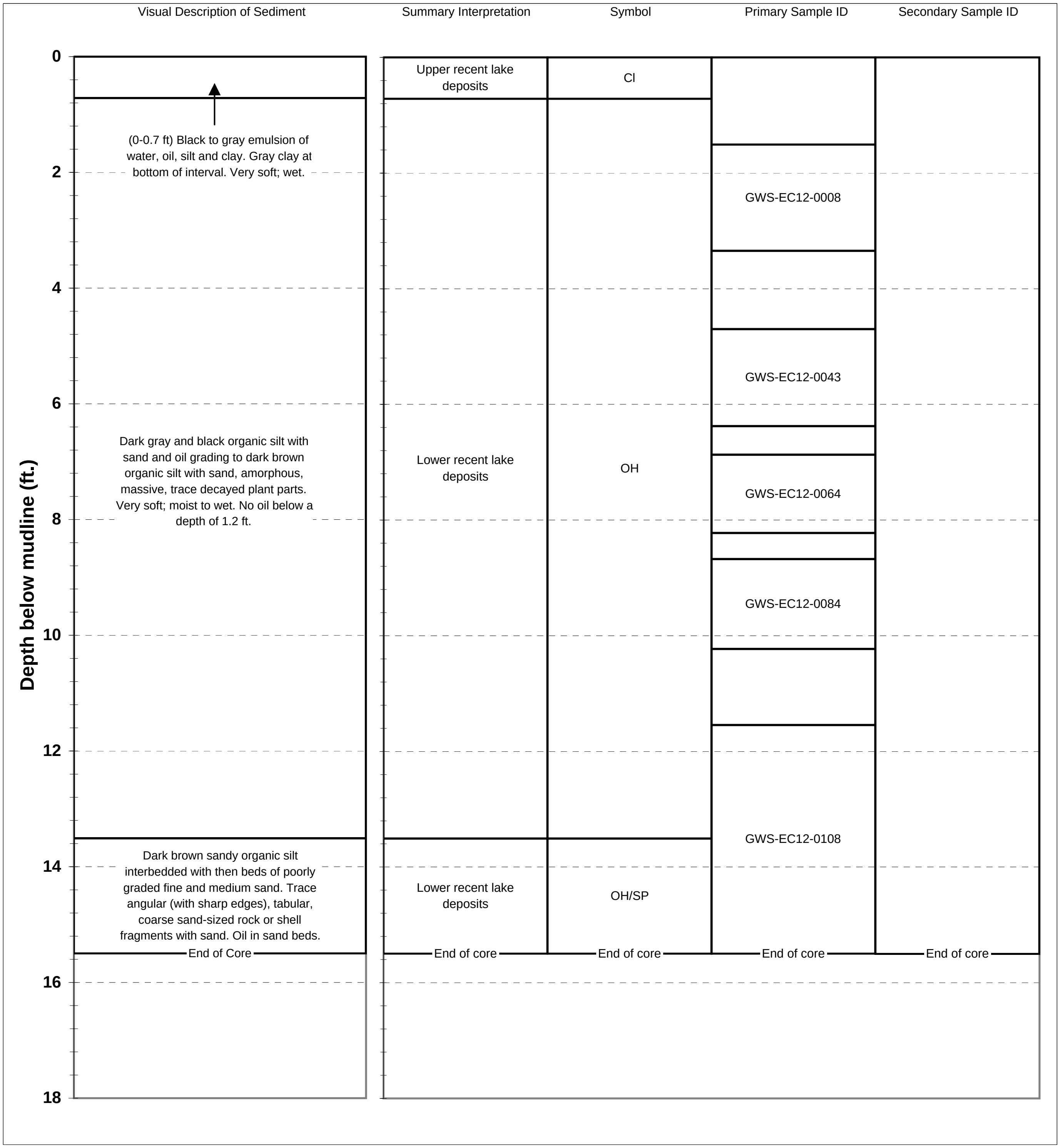
Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC12**

Project No: 3400542.002

Maximum depth of retained sediment: 15.5 ft

Mudline elevation: -19.0 **ft (Corps lake datum)** **Percent recovery (on-deck):** 73%

	Core collection	**Laboratory processing**				
			Position:	N239177	E1269370	(NAD83 SPC WAN)
Date:	5/17/2005	5/17/2005	**Field Log:**	John LaMann a		
Time:	8:46	0:00	**Summary Log:**	John LaMann a		



(0-0.7 ft) Black to gray emulsion of water, oil, silt and clay. Gray clay at bottom of interval. Very soft; wet.

Dark gray and black organic silt with sand and oil grading to dark brown organic silt with sand, amorphous, massive, trace decayed plant parts. Very soft; moist to wet. No oil below a depth of 1.2 ft.

Dark brown sandy organic silt interbedded with then beds of poorly graded fine and medium sand. Trace angular (with sharp edges), tabular, coarse sand-sized rock or shell fragments with sand. Oil in sand beds.

Core Summary Log

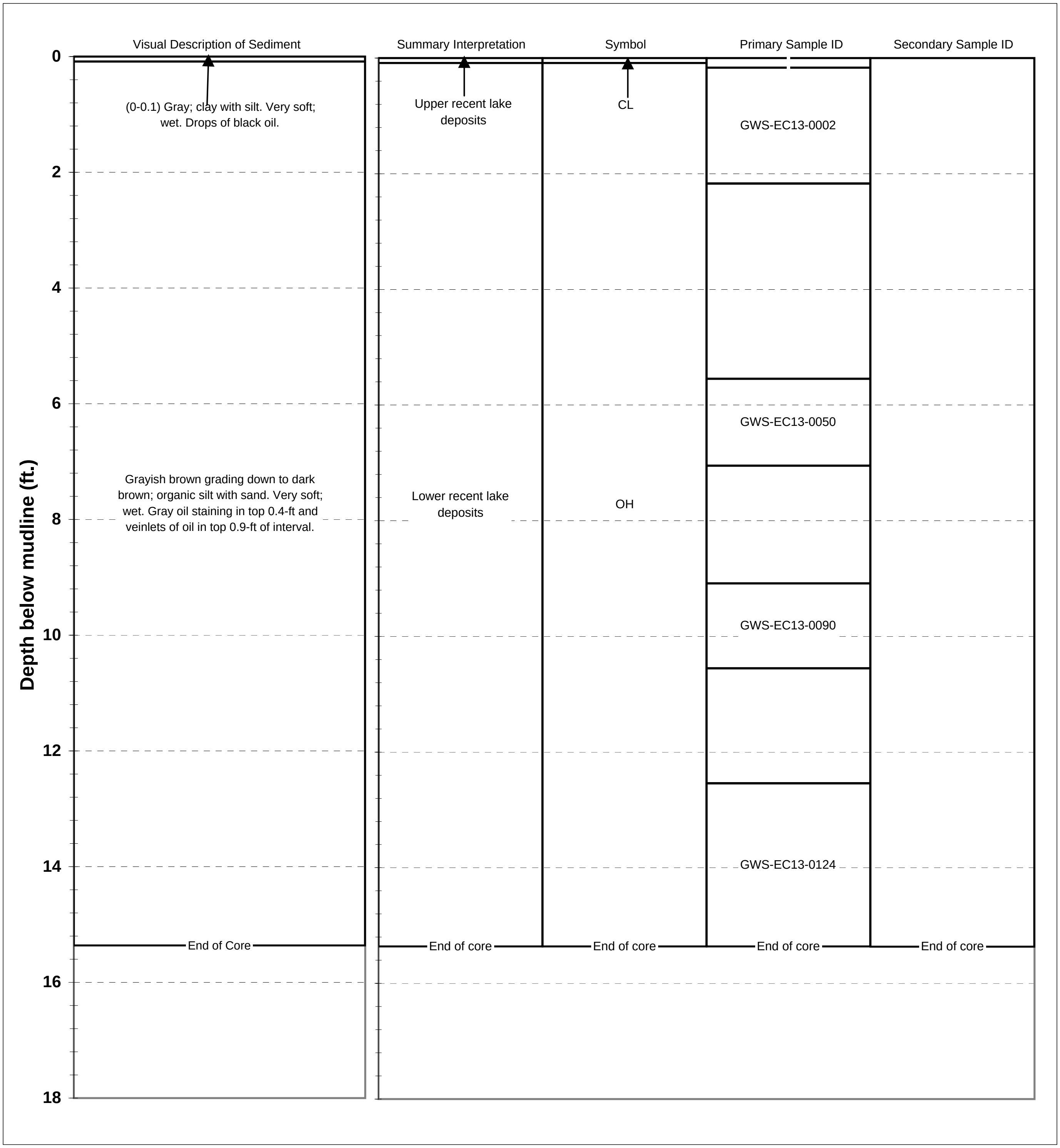
Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC13**

Project No: 3400542.002

Maximum depth of retained sediment: 15.4 ft

Mudline elevation: -20.4 **ft (Corps lake datum)** **Percent recovery (on-deck):** 73%

	Core collection	Laboratory processing				
			Position:	N239061	E1269278	(NAD83 SPC WAN)
Date:	5/17/2005	5/17/2005	**Field Log:**	John LaManna		
Time:	9:39	0:00	**Summary Log:**	John LaManna		



(0-0.1) Gray; clay with silt. Very soft; wet. Drops of black oil.

Grayish brown grading down to dark brown; organic silt with sand. Very soft; wet. Gray oil staining in top 0.4-ft and veinlets of oil in top 0.9-ft of interval.

Core Summary Log

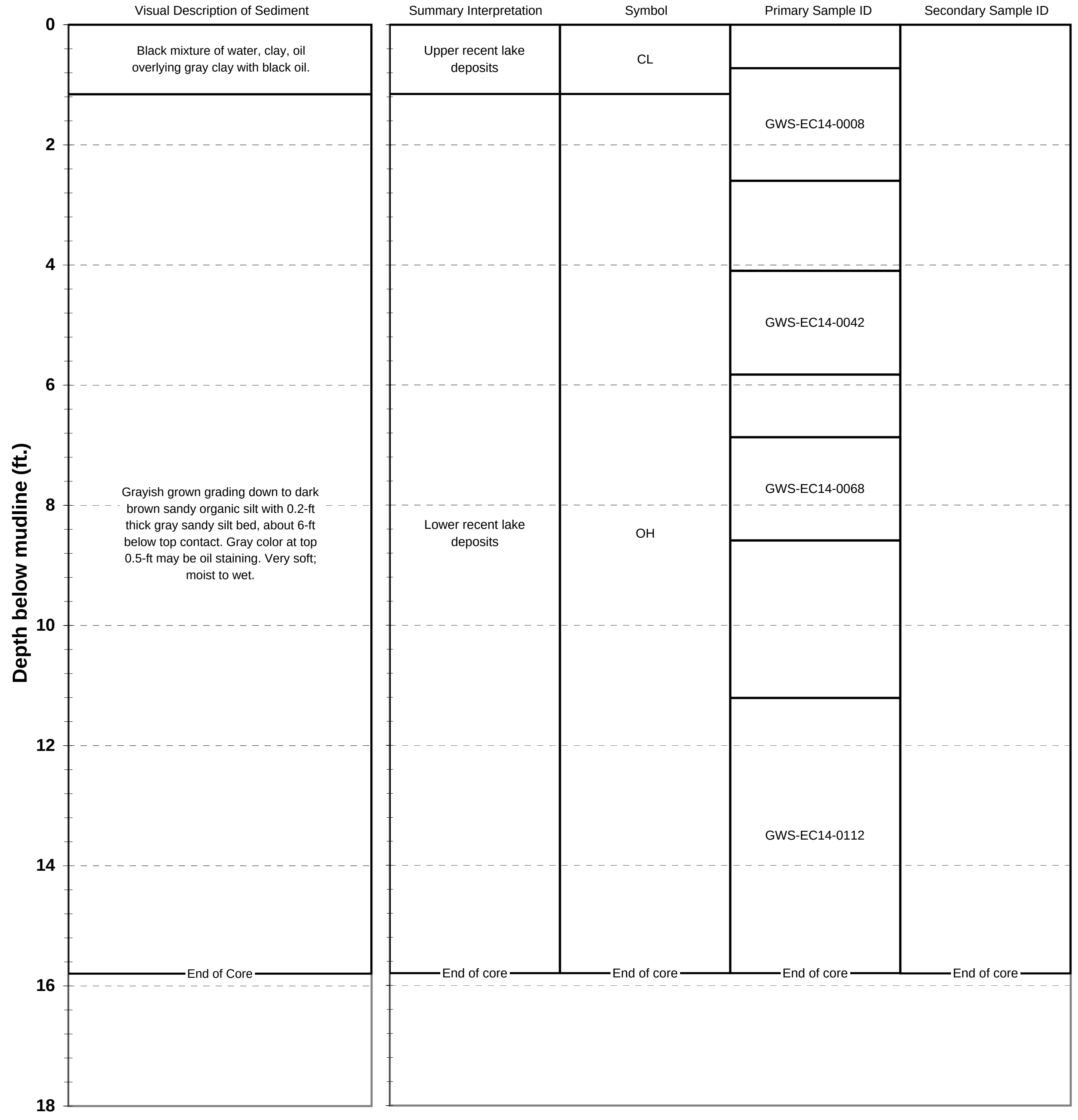
Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC14**

Project No: 3400542.002

Maximum depth of retained sediment: 15.8 ft

Mudline elevation: -20.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 71%

	Core collection	**Laboratory processing**				
Date:	5/17/2005	5/17/2005	**Position:**	N239240	E1269295	(NAD83 SPC WAN)
Time:	13:35	0:00	**Field Log:**	John LaManna		
			Summary Log:			



Visual Description of Sediment	Summary Interpretation	Symbol	Primary Sample ID	Secondary Sample ID
Black mixture of water, clay, oil overlying gray clay with black oil.	Upper recent lake deposits	CL		
			GWS-EC14-0008	
			GWS-EC14-0042	
Grayish grown grading down to dark brown sandy organic silt with 0.2-ft thick gray sandy silt bed, about 6-ft below top contact. Gray color at top 0.5-ft may be oil staining. Very soft; moist to wet.	Lower recent lake deposits	OH	GWS-EC14-0068	
			GWS-EC14-0112	
End of Core	End of core	End of core	End of core	End of core

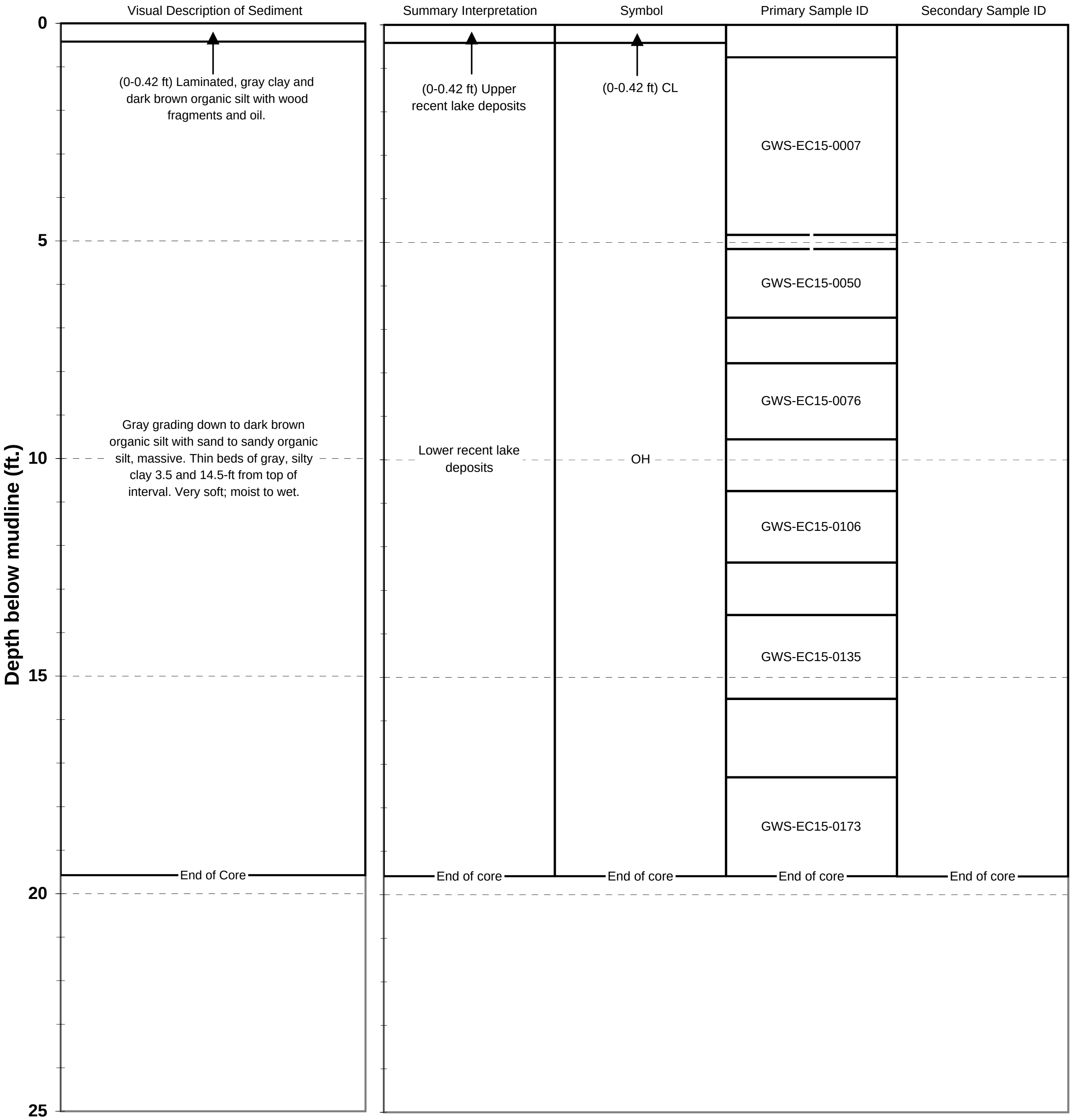
Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC15**
Project No: 3400542.002

Maximum depth of retained sediment: 19.6 ft
Mudline elevation: -19.3 **ft (Corps lake datum)** **Percent recovery (on-deck):** 71%

	Core collection	Laboratory processing
Date:	5/20/2005	5/20/2005
Time:	9:30	0:00

Position: N239001 E1269161 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



(0-0.42 ft) Laminated, gray clay and dark brown organic silt with wood fragments and oil.

(0-0.42 ft) Upper recent lake deposits

(0-0.42 ft) CL

Gray grading down to dark brown organic silt with sand to sandy organic silt, massive. Thin beds of gray, silty clay 3.5 and 14.5-ft from top of interval. Very soft; moist to wet.

Lower recent lake deposits

OH

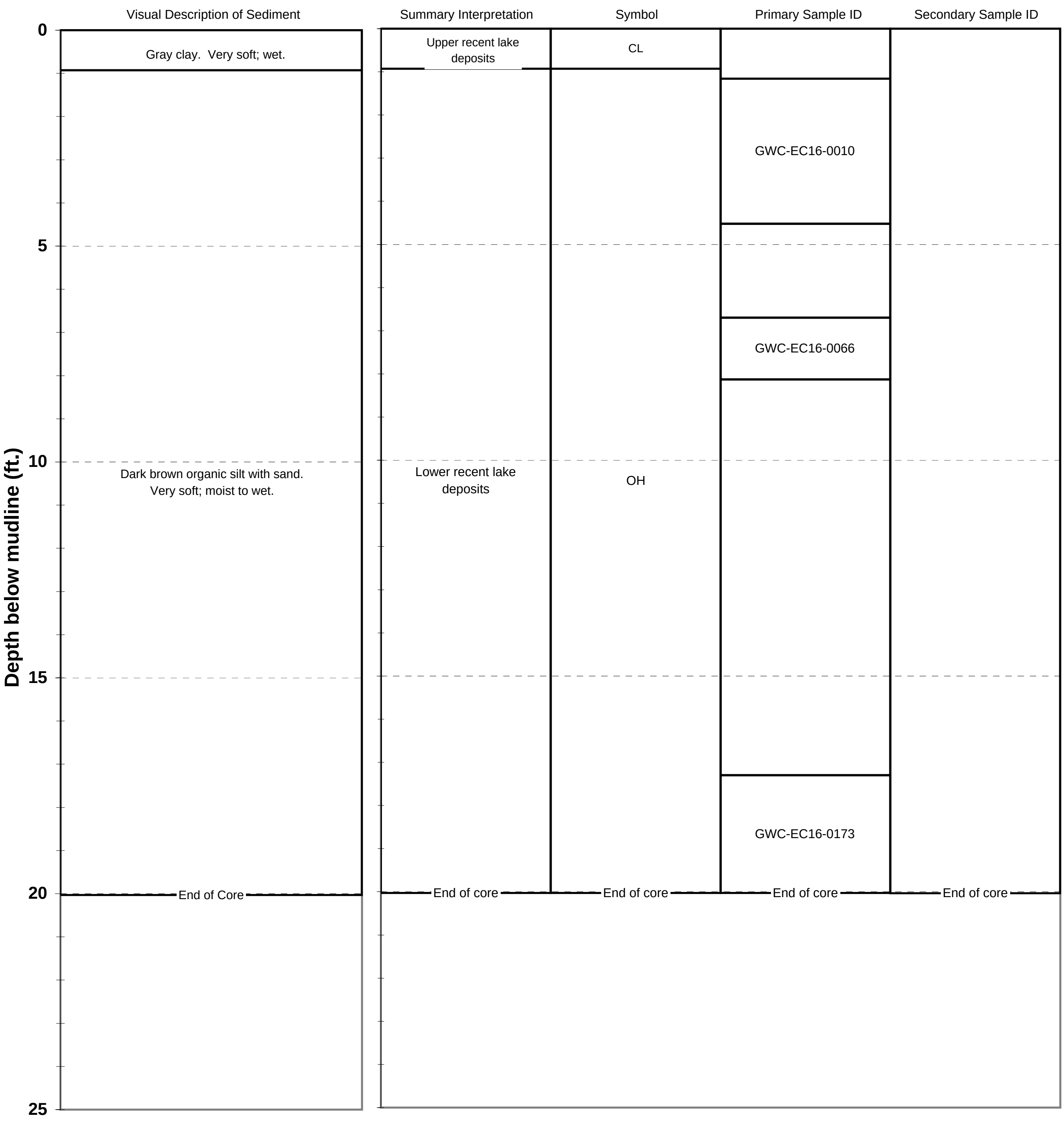
Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC16**
Project No: 3400542.002

Maximum depth of retained sediment: 20.0 ft
Mudline elevation: -19.0 **ft (Corps lake datum)** **Percent recovery (on-deck):** 74%

	Core collection	**Laboratory processing**
Date:	5/18/2005	5/18/2005
Time:	10:58	0:00

Position: N238874 E1268806 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



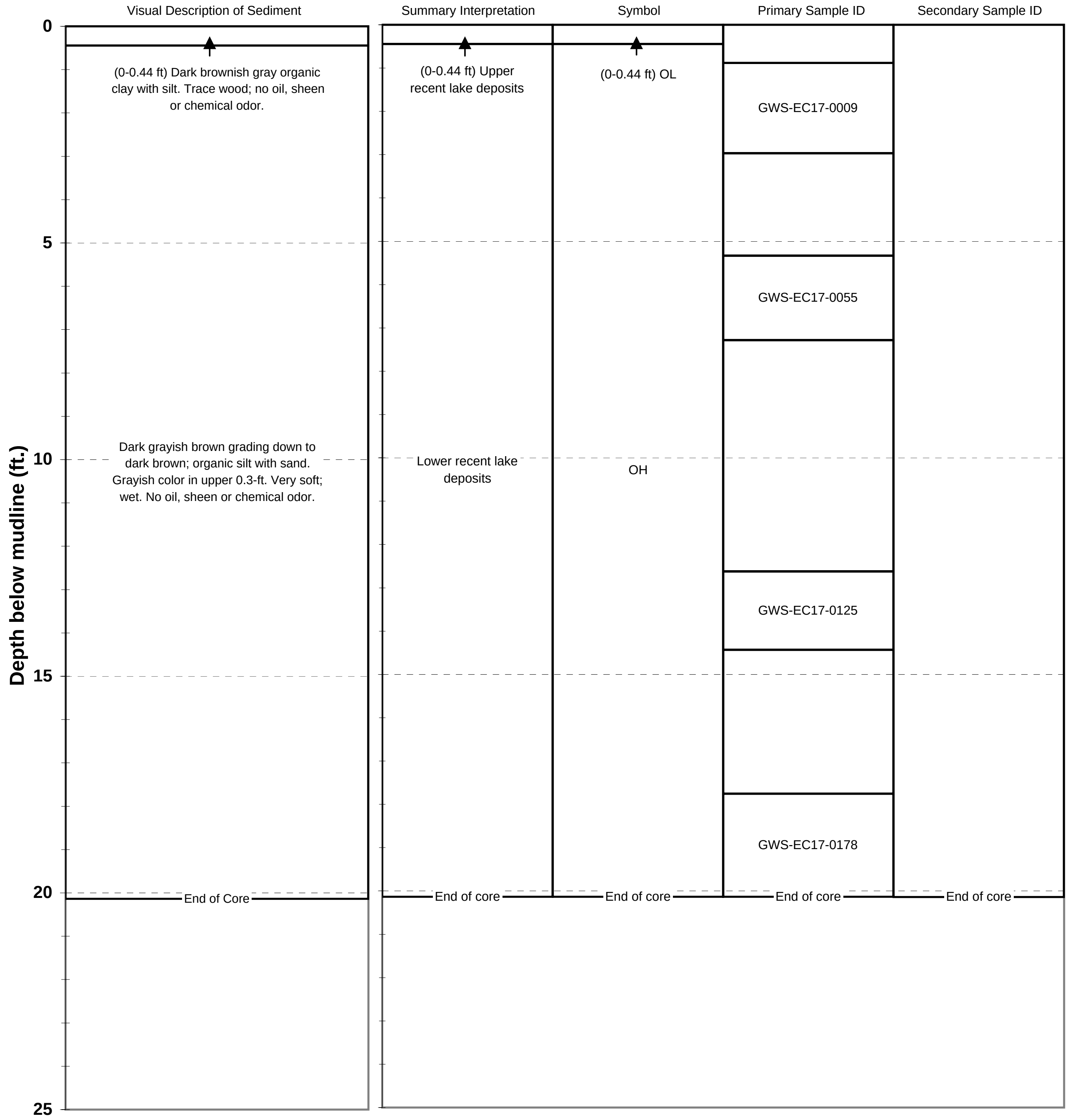
Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC17**
Project No: 3400542.002

Maximum depth of retained sediment: 20.1 ft
Mudline elevation: -19.1 **ft (Corps lake datum)** **Percent recovery (on-deck):** 74%

	Core collection	**Laboratory processing**
Date:	5/20/2005	5/20/2005
Time:	8:25	0:00

Position: N238760 E1269052 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



(0-0.44 ft) Dark brownish gray organic clay with silt. Trace wood; no oil, sheen or chemical odor.

(0-0.44 ft) Upper recent lake deposits

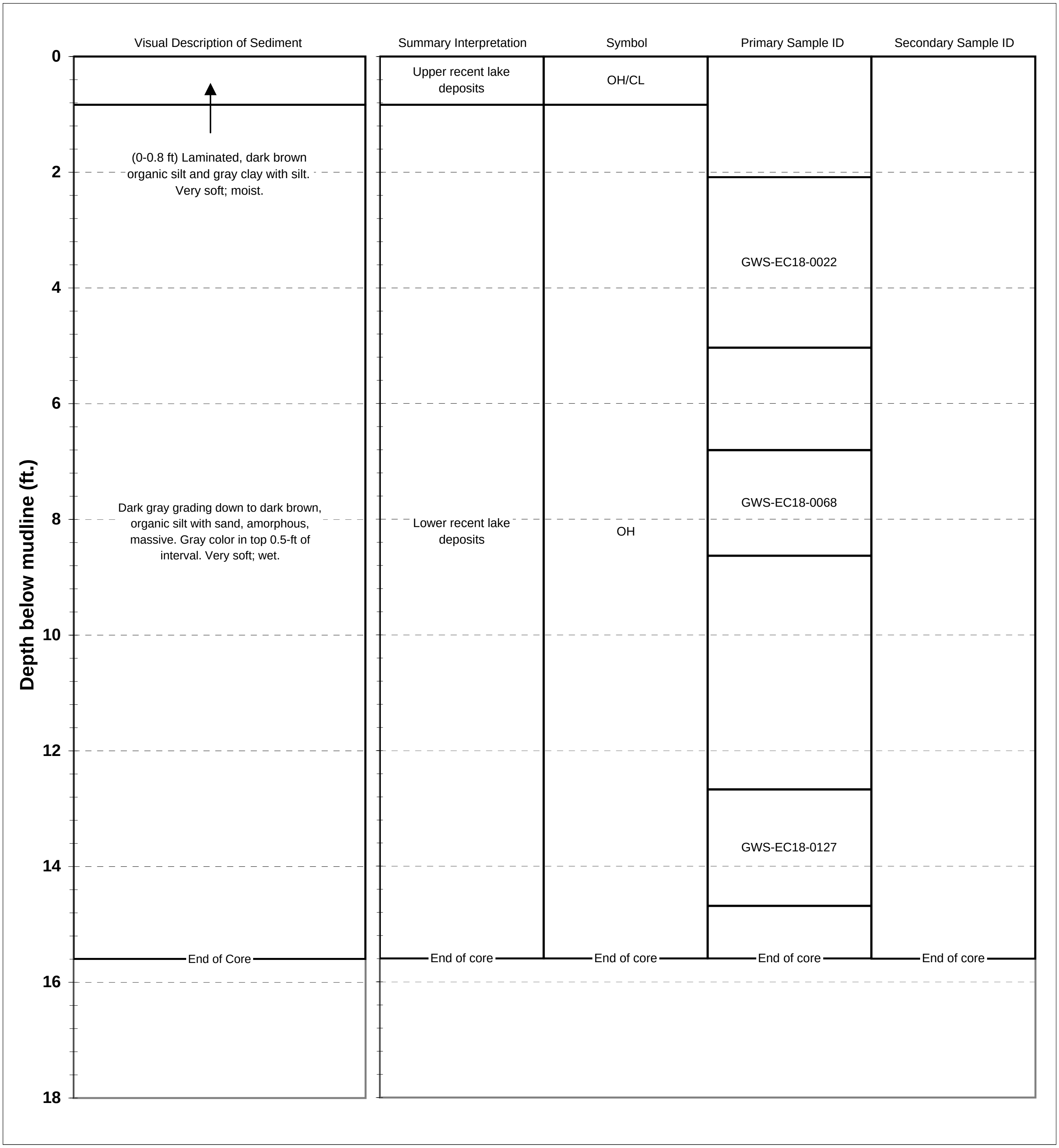
Dark grayish brown grading down to dark brown; organic silt with sand. Grayish color in upper 0.3-ft. Very soft; wet. No oil, sheen or chemical odor.

Lower recent lake deposits

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC18**
Project No: 3400542.002
Maximum depth of retained sediment: 15.6 ft
Mudline elevation: -19.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 70%

	Core collection	**Laboratory processing**	**Position:**	N239112	E1268852	(NAD83 SPC WAN)
Date:	5/20/2005	5/20/2005	**Field Log:**	John LaManna		
Time:	11:15	0:00	**Summary Log:**	John LaManna		



(0-0.8 ft) Laminated, dark brown organic silt and gray clay with silt. Very soft; moist.

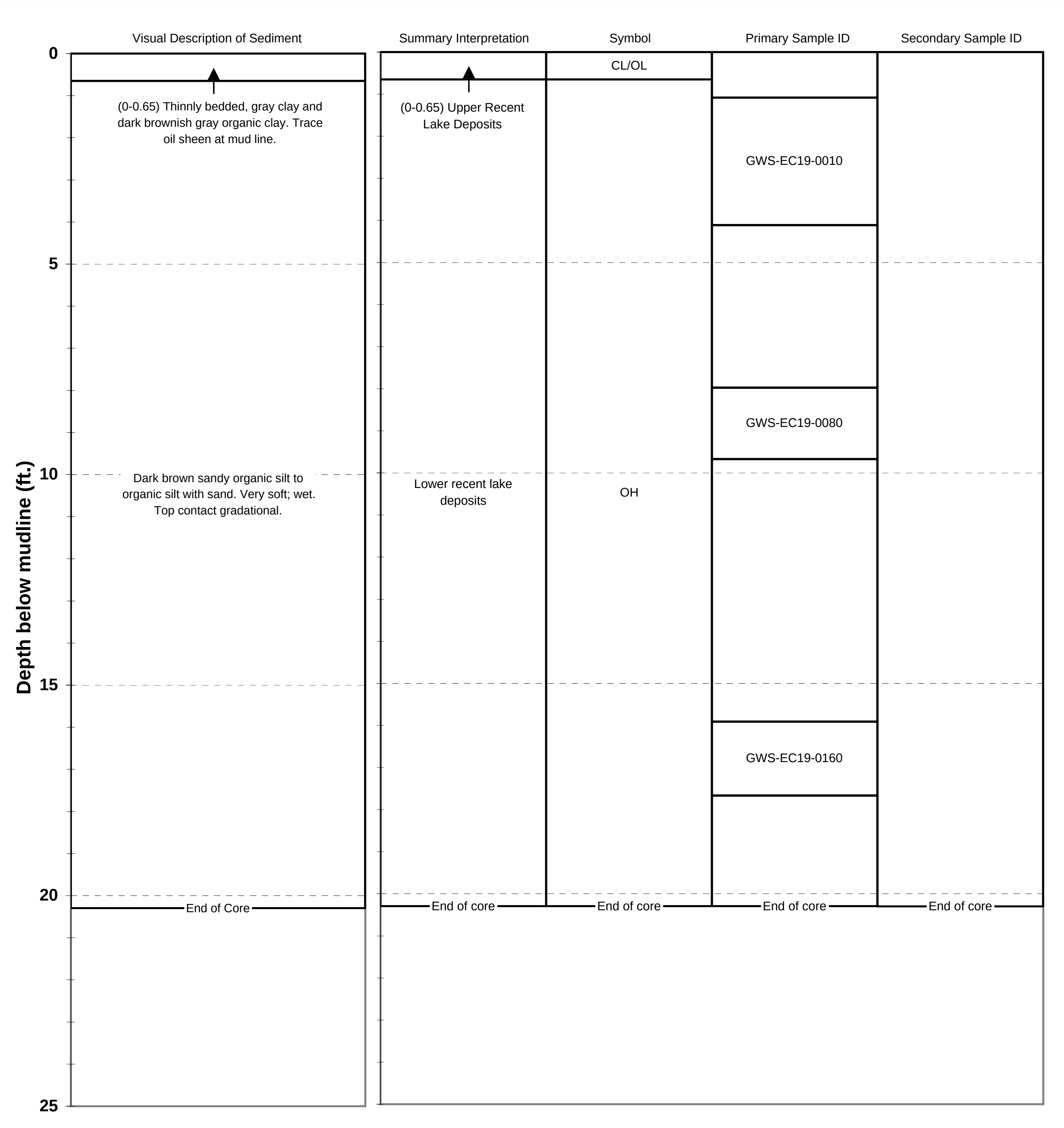
Dark gray grading down to dark brown, organic silt with sand, amorphous, massive. Gray color in top 0.5-ft of interval. Very soft; wet.

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** GWS-EC19
Project No: 3400542.002
Maximum depth of retained sediment: 20.3 ft
Mudline elevation: -19.1 **ft (Corps lake datum)** **Percent recovery (on-deck):** 79%

	Core collection	Laboratory processing
Date:	5/18/2005	5/18/2005
Time:	9:07	0:00

Position: N239034 E1268729 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



(0-0.65) Thinnly bedded, gray clay and dark brownish gray organic clay. Trace oil sheen at mud line.

Dark brown sandy organic silt to organic silt with sand. Very soft; wet. Top contact gradational.

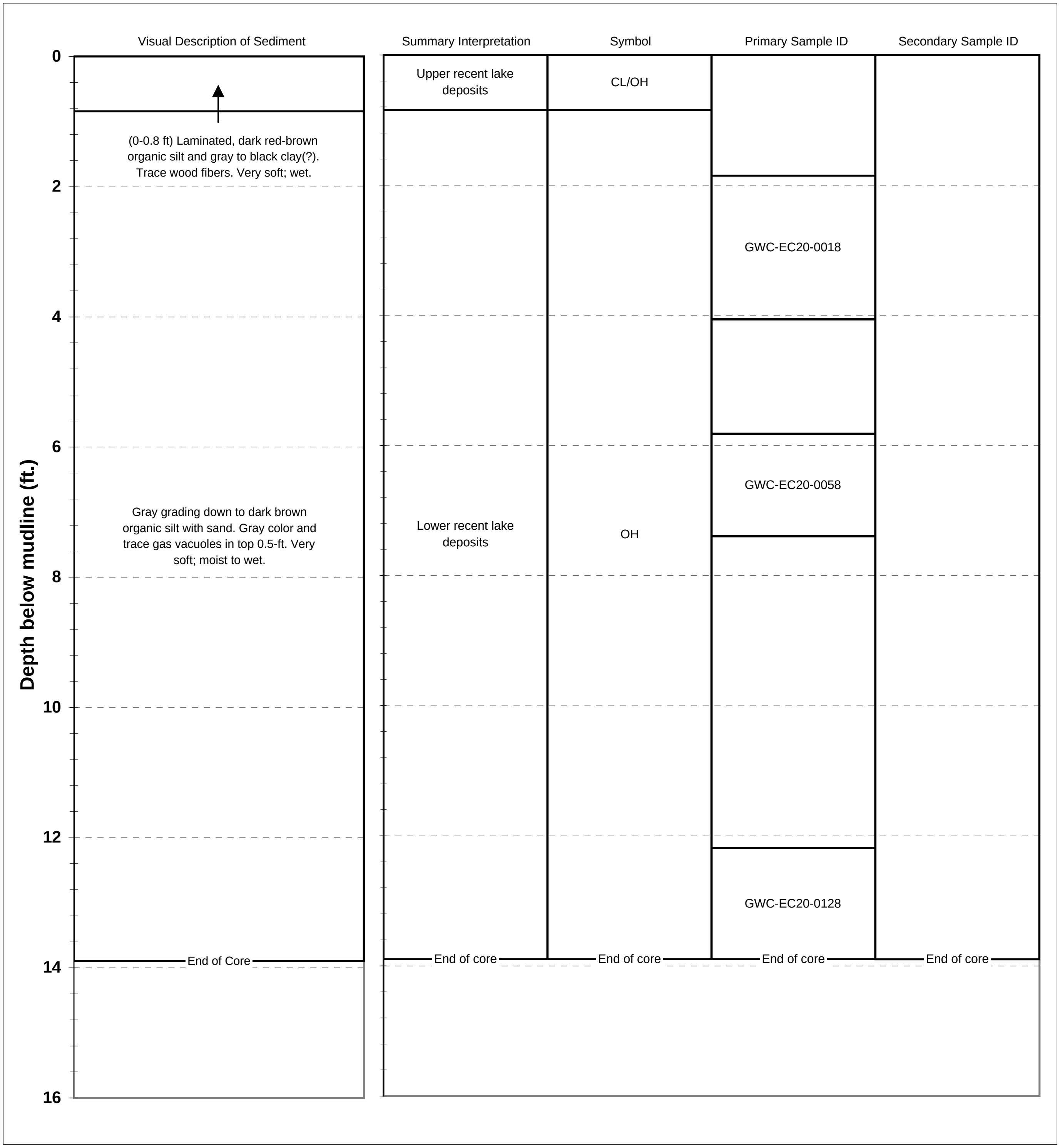
(0-0.65) Upper Recent Lake Deposits

Lower recent lake deposits

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC20**
Project No: 3400542.002
Maximum depth of retained sediment: 13.9 ft
Mudline elevation: -19.5 **ft (Corps lake datum)** **Percent recovery (on-deck):** 69%

	Core collection	**Laboratory processing**	**Position:**	N238479	E1269361	(NAD83 SPC WAN)
Date:	5/19/2005	5/19/2005	**Field Log:**	John LaManna		
Time:	9:38	0:00	**Summary Log:**	John LaManna		



(0-0.8 ft) Laminated, dark red-brown organic silt and gray to black clay(?). Trace wood fibers. Very soft; wet.

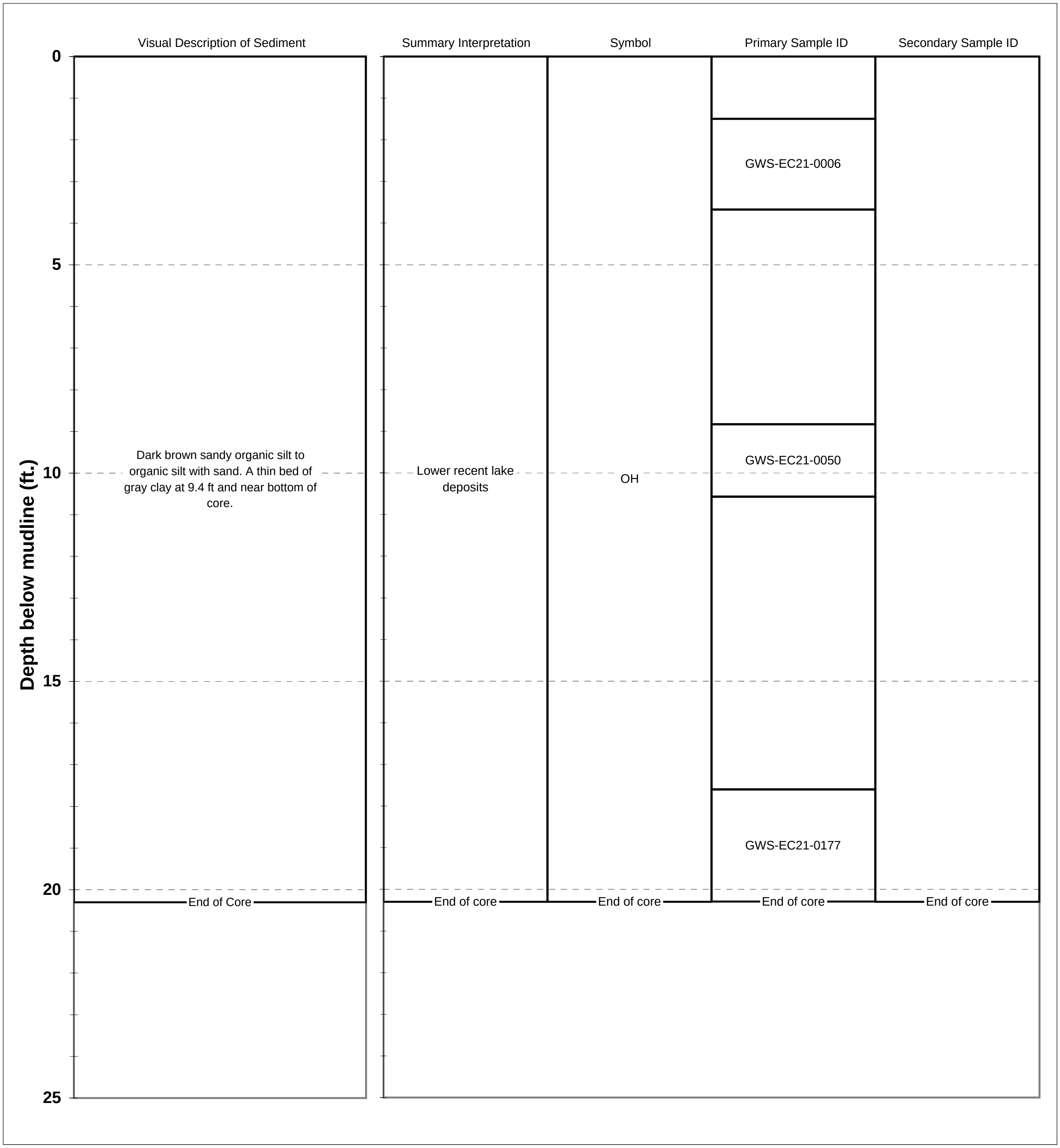
Gray grading down to dark brown organic silt with sand. Gray color and trace gas vacuoles in top 0.5-ft. Very soft; moist to wet.

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC21**
Project No: 3400542.002
Maximum depth of retained sediment: 20.3 ft
Mudline elevation: -18.8 **ft (Corps lake datum)** **Percent recovery (on-deck):** 77%

	Core collection	Laboratory processing
Date:	5/18/2005	5/18/2005
Time:	12:10	0:00

Position: N238265 E1269126 (NAD83 SPC WAN)
Field Log: John LaManna
Summary Log: John LaManna



Dark brown sandy organic silt to organic silt with sand. A thin bed of gray clay at 9.4 ft and near bottom of core.

Lower recent lake deposits

Core Summary Log

Project: Gas Works Sediment-Western Study Area **Station:** **GWS-EC22**

Project No: 3400542.002

Maximum depth of retained sediment: 19.8 ft

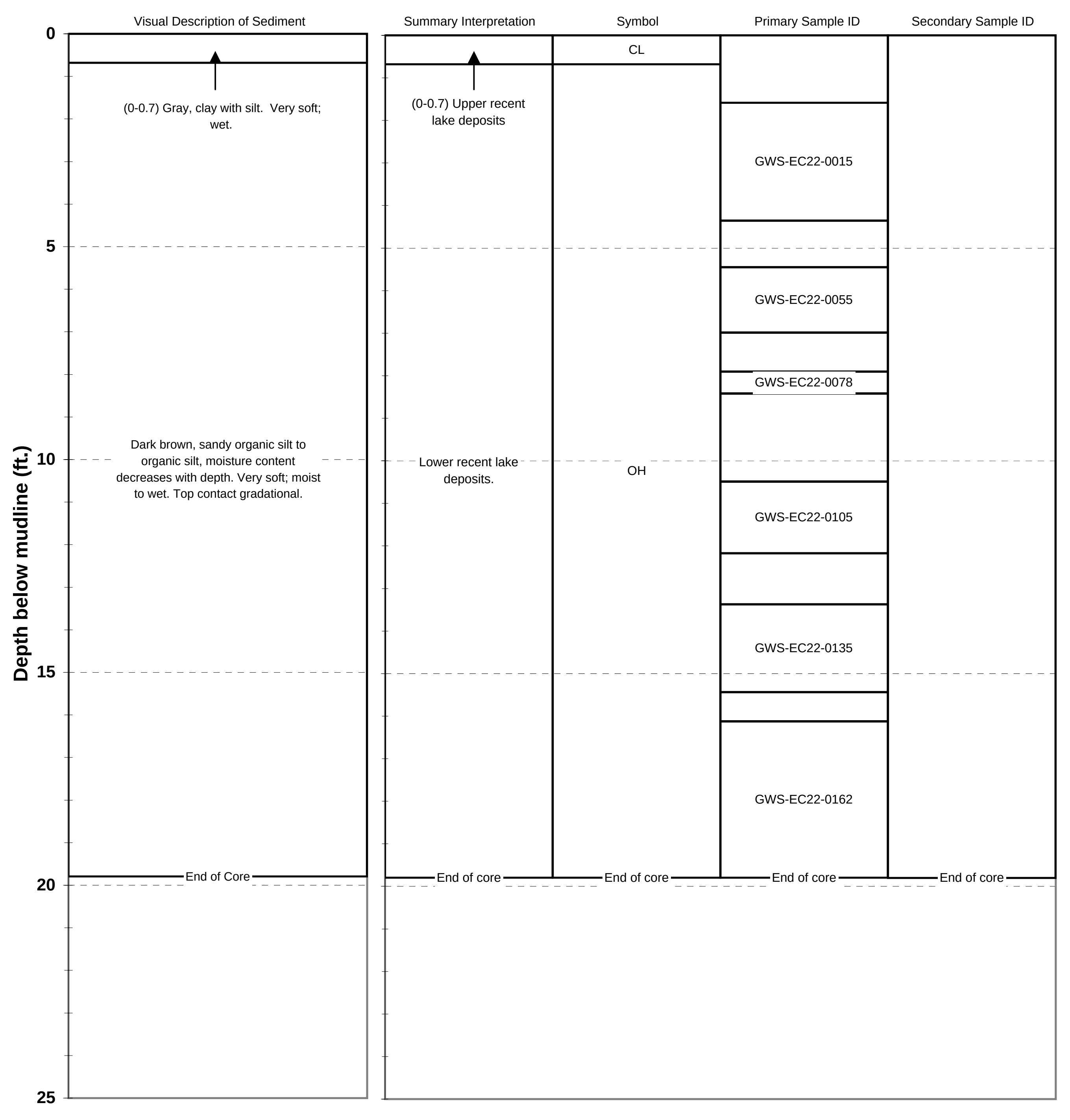
Mudline elevation: -17.8 **ft (Corps lake datum)** **Percent recovery (on-deck):** 73%

	Core collection	**Laboratory processing**
Date:	5/17/2005	5/17/2005
Time:	14:25	0:00

Position: N238694 E1268638 (NAD83 SPC WAN)

Field Log: John LaManna

Summary Log: John LaManna



(0-0.7) Gray, clay with silt. Very soft; wet.

Dark brown, sandy organic silt to organic silt, moisture content decreases with depth. Very soft; moist to wet. Top contact gradational.

(0-0.7) Upper recent lake deposits

Lower recent lake deposits.

SUB-ATTACHMENT 2D-4.4

Photographs of NAPL Investigation 2004 Sediment Cores

Seattle Law Department
Gas Works Park

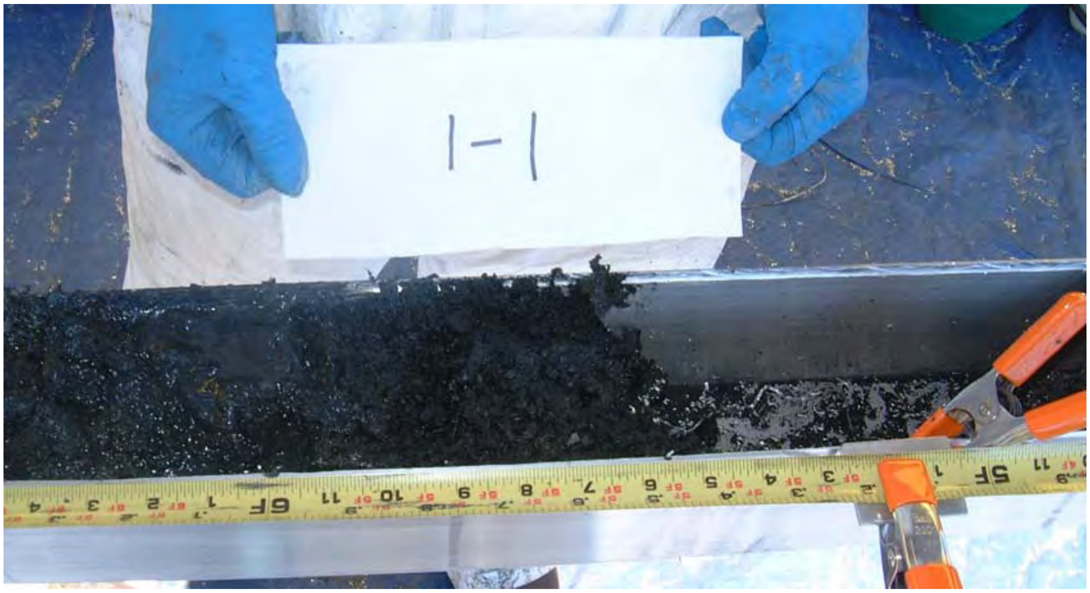
Chemical Forensics Sampling Report

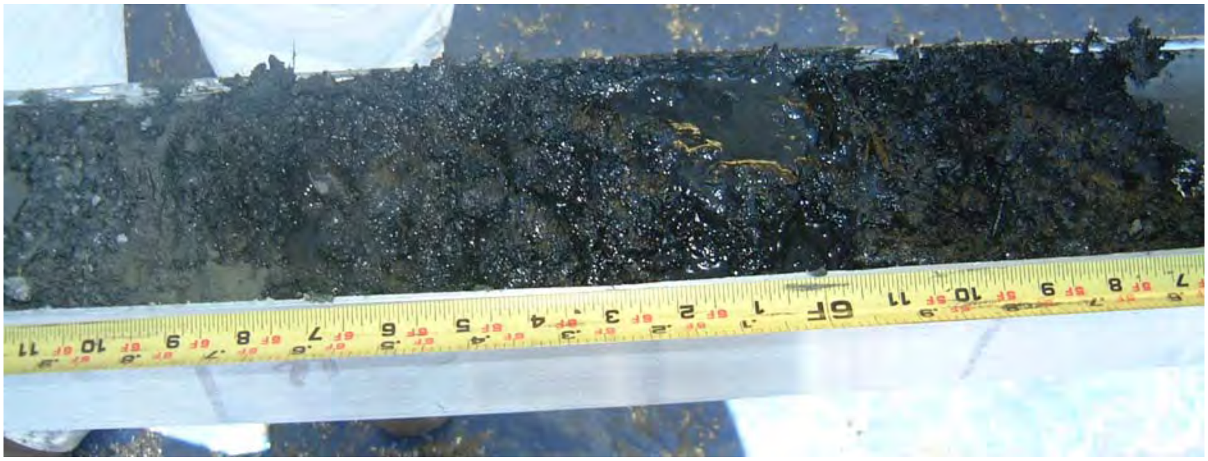
Appendix D
Photographs of NAPL Investigation 2004 Sediment Cores

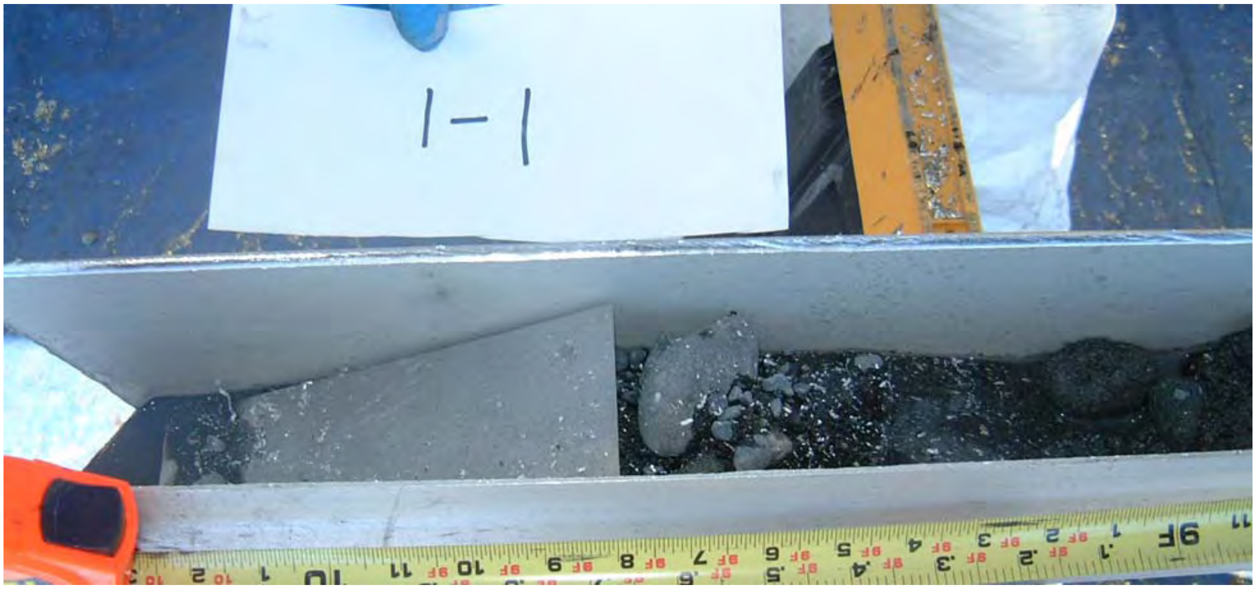
DRAFT

CONFIDENTIAL AND PRIVILEGED: PREPARED IN PREPARATION FOR LITIGATION

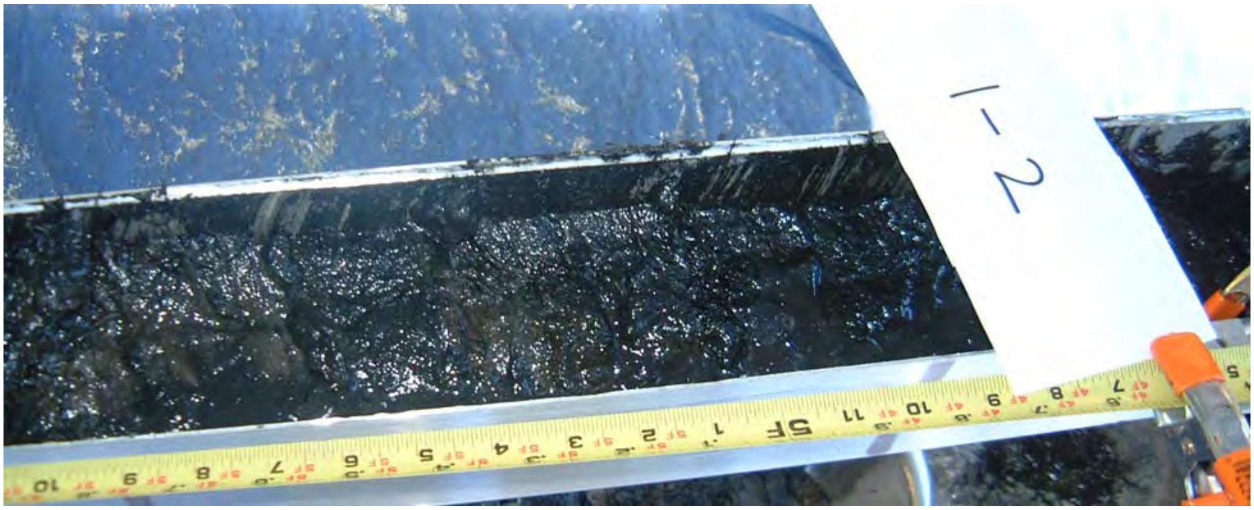
Photographs of NAPL Investigation Core 1-1: Starting at the top of the core

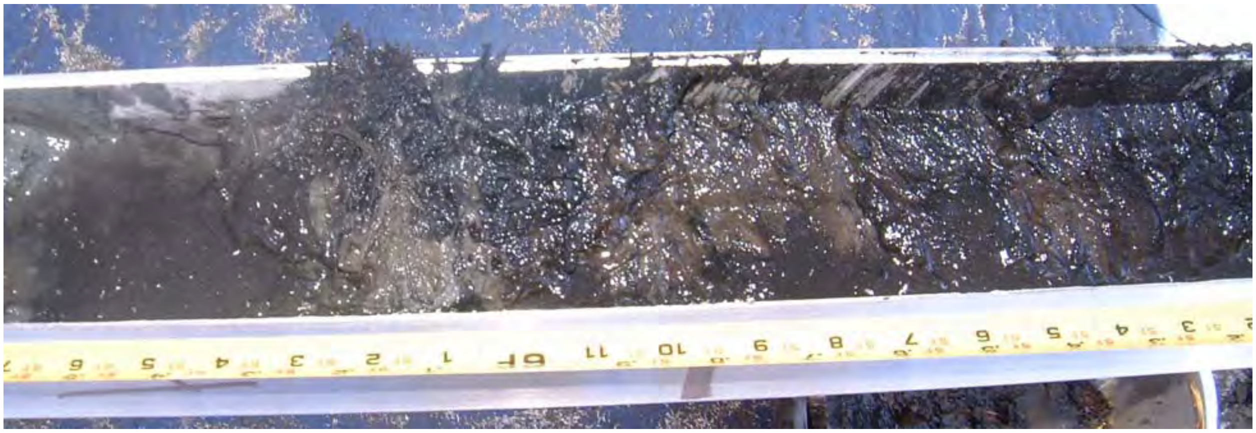


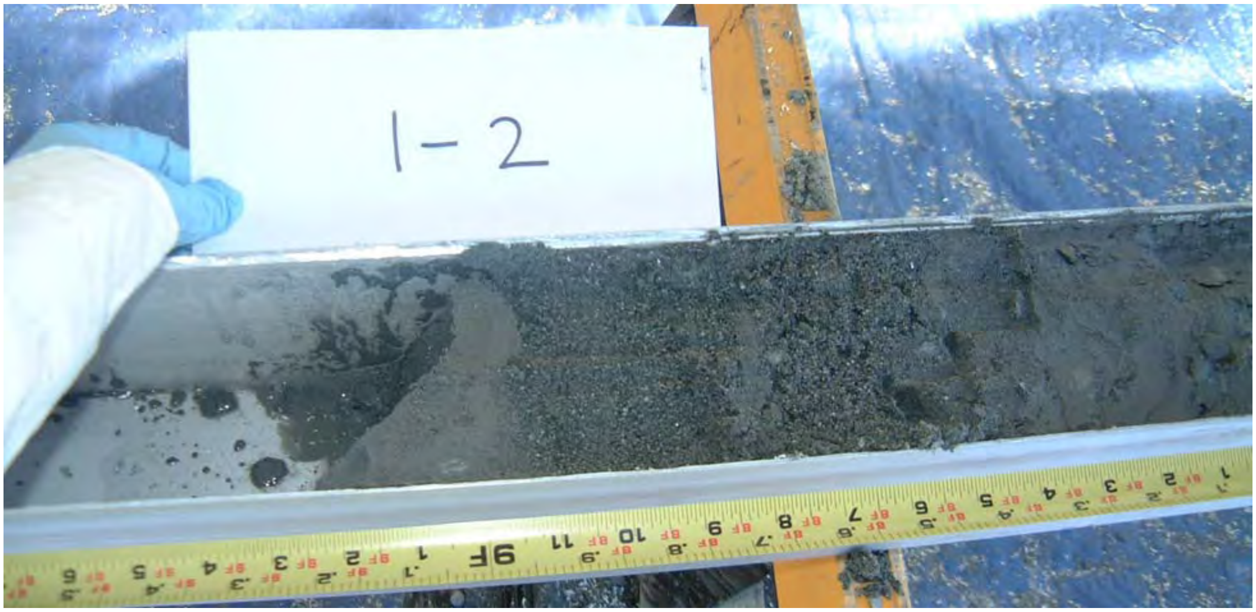



1-1

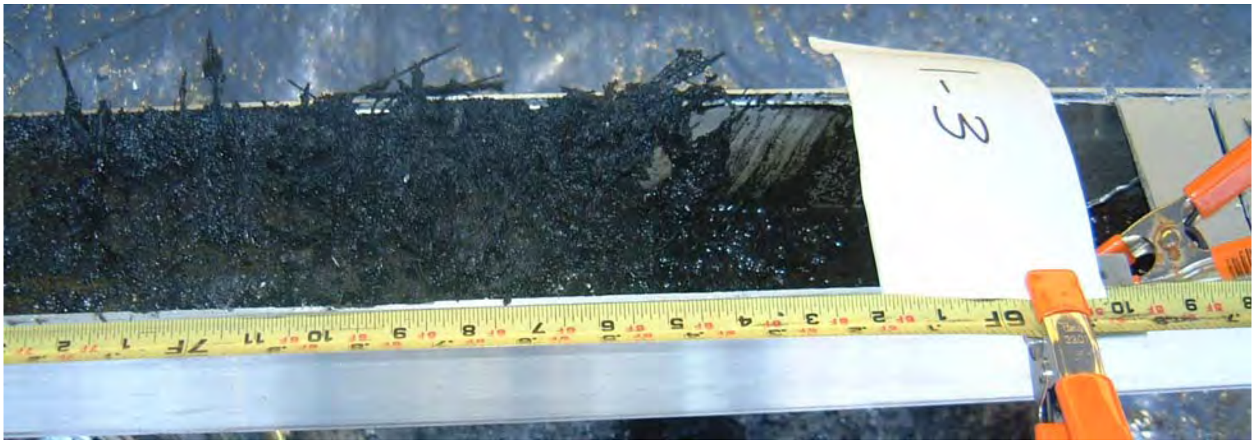
Photographs of NAPL Investigation Core 1-2: Starting at the top of the core

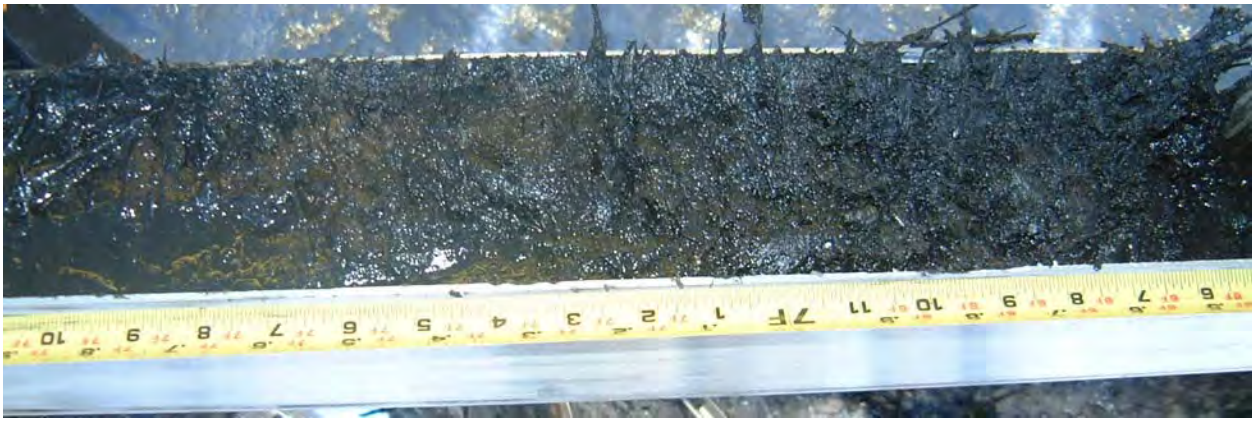


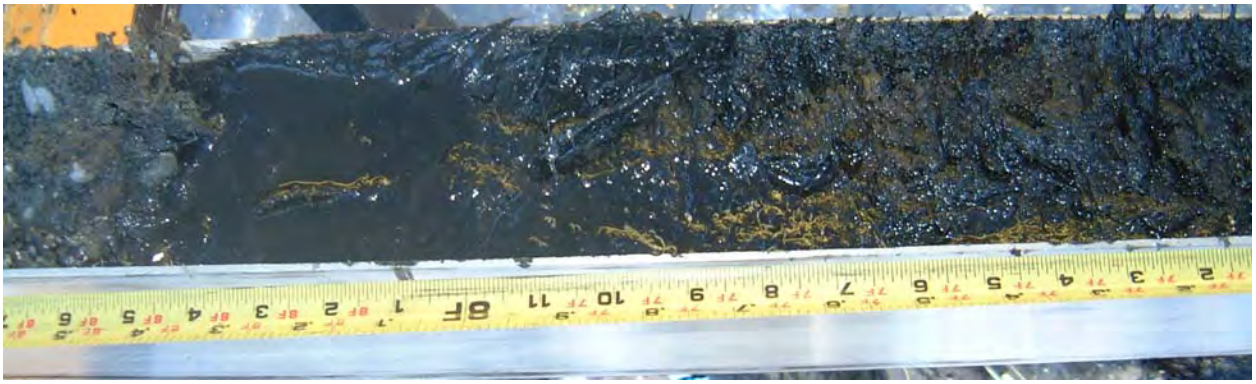


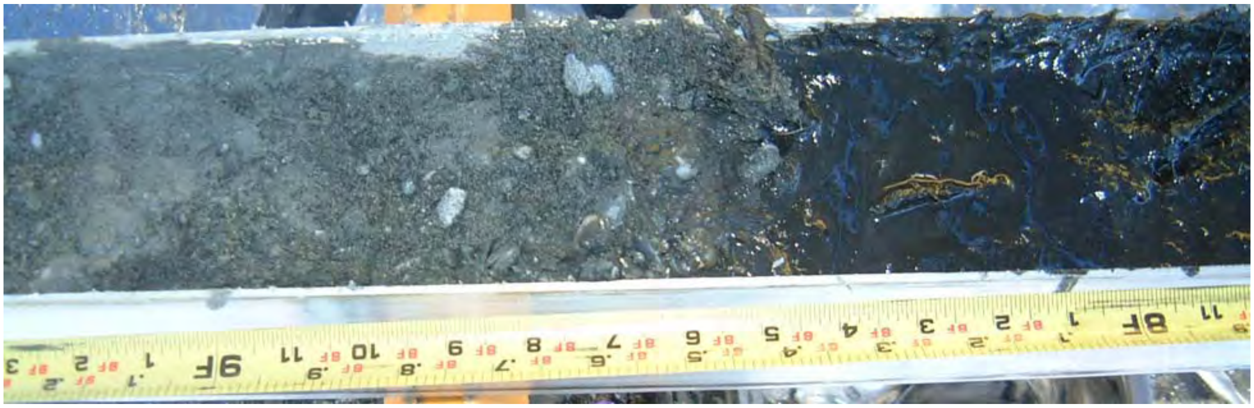

1-2

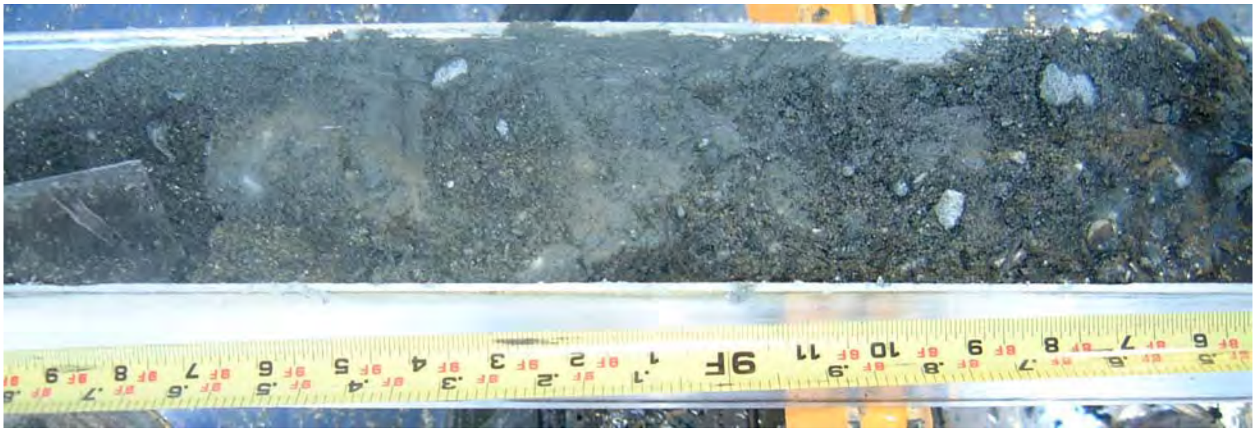
Photographs of NAPL Investigation Core 1-3: Starting at the top of the core

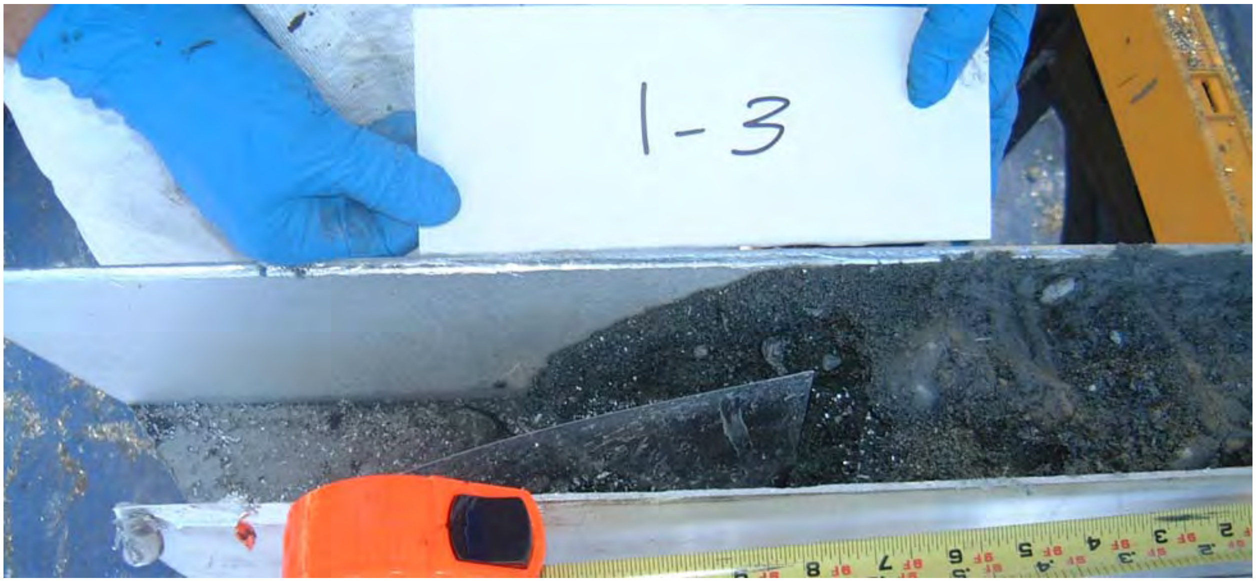




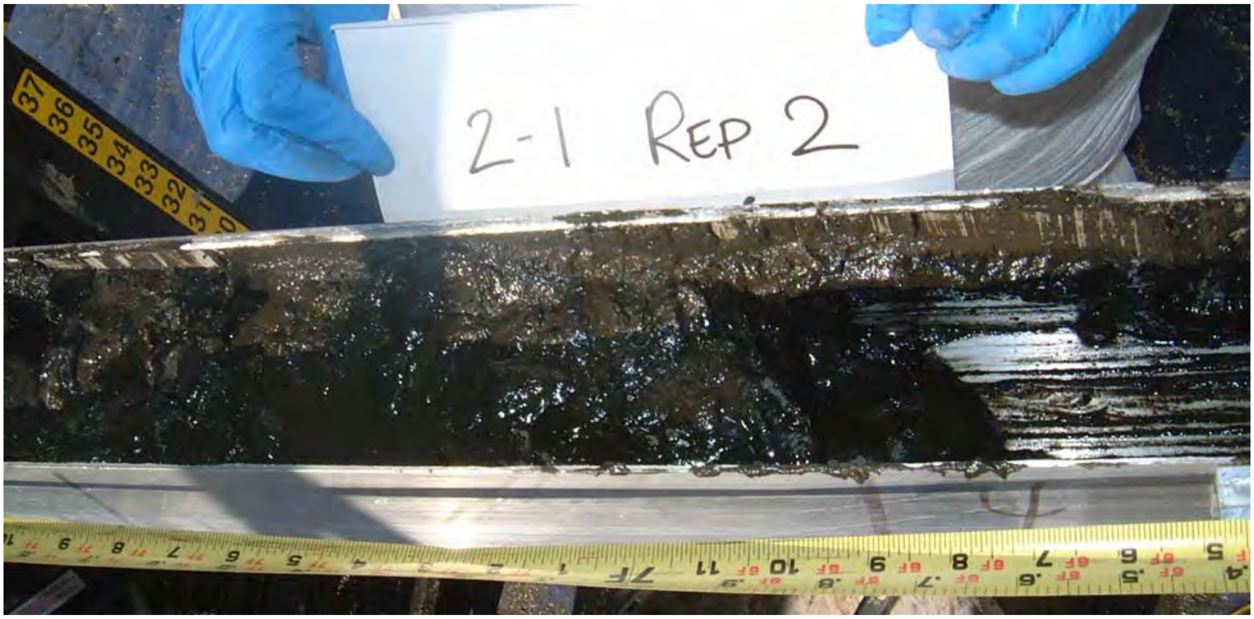


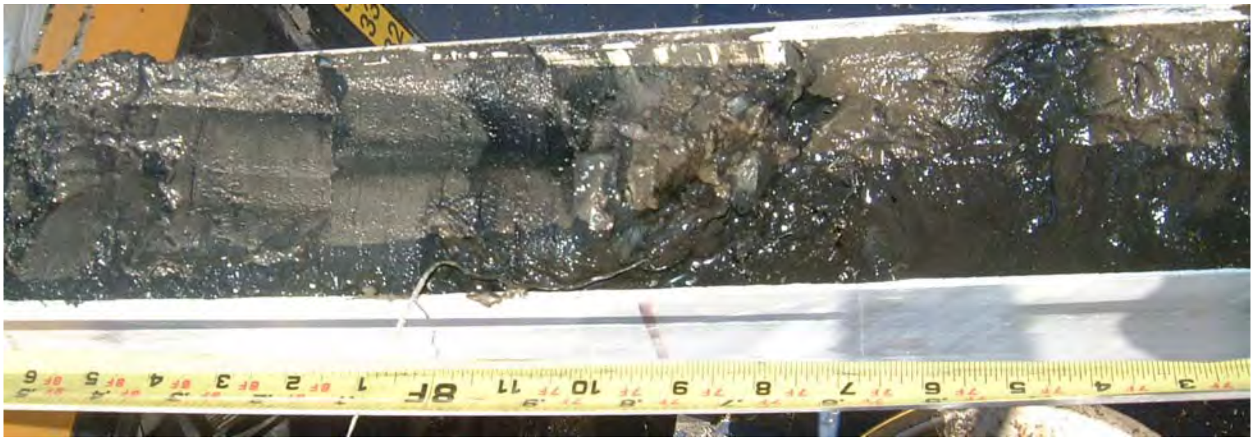


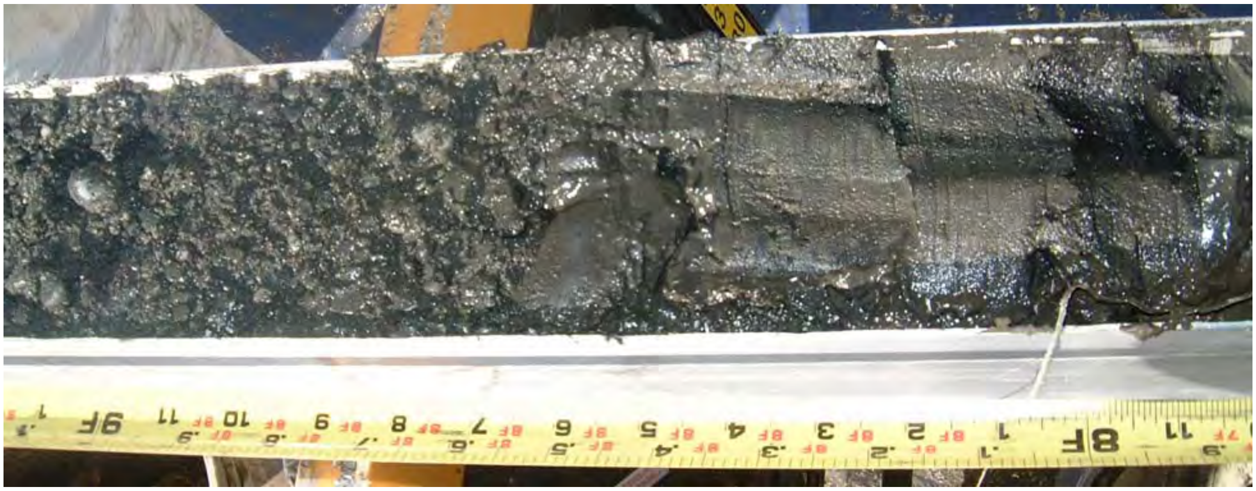


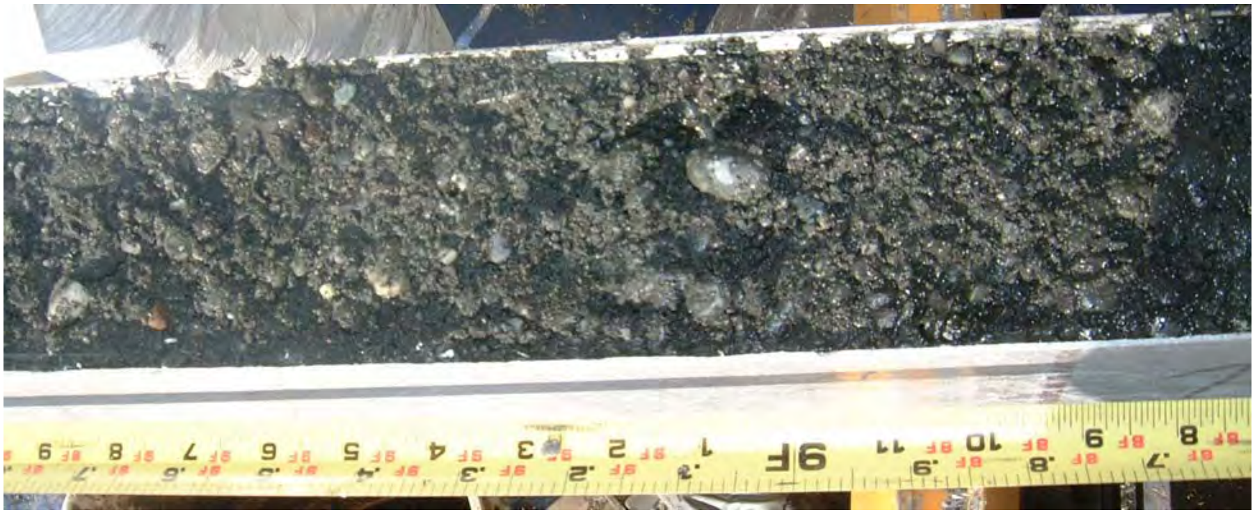

1-3

Photographs of NAPL Investigation Core 2-1 Rep 2: Starting at the top of the core



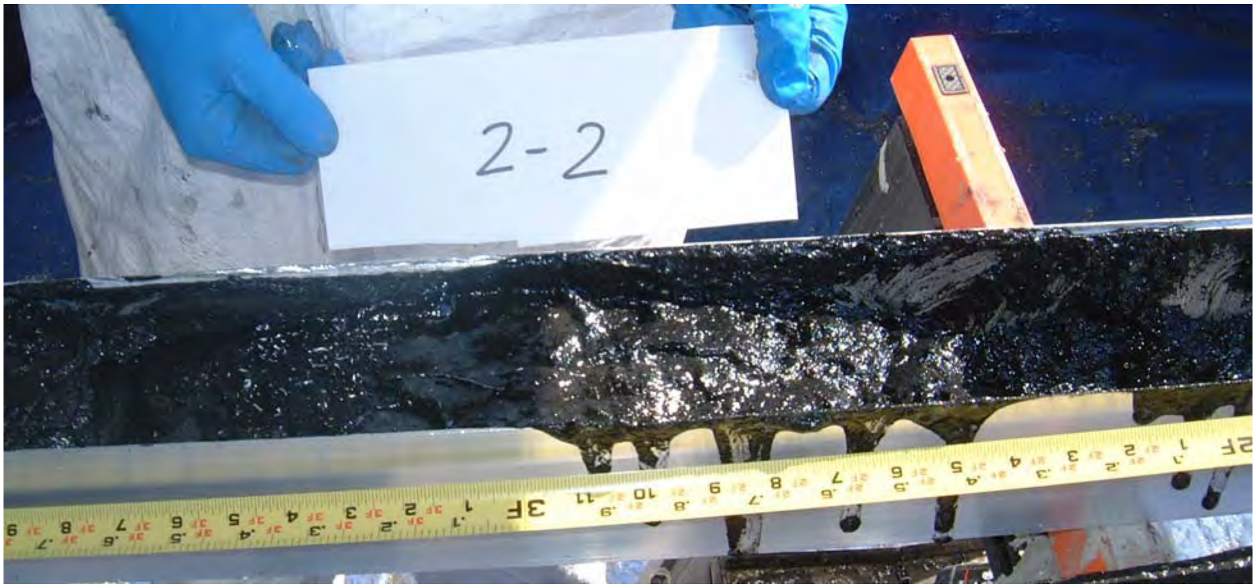


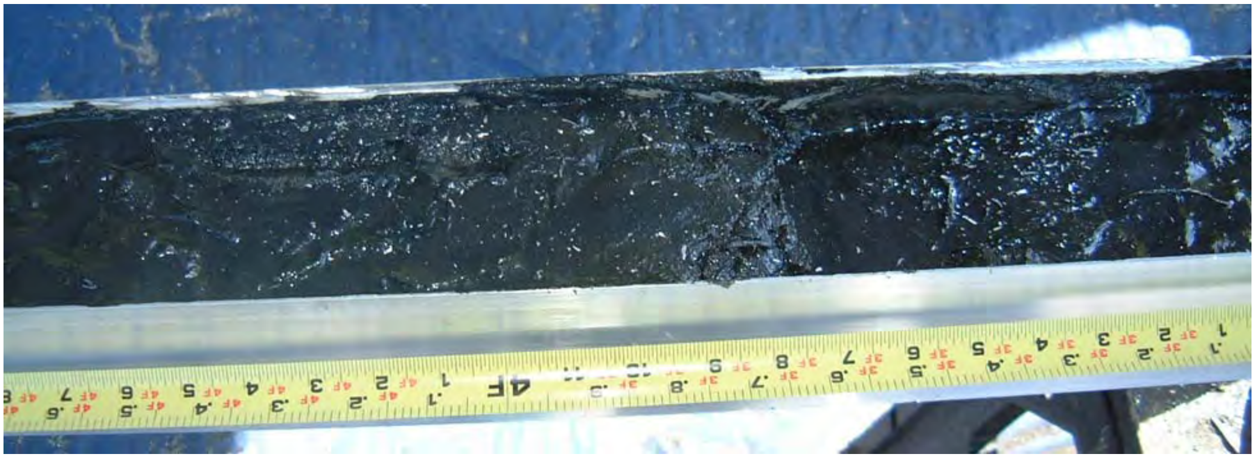


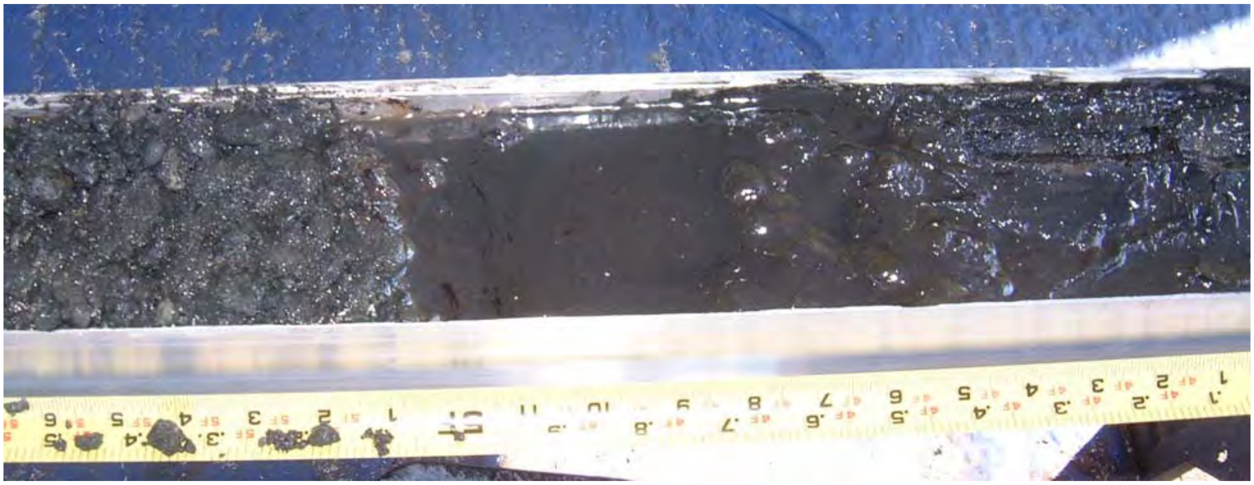


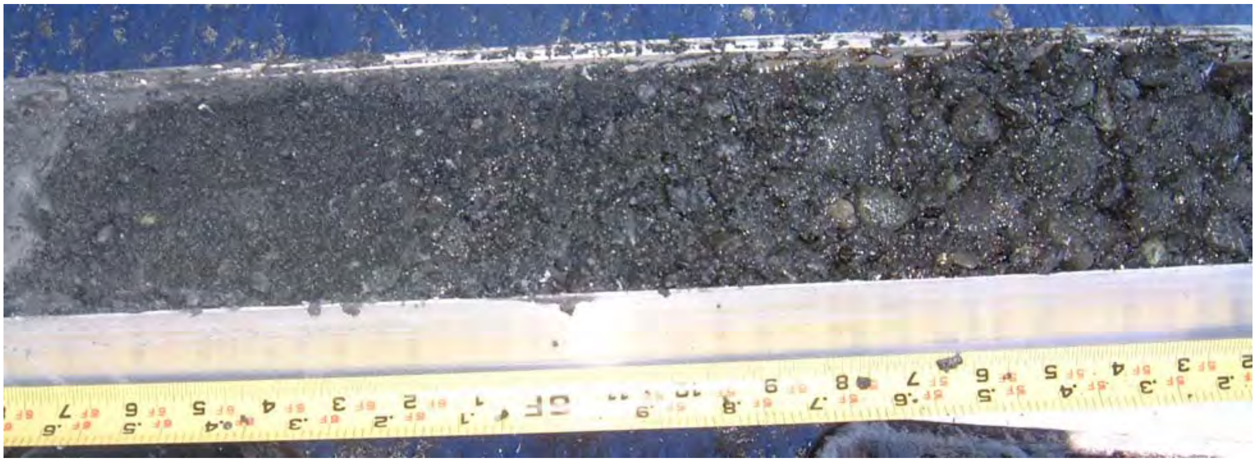

2-1 REP 2

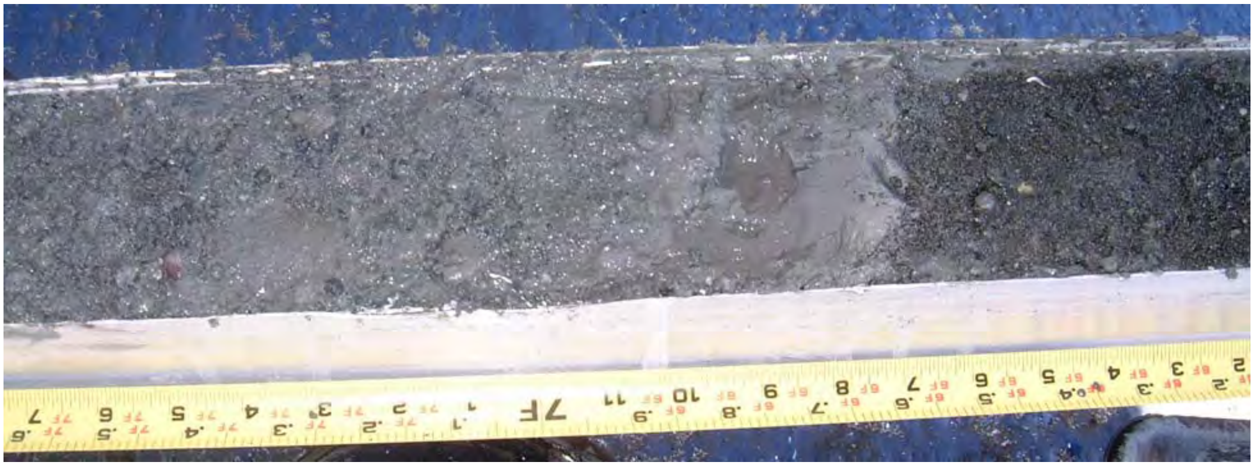
Photographs of NAPL Investigation Core 2-2: Starting at the top of the core





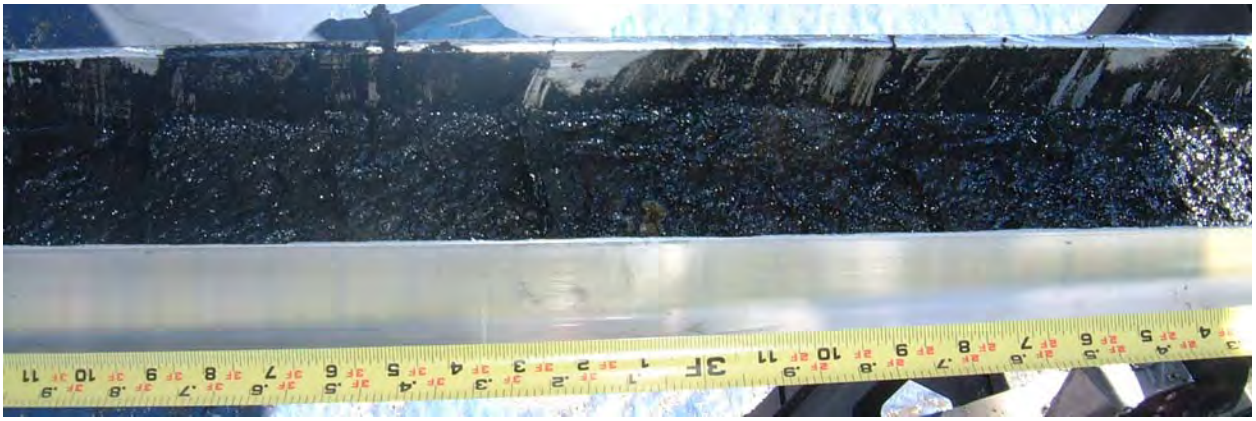


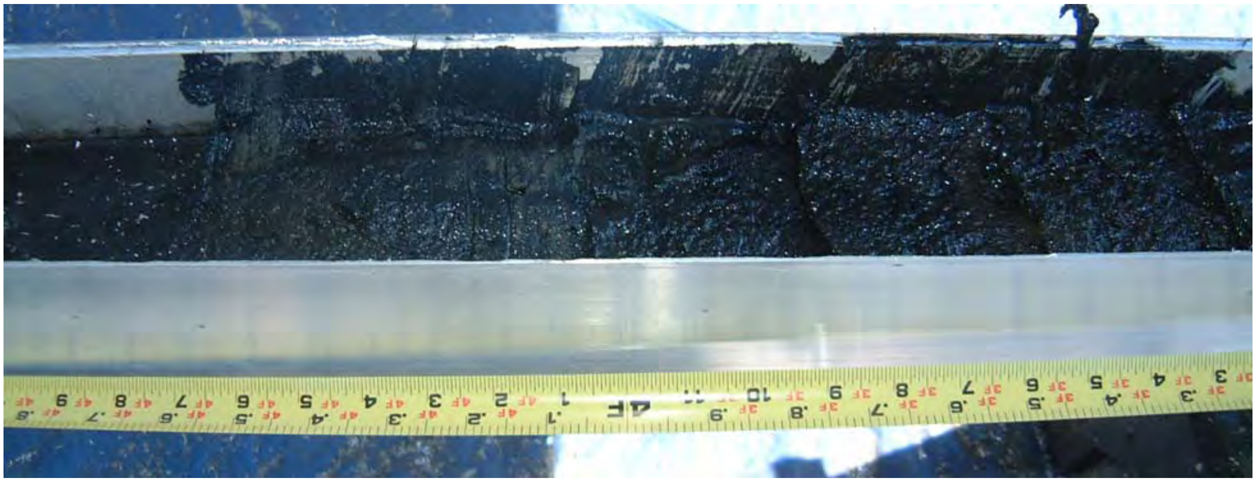


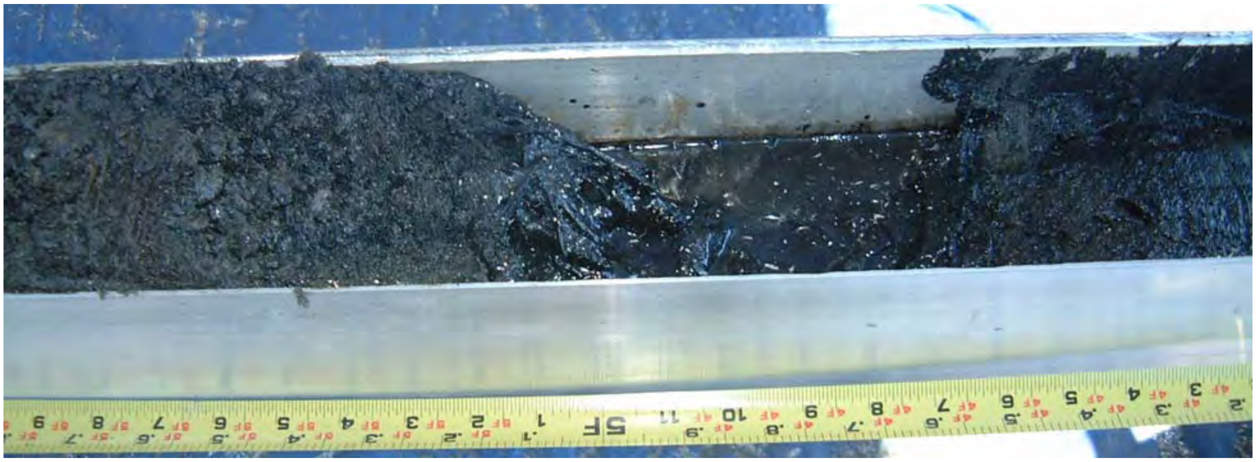


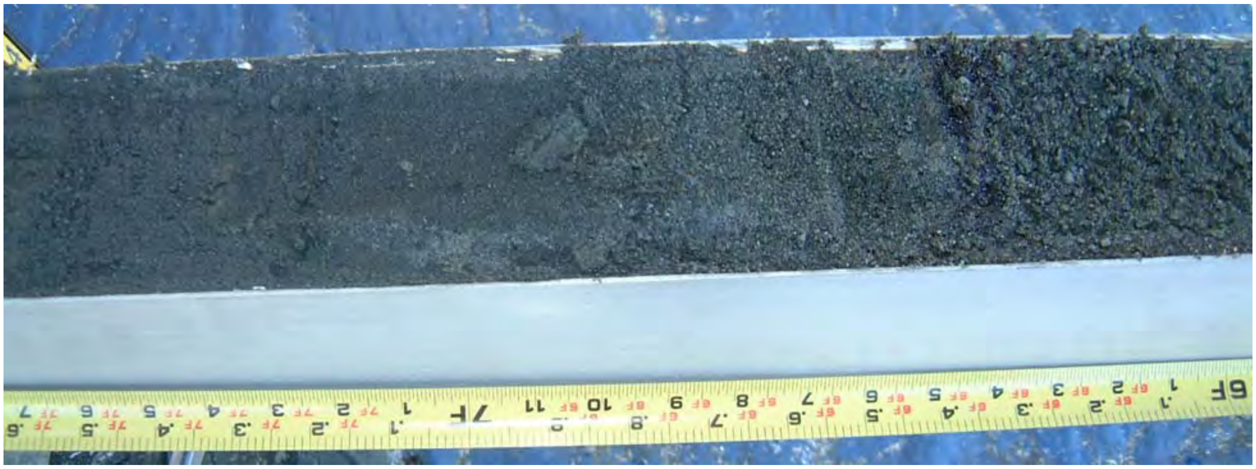

2-2

Photographs of NAPL Investigation Core 2-2 A: Starting at the top of the core



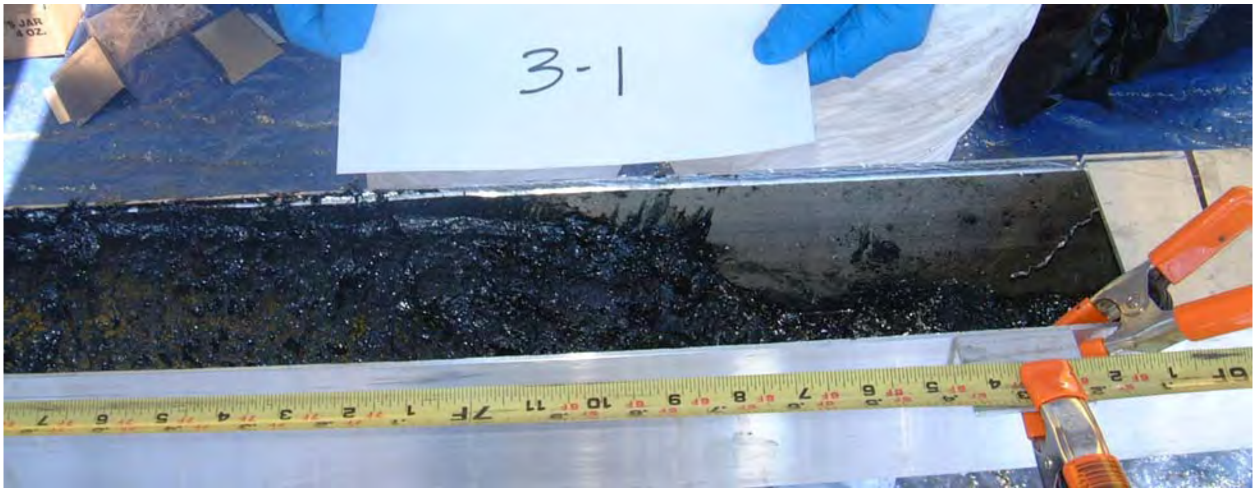


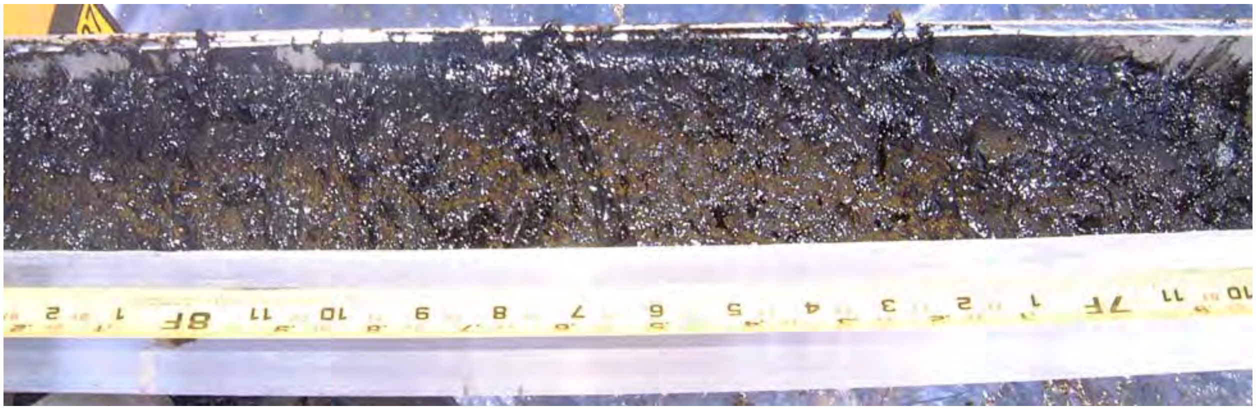


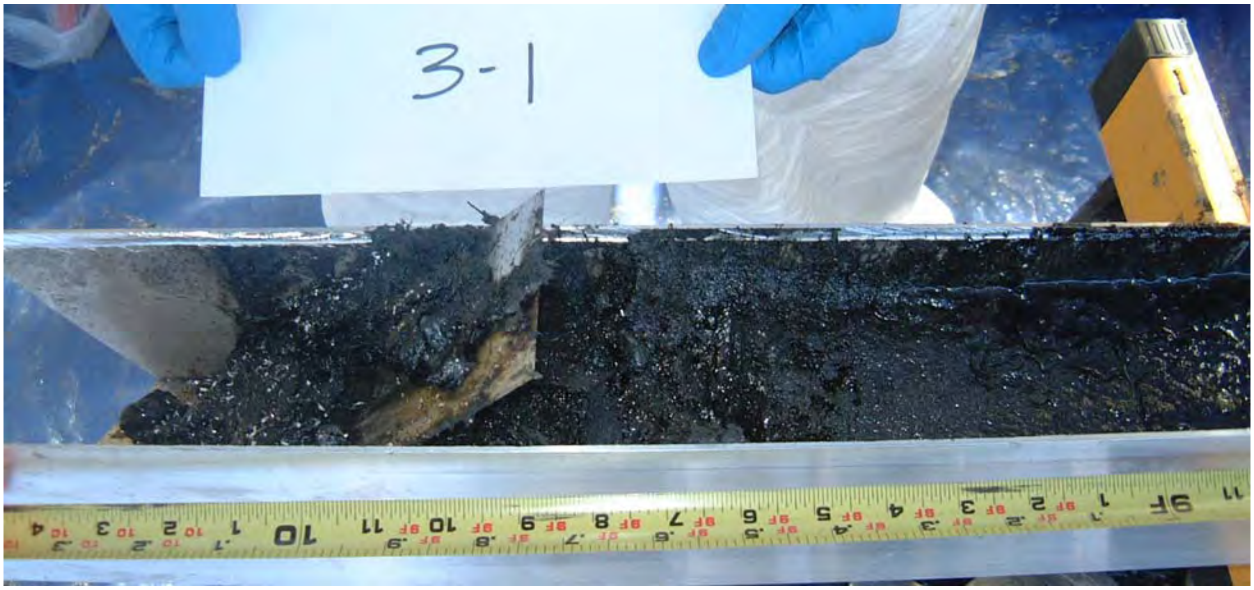


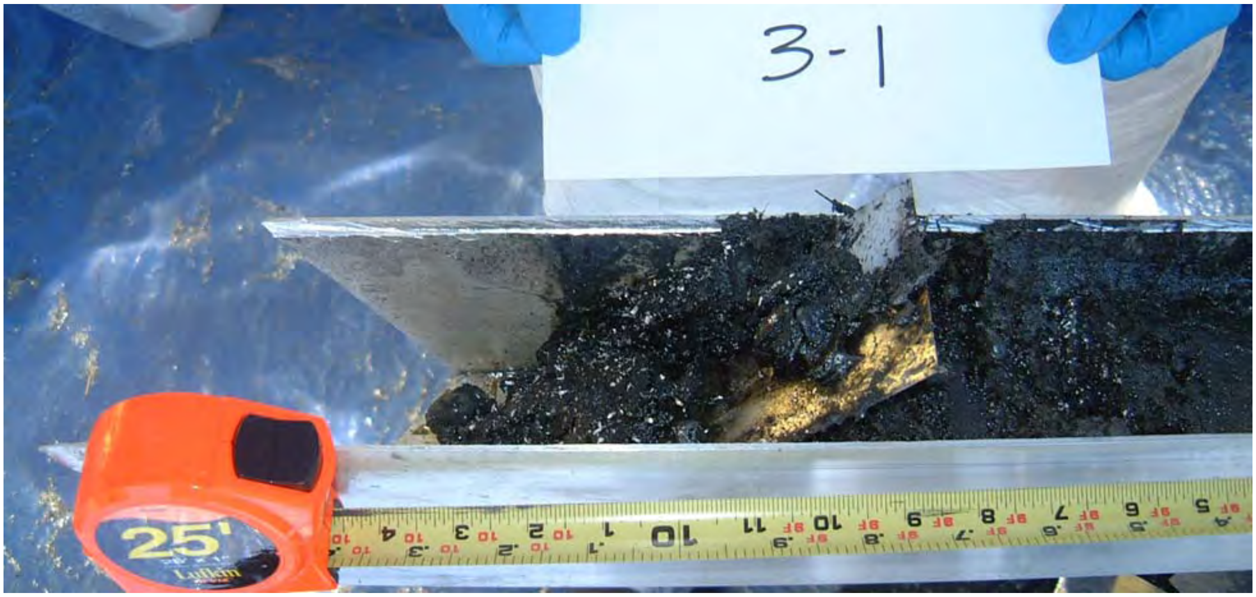

2-2 A

Photographs of NAPL Investigation Core 3-1: Starting at the top of the core

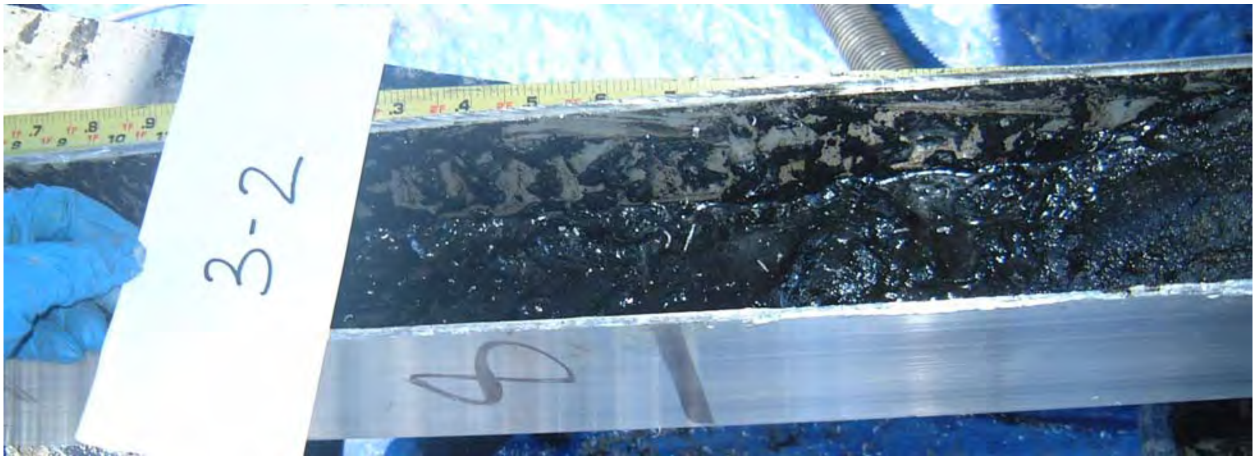


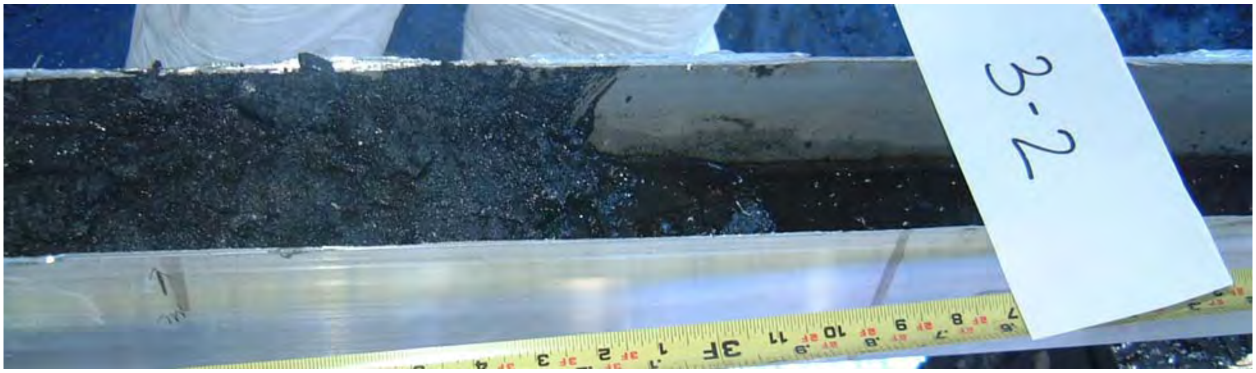


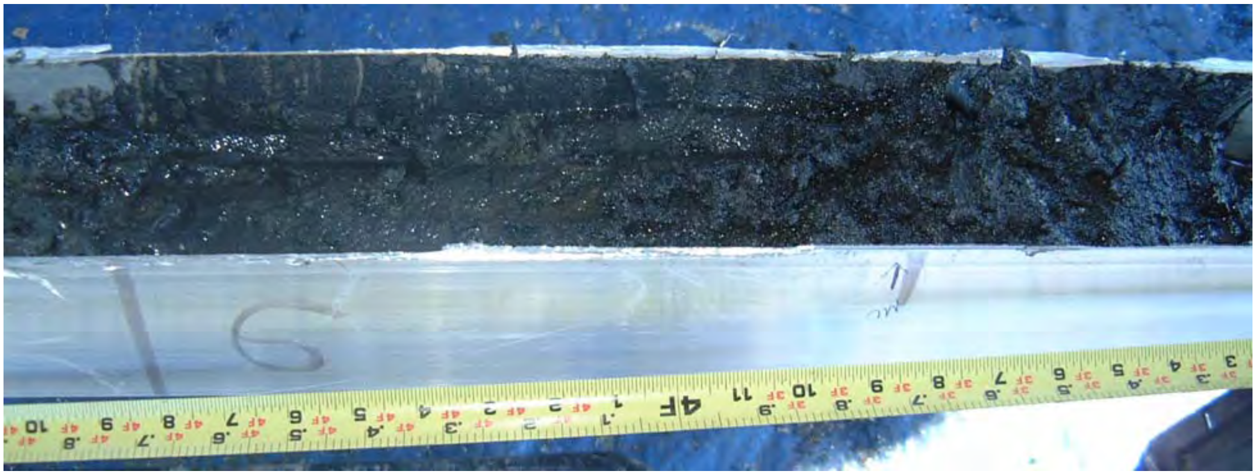


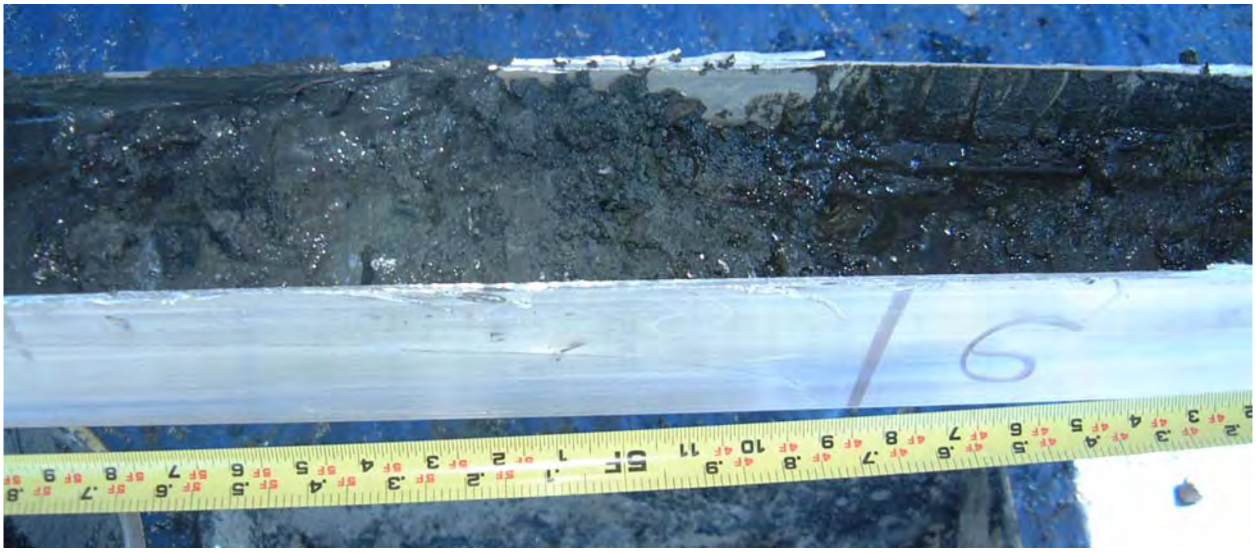

3-1
25'
Lufkin

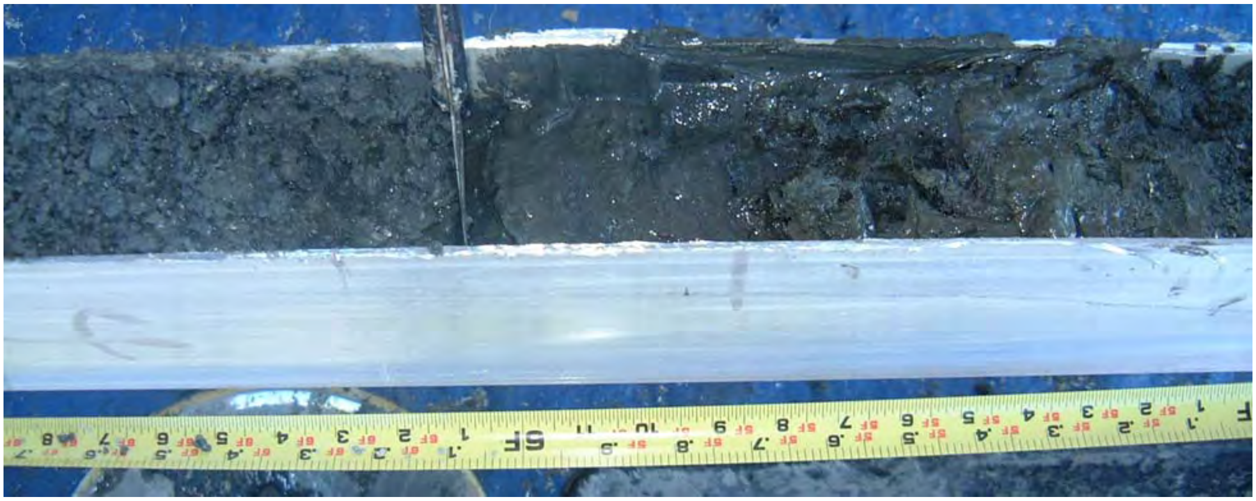
Photographs of NAPL Investigation Core 3-2: Starting at the top of the core

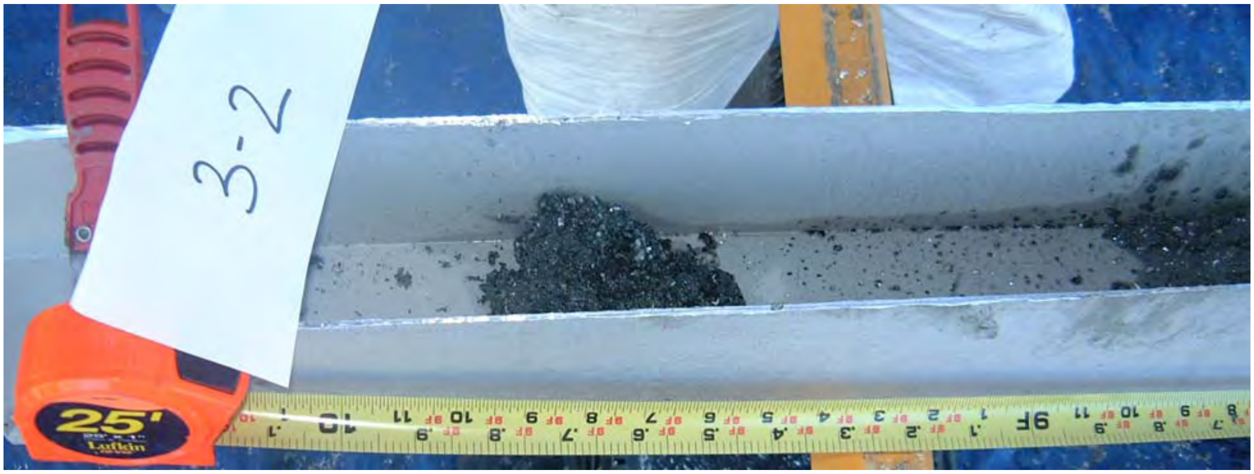




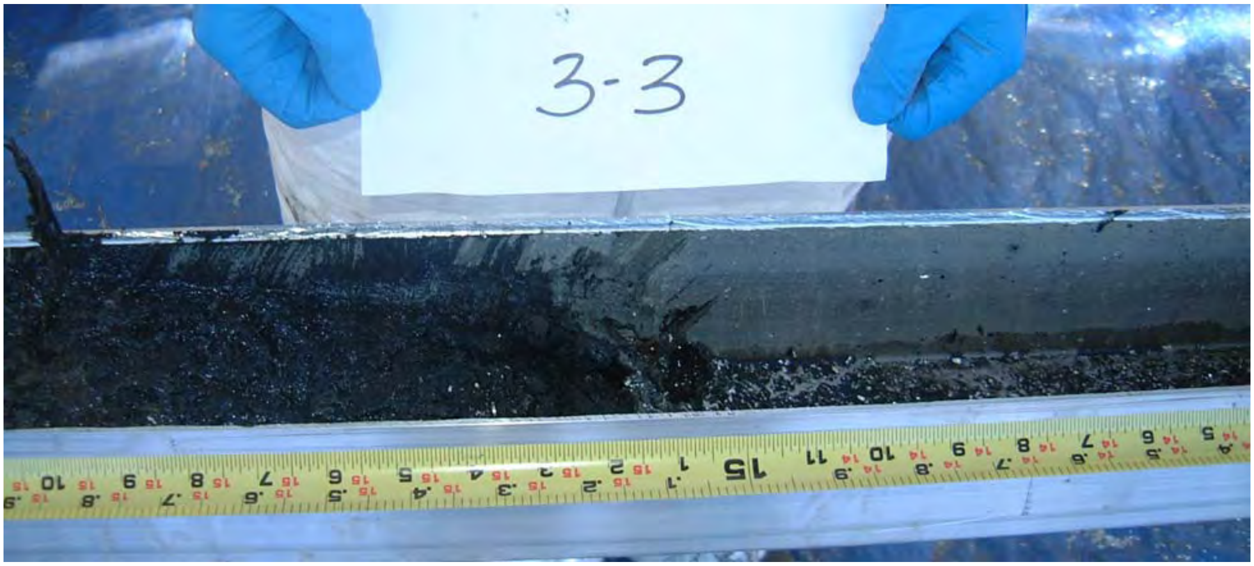


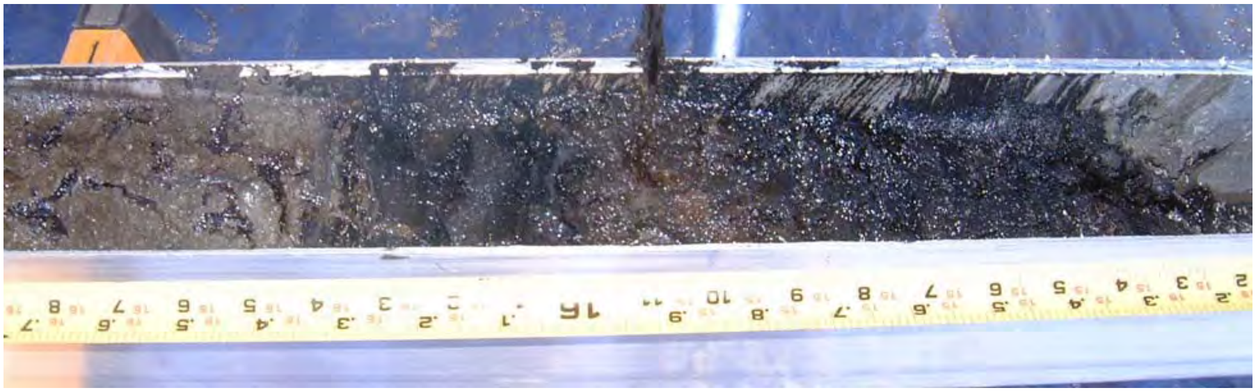


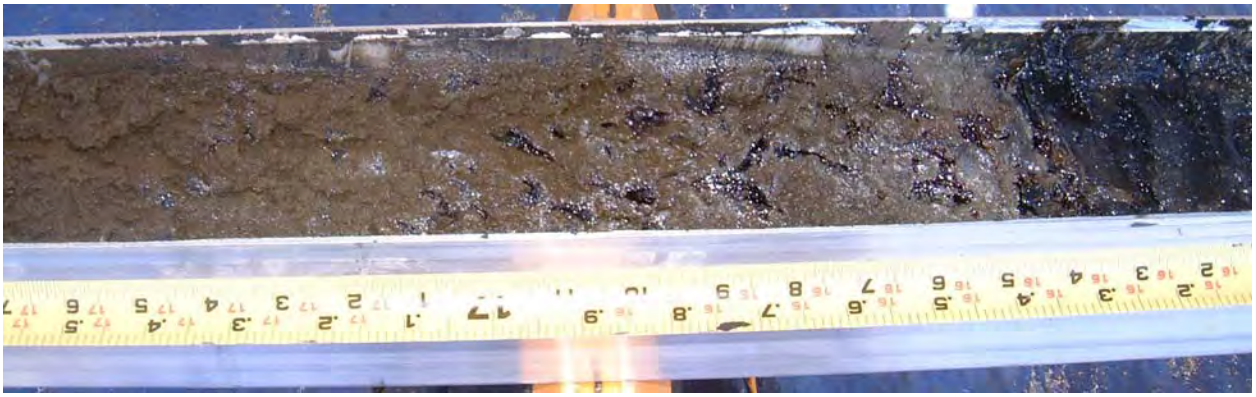


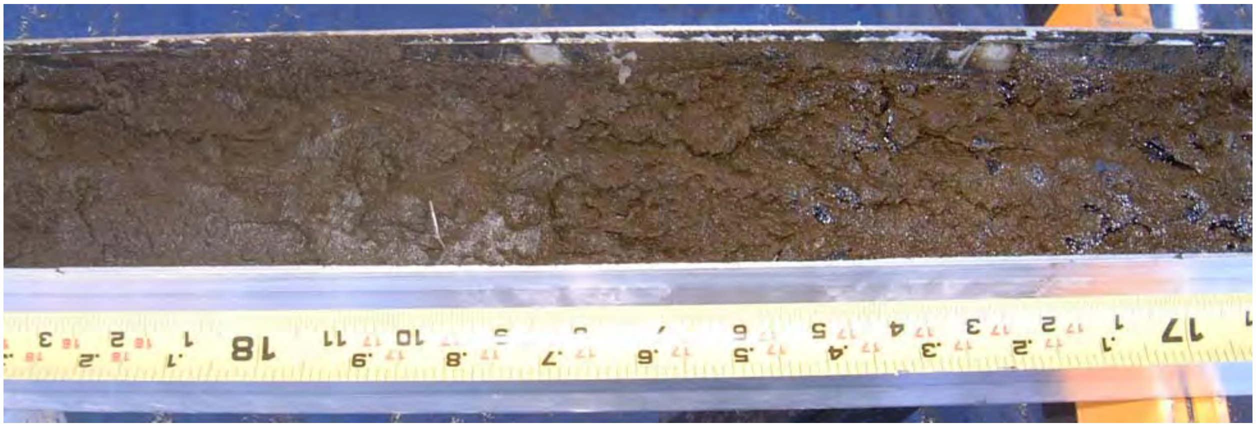

3-2
25'
Lufkin

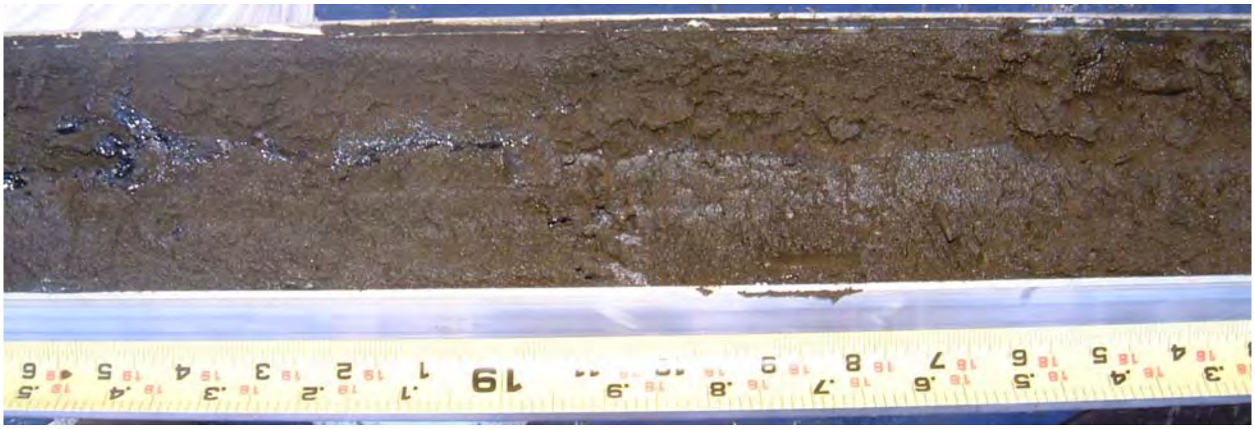
Photographs of NAPL Investigation Core 3-3: Starting at the top of the core

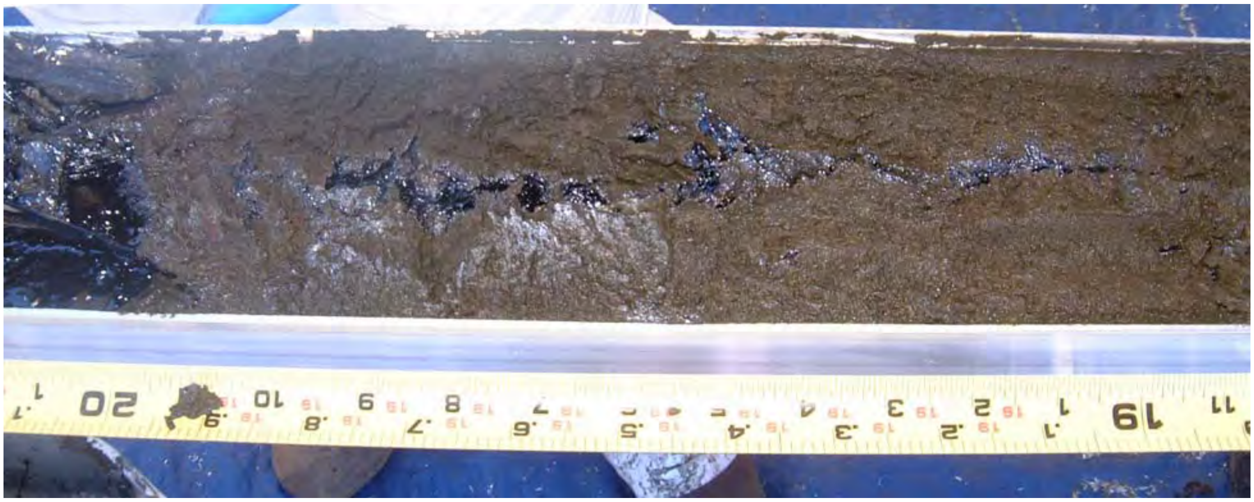


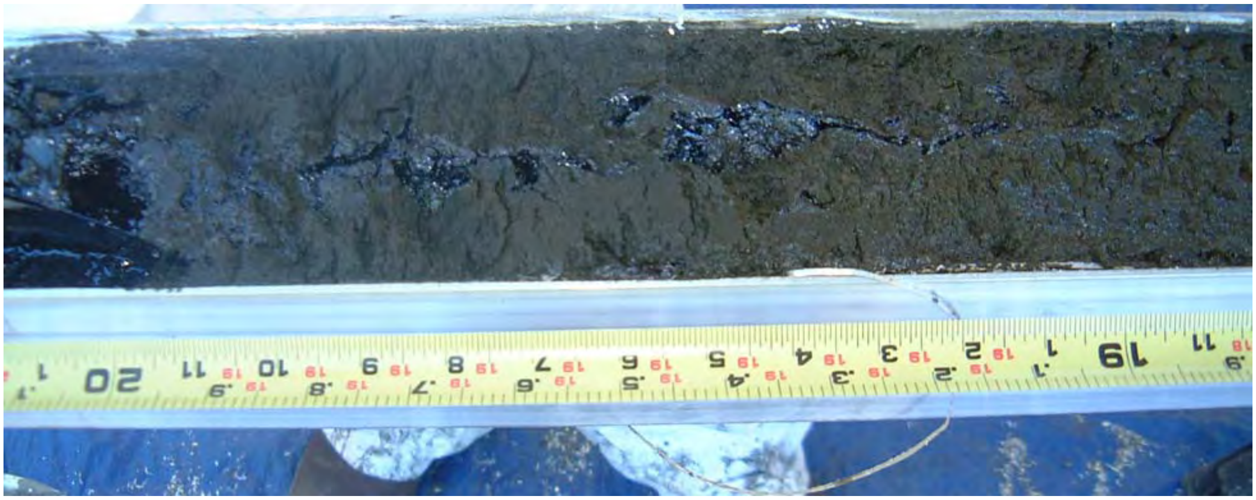


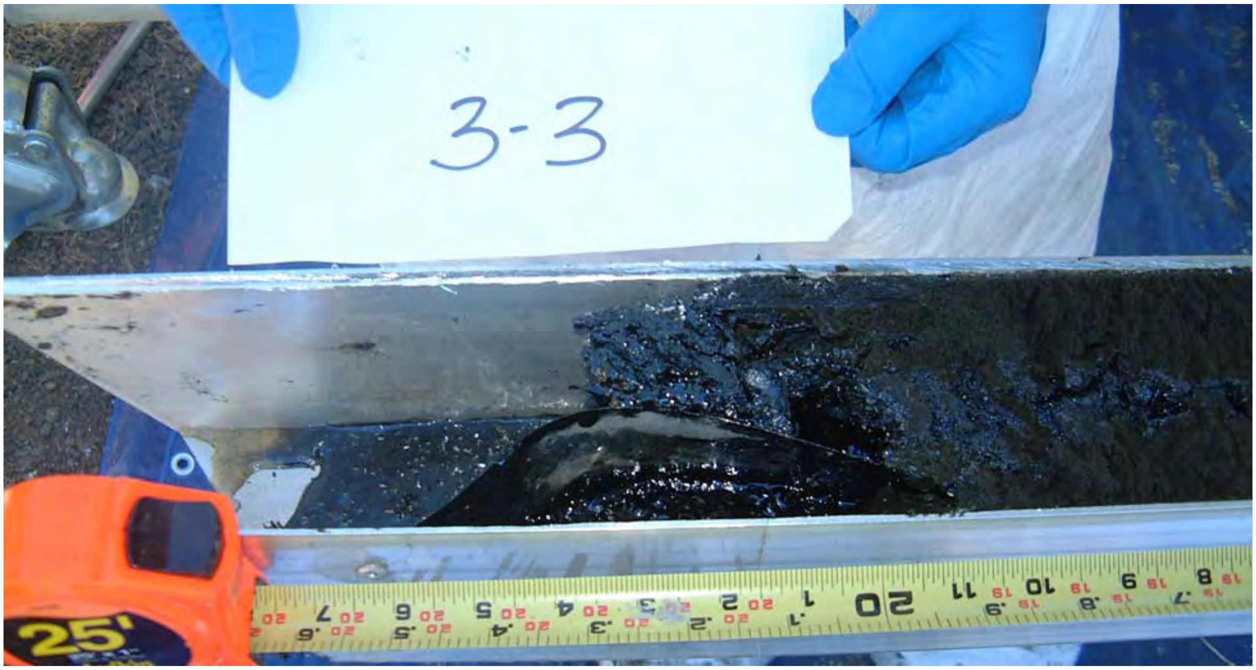


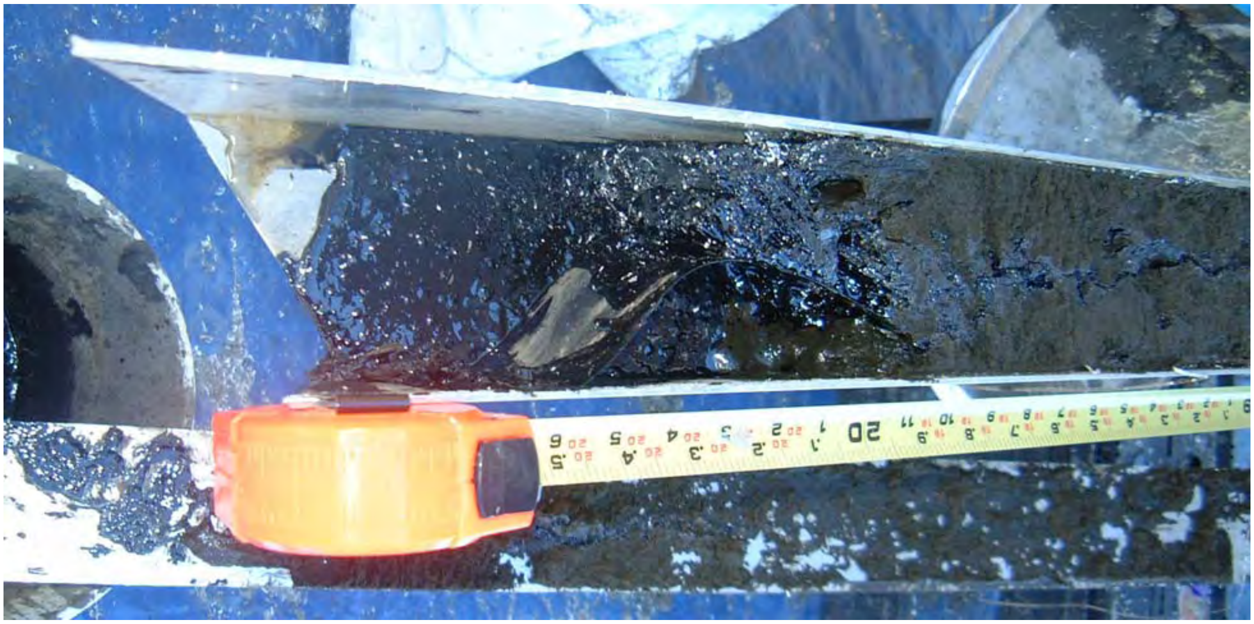




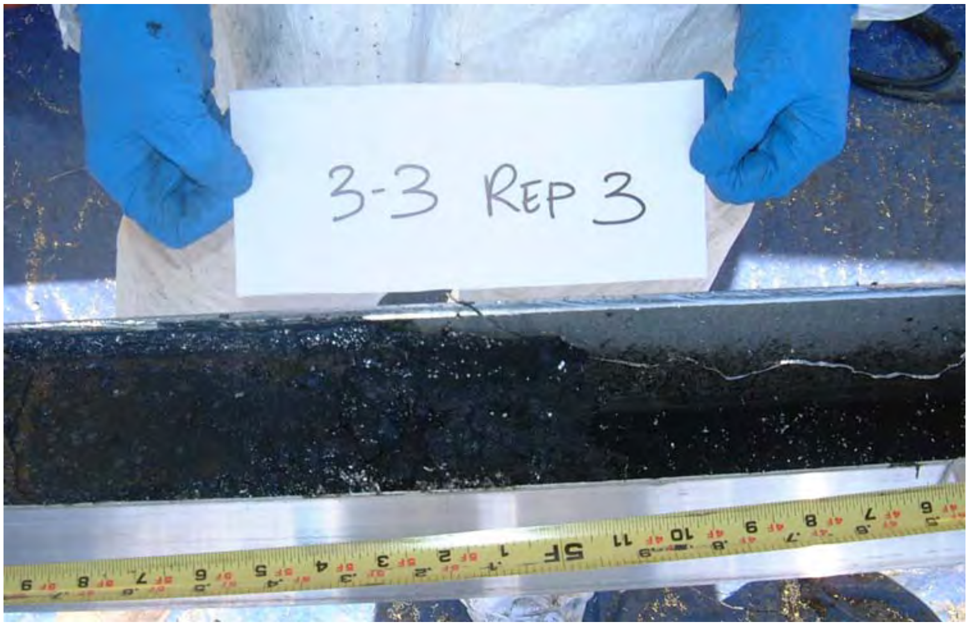


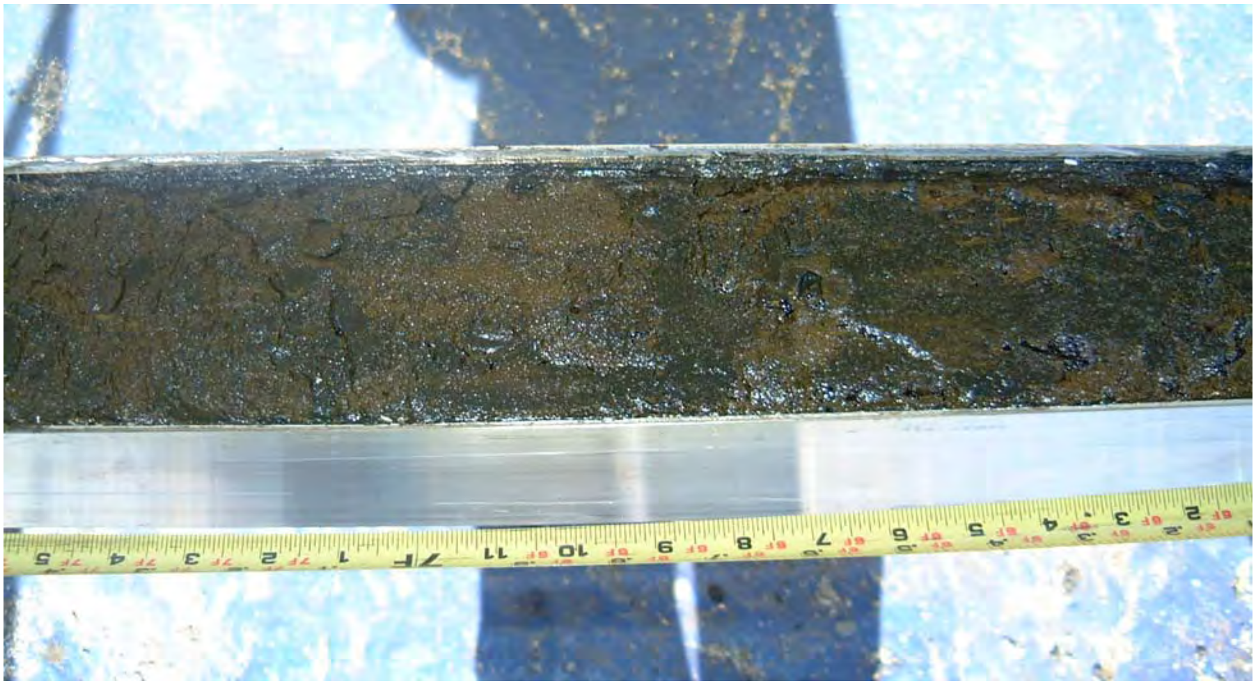


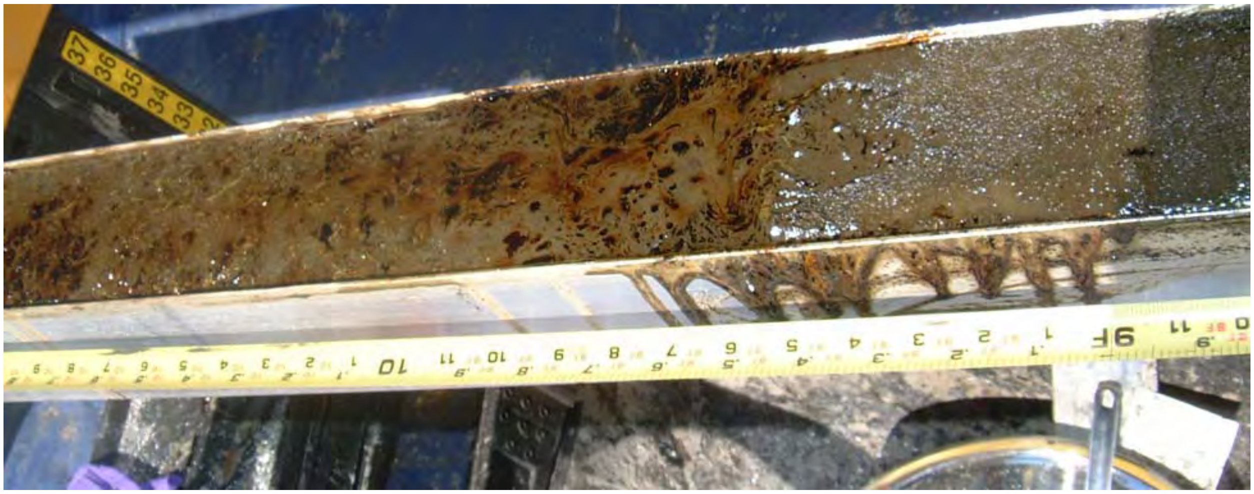

3-3



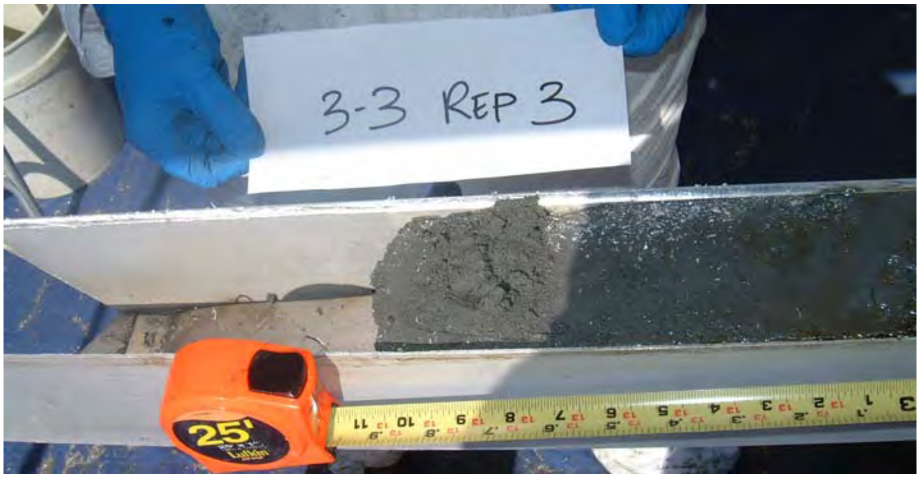
Photographs of Core 3-3 Rep 3: Starting at the top of the core



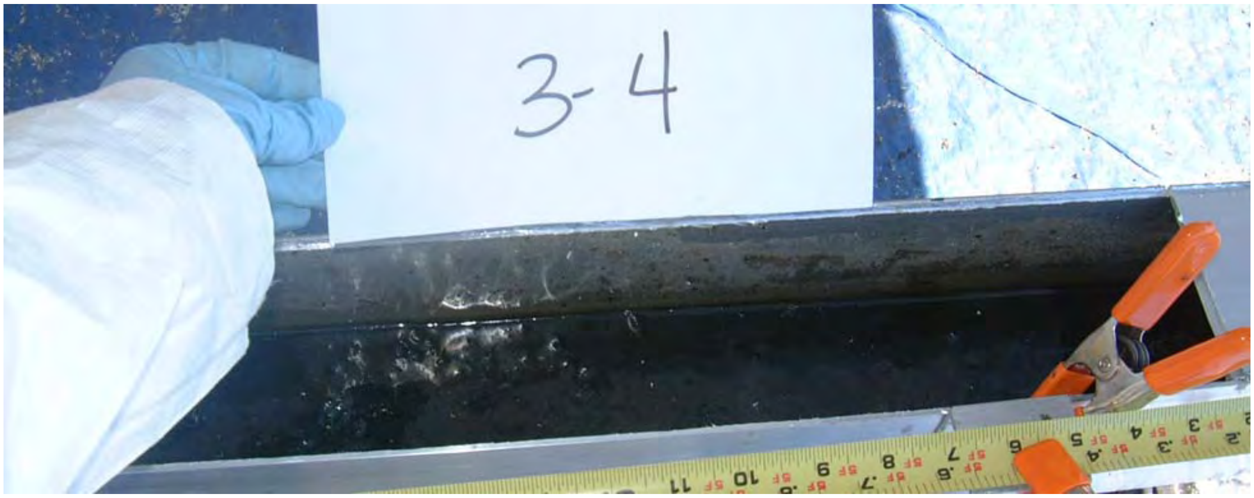


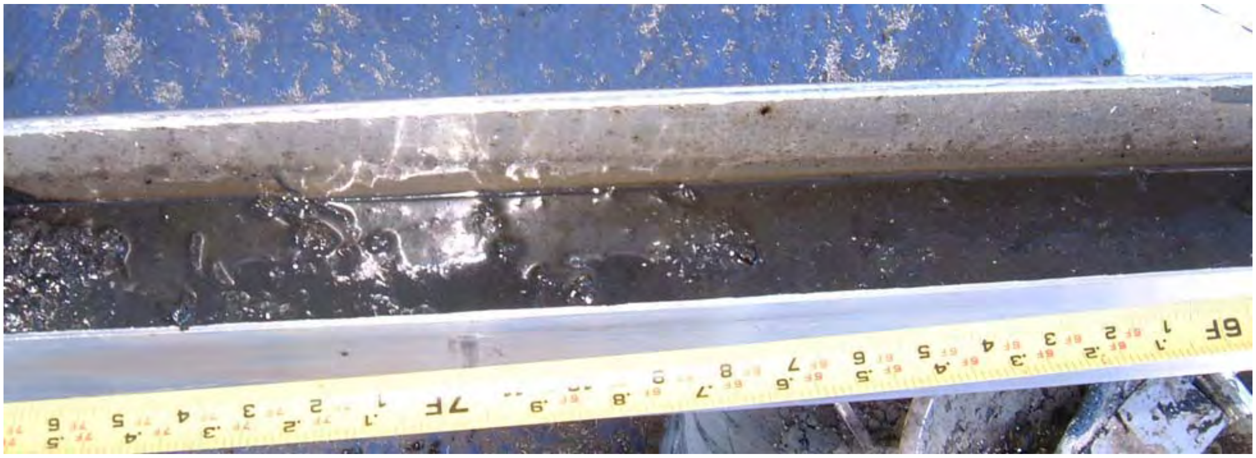


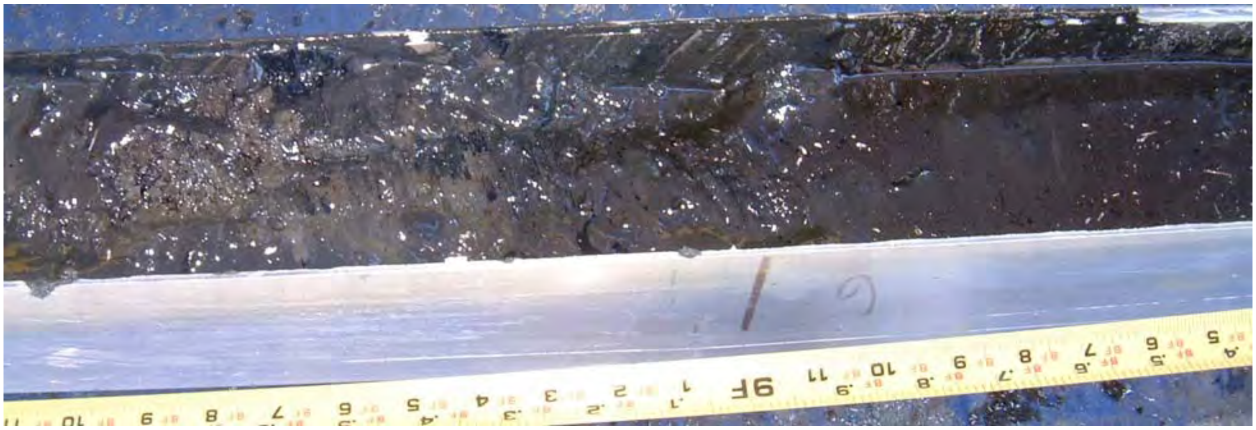

3 REP 3

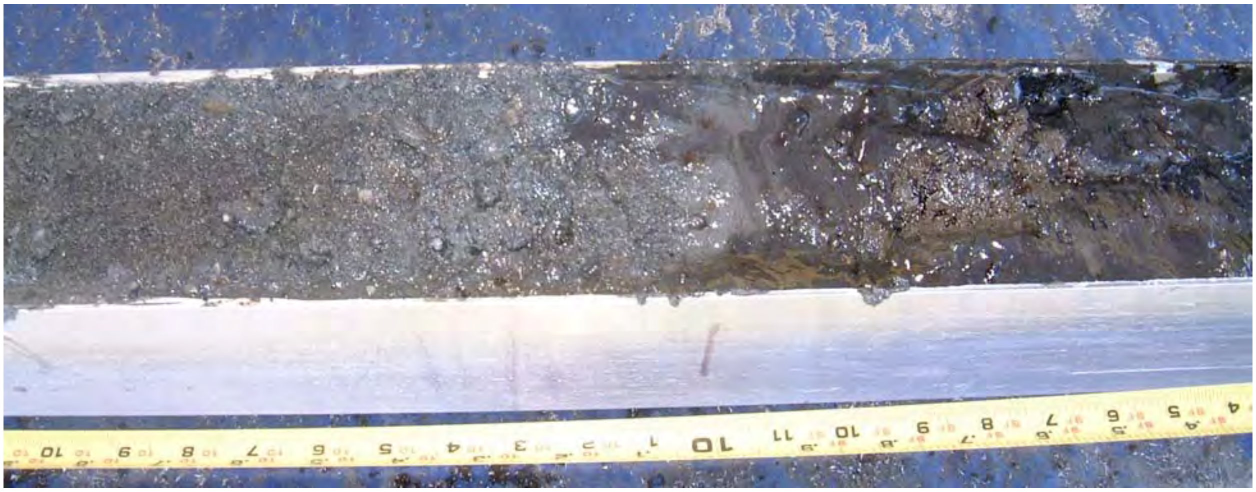

3-3 REP 3
25'

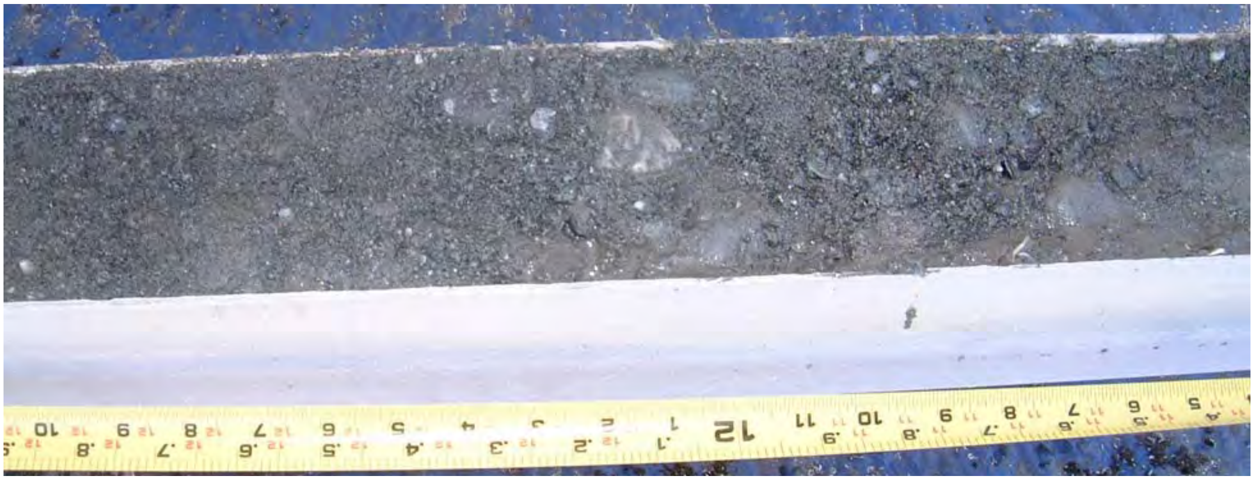
Photographs of NAPL Investigation Core 3-4: Starting at the top of the core

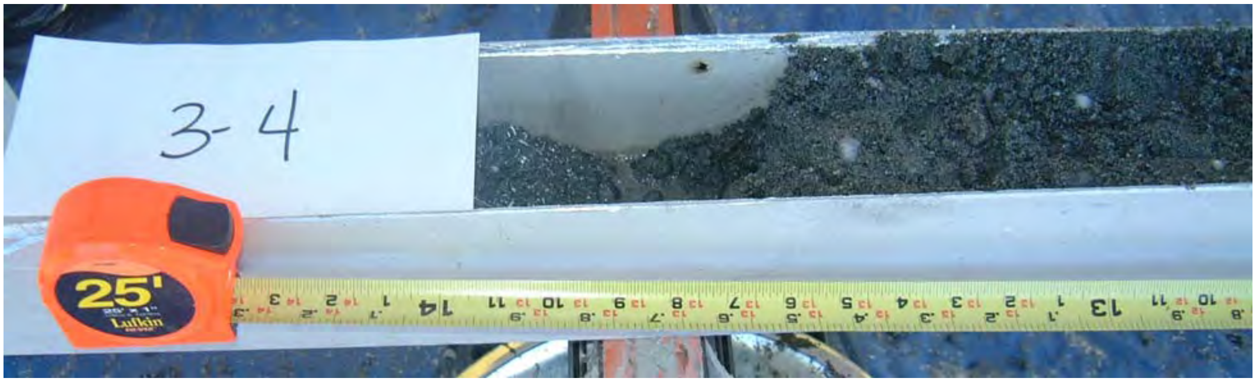




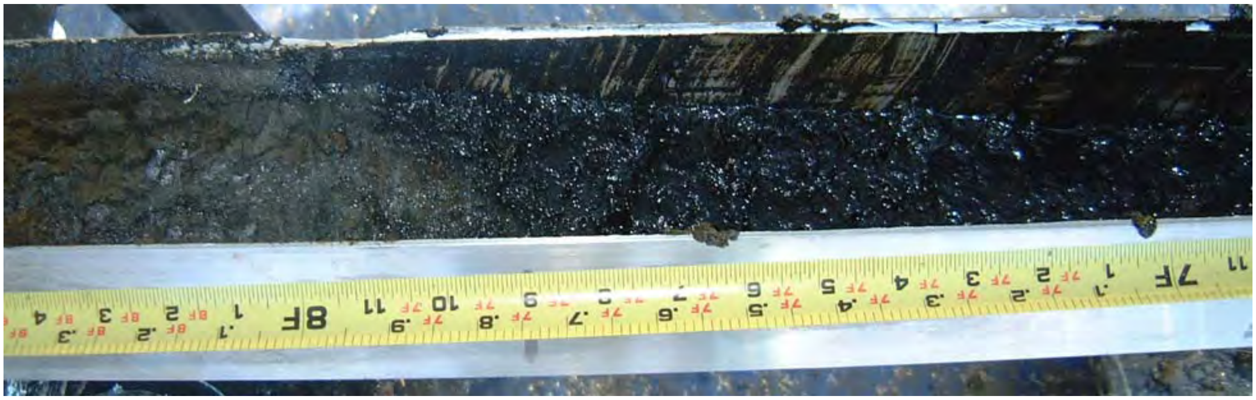


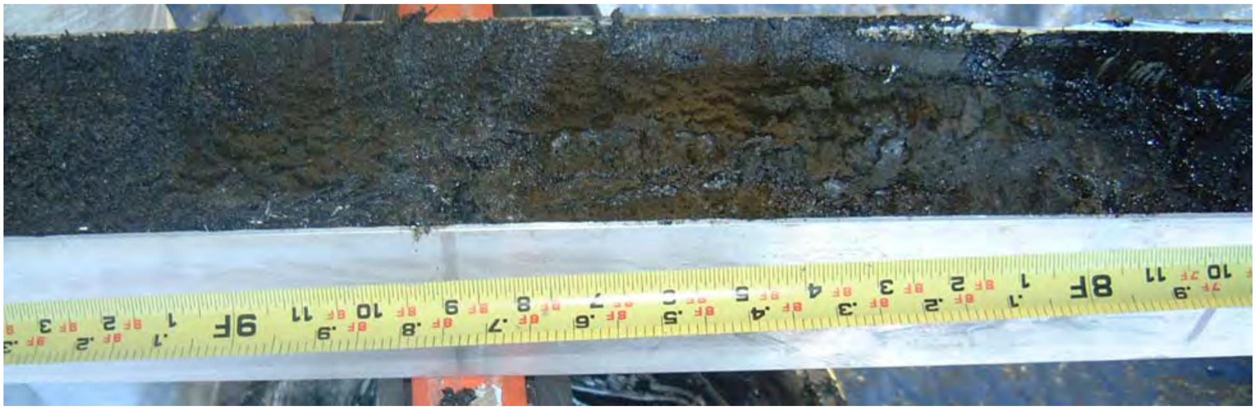


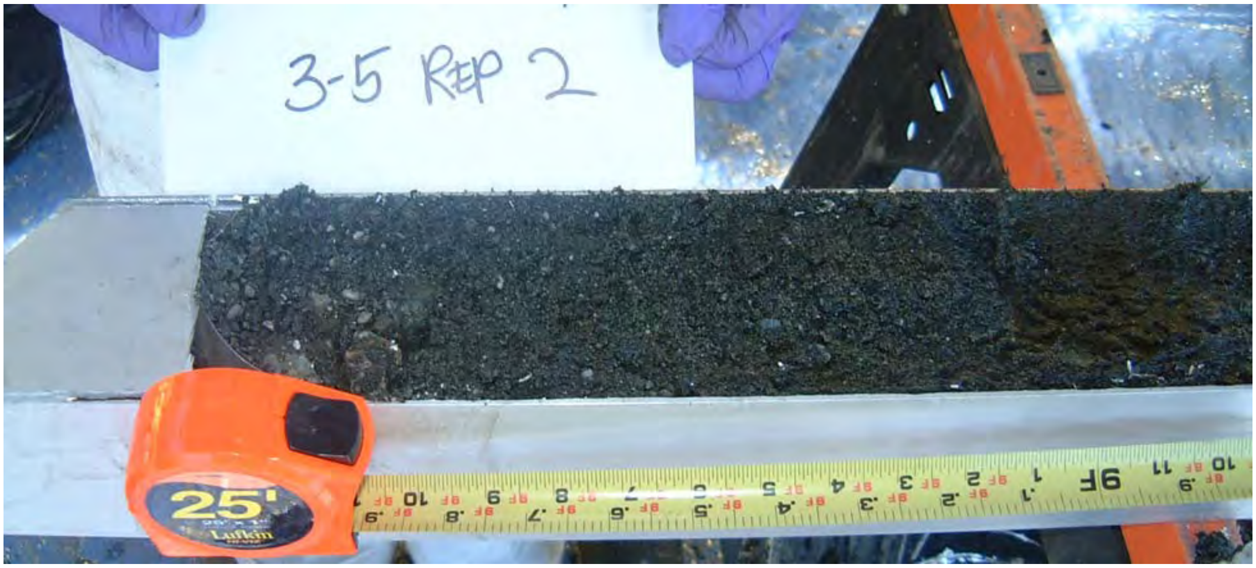



3-4
25'
Lufkin

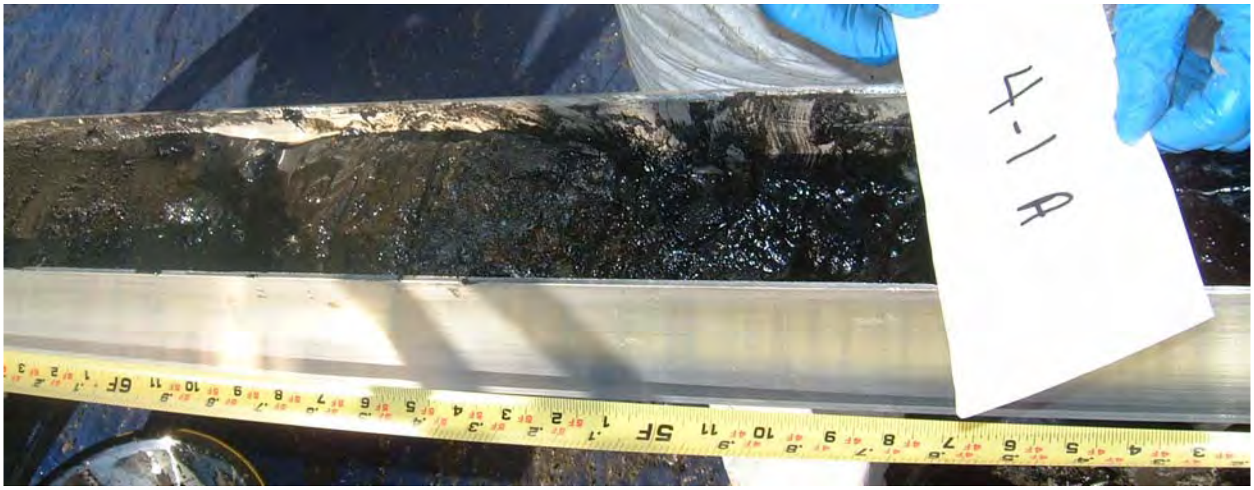
Photographs of NAPL Investigation Core 3-5 Rep 2: Starting at the top of the core

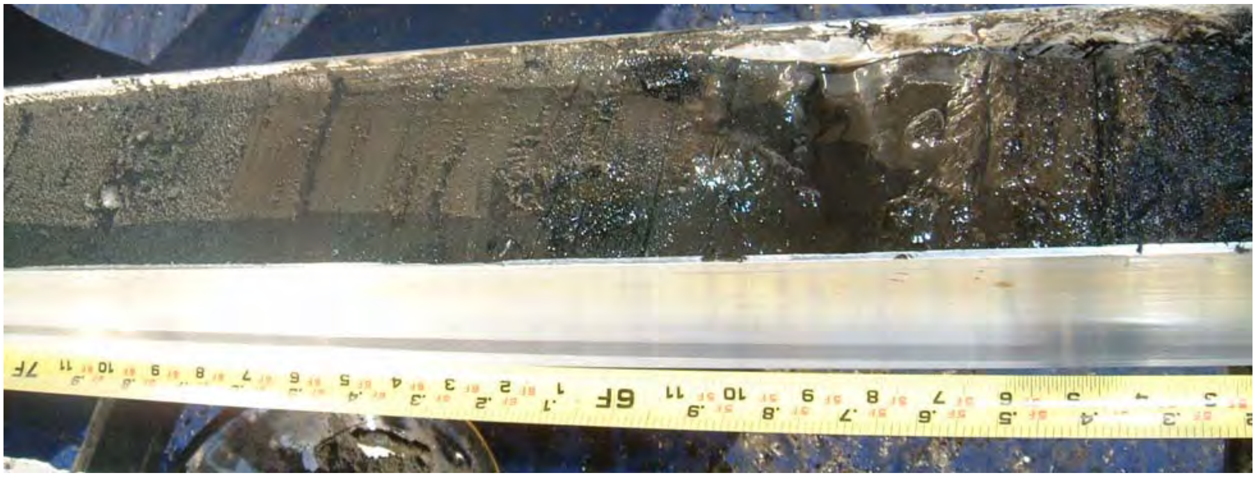


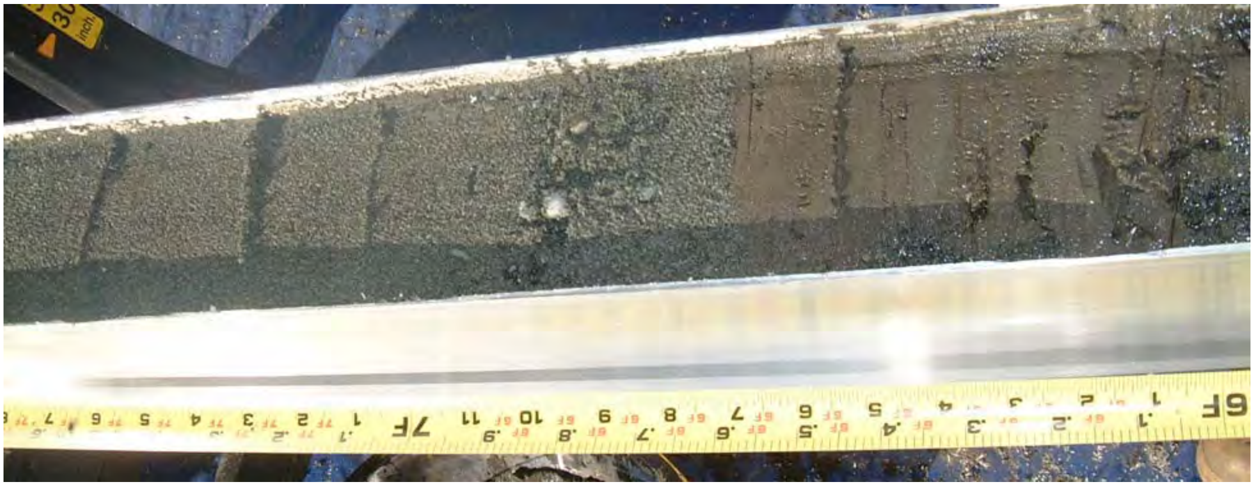


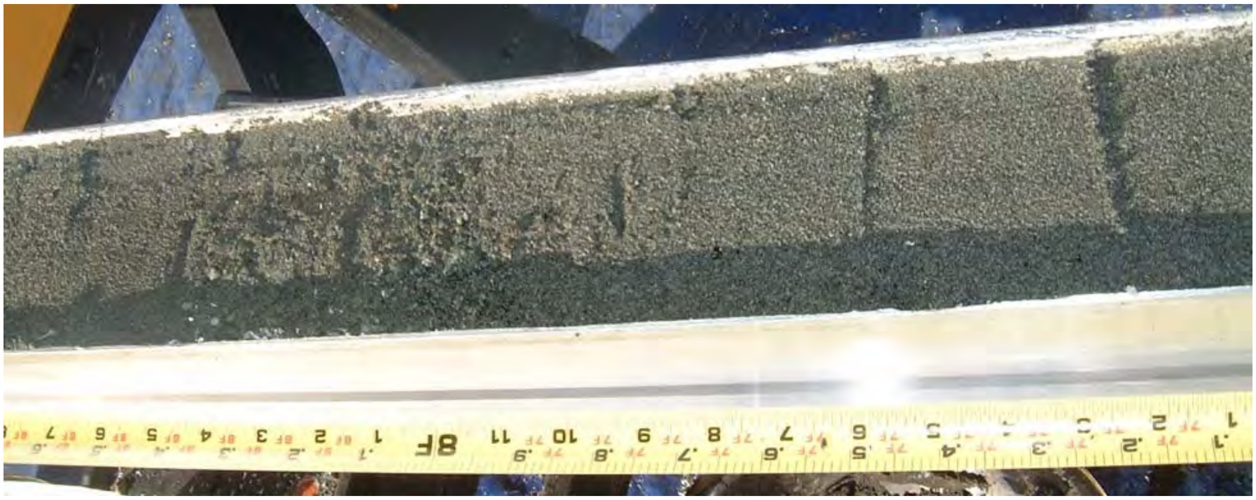

3-5 REP 2
25'
Lufkin

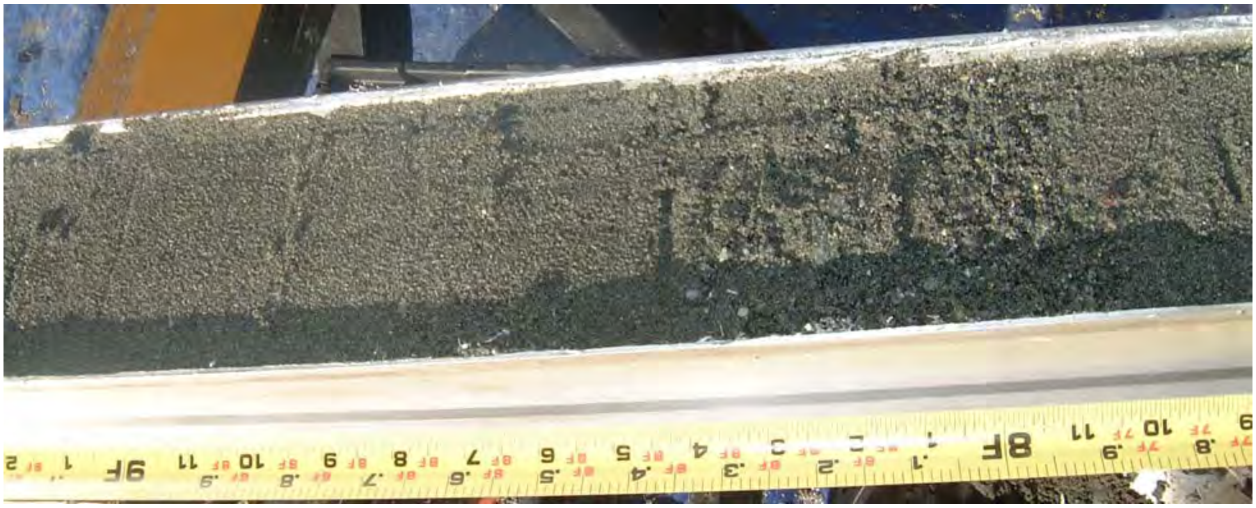
Photographs of NAPL Investigation Core 4-1 A: Starting at the top of the core

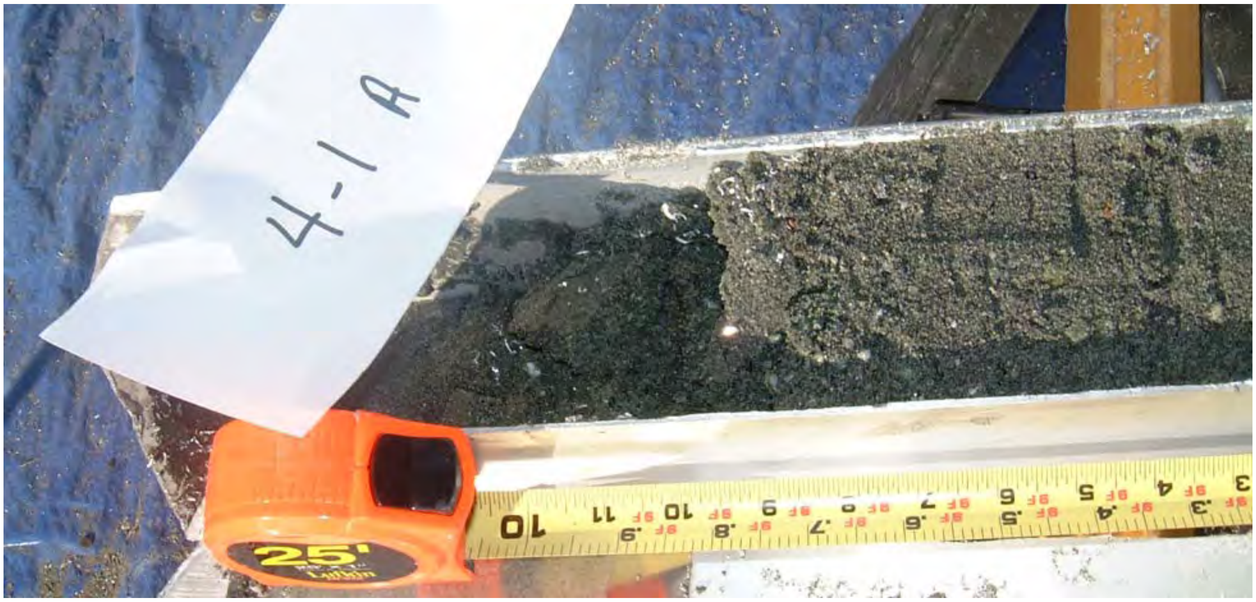




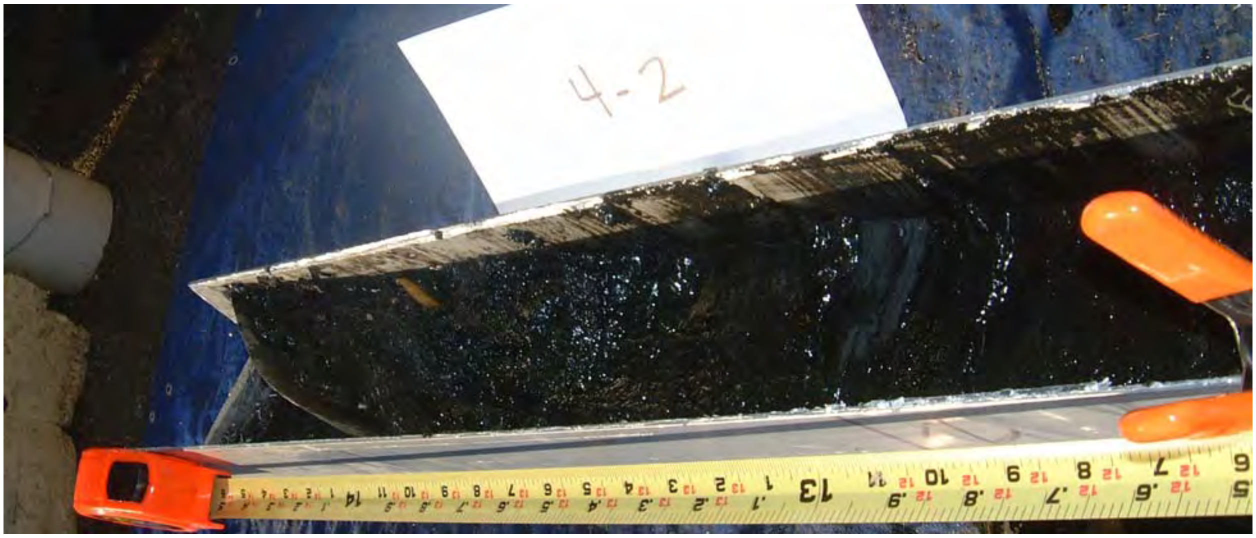




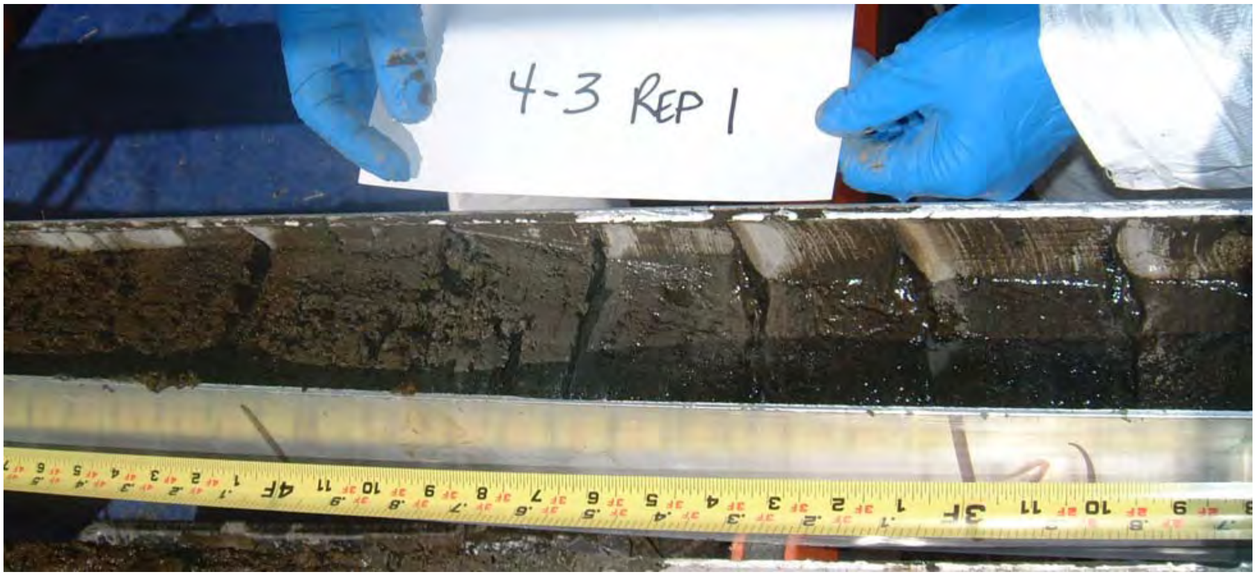


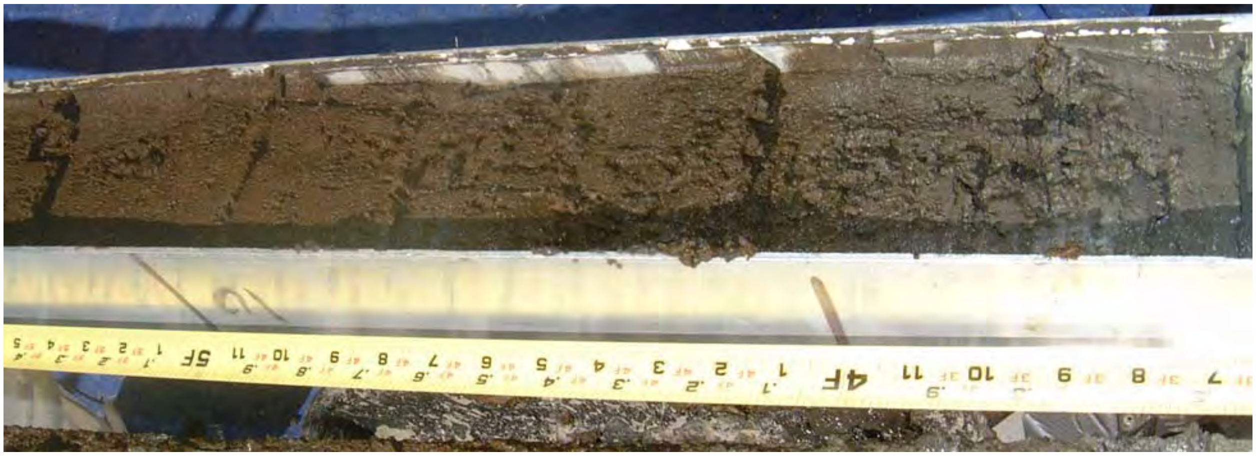

4-1 A
25'

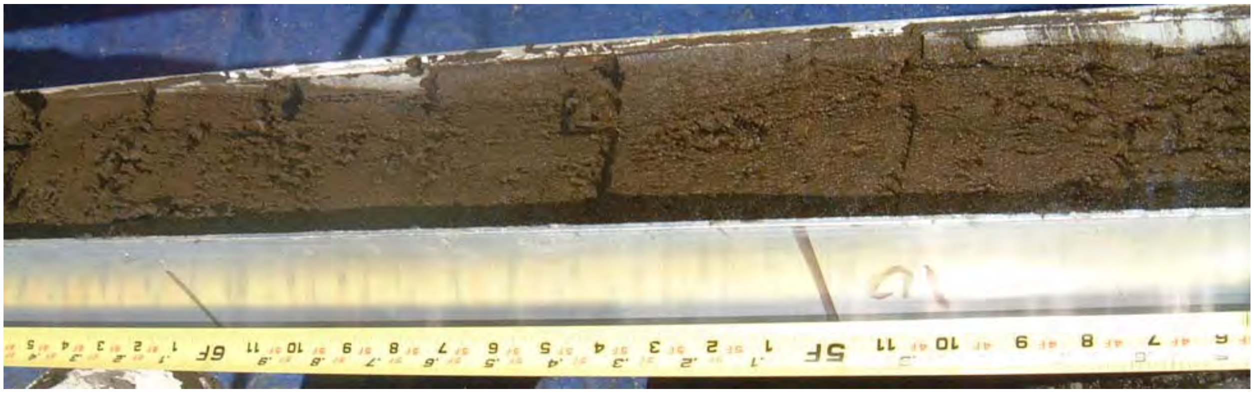
Photographs of NAPL Investigation Core 4-2: Starting at the top of the core



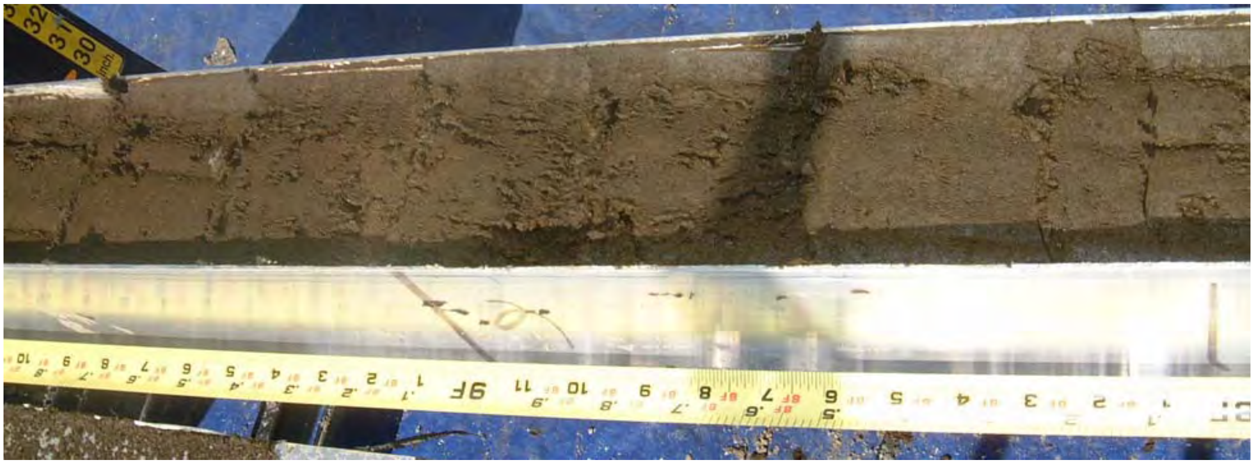
Photographs of NAPL Investigation Core 4-3 Rep 1: Starting at the top of the core

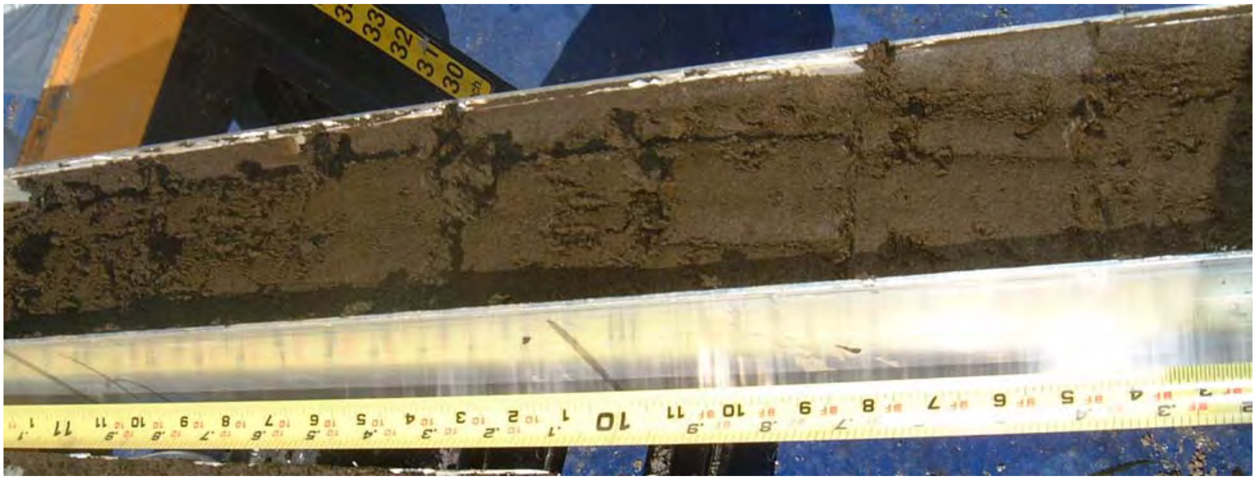


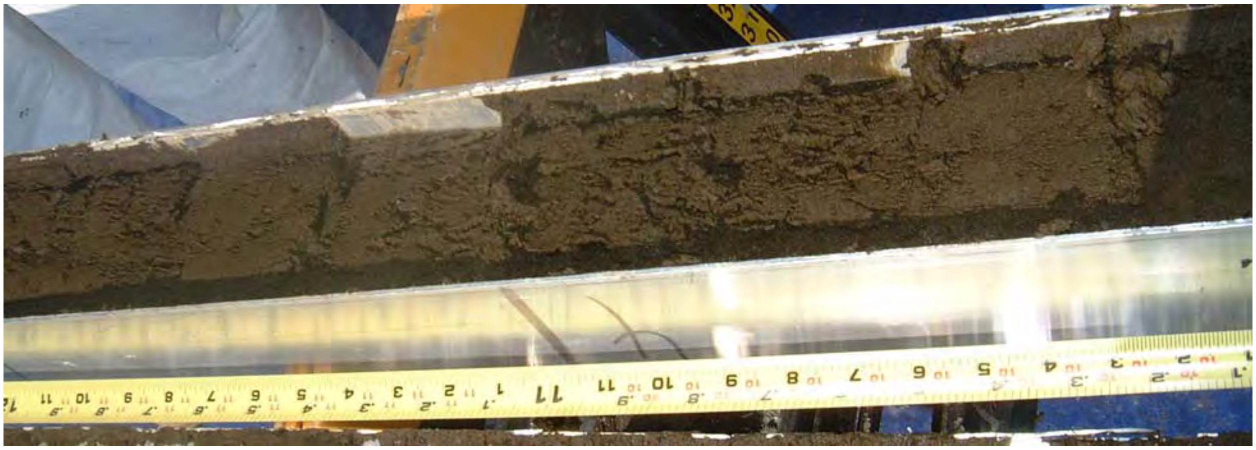


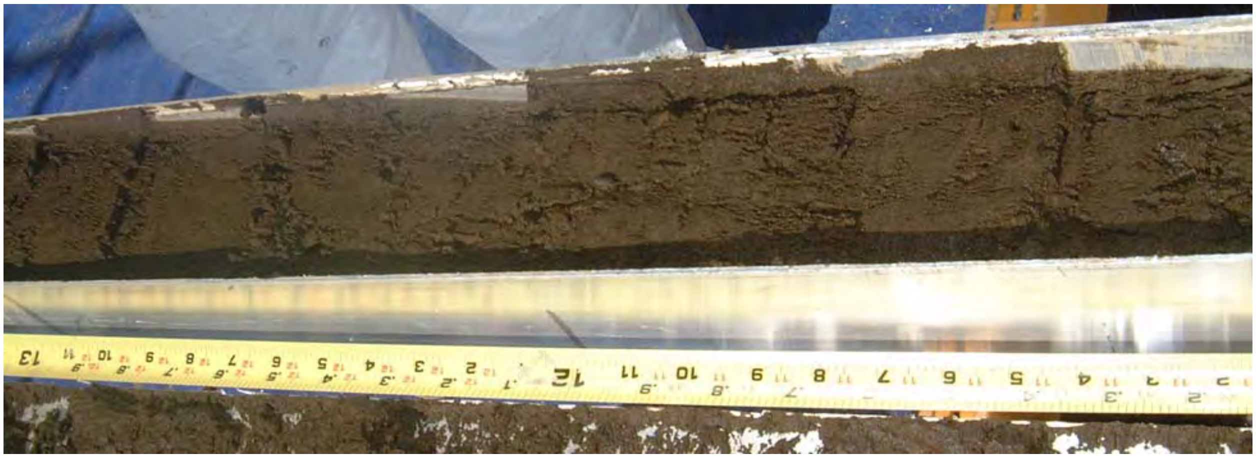


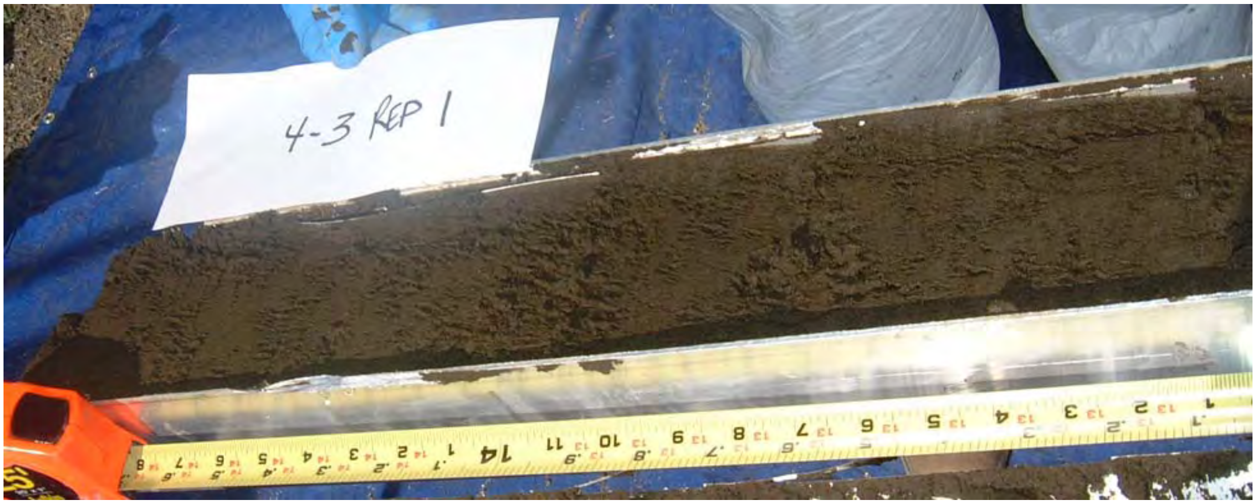

8



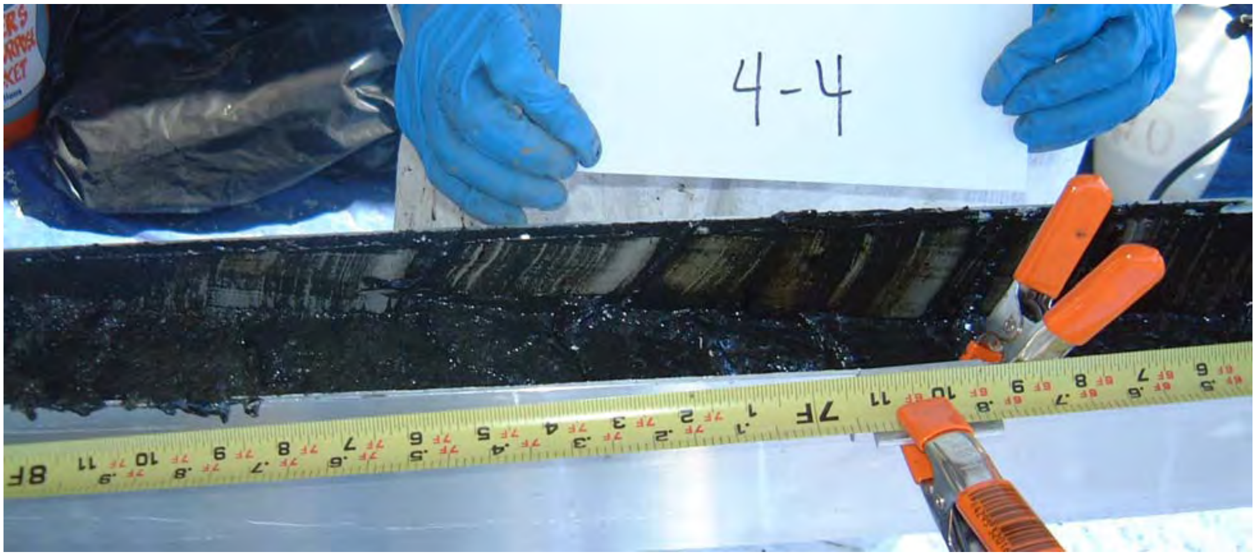


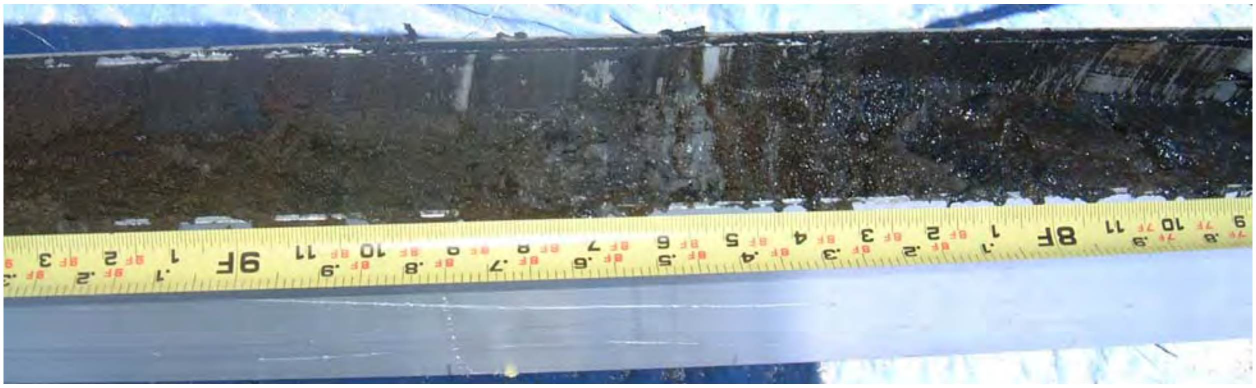


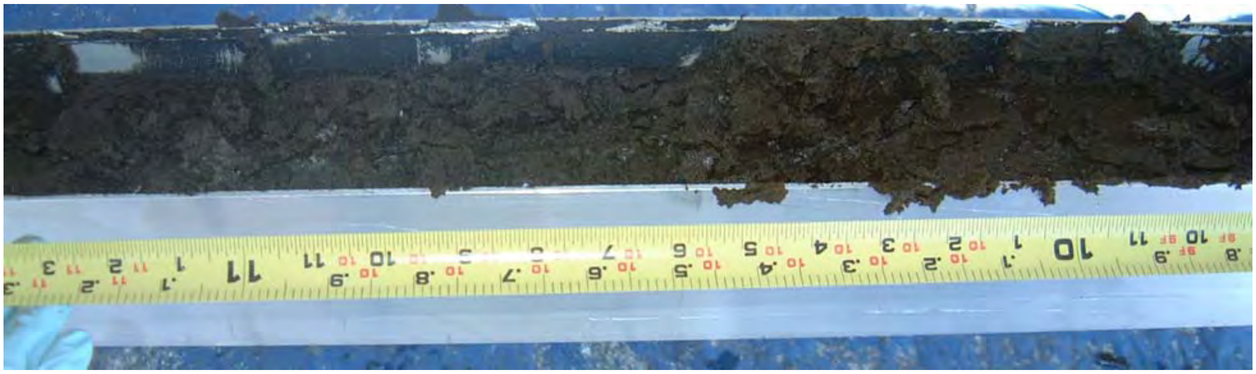


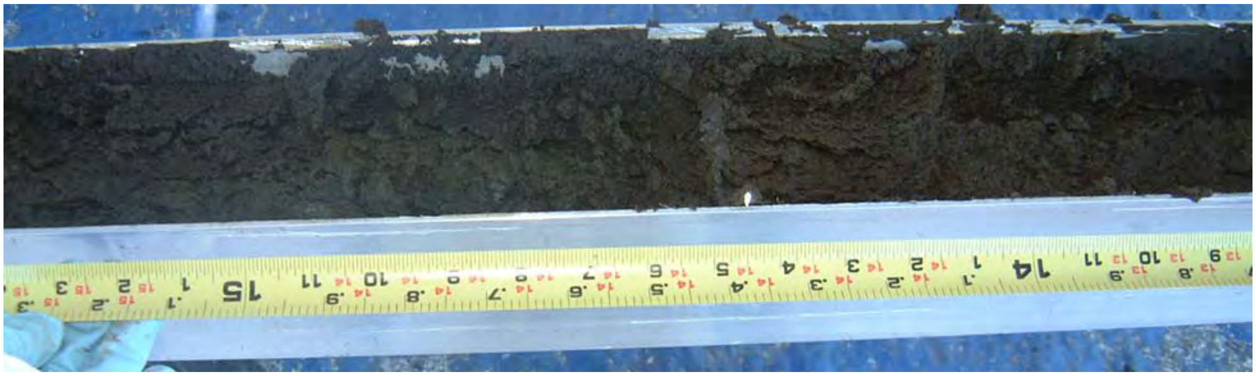

4-3 REP 1

Photographs of NAPL Investigation Core 4-4: Starting at the top of the core



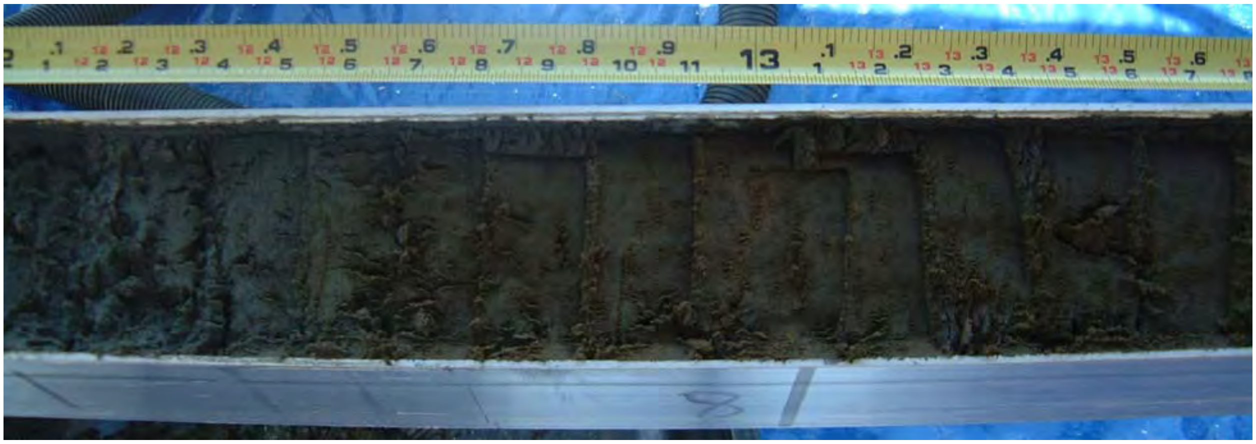






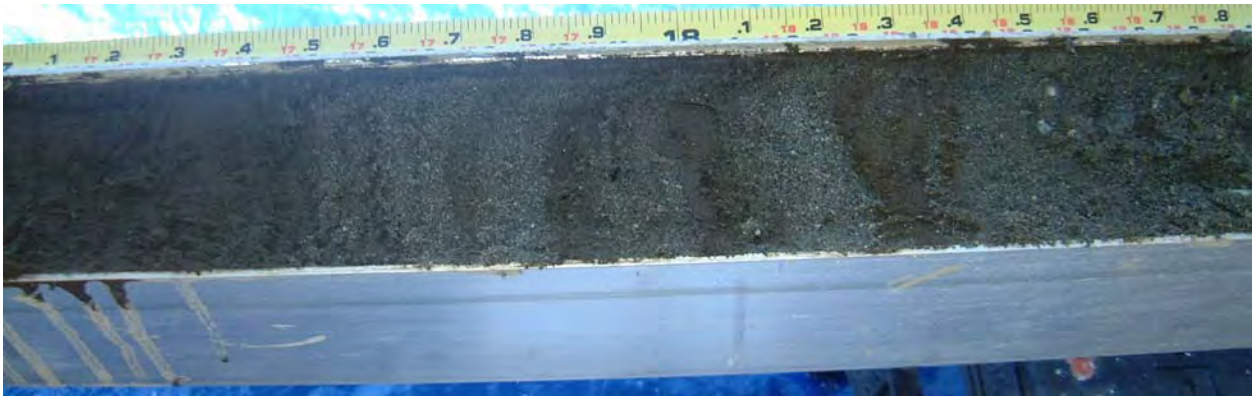

4-4

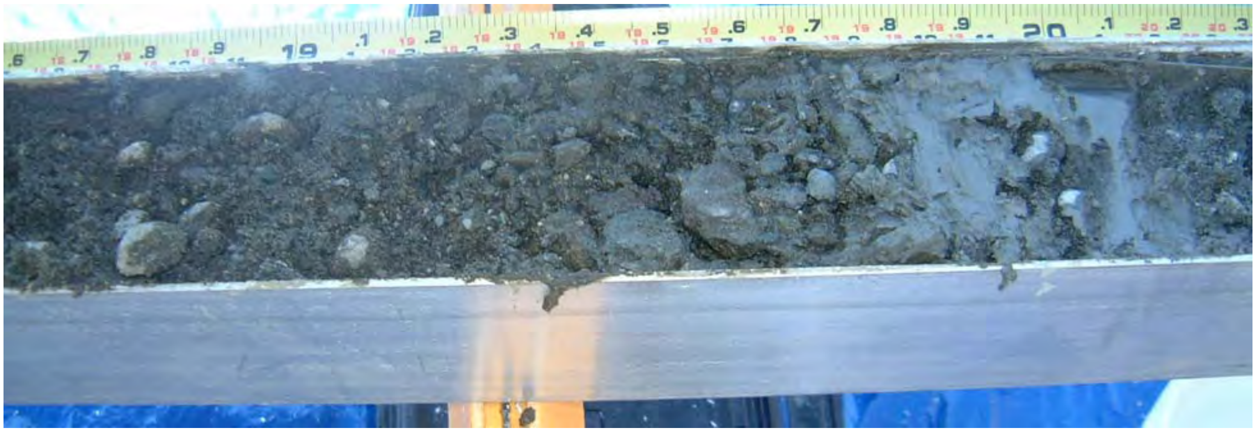
Photographs of NAPL Investigation Core 5-1 Rep 2: Starting at the top of the core



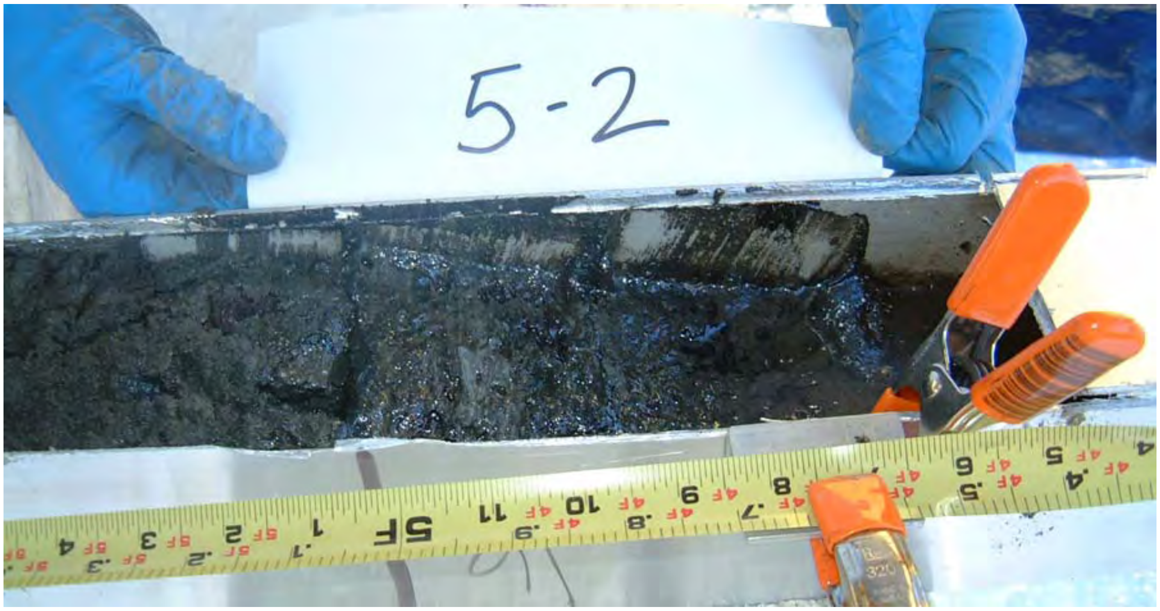

14
15

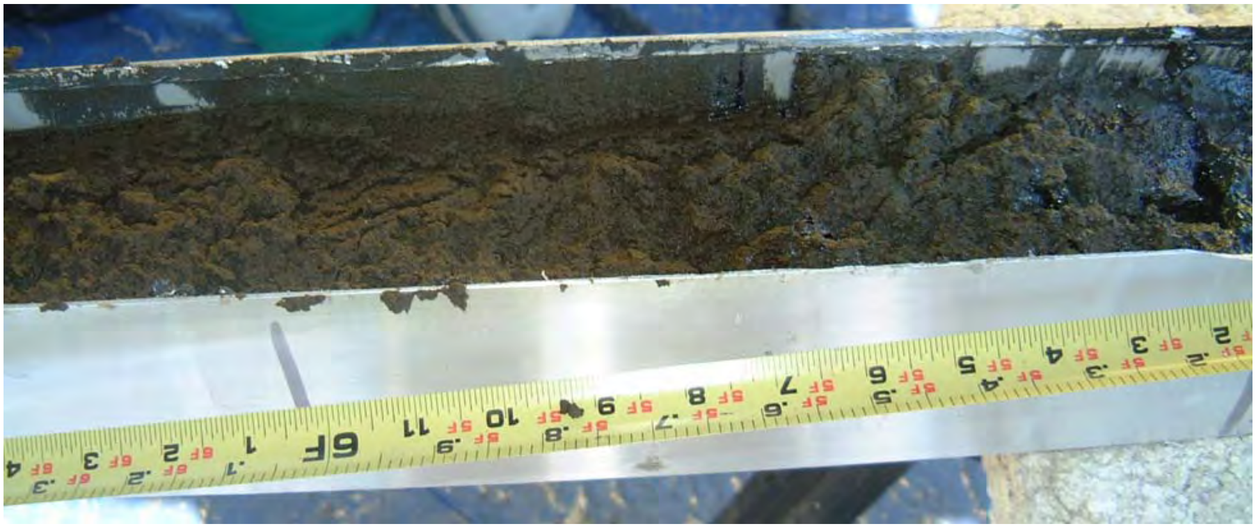

16


18



Photographs of NAPL Investigation Core 5-2: Starting at the top of the core

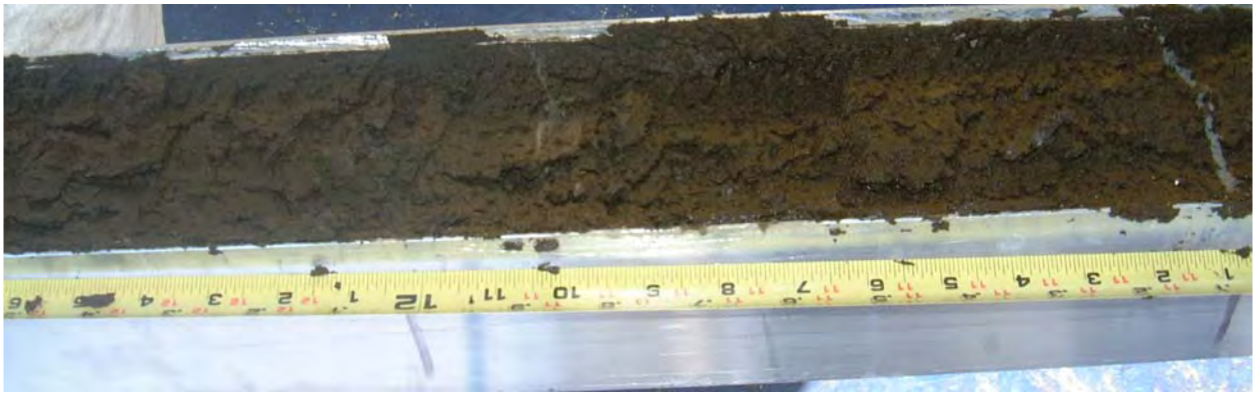


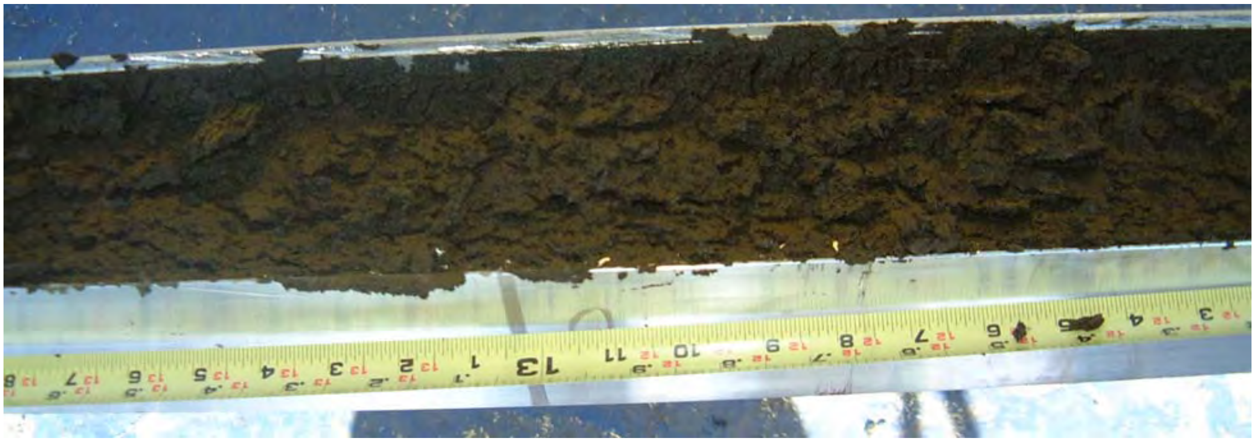



8F


10

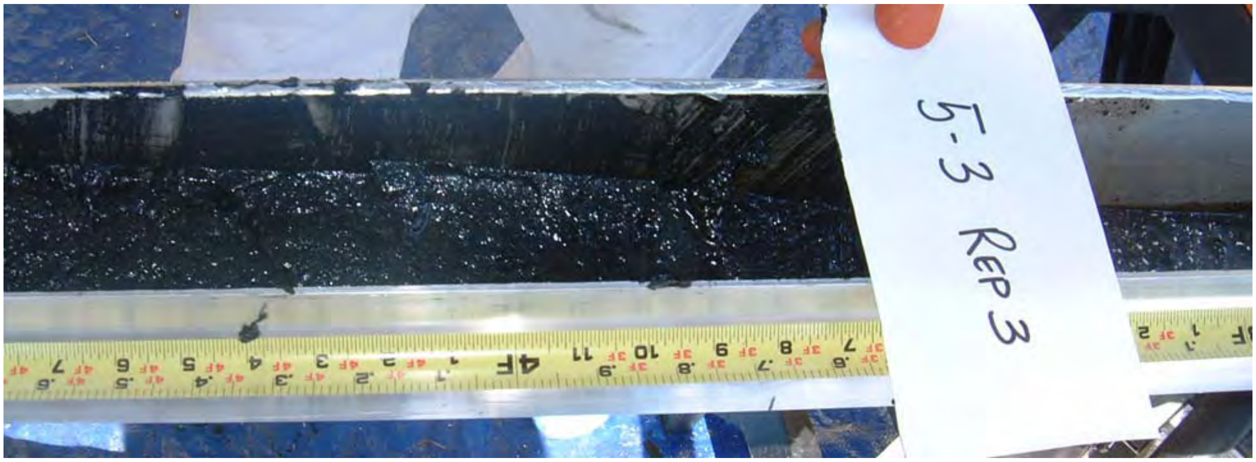

11

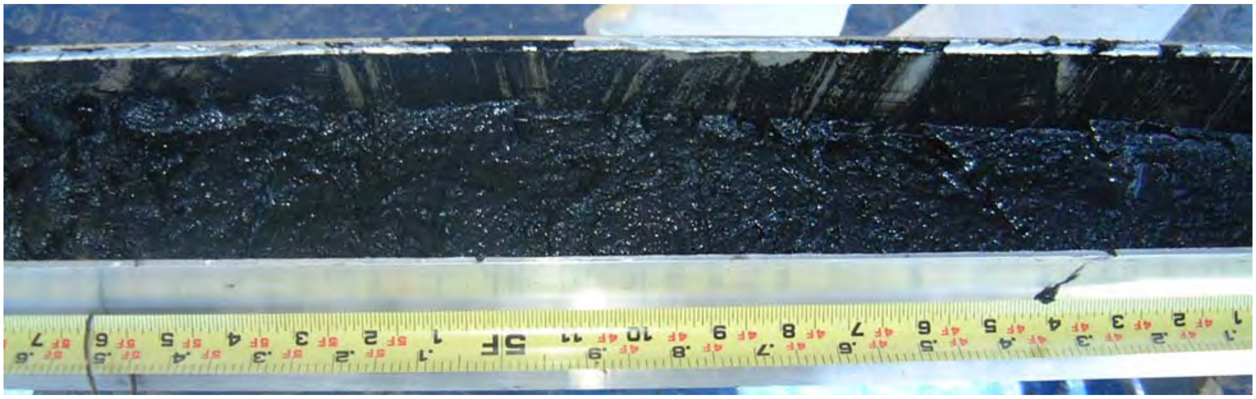


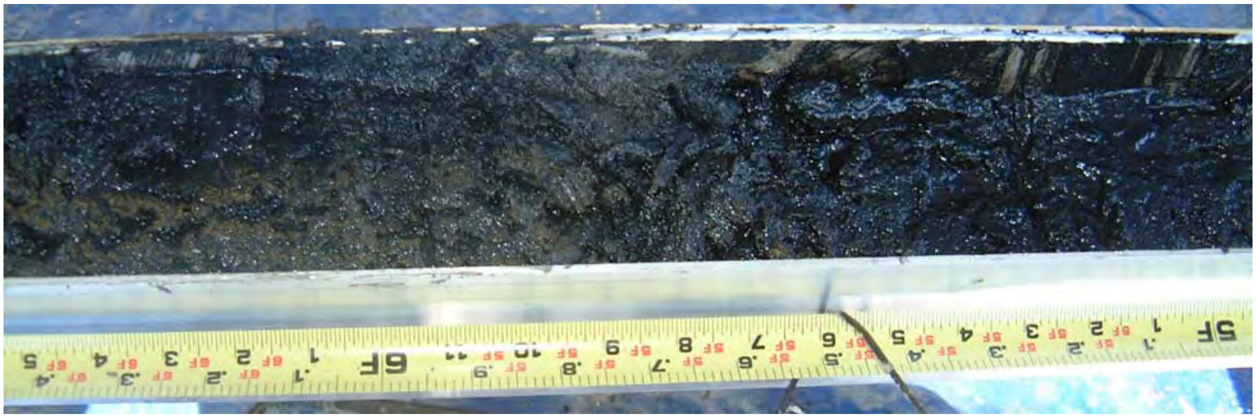


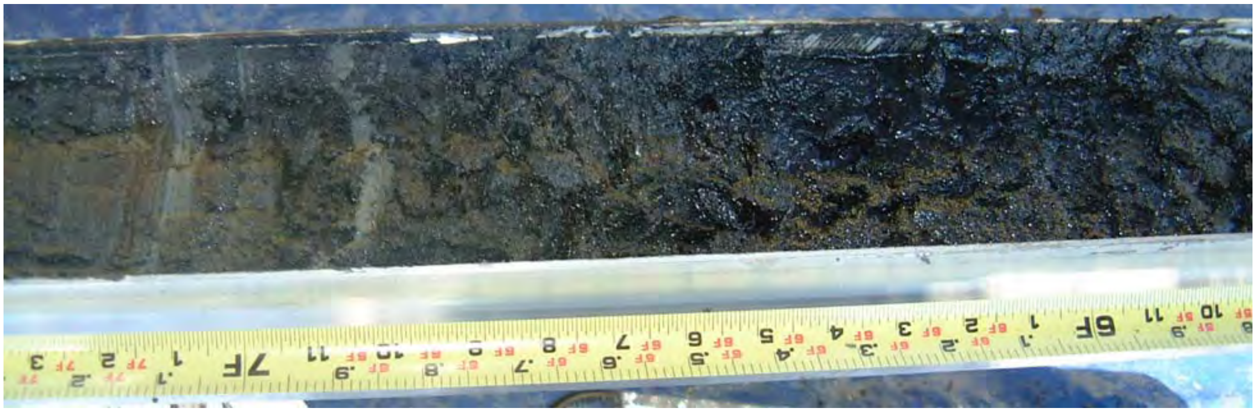

5-2

Photographs of NAPL Investigation Core 5-3 Rep 3: Starting at the top of the core



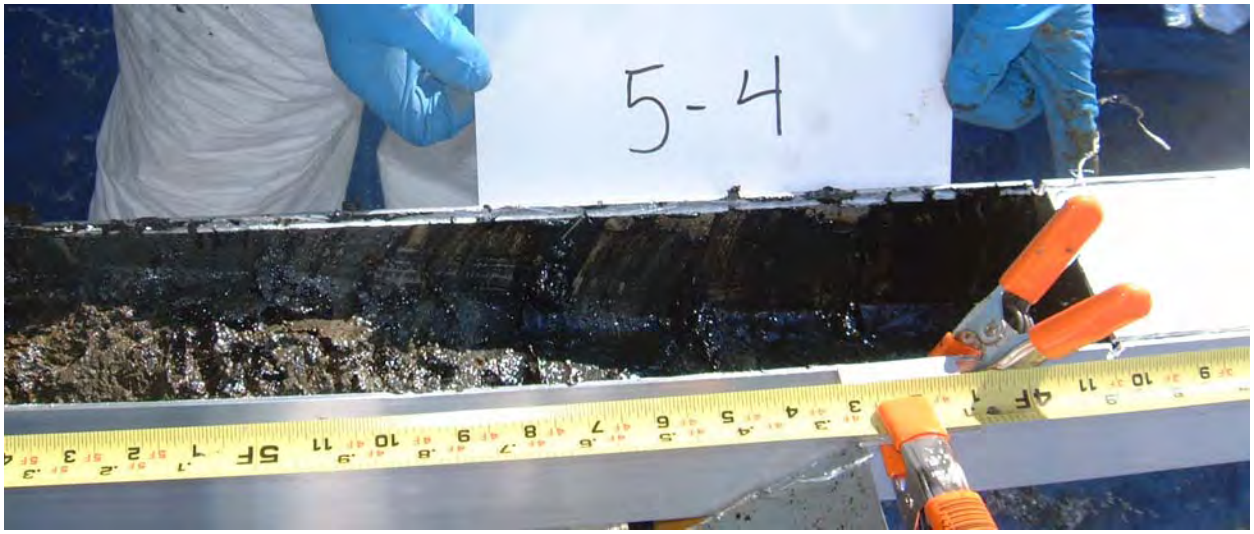


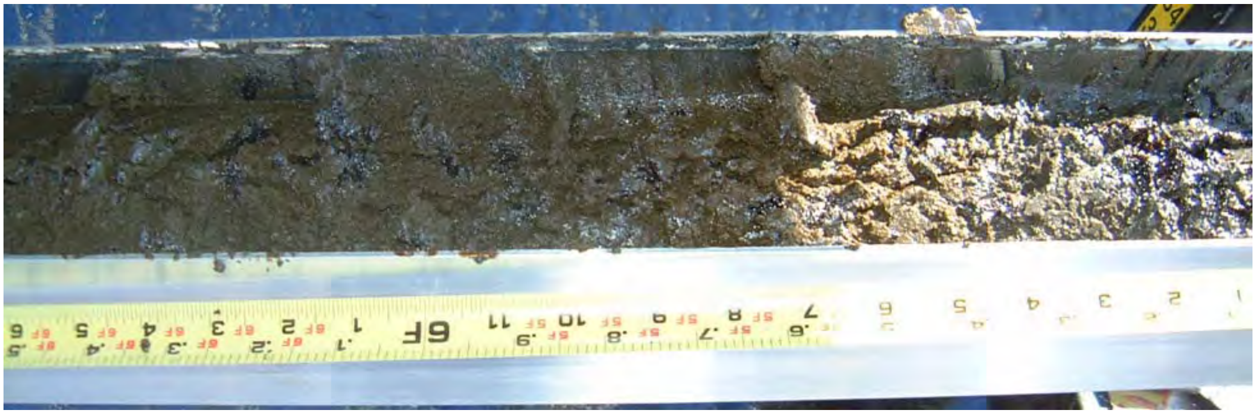


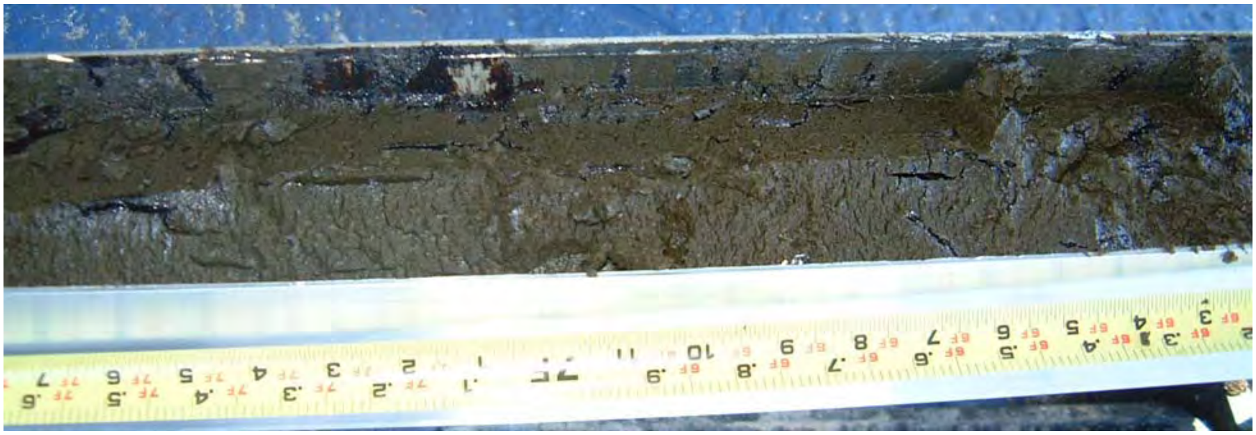


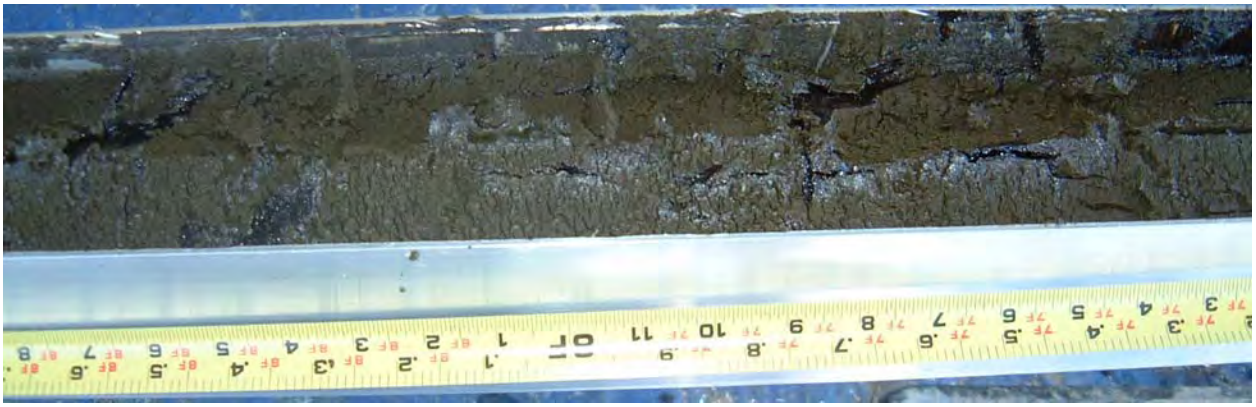

5-3 REP 3

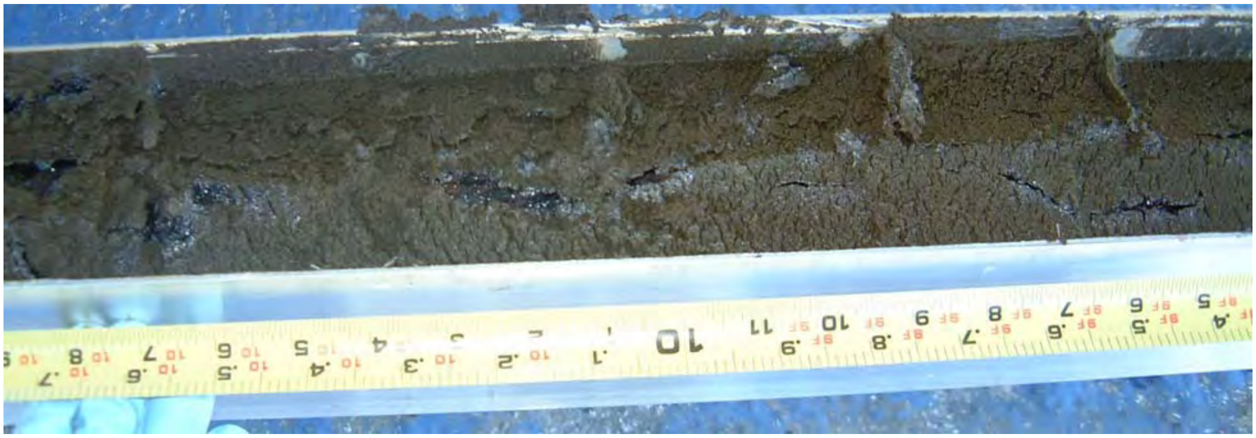
Photographs of NAPL Investigation Core 5-4: Starting at the top of the core

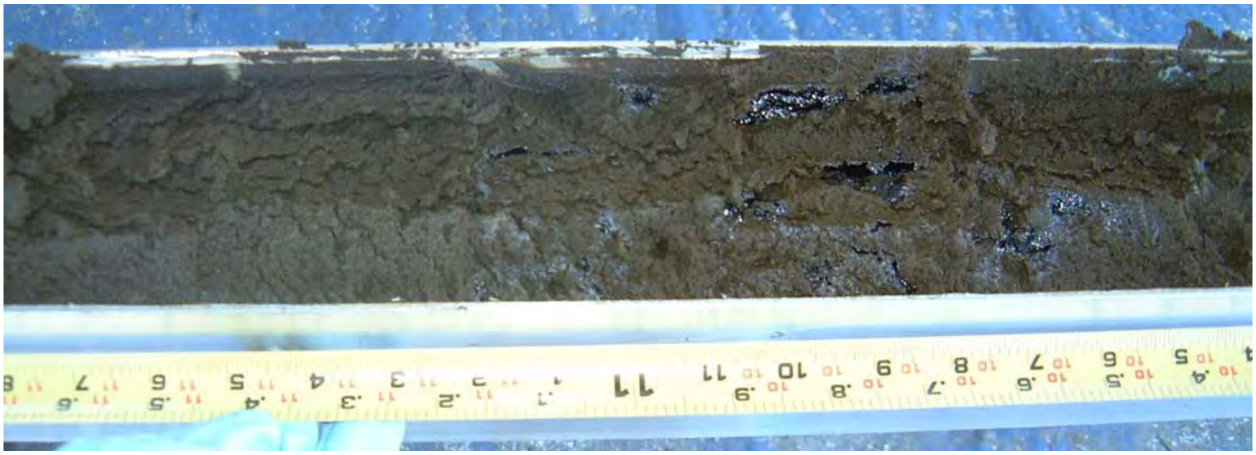


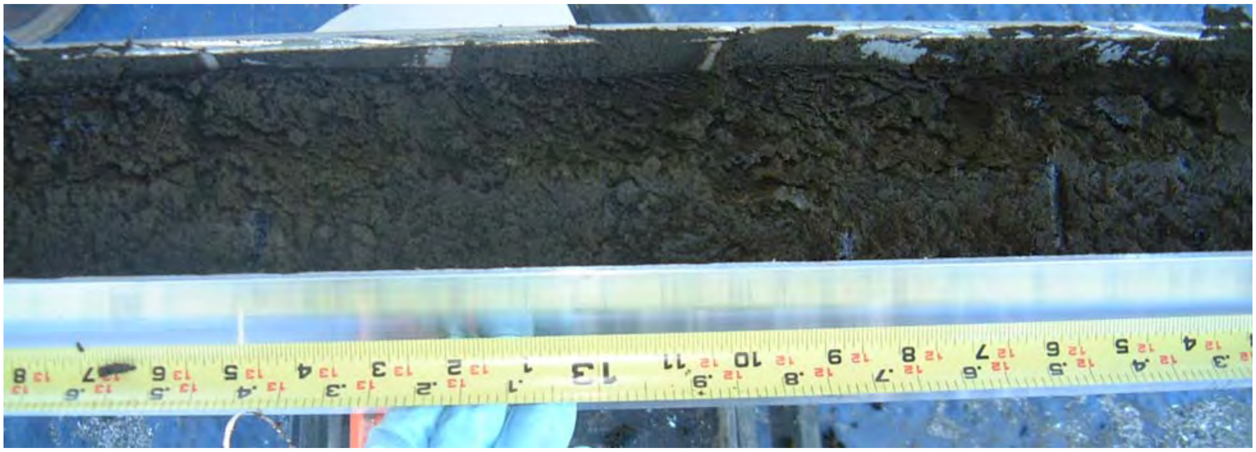













5-4

ATTACHMENT 2D-5

Battelle February 2007 Data Report

Battelle
The Business *of* Innovation

Data Report

Gas Works Park
Soils

February 2007

Prepared for:

Brad Bessinger
Exponent, Incorporated

Prepared by:

Battelle
397 Washington Street
Duxbury, Massachusetts 02332

Chain of Custody

Battelle
The Business of Innovation

ShpNo SHP-070116-01

Battelle Project No: 06746-0001

Sample Receipt Form

Approved: ☐ **Authorized** ☐

Project Number: BN03005.001 **Client:** Exponent

Received by: Seyfert, Jeannine **Date/Time Received:** Tuesday, January 16, 2007 10:44 AM

No. of Shipping Containers: **1**

SHIPMENT

Method of Delivery: Commercial Carrier **Tracking Number:** 8585-3984-8924

COC Forms: ☑ **Shipped with samples** ☐ **No Forms**

Cooler(s)/Box(es)

Cntr	Type	Tracking No.	Seal	Seal Condition	Container Condition	Temp C	Smps
1 of 1	Cooler		Tape	Intact	Intact	3.0	22

Samples

Sample Labels:
☑ Sample labels agree with COC forms
☐ Discrepancies (see Sample Custody Corrective Action Form)

Container Seals:
☐ Tape ☐ Custody Seals ☐ Other Seals (See sample Log)
☑ Seals intact for each shipping container
☐ Seals broken (See sample log for impacted samples)

Condition of Samples:
☐ Sample containers intact
☑ Sample containers broken/leaking (See Custody Corrective Action Form)

Temperature upon receipt (°C): 3 Temperature Blank used ☐ Yes ☑ No
(Note: If temperature upon receipt differs from required conditions, see sample log comment field)

Samples Acidified: ☐ Yes ☐ No ☑ Unknown

Initial pH 5-9?: ☐ Yes ☐ No ☑ NA
If no, individual sample adjustments on the Auxiliary Sample Receipt Form

Total Residual Chlorine Present?: ☐ Yes ☐ No ☑ NA
If yes, individual sample adjustments on the Auxiliary Sample Receipt Form

Head Space <1% in samples for water VOC analysis: ☐ Yes ☐ No ☑ NA
Individual sample deviations noted on sample log

Samples Containers:
Samples returned in PC-grade jars: ☐ Yes ☐ No ☑ Unknown /Lot No.: Unknown

Storage Location: Field Room II: Refrigerator - R0004 (Lower Col **BDO IDs Assigned:** R5521 - R5542

Samples logged in by: Seyfert, Jeannine **Date/Time:** 01/16/2007 10:44 AM

Approved By: **Approved On:**

Authorized By: **Authorized On:**

Battelle
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ShpNo SHP-070116-01

Battelle Project No: 06746-0001

Sample Receipt Form Details

Approved: ☐ **Authorized** ☐

Project Number: BN03005.001 **Client:** Exponent

Received by: Seyfert, Jeannine **Date/Time Received:** Tuesday, January 16, 2007 10:44 AM

No. of Shipping Containers: 1

BDO Id:	Client Sample ID:	Collection Date:	Login Date:	Ctrs:	Matrix:	Temp:	pH:	TRC:	VOC:	Stored In:	Loc:	No:	Comments:
R5521	GWP07T01	01/11/07 12:00	01/16/07 11:04	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5522	GWP07DW401	01/11/07 10:54	01/16/07 11:05	1	NAPL	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5523	GWP07DW402	01/11/07 10:54	01/16/07 11:06	1	NAPL	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5524	GWP07MW9	01/12/07 10:50	01/16/07 11:07	1	NAPL	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5525	GWP07T02	01/11/07 12:10	01/16/07 11:09	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5526	GWP07T03	01/11/07 12:10	01/16/07 11:19	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5527	GWP07T04	01/11/07 12:20	01/16/07 11:20	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5528	GWP07T05	01/11/07 12:35	01/16/07 11:21	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5529	GWP07T06	01/11/07 12:40	01/16/07 11:22	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5530	GWP07T07	01/11/07 12:45	01/16/07 11:23	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5531	GWP07T08	01/11/07 13:10	01/16/07 11:28	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5532	GWP07T09	01/11/07 13:40	01/16/07 11:28	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5533	GWP07T10	01/11/07 13:48	01/16/07 11:29	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5534	GWP07T11	01/11/07 14:20	01/16/07 11:31	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5535	GWP07T12	01/11/07 14:50	01/16/07 11:33	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5536	GWP07T13	01/11/07 14:55	01/16/07 11:33	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5537	GWP07T14	01/11/07 15:05	01/16/07 11:34	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5538	GWP07S01	01/12/07 9:30	01/16/07 11:35	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5539	GWP07S02	01/12/07 9:35	01/16/07 11:36	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5540	GWP07S03	01/12/07 10:15	01/16/07 11:36	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5541	GWP07S04	01/12/07 10:30	01/16/07 11:37	1	TAR	3	NA	NA	NA	R0004 (Lower C	BIN	21	
R5542	TDW3-4.5	09/26/06 12:56	01/16/07 11:39	1	SOIL	3	NA	NA	NA	R0004 (Lower C	BIN	21	

Total Samples: 22

CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM

Page 1 of 2

Exponent

Environmental Group

Bellevue, WA (425) 643-9803
Boston, MA (781) 466-6681
Boulder, CO (303) 444-7270
Portland, OR (503) 636-4338
Washington, D.C. (301) 577-7830

Project: (Name and Number) GAS WORKS PARK, BN03005.001

Exponent Contact: BRAD BESSINGER Office: BE

Samplers: B. Bessinger / J. Massingale (Floyd|Snider)

Ship to: BATTELLE APPLIED ENVIRONMENTAL CHEMISTRY
397 WASHINGTON ST.
DUXBURY, MA 02332

Lab Contact/Phone: SANDRA JENKINS 781-952-5307 OR K. KRAHFORST

Sample No.	Tag No.	Date	Time	Matrix	Analyses Requested: SOP 5-157, EPA Method 8270-Mod	SOP 5-202 EPA Method 8015-Mod					Extra Container	Archive	Battelle# Remarks
GWP07T01	75601	1/11/07	12:00	T	X	X							R5521
GWP07DW401	75650	1/11/07	10:54	NAPL	X	X							R5522
GWP07DW402	75651	1/11/07	10:54	NAPL	X	X							R5523
GWP07MW9	75625	1/12/07	10:50	NAPL	X	X							R5524
GWP07T02	75602	1/11/07	12:10	T	X	X							R5525
GWP07T03	75603	1/11/07	12:10	T	X	X							R5526
GWP07T04	75604	1/11/07	12:20	T	X	X							R5527
GWP07T05	75605	1/11/07	12:35	T	X	X							R5528
GWP07T06	75606	1/11/07	12:40	T	X	X							R5529
GWP07T07	75607	1/11/07	12:45	T	X	X							R5530
GWP07T08	75608	1/11/07	13:10	T	X	X							R5531
GWP07T09	75609	1/11/07	13:40	T	X	X							R5532
GWP07T10	75610	1/11/07	13:48	T	X	X							R5533
GWP07T11	75611	1/11/07	14:20	T	X	X							R5534
GWP07T12	75612	1/11/07	14:50	T	X	X							R5535
GWP07T13	75613	1/11/07	14:55	T	X	X							R5536
GWP07T14	75617	1/11/07	15:05	T	X	X							R5537
GWP07S01	75621	1/12/07	09:30	T	X	X							R5538
GWP07S02	75622	1/12/07	09:35	T	X	X							R5539
GWP07S03	75623	1/12/07	10:15	T	X	X							R5540

Matrix Code: GW - Groundwater SL - Soil SD - Sediment SW - Surface water

OTHER - Please identify codes T-TAR

Priority: ☒ Normal ☐ Rush Rush time period

Shipped via: ☐ FedEx/UPS ☐ Courier Other

Condition of Samples Upon Receipt:

Custody Seal Intact: ☐ Yes ☐ No ☐ None

Relinquished by: Brad Bessinger (Signature) Date/Time: 1/12/07 13:32 Received by: Jessi Massingale (Signature) Date/Time: 1/12/07 13:32

Relinquished by: Jessi Massingale (Signature) Date/Time: 1/15/07 1330 Received by: Jeannine D. Seyfert (Signature) Date/Time: 1/16/07 10:40

05885

Distribution: White and Yellow Copies - Accompany Shipment; Pink Copy - Project File

CHAIN OF CUSTODY RECORD/SAMPLE ANALYSIS REQUEST FORM

Page 2 of 2

Exponent

Environmental Group

Bellevue, WA
(425) 643-9803
Boston, MA
(781) 466-6681
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(303) 444-7270
Portland, OR
(503) 636-4338
Washington, D.C.
(301) 577-7830

Project: (Name and Number) GAS WORKS PARK, BN03005.001

Exponent Contact: BRAD BESSINGER Office: BE

Ship to: BATTELLE APPLIED ENVIRONMENTAL CHEMISTRY
397 WASHINGTON STREET
DUXBURY, MA 02332

Lab Contact/Phone: SANDRA JENKINS 781-952-5307
OR K. KRAHFORST

Samplers: B. Bessinger / J. Massingale (Floyd\|Snider)

Analyses Requested

Sample No.	Tag No.	Date	Time	Matrix	SOP 5-157 EPA METHOD 8270-MOD	SOP 5-202 EPA METHOD 8015-MOD					Extra Container	Archive	Battelle # Remarks
GWP07504	75624	1/12/07	10:30	T	X	X							R5541
@TDW3-4.5	-	9/26/06	1256	soil	X	X							R5542

Matrix Code: GW - Groundwater SL - Soil SD - Sediment SW - Surface water
OTHER - Please identify codes T-TAR

Priority: ☒ Normal ☐ Rush Rush time period

Shipped via: ☐ FedEx/UPS ☐ Courier Other

Condition of Samples Upon Receipt:

Custody Seal Intact: ☐ Yes ☐ No ☐ None

Relinquished by: Brad Bessinger (Signature) Date/Time: 1/12/07 13:32 Received by: Jessi Massingale (Signature) Date/Time: 1/12/07 13:32

Relinquished by: Jessi Massingale (Signature) Date/Time: 1/15/07 1330 Received by: Jeannine D. Seyfort (Signature) Date/Time: 1/16/07 10:40

05887

Distribution: White and Yellow Copies - Accompany Shipment; Pink Copy - Project File

SHC Data and Chromatograms

SHC and TPH – Sediment QA/QC Summary
Batches 07-0010

PROJECT:	Exponent – Gas Works Park
PARAMETER:	Saturated Hydrocarbons (SHC) and Total Petroleum Hydrocarbons (TPH)
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Sediment
SAMPLE CUSTODY:	Eighteen tar samples, three NAPLs samples, and 1 soil sample were received at the Battelle Duxbury Operations (BDO) Laboratory on 1/16/2007. Upon receipt of samples, the temperatures of the coolers were taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was within the acceptable range. Samples were either stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin. The soil and tar samples were extracted together in one analytical batch, batch 07-0001.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Blank	Surrogate Recovery	LCS/MS Recovery	MS/MSD Precision	Control Oil % Diff.
SHC and TPH	General NS&T	< 5x MDL	40-120% Recovery	40-120% Recovery MS target spike must be > 5 x background	< 30% RPD	PD < 30% for 90% of the analytes

---

METHOD: Soil and tar samples were extracted following general NS&T methodologies. Approximately 5-8 grams of sample was spiked with SHC, PAH, and biomarker surrogates and serially extracted three times with dichloromethane using orbital shaker table techniques. The combined extracts were dried over sodium sulfate and concentrated by Kuderna-Danish and nitrogen evaporation techniques. The sample extracts were split in half; one-half of the extract was removed for archiving; the other half was processed through an alumina gravity column to isolate the hydrocarbon fractions of interest. The weights of the resulting extracts were determined gravimetrically. The extracts were concentrated to 1 ml, split, and spiked with IS. The pre-injection volume and/or extract split were adjusted to achieve 5 mg/mL. One extract was submitted for PAH and petroleum biomarker analysis, and the second extract was submitted for SHC and TPH analysis.

SHC and TPH were measured by gas chromatography with flame ionization detection (GC/FID). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of SHC and TPH were calculated by the internal standard method. Normal alkanes were quantified using the average RF generated from the initial calibration. TPH concentrations were quantified using the average RF of nC8 through nC40. Isoprenoid hydrocarbon concentrations were quantified using the average RF of the n-alkanes immediately preceding and immediately following each target isoprenoid hydrocarbon.

HOLDING TIMES: Samples were prepared for analysis in one analytical batch. Samples were extracted within 14 days of sample receipt and analyzed within 40 days of extraction. Holding times from collection to extraction for soil samples are 14-days if refrigerated, 365-days if frozen. Since the storage conditions for sample TDW3-4.5, collected 9/26/2006, prior to its arrival at BDO are unknown, this data has been conservatively qualified with a "T".

Batch ID	Extraction Date	Analysis Date(s)
07-0010	1/24/2007	1/31/2007 – 2/1/2004

SHC and TPH – Sediment QA/QC Summary
Batches 07-0010

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. The blank was analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0010 – No exceedences noted.

Comments- None

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0010 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY:

Two surrogate compounds were added prior to extraction, including o-terphenyl and 5a-androstane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0010 – No exceedences noted.

Comments – None

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0010 – No exceedences noted.

Comments – None.

CALIBRATIONS:

The GC/FID is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (%RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be <20%. Each batch of samples analyzed is bracketed by continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be <20% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be <20%.

07-0010 – No exceedences noted.

Comments – None.

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T01	GWP07T02	GWP07T03	GWP07T04
Battelle ID	R5521-P	R5525-P	R5526-P	R5527-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	01/31/07	01/31/07	01/31/07	02/01/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	28.88	50.1	50.3	34.93
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.44	1.02	1.01	1.44
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	55.58	245.10	198.1	92.67
Units	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY
n-Nonane	U	U	U	U
n-Decane	U	1193.55	996.66	444.11
n-Undecane	U	612.43	533.37	88.93 J
n-Dodecane	948.54	2935.42	2429.74	1312.88
n-Tridecane	468.84 ME	2504.47 ME	2367.65 ME	1524.69 ME
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	152.15	336.6	264.56	193.36
Isoprenoid RRT 1470	136.99	278.2	231.91	176.53
n-Pentadecane	79.8	159.6 J	131.08 J	98.43
n-Hexadecane	108.22	258.18	177.19 J	125.75
Norpristane (1650)	201.38	404.98	319.4	240.35
n-Heptadecane	52.84 J	134.02 J	95.89 J	65.46 J
Pristane	55 J	121.46 J	86.69 J	62.31 J
n-Octadecane	1472.34	3144.3	2446.92	1737.93
Phytane	36.74 J	76.6 J	60.75 J	37.48 J
n-Nonadecane	11.78 J	29.82 J	21.48 J	16.34 J
n-Eicosane	37.55 J	82.28 J	72.9 J	43.75 J
n-Heneicosane	454.04	1059.47	826.47	581.65
n-Docosane	157.29	340.27	233.82	196.96
n-Tricosane	38.99 J	82.85 J	63.45 J	43.91 J
n-Tetracosane	80.7	198.52 J	138.97 J	91.93 J
n-Pentacosane	U	U	528.12	U
n-Hexacosane	U	U	176.8 J	U
n-Heptacosane	U	U	U	U
n-Octacosane	U	U	U	U
n-Nonacosane	U	U	U	U
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	194301.96	600370.63	457694.31	232050.17

Surrogate Recoveries (%)

O-Terphenyl	91	106	99	108
5a-androstane	84	90	87	88

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

Battelle
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Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T05	GWP07T06	GWP07T07	GWP07T08
Battelle ID	R5528-P	R5529-P	R5530-P	R5531-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/01/07	02/01/07	02/01/07	02/01/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	4.23	6.94	6.47	30.28
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.92	1.93	1.87	1.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	270.83	174.16	178.3	167.92
Units	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY
n-Nonane	U	U	U	U
n-Decane	U	U	U	U
n-Undecane	U	U	U	U
n-Dodecane	154.79 J	102.49 J	132.16 J	750.35
n-Tridecane	958.19 ME	709.86 ME	887.45 ME	2733.76 ME
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	349.29	280.5	314.44	290.87
Isoprenoid RRT 1470	224.99 J	194.69	205.67	572.59
n-Pentadecane	75.85 J	57.61 J	55.65 J	236.74
n-Hexadecane	184.63 J	165.06 J	177.34 J	63.43 J
Norpristane (1650)	673.76	641.75	640.32	48.89 J
n-Heptadecane	142.89 J	104.99 J	129.55 J	140.64 J
Pristane	124.44 J	117.49 J	135.72 J	223.04
n-Octadecane	7021.65	6582	6697.6	3557.74
Phytane	847.82	798.53	885.03	38.47 J
n-Nonadecane	U	U	U	U
n-Eicosane	246.16 J	228.46	206.47	U
n-Heneicosane	U	U	U	1108.3
n-Docosane	876.93	767.75	896.07	639.18
n-Tricosane	183.14 J	U	U	U
n-Tetracosane	393.55	295.92	U	527.55
n-Pentacosane	1499.75	174.84	1516.28	U
n-Hexacosane	1156.24	1079.68	1269.93	U
n-Heptacosane	U	U	U	U
n-Octacosane	4408.6	3893.14	4634.83	U
n-Nonacosane	U	U	U	U
n-Triacontane	228.82 J	178.94	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	260.88 J	207.53	U	U
n-Tetratriacontane	214.32 J	226.89	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	297041.61	269380.89	292690.39	227878.18

Surrogate Recoveries (%)

O-Terphenyl	101	117	102	97
5a-androstane	108	111	103	81

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

Main: S07-0010FID-Master_202-Final.xls

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T09	GWP07T10	GWP07T11	GWP07T12
Battelle ID	R5532-P	R5533-P	R5534-P	R5535-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/01/07	02/01/07	02/01/07	02/01/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	19.46	32.51	5.51	10.85
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.72	1.45	2.05	1.79
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	193.8	137.93	19.51	74.68
Units	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY
n-Nonane	U	U	U	U
n-Decane	U	U	3.13 J	70.47 J
n-Undecane	U	505.29	6.18 J	50.98 J
n-Dodecane	564.36	1619.57	5.1 J	195.2
n-Tridecane	4528.19 ME	6168.86 ME	154.92 ME	1161.6 ME
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	296.14	245.96	94.21	104.69
Isoprenoid RRT 1470	604.8	223.3	65.08	143.44
n-Pentadecane	258.95	119.69 J	20.29	70.38 J
n-Hexadecane	386.22	172.46	42.1	122.55
Norpristane (1650)	59.23 J	301.71	25.35	344.25
n-Heptadecane	234.55	86.53 J	27.6	59.62 J
Pristane	319.15	105.86 J	49.55	69.94 J
n-Octadecane	3992.53	2285.79	350.75	2343.65
Phytane	56.2 J	54.28 J	10.08 J	84.67
n-Nonadecane	U	U	U	U
n-Eicosane	U	73.73 J	U	79.21
n-Heneicosane	1428.89	743.82	160.46	806.59
n-Docosane	782.6	274.01	84.28	329.85
n-Tricosane	U	U	U	60.23 J
n-Tetracosane	670.89	165.71	52.92	186.34
n-Pentacosane	519.51	517.29	44.8	526.92
n-Hexacosane	677.44	225.75	111.55	424.36
n-Heptacosane	U	U	26.51	158.31
n-Octacosane	U	U	188.55	1724.06
n-Nonacosane	U	U	U	U
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	258542.94	306102.65	26740.08	123144.75

Surrogate Recoveries (%)

O-Terphenyl	107	106	101	111
5a-androstane	96	78	80	91

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T13	GWP07T14	GWP07S01	GWP07S02
Battelle ID	R5536-P	R5537-P	R5538-P	R5539-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07	01/12/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/01/07	02/01/07	02/01/07	02/01/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	12.18	7.01	13.85	10.23
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.83	1.95	1.75	1.80
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	72.86	2.06	190.48	185.33
Units	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY
n-Nonane	U	U	U	U
n-Decane	U	U	U	U
n-Undecane	185.62	U	U	U
n-Dodecane	562.64	0.59 J	681.52	345.73
n-Tridecane	2124.98 ME	1.28 JME	806.85 ME	315.85 ME
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	154.67	0.55 J	41.31 J	13.81 J
Isoprenoid RRT 1470	174.68	0.37 J	35.44 J	14.1 J
n-Pentadecane	96.34	U	38.51 J	16.02 J
n-Hexadecane	171.28	U	54.63 J	65.43 J
Norpristane (1650)	360.8	U	U	U
n-Heptadecane	66.74 J	0.51 J	14.3 J	U
Pristane	129.3	0.75 J	33.74 J	U
n-Octadecane	2311.44	8.39	3632.75	3464.74
Phytane	90.08	0.48 J	104.55 J	108.04 J
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	105.71 J	111.97 J
n-Heneicosane	828.22	7.19	3014.6	3804.27
n-Docosane	290.38	7.78	428.84	425.53
n-Tricosane	59.51 J	U	U	U
n-Tetracosane	150.32	7.09	697.9	647.33
n-Pentacosane	67.73 J	4.53	491.26	391.39
n-Hexacosane	240.61	U	263.33	U
n-Heptacosane	U	U	188.48 J	U
n-Octacosane	U	U	3959.9	U
n-Nonacosane	U	U	U	U
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	135670.62	2233.63	274222.32	258510.39

Surrogate Recoveries (%)

O-Terphenyl	98	96	107	110
5a-androstane	84	78	96	108

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

Battelle
The Business of Innovation

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07S03	GWP07S04	TDW3-4.5
Battelle ID	R5540-P	R5541-P	R5542-P
Sample Type	SA	SA	SA
Collection Date	01/12/07	01/12/07	09/26/06
Extraction Date	01/24/07	01/24/07	01/24/07
Analysis Date	02/01/07	02/01/07	02/01/07
Analytical Instrument	FID	FID	FID
% Moisture	20.14	12.16	14.86
% Lipid	NA	NA	NA
Matrix	TAR	TAR	SOIL
Sample Size	1.66	1.85	17.17
Size Unit-Basis	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	200.8	240.24	1.16
Units	MG/KG_DRY	MG/KG_DRY	MG/KG_DRY
n-Nonane	U	U	UT
n-Decane	U	U	UT
n-Undecane	U	U	UT
n-Dodecane	1802	2181.26	0.27 JT
n-Tridecane	9548.63 ME	8148.73 ME	0.58 JTME
Isoprenoid RRT 1380	U	U	UT
n-Tetradecane	1057.6	1071.68	0.18 JT
Isoprenoid RRT 1470	1502.73	1495.76	0.22 JT
n-Pentadecane	418.89	482.53	0.18 JT
n-Hexadecane	875.13	857.02	0.17 JT
Norpristane (1650)	157.34 J	128.43 J	0.17 JT
n-Heptadecane	674.32	233.72 J	0.31 JT
Pristane	655.85	550.55	0.7 JT
n-Octadecane	3444.29	2423.07	5.9 T
Phytane	118.4 J	187.21 J	0.31 JT
n-Nonadecane	U	U	UT
n-Eicosane	135.2 J	U	UT
n-Heneicosane	1633.15	1599.8	8.69 T
n-Docosane	1117.65	1133.15	4.77 T
n-Tricosane	357.64	81.9 J	0.25 JT
n-Tetracosane	502.47	924.27	9.59 T
n-Pentacosane	371.94	401.16	2.51 T
n-Hexacosane	1360.81	U	7.21 T
n-Heptacosane	U	U	3.72 T
n-Octacosane	U	U	UT
n-Nonacosane	U	U	UT
n-Triacontane	U	U	UT
n-Hentriacontane	U	U	UT
n-Dotriacontane	U	U	UT
n-Tritriacontane	U	U	UT
n-Tetratriacontane	U	U	UT
n-Pentatriacontane	U	U	UT
n-Hexatriacontane	U	U	UT
n-Heptatriacontane	U	U	UT
n-Octatriacontane	U	U	UT
n-Nonatriacontane	U	U	UT
n-Tetracontane	U	U	UT
TPH(total)	421505.26	360563.27	1106.76 T

Surrogate Recoveries (%)

O-Terphenyl	90	115	102
5a-androstane	102	104	80

Not Surrogate Corrected

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2/16/2007

Main: S07-0010FID-Master_202-Final.xls

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank
Battelle ID	BJ939PB-P
Sample Type	PB
Collection Date	01/24/07
Extraction Date	01/24/07
Analysis Date	01/31/07
Analytical Instrument	FID
% Moisture	19.52
% Lipid	NA
Matrix	SOIL, TAR
Sample Size	2.44
Size Unit-Basis	G_DRY
Minimum Reporting Limit	1.64
Units	MG/KG_DRY

n-Nonane		U
n-Decane		U
n-Undecane		U
n-Dodecane		U
n-Tridecane		U
Isoprenoid RRT 1380		U
n-Tetradecane		U
Isoprenoid RRT 1470		U
n-Pentadecane		U
n-Hexadecane		U
Norpristane (1650)		U
n-Heptadecane		U
Pristane		U
n-Octadecane		U
Phytane		U
n-Nonadecane		U
n-Eicosane		U
n-Heneicosane		U
n-Docosane		U
n-Tricosane		U
n-Tetracosane		U
n-Pentacosane		U
n-Hexacosane		U
n-Heptacosane		U
n-Octacosane		U
n-Nonacosane		U
n-Triacontane		U
n-Hentriacontane		U
n-Dotriacontane		U
n-Tritriacontane		U
n-Tetratriacontane		U
n-Pentatriacontane		U
n-Hexatriacontane		U
n-Heptatriacontane		U
n-Octatriacontane		U
n-Nonatriacontane		U
n-Tetracontane		U
TPH(total)		U

Surrogate Recoveries (%)

O-Terphenyl	100
5a-androstane	79

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	060208-03: Sand, White Quartz, -50+70
Battelle ID	BJ940LCS-P
Sample Type	LCS
Collection Date	01/24/07
Extraction Date	01/24/07
Analysis Date	01/31/07
Analytical Instrument	FID
% Moisture	NA
% Lipid	NA
Matrix	SOIL, TAR
Sample Size	20.01
Size Unit-Basis	G_DRY
Minimum Reporting Limit	0.2

Units	MG/KG_DRY		Target	% Recovery	Qualifier
n-Nonane	0.89		1.25	71	
n-Decane	1.04		1.25	83	
n-Undecane		U			
n-Dodecane	1.13		1.25	90	
n-Tridecane		U			
Isoprenoid RRT 1380		U			
n-Tetradecane	1.12		1.25	90	
Isoprenoid RRT 1470		U			
n-Pentadecane		U			
n-Hexadecane	1.17		1.25	94	
Norpristane (1650)		U			
n-Heptadecane		U			
Pristane	1.25		1.25	100	
n-Octadecane	1.31		1.25	105	
Phytane	1.15		1.25	92	
n-Nonadecane	0.97		1.25	78	
n-Eicosane	1.21		1.25	97	
n-Heneicosane		U			
n-Docosane	1.24		1.25	99	
n-Tricosane		U			
n-Tetracosane	1.21		1.25	97	
n-Pentacosane		U			
n-Hexacosane	1.2		1.25	96	
n-Heptacosane		U			
n-Octacosane	1.36		1.25	109	
n-Nonacosane		U			
n-Triacontane	1.22		1.25	98	
n-Hentriacontane		U			
n-Dotriacontane		U			
n-Tritriacontane		U			
n-Tetratriacontane		U			
n-Pentatriacontane		U			
n-Hexatriacontane	1.3		1.25	104	
n-Heptatriacontane		U			
n-Octatriacontane		U			
n-Nonatriacontane		U			
n-Tetracontane		U			
TPH(total)		U			

Surrogate Recoveries (%)

O-Terphenyl	101
5a-androstane	81

Not Surrogate Corrected

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2/16/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude				
Battelle ID	BJ952NSC-P				
Sample Type	NSC				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	01/31/07				
Analytical Instrument	FID				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.01				
Size Unit-Basis	MG_OIL				
Minimum Reporting Limit	299.7				
Units	MG/KG_OIL		Target	% Difference	Qualifier
n-Nonane	5020.14		4670.06	7.5	
n-Decane	4863.37		4951.66	1.8	
n-Undecane	4861.8		4506.16	7.9	
n-Dodecane	4899.16		4576.43	7.1	
n-Tridecane	4096.3	ME	4189.33	2.2	
Isoprenoid RRT 1380	965.4		961.81	0.4	
n-Tetradecane	4398.78		3919.50	12.2	
Isoprenoid RRT 1470	1572.82		1532.69	2.6	
n-Pentadecane	4350.22		3990.56	9.0	
n-Hexadecane	3700.26		3640.11	1.7	
Norpristane (1650)	1190.91		1141.72	4.3	
n-Heptadecane	3302.36		3078.38	7.3	
Pristane	2374.46		2280.61	4.1	
n-Octadecane	2877.12		2796.74	2.9	
Phytane	1557.22		1659.88	6.2	
n-Nonadecane	2373.76		2540.37	6.6	
n-Eicosane	2668.31		2502.77	6.6	
n-Heneicosane	2572.46		2419.45	6.3	
n-Docosane	2487.37		2251.79	10.5	
n-Tricosane	2153.59		2050.41	5.0	
n-Tetracosane	2067.1		1948.20	6.1	
n-Pentacosane	1787.61		1795.70	0.5	
n-Hexacosane	1702.6		1639.60	3.8	
n-Heptacosane	1349.47		1230.99	9.6	
n-Octacosane	1105.92		1004.15	10.1	
n-Nonacosane	937.02		872.21	7.4	
n-Triacontane	687.11		669.33	2.7	
n-Hentriacontane	619.57		606.82	2.1	
n-Dotriacontane	503.97		465.97	8.2	
n-Tritriacontane	404.55		399.05	1.4	
n-Tetratriacontane	367.32		371.75	1.2	
n-Pentatriacontane	383.03		378.11	1.3	
n-Hexatriacontane	244.25	J	235.65	3.6	
n-Heptatriacontane	214.78	J	210.06	2.2	
n-Octatriacontane	216.26	J	205.75	5.1	
n-Nonatriacontane	159.07	J	153.92	3.3	
n-Tetracontane	172.95	J	161.64	7.0	
TPH(total)	634437.42		578973.63	9.6	

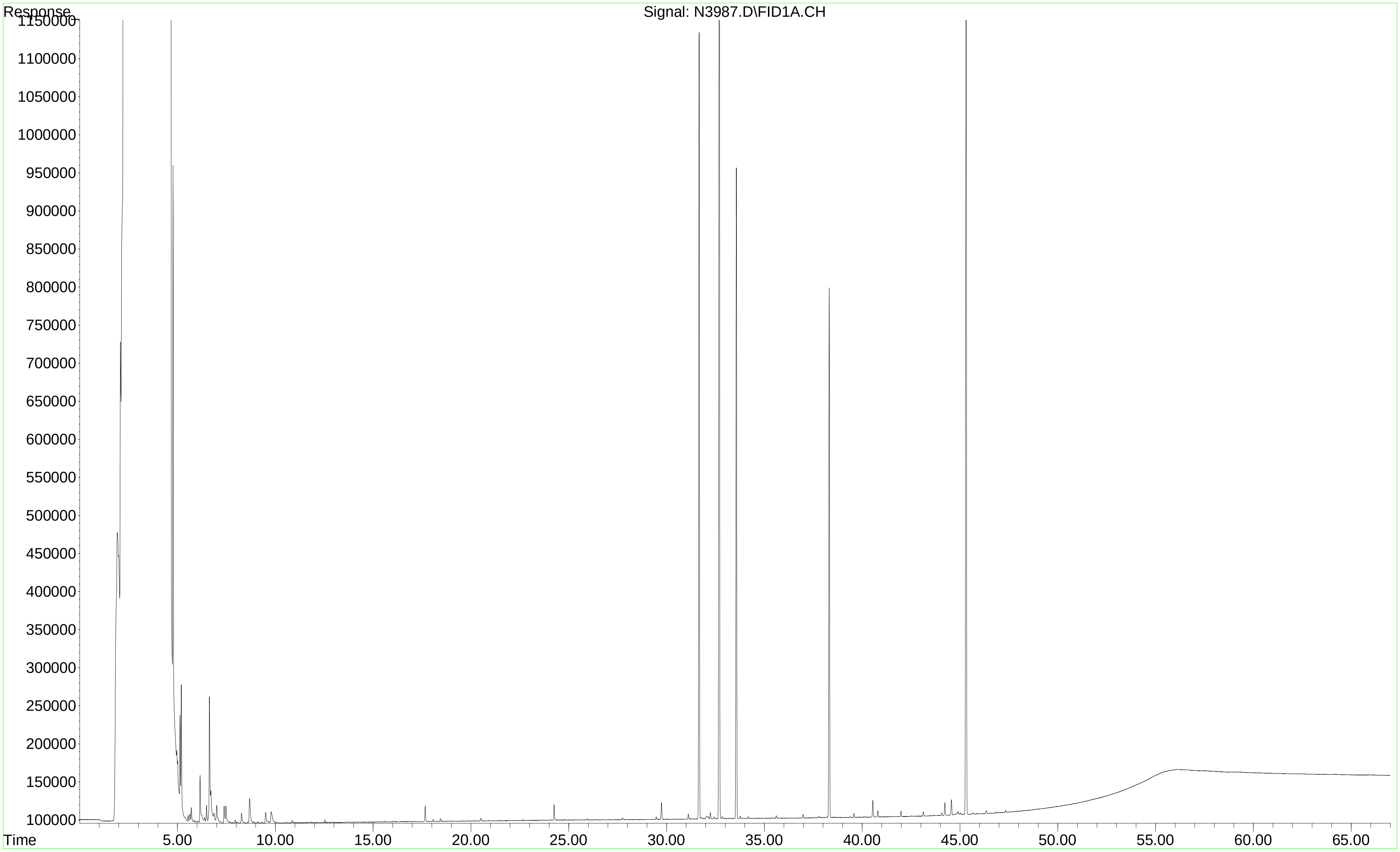
Surrogate Recoveries (%)

O-Terphenyl	104
5a-androstane	85

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

```
File       : F:\N\DATA\SN0223\N3987.D
Operator   : MM
Acquired   : 1-31-2007 02:46:51 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BJ939PB-P-FID(4)
Misc Info  : Procedural Blank 5-202 07-0010
Vial Number: 6
```



```
File       : F:\N\DATA\SN0223\N3989.D
Operator   : MM
Acquired   : 1-31-2007 04:08:48 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BJ940LCS-P-FID(4)
Misc Info  : Laboratory Control Sample 5-202 07-0010
Vial Number: 7
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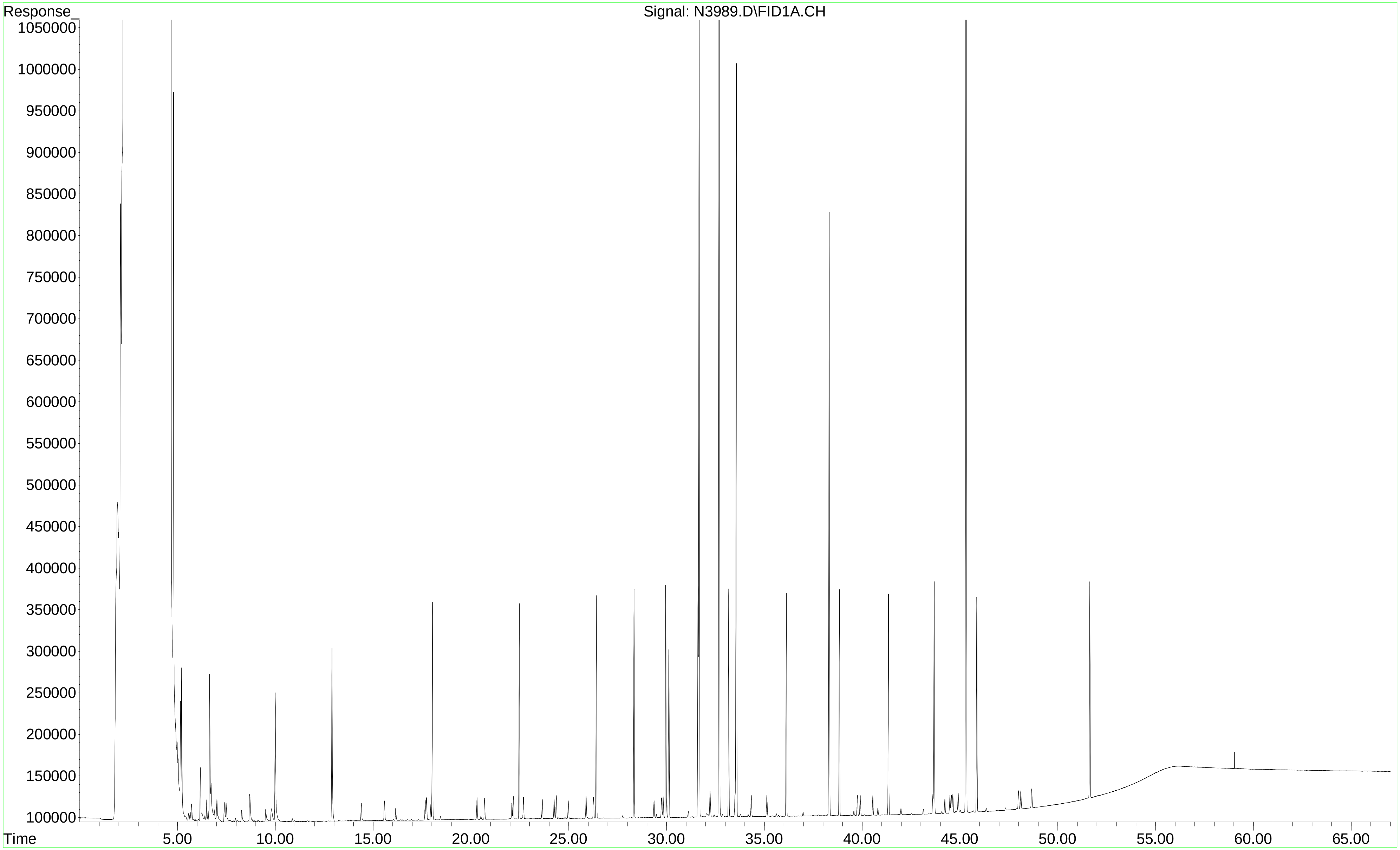
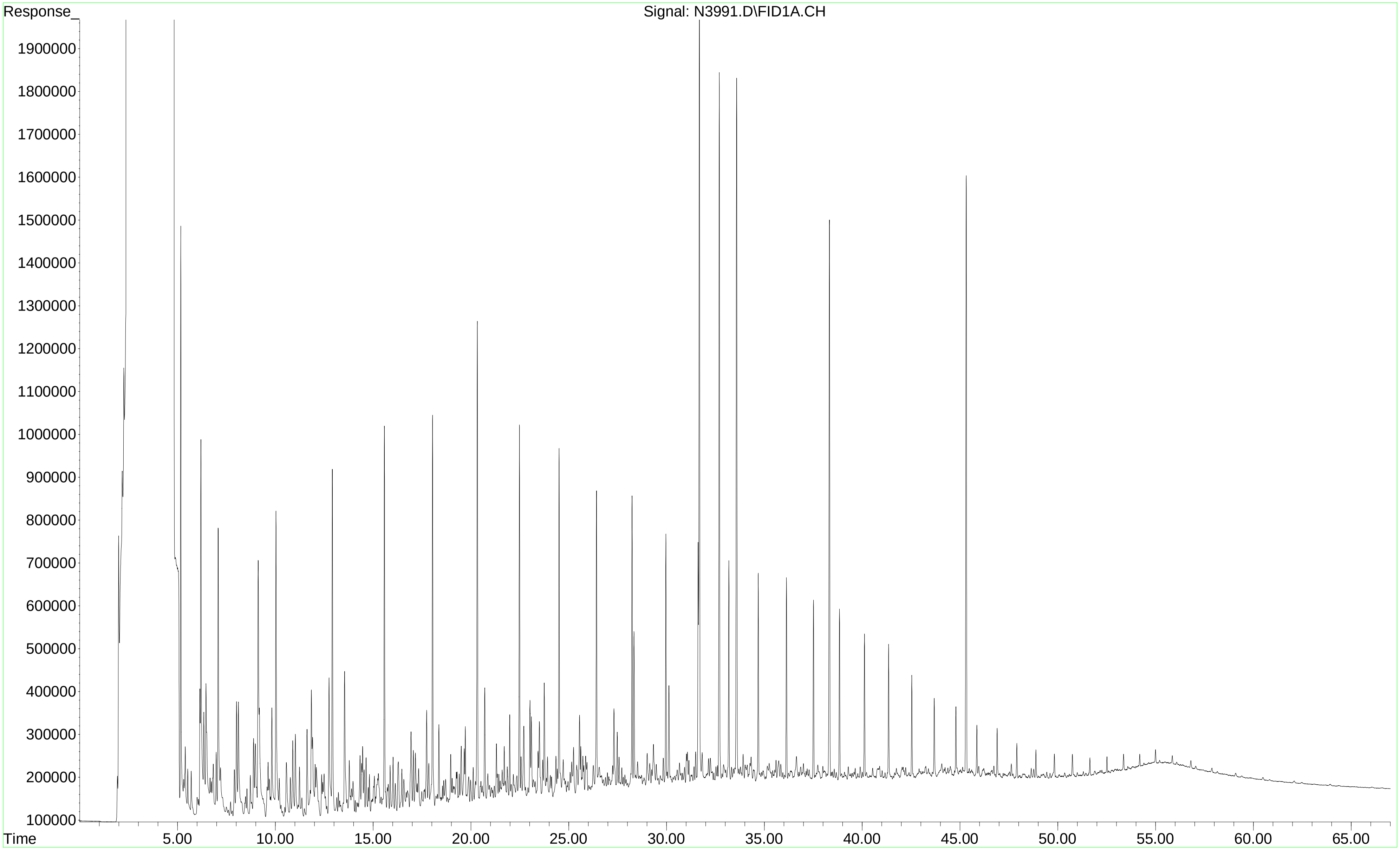
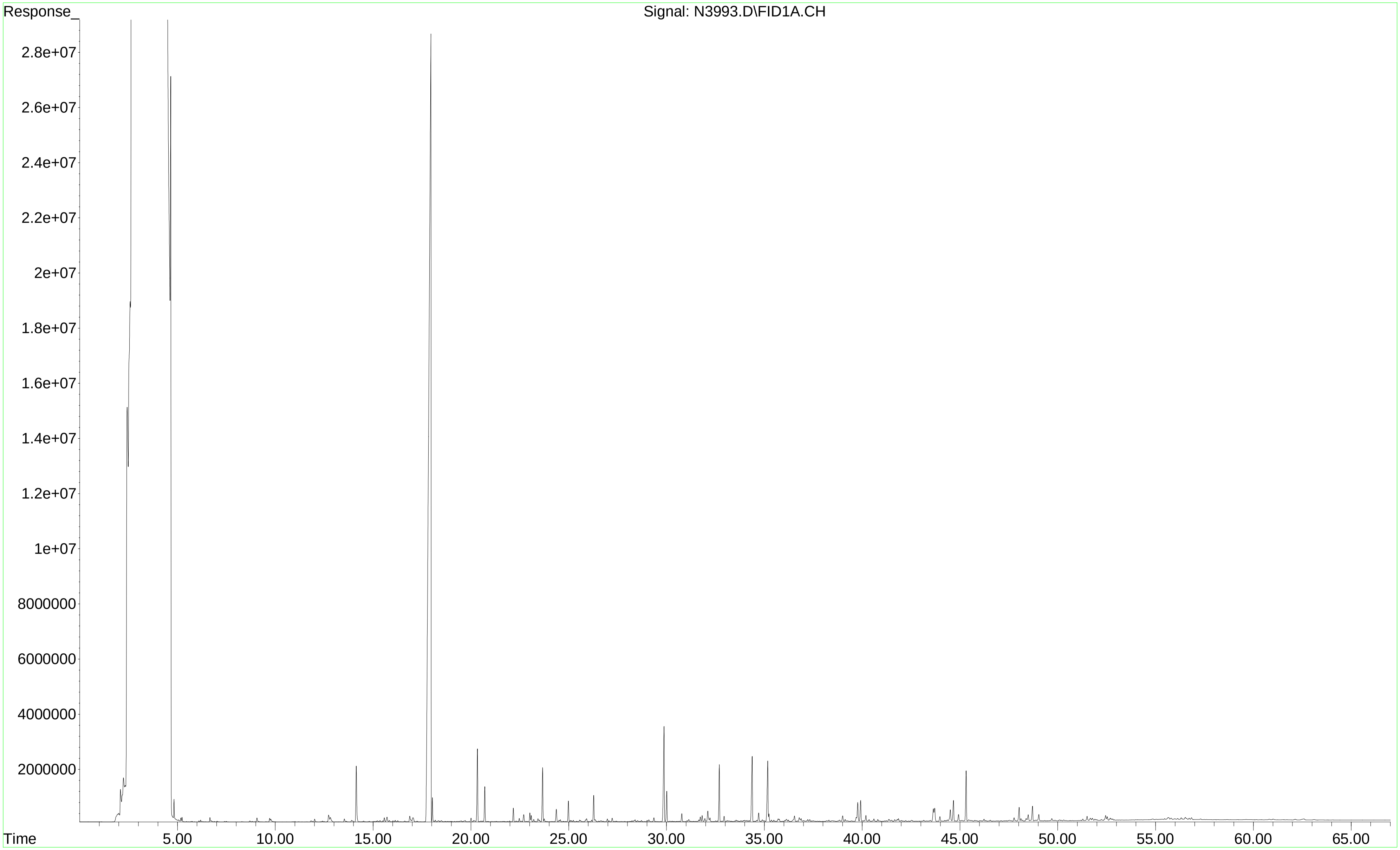


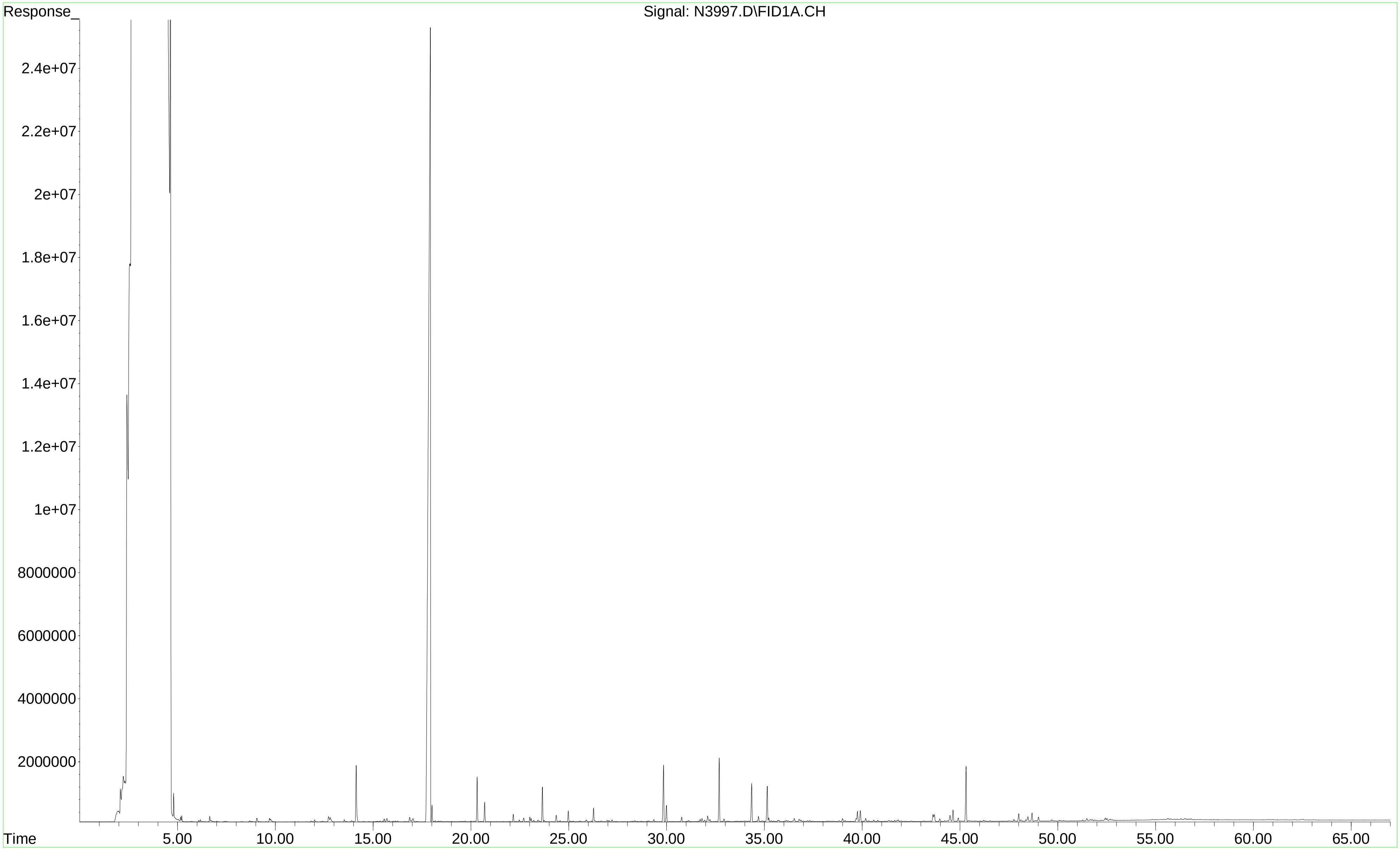
```
File       : F:\N\DATA\SN0223\N3991.D
Operator   : MM
Acquired   : 1-31-2007 05:29:00 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BJ952NSC-P(0)
Misc Info  : North Slope Crude FID 5-202 07-0010
Vial Number: 8
```



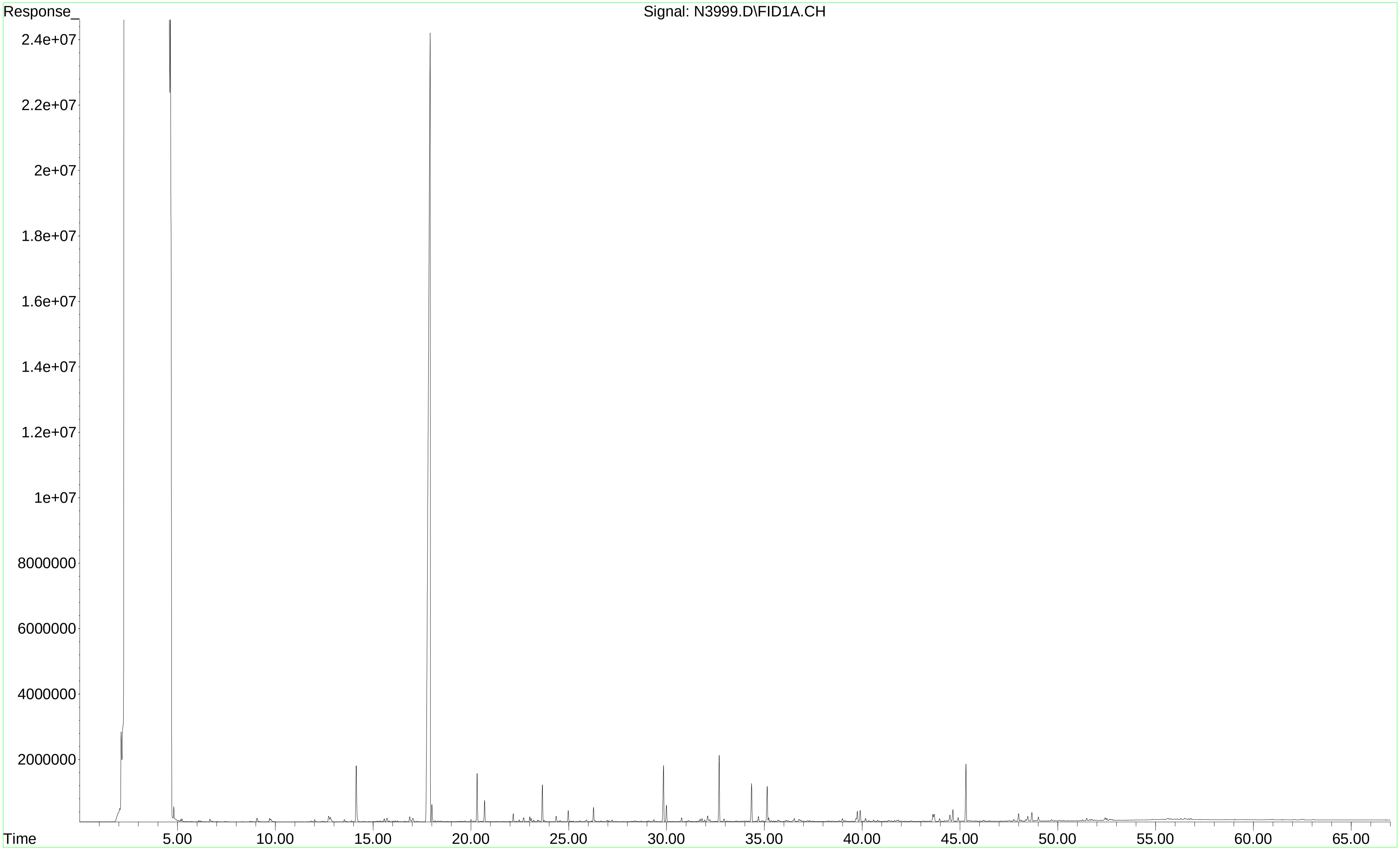
```
File       : F:\N\DATA\SN0223\N3993.D
Operator   : MM
Acquired   : 1-31-2007 06:49:17 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5521-P-FID(11)
Misc Info  : GWP07T01 5-202 07-0010
Vial Number: 9
```



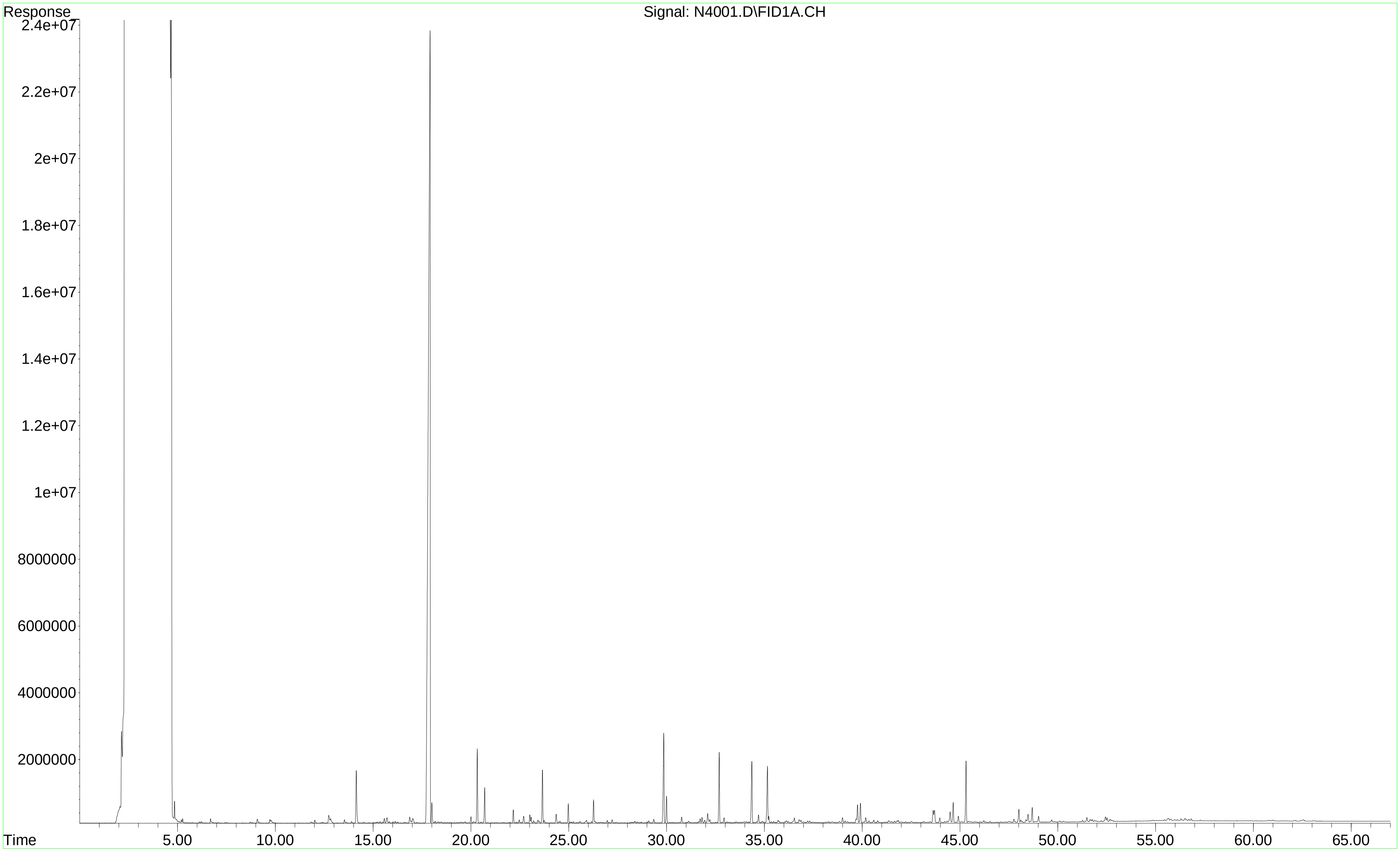
```
File       : F:\N\DATA\SN0223\N3997.D
Operator   : MM
Acquired   : 1-31-2007 09:29:10 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5525-P-FID(11)
Misc Info  : GWP07T02 5-202 07-0010
Vial Number: 11
```



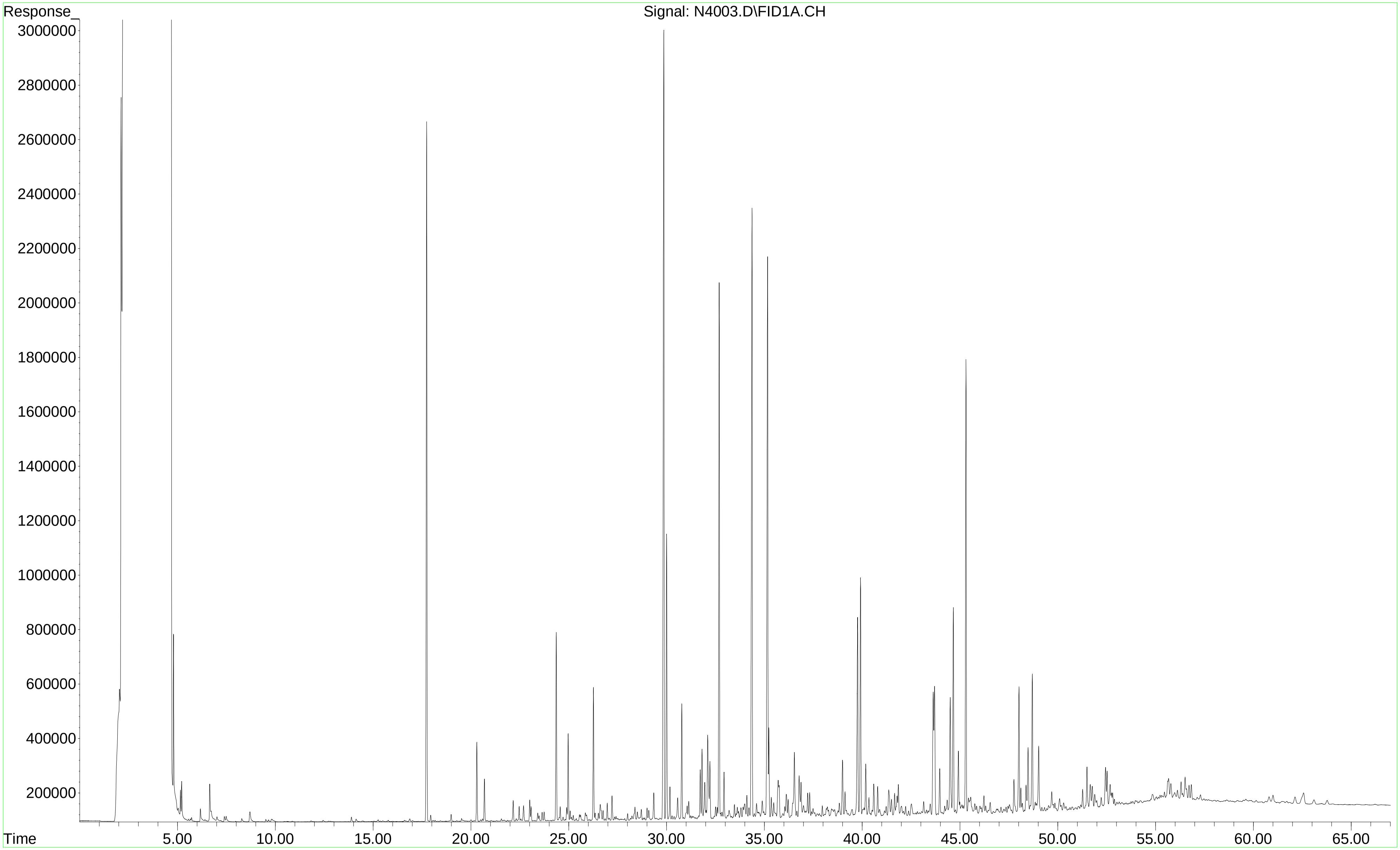
```
File       : F:\N\DATA\SN0223\N3999.D
Operator   : MM
Acquired   : 31 Jan 2007  10:50 pm using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5526-P-FID(11)
Misc Info  : GWP07T03 5-202 07-0010
Vial Number: 12
```



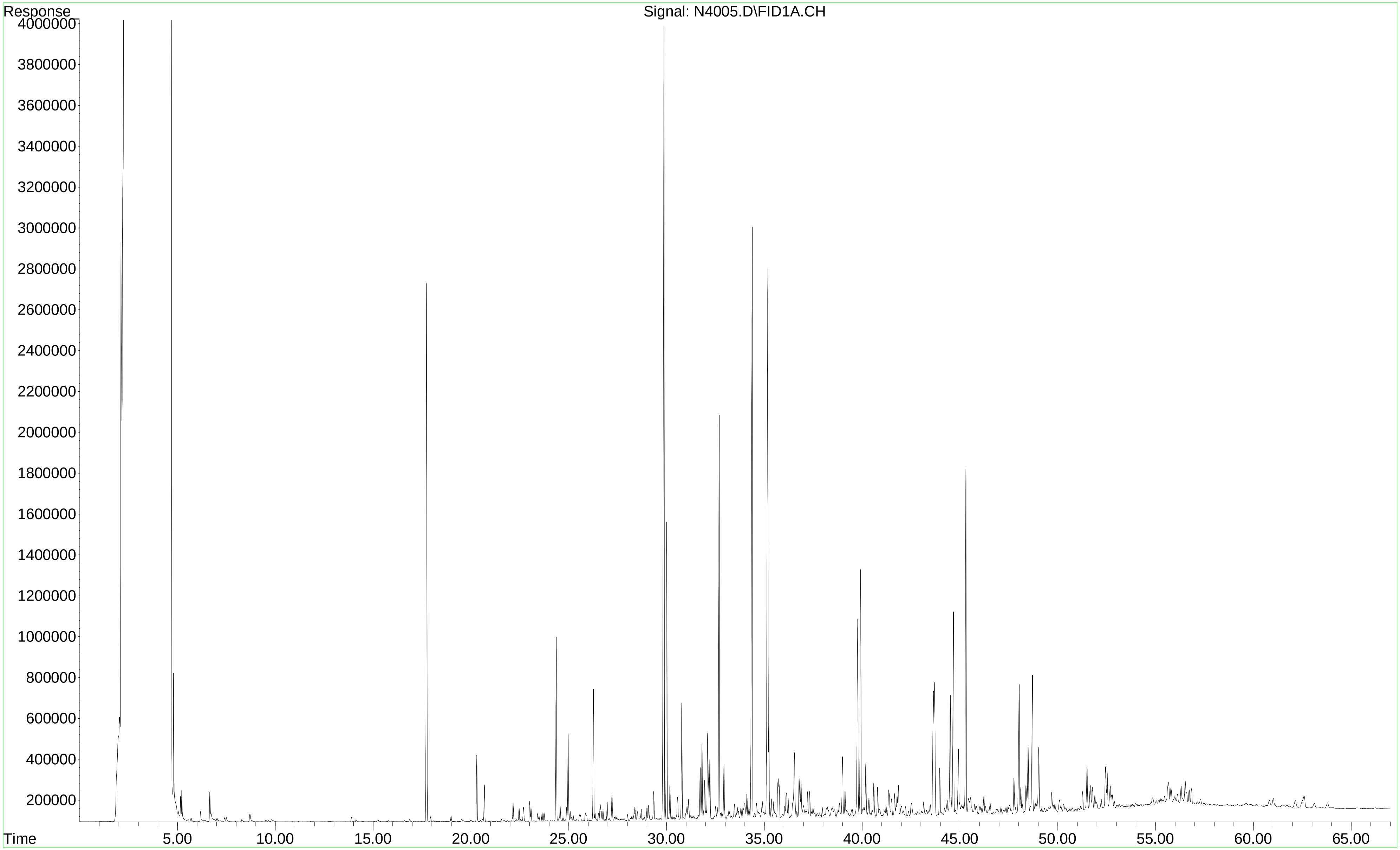
```
File       : F:\N\DATA\SN0223\N4001.D
Operator   : MM
Acquired   : 01 Feb 2007  12:11 am using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5527-P-FID(11)
Misc Info  : GWP07T04 5-202 07-0010
Vial Number: 13
```



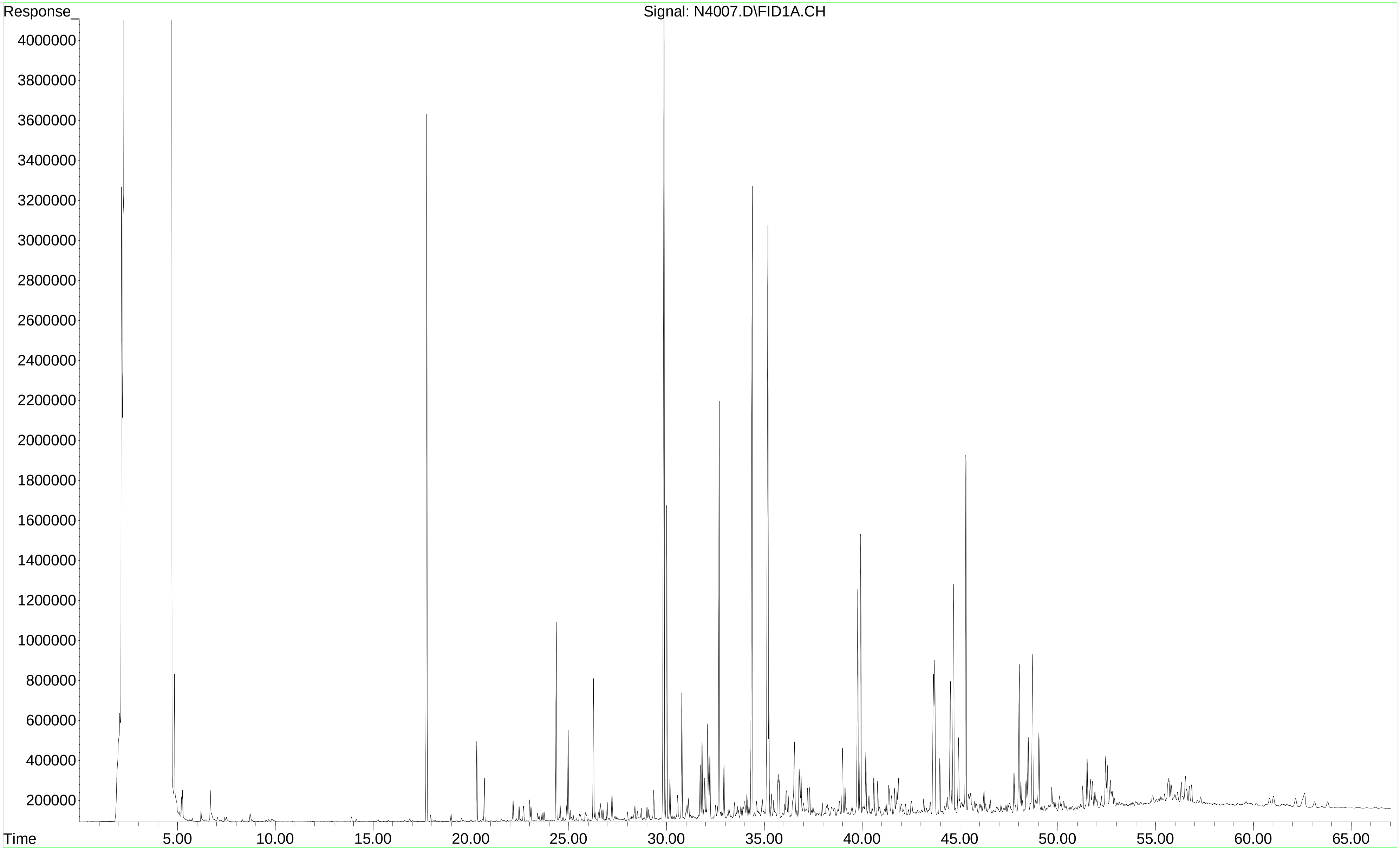
```
File       : F:\N\DATA\SN0223\N4003.D
Operator   : MM
Acquired   : 2-1-2007 01:30:53 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5528-P-A-FID(13)
Misc Info  : GWP07T05 5-202 07-0010
Vial Number: 14
```



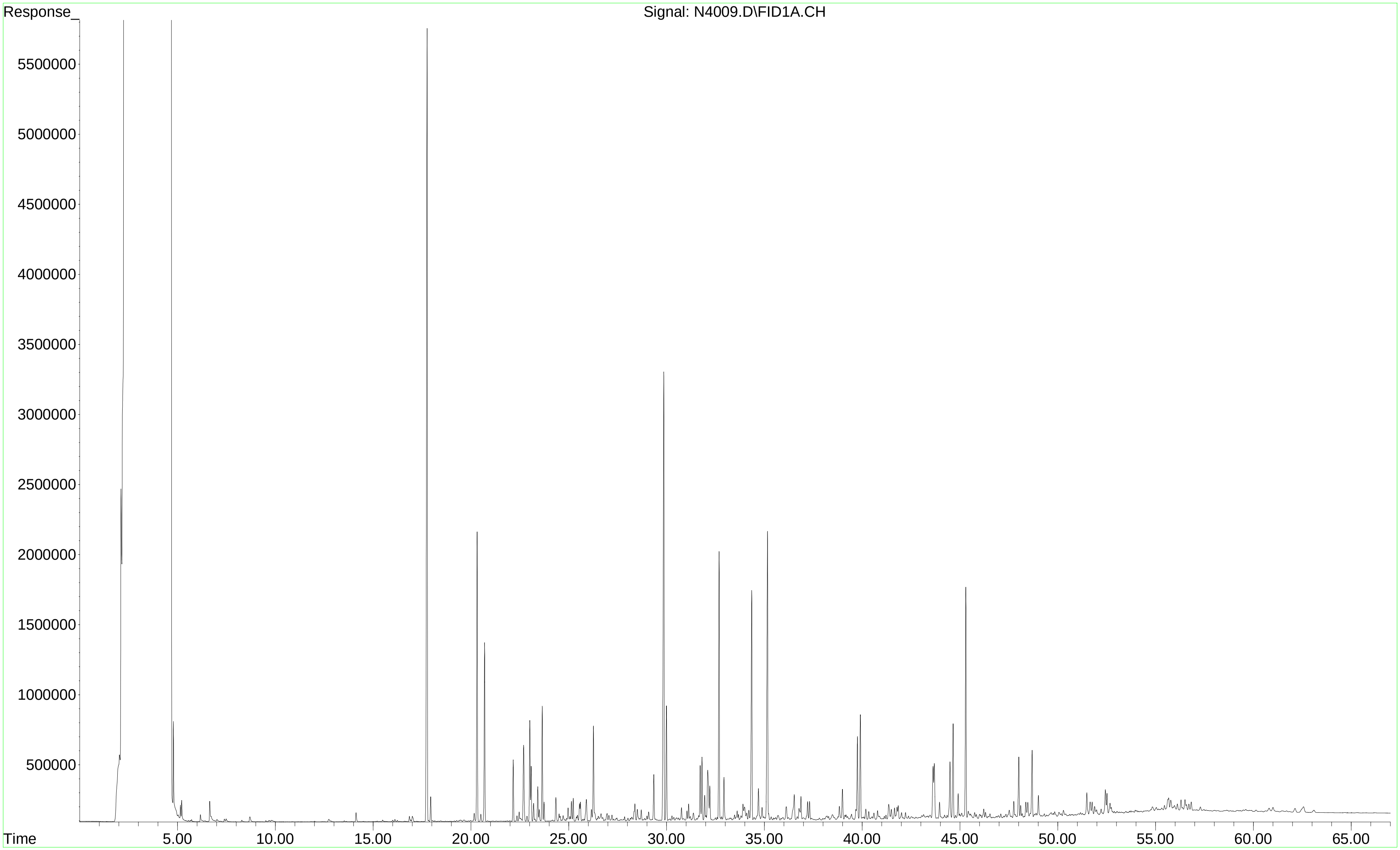
```
File       : F:\N\DATA\SN0223\N4005.D
Operator   : MM
Acquired   : 2-1-2007 02:50:25 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5529-P-A-FID(13)
Misc Info  : GWP07T06 5-202 07-0010
Vial Number: 15
```



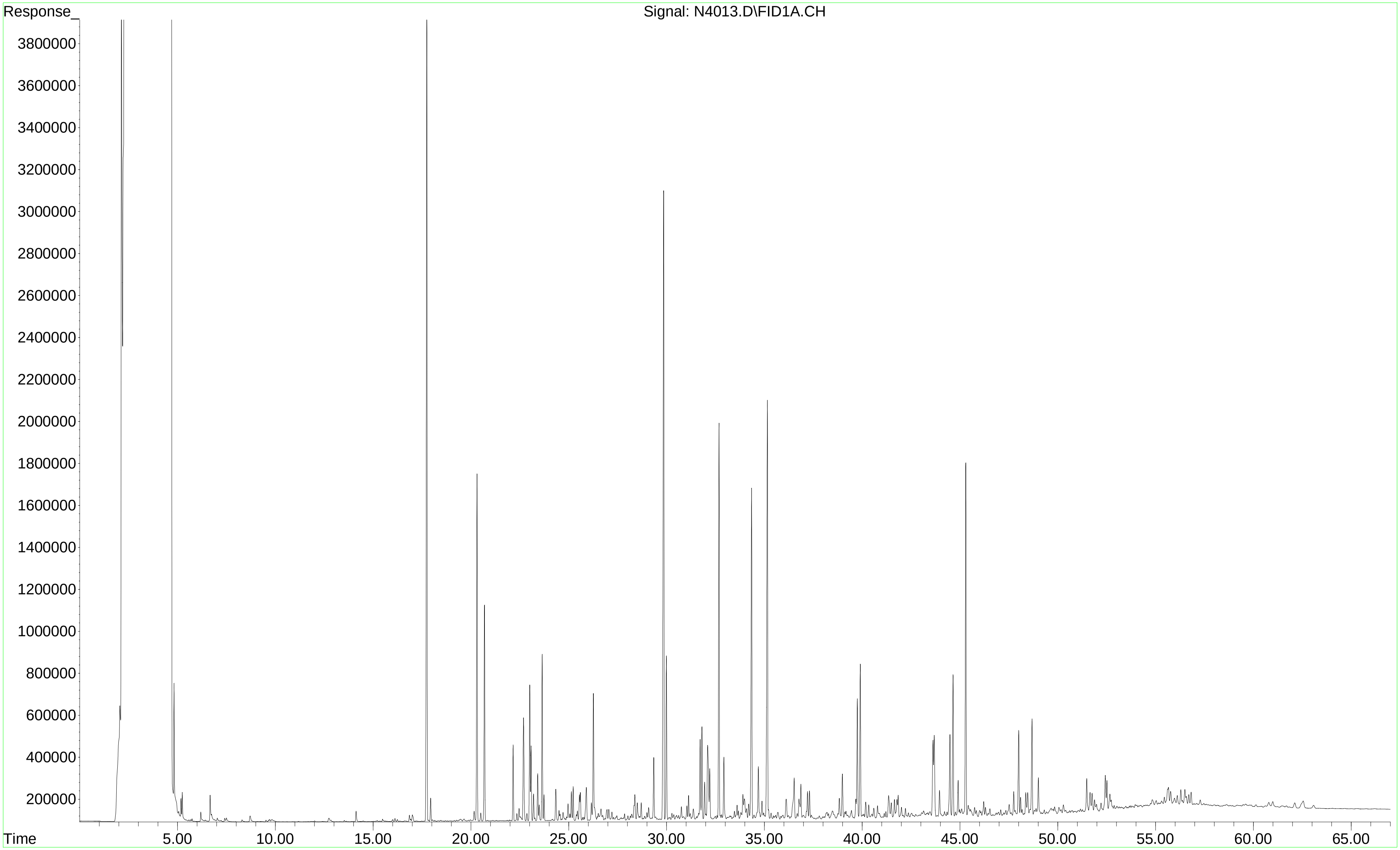
```
File       : F:\N\DATA\SN0223\N4007.D
Operator   : MM
Acquired   : 2-1-2007 04:09:54 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5530-P-FID(11)
Misc Info  : GWP07T07 5-202 07-0010
Vial Number: 16
```



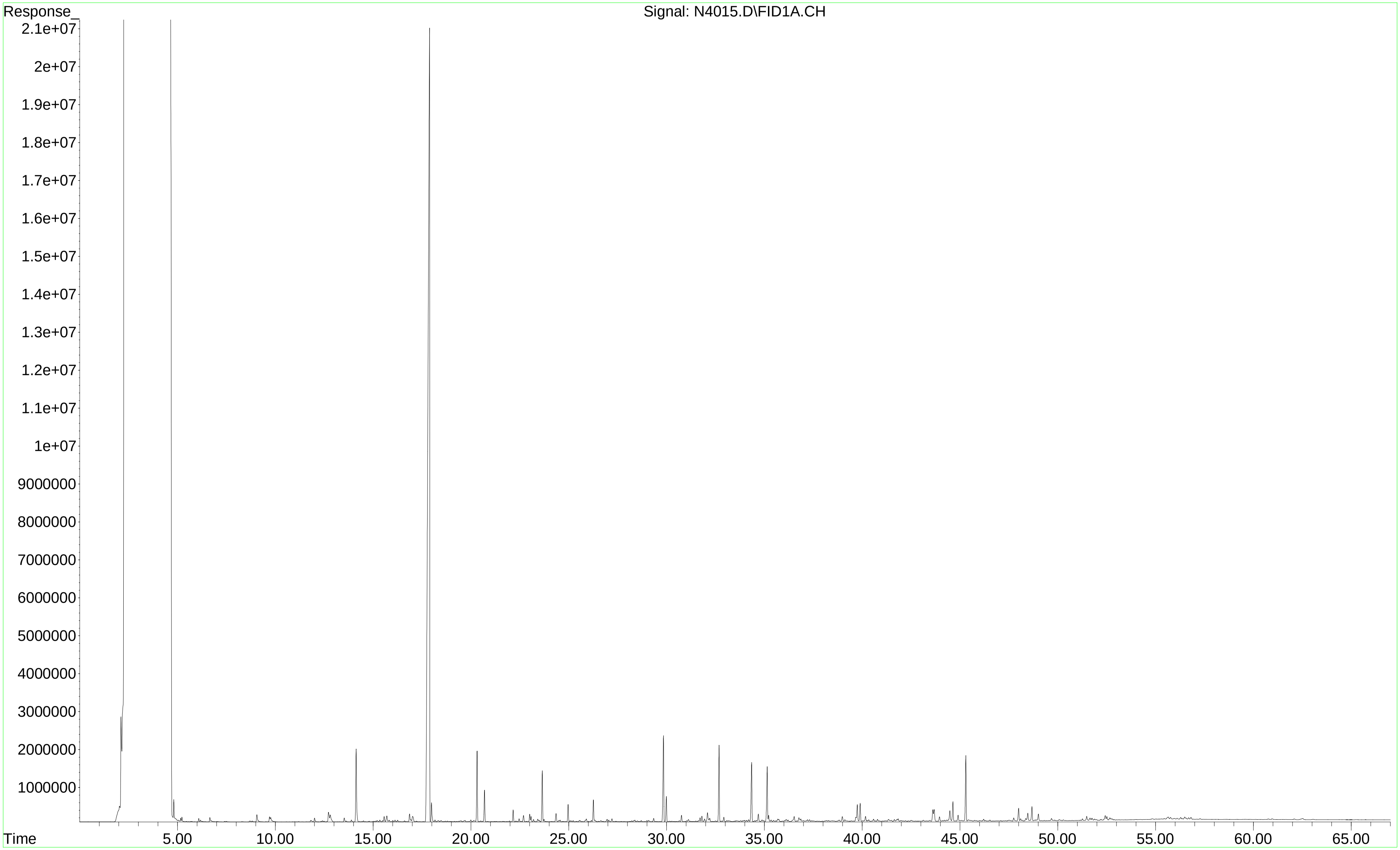
```
File       : F:\N\DATA\SN0223\N4009.D
Operator   : MM
Acquired   : 2-1-2007 05:29:42 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5531-P-FID(11)
Misc Info  : GWP07T08 5-202 07-0010
Vial Number: 17
```



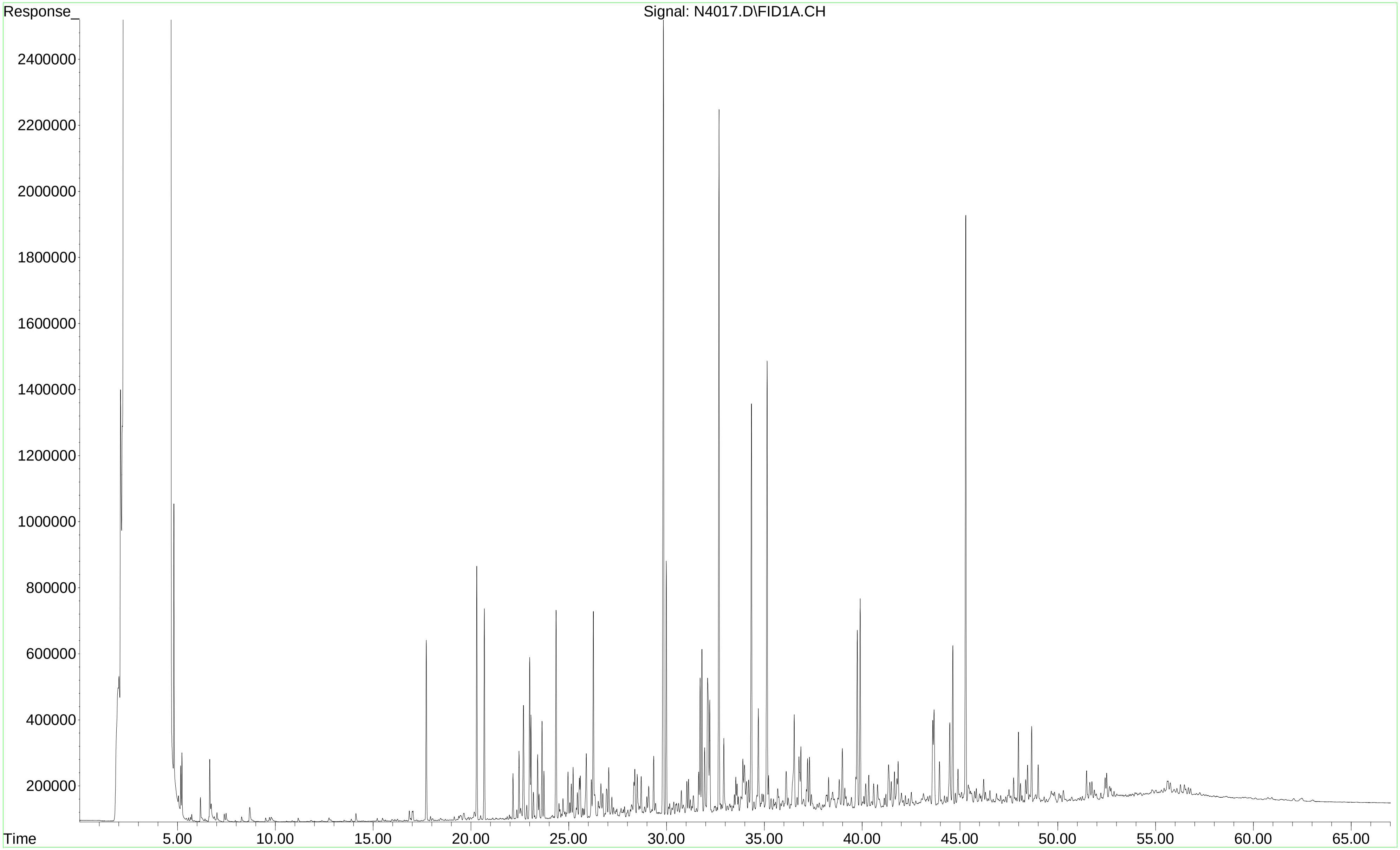
```
File       : F:\N\DATA\SN0223\N4013.D
Operator   : MM
Acquired   : 2-1-2007 08:09:16 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5532-P-FID(11)
Misc Info  : GWP07T09 5-202 07-0010
Vial Number: 19
```



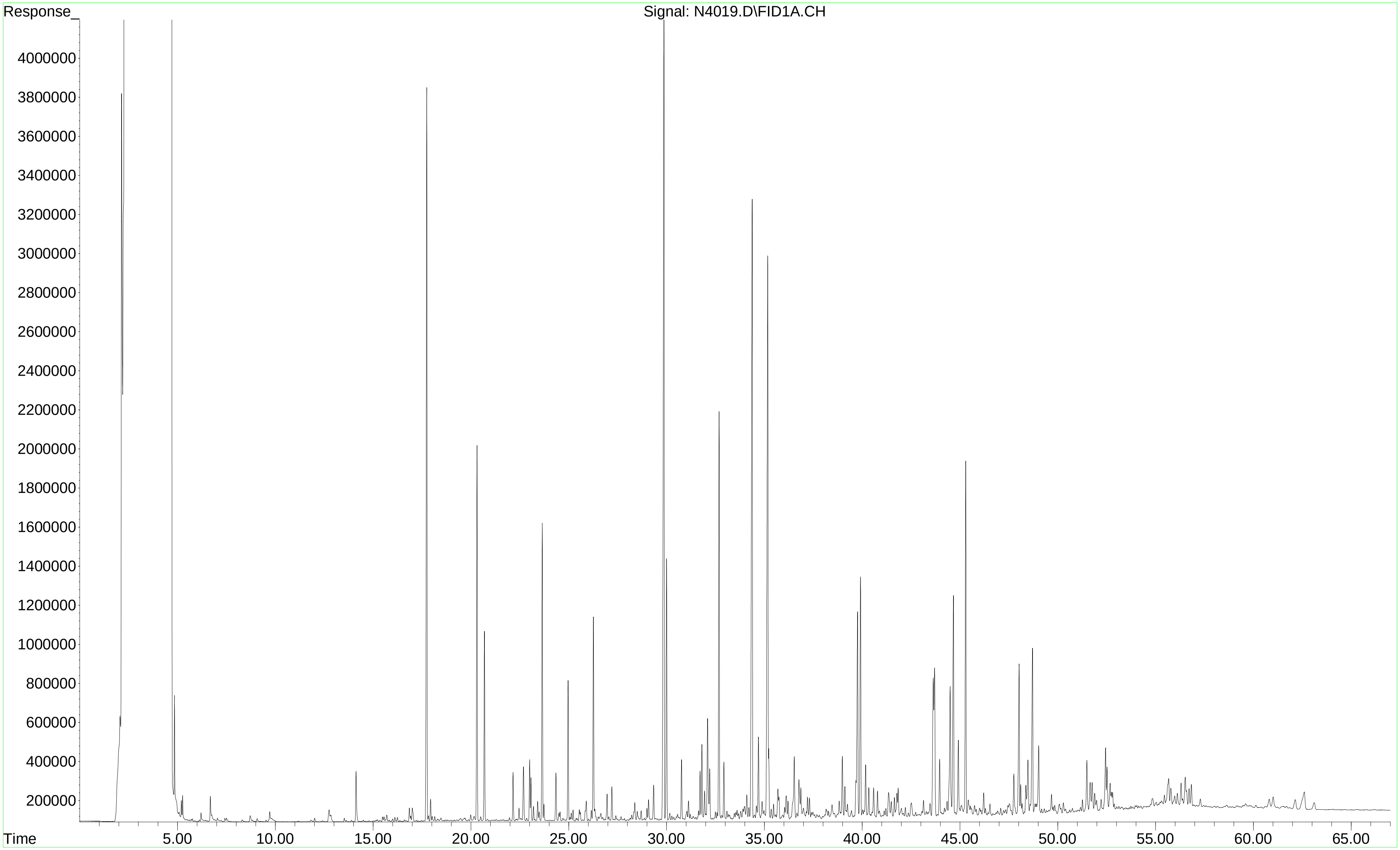
```
File       : F:\N\DATA\SN0223\N4015.D
Operator   : MM
Acquired   : 2-1-2007 09:29:43 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5533-P-FID(11)
Misc Info  : GWP07T10 5-202 07-0010
Vial Number: 20
```



```
File       : F:\N\DATA\SN0223\N4017.D
Operator   : MM
Acquired   : 01 Feb 2007  10:50 am using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5534-P-FID(11)
Misc Info  : GWP07T11 5-202 07-0010
Vial Number: 21
```



```
File       : F:\N\DATA\SN0223\N4019.D
Operator   : MM
Acquired   : 01 Feb 2007  12:10 pm using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5535-P-FID(11)
Misc Info  : GWP07T12 5-202 07-0010
Vial Number: 22
```



```
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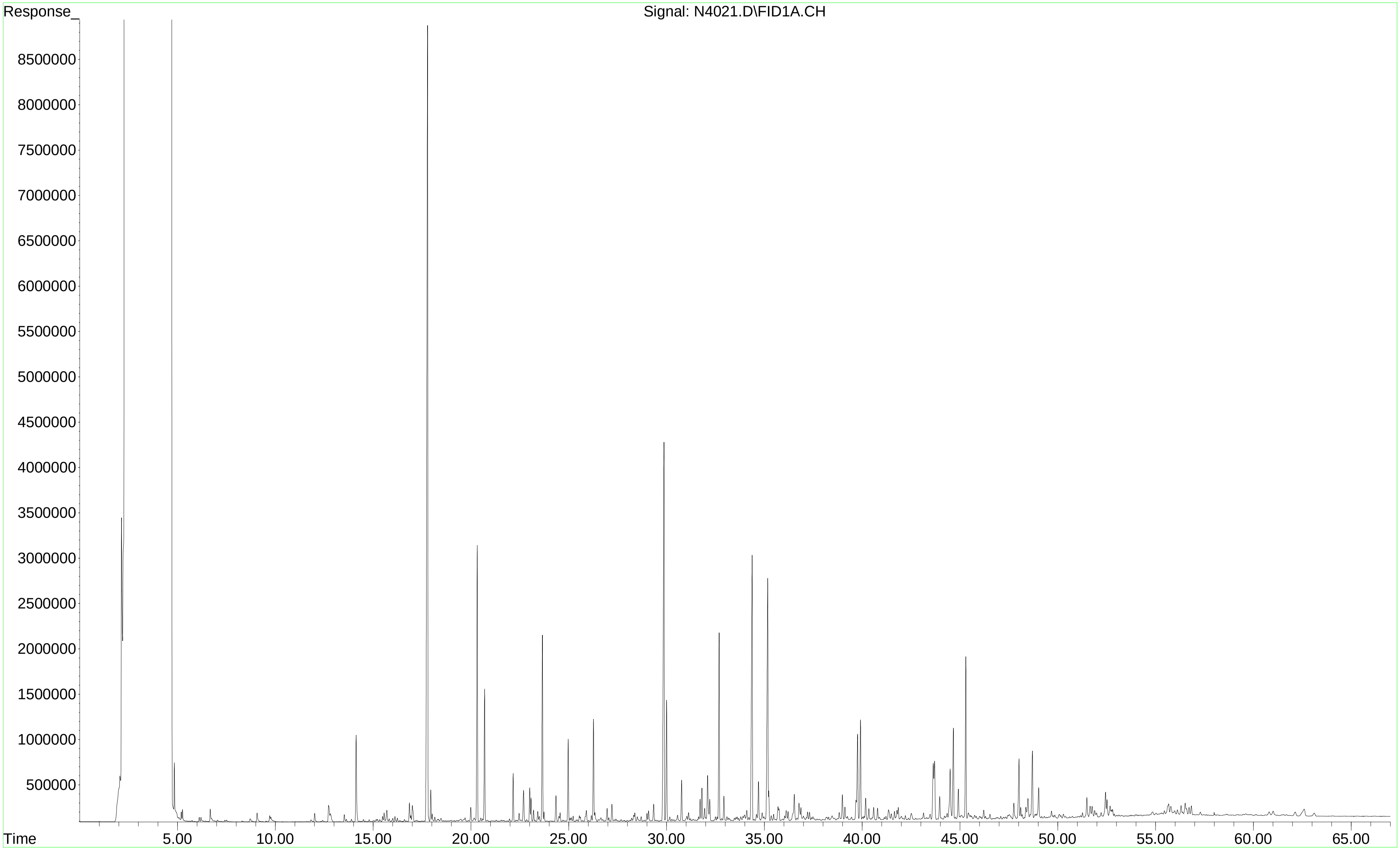
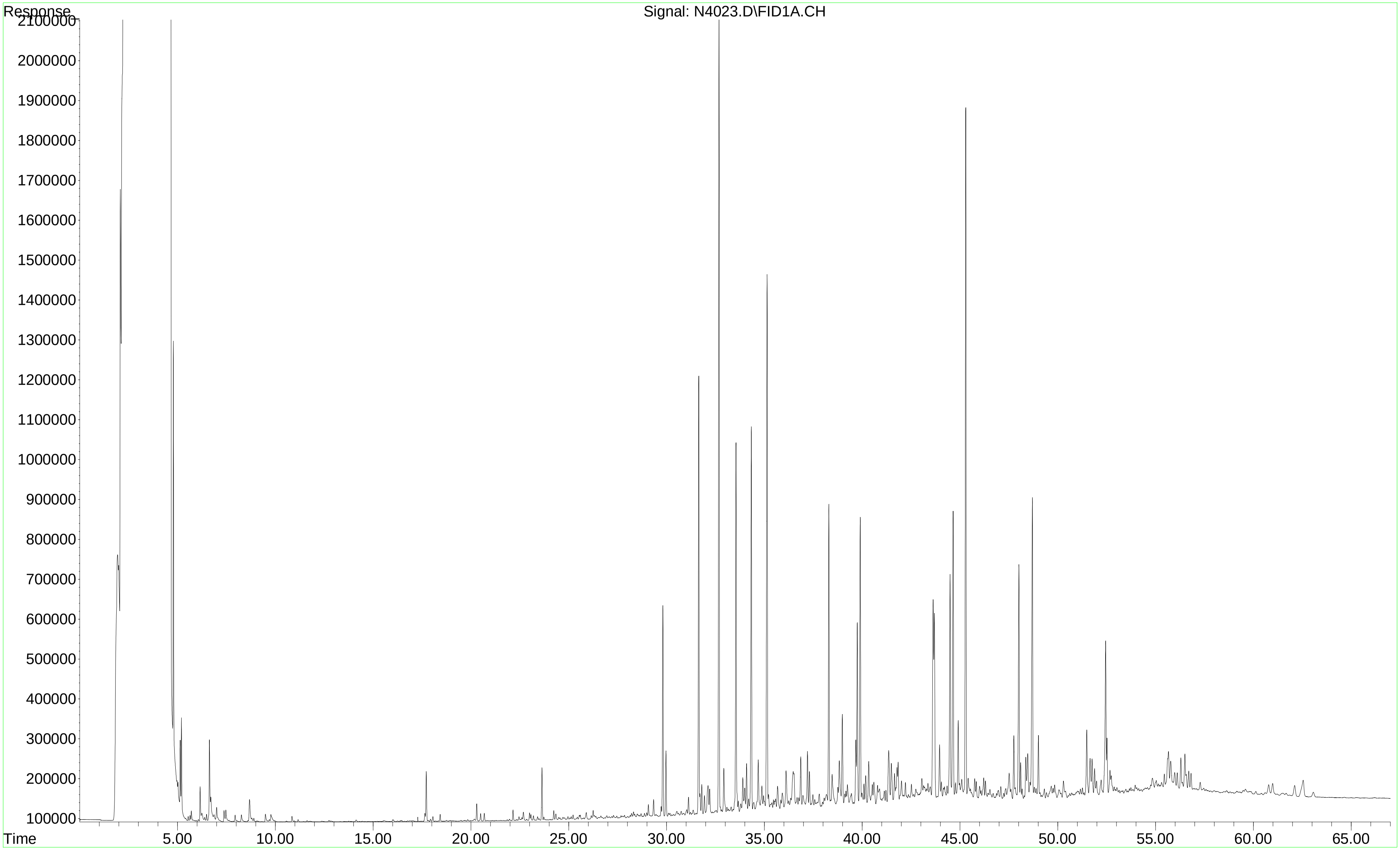
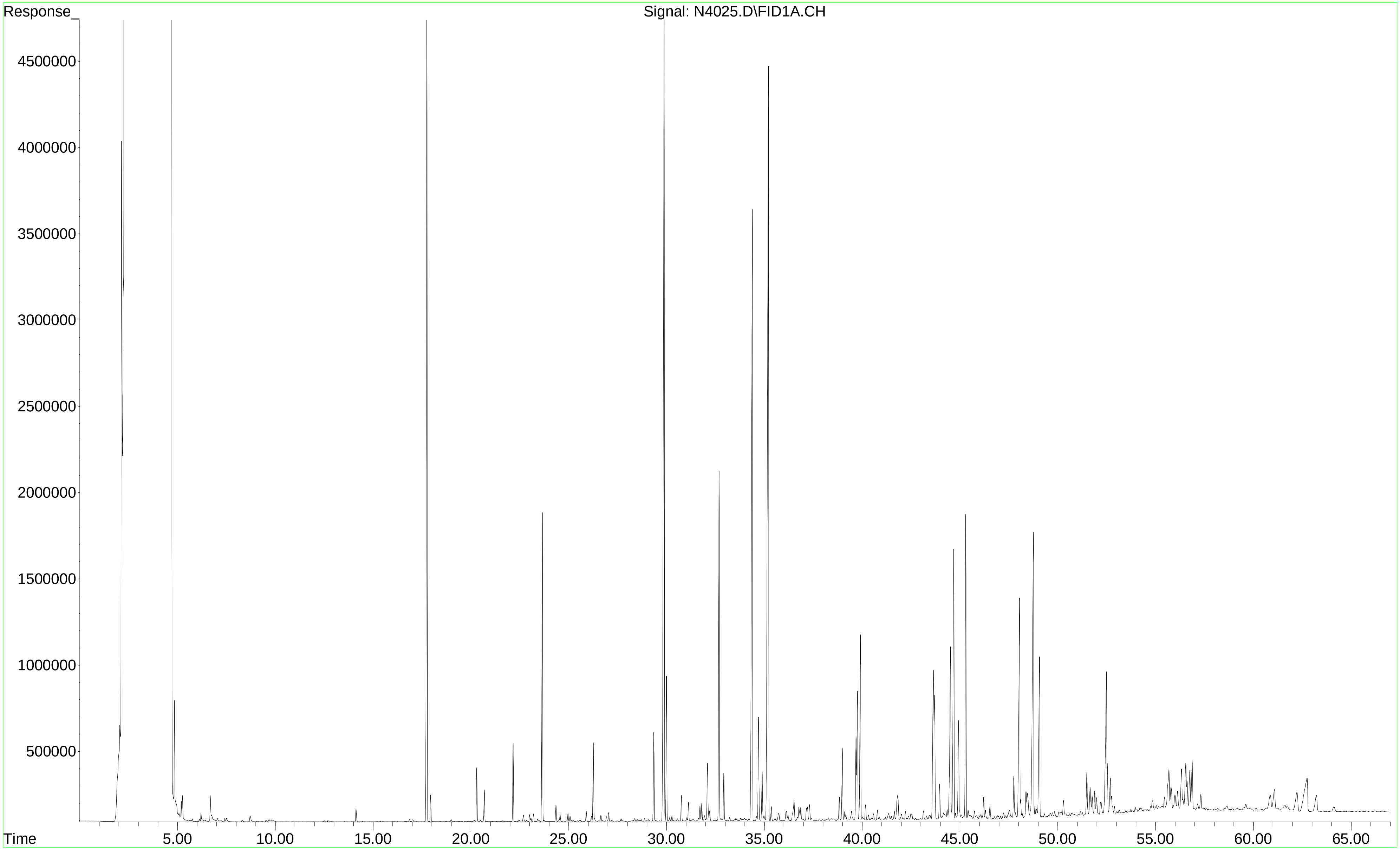
Operator   : MM
Acquired   : 2-1-2007 01:31:24 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5536-P-FID(11)
Misc Info  : GWP07T13 5-202 07-0010
Vial Number: 23
```



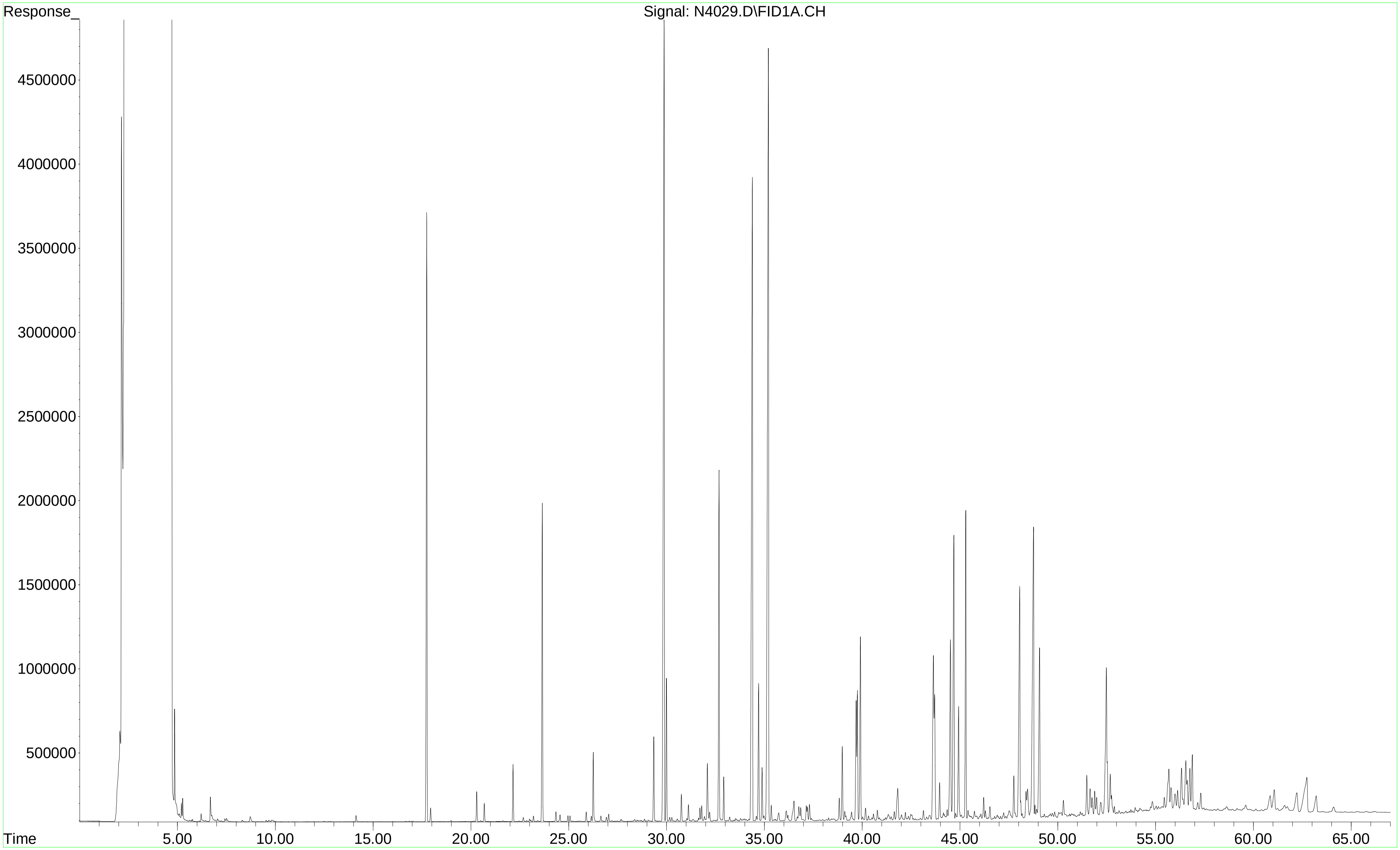
```
File       : F:\N\DATA\SN0223\N4023.D
Operator   : MM
Acquired   : 2-1-2007 02:52:05 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5537-P-FID(8)
Misc Info  : GWP07T14 5-202 07-0010
Vial Number: 24
```



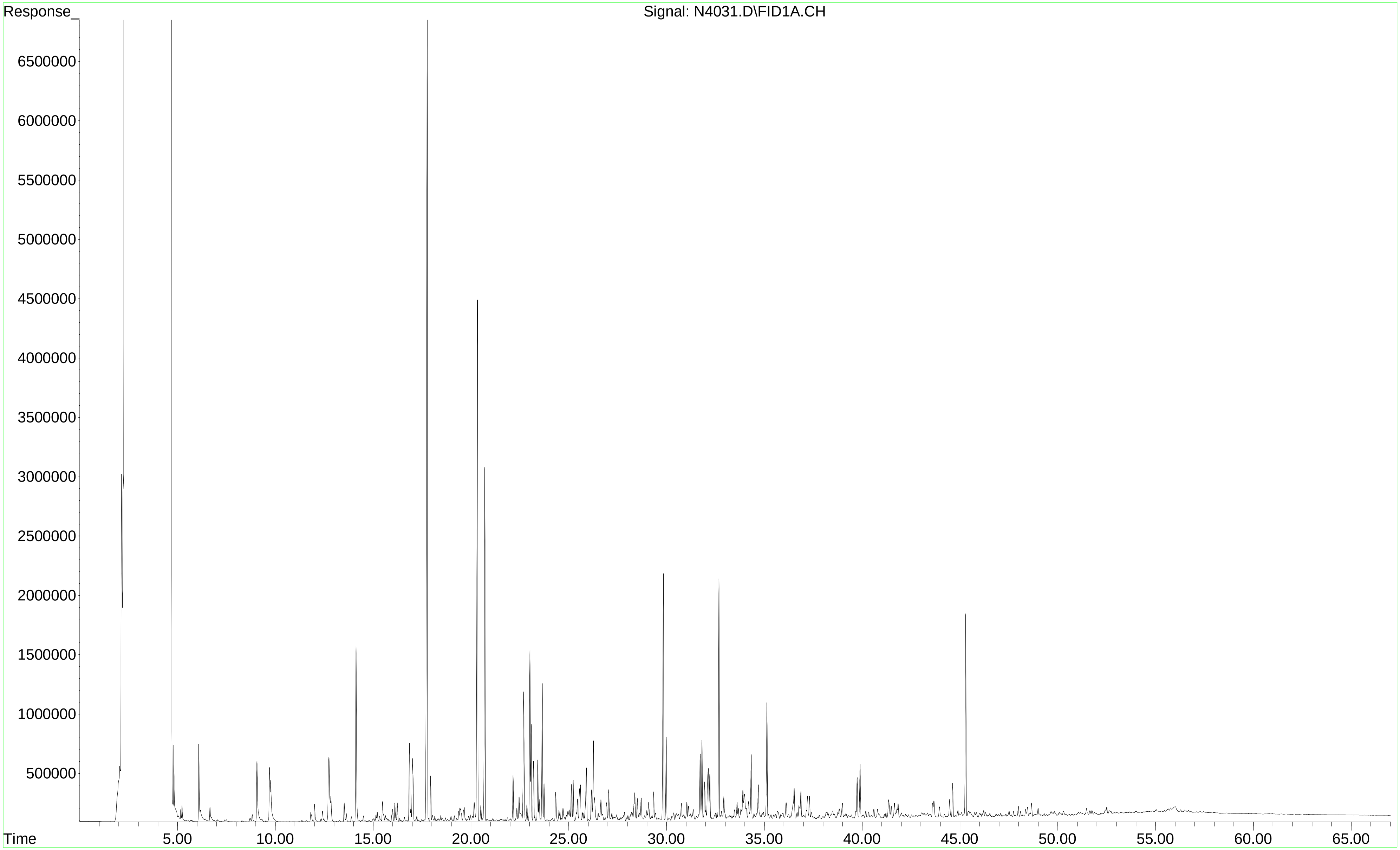
```
File       : F:\N\DATA\SN0223\N4025.D
Operator   : MM
Acquired   : 2-1-2007 04:12:23 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5538-P-FID(11)
Misc Info  : GWP07S01 5-202 07-0010
Vial Number: 25
```



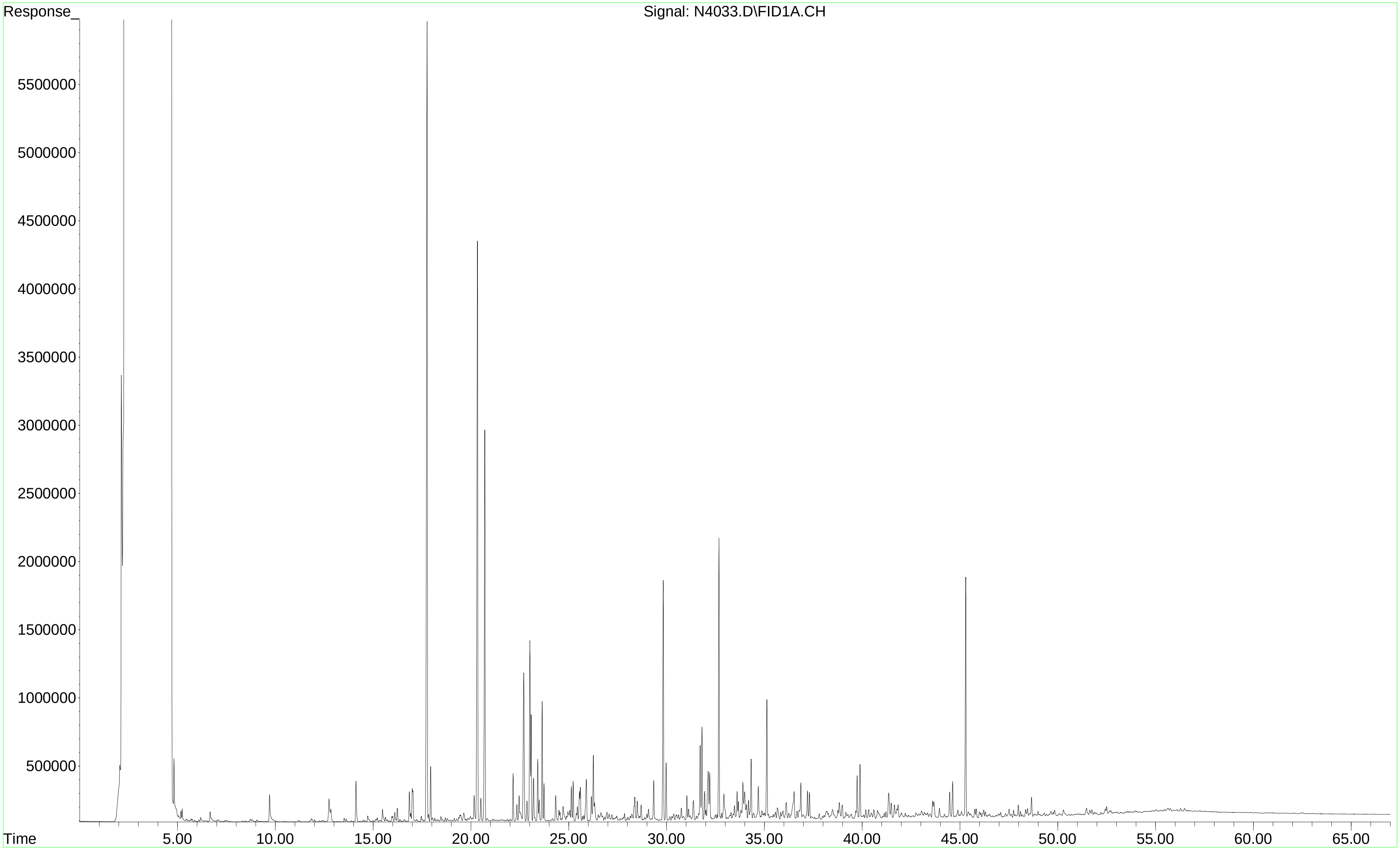
```
File       : F:\N\DATA\SN0223\N4029.D
Operator   : MM
Acquired   : 2-1-2007 06:52:57 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5539-P-FID(11)
Misc Info  : GWP07S02 5-202 07-0010
Vial Number: 27
```



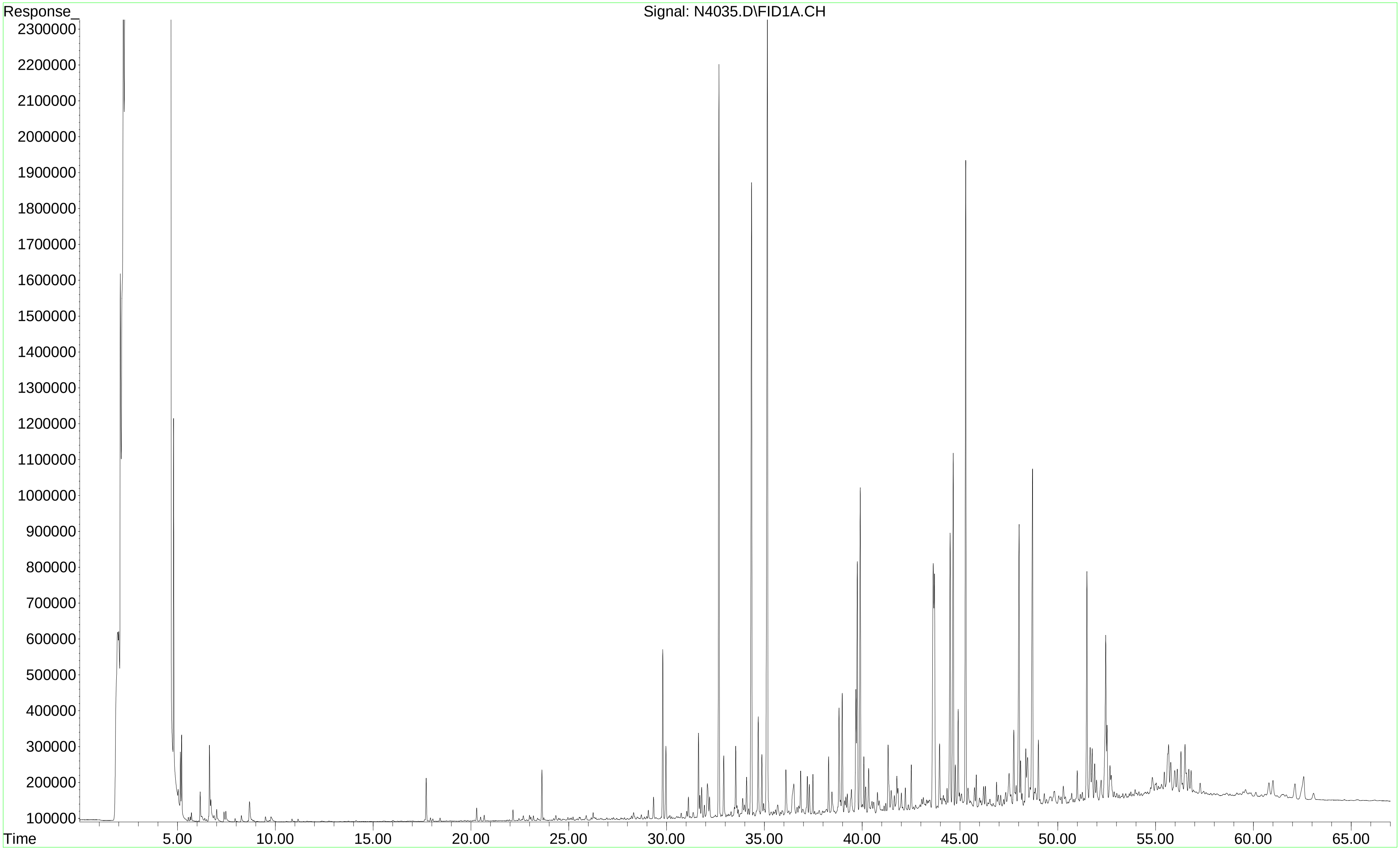
```
File       : F:\N\DATA\SN0223\N4031.D
Operator   : MM
Acquired   : 2-1-2007 08:13:08 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5540-P-FID(11)
Misc Info  : GWP07S03 5-202 07-0010
Vial Number: 28
```



```
File       : F:\N\DATA\SN0223\N4033.D
Operator   : MM
Acquired   : 2-1-2007 09:33:07 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5541-P-FID(11)
Misc Info  : GWP07S04 5-202 07-0010
Vial Number: 29
```



```
File       : F:\N\DATA\SN0223\N4035.D
Operator   : MM
Acquired   : 01 Feb 2007  10:53 pm using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5542-P-A-FID(11)
Misc Info  : TDW3-4.5 5-202 07-0010
Vial Number: 30
```



SHC and TPH – NAPL QA/QC Summary
Batch 07-0011

PROJECT:	Exponent – Gas Works
PARAMETER:	Saturated Hydrocarbons (SHC) and Total Petroleum Hydrocarbons (TPH)
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Non-aqueous phase liquid (NAPL)
SAMPLE CUSTODY:	Eighteen tar samples, three NAPLs samples, and 1 soil sample were received at the Battelle Duxbury Operations (BDO) Laboratory on 1/16/2007. Upon receipt of samples, the temperatures of the coolers were taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was within the acceptable range. Samples were either stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin. The NAPL samples were extracted together in one analytical batch, batch 07-0011.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Blank	Surrogate Recovery	LCS/MS Recovery	Control Oil % Diff.
SHC and TPH	General NS&T	< 5x MDL	40-120% Recovery	40-120% Recovery MS target spike must be > 5 x background	PD < 30% for 90% of the analytes

METHOD:

NAPL and filter samples were extracted following general NS&T methodologies. Approximately 50 mg of oil was weighed and diluted with 10 mL of hexane, while filter samples were extracted in entirety with 10 mL of Hexane. A portion of the extract was removed and spiked with SIS and IS. One extract was submitted for PAH and petroleum biomarker analysis, and the second extract was submitted for SHC and TPH analysis. NAPL sample data is reported on an oil weight basis, filter sample Bulkhead-02-fp data is reported on a gravimetric weight basis while filter sample Bulkhead Blank data is reported on a ng basis since the sample had no gravimetric weight.

SHC and TPH were measured by gas chromatography with flame ionization detection (GC/FID). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of SHC and TPH were calculated by the internal standard method. Normal alkanes were quantified using the average RF generated from the initial calibration. TPH concentrations were quantified using the average RF of nC8 through nC40. Isoprenoid hydrocarbon concentrations were quantified using the average RF of the n-alkanes immediately preceding and immediately following each target isoprenoid hydrocarbon.

HOLDING TIMES:

Samples were stored cool at approximately 4°C until extraction.

Samples were prepared for analysis in one analytical batch and analyzed within 40 days of extraction.

Batch ID	Extraction Date	Analysis Date(s)
07-0011	1/30/2007	2/5/2007 – 2/6/2007

SHC and TPH – NAPL QA/QC Summary
Batch 07-0011

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. The blank was analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0011 – No exceedences noted.

Comments- None

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0011 – No exceedences noted.

Comments- None

SURROGATE RECOVERY:

Two surrogate compounds were added prior to extraction, including o-terphenyl and 5a-androstane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0011 – No exceedences noted.

Comments- None

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0011 – No exceedences noted.

Comments – None.

CALIBRATIONS:

The GC/FID is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (%RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be <20%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be <20% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be <20%.

07-0011 – No exceedences noted.

Comments – None.

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07DW401		GWP07DW402		GWP07MW9	
Battelle ID	R5522-P		R5523-P		R5524-P	
Sample Type	SA		SA		SA	
Collection Date	01/11/07		01/11/07		01/12/07	
Extraction Date	01/30/07		01/30/07		01/30/07	
Analysis Date	02/05/07		02/05/07		02/06/07	
Analytical Instrument	FID		FID		FID	
% Moisture	NA		NA		NA	
% Lipid	NA		NA		NA	
Matrix	NAPL		NAPL		NAPL	
Sample Size	49.50		47.40		45.80	
Size Unit-Basis	MG_OIL		MG_OIL		MG_OIL	
Reporting Limit	303.03		316.46		327.51	
Units	MG/KG_OIL		MG/KG_OIL		MG/KG_OIL	
n-Nonane		U		U		U
n-Decane		U		U		U
n-Undecane	985.16		904.4			U
n-Dodecane	2909.61		2982.5			U
n-Tridecane	5232.44	ME	8415.55	ME	4205.06	ME
Isoprenoid RRT 1380		U		U	6331.01	
n-Tetradecane	4571.43		4648.67		2968.95	
Isoprenoid RRT 1470	3316.27		3374.48		7188.74	
n-Pentadecane	1547.03		1667.54			U
n-Hexadecane	1388.3			U		U
Norpristane (1650)	1658.57		363.09		6678.5	
n-Heptadecane	946.27		970.61		480.82	
Pristane	1377.81		1311.14		10138.83	
n-Octadecane	9014.06		9221.92		1509.41	
Phytane	317.24		353.6		6173.46	
n-Nonadecane		U		U		U
n-Eicosane	468.06		482.61			U
n-Heneicosane	1908.32		1992.63		768.98	
n-Docosane	1254.65		1294.69		342.06	
n-Tricosane		U		U		U
n-Tetracosane		U		U		U
n-Pentacosane	843.09		868.18			U
n-Hexacosane	1279.06		1262.68			U
n-Heptacosane	205.75	J	224.86	J		U
n-Octacosane	2113.46		2295.97			U
n-Nonacosane		U		U		U
n-Triacontane		U		U		U
n-Hentriacontane		U		U		U
n-Dotriacontane		U		U		U
n-Tritriacontane		U		U		U
n-Tetratriacontane		U		U		U
n-Pentatriacontane		U		U		U
n-Hexatriacontane		U		U		U
n-Heptatriacontane		U		U		U
n-Octatriacontane		U		U		U
n-Nonatriacontane		U		U		U
n-Tetracontane		U		U		U
TPH(total)	774165.21		786091.98		869177.39	

Surrogate Recoveries (%)

O-Terphenyl	107	103	108
5a-androstane	86	87	86

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank FID
Battelle ID	BJ963PB-P
Sample Type	PB
Collection Date	01/30/07
Extraction Date	01/30/07
Analysis Date	02/05/07
Analytical Instrument	FID
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	5.00
Size Unit-Basis	MG_OIL
Minimum Reporting Limit	300
Units	MG/KG_OIL
n-Nonane	U
n-Decane	U
n-Undecane	U
n-Dodecane	U
n-Tridecane	U
Isoprenoid RRT 1380	U
n-Tetradecane	U
Isoprenoid RRT 1470	U
n-Pentadecane	U
n-Hexadecane	U
Norpristane (1650)	U
n-Heptadecane	U
Pristane	U
n-Octadecane	U
Phytane	U
n-Nonadecane	U
n-Eicosane	U
n-Heneicosane	U
n-Docosane	U
n-Tricosane	U
n-Tetracosane	U
n-Pentacosane	U
n-Hexacosane	U
n-Heptacosane	U
n-Octacosane	U
n-Nonacosane	U
n-Triacontane	U
n-Hentriacontane	U
n-Dotriacontane	U
n-Tritriacontane	U
n-Tetratriacontane	U
n-Pentatriacontane	U
n-Hexatriacontane	U
n-Heptatriacontane	U
n-Octatriacontane	U
n-Nonatriacontane	U
n-Tetracontane	U
TPH(total)	U

Surrogate Recoveries (%)

O-Terphenyl	107
5a-androstane	86

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Laboratory Control Sample FID				
Battelle ID	BJ964LCS-P				
Sample Type	LCS				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/05/07				
Analytical Instrument	FID				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	NA				
Size Unit-Basis	NA				
Minimum Reporting Limit	1000				
Units	NG		Target	% Recovery	Qualifier
n-Nonane	24417.91		25000.00	98	
n-Decane	25466.5		25000.00	102	
n-Undecane		U			
n-Dodecane	25452.29		25000.00	102	
n-Tridecane		U			
Isoprenoid RRT 1380		U			
n-Tetradecane	25215.84		25000.00	101	
Isoprenoid RRT 1470		U			
n-Pentadecane		U			
n-Hexadecane	25548.96		25000.00	102	
Norpristane (1650)		U			
n-Heptadecane		U			
Pristane	26973.83		25005.00	108	
n-Octadecane	25361.5		25000.00	101	
Phytane	24683.95		25017.50	99	
n-Nonadecane	23835.33		25000.00	95	
n-Eicosane	25536.21		25000.00	102	
n-Heneicosane		U			
n-Docosane	26224.58		25000.00	105	
n-Tricosane		U			
n-Tetracosane	25409.65		25000.00	102	
n-Pentacosane		U			
n-Hexacosane	25290.62		25000.00	101	
n-Heptacosane		U			
n-Octacosane	25240.62		25000.00	101	
n-Nonacosane		U			
n-Triacontane	25174.25		25000.00	101	
n-Hentriacontane		U			
n-Dotriacontane		U			
n-Tritriacontane		U			
n-Tetratriacontane		U			
n-Pentatriacontane		U			
n-Hexatriacontane	23884.94		25000.00	96	
n-Heptatriacontane		U			
n-Octatriacontane		U			
n-Nonatriacontane		U			
n-Tetracontane		U			
TPH(total)		U			

Surrogate Recoveries (%)

O-Terphenyl	99
5a-androstane	85

Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude
Battelle ID	BJ960NSC-P
Sample Type	NSC
Collection Date	01/30/07
Extraction Date	01/30/07
Analysis Date	02/05/07
Analytical Instrument	FID
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	5.01
Size Unit-Basis	MG_OIL
Minimum Reporting Limit	299.7

Units	MG/KG_OIL		Target	% Difference	Qualifier
n-Nonane	5001.37		4670.06	7.1	
n-Decane	4915.31		4951.66	0.7	
n-Undecane	4816.79		4506.16	6.9	
n-Dodecane	4828.72		4576.43	5.5	
n-Tridecane	4726.74	ME	4189.33	12.8	
Isoprenoid RRT 1380	977.58		961.81	1.6	
n-Tetradecane	4166.88		3919.50	6.3	
Isoprenoid RRT 1470	1419.61		1532.69	7.4	
n-Pentadecane	4278.1		3990.56	7.2	
n-Hexadecane	3638.09		3640.11	0.1	
Norpristane (1650)	1145.36		1141.72	0.3	
n-Heptadecane	3308.17		3078.38	7.5	
Pristane	2267.36		2280.61	0.6	
n-Octadecane	2860.32		2796.74	2.3	
Phytane	1535.02		1659.88	7.5	
n-Nonadecane	2453.53		2540.37	3.4	
n-Eicosane	2609.57		2502.77	4.3	
n-Heneicosane	2447.38		2419.45	1.2	
n-Docosane	2466.56		2251.79	9.5	
n-Tricosane	2120.65		2050.41	3.4	
n-Tetracosane	2087.24		1948.20	7.1	
n-Pentacosane	1785.6		1795.70	0.6	
n-Hexacosane	1685.79		1639.60	2.8	
n-Heptacosane	1345.81		1230.99	9.3	
n-Octacosane	1051.9		1004.15	4.8	
n-Nonacosane	868.68		872.21	0.4	
n-Triacontane	668.2		669.33	0.2	
n-Hentriacontane	638.48		606.82	5.2	
n-Dotriacontane	478.41		465.97	2.7	
n-Tritriacontane	389.91		399.05	2.3	
n-Tetratriacontane	355.59		371.75	4.3	
n-Pentatriacontane	360.66		378.11	4.6	
n-Hexatriacontane	234.32	J	235.65	0.6	
n-Heptatriacontane	206.67	J	210.06	1.6	
n-Octatriacontane	218.79	J	205.75	6.3	
n-Nonatriacontane	163.55	J	153.92	6.3	
n-Tetracontane	163.61	J	161.64	1.2	
TPH(total)	612781.39		578973.63	5.8	

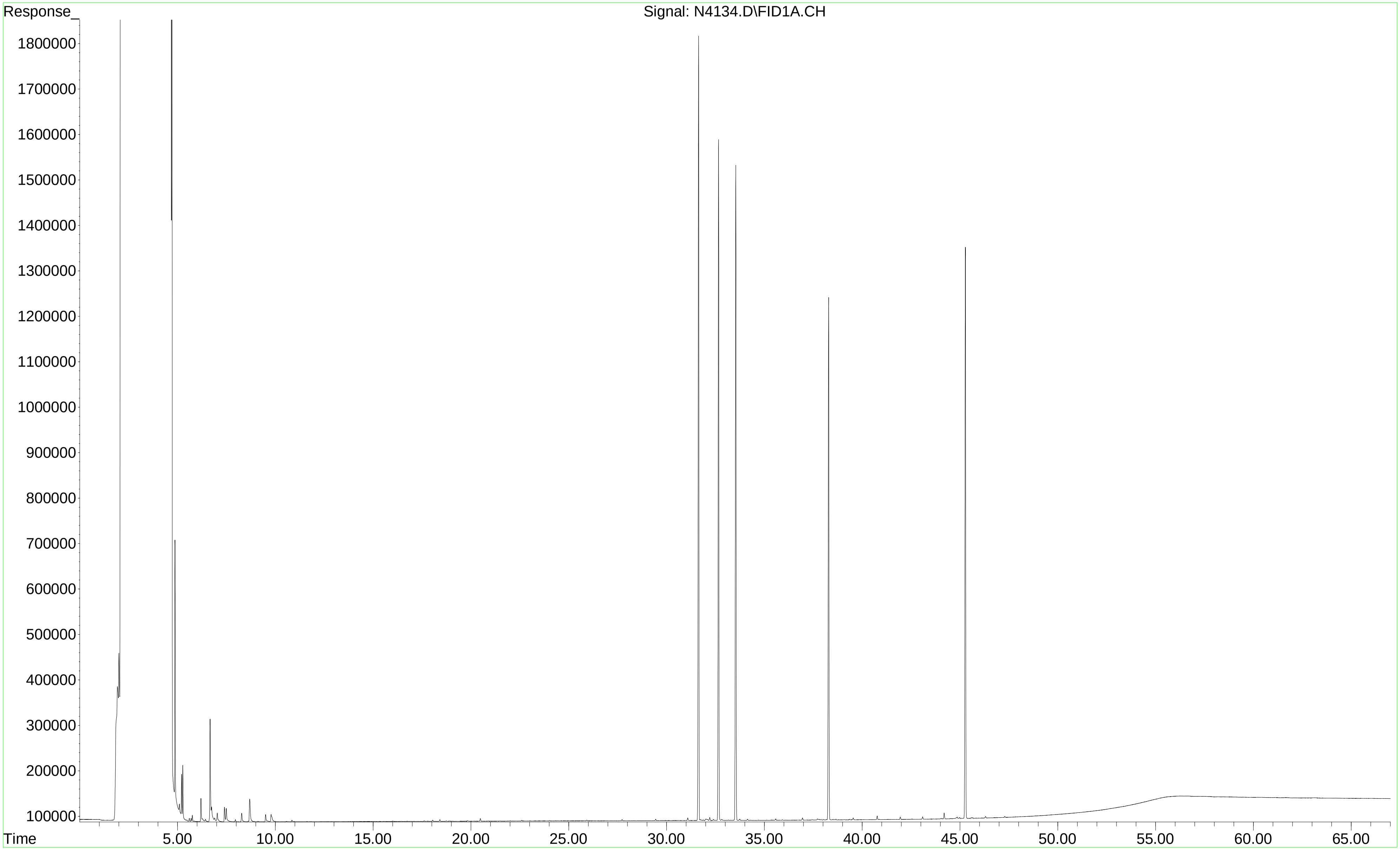
Surrogate Recoveries (%)

O-Terphenyl	98
5a-androstane	83

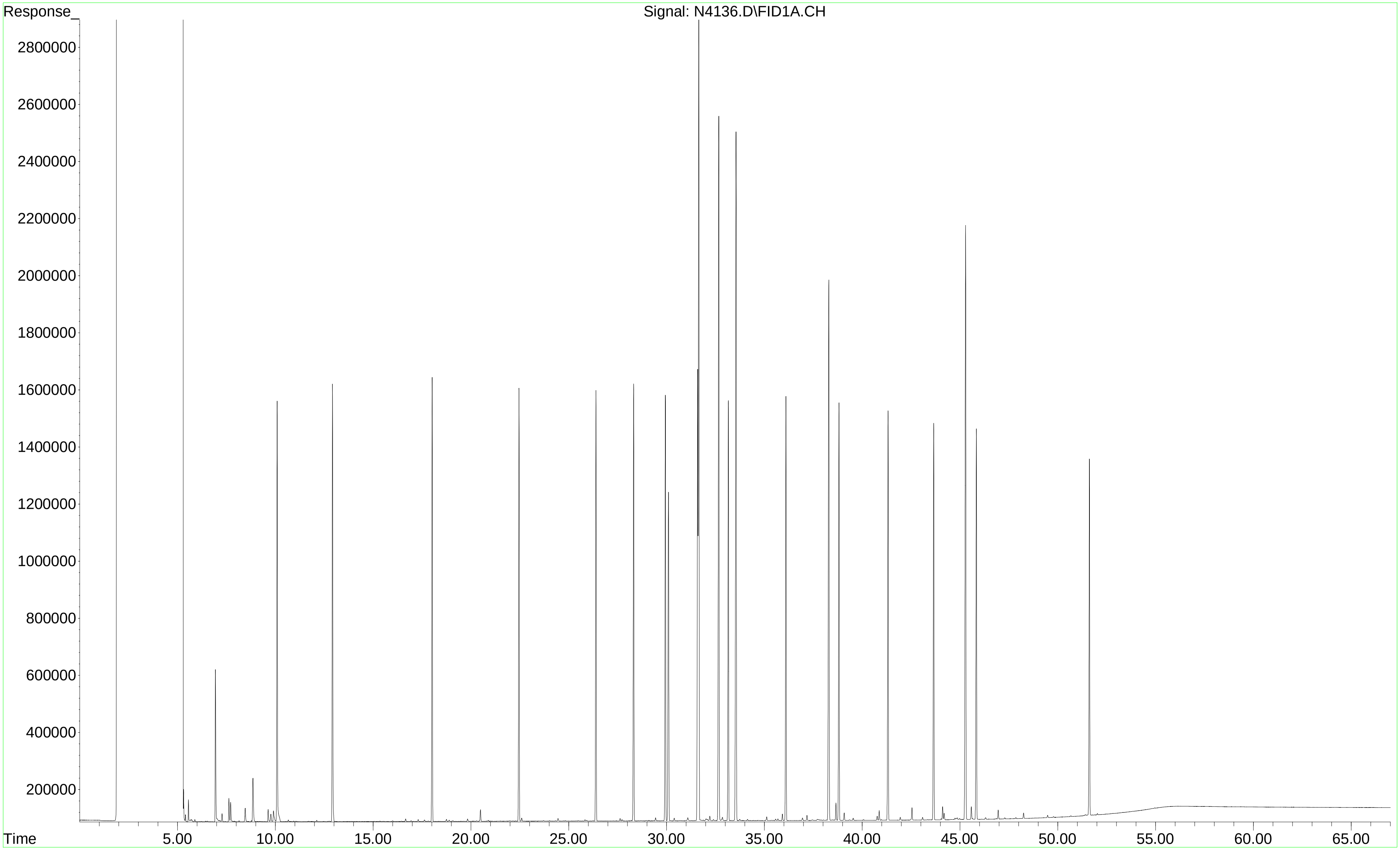
Not Surrogate Corrected

Analyzed by Meara, Michael
2/16/2007

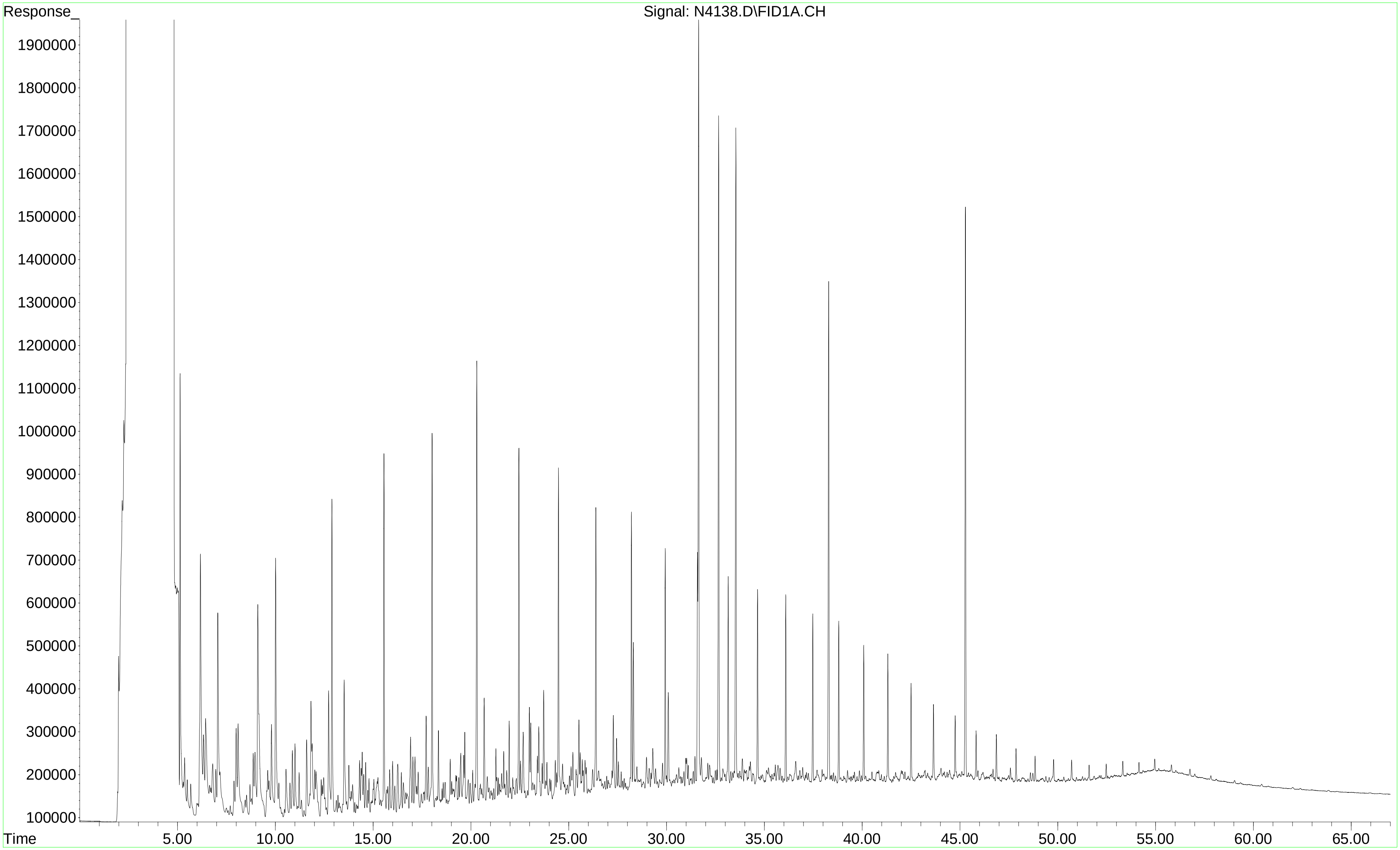
```
File       : F:\N\DATA\SN0224\N4134.D
Operator   : MM
Acquired   : 2-5-2007 05:05:46 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BJ963PB-P(0)
Misc Info  : Procedural Blank FID 5-202 07-0011
Vial Number: 36
```



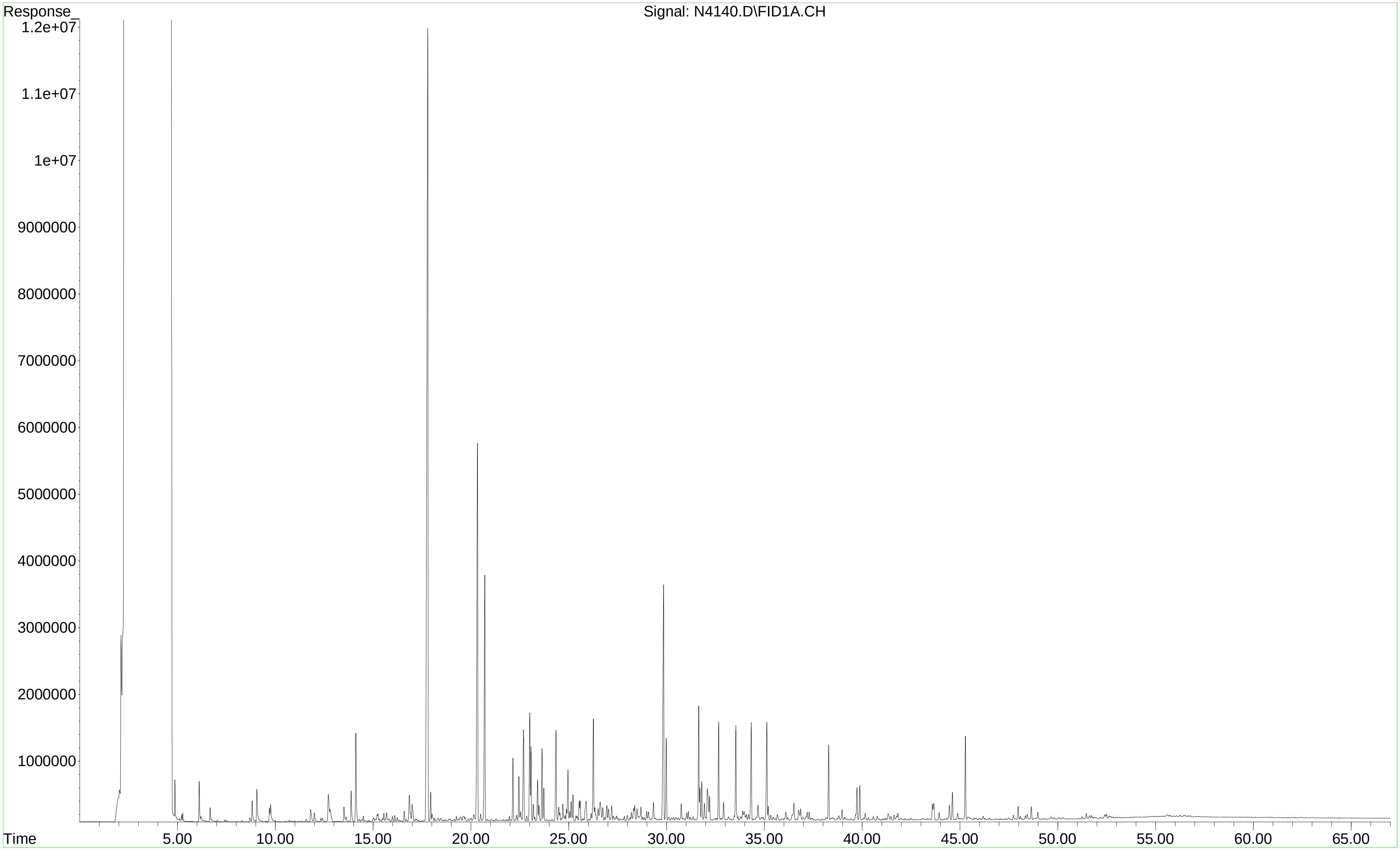
```
File       : F:\N\DATA\SN0224\N4136.D
Operator   : MM
Acquired   : 2-5-2007 06:24:37 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BJ964LCS-P(0)
Misc Info  : Laboratory Control Sample FID 5-202 07-0011
Vial Number: 37
```



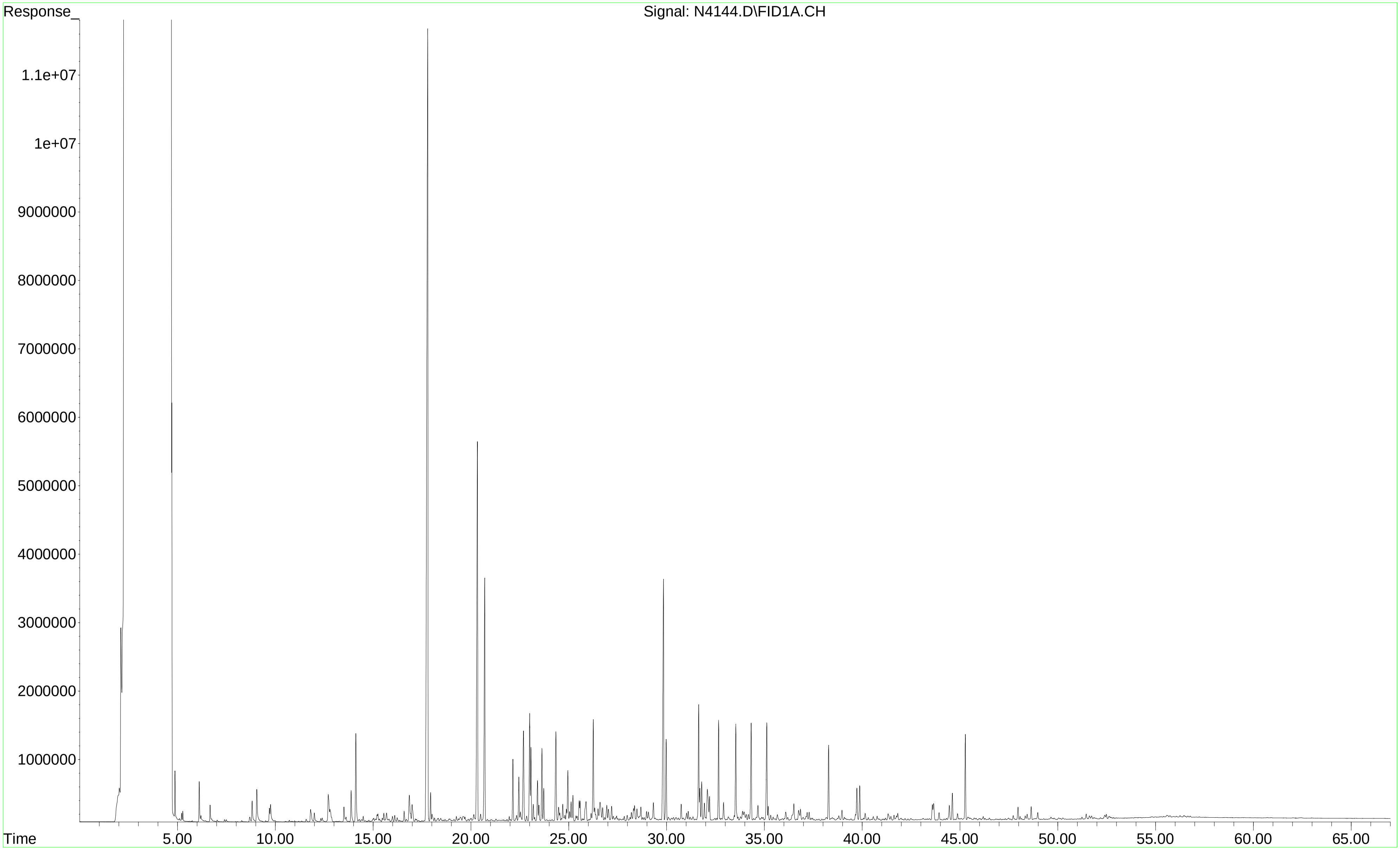
```
File       : F:\N\DATA\SN0224\N4138.D
Operator   : MM
Acquired   : 2-5-2007 07:43:23 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BJ960NSC-P(0)
Misc Info  : North Slope Crude FID 5-202 07-0011
Vial Number: 38
```



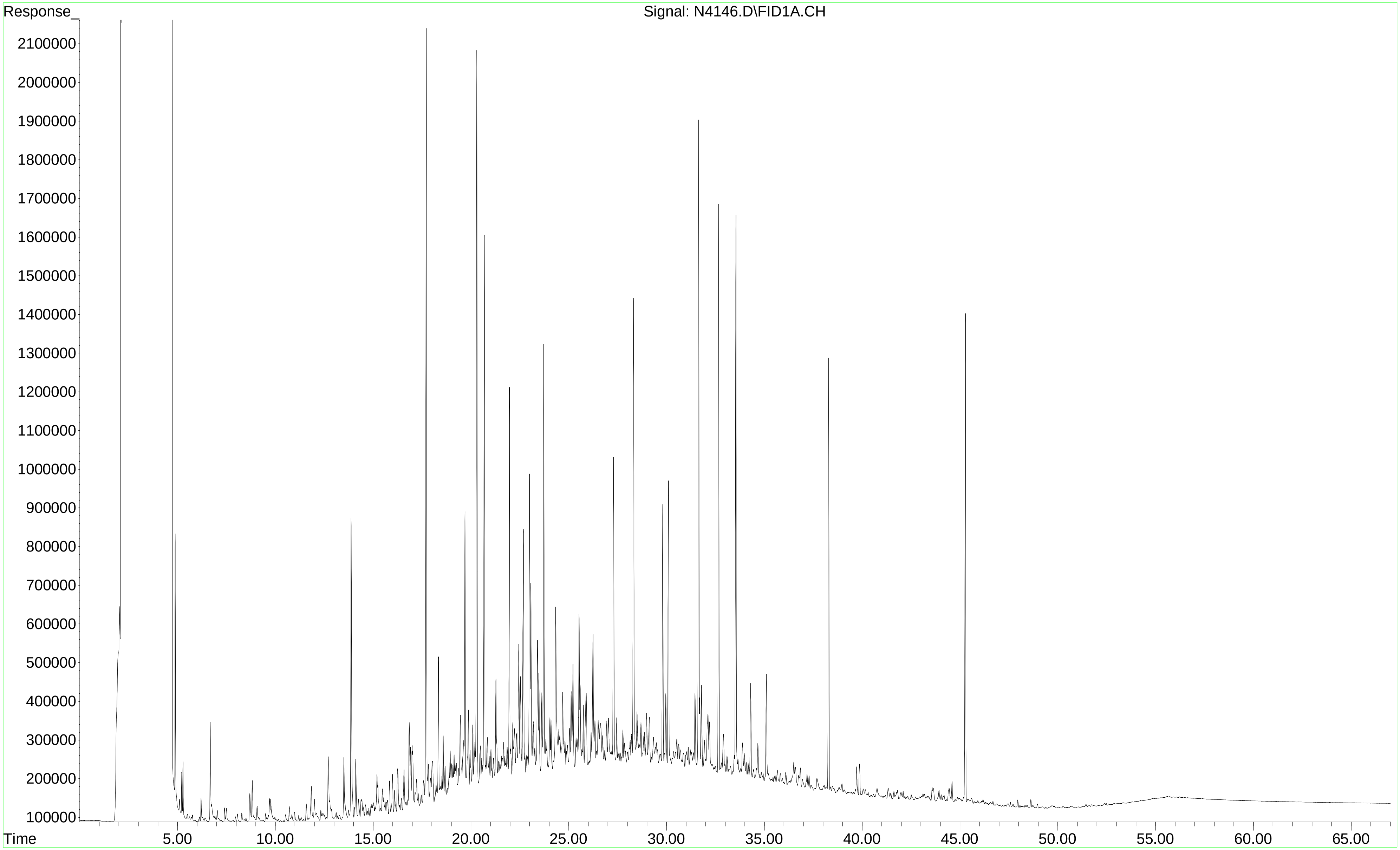
```
File       : F:\N\DATA\SN0224\N4140.D
Operator   : MM
Acquired   : 2-5-2007 09:02:02 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5522-P-FID(5)
Misc Info  : GWP07DW401 5-202 07-0011
Vial Number: 39
```



```
File       : F:\N\DATA\SN0224\N4144.D
Operator   : MM
Acquired   : 05 Feb 2007  11:39 pm using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5523-P-FID(5)
Misc Info  : GWP07DW402 5-202 07-0011
Vial Number: 41
```



```
File       : F:\N\DATA\SN0224\N4146.D
Operator   : MM
Acquired   : 06 Feb 2007  12:59 am using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: R5524-P-FID(5)
Misc Info  : GWP07MW9 5-202 07-0011
Vial Number: 42
```



PAH Data and Histograms
Biomarker Data and EICPs

PAH and Biomarker – Sediment QA/QC Summary
Batches 07-0010

PROJECT:	Exponent – Gas Works Park
PARAMETER:	Polycyclic Aromatic Hydrocarbons and Biomarkers
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Tar and Soil
SAMPLE CUSTODY:	Eighteen tar samples, three NAPLs samples, and 1 soil sample were received at the Battelle Duxbury Operations (BDO) Laboratory on 1/16/2007. Upon receipt of samples, the temperatures of the coolers were taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was within the acceptable range. Samples were either stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin. The soil and tar samples were extracted together in one analytical batch, batch 07-0010.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Blank	Surrogate Recovery	LCS/MS Recovery	MS/MSD Precision	Control Oil % Diff.
PAH and petroleum biomarkers	General NS&T	< 5x MDL	40-120% Recovery	40-120% Recovery MS target spike must be > 5 x background	< 30% RPD	PD < 30% for 90% of the analytes

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METHOD:

Soil samples were extracted following general NS&T methodologies. Approximately 15 to 30 grams of soil was spiked with SHC, PAH, and biomarker surrogates and serially extracted three times with dichloromethane using orbital shaker table techniques. The combined extracts were dried over sodium sulfate and concentrated by Kuderna-Danish and nitrogen evaporation techniques. The sample extracts were split in half; one-half of the extract was removed for archiving; the other half was processed through an alumina gravity column to isolate the hydrocarbon fractions of interest. The weight of the resulting extract was determined gravimetrically. The extracts were concentrated to 1 ml, split, and spiked with IS. The pre-injection volume and/or extract split were adjusted to achieve 3 mg/mL. One extract was submitted for PAH and petroleum biomarker analysis, and the second extract was submitted for SHC and TPH analysis.

PAH and petroleum biomarkers were measured by gas chromatography-mass spectrometry (GC/MS) in the selected ion mode (SIM). An initial calibration consisting of target analytes was analyzed prior to analysis to demonstrate the linear range of analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of PAH and petroleum biomarkers were calculated versus internal standards. Target PAH were quantified using the average response factors (RF) generated from the initial calibration. The alkyl homolgue PAH series were assigned the RF of the parent PAH, steranes were assigned the RF of cholestane, and triterpanes were assigned the RF of moretane.

Note: the reporting limit for alkylbenzene compounds is orders of magnitude higher than the reporting limit for the rest of the PAH compounds.

PAH and Biomarker – Sediment QA/QC Summary
Batches 07-0010

HOLDING TIMES:

Samples were prepared for analysis in one analytical batch. Samples were extracted within 14 days of sample receipt and analyzed within 40 days of extraction. Holding times from collection to extraction for soil samples are 14-days if refrigerated, 365-days if frozen. Since the storage conditions for sample TDW3-4.5, collected 9/26/2006, prior to its arrival at BDO are unknown, this data has been conservatively qualified with a “T”.

Batch ID	Extraction Date	Analysis Date(s)
07-0010	1/24/2007	2/7/2006 – 2/14/2007

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. The blank was analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0010 – 1 exceedence noted.

Comments- Naphthalene was detected in the blank at a concentration greater than five times the MDL (8.42 ng/g). Field sample concentrations for naphthalene were significantly higher than the concentration detected in the blank. No corrective action required.

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0010 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY:

Five surrogate compounds were added prior to extraction, including d8-naphthalene, d10-acenaphthene, d10-phenanthrene, and d12-benzo(a)pyrene, and 5(b)H-cholane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0010 – 31 exceedences noted.

Comments – (b)H-cholane was over-recovered in all field samples. d8-Naphthalene was under-recovered in samples GWP07T01and GWP07T03. d-12 Benzo(a)pyrene was over-recovered in samples GWP07T05, GWP07T07, GWP07T08, GWP07T09, GWP07T12, GWP07T13, GW07S01, GWP07S02, GWP07S03, and GWPO7S04. All surrogate exceedences are due to the high contamination level in the samples, and have been qualified with an “NME” to indicate the exceedences are due to matrix effect.

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0010 – No exceedences noted.

Comments – None.

PAH and Biomarker – Sediment QA/QC Summary
Batches 07-0010

CALIBRATIONS:

The GC/MS is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (%RSD) between RF for the individual target analytes must be ≤30%, and the mean RSD of all target analytes must be <15%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be <25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be <25%.

07-0010 – No exceedences noted.

Comments – None.

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T01	GWP07T02	GWP07T03	GWP07T04
Battelle ID	R5521-P	R5525-P	R5526-P	R5527-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/12/07	02/10/07	02/09/07	02/09/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	28.88	50.1	50.3	34.93
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.44	1.02	1.01	1.44
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	281.14	1240.34	1044.29	488.3
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	200241.89	740500.51	544602.3	320855.54
C4-Alkylbenzenes	127384.2	392300.28	291736.71	199914.12
C5-Alkylbenzenes	23379.2 J	69444.5 J	51860.33 J	37371.72 J
C6-Alkylbenzenes	9519.52 J	26200.83 J	19546.42 J	14739.7 J
Benzo(b)thiophene	808170.83	2934365.74	2091464.31	1072137.6
C1-benzo(b)thiophenes	82288.56	219469.33	161209.05	118049
C2-benzo(b)thiophenes	25587.92	63190.68	45916.09	34531.23
C3-benzo(b)thiophenes	6724.18	17958.79	13558.37	8978.88
C4-benzo(b)thiophenes	1516.3	4177.36	2615.75	1908.26
Naphthalene	87981028.34 D	378914338.6 D	248684663.2 D	113638067.2 D
C1-Naphthalenes	2197272.8	6076038.76	4544807	3162312.68
C2-Naphthalenes	599102.14	1518395.61	1092221.59	817449.67
C3-Naphthalenes	197880.46	477415.52	336362.53	256499.08
C4-Naphthalenes	52064.86	127870.43	85971.42	65429.99
Biphenyl	454683.59	1184039.28	868480.2	639554.02
C1-Biphenyls + Dibenzofuran	966212.61	2460541.43	1791369.85	1328068.78
C2-Biphenyls + C1-Dibenzofurans	262579.31	637542.98	455780.84	349172.44
Acenaphthylene	1973285.53 D	5537642.35 D	4060515.93 D	2692348.15 D
Acenaphthene	285034.92	709485.38	510151.04	375293.53
Dibenzofuran	837673.49	2145426.95	1564653.17	1156883.78
Fluorene	904621.84	2349835.85	1683830.72	1205960.13
C1-Fluorenes	112323.51	292247.97	179830.74	129613.09
C2-Fluorenes	41956.52	90599.94	63677.05	45832.25
C3-Fluorenes	28090.04	55225.82	43056.81	41673.07
C4-Fluorenes	23282.04	37973.81	38625	29355.34
Anthracene	748435.91 D	2660367.97	1900732.77	1340503.68
Phenanthrene	3719663.76 D	8334306.16 D	6784198.36 D	5438479.44 D
C1-Phenanthrenes/Anthracenes	545149.65	1316736.52	922450.96	709667.29
C2-Phenanthrenes/Anthracenes	175754.19	384891.14	280592.34	209185.93
C3-Phenanthrenes/Anthracenes	60038.95	137878.3	96256.35	71843.81
C4-Phenanthrenes/Anthracenes	16755.98	37901.3	30011.68	20688.25
Retene	16608.63	37693.1	25082.64	18792.64
Dibenzothiophene	156443.91	386954.46	273906.09	208212.9
C1-Dibenzothiophenes	31741.48	77811.54	53431.96	40801.72
C2-Dibenzothiophenes	11763.09	28766.57	19936.93	15567.12
C3-Dibenzothiophenes	5766.46	13019.78	9164.7	6731.11
C4-Dibenzothiophenes	1556.21	5215.75	2668.13	1791.68
Fluoranthene	2667711.89 D	6197361.74 D	4646671.1 D	3690165.6 D
Pyrene	2277073.94 D	4820682.77 D	3900598.32 D	3063545.13 D
C1-Fluoranthenes/Pyrenes	604569.61	1510567.23	1044364.86	740920.57
C2-Fluoranthenes/Pyrenes	157177.94	324998.68	233225.34	193823.39
C3-Fluoranthenes/Pyrenes	49635.71	124029.31	83739.63	66622.04
C4-Fluoranthenes/Pyrenes	27127.96	38210.82	48389.03	35783.93
C0-Benzo(b)naphthothiophenes	39868.25	93925.17	66452.3	52190.34
C1-Benzo(b)naphthothiophenes	18780.12	42078.27	27938.49	23608.21
C2-Benzo(b)naphthothiophenes	5816.1	13668.57	10299.92	6895.74
C3-Benzo(b)naphthothiophenes	7116.14	16044.83	13620.22	8640.99
C4-Benzo(b)naphthothiophenes	1267.71	3337.31	1625.15	1836.15
Benzo(a)anthracene	779123.01	1881479.4	1329724.3	991494.48
Chrysene	735216.55	1705008.49	1235623.91	919283.01

Battelle
The Business *of* Innovation

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T01	GWP07T02	GWP07T03	GWP07T04
Battelle ID	R5521-P	R5525-P	R5526-P	R5527-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/12/07	02/10/07	02/09/07	02/09/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	28.88	50.1	50.3	34.93
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.44	1.02	1.01	1.44
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	281.14	1240.34	1044.29	488.3
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C1-Chrysenes	186899	427281.94	293837.11	223996.13
C2-Chrysenes	63142.39	146843.07	99966.78	72766.81
C3-Chrysenes	32332.16	106991.93	80682.88	49488.17
C4-Chrysenes	8735.48	14005.92	12381.17	8380.26
Benzo(b)fluoranthene	613443.59	1298687.15	949836.19	752475.2
Benzo(k)fluoranthene	695610.31	1645954.33	1155474.88	866874.81
Benzo(e)pyrene	554569.65	1255137.45	911100.65	689339.59
Benzo(a)pyrene	1065303.82	2408803.35	1719568.32	1289502.51
Perylene	345127.64	740509.08	528443.28	410475.45
Indeno(1,2,3-cd)pyrene	761702.38	1731032.79	1240056.85	961042.01
Dibenz(a,h)anthracene	119887.72	240723.05	168280.12	131715.72
Benzo(g,h,i)perylene	764495.1	1720045.71	1254098.16	965716.53
Total PAH	113619845.5	441162555.3	294979245.5	148378016.9

Surrogate Recoveries (%)

Naphthalene-d8	24 NME	70	38 NME	67
Acenaphthene-d10	73	78	66	70
Phenanthrene-d10	80	90	80	87
Benzo(a)pyrene-d12	110	96	94	94

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T05	GWP07T06	GWP07T07	GWP07T08
Battelle ID	R5528-P	R5529-P	R5530-P	R5531-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/08/07	02/08/07	02/08/07	02/11/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	4.23	6.94	6.47	30.28
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.92	1.93	1.87	1.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1449.65	969.51	992.27	934.01
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	16643.82 J	11632.94 J	11720.98 J	35938.6 J
C4-Alkylbenzenes	18269.2 J	13375.85 J	13845.59 J	65757.51 J
C5-Alkylbenzenes	4900.61 J	3514.58 J	3497.96 J	12543.17 J
C6-Alkylbenzenes	1894.64 J	U	982.99 J	7874.5 J
Benzo(b)thiophene	170508.78	108387.93	141819.22	782246.38
C1-benzo(b)thiophenes	43922.65	31332.87	35349.83	605540.6
C2-benzo(b)thiophenes	30116.14	24141.77	25158.21	549105.87
C3-benzo(b)thiophenes	13843.29	12339.22	11883.37	177168.13
C4-benzo(b)thiophenes	4725.35	4270.95	3571.41	29031.26
Naphthalene	12799972.26 D	8370861.88 D	11298733.16 D	22267654.71 D
C1-Naphthalenes	1486915.45	1078913.71	1185207.88	6376462.97
C2-Naphthalenes	884717.78	731690.04	732986.71	3933479.51
C3-Naphthalenes	465601.45	427265.02	413581.2	1319799.8
C4-Naphthalenes	186182.16	182598.98	173957.22	234321.2
Biphenyl	397569.91	304501.81	321153.01	1370918.67
C1-Biphenyls + Dibenzofuran	2422635.2	2080320.47	1967361.36	757779.53
C2-Biphenyls + C1-Dibenzofurans	959968.41	896783.56	844367.87	509842.78
Acenaphthylene	44864.09	31802.1	28696.3	2408513.29
Acenaphthene	3770326.74	3018808.59 D	3283019.88 D	316370.51
Dibenzofuran	2066229.18	1775620.25	1782695.2 D	371781.72
Fluorene	2673369.51	2279642.43	2343495.76 D	2210941.52
C1-Fluorenes	432142.76	403061	411620.05	747906.54
C2-Fluorenes	200826.92	190577.73	222271.76	255951.1
C3-Fluorenes	161247.38	200254.06	171384.74	157418.35
C4-Fluorenes	146309.67	145878.09	152394.9	61709.87
Anthracene	5353451.21 D	5197306.26 D	5324002.63 D	2576612.15
Phenanthrene	16503180.16 D	15593447.41 D	16283960.62 D	13778166.28 D
C1-Phenanthrenes/Anthracenes	3738000.72	3513357.24	3369621.5	3777576.77
C2-Phenanthrenes/Anthracenes	1460972.93	1415337.3	1439871.86	1177836.63
C3-Phenanthrenes/Anthracenes	604353.09	576273.77	603675.97	254939.68
C4-Phenanthrenes/Anthracenes	169873.5	170503.18	201299.14	40945.67
Retene	351280.25	345423.48	359624.96	U
Dibenzothiophene	562702.85	526970.55	498078.59	1306618.92
C1-Dibenzothiophenes	150631.44	145321.6	142086.32	611469.7
C2-Dibenzothiophenes	64336.15	63060.51	64238.87	292654.59
C3-Dibenzothiophenes	32726.6	30226.36	32725.71	87040.51
C4-Dibenzothiophenes	9836.09	7614.17	11307.3	14206.06
Fluoranthene	12427734.3 D	11851310.8 D	12984354.54 D	6410742.12 D
Pyrene	12257379.44 D	11684717.46 D	12912726.03 D	8576504.35 D
C1-Fluoranthenes/Pyrenes	3666549.68	3248534.17	3512515.4	2565017.43
C2-Fluoranthenes/Pyrenes	958652.35	965239.01	1056810.25	736260.09
C3-Fluoranthenes/Pyrenes	396583.89	438139.89	436357.63	194956.72
C4-Fluoranthenes/Pyrenes	183519.7	193563.04	213915.67	46774.56
C0-Benzo(b)naphthothiophenes	202024.03	188707.18	200086.12	351643.5
C1-Benzo(b)naphthothiophenes	99858.18	100235.56	103812.64	250739.06
C2-Benzo(b)naphthothiophenes	36081.65	32482.84	39025.68	105906.27
C3-Benzo(b)naphthothiophenes	39767.85	40157.99	47446.73	59034.8
C4-Benzo(b)naphthothiophenes	10500.81	11174.56	14645.47	14094.95
Benzo(a)anthracene	3848884.26	3691087.79 D	4139655.69 D	2121727.42
Chrysene	3664745.85	3625200.38 D	4057987.38 D	2437418.12

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T05	GWP07T06	GWP07T07	GWP07T08
Battelle ID	R5528-P	R5529-P	R5530-P	R5531-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/08/07	02/08/07	02/08/07	02/11/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	4.23	6.94	6.47	30.28
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.92	1.93	1.87	1.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1449.65	969.51	992.27	934.01
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C1-Chrysenes	1148640.89	1073725.91	1212316.18	1003941.42
C2-Chrysenes	428957.15	436161.25	535767.32	361014.6
C3-Chrysenes	303677.61	281809.93	338022.76	150152.43
C4-Chrysenes	45363.1	56221.48	84118.52	34853.32
Benzo(b)fluoranthene	2651645.19	2613760.42	2722647.73 D	1530971.59
Benzo(k)fluoranthene	3316052.5	3043902.3	3009453.47	1914736.39
Benzo(e)pyrene	2633480.75	2503298.29	2697597.76 D	1774418.3
Benzo(a)pyrene	4643724.57 D	4252114.79 D	4862823.78 D	3113342.2
Perylene	1417611.53	1367073.07	1580992.44	812754.07
Indeno(1,2,3-cd)pyrene	3311073.71	2792696.64 D	3189174.8 D	2288335.56
Dibenz(a,h)anthracene	503905.76	534705.23	605991.98	386713.77
Benzo(g,h,i)perylene	3245118.71	3000716.48 D	3400513.54 D	2220649.95
Total PAH	115089811.6	103695431.2	113679498.6	104524096.7

Surrogate Recoveries (%)

Naphthalene-d8	88	104	101	81
Acenaphthene-d10	88	79	81	68
Phenanthrene-d10	88	94	87	77
Benzo(a)pyrene-d12	399 NME	89	411 NME	157 NME

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T09	GWP07T10	GWP07T11	GWP07T12
Battelle ID	R5532-P	R5533-P	R5534-P	R5535-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/08/07	02/09/07	02/11/07	02/08/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	19.46	32.51	5.51	10.85
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.72	1.45	2.05	1.79
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1078.81	698.01	977.56	414.65
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	36580.22 J	525029.89	2191.57 DJ	39680.66 J
C4-Alkylbenzenes	71566.13 J	267770.56	5055.11 DJ	44626.03 J
C5-Alkylbenzenes	13353.4 J	50020.43 J	1590.34 DJ	7993.18 J
C6-Alkylbenzenes	9286.1 J	18809.7 J	1132.86 DJ	4237.2 J
Benzo(b)thiophene	600997.35	1409434.13	6602.21 D	202487.18
C1-benzo(b)thiophenes	559175.82	138298.11	18195.82 D	82126.5
C2-benzo(b)thiophenes	580029.73	40696.8	32674.4 D	36340.56
C3-benzo(b)thiophenes	207713.37	11562.9	20464.75 D	9868.5
C4-benzo(b)thiophenes	36712.3	2649.01	6076.18 D	1944.66
Naphthalene	15284889.93 D	145298242.7 D	223304.71 D	4999828.2 D
C1-Naphthalenes	6211078.04	3899752.92	350693.91 D	2205708.83
C2-Naphthalenes	4284353.22	970727.61	352583.57 D	809484.01
C3-Naphthalenes	1569159.41	306810.83	137220.32 D	248499.46
C4-Naphthalenes	293313.36	82897.14	36593.43 D	64641.58
Biphenyl	1353389.83	753471.08	50124.82 D	317396
C1-Biphenyls + Dibenzofuran	814568.89	1566453.23	103159.32 D	1263797.88
C2-Biphenyls + C1-Dibenzofurans	617126.67	410565.66	84113.06 D	478999.88
Acenaphthylene	2723434.28	3466032.62 D	70113.9 D	1849540.36 D
Acenaphthene	322276.01	444398.4	238718.81 D	266858.11
Dibenzofuran	381628.07	1361607.06	61672.29 D	1201966.66 D
Fluorene	2430112.88	1491341.86	245201.44 D	1473457.49 D
C1-Fluorenes	926137.56	178262.98	113263.88 D	194027.96
C2-Fluorenes	355186.83	66723.22	51536.29 D	73084.62
C3-Fluorenes	179920.17	37615.8	18702.8 D	85391.42
C4-Fluorenes	76583.75	40720.93	12491.92 D	51229.37
Anthracene	2965638.91	1750201.39	277290.96 D	1620907.51 D
Phenanthrene	14428616.22 D	7263752.38 D	1060654.5 D	6996121.82 D
C1-Phenanthrenes/Anthracenes	4511051.53	862740.73	500955.37 D	1230217.63
C2-Phenanthrenes/Anthracenes	1474202.26	278082.25	179938.85 D	433471.24
C3-Phenanthrenes/Anthracenes	330344.99	97771.75	48951.4 D	136666.94
C4-Phenanthrenes/Anthracenes	57750.41	28485.65	11119.04 D	38936.33
Retene	U	36778.51	4865.52 D	52945.19
Dibenzothiophene	1446533.18	247820.26	79816.35 D	257089.58
C1-Dibenzothiophenes	732148.82	49989.6	74607.4 D	65380.27
C2-Dibenzothiophenes	365443.44	19653.69	45202.6 D	25930.43
C3-Dibenzothiophenes	116396.7	8170.17	17548.54 D	10655.43
C4-Dibenzothiophenes	21781.27	2639.63	4933.51 D	2258.07
Fluoranthene	7291103.73 D	5056902.67 D	519719.5 D	5371309.03 D
Pyrene	10065014.19 D	4262558.61 D	632498.36 D	5122420.76 D
C1-Fluoranthenes/Pyrenes	3272368.71	1009297.21	374611.91 D	1270064.14
C2-Fluoranthenes/Pyrenes	937168.77	229850.65	110112.61 D	427613.13
C3-Fluoranthenes/Pyrenes	246295.46	80465.28	31944.82 D	125298.55
C4-Fluoranthenes/Pyrenes	62759.66	49537.86	8622.3 D	53036.15
C0-Benzo(b)naphthothiophenes	423790.53	65863.38	27427.54 D	115923.36
C1-Benzo(b)naphthothiophenes	302029.96	30065.31	27932.63 D	52530.21
C2-Benzo(b)naphthothiophenes	131066.21	10891.34	12159.6 D	16868.85
C3-Benzo(b)naphthothiophenes	77214.29	11772.33	5496.42 D	16075.47
C4-Benzo(b)naphthothiophenes	16587.38	2259.44	2178.97 D	2823.57
Benzo(a)anthracene	2488334.87	1273089.82	228885.55 D	1642711.55 D
Chrysene	2867991.71	1190069.72	236434.16 D	1614818.64 D

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T09	GWP07T10	GWP07T11	GWP07T12
Battelle ID	R5532-P	R5533-P	R5534-P	R5535-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/08/07	02/09/07	02/11/07	02/08/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	19.46	32.51	5.51	10.85
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.72	1.45	2.05	1.79
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1078.81	698.01	977.56	414.65
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C1-Chrysenes	1215740.74	298416.09	116117.61 D	430987.26
C2-Chrysenes	425207.68	97163.86	33587.03 D	145186.25
C3-Chrysenes	158003.22	72744.66	11370.82 D	70869.11
C4-Chrysenes	41669.54	10381.95	2119.89 D	18003.21
Benzo(b)fluoranthene	1807708.96	965211.2	102703.46 D	1193235.69 D
Benzo(k)fluoranthene	2216835.94	1146342.11	145824.59 D	1441182.67
Benzo(e)pyrene	2048385.44	913574.37	113381.94 D	1135788.54 D
Benzo(a)pyrene	3686081.03	1736642.79	216113.91 D	1969951.25 D
Perylene	941296.51	547303.45	42255.27 D	698839.98
Indeno(1,2,3-cd)pyrene	2601656.25	1220562.11	108369.76 D	1488582.15 D
Dibenz(a,h)anthracene	432410.31	170838	24908.62 D	301431.86
Benzo(g,h,i)perylene	2477511.48	1266127.39	104107.18 D	1620078.65 D
Total PAH	107985571.9	190514733.7	7405815.68	50695892.37

Surrogate Recoveries (%)

Naphthalene-d8	99	41	78 D	94
Acenaphthene-d10	88	56	54 D	61
Phenanthrene-d10	84	83	80 D	89
Benzo(a)pyrene-d12	194 NME	111	89 D	138 NME

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T13	GWP07T14	GWP07S01	GWP07S02
Battelle ID	R5536-P	R5537-P	R5538-P	R5539-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07	01/12/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/09/07	02/09/07	02/09/07	02/08/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	12.18	7.01	13.85	10.23
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.83	1.95	1.75	1.80
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	384.24	12.91	1004.51	1030.86
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	190546.76	42.74 J	9764.91 J	2246.68 J
C4-Alkylbenzenes	125716.17	29.24 J	8066.24 J	1603.81 J
C5-Alkylbenzenes	20333.3 J	19.14 J	2046.11 J	U
C6-Alkylbenzenes	8708.41 J	16.89 J	1470.33 J	U
Benzo(b)thiophene	563452.05	292.66	758954.67	395927.35
C1-benzo(b)thiophenes	131790.2	150.38	86699.74	36079.64
C2-benzo(b)thiophenes	41945.85	221.93	42898	13843.85
C3-benzo(b)thiophenes	9133.19	170.14	14447.97	3948.09
C4-benzo(b)thiophenes	1706.06	115.18	3549.83	897.61 J
Naphthalene	16263103.13 D	5059.57	21721142 D	12234462.62 D
C1-Naphthalenes	3314100.42	1481.53	1127445.06	623848.67
C2-Naphthalenes	905688.15	1564.22	246488.39	84945.32
C3-Naphthalenes	268147.15	1130.83	64876.2	18541.83
C4-Naphthalenes	87700.42	778.54	15114.43	4413.73
Biphenyl	632479.48	995.72	1562671.63	1113379.92
C1-Biphenyls + Dibenzofuran	1524802.87	590.82	291733.82	192543.94
C2-Biphenyls + C1-Dibenzofurans	482761.56	646.64	57689.31	34707.76
Acenaphthylene	2847800.61 D	3922.19	7231603.33 D	6490099.33 D
Acenaphthene	271355.89	187.75	232629.82	112631.05
Dibenzofuran	1652087.79 D	322.84	206558.66	144056.33
Fluorene	1725178.93 D	777.53	1676012.74	1438195.8
C1-Fluorenes	181489.89	568.29	102492.82	57887.68
C2-Fluorenes	64836.33	1136.75	29679.66	14011.39
C3-Fluorenes	66157.24	2655.14	23834.33	10175.46
C4-Fluorenes	44910.49	3959.41	7772.65	3654.53
Anthracene	1607520.18 D	4195.11	2774651.05	2925100.01
Phenanthrene	8192705.83 D	21141.12	28059893.4 D	21867409.72 D
C1-Phenanthrenes/Anthracenes	1083410.58	8694.55	939016.67	770315.86
C2-Phenanthrenes/Anthracenes	367874.88	11122.07	151458.42	88878.02
C3-Phenanthrenes/Anthracenes	117746.98	7938.89	42447.12	22664.61
C4-Phenanthrenes/Anthracenes	35588.9	2817.46	7548.84	3506.41
Retene	55643.33	726.77	2239.34	845.44 J
Dibenzothiophene	253540.14	2104.04	2296634.96	2175735.95
C1-Dibenzothiophenes	57973.86	1438.73	141231.41	101150.11
C2-Dibenzothiophenes	19815.42	2547.28	42580.56	23842.63
C3-Dibenzothiophenes	8012.08	2413.97	18234.26	9336.34
C4-Dibenzothiophenes	1692.49	1000.78	4058.68	2196.64
Fluoranthene	5676062.55 D	39773.81	21361152.11 D	17772525.52 D
Pyrene	5293384.47 D	65047.13 D	29709883.05 D	23700020.48 D
C1-Fluoranthenes/Pyrenes	1087088.92	22213.95	1927284.7	1862567.79
C2-Fluoranthenes/Pyrenes	317097.28	15552.37	195657.49	148188.86
C3-Fluoranthenes/Pyrenes	90786.78	8997.16	42100.99	27531.43
C4-Fluoranthenes/Pyrenes	43675.06	5050.3	22284.19	U
C0-Benzo(b)naphthothiophenes	95761.46	4337.03	625856.11	575552.01
C1-Benzo(b)naphthothiophenes	39637.36	4150.54	89078.51	68284.05
C2-Benzo(b)naphthothiophenes	12526.87	2683.1	24192.79	14774.05
C3-Benzo(b)naphthothiophenes	12395.15	1688.02	54788.21	47679.14
C4-Benzo(b)naphthothiophenes	2104.03	465.72	3861.4	2730.45
Benzo(a)anthracene	1354796.64	19761.41	2814695.87 D	2782388.99
Chrysene	1292269.51	28241.94	4315321.21 D	3838732.39 D

Battelle
The Business of Innovation

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T13	GWP07T14	GWP07S01	GWP07S02
Battelle ID	R5536-P	R5537-P	R5538-P	R5539-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07	01/12/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/09/07	02/09/07	02/09/07	02/08/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	12.18	7.01	13.85	10.23
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.83	1.95	1.75	1.80
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	384.24	12.91	1004.51	1030.86
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C1-Chrysenes	350632.98	14801.48	334128.56	259854.13
C2-Chrysenes	115498.52	8152.3	82098.52	59322.94
C3-Chrysenes	84453.72	3756.19	19307.78	12665.37
C4-Chrysenes	15108.51	1094.7	U	U
Benzo(b)fluoranthene	1046794.12	23921.92	3939621.07 D	4198747.8 D
Benzo(k)fluoranthene	1249814.43	24395.92	3111284.69	3214063.68
Benzo(e)pyrene	1018539.66	27937.45	4949803.45 D	5010843.9 D
Benzo(a)pyrene	1350021.51 D	35234.46	7607195.93 D	8192228.11 D
Perylene	588546.04	10279.86	1960653.87 D	3213617.69
Indeno(1,2,3-cd)pyrene	992432.6 D	35802.93	7385669.2 D	7867281.06 D
Dibenz(a,h)anthracene	224314.97	5396.98	715519.56	599913.8
Benzo(g,h,i)perylene	1200172.25 D	38276.68 D	11127333.87 D	10804525.44 D
Total PAH	63373822.23	514633.54	170317016.4	143901804.8

Surrogate Recoveries (%)

Naphthalene-d8	97	66	107	99
Acenaphthene-d10	62	76	66	63
Phenanthrene-d10	89	80	80	91
Benzo(a)pyrene-d12	181 NME	83	155 NME	139 NME

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07S03	GWP07S04	TDW3-4.5
Battelle ID	R5540-P	R5541-P	R5542-P
Sample Type	SA	SA	SA
Collection Date	01/12/07	01/12/07	09/26/06
Extraction Date	01/24/07	01/24/07	01/24/07
Analysis Date	02/12/07	02/08/07	02/09/07
Analytical Instrument	MS	MS	MS
% Moisture	20.14	12.16	14.86
% Lipid	NA	NA	NA
Matrix	TAR	TAR	SOIL
Sample Size	1.66	1.85	17.17
Size Unit-Basis	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1117.8	1337.34	6.48
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	1294243.87	158106.44 J	17.7 JT
C4-Alkylbenzenes	797410.21	382114.16	18.1 JT
C5-Alkylbenzenes	121385.55 J	67650.97 J	9.96 JT
C6-Alkylbenzenes	41402.02 J	33688.64 J	9.52 JT
Benzo(b)thiophene	1788561.97	2254325.92	328.76 T
C1-benzo(b)thiophenes	2045245.44	3058073.54	100.13 T
C2-benzo(b)thiophenes	1583925.71	2374427.64	102.97 T
C3-benzo(b)thiophenes	579130.31	763348.46	77 T
C4-benzo(b)thiophenes	116971.38	131691.56	40.58 T
Naphthalene	31350491.1 D	28051647.36 D	2965.03 T
C1-Naphthalenes	15885043.89	18087022.6	756.44 T
C2-Naphthalenes	8946938.73	9894089.64	642.61 T
C3-Naphthalenes	3262299.36	3138374.42	515.15 T
C4-Naphthalenes	723383.94	594581.58	332.96 T
Biphenyl	1314448.7	1419183.18	709.08 T
C1-Biphenyls + Dibenzofuran	1068258.12	990601.92	332.42 T
C2-Biphenyls + C1-Dibenzofurans	1131285.97	913603.05	295.76 T
Acenaphthylene	4151973.75 D	3725782.99	2665.3 T
Acenaphthene	355568.86	308642.76	113 T
Dibenzofuran	327097.45	299699.54	205.07 T
Fluorene	2469334.06	2089016.85	456.79 T
C1-Fluorenes	1981109.01	1635741.32	280.93 T
C2-Fluorenes	1008404.37	833572.19	365.9 T
C3-Fluorenes	335631.47	439976.77	1220.15 T
C4-Fluorenes	147321.1	253597.8	572.27 T
Anthracene	2575820.2	1878925.68	3596.5 T
Phenanthrene	8251686.47 D	8665001.32 D	10905.75 T
C1-Phenanthrenes/Anthracenes	6530972.32	6966200.73	5353.75 T
C2-Phenanthrenes/Anthracenes	2876421.64	3716568.09	3710.04 T
C3-Phenanthrenes/Anthracenes	784697.31	1228739.4	1707.85 T
C4-Phenanthrenes/Anthracenes	170962.04	260004.02	530.66 T
Retene	U	U	490.91 T
Dibenzothiophene	1012181.57	1533863.59	1711.31 T
C1-Dibenzothiophenes	1200051.65	2093835.6	1166.67 T
C2-Dibenzothiophenes	753681.47	1646871.81	1188.44 T
C3-Dibenzothiophenes	301581.59	732821.53	681.43 T
C4-Dibenzothiophenes	68117.41	165057.12	196.34 T
Fluoranthene	1873682.81	1856741.01	48371.32 DT
Pyrene	3791787.81	3955992.67	69765.27 DT
C1-Fluoranthenes/Pyrenes	4310483.13	4455074.97	11962.25 T
C2-Fluoranthenes/Pyrenes	1666681.85	2144404.39	5261.06 T
C3-Fluoranthenes/Pyrenes	570324.57	778142.29	1646.56 T
C4-Fluoranthenes/Pyrenes	115630.39	166123.68	812.45 T
C0-Benzo(b)naphthothiophenes	234913.79	490166.25	5655.43 T
C1-Benzo(b)naphthothiophenes	445315.32	994243.91	2287.75 T
C2-Benzo(b)naphthothiophenes	236901.37	638001.83	940.77 T
C3-Benzo(b)naphthothiophenes	101327.36	248438.76	705.23 T
C4-Benzo(b)naphthothiophenes	27841.45	63057.34	126.43 T
Benzo(a)anthracene	1484981.4	1613574.99	17677.03 T
Chrysene	1614197.23	1754172.46	21363.2 T

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07S03	GWP07S04	TDW3-4.5
Battelle ID	R5540-P	R5541-P	R5542-P
Sample Type	SA	SA	SA
Collection Date	01/12/07	01/12/07	09/26/06
Extraction Date	01/24/07	01/24/07	01/24/07
Analysis Date	02/12/07	02/08/07	02/09/07
Analytical Instrument	MS	MS	MS
% Moisture	20.14	12.16	14.86
% Lipid	NA	NA	NA
Matrix	TAR	TAR	SOIL
Sample Size	1.66	1.85	17.17
Size Unit-Basis	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1117.8	1337.34	6.48
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY
C1-Chrysenes	1650064.43	2194426.25	5462.79 T
C2-Chrysenes	699503.7	1208945.48	2180.9 T
C3-Chrysenes	314904.32	421187.55	793.81 T
C4-Chrysenes	68838.45	91294.52	UT
Benzo(b)fluoranthene	520198.7	567719.71	21099.37 T
Benzo(k)fluoranthene	759851.51	793548.85	19967.55 T
Benzo(e)pyrene	746671.21	1082489.22	23771.27 T
Benzo(a)pyrene	1448281.84	1507281.33	24775.08 DT
Perylene	262250.29	298368.92	8679.4 T
Indeno(1,2,3-cd)pyrene	522843.71	590739.46	23701.94 DT
Dibenz(a,h)anthracene	203297.51	224563.2	4440.35 T
Benzo(g,h,i)perylene	545106.51	808491.22	28198.79 DT
Total PAH	119691849.3	125752378.6	381095.09 T

Surrogate Recoveries (%)

Naphthalene-d8	77	103	78
Acenaphthene-d10	74	63	87
Phenanthrene-d10	77	82	86
Benzo(a)pyrene-d12	219 NME	169 NME	101

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank	
Battelle ID	BJ939PB-P	
Sample Type	PB	
Collection Date	01/24/07	
Extraction Date	01/24/07	
Analysis Date	02/10/07	
Analytical Instrument	MS	
% Moisture	19.52	
% Lipid	NA	
Matrix	SOIL, TAR	
Sample Size	2.44	
Size Unit-Basis	G_DRY	
Minimum Reporting Limit	8.21	
Units	NG/G_DRY	
C3-Alkylbenzenes	3.48	J
C4-Alkylbenzenes		U
C5-Alkylbenzenes		U
C6-Alkylbenzenes		U
Benzo(b)thiophene		U
C1-benzo(b)thiophenes		U
C2-benzo(b)thiophenes		U
C3-benzo(b)thiophenes		U
C4-benzo(b)thiophenes		U
Naphthalene	8.42	N
C1-Naphthalenes	2.13	J
C2-Naphthalenes		U
C3-Naphthalenes		U
C4-Naphthalenes		U
Biphenyl		U
C1-Biphenyls + Dibenzofuran		U
C2-Biphenyls + C1-Dibenzofurans		U
Acenaphthylene		U
Acenaphthene		U
Dibenzofuran		U
Fluorene		U
C1-Fluorenes		U
C2-Fluorenes		U
C3-Fluorenes		U
C4-Fluorenes		U
Anthracene		U
Phenanthrene	2.37	J
C1-Phenanthrenes/Anthracenes		U
C2-Phenanthrenes/Anthracenes		U
C3-Phenanthrenes/Anthracenes		U
C4-Phenanthrenes/Anthracenes		U
Retene		U
Dibenzothiophene		U
C1-Dibenzothiophenes		U
C2-Dibenzothiophenes		U
C3-Dibenzothiophenes		U
C4-Dibenzothiophenes		U
Fluoranthene	1.34	J
Pyrene	1.54	J
C1-Fluoranthenes/Pyrenes		U
C2-Fluoranthenes/Pyrenes		U
C3-Fluoranthenes/Pyrenes		U
C4-Fluoranthenes/Pyrenes		U
C0-Benzo(b)naphthothiophenes		U
C1-Benzo(b)naphthothiophenes		U
C2-Benzo(b)naphthothiophenes		U
C3-Benzo(b)naphthothiophenes		U
C4-Benzo(b)naphthothiophenes		U
Benzo(a)anthracene		U
Chrysene		U

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank
Battelle ID	BJ939PB-P
Sample Type	PB
Collection Date	01/24/07
Extraction Date	01/24/07
Analysis Date	02/10/07
Analytical Instrument	MS
% Moisture	19.52
% Lipid	NA
Matrix	SOIL, TAR
Sample Size	2.44
Size Unit-Basis	G_DRY
Minimum Reporting Limit	8.21
Units	NG/G_DRY
C1-Chrysenes	U
C2-Chrysenes	U
C3-Chrysenes	U
C4-Chrysenes	U
Benzo(b)fluoranthene	U
Benzo(k)fluoranthene	U
Benzo(e)pyrene	U
Benzo(a)pyrene	U
Perylene	U
Indeno(1,2,3-cd)pyrene	1.51 J
Dibenz(a,h)anthracene	0.73 J
Benzo(g,h,i)perylene	2.07 J
Total PAH	20.11 J

Surrogate Recoveries (%)

Naphthalene-d8	94
Acenaphthene-d10	89
Phenanthrene-d10	94
Benzo(a)pyrene-d12	71

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	060208-03: Sand, White Quartz, -50+70				
Battelle ID	BJ940LCS-P				
Sample Type	LCS				
Collection Date	01/24/07				
Extraction Date	01/24/07				
Analysis Date	02/10/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	SOIL, TAR				
Sample Size	20.01				
Size Unit-Basis	G_DRY				
Minimum Reporting Limit	1.00				
Units	NG/G_DRY		Target	% Recovery	Qualifier
C3-Alkylbenzenes		U			
C4-Alkylbenzenes		U			
C5-Alkylbenzenes		U			
C6-Alkylbenzenes		U			
Benzo(b)thiophene	132.09		125.02	106	
C1-benzo(b)thiophenes		U			
C2-benzo(b)thiophenes		U			
C3-benzo(b)thiophenes		U			
C4-benzo(b)thiophenes		U			
Naphthalene	138.71		124.96	111	
C1-Naphthalenes		U			
C2-Naphthalenes		U			
C3-Naphthalenes		U			
C4-Naphthalenes		U			
Biphenyl	134.58		125.15	108	
C1-Biphenyls + Dibenzofuran		U			
C2-Biphenyls + C1-Dibenzofurans		U			
Acenaphthylene	129.1		125.05	103	
Acenaphthene	136.48		125.02	109	
Dibenzofuran	135.53		125.17	108	
Fluorene	137.31		125.01	110	
C1-Fluorenes		U			
C2-Fluorenes		U			
C3-Fluorenes		U			
C4-Fluorenes		U			
Anthracene	134.3		124.96	107	
Phenanthrene	143.66		125.00	115	
C1-Phenanthrenes/Anthracenes		U			
C2-Phenanthrenes/Anthracenes		U			
C3-Phenanthrenes/Anthracenes		U			
C4-Phenanthrenes/Anthracenes		U			
Retene		U			
Dibenzothiophene	137.72		125.51	110	
C1-Dibenzothiophenes		U			
C2-Dibenzothiophenes		U			
C3-Dibenzothiophenes		U			
C4-Dibenzothiophenes		U			
Fluoranthene	145.74		125.00	117	
Pyrene	142.26		124.98	114	
C1-Fluoranthenes/Pyrenes		U			
C2-Fluoranthenes/Pyrenes		U			
C3-Fluoranthenes/Pyrenes		U			
C4-Fluoranthenes/Pyrenes		U			
C0-Benzo(b)naphthothiophenes		U			
C1-Benzo(b)naphthothiophenes		U			
C2-Benzo(b)naphthothiophenes		U			
C3-Benzo(b)naphthothiophenes		U			
C4-Benzo(b)naphthothiophenes		U			
Benzo(a)anthracene	108.23		124.97	87	

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	060208-03: Sand, White Quartz, -50+70
Battelle ID	BJ940LCS-P
Sample Type	LCS
Collection Date	01/24/07
Extraction Date	01/24/07
Analysis Date	02/10/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	SOIL, TAR
Sample Size	20.01
Size Unit-Basis	G_DRY
Minimum Reporting Limit	1.00

Units	NG/G_DRY		Target	% Recovery	Qualifier
Chrysene	119.18		124.99	95	
C1-Chrysenes		U			
C2-Chrysenes		U			
C3-Chrysenes		U			
C4-Chrysenes		U			
Benzo(b)fluoranthene	107.83		125.04	86	
Benzo(k)fluoranthene	121.31		125.01	97	
Benzo(e)pyrene	114.48		125.25	91	
Benzo(a)pyrene	105.11		125.04	84	
Perylene	88.5		125.19	71	
Indeno(1,2,3-cd)pyrene	101.19		125.00	81	
Dibenz(a,h)anthracene	109.51		125.01	88	
Benzo(g,h,i)perylene	110.44		124.98	88	
Total PAH	2601.17				

Surrogate Recoveries (%)

Naphthalene-d8	109
Acenaphthene-d10	103
Phenanthrene-d10	112
Benzo(a)pyrene-d12	76

Battelle
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Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude				
Battelle ID	BJ959NSC-P				
Sample Type	NSC				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/07/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.01				
Size Unit-Basis	G_OIL				
Minimum Reporting Limit	1.3				
Units	NG/G_OIL		Target	% Difference	Qualifier
C3-Alkylbenzenes	2027.44				
C4-Alkylbenzenes	1510.05				
C5-Alkylbenzenes	795.79				
C6-Alkylbenzenes	488.99				
Benzo(b)thiophene	13.52				
C1-benzo(b)thiophenes	45				
C2-benzo(b)thiophenes	79.93		95.74	16.5	
C3-benzo(b)thiophenes	141.48		132.67	6.6	
C4-benzo(b)thiophenes	96.21		96.72	0.5	
Naphthalene	806.17		740.29	8.9	
C1-Naphthalenes	1634.24		1516.04	7.8	
C2-Naphthalenes	2010.9		2000.10	0.5	
C3-Naphthalenes	1445.89		1526.96	5.3	
C4-Naphthalenes	785.13		898.03	12.6	
Biphenyl	371.59				
C1-Biphenyls + Dibenzofuran	240.71		220.82	9.0	
C2-Biphenyls + C1-Dibenzofurans	514.5				
Acenaphthylene		U			
Acenaphthene	13.75		14.50	5.2	
Dibenzofuran	77.57		77.75	0.2	
Fluorene	96.04		92.51	3.8	
C1-Fluorenes	223.14		227.01	1.7	
C2-Fluorenes	345.32		367.09	5.9	
C3-Fluorenes	295.4		326.32	9.5	
C4-Fluorenes	212.42				
Anthracene		U			
Phenanthrene	285.03		249.49	14.2	
C1-Phenanthrenes/Anthracenes	584.34		549.17	6.4	
C2-Phenanthrenes/Anthracenes	669.09		642.72	4.1	
C3-Phenanthrenes/Anthracenes	453.02		446.11	1.5	
C4-Phenanthrenes/Anthracenes	176.09		180.02	2.2	
Retene	74.51				
Dibenzothiophene	241.56		210.35	14.8	
C1-Dibenzothiophenes	440.7		409.03	7.7	
C2-Dibenzothiophenes	573.69		551.46	4.0	
C3-Dibenzothiophenes	483.6		471.36	2.6	
C4-Dibenzothiophenes	261.9		243.11	7.7	
Fluoranthene		U			
Pyrene	14.53		12.99	11.9	
C1-Fluoranthenes/Pyrenes	84.98		70.92	19.8	
C2-Fluoranthenes/Pyrenes	145.97		117.89	23.8	
C3-Fluoranthenes/Pyrenes	154.91		137.25	12.9	
C4-Fluoranthenes/Pyrenes	123.35				
C0-Benzo(b)naphthothiophenes	46.42				
C1-Benzo(b)naphthothiophenes	162.78				
C2-Benzo(b)naphthothiophenes	204.91				
C3-Benzo(b)naphthothiophenes	163.24				
C4-Benzo(b)naphthothiophenes	66.74				
Benzo(a)anthracene		U			

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Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude				
Battelle ID	BJ959NSC-P				
Sample Type	NSC				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/07/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.01				
Size Unit-Basis	G_OIL				
Minimum Reporting Limit	1.3				
Units	NG/G_OIL		Target	% Difference	Qualifier
Chrysene	51.12		47.18	8.4	
C1-Chrysenes	85.28		78.82	8.2	
C2-Chrysenes	113.52		102.67	10.6	
C3-Chrysenes	97.23		85.36	13.9	
C4-Chrysenes	62.06		61.99	0.1	
Benzo(b)fluoranthene	6.18		6.08	1.6	
Benzo(k)fluoranthene		U			
Benzo(e)pyrene	13.86		12.88	7.6	
Benzo(a)pyrene		U			
Perylene		U			
Indeno(1,2,3-cd)pyrene		U			
Dibenz(a,h)anthracene	1.1	J			
Benzo(g,h,i)perylene	3.86		3.44	12.2	
Total PAH	12977.88				

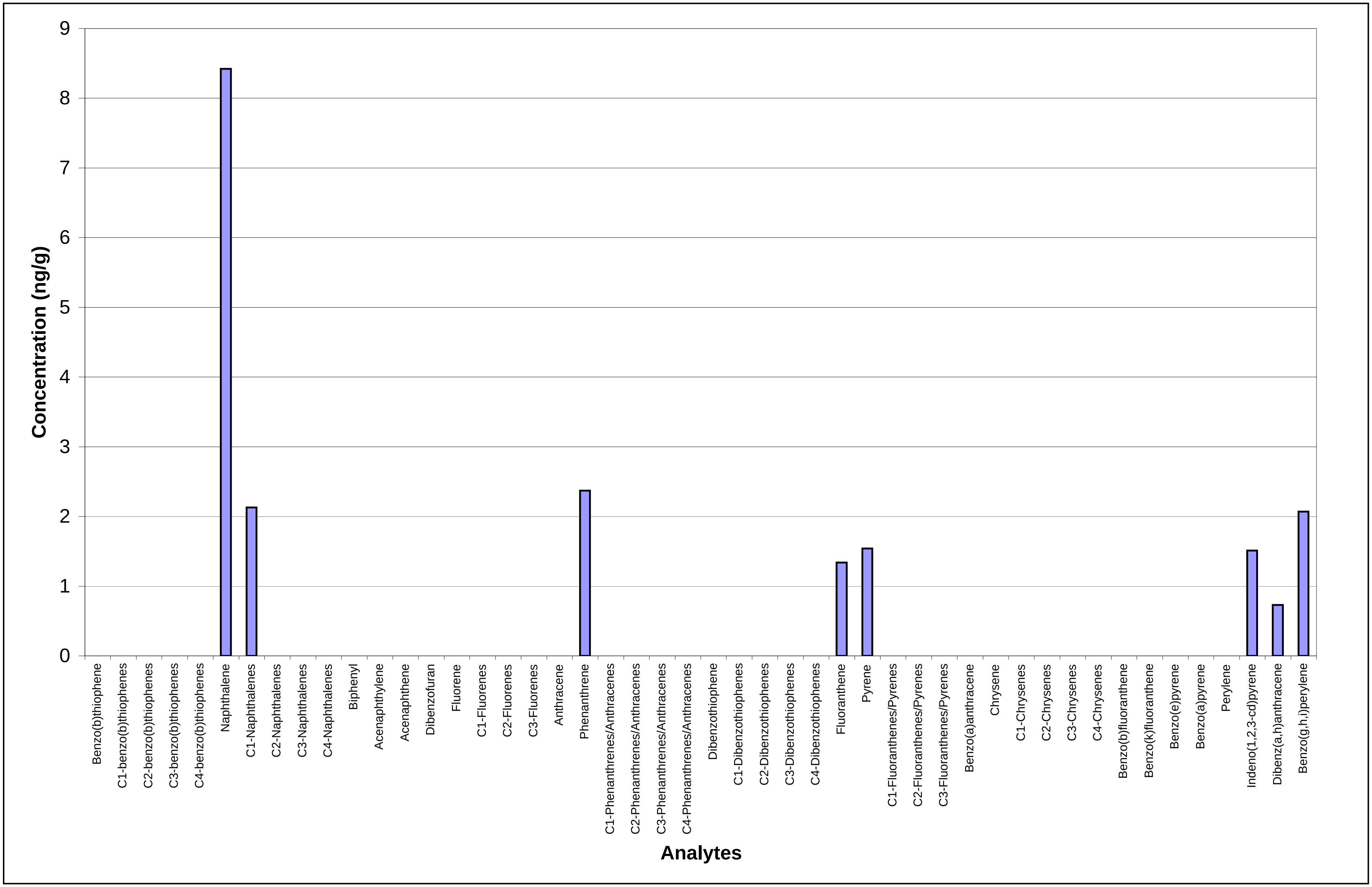
Surrogate Recoveries (%)

Naphthalene-d8	109
Acenaphthene-d10	106
Phenanthrene-d10	97
Benzo(a)pyrene-d12	119

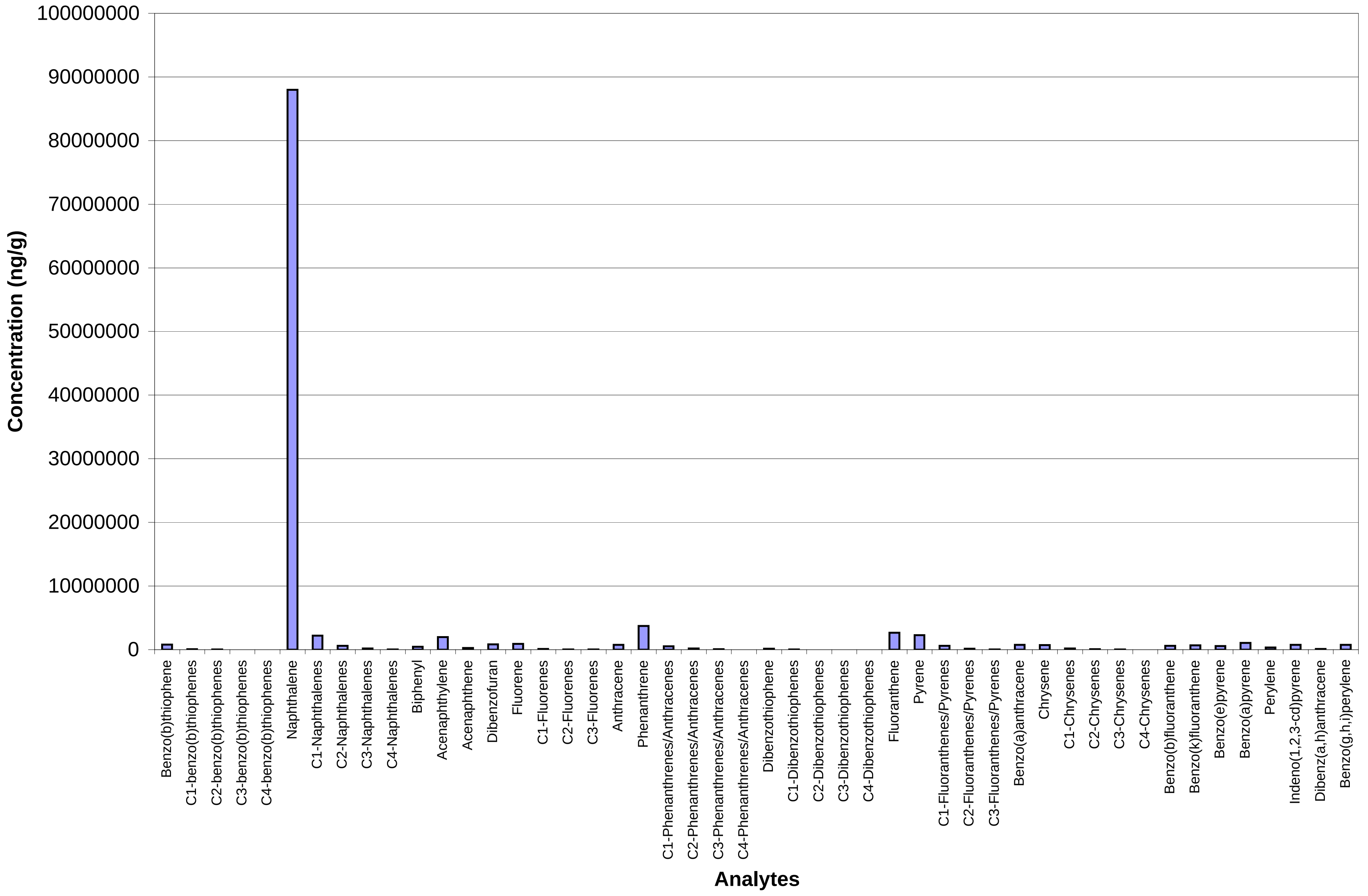
Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Procedural Blank (BJ939PB-P)



GWP07T01 (R5521-P)



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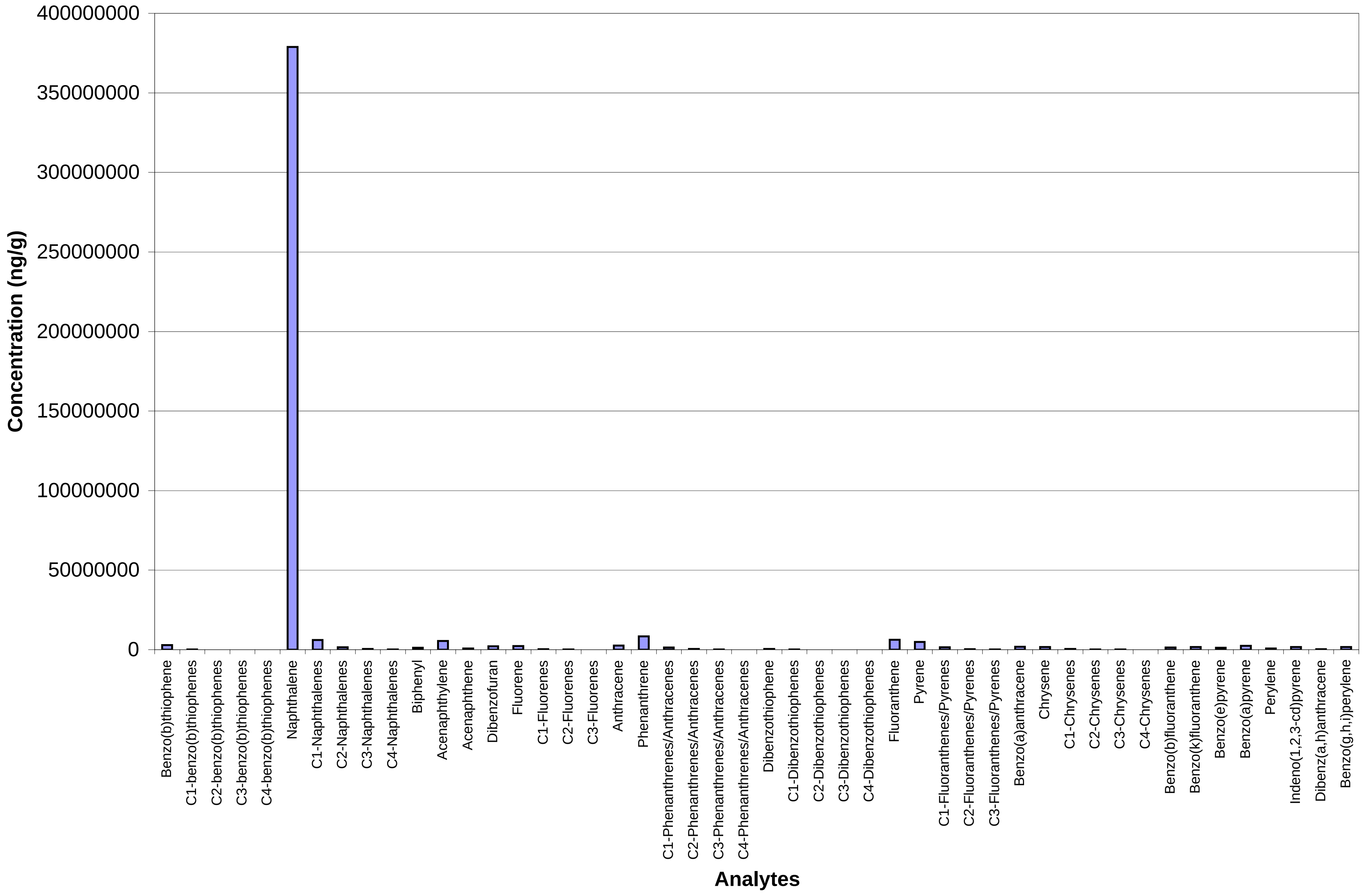
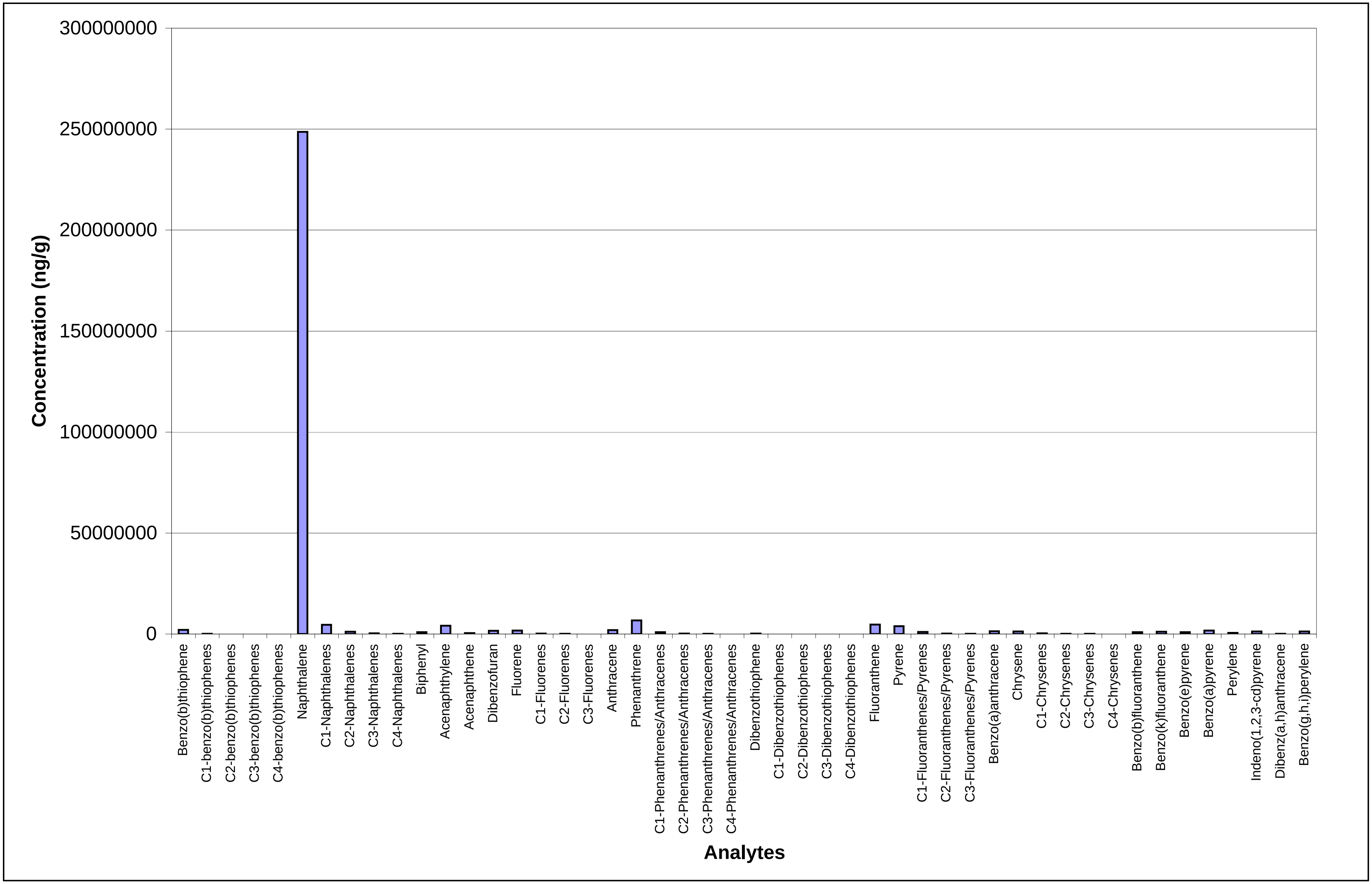
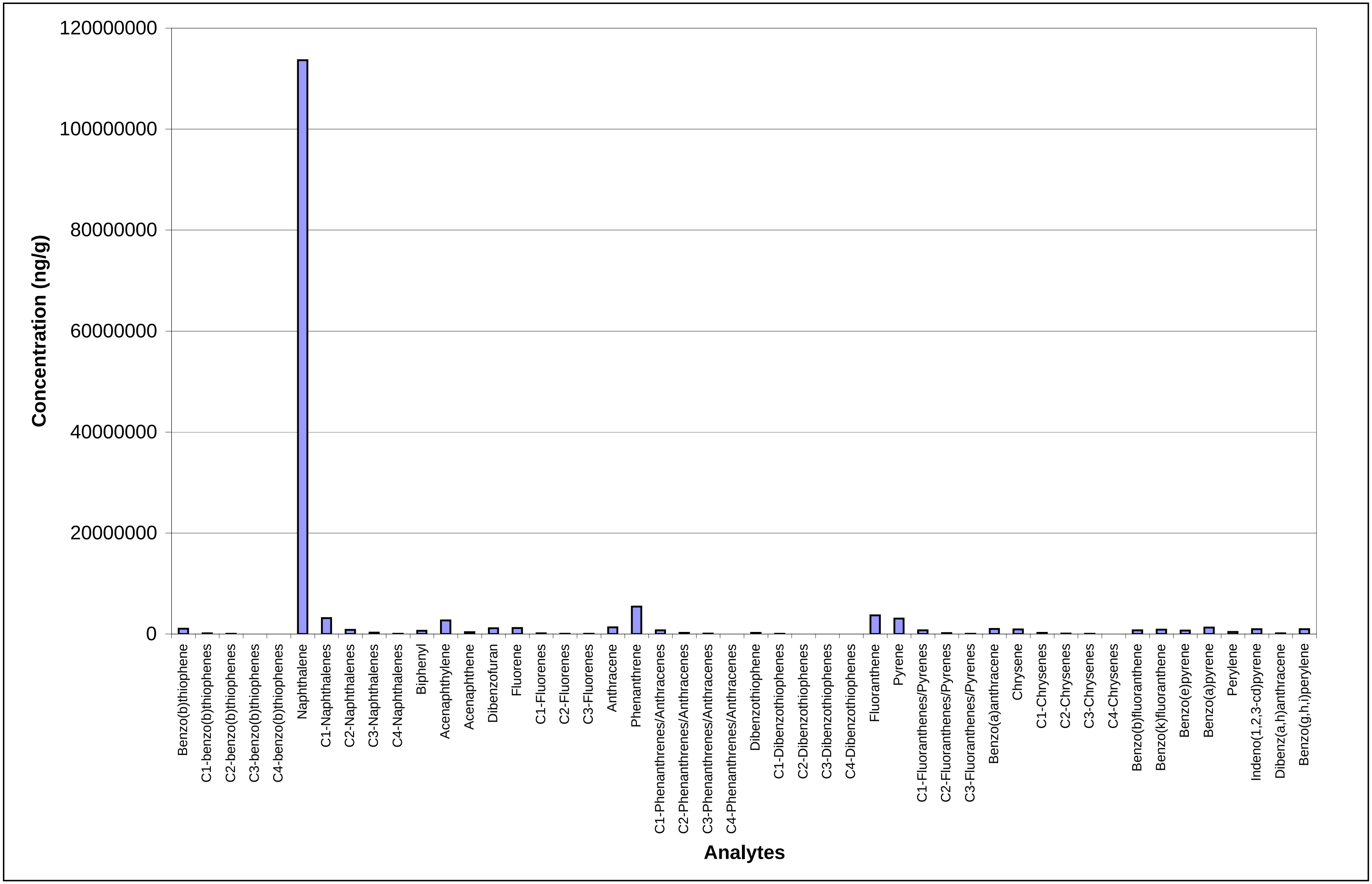
GWP07T02 (R5525-P)



GWP07T03 (R5526-P)



GWP07T04 (R5527-P)



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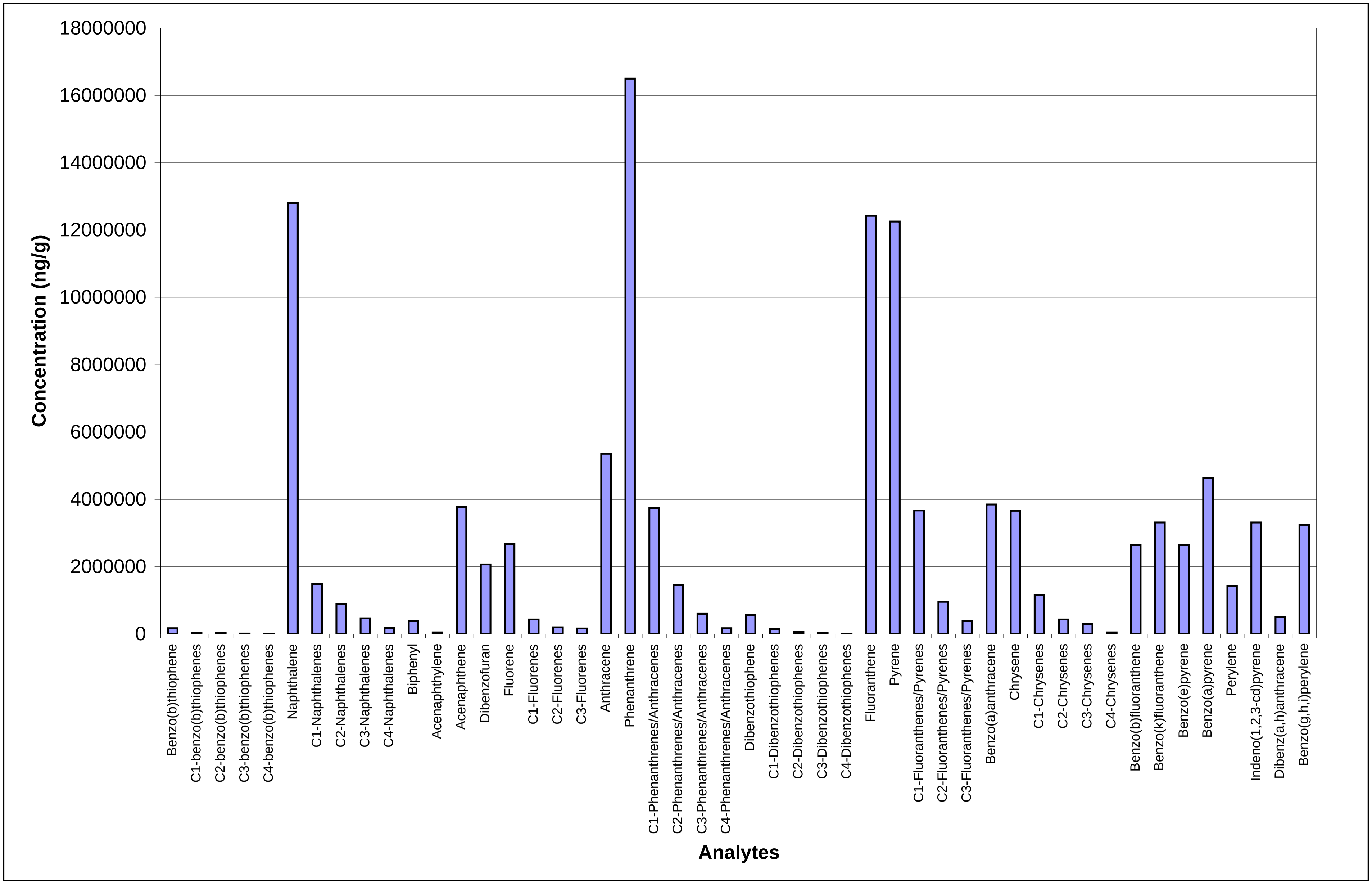
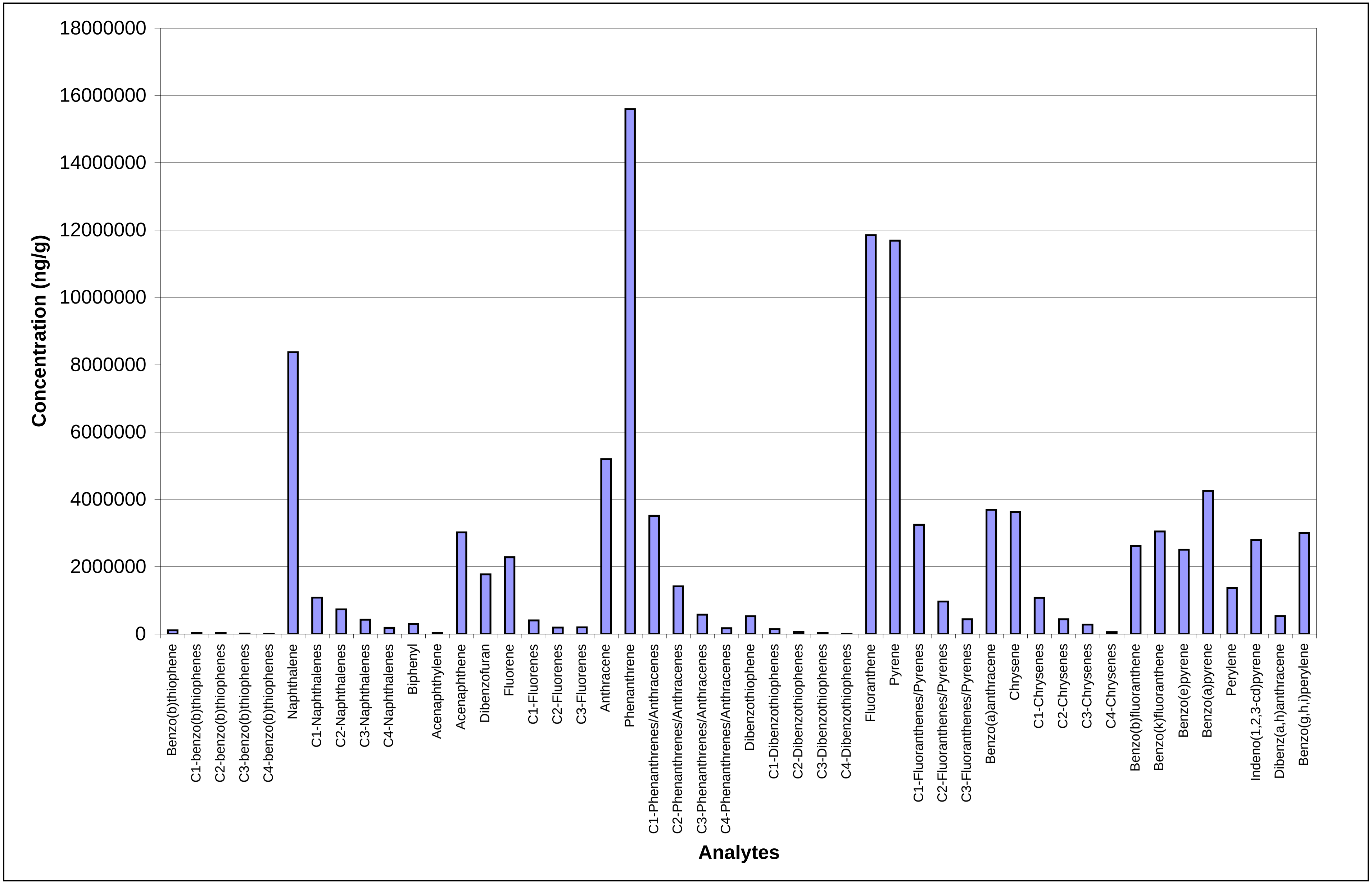
GWP07T05 (R5528-P)



GWP07T06 (R5529-P)



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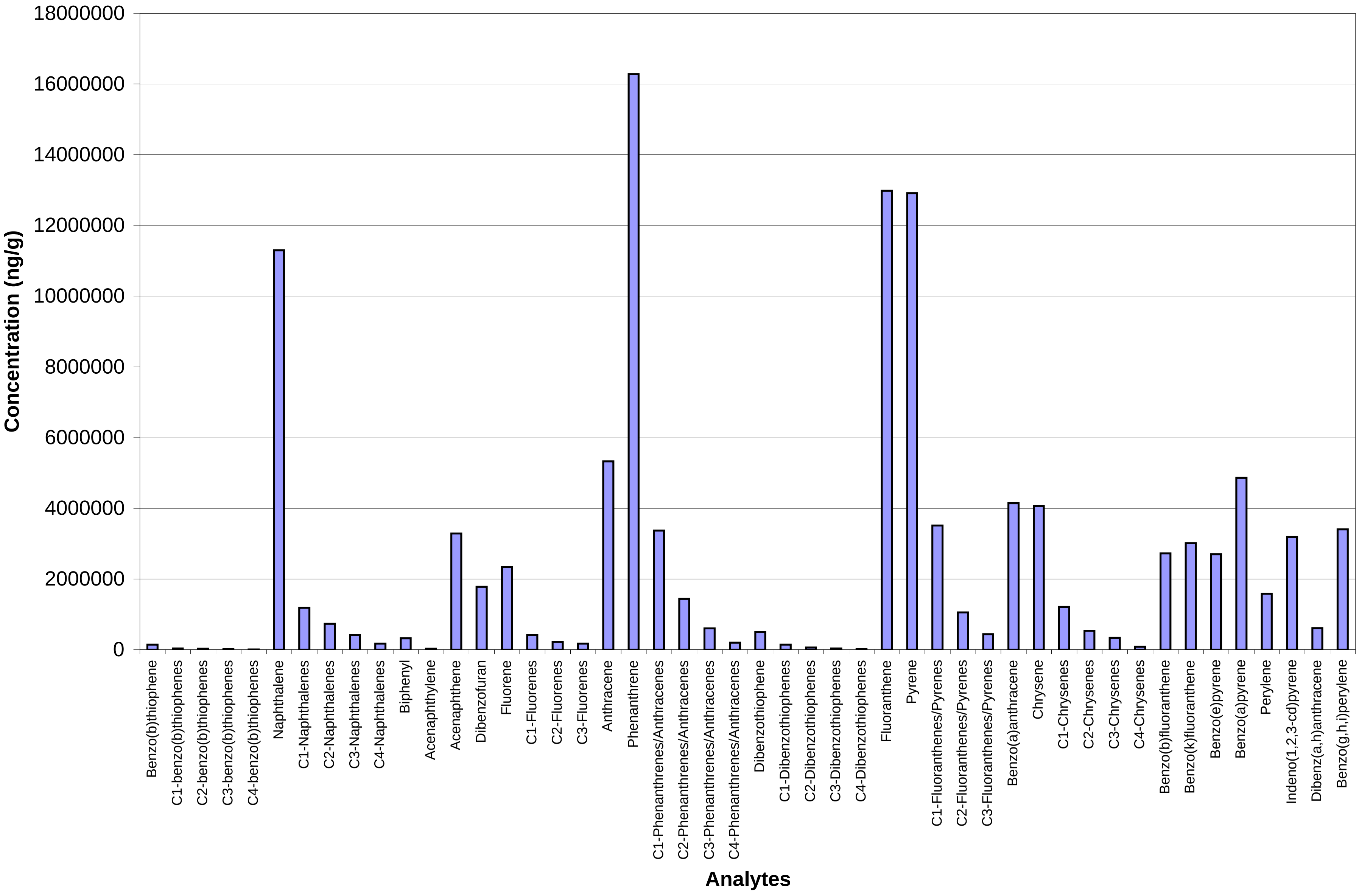
GWP07T07 (R5530-P)



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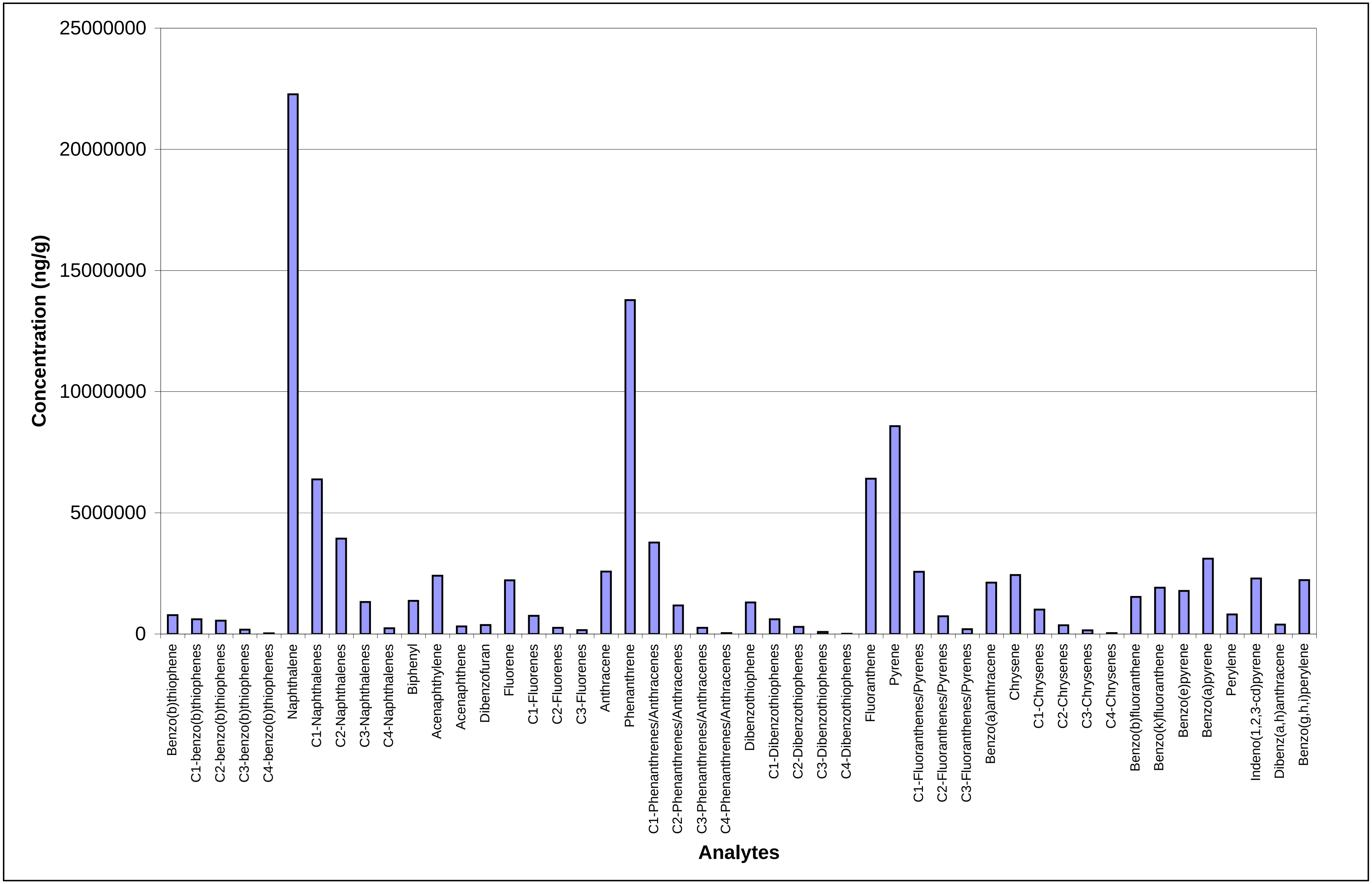
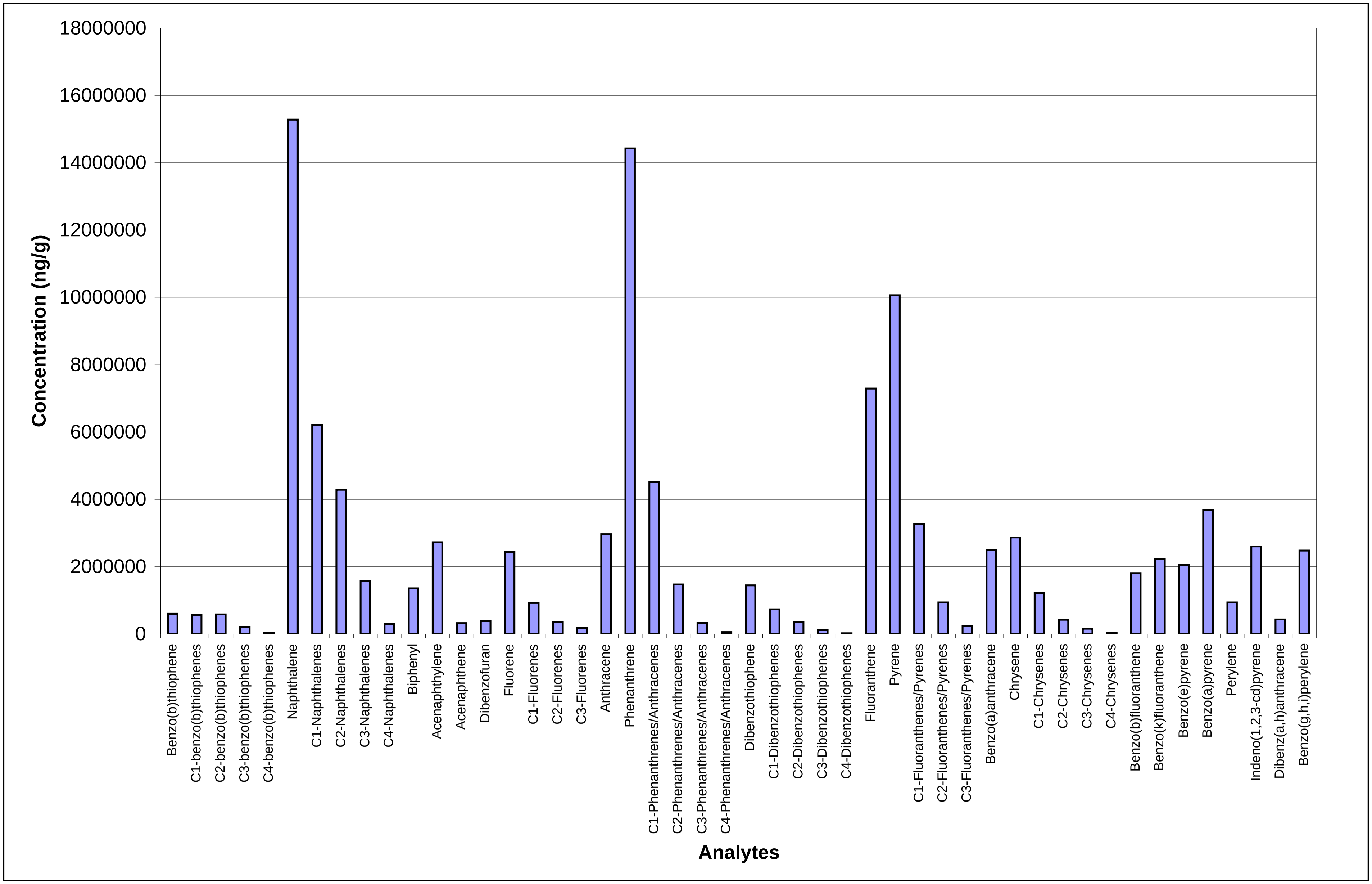
GWP07T08 (R5531-P)



GWP07T09 (R5532-P)



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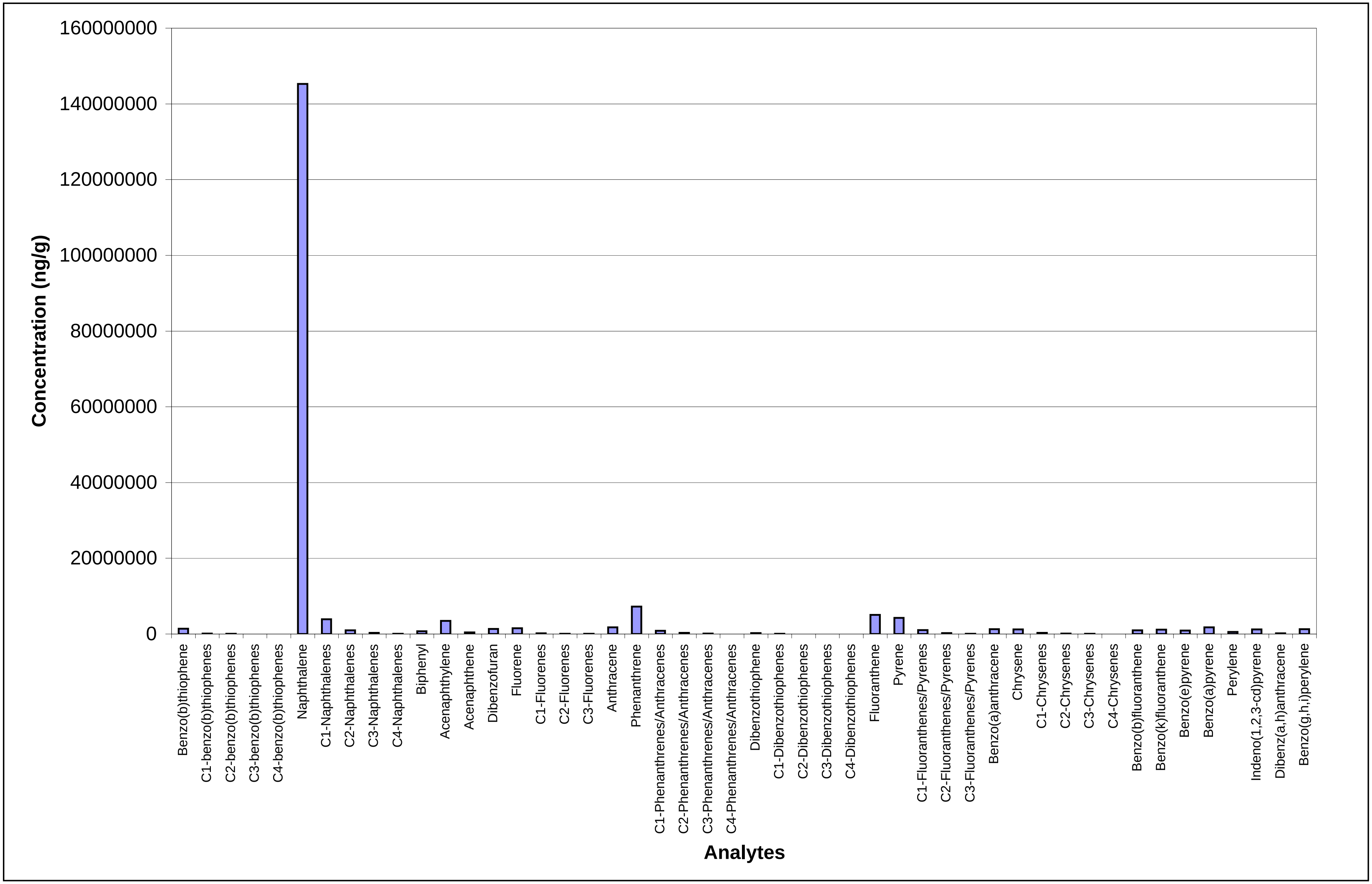
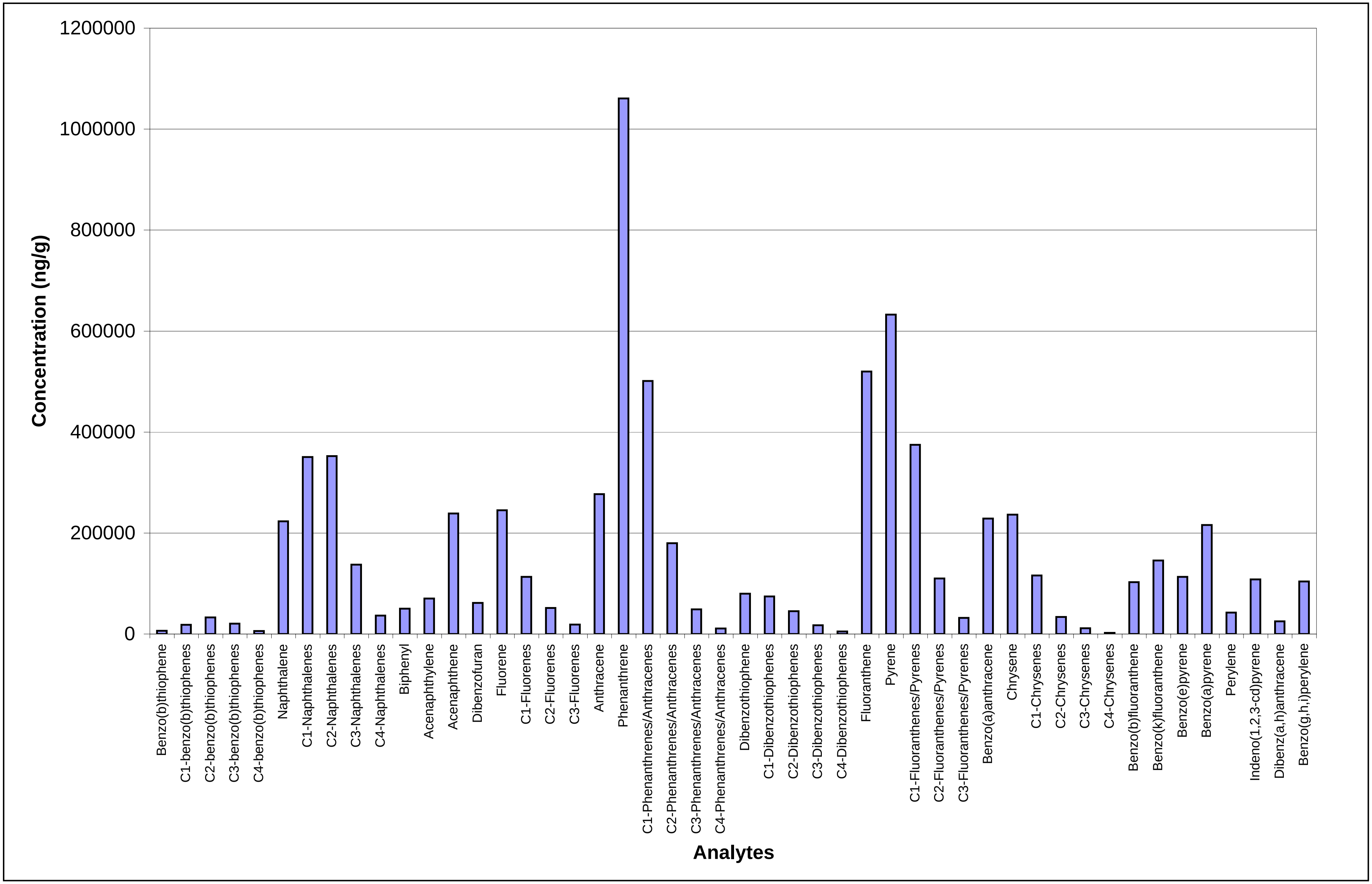
GWP07T10 (R5533-P)



GWP07T11 (R5534-P)



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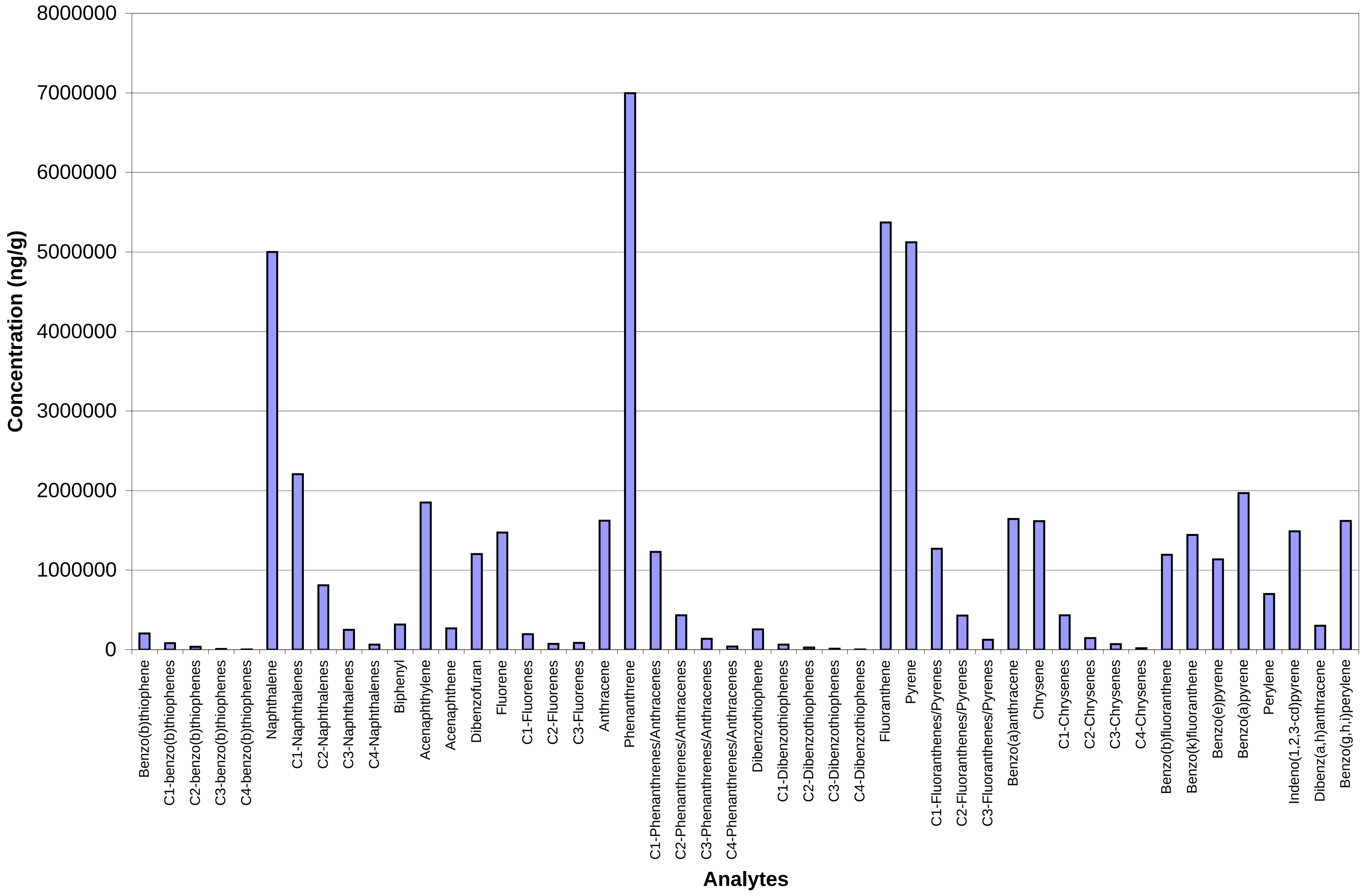
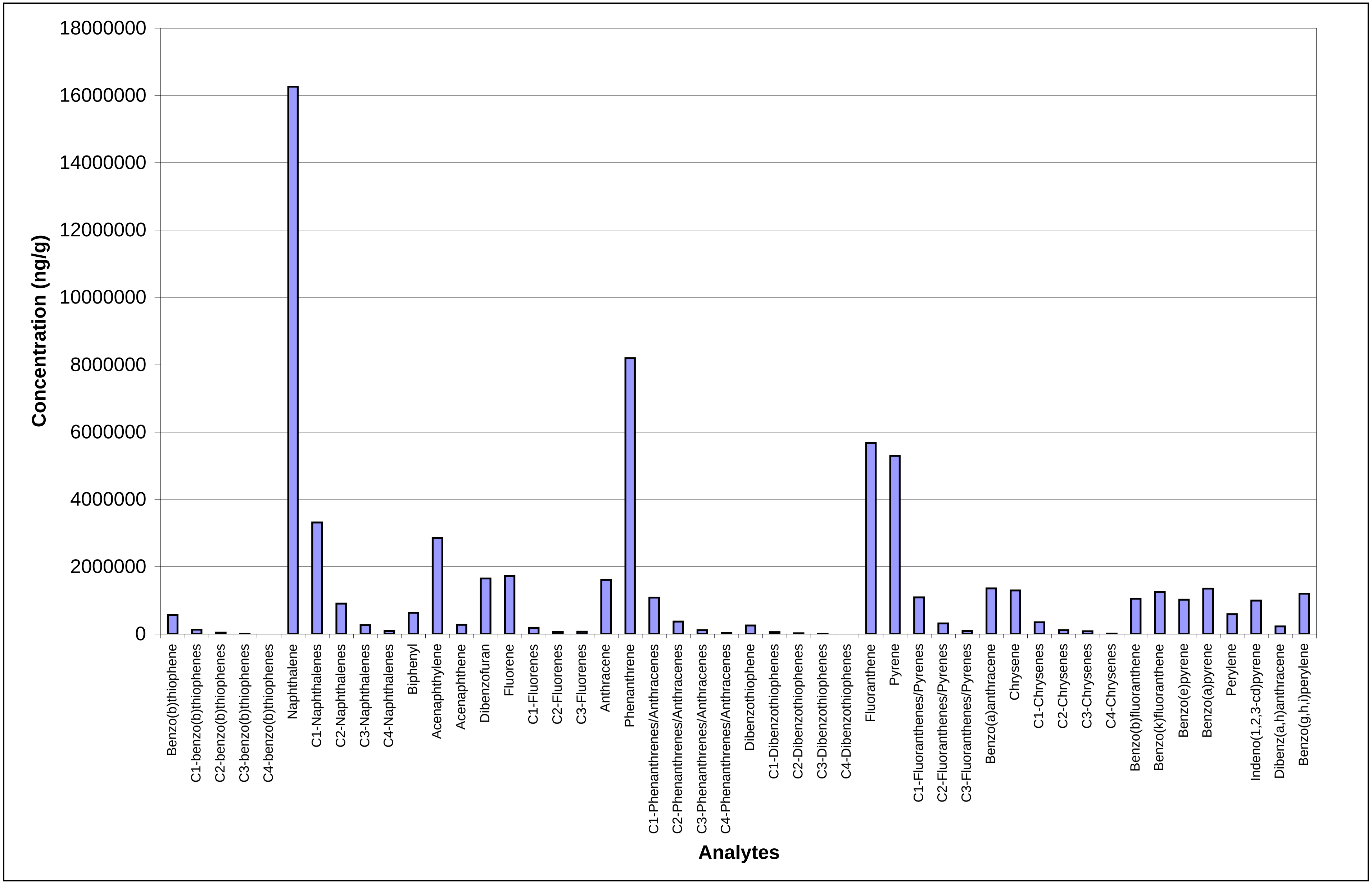
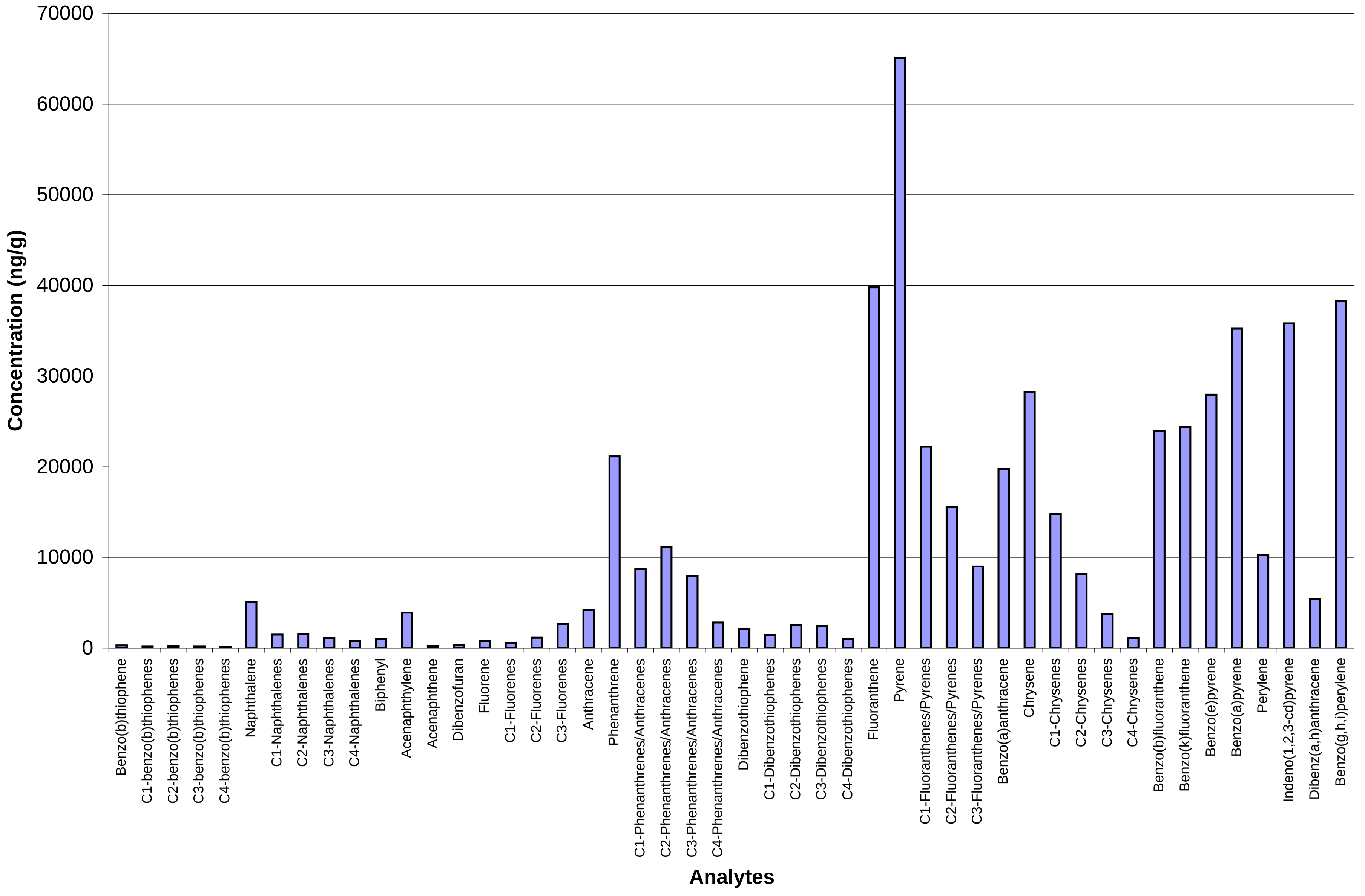
GWP07T12 (R5535-P)



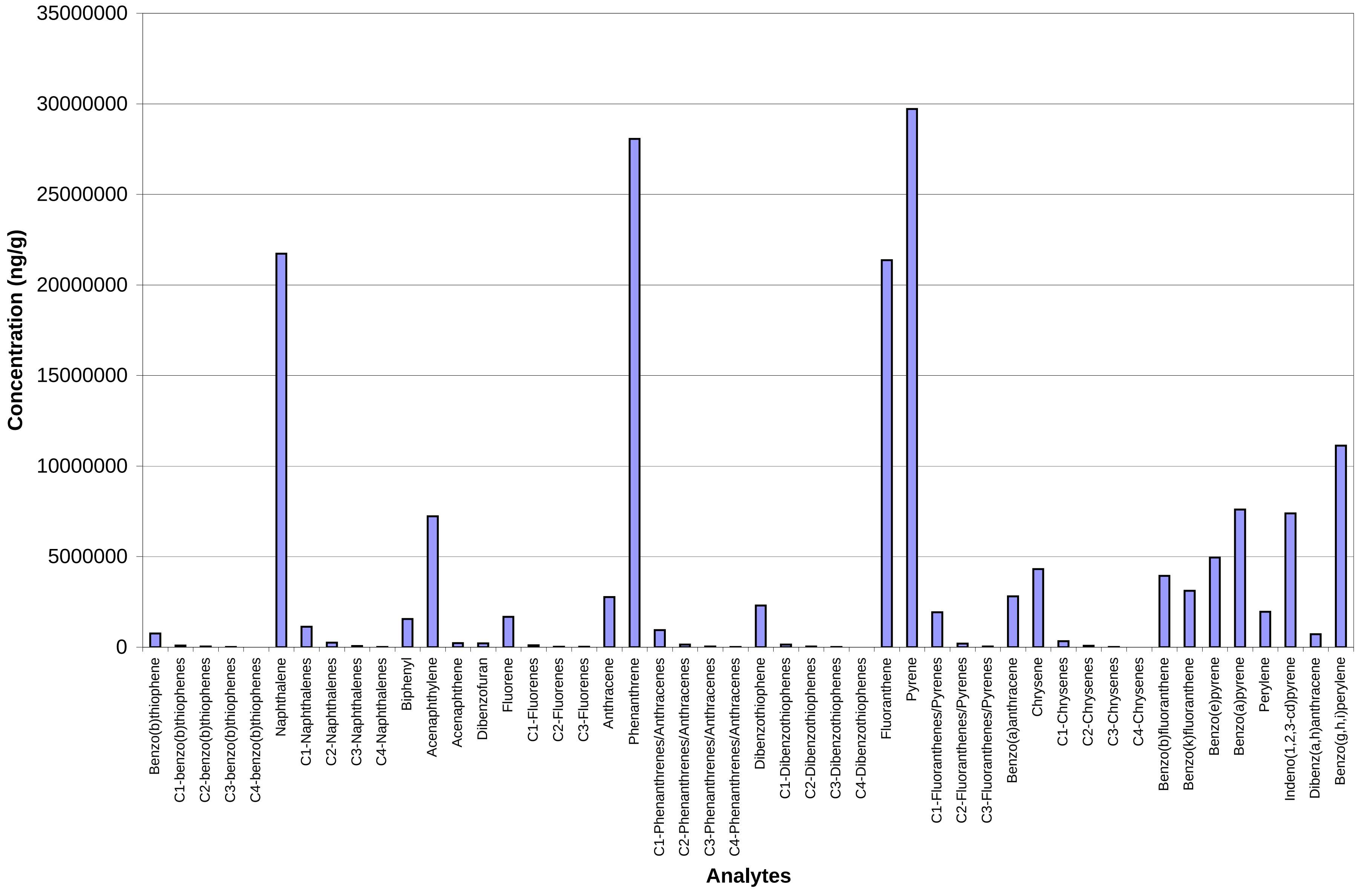
GWP07T13 (R5536-P)



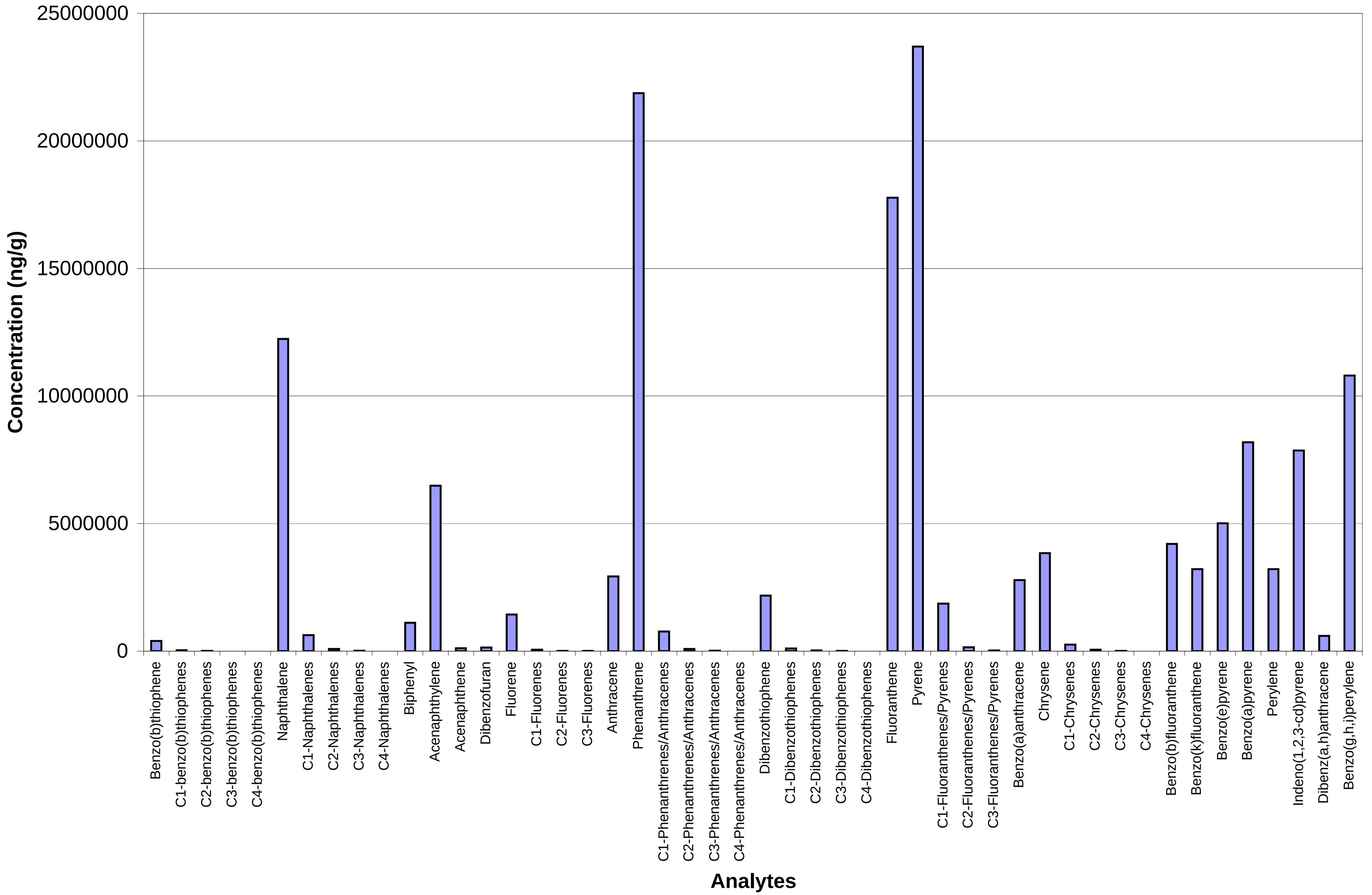
GWP07T14 (R5537-P)



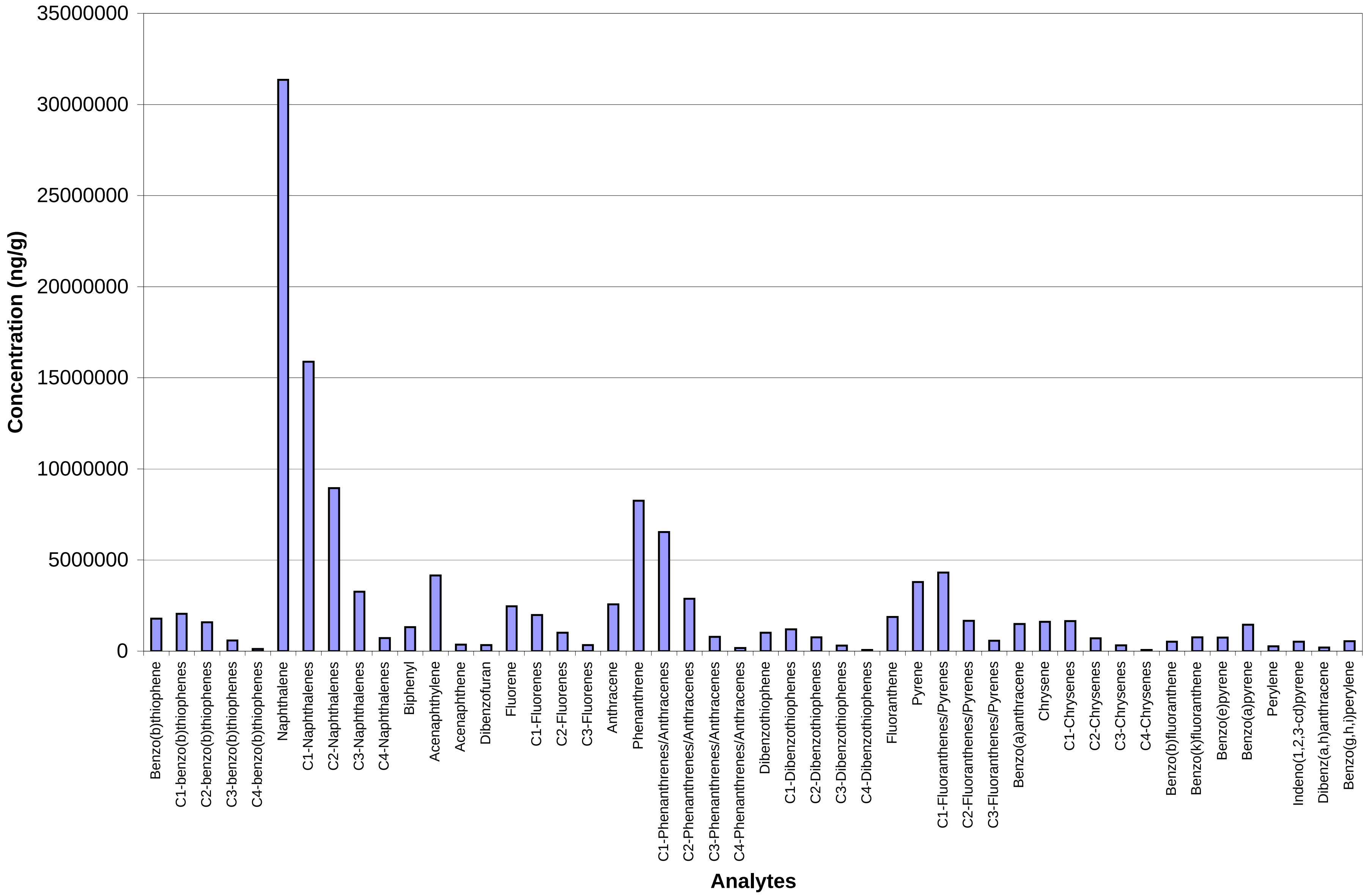
GWP07S01 (R5538-P)



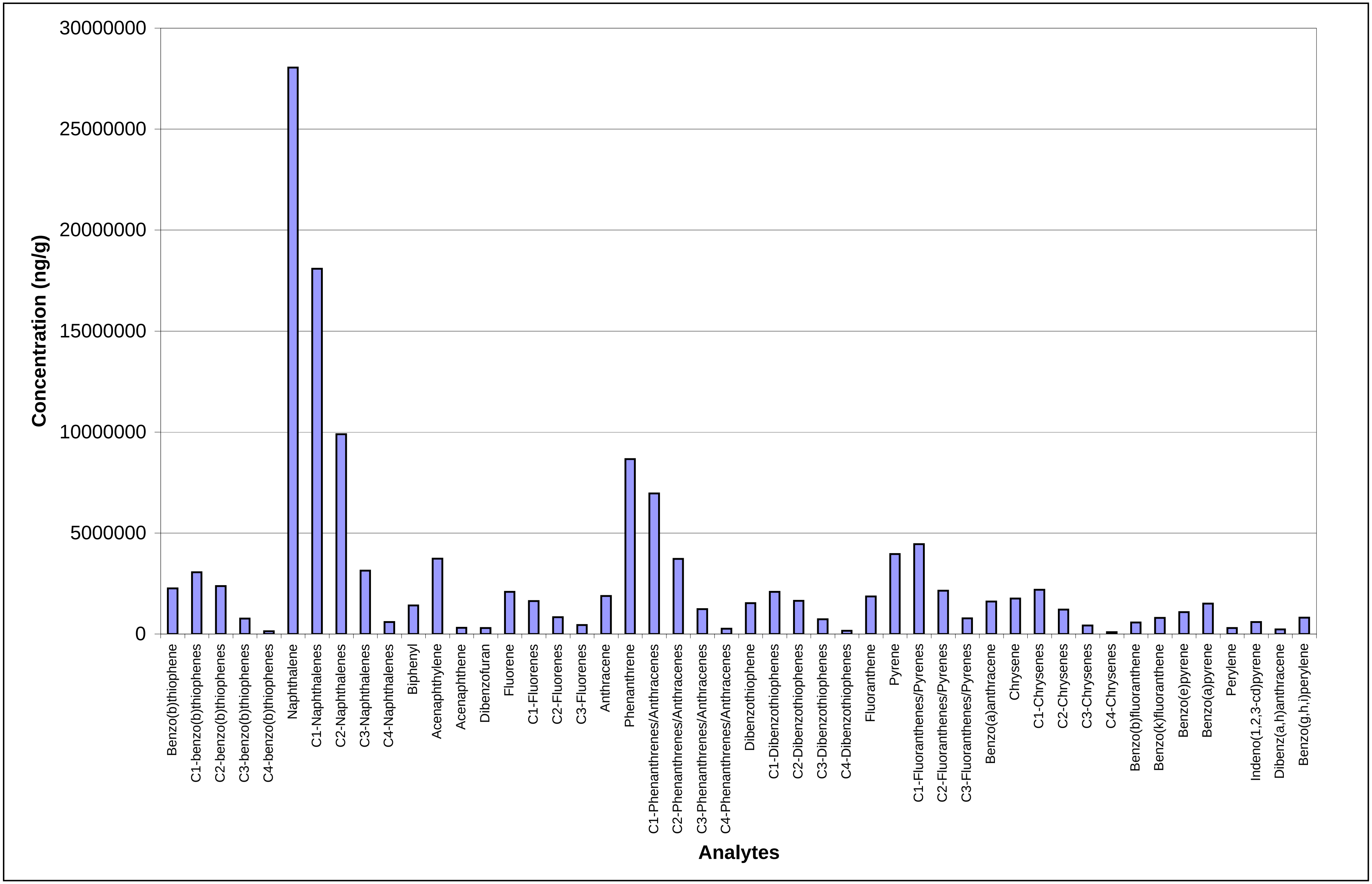
GWP07S02 (R5539-P)



GWP07S03 (R5540-P)



GWP07S04 (R5541-P)



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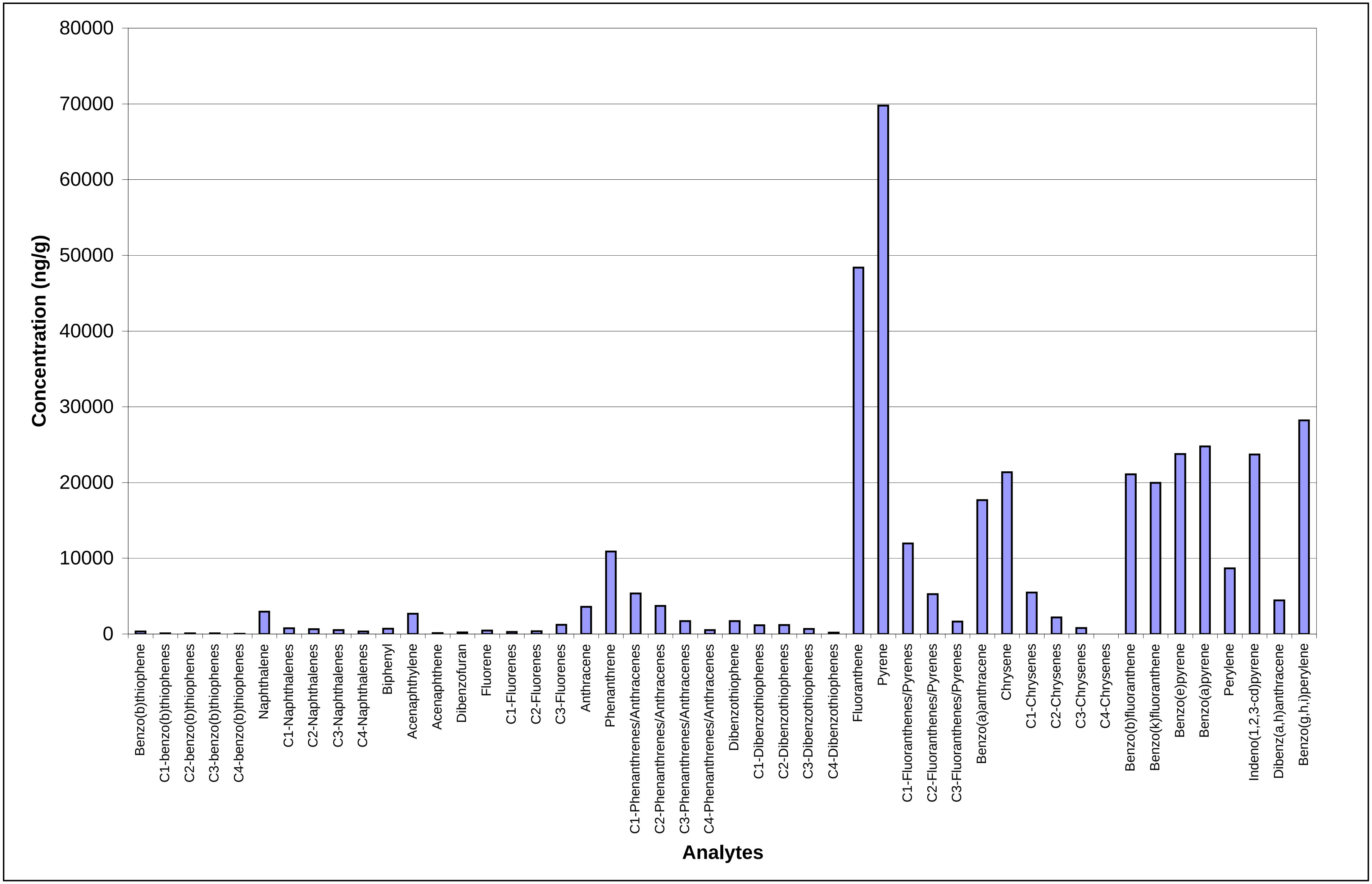
TDW3-4.5 (R5542-P)



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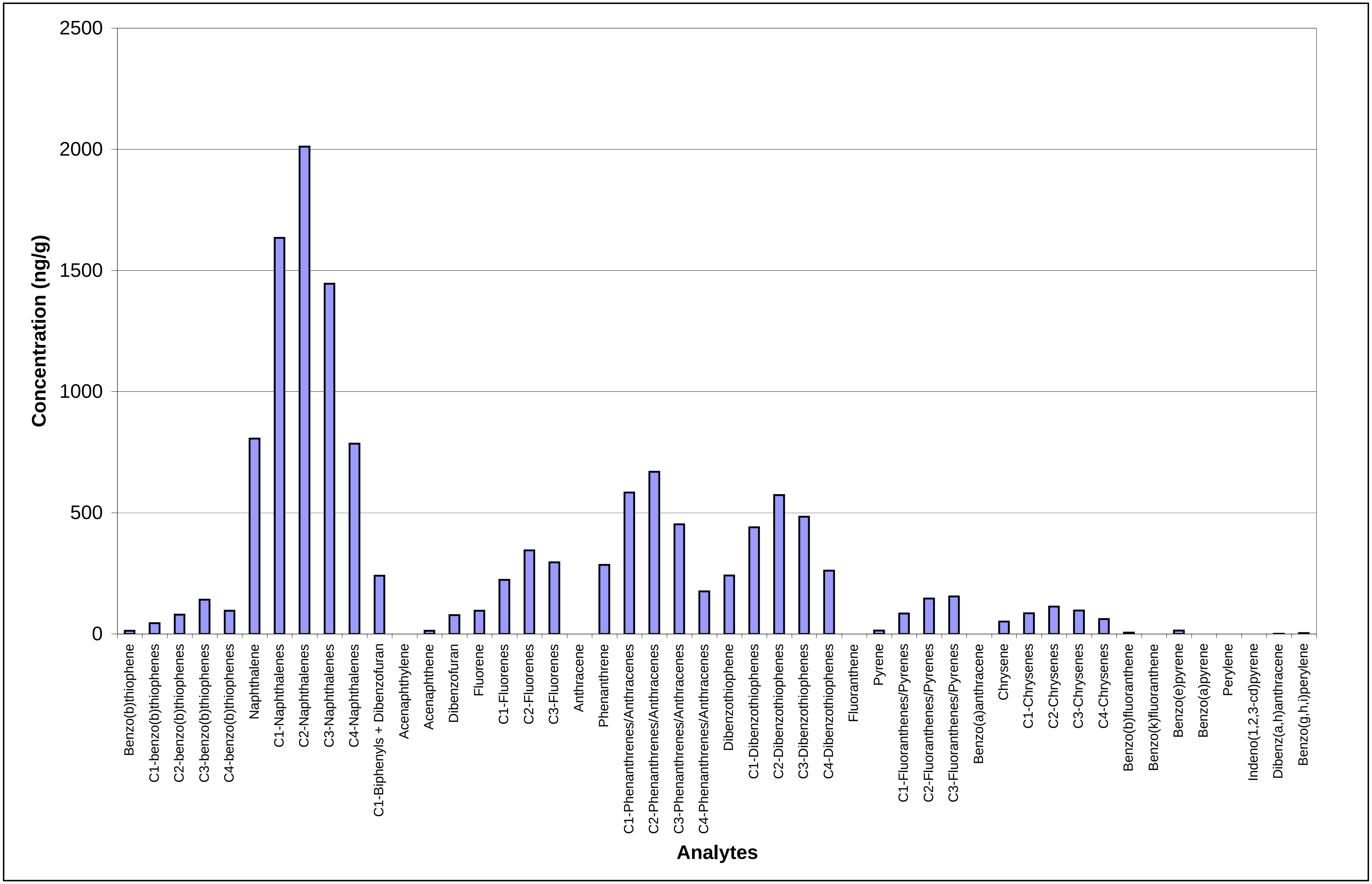
GN62: North Slope Crude (BJ959NSC-P)



Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T01	GWP07T02	GWP07T03	GWP07T04
Battelle ID	R5521-P	R5525-P	R5526-P	R5527-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/12/07	02/10/07	02/09/07	02/09/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	28.88	50.1	50.3	34.93
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.44	1.02	1.01	1.44
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	281.71	1242.82	1046.38	489.28
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	U	U	U	U
C29 Tricyclic Terpane -22S	U	U	U	U
C29 Tricyclic Terpane -22R	U	U	U	U
18a(H)-22,29,30-Trisnorneohopane -TS	U	U	U	U
17a(H)-22,29,30-Trisnorhopane -TM	556.01 J	U	U	U
30-Norhopane	1062.22	U	U	U
18a(H) & 18b(H)-Oleananes	U	U	U	U
Hopane	1827.01	U	U	U
30-Homohopane -22S	U	U	U	U
30-Homohopane -22R	U	U	U	U
13b(H),17a(H)-20S-Diacholestane	U	U	U	U
13b(H),17a(H)-20R-Diacholestane	U	U	U	U
14a(H),17a(H)-20R-methylcholestane	519.25 J	U	U	478.26 J
14a(H),17a(H)-20S-Ethylcholestane	407.28 J	U	U	445.87 J
14a(H),17a(H)-20R-Ethylcholestane	362.99 J	U	U	316.3 J
C21-TAS	U	U	U	U
C26-TAS(20S)	81.59 J	213.02 J	U	U
C26,C27-TAS	205.25 J	432.58 J	257.21 J	U
C27-TAS(20R)	116.48 J	241.98 J	206.94 J	U
C28-TAS(20S)	82.36 J	174.71 J	U	U
C28-TAS(20R)	93.9 J	231.7 J	183.48 J	U
C21-MAS	U	U	U	U
C22-MAS	U	U	U	U
C27-MAS	U	U	U	U
C27-20R-MAS	3355.08	U	U	U
C27-20S-MAS	989.82	U	U	U
C28-20S-MAS	U	U	U	U
C27-C2920S/R-MAS	35605.15	U	U	U
C29-20S-MAS	44868.64	U	U	U
C29-20R-MAS	U	U	2221.04	U
TAS_245	NA	NA	NA	NA
MAS_239	NA	NA	NA	NA

Surrogate Recoveries (%)

5b(H)-Cholane	18404 NME	32515 NME	23623 NME	22622 NME

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Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T05	GWP07T06	GWP07T07	GWP07T08
Battelle ID	R5528-P	R5529-P	R5530-P	R5531-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/08/07	02/08/07	02/08/07	02/11/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	4.23	6.94	6.47	30.28
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.92	1.93	1.87	1.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1452.54	971.44	994.26	935.87
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	U	U	U	U
C29 Tricyclic Terpane -22S	U	U	U	U
C29 Tricyclic Terpane -22R	U	U	U	U
18a(H)-22,29,30-Trisnorneohopane -TS	U	U	U	U
17a(H)-22,29,30-Trisnorhopane -TM	U	U	U	U
30-Norhopane	5597.06	4469.68	4619.9	U
18a(H) & 18b(H)-Oleananes	U	U	U	U
Hopane	7476.45	5024.06	5375.22	U
30-Homohopane -22S	U	U	3152.17	U
30-Homohopane -22R	U	U	3078.5	U
13b(H),17a(H)-20S-Diacholestane	U	U	U	U
13b(H),17a(H)-20R-Diacholestane	U	U	U	U
14a(H),17a(H)-20R-methylcholestane	U	U	U	U
14a(H),17a(H)-20S-Ethylcholestane	U	U	1364.18 J	U
14a(H),17a(H)-20R-Ethylcholestane	U	U	1732.93 J	U
C21-TAS	U	U	U	U
C26-TAS(20S)	U	U	U	U
C26,C27-TAS	U	388.11 J	368.9 J	576.43 J
C27-TAS(20R)	U	226.69 J	U	454.53 J
C28-TAS(20S)	U	U	U	227.67 J
C28-TAS(20R)	U	U	U	261.58 J
C21-MAS	U	U	U	U
C22-MAS	U	U	U	U
C27-MAS	U	U	U	U
C27-20R-MAS	U	U	U	U
C27-20S-MAS	U	U	U	U
C28-20S-MAS	U	U	U	U
C27-C2920S/R-MAS	U	U	U	U
C29-20S-MAS	U	U	U	U
C29-20R-MAS	U	U	U	U
TAS_245	NA	NA	NA	NA
MAS_239	NA	NA	NA	NA

Surrogate Recoveries (%)

5b(H)-Cholane	155388 NME	153337 NME	170266 NME	19515 NME

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T09	GWP07T10	GWP07T11	GWP07T12
Battelle ID	R5532-P	R5533-P	R5534-P	R5535-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/11/07	01/11/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/08/07	02/09/07	02/11/07	02/08/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	19.46	32.51	5.51	10.85
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.72	1.45	2.05	1.79
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1080.96	699.41	979.51	415.48
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	U	U	DU	U
C29 Tricyclic Terpane -22S	U	U	DU	U
C29 Tricyclic Terpane -22R	U	U	DU	U
18a(H)-22,29,30-Trisnorneohopane -TS	U	U	DU	U
17a(H)-22,29,30-Trisnorhopane -TM	U	U	DU	U
30-Norhopane	U	U	DU	U
18a(H) & 18b(H)-Oleananes	U	U	DU	U
Hopane	U	U	DU	U
30-Homohopane -22S	U	U	DU	U
30-Homohopane -22R	U	U	DU	U
13b(H),17a(H)-20S-Diacholestane	U	U	DU	U
13b(H),17a(H)-20R-Diacholestane	U	U	DU	U
14a(H),17a(H)-20R-methylcholestane	U	U	3464.38 D	U
14a(H),17a(H)-20S-Ethylcholestane	U	U	1275.21 DJ	U
14a(H),17a(H)-20R-Ethylcholestane	U	U	2158.71 D	U
C21-TAS	U	U	DU	U
C26-TAS(20S)	U	159.25 J	510.92 DJ	U
C26,C27-TAS	646.21 J	392.28 J	1941.12 D	170.77 J
C27-TAS(20R)	469.54 J	233.02 J	1115.3 D	100.81 J
C28-TAS(20S)	304.97 J	148.22 J	670.63 DJ	66.82 J
C28-TAS(20R)	361.69 J	U	690.6 DJ	81.1 J
C21-MAS	U	U	DU	U
C22-MAS	U	U	DU	U
C27-MAS	U	U	DU	U
C27-20R-MAS	U	U	DU	U
C27-20S-MAS	U	U	DU	U
C28-20S-MAS	U	U	DU	U
C27-C2920S/R-MAS	U	U	DU	U
C29-20S-MAS	U	U	DU	U
C29-20R-MAS	U	U	DU	U
TAS_245	NA	NA	NA	NA
MAS_239	NA	NA	NA	NA

Surrogate Recoveries (%)

5b(H)-Cholane	32311 NME	27454 NME	5507 ND	48227 NME

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Battelle
The Business *of* Innovation

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07T13	GWP07T14	GWP07S01	GWP07S02
Battelle ID	R5536-P	R5537-P	R5538-P	R5539-P
Sample Type	SA	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07	01/12/07
Extraction Date	01/24/07	01/24/07	01/24/07	01/24/07
Analysis Date	02/09/07	02/09/07	02/09/07	02/08/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	12.18	7.01	13.85	10.23
% Lipid	NA	NA	NA	NA
Matrix	TAR	TAR	TAR	TAR
Sample Size	1.83	1.95	1.75	1.80
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	385.01	12.94	1006.52	1032.92
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	U	82.07	U	U
C29 Tricyclic Terpane -22S	U	55.09	U	U
C29 Tricyclic Terpane -22R	U	42.19	U	U
18a(H)-22,29,30-Trisnorneohopane -TS	U	33.26	U	U
17a(H)-22,29,30-Trisnorhopane -TM	U	50.17	U	U
30-Norhopane	U	167.1	U	U
18a(H) & 18b(H)-Oleananes	U	92.31	U	U
Hopane	U	308.82	U	U
30-Homohopane -22S	U	99.1	U	U
30-Homohopane -22R	U	73.11	U	U
13b(H),17a(H)-20S-Diacholestane	U	190.73	U	U
13b(H),17a(H)-20R-Diacholestane	U	127.58	U	U
14a(H),17a(H)-20R-methylcholestane	U	187.19	U	U
14a(H),17a(H)-20S-Ethylcholestane	U	86.87	U	U
14a(H),17a(H)-20R-Ethylcholestane	U	154.99	U	U
C21-TAS	U	U	U	U
C26-TAS(20S)	U	U	U	U
C26,C27-TAS	127.76 J	45.4	U	U
C27-TAS(20R)	78.73 J	30.21	U	U
C28-TAS(20S)	218.3 J	20.81	U	U
C28-TAS(20R)	162.12 J	16.11	U	U
C21-MAS	U	U	U	U
C22-MAS	U	U	U	U
C27-MAS	U	U	U	U
C27-20R-MAS	U	U	21465.67	17342.52
C27-20S-MAS	U	U	3524.46	2631.01
C28-20S-MAS	U	U	U	U
C27-C2920S/R-MAS	U	U	U	U
C29-20S-MAS	U	U	U	U
C29-20R-MAS	U	U	U	U
TAS_245	NA	NA	NA	NA
MAS_239	NA	NA	NA	NA

Surrogate Recoveries (%)

5b(H)-Cholane	46836 NME	212 NME	46848 NME	42830 NME

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Main: S07-0010MS-BIOMARKER-Final.xls

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07S03	GWP07S04	TDW3-4.5
Battelle ID	R5540-P	R5541-P	R5542-P
Sample Type	SA	SA	SA
Collection Date	01/12/07	01/12/07	09/26/06
Extraction Date	01/24/07	01/24/07	01/24/07
Analysis Date	02/12/07	02/08/07	02/09/07
Analytical Instrument	MS	MS	MS
% Moisture	20.14	12.16	14.86
% Lipid	NA	NA	NA
Matrix	TAR	TAR	SOIL
Sample Size	1.66	1.85	17.17
Size Unit-Basis	G_DRY	G_DRY	G_DRY
Minimum Reporting Limit	1120.03	1340.01	6.5
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	U	U	17.62 T
C29 Tricyclic Terpane -22S	U	U	UT
C29 Tricyclic Terpane -22R	U	U	UT
18a(H)-22,29,30-Trisnorneohopane -TS	U	U	UT
17a(H)-22,29,30-Trisnorhopane -TM	U	U	26.61 T
30-Norhopane	U	U	69.06 T
18a(H) & 18b(H)-Oleananes	U	U	55.34 T
Hopane	U	U	113.88 T
30-Homohopane -22S	U	U	49.49 T
30-Homohopane -22R	U	U	38.99 T
13b(H),17a(H)-20S-Diacholestane	U	U	39.08 T
13b(H),17a(H)-20R-Diacholestane	U	U	22.14 T
14a(H),17a(H)-20R-methylcholestane	U	U	75.52 T
14a(H),17a(H)-20S-Ethylcholestane	U	U	43.36 T
14a(H),17a(H)-20R-Ethylcholestane	U	U	61.76 T
C21-TAS	U	U	UT
C26-TAS(20S)	U	U	UT
C26,C27-TAS	U	U	56.03 T
C27-TAS(20R)	U	U	35.08 T
C28-TAS(20S)	U	U	23.85 T
C28-TAS(20R)	U	U	20.94 T
C21-MAS	U	U	UT
C22-MAS	U	U	UT
C27-MAS	U	U	UT
C27-20R-MAS	11737.95	U	UT
C27-20S-MAS	4918.55	U	UT
C28-20S-MAS	U	U	UT
C27-C2920S/R-MAS	U	U	UT
C29-20S-MAS	U	U	UT
C29-20R-MAS	U	U	UT
TAS_245	NA	NA	NA
MAS_239	NA	NA	NA

Surrogate Recoveries (%)

5b(H)-Cholane	48709 NME	20141 NME	691 NME

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank
Battelle ID	BJ939PB-P
Sample Type	PB
Collection Date	01/24/07
Extraction Date	01/24/07
Analysis Date	02/10/07
Analytical Instrument	MS
% Moisture	19.52
% Lipid	NA
Matrix	SOIL, TAR
Sample Size	2.44
Size Unit-Basis	G_DRY
Minimum Reporting Limit	8.23
Units	NG/G_DRY

C23 Tricyclic Terpane		U
C29 Tricyclic Terpane -22S		U
C29 Tricyclic Terpane -22R		U
18a(H)-22,29,30-Trisnorneohopane -TS		U
17a(H)-22,29,30-Trisnorhopane -TM		U
30-Norhopane		U
18a(H) & 18b(H)-Oleananes		U
Hopane		U
30-Homohopane -22S		U
30-Homohopane -22R		U
13b(H),17a(H)-20S-Diacholestane		U
13b(H),17a(H)-20R-Diacholestane		U
14a(H),17a(H)-20R-methylcholestane		U
14a(H),17a(H)-20S-Ethylcholestane		U
14a(H),17a(H)-20R-Ethylcholestane		U
C21-TAS		U
C26-TAS(20S)		U
C26,C27-TAS		U
C27-TAS(20R)		U
C28-TAS(20S)		U
C28-TAS(20R)		U
C21-MAS		U
C22-MAS		U
C27-MAS		U
C27-20R-MAS		U
C27-20S-MAS		U
C28-20S-MAS		U
C27-C2920S/R-MAS		U
C29-20S-MAS		U
C29-20R-MAS		U
TAS_245	NA	
MAS_239	NA	

Surrogate Recoveries (%)

5b(H)-Cholane	75

Battelle
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Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	060208-03: Sand, White Quartz, -50+70				
Battelle ID	BJ940LCS-P				
Sample Type	LCS				
Collection Date	01/24/07				
Extraction Date	01/24/07				
Analysis Date	02/10/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	SOIL, TAR				
Sample Size	20.01				
Size Unit-Basis	G_DRY				
Minimum Reporting Limit	1				
Units	NG/G_DRY		Target	% Recovery	Qualifier
C23 Tricyclic Terpane		U			
C29 Tricyclic Terpane -22S		U			
C29 Tricyclic Terpane -22R		U			
18a(H)-22,29,30-Trisnorneohopane -TS		U			
17a(H)-22,29,30-Trisnorhopane -TM		U			
30-Norhopane		U			
18a(H) & 18b(H)-Oleananes		U			
Hopane		U			
30-Homohopane -22S		U			
30-Homohopane -22R		U			
13b(H),17a(H)-20S-Diacholestane		U			
13b(H),17a(H)-20R-Diacholestane		U			
14a(H),17a(H)-20R-methylcholestane		U			
14a(H),17a(H)-20S-Ethylcholestane		U			
14a(H),17a(H)-20R-Ethylcholestane		U			
C21-TAS		U			
C26-TAS(20S)		U			
C26,C27-TAS		U			
C27-TAS(20R)		U			
C28-TAS(20S)		U			
C28-TAS(20R)		U			
C21-MAS		U			
C22-MAS		U			
C27-MAS		U			
C27-20R-MAS		U			
C27-20S-MAS		U			
C28-20S-MAS		U			
C27-C2920S/R-MAS		U			
C29-20S-MAS		U			
C29-20R-MAS		U			
TAS_245	NA				
MAS_239	NA				

Surrogate Recoveries (%)

5b(H)-Cholane	75

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude
Battelle ID	BJ959NSC-P
Sample Type	NSC
Collection Date	01/30/07
Extraction Date	01/30/07
Analysis Date	02/07/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	5.01
Size Unit-Basis	G_OIL
Minimum Reporting Limit	1.3

Units	NG/G_OIL		Target	% Difference	Qualifier
C23 Tricyclic Terpane	43.65		47.76	8.6	
C29 Tricyclic Terpane -22S	12.63		14.70	14.1	
C29 Tricyclic Terpane -22R	13.24		14.64	9.6	
18a(H)-22,29,30-Trisnorneohopane -TS	15.95		15.96	0.1	
17a(H)-22,29,30-Trisnorhopane -TM	24.18		24.82	2.6	
30-Norhopane	73.99		69.58	6.3	
18a(H) & 18b(H)-Oleananes		U			
Hopane	124.37		120.14	3.5	
30-Homohopane -22S	62.52		59.93	4.3	
30-Homohopane -22R	38.83		39.69	2.2	
13b(H),17a(H)-20S-Diacholestane	44.55		44.18	0.8	
13b(H),17a(H)-20R-Diacholestane	25.35		25.52	0.7	
14a(H),17a(H)-20R-methylcholestane	35.49		33.94	4.6	
14a(H),17a(H)-20S-Ethylcholestane	41.61		35.93	15.8	
14a(H),17a(H)-20R-Ethylcholestane	40.28		39.17	2.8	
C21-TAS	18.59				
C26-TAS(20S)	15.53				
C26,C27-TAS	55.26				
C27-TAS(20R)	37.91				
C28-TAS(20S)	31.48				
C28-TAS(20R)	31.26				
C21-MAS	6.09				
C22-MAS	3.54				
C27-MAS	4.73				
C27-20R-MAS	5.98				
C27-20S-MAS	2.57				
C28-20S-MAS	14.9				
C27-C2920S/R-MAS	12.33				
C29-20S-MAS	4.08				
C29-20R-MAS	9.14				
TAS_245	NA				
MAS_239	NA				

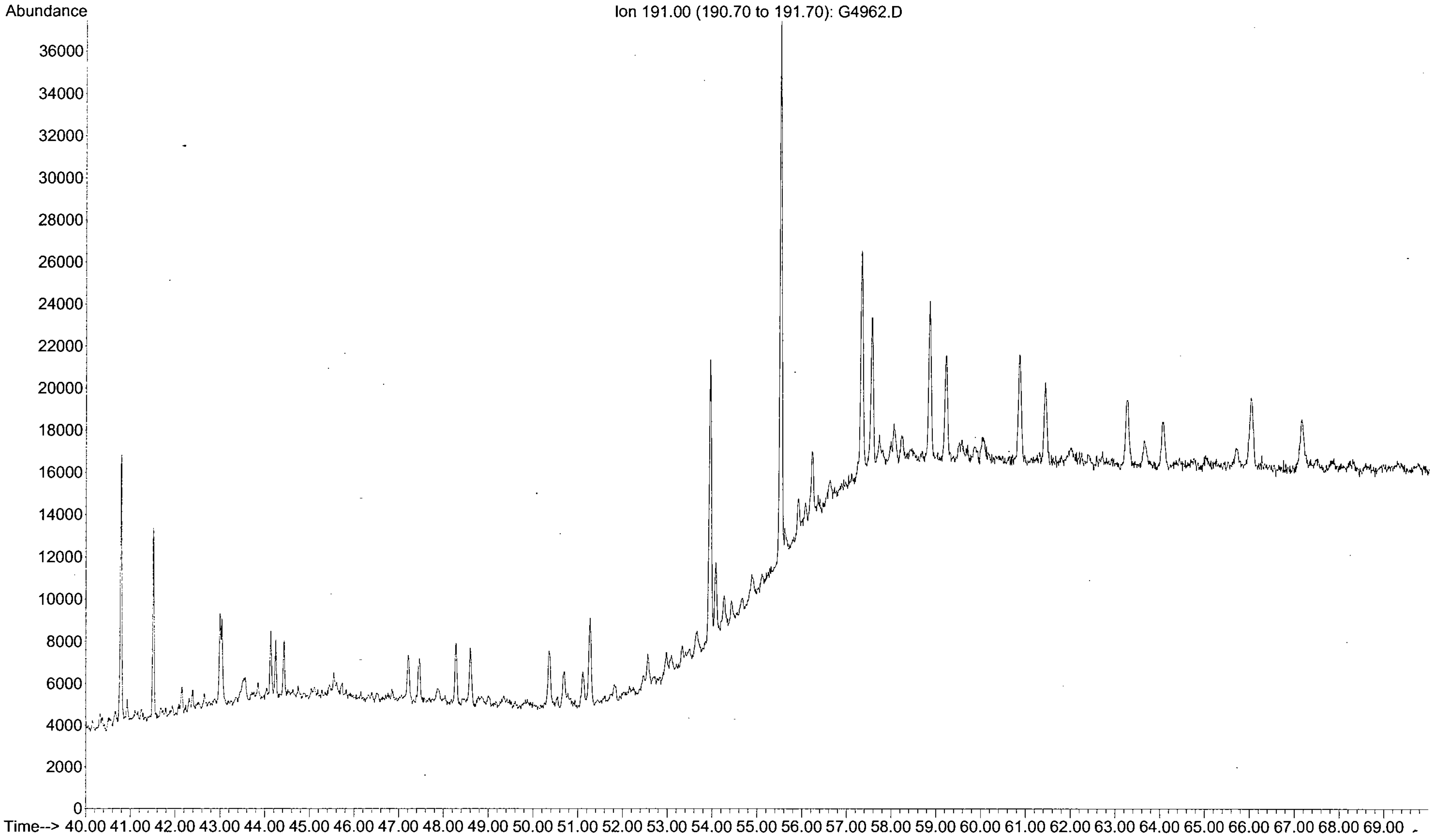
Surrogate Recoveries (%)

5b(H)-Cholane	93

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

File   : G:\G\DATA\SG0319\G4962.D
Operator   : DPB
Acquired   : 7 Feb 2007 10:57 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info   : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4



```
File       : G:\G\DATA\SG0319\G4963.D
Operator   : DPB
Acquired   :  8 Feb 2007  12:50 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5528-P-A-MS-D(15)
Misc Info  : GWP07T05 5-157 07-0010
Vial Number: 5
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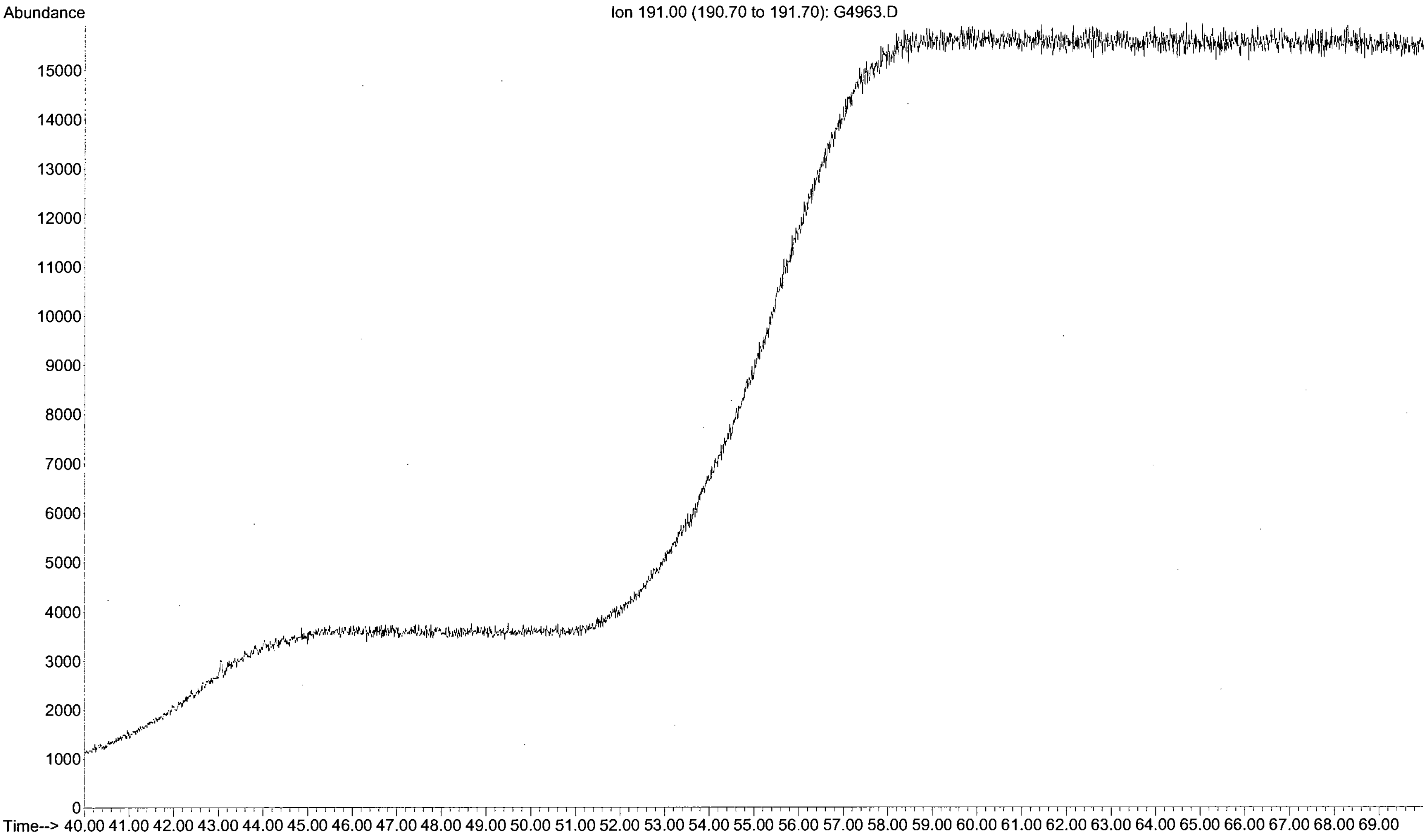

```
File       : G:\G\DATA\SG0319\G4964.D
Operator   : DPB
Acquired   :  8 Feb 2007   2:10 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5529-P-A-MS-D(15)
Misc Info  : GWP07T06 5-157 07-0010
Vial Number: 6
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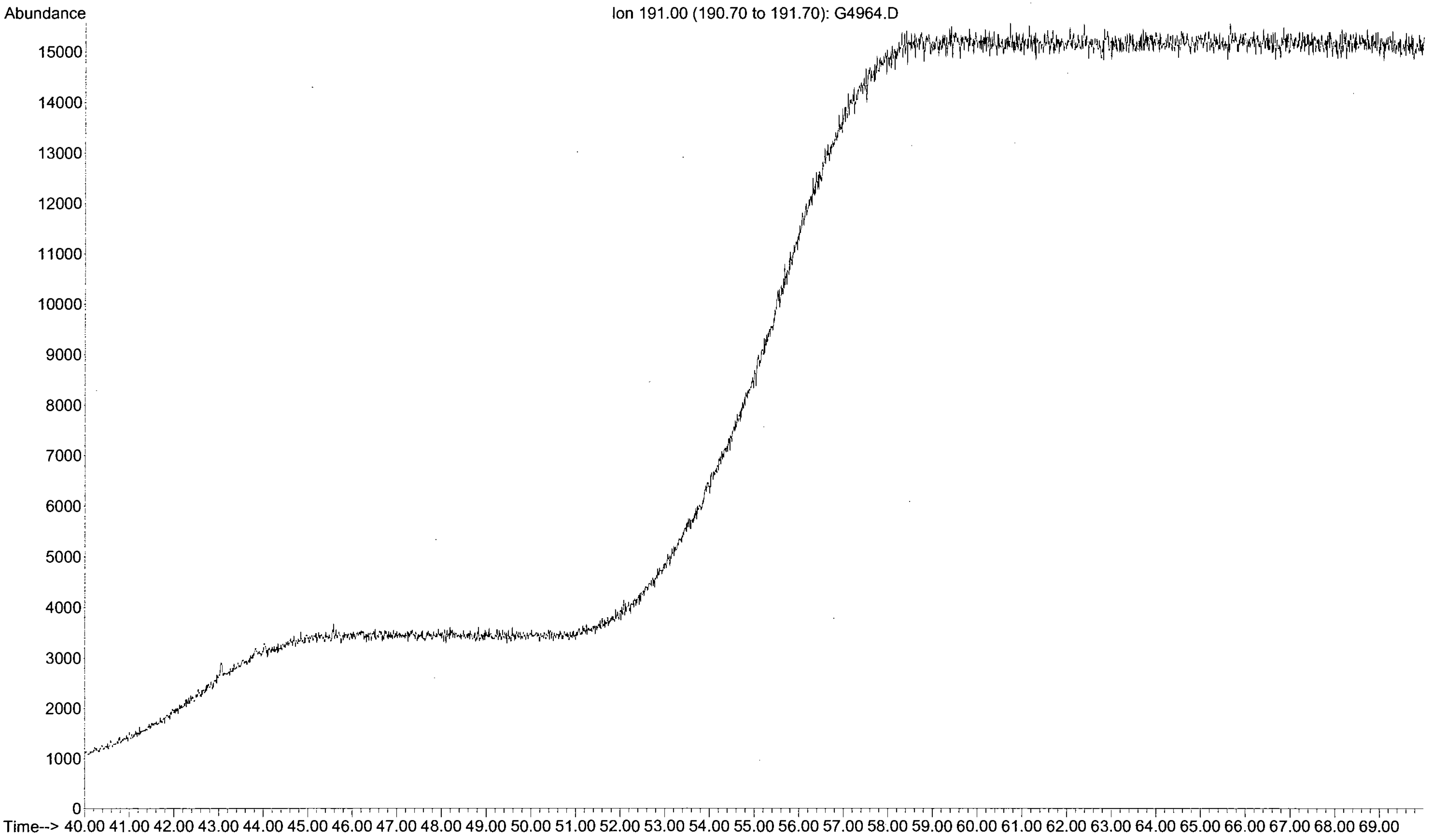
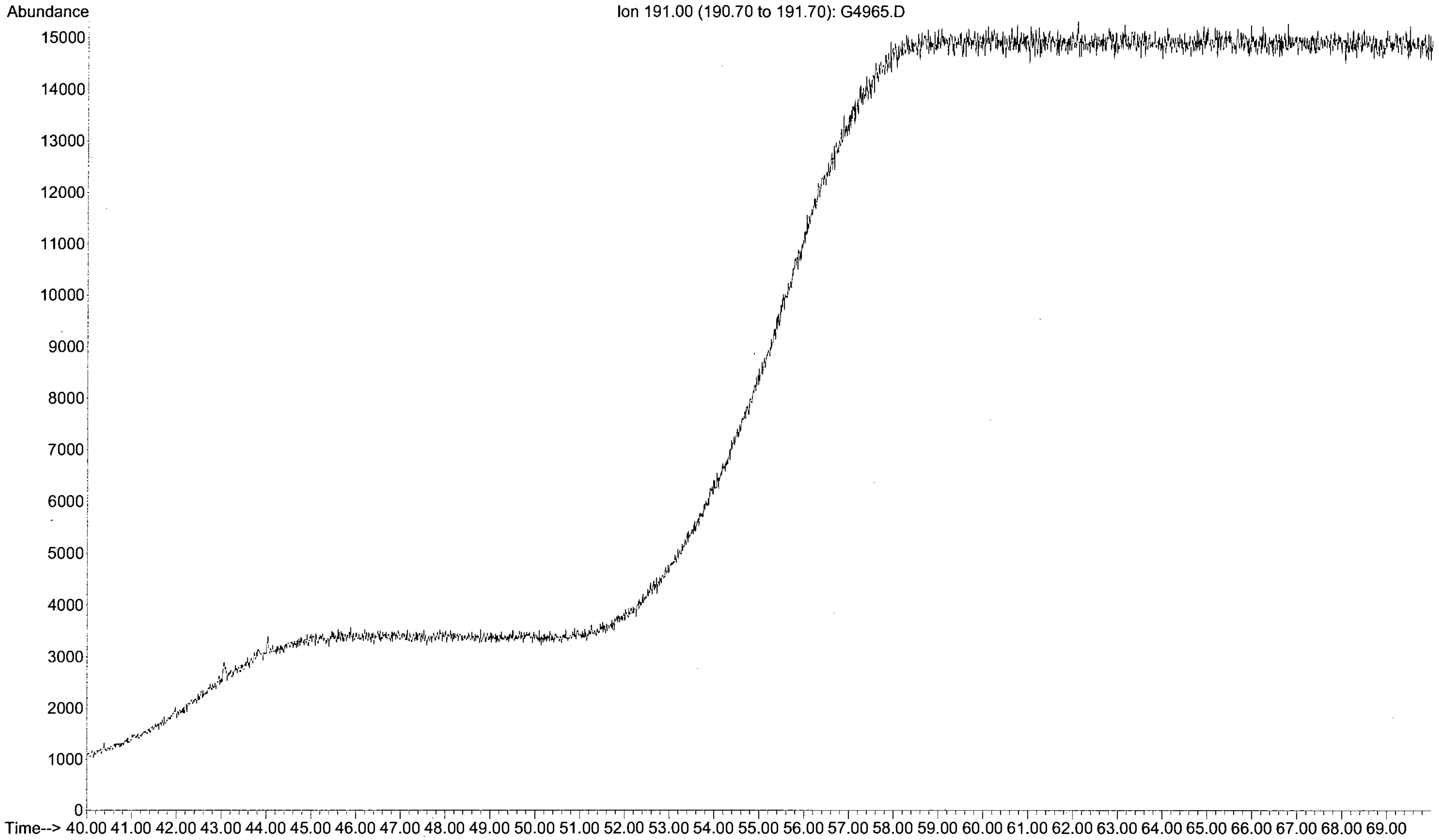
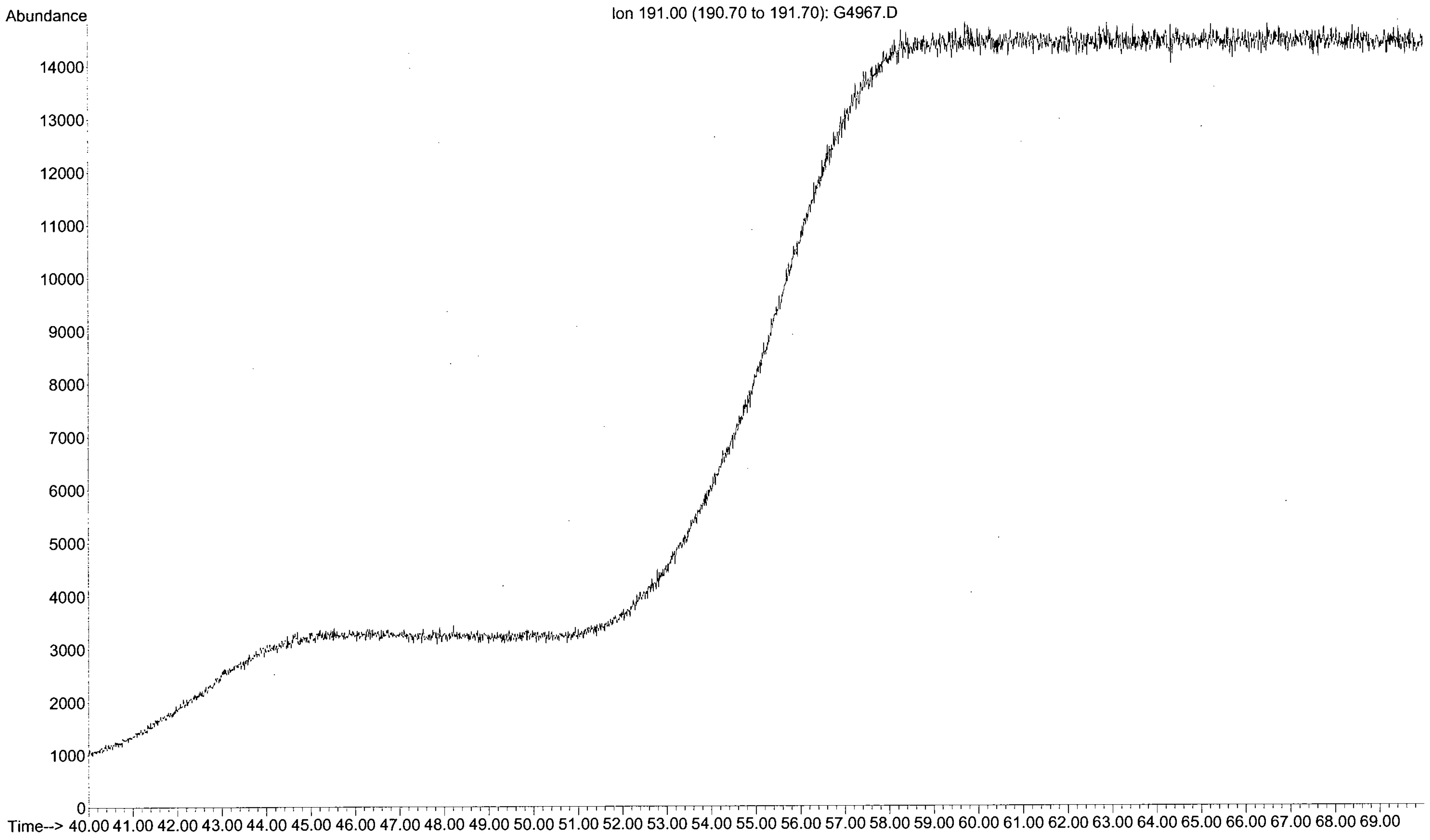


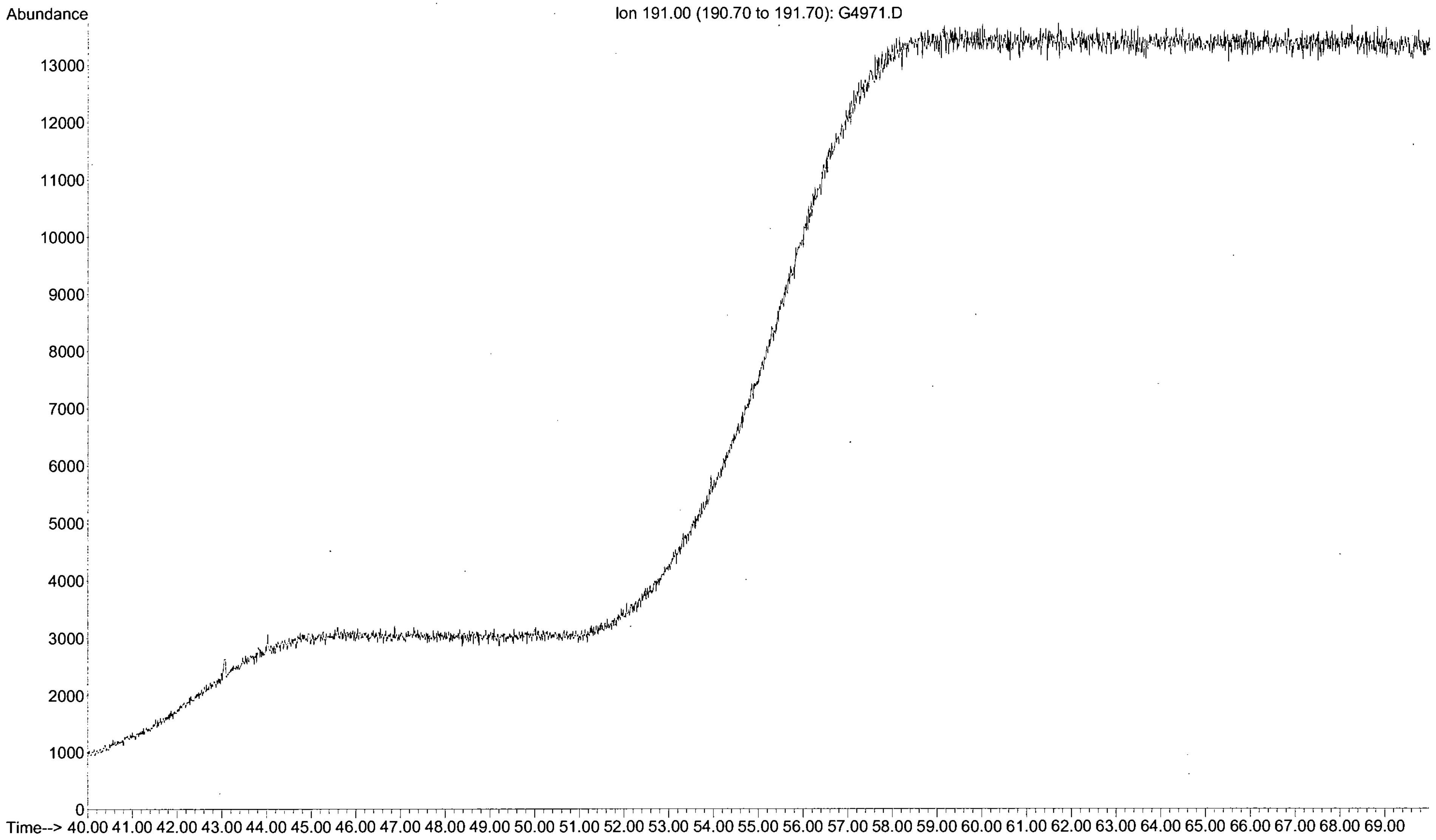
```
File       : G:\G\DATA\SG0319\G4965.D
Operator   : DPB
Acquired   :  8 Feb 2007   3:31 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5530-P-MS-D(13)
Misc Info  : GWP07T07 5-157 07-0010
Vial Number: 7
```



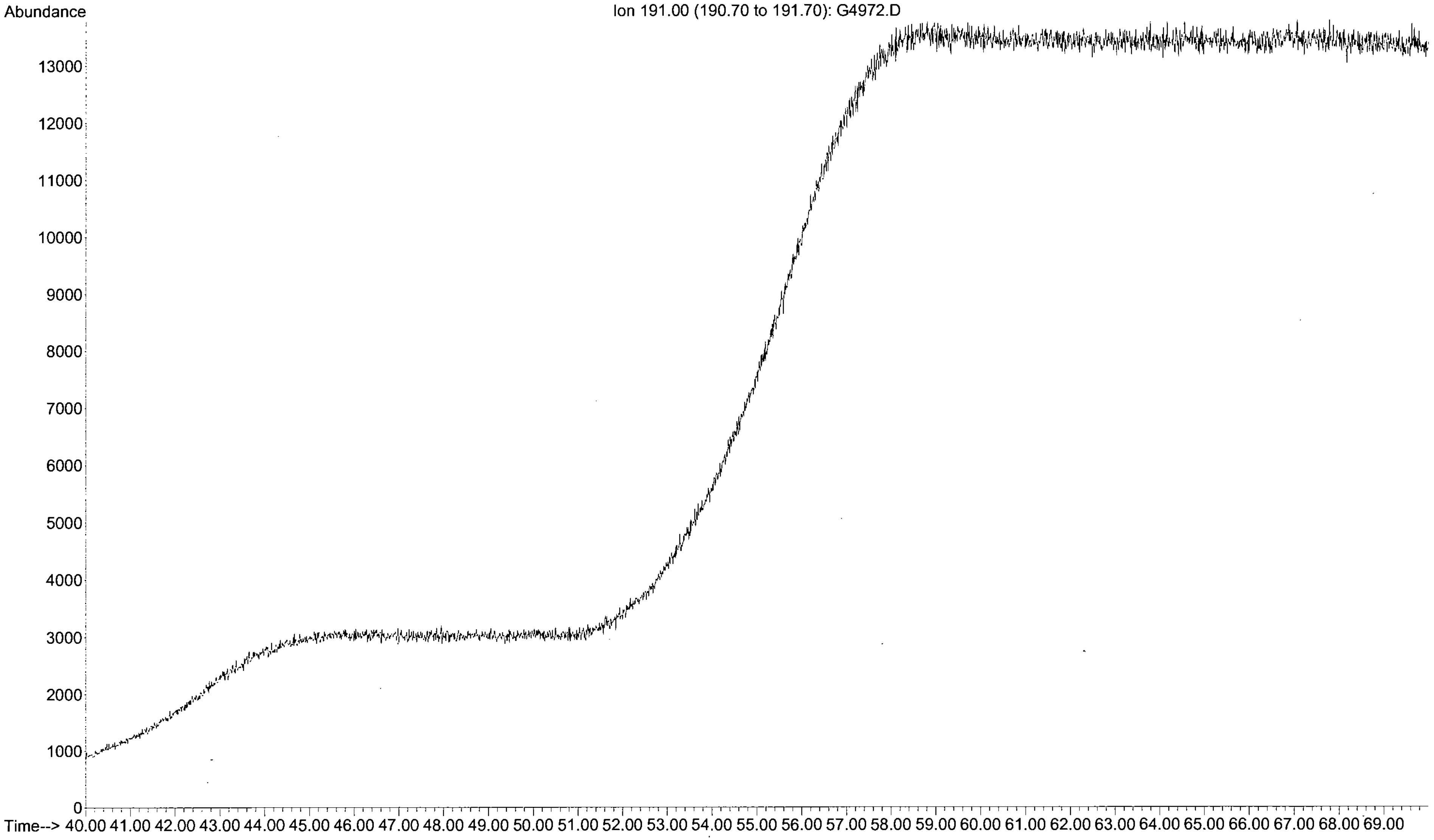
```
File        : G:\G\DATA\SG0319\G4967.D
Operator    : DPB
Acquired    :  8 Feb 2007   6:14 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5532-P-MS-D(13)
Misc Info   : GWP07T09 5-157 07-0010
Vial Number: 9
```



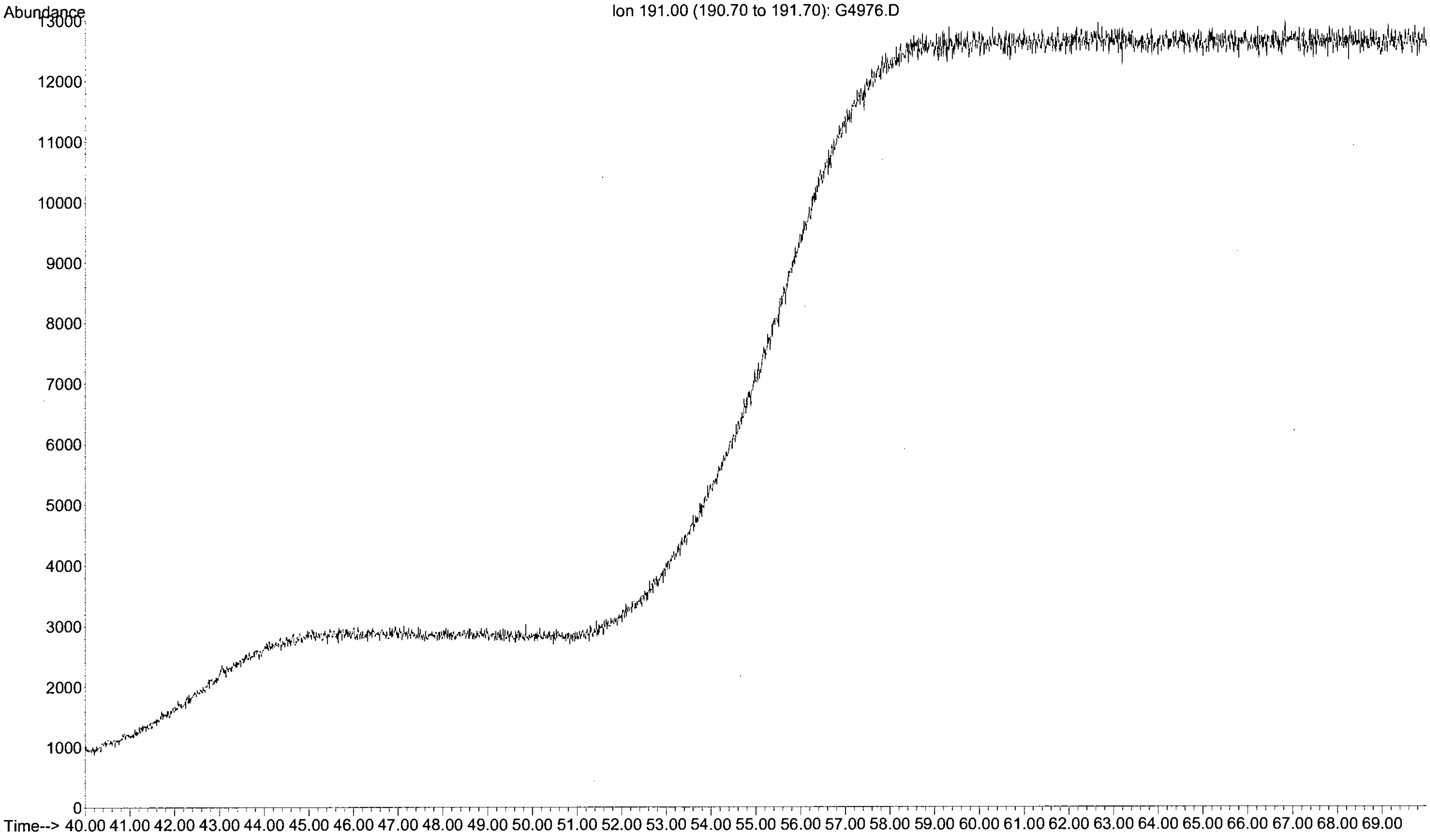
```
File       : G:\G\DATA\SG0319\G4971.D
Operator   : DPB
Acquired   :  8 Feb 2007  11:43 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5535-P-MS-D(13)
Misc Info  : GWP07T12 5-157 07-0010
Vial Number: 13
```



```
File        : G:\G\DATA\SG0319\G4972.D
Operator    : DPB
Acquired    :  8 Feb 2007   5:37 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5539-P-MS-D(13)
Misc Info   : GWP07S02 5-157 07-0010
Vial Number: 14
```



```
File       : G:\G\DATA\SG0319\G4976.D
Operator   : DPB
Acquired   :  8 Feb 2007  11:03 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5541-P-MS-D(13)
Misc Info  : GWP07S04 5-157 07-0010
Vial Number: 18
```



```
File        : G:\G\DATA\SG0319\G4977.D
Operator    : DPB
Acquired    :  9 Feb 2007  12:25 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5542-P-MS-D(13)
Misc Info   : TDW3-4.5 5-157 07-0010
Vial Number: 19
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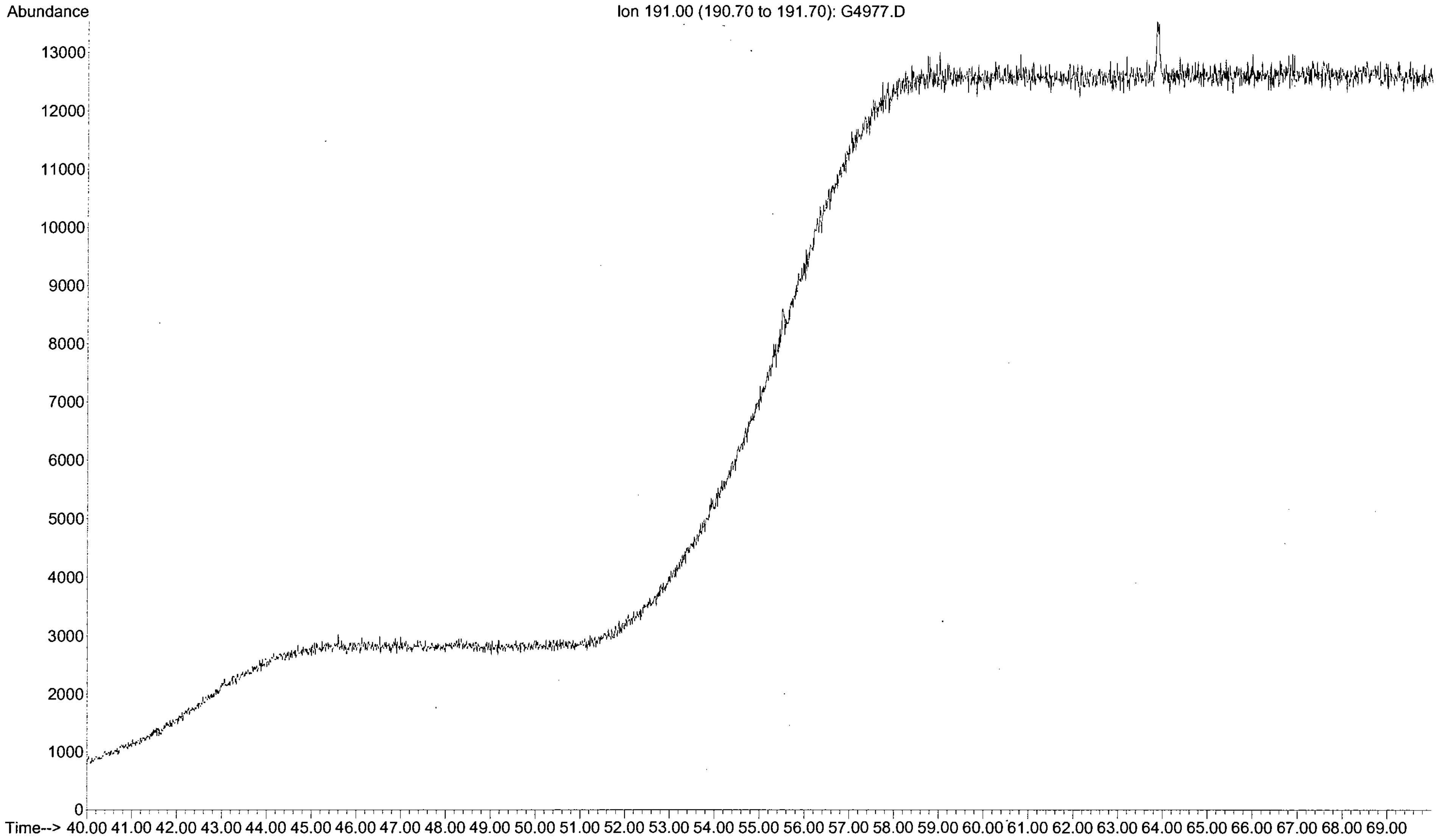
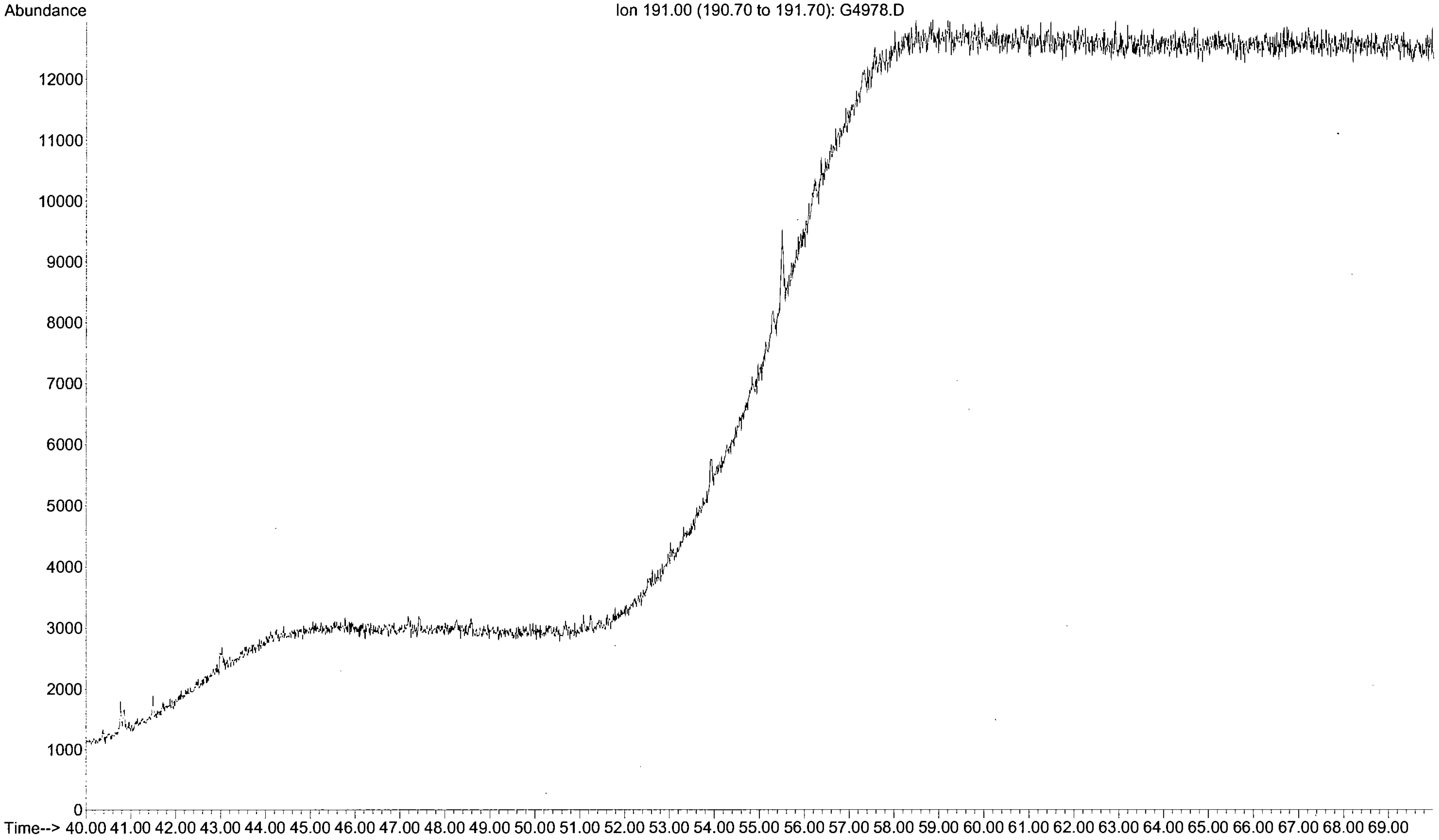
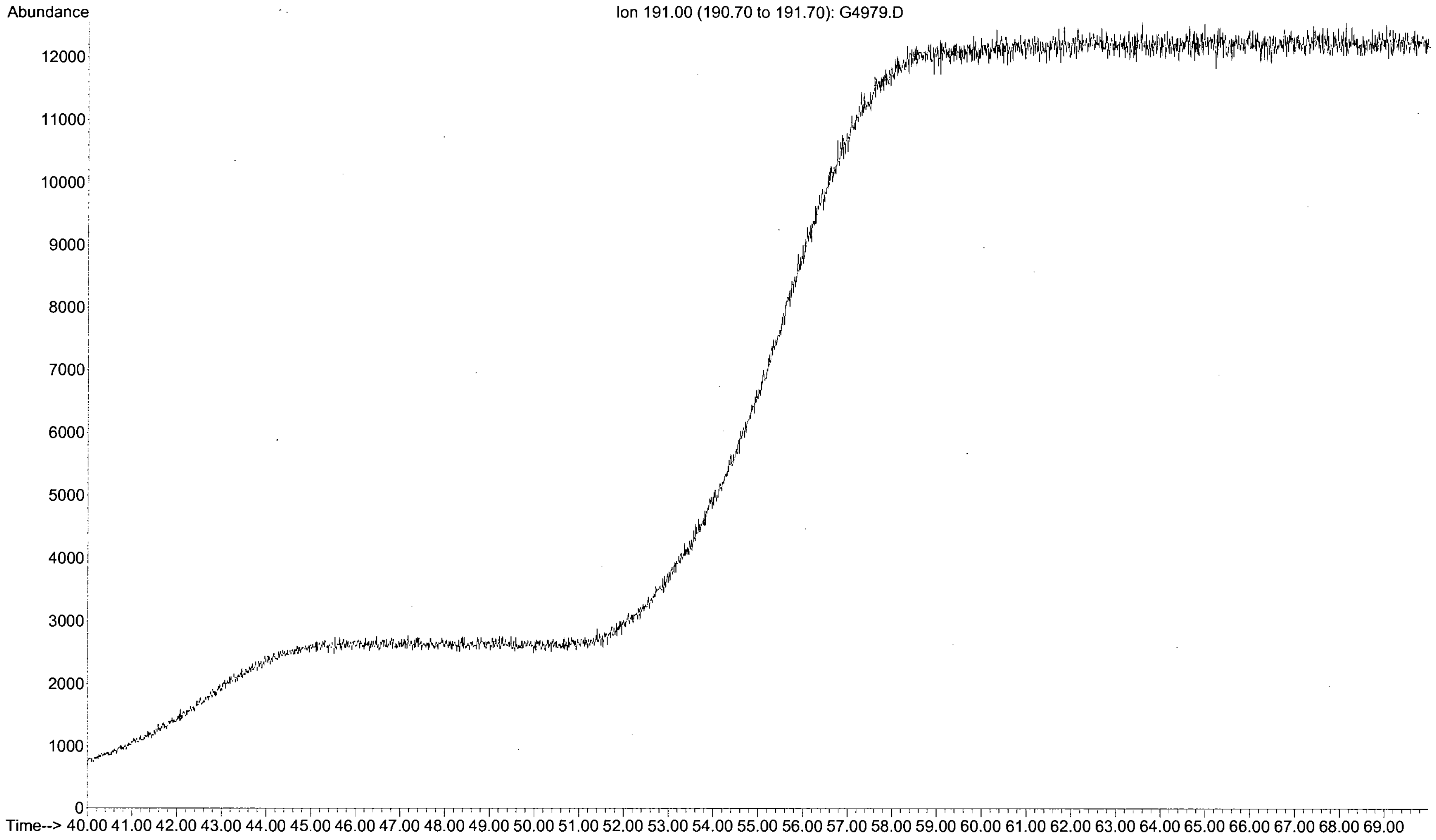


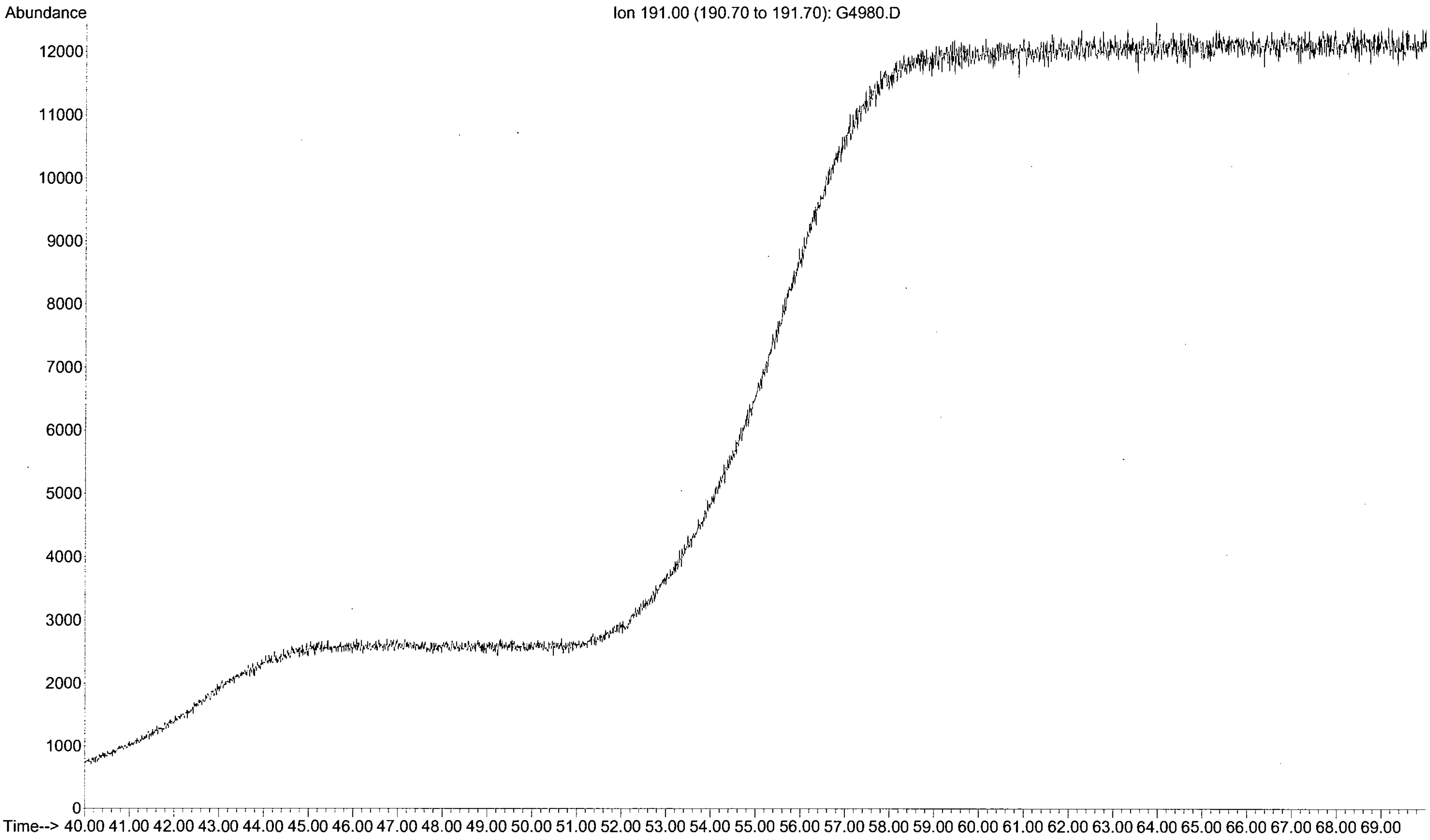
```
File       : G:\G\DATA\SG0319\G4978.D
Operator   : DPB
Acquired   :  9 Feb 2007   1:47 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5537-P-MS-D(11)
Misc Info  : GWP07T14 5-157 07-0010
Vial Number: 20
```



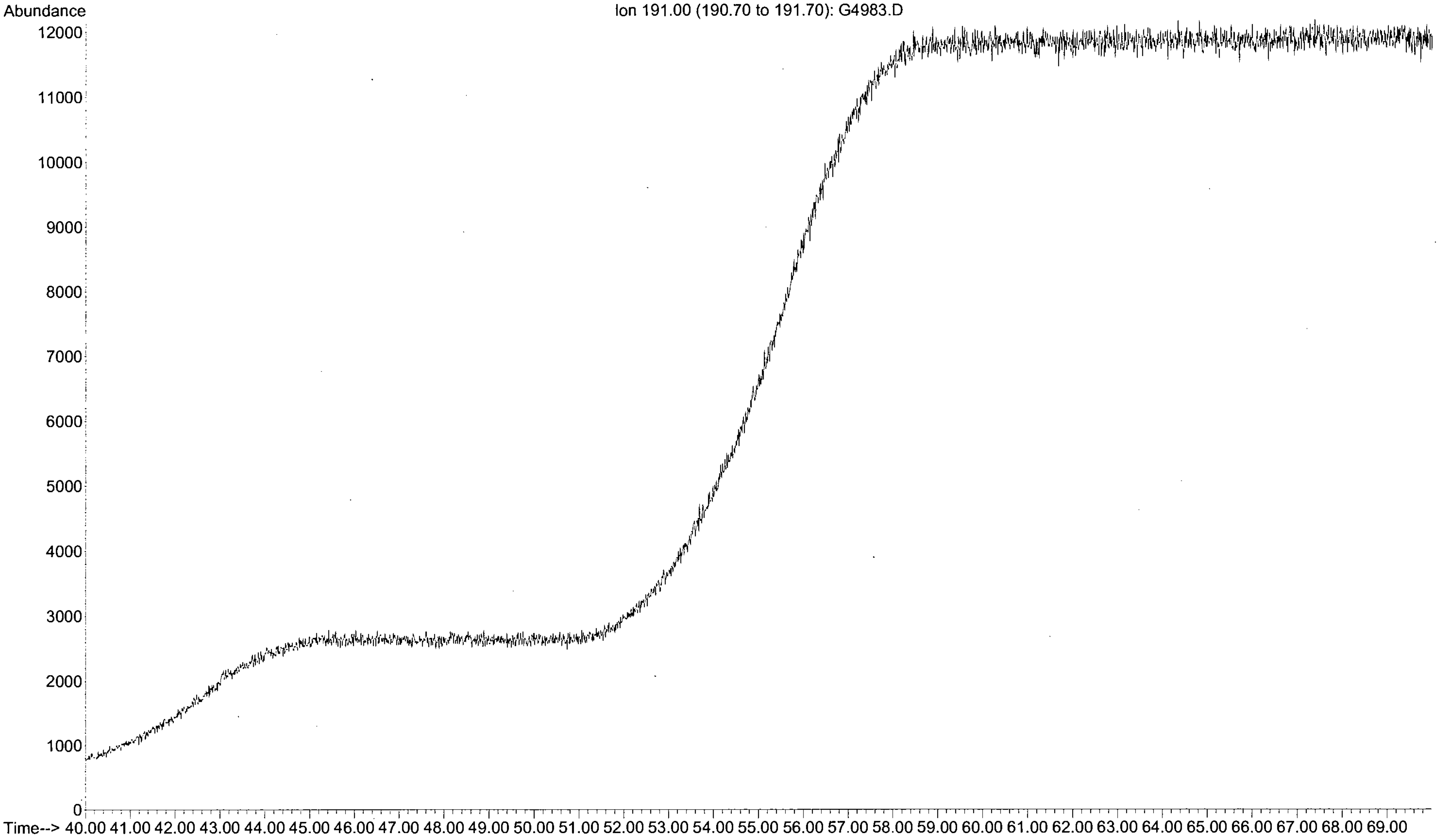
```
File       : G:\G\DATA\SG0319\G4979.D
Operator   : DPB
Acquired   :  9 Feb 2007   3:10 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5526-P-MS-D(15)
Misc Info  : GWP07T03 5-157 07-0010
Vial Number: 21
```



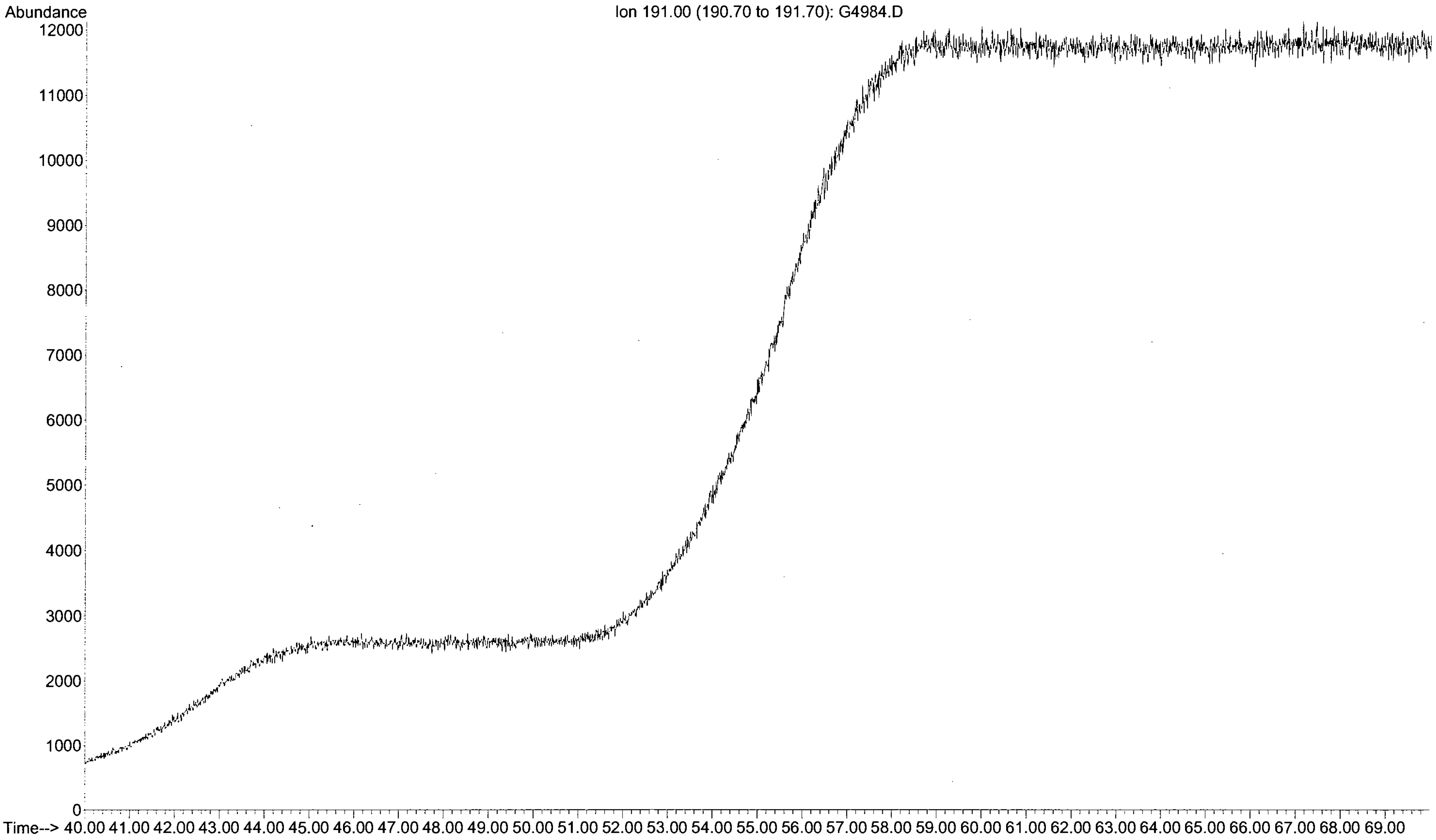
```
File       : G:\G\DATA\SG0319\G4980.D
Operator   : DPB
Acquired   :  9 Feb 2007   4:34 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS-D(15)
Misc Info  : GWP07T04 5-157 07-0010
Vial Number: 22
```


Ion 191.00 (190.70 to 191.70): G4980.D

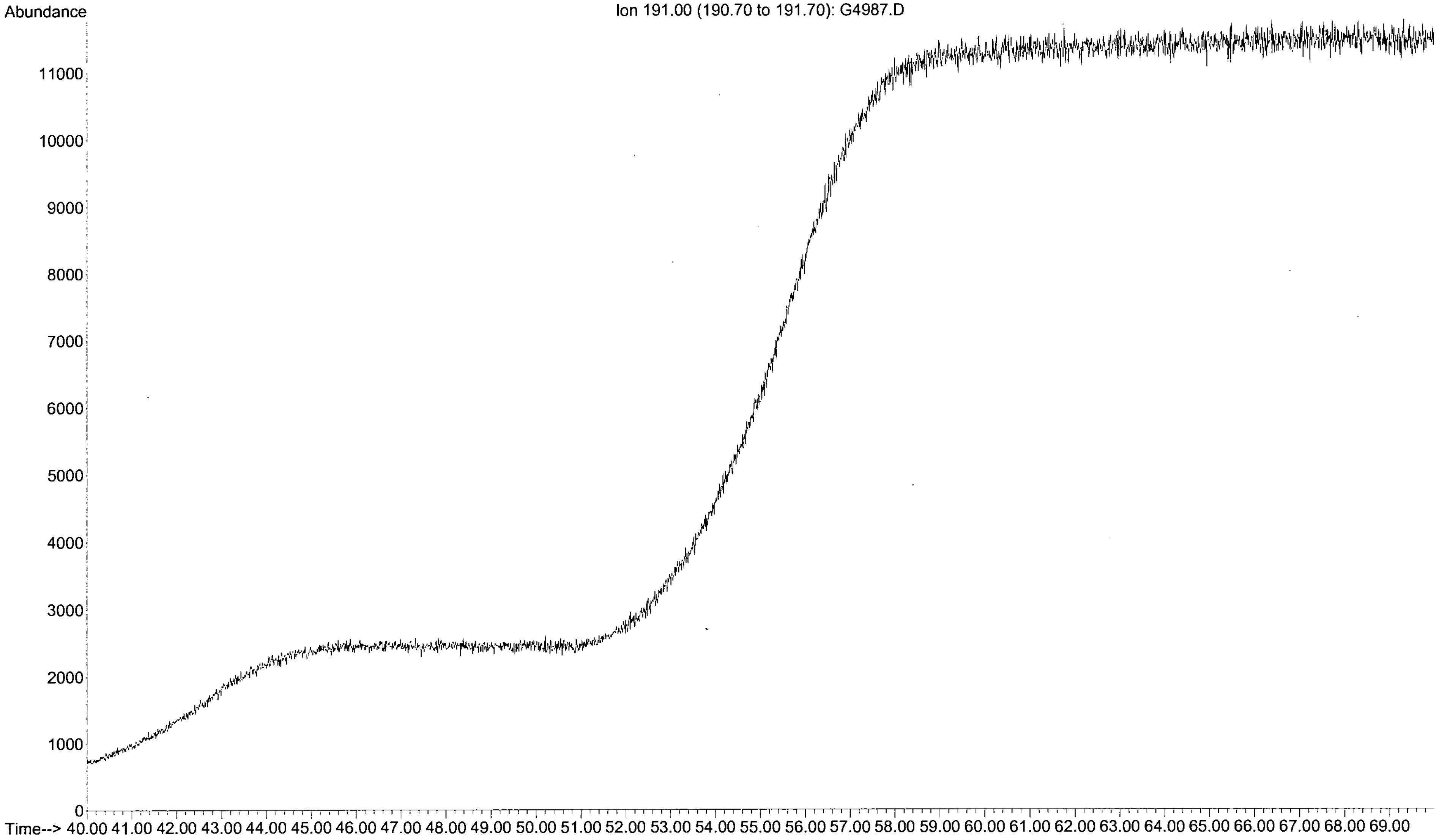
```
File        : G:\G\DATA\SG0319\G4983.D
Operator    : DPB
Acquired    :  9 Feb 2007   8:41 am using AcqMethod BIOPLUS
Instrument  :    Inst. G
Sample Name: R5536-P-MS-D(13)
Misc Info   : GWP07T13 5-157 07-0010
Vial Number: 25
```



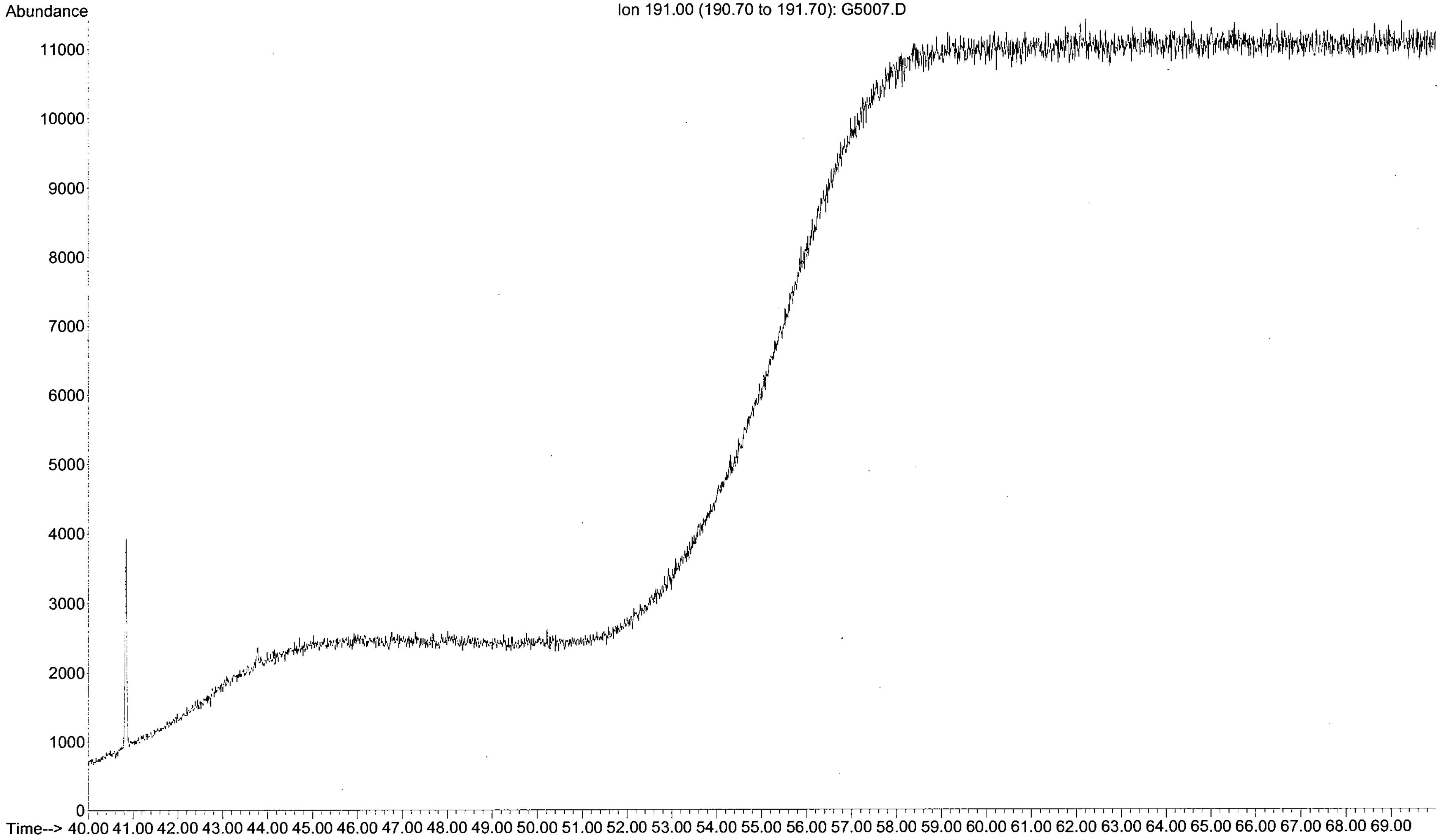
```
File       : G:\G\DATA\SG0319\G4984.D
Operator   : DPB
Acquired   :  9 Feb 2007  10:03 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5538-P-MS-D(13)
Misc Info  : GWP07S01 5-157 07-0010
Vial Number: 26
```



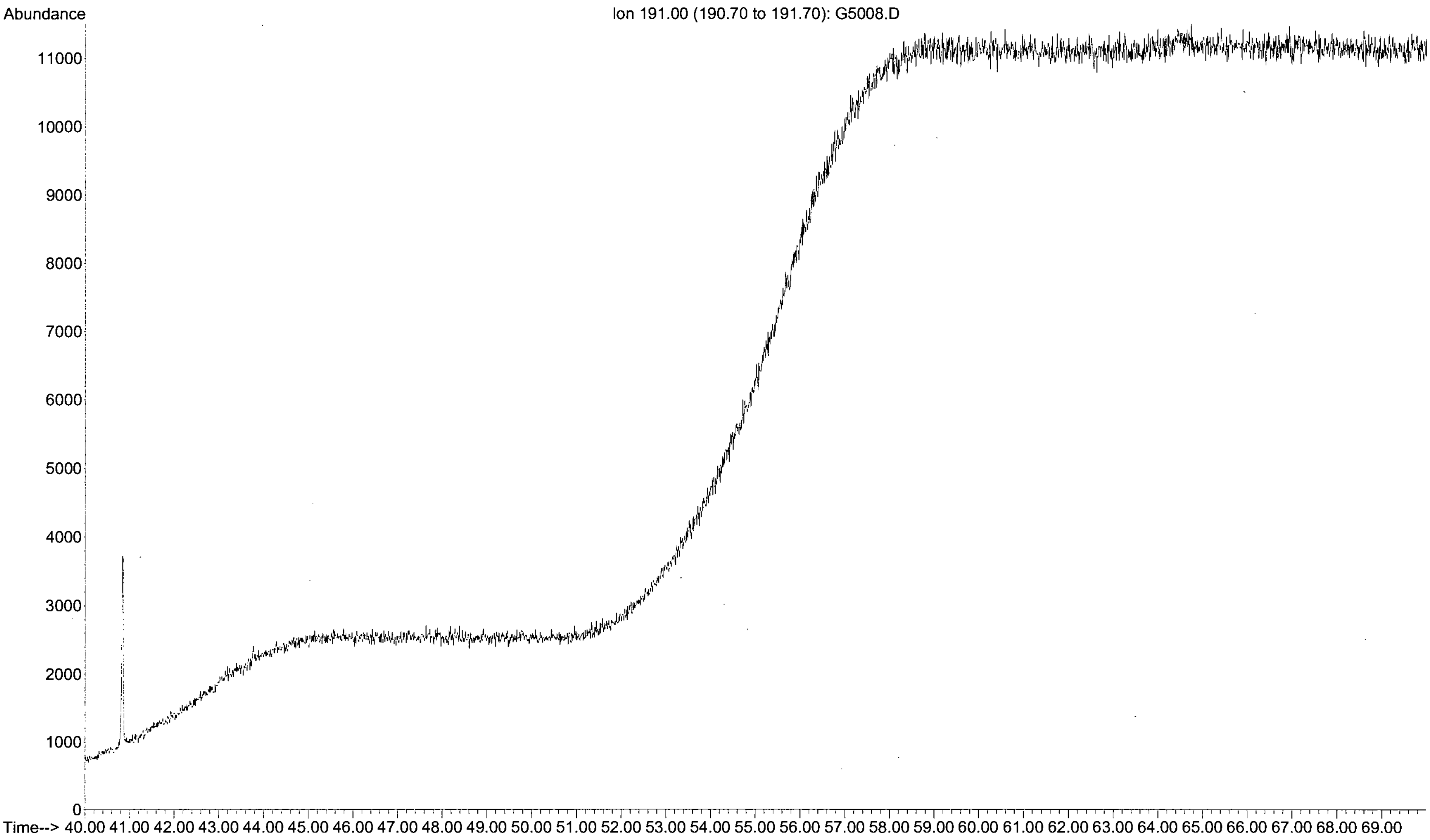
```
File        : G:\G\DATA\SG0319\G4987.D
Operator    : DPB
Acquired    :  9 Feb 2007   2:08 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5533-P-MS-D(13)
Misc Info   : GWP07T10 5-157 07-0010
Vial Number: 29
```



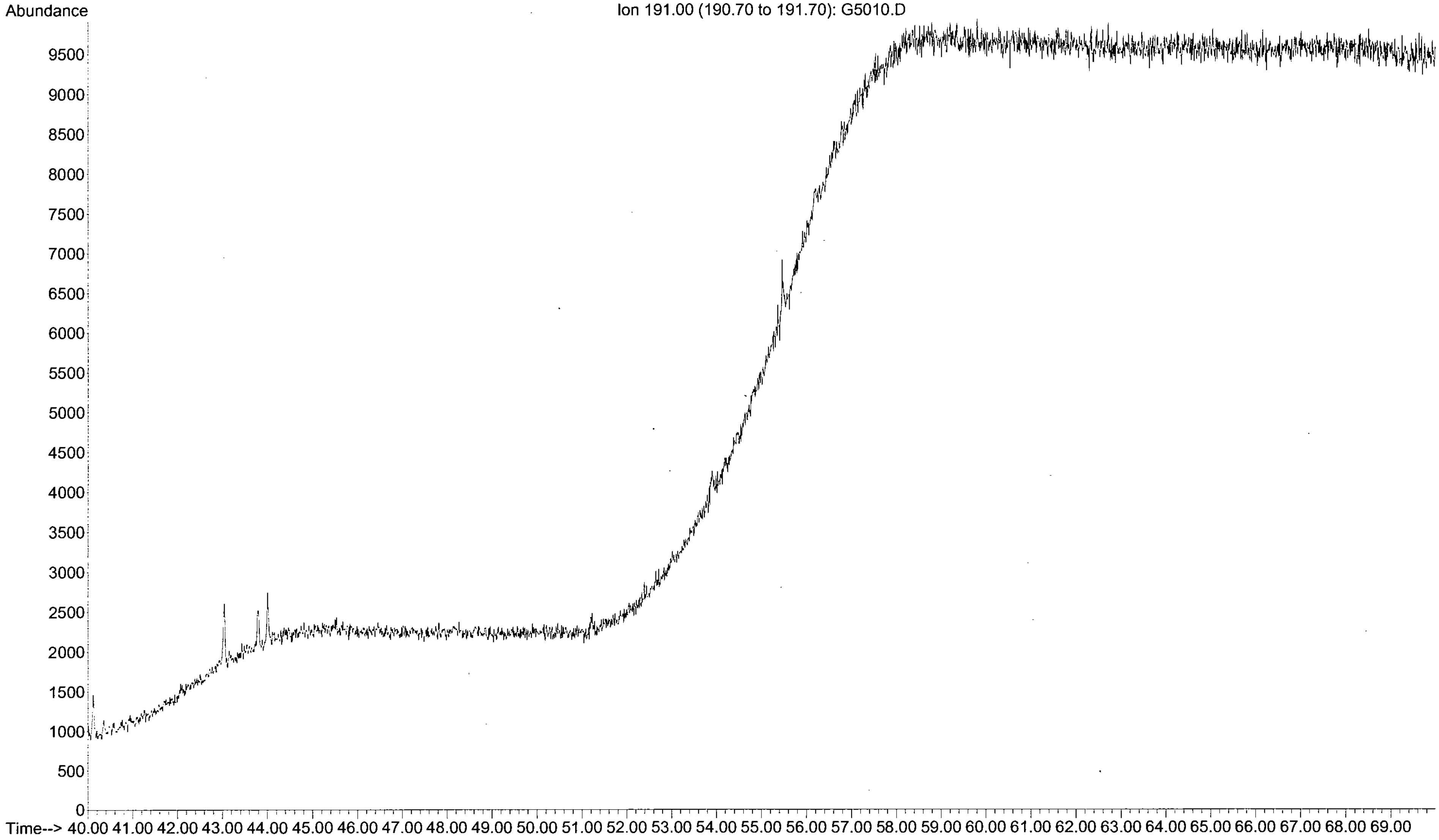
```
File       : G:\G\DATA\SG0319\G5007.D
Operator   : DPB
Acquired   : 10 Feb 2007   5:18 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ939PB-P-MS(5)
Misc Info  : Procedural Blank 5-157 07-0010
Vial Number: 49
```



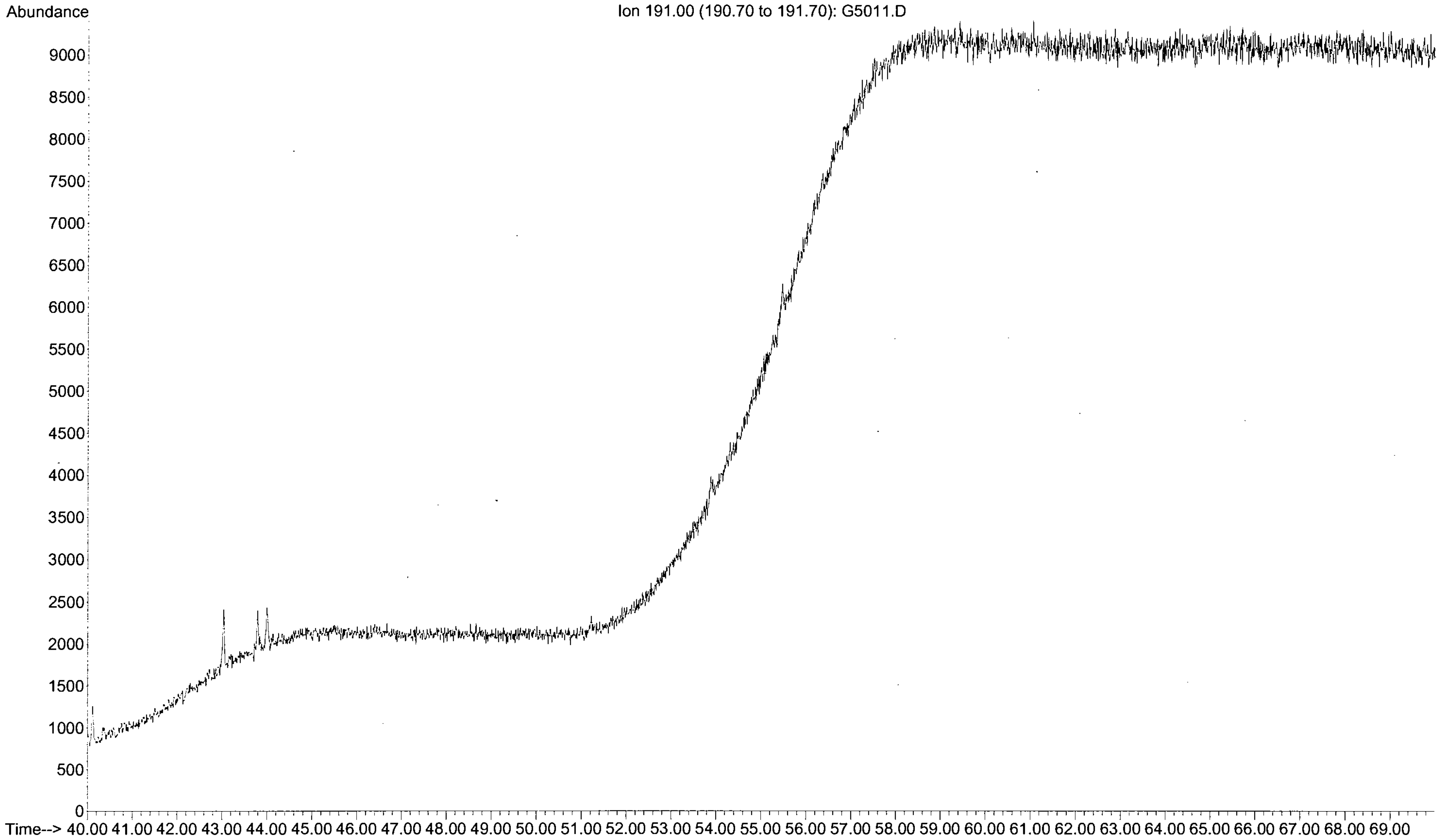
```
File       : G:\G\DATA\SG0319\G5008.D
Operator   : DPB
Acquired   : 10 Feb 2007   6:37 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ940LCS-P-MS(5)
Misc Info  : Laboratory Control Sample 5-157 07-0010
Vial Number: 50
```



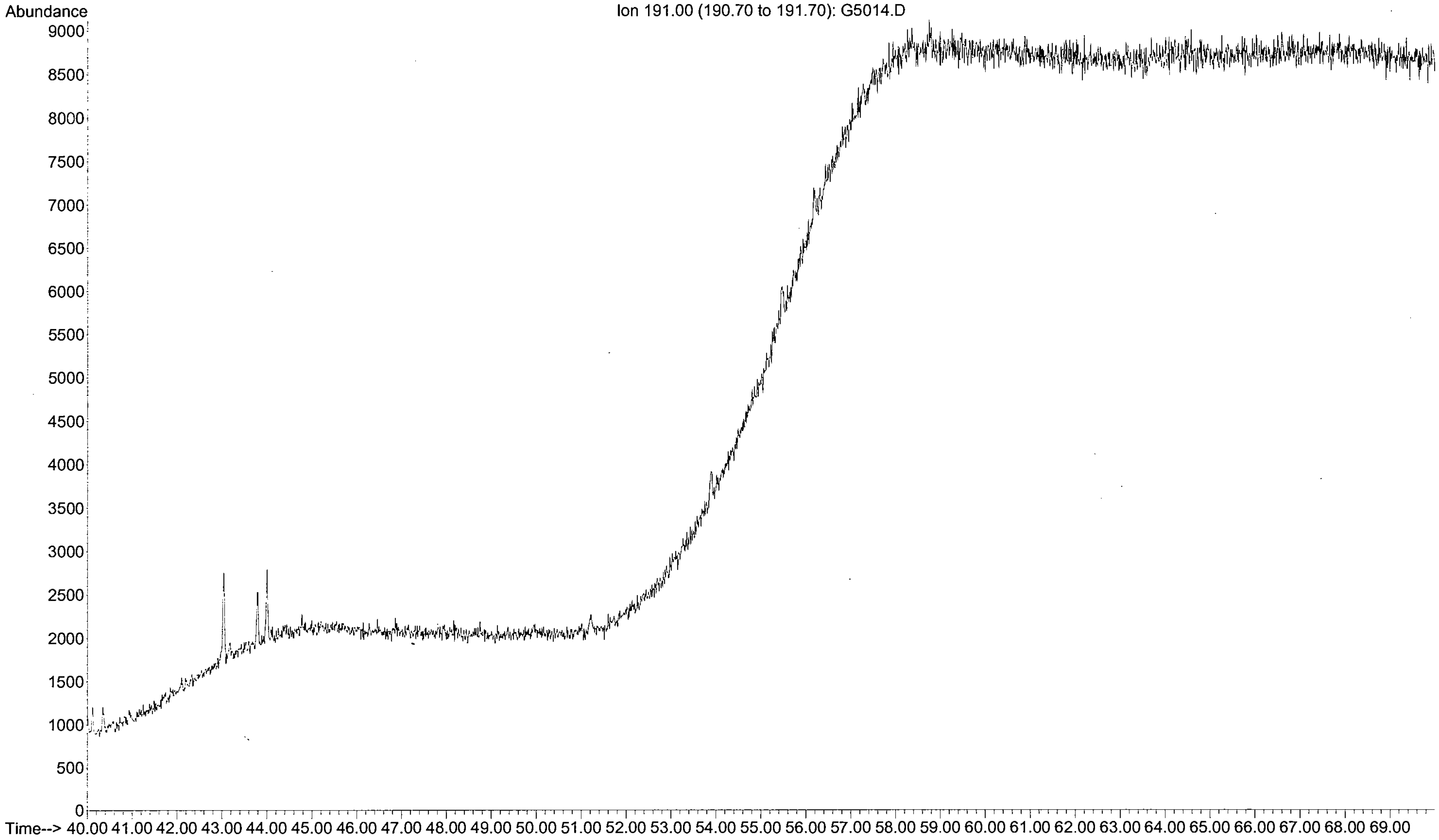
```
File        : G:\G\DATA\SG0319\G5010.D
Operator    : DPB
Acquired    : 10 Feb 2007   9:21 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5525-P-MS(12)
Misc Info   : GWP07T02 5-157 07-0010
Vial Number: 52
```



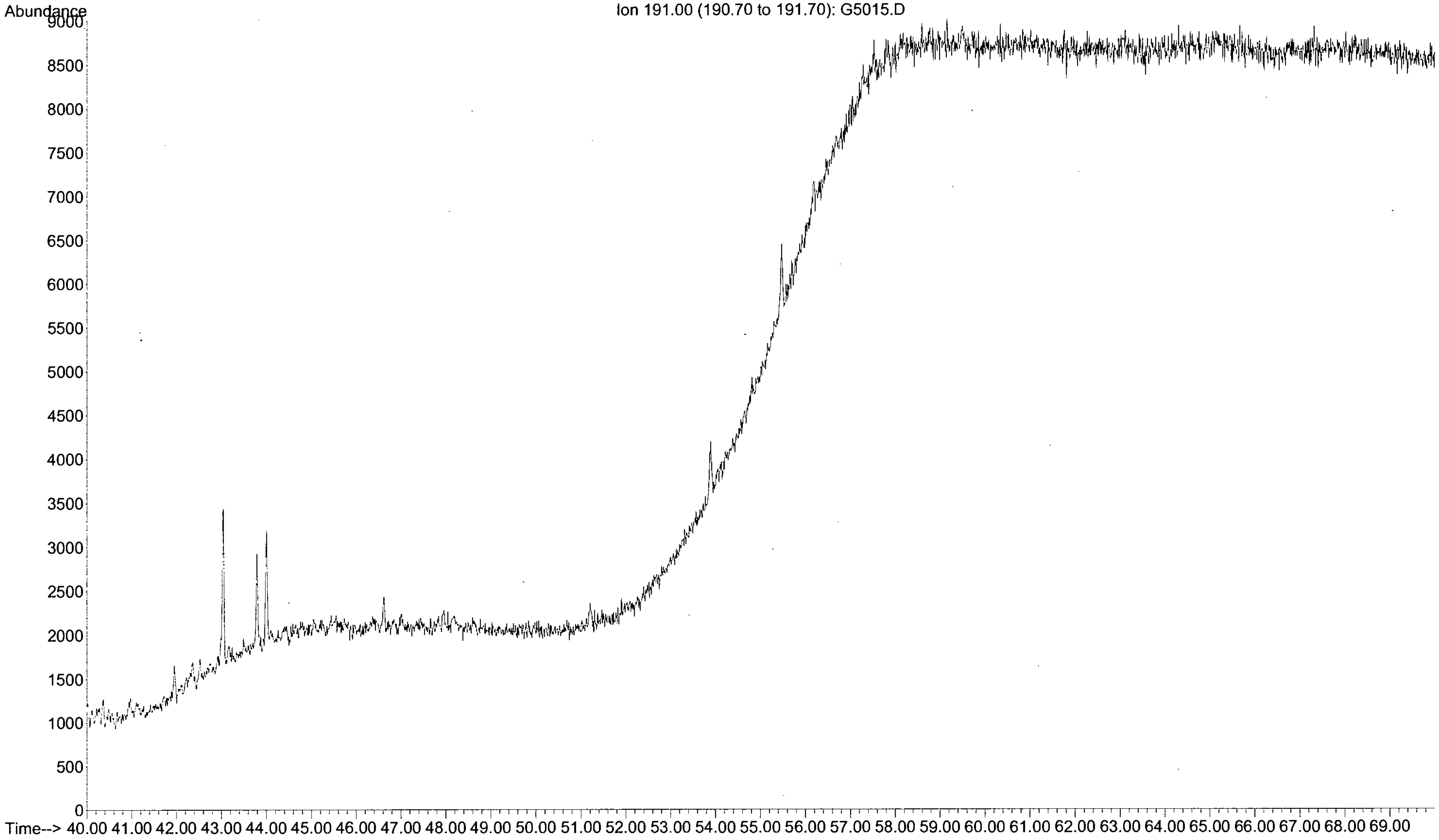
```
File        : G:\G\DATA\SG0319\G5011.D
Operator    : DPB
Acquired    : 10 Feb 2007  10:43 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5526-P-MS(12)
Misc Info   : GWP07T03 5-157 07-0010
Vial Number: 53
```



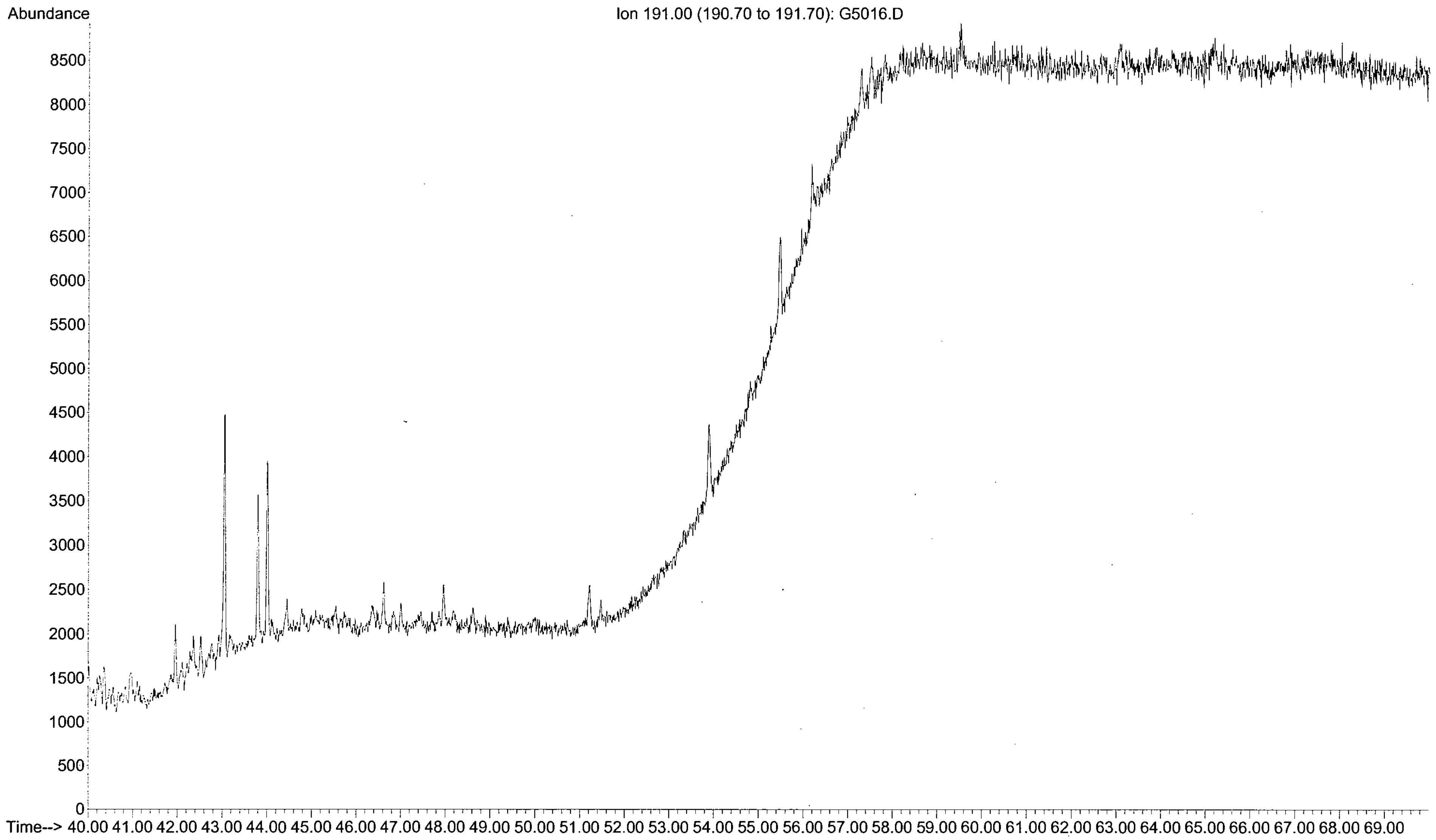
```
File       : G:\G\DATA\SG0319\G5014.D
Operator   : DPB
Acquired   : 11 Feb 2007   2:47 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS(12)
Misc Info  : GWP07T04 5-157 07-0010
Vial Number: 56
```



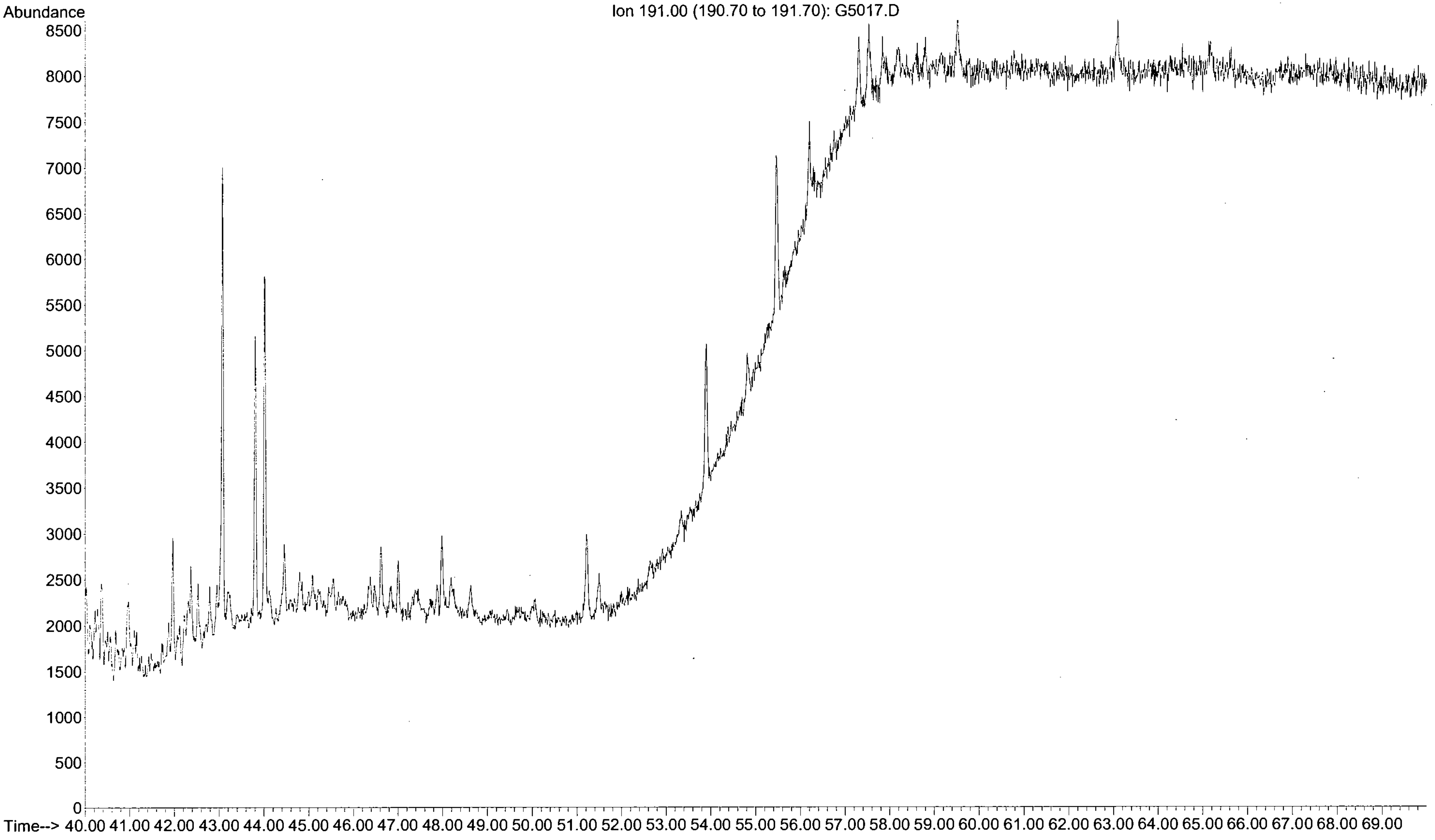
```
File        : G:\G\DATA\SG0319\G5015.D
Operator    : DPB
Acquired    : 11 Feb 2007   4:09 am using AcqMethod BIOPLUS
Instrument  :    Inst. G
Sample Name: R5528-P-A-MS(14)
Misc Info   : GWP07T05 5-157 07-0010
Vial Number: 57
```



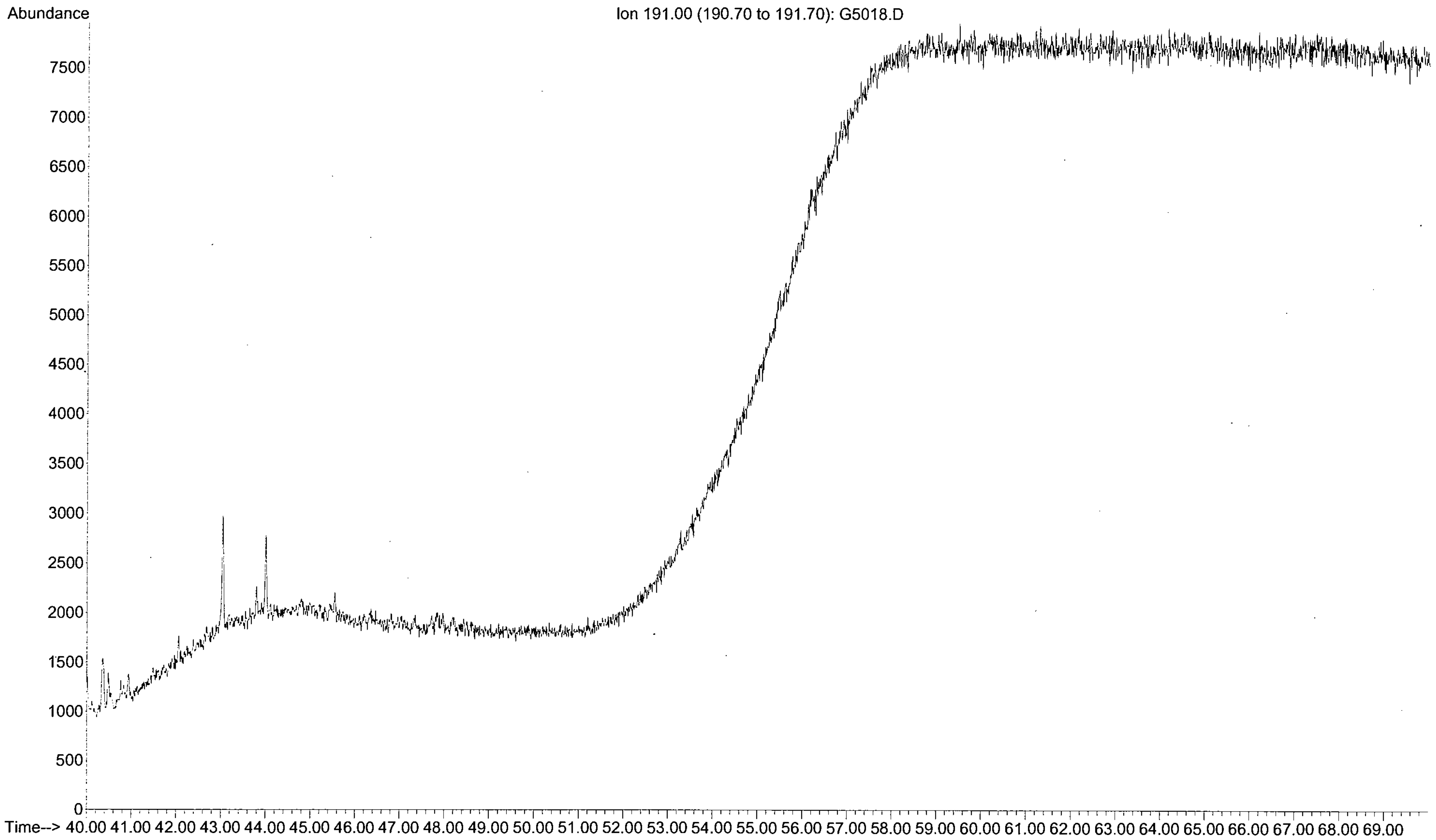
```
File        : G:\G\DATA\SG0319\G5016.D
Operator    : DPB
Acquired    : 11 Feb 2007   5:31 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5529-P-A-MS(14)
Misc Info   : GWP07T06 5-157 07-0010
Vial Number: 58
```



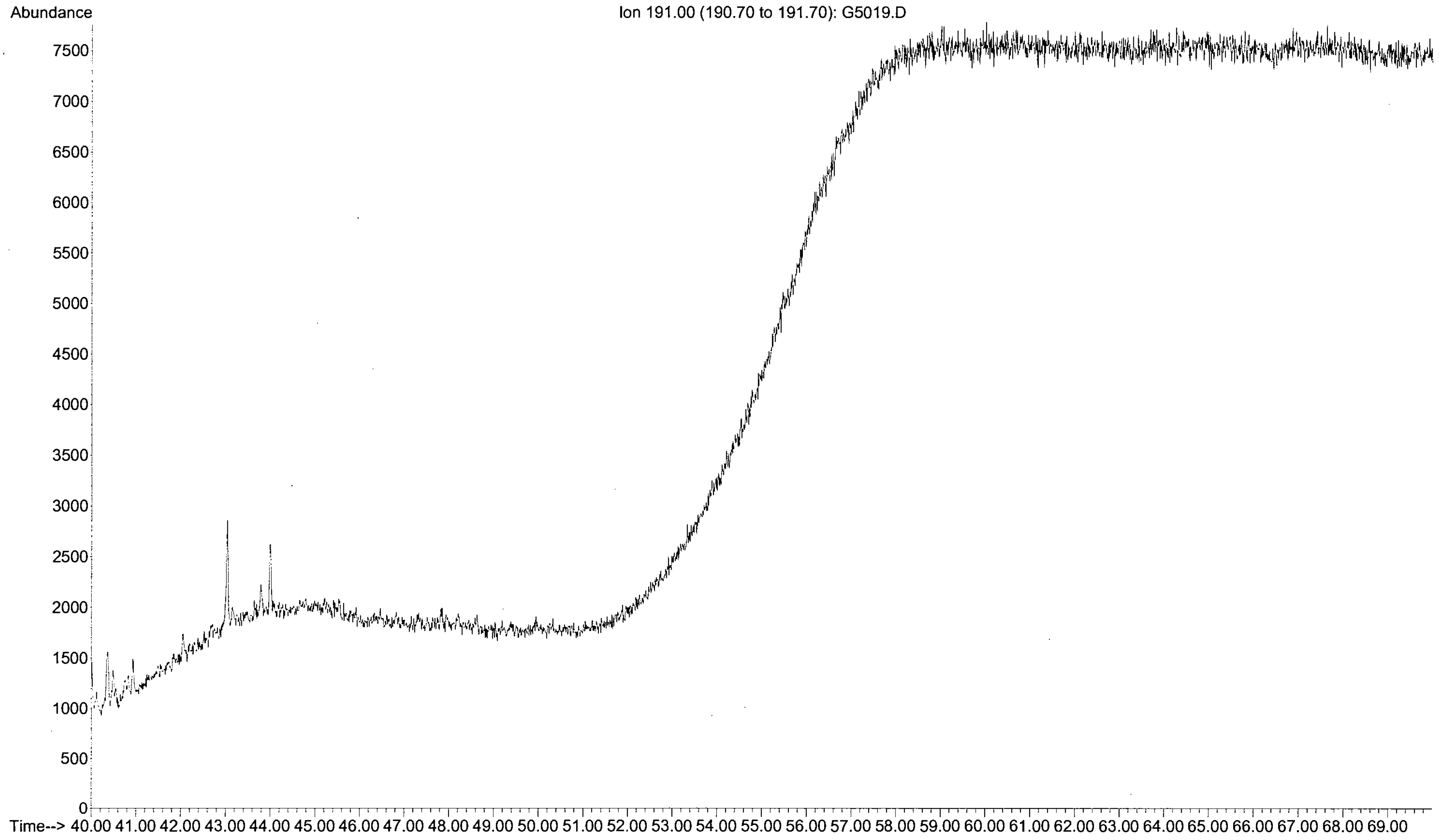
```
File        : G:\G\DATA\SG0319\G5017.D
Operator    : DPB
Acquired    : 11 Feb 2007   6:53 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5530-P-MS(12)
Misc Info   : GWP07T07 5-157 07-0010
Vial Number: 59
```



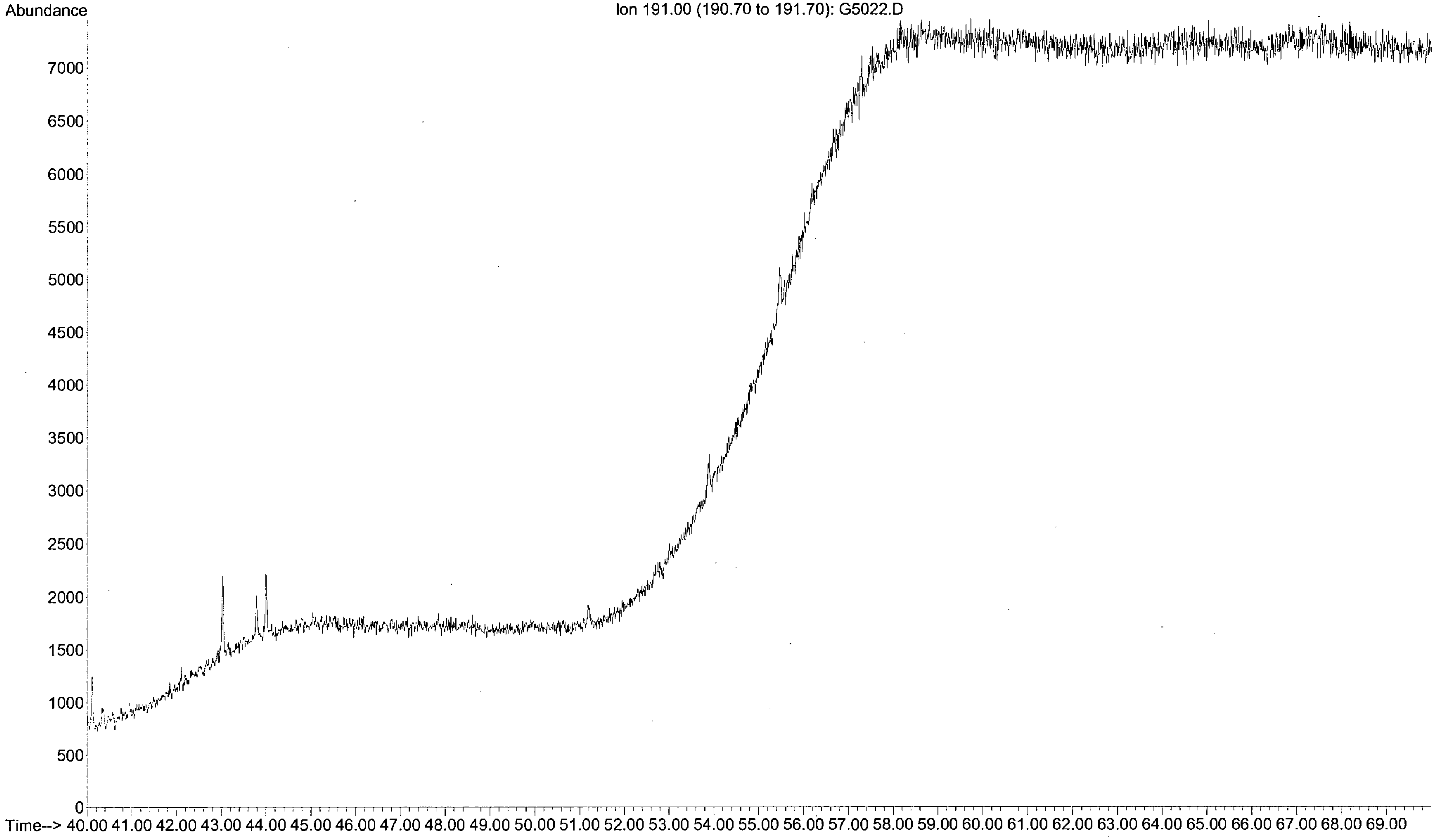
```
File       : G:\G\DATA\SG0319\G5018.D
Operator   : DPB
Acquired   : 11 Feb 2007   8:15 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5531-P-MS(12)
Misc Info  : GWP07T08 5-157 07-0010
Vial Number: 60
```



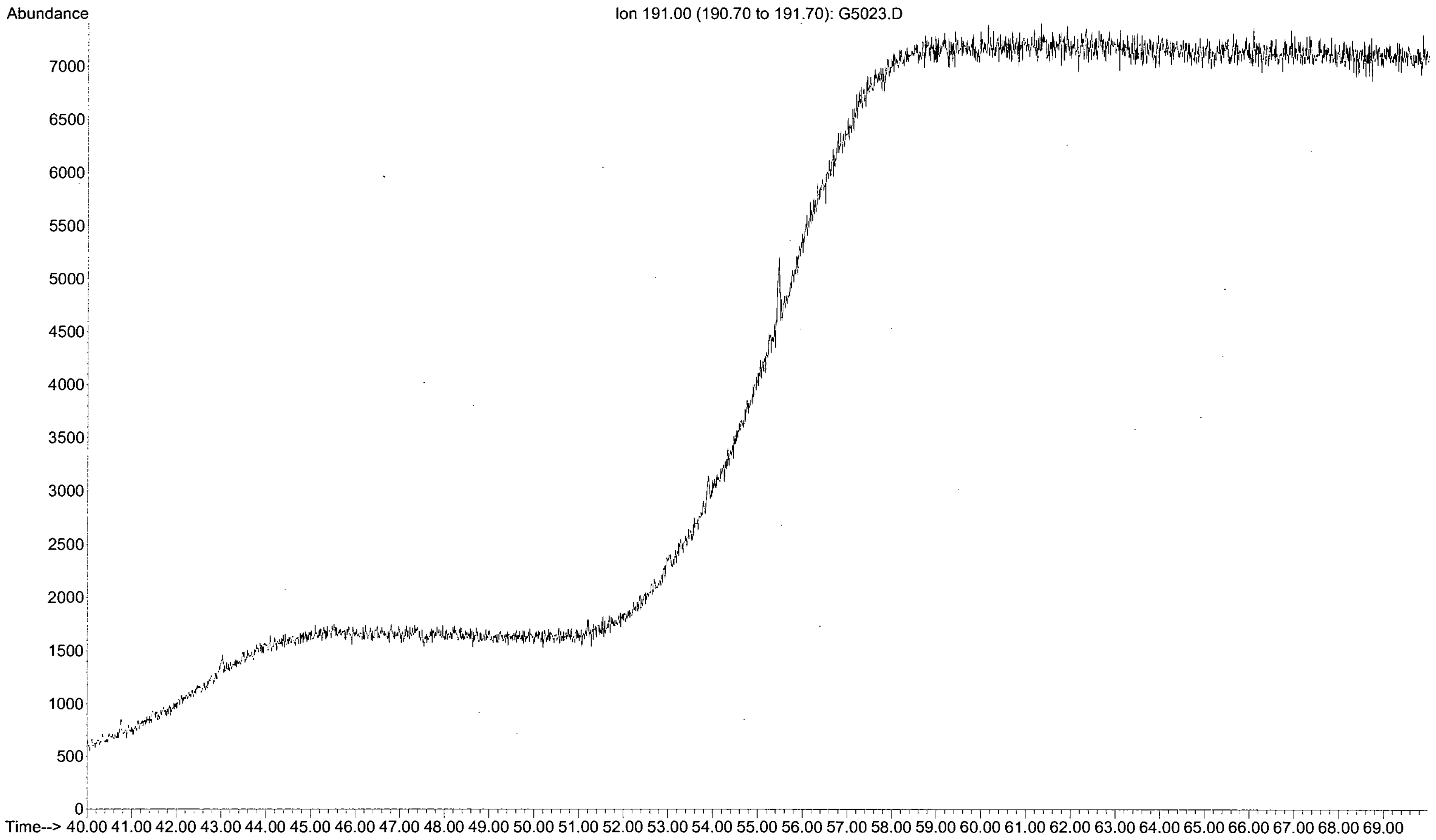
```
File       : G:\G\DATA\SG0319\G5019.D
Operator   : DPB
Acquired   : 11 Feb 2007   9:36 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5532-P-MS(12)
Misc Info  : GWP07T09 5-157 07-0010
Vial Number: 61
```



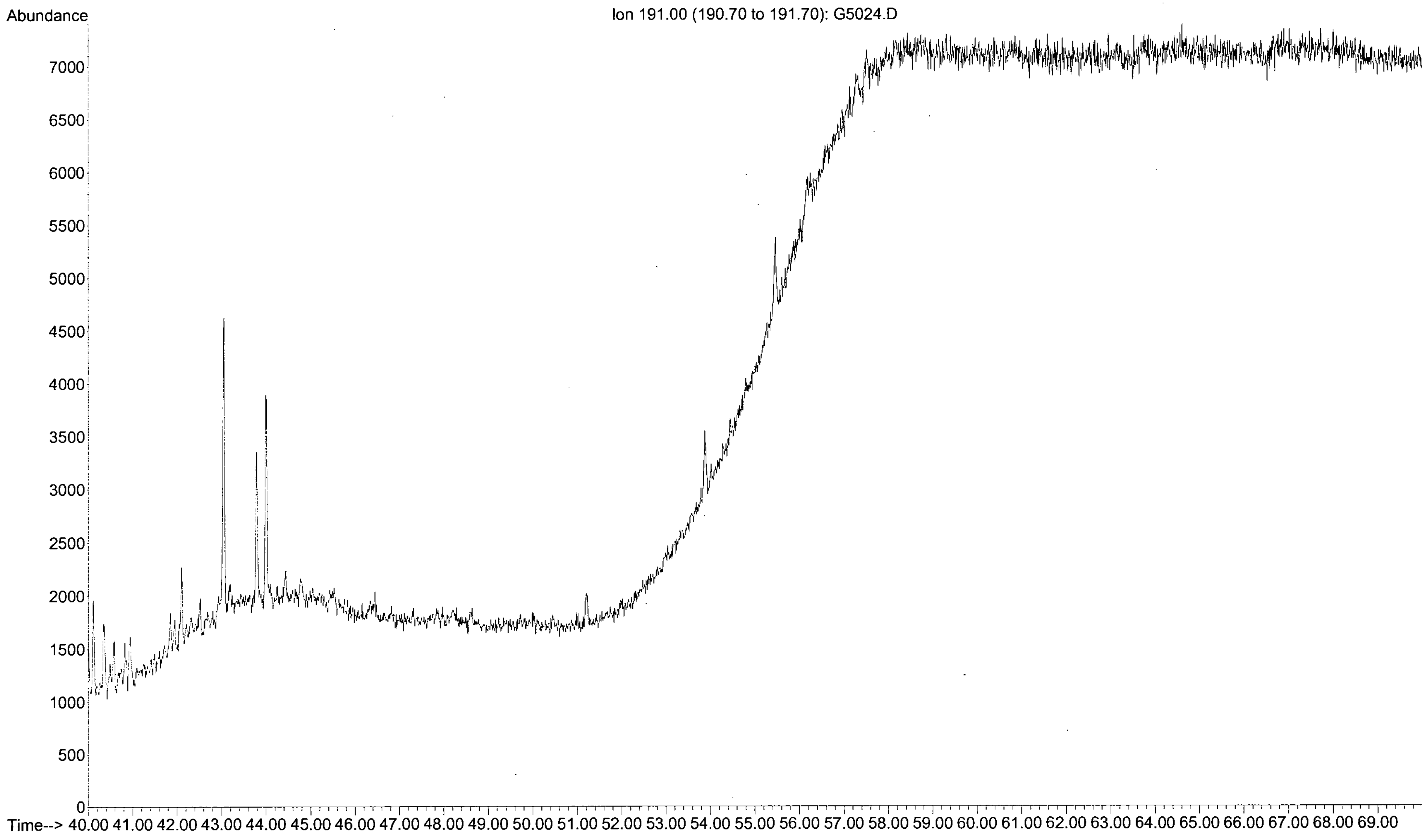
```
File        : G:\G\DATA\SG0319\G5022.D
Operator    : DPB
Acquired    : 11 Feb 2007   1:40 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5533-P-MS(12)
Misc Info   : GWP07T10 5-157 07-0010
Vial Number: 64
```



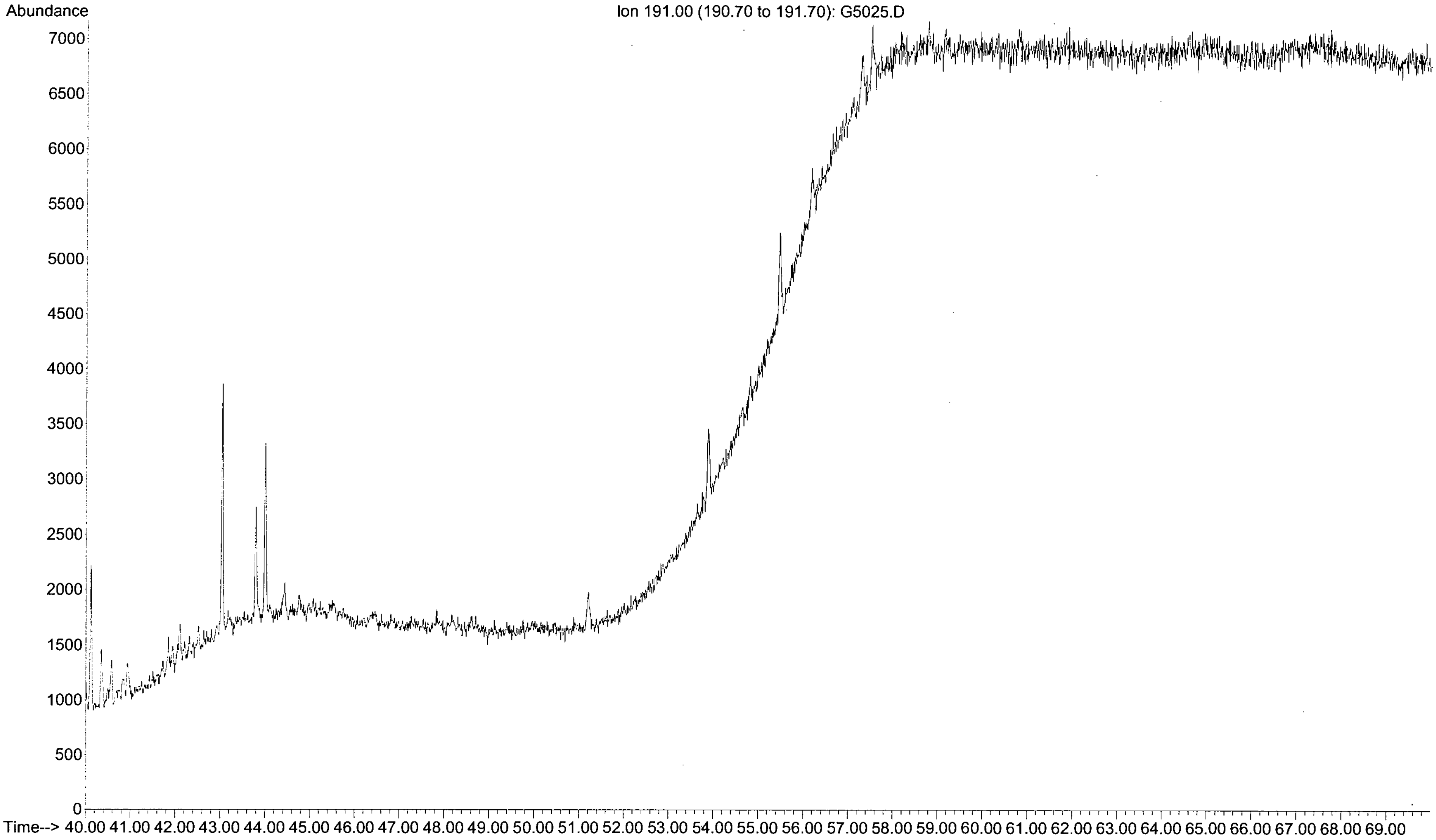
```
File        : G:\G\DATA\SG0319\G5023.D
Operator    : DPB
Acquired    : 11 Feb 2007   3:02 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5534-P-MS-D(13)
Misc Info   : GWP07T11 5-157 07-0010
Vial Number: 65
```



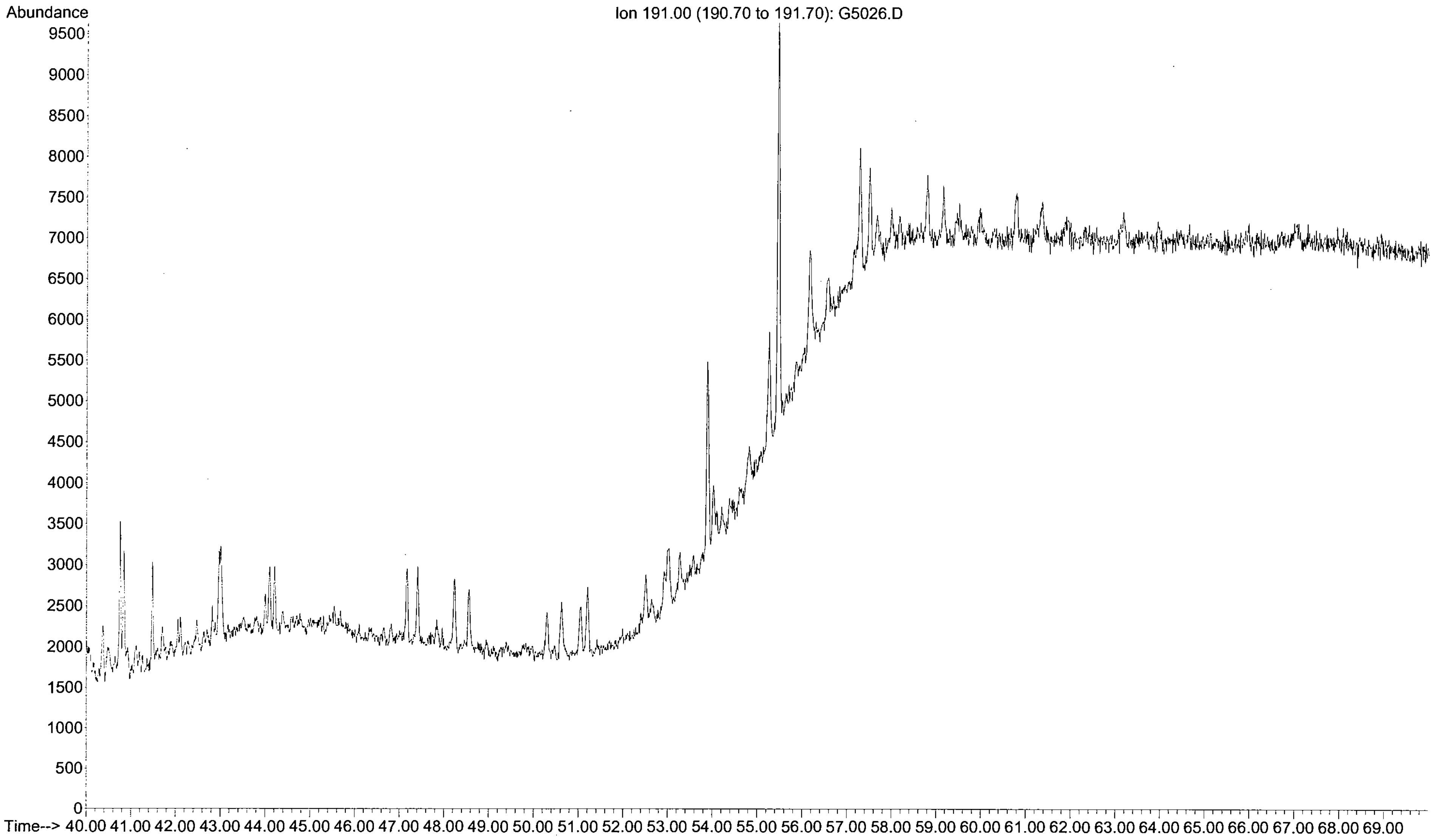
```
File        : G:\G\DATA\SG0319\G5024.D
Operator    : DPB
Acquired    : 11 Feb 2007   4:24 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5535-P-MS(12)
Misc Info   : GWP07T12 5-157 07-0010
Vial Number: 66
```



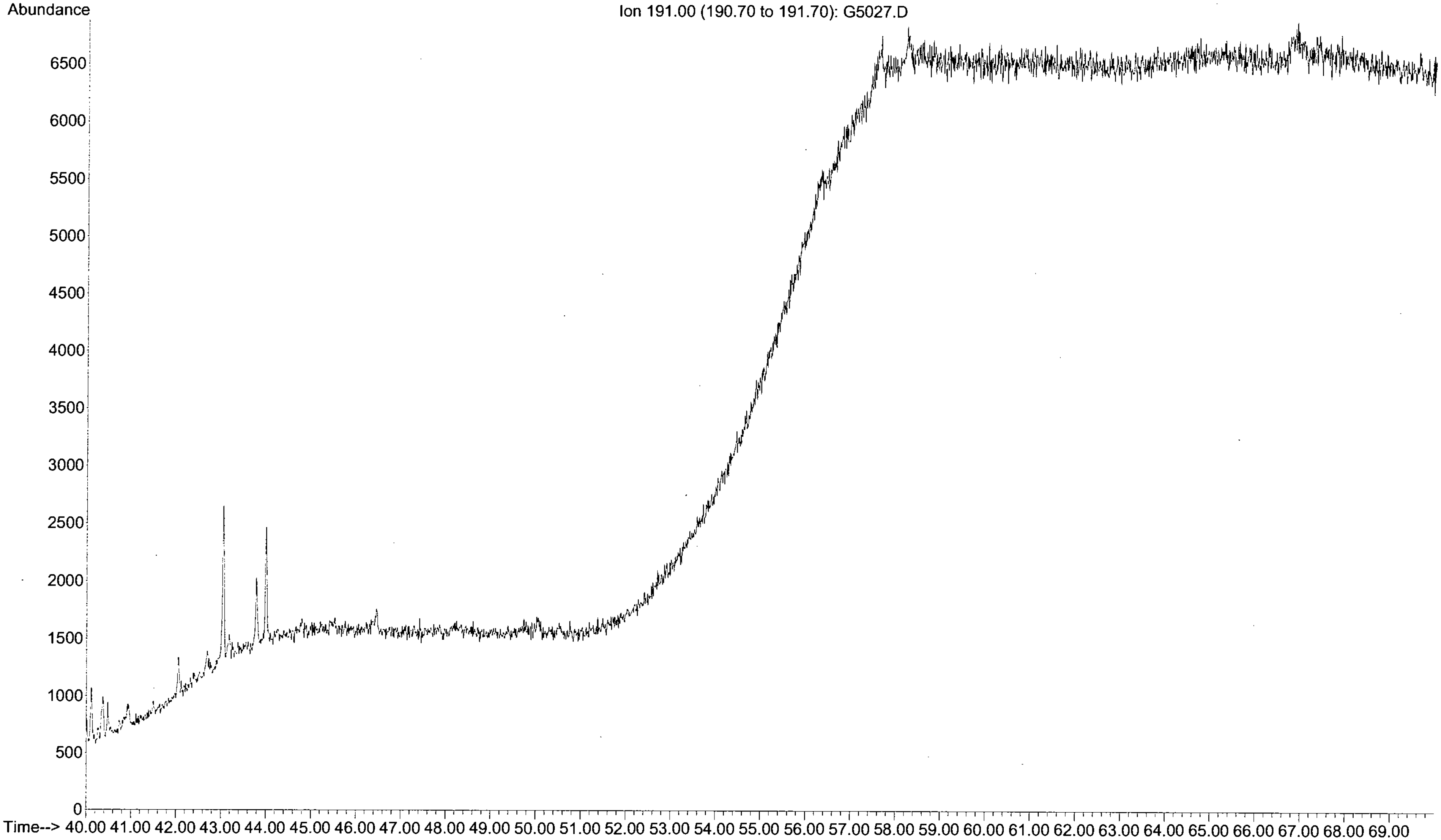
```
File        : G:\G\DATA\SG0319\G5025.D
Operator    : DPB
Acquired    : 11 Feb 2007   5:44 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5536-P-MS(12)
Misc Info   : GWP07T13 5-157 07-0010
Vial Number: 67
```



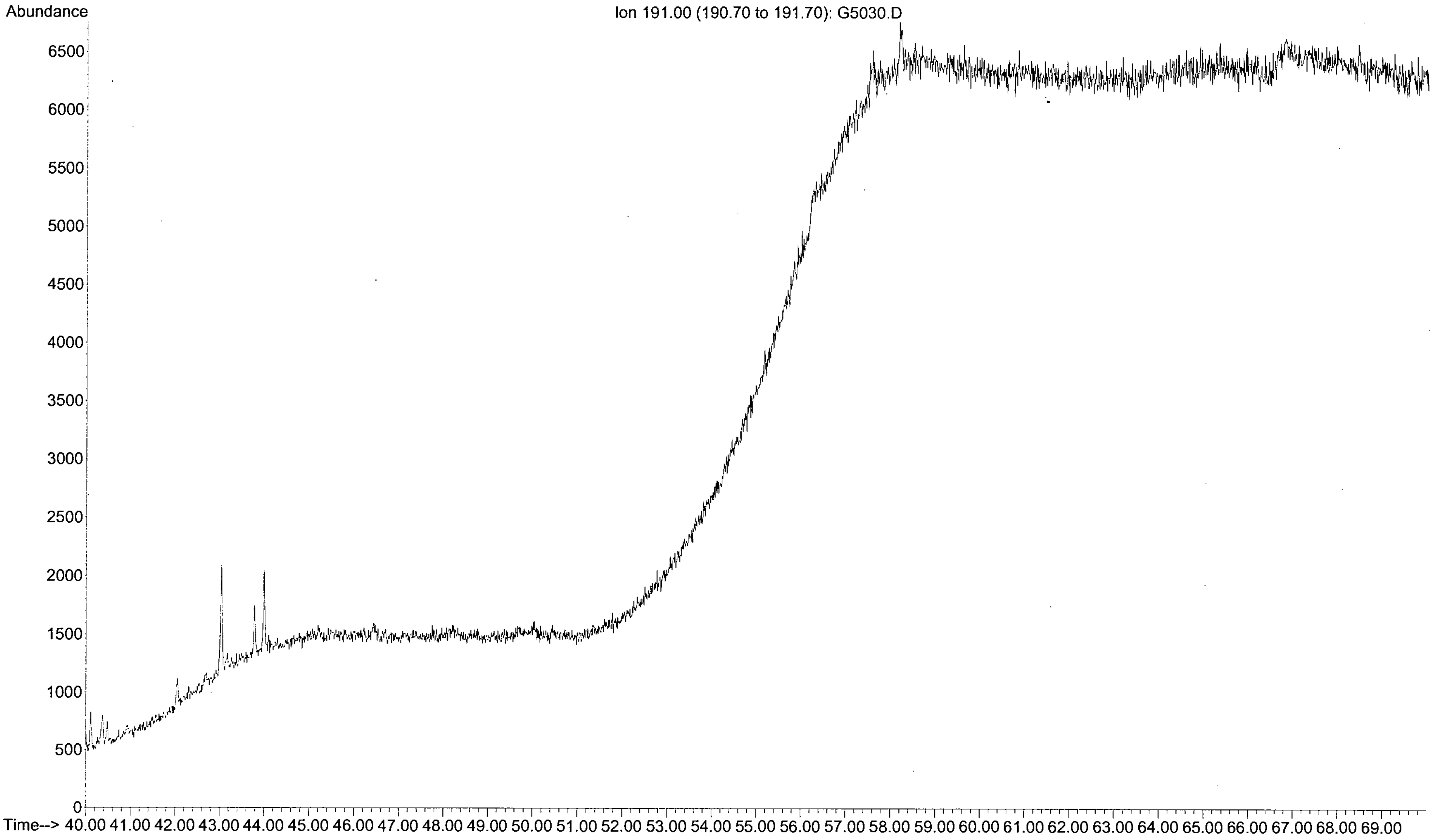
```
File        : G:\G\DATA\SG0319\G5026.D
Operator    : DPB
Acquired    : 11 Feb 2007   7:06 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5537-P-MS(10)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 68
```



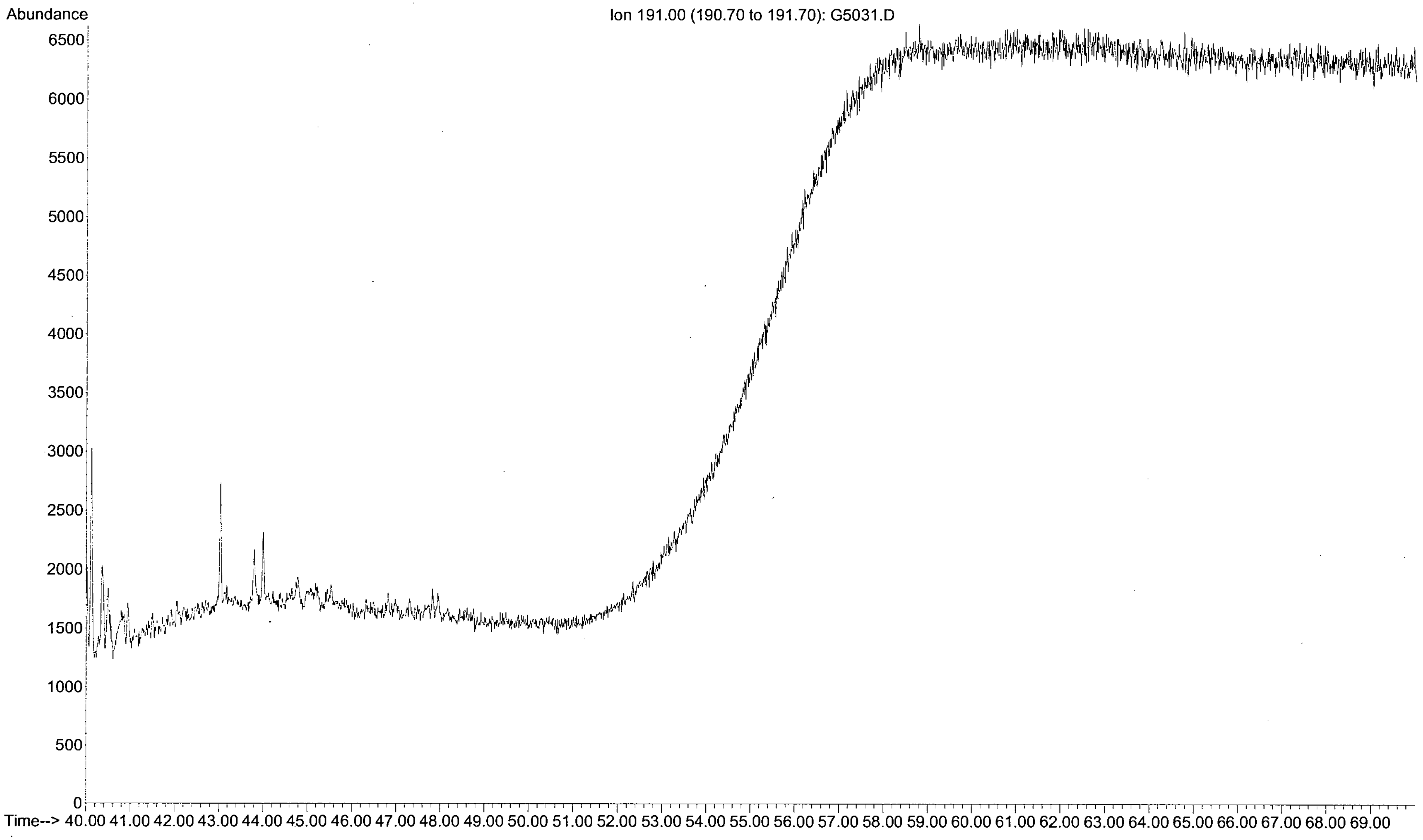
```
File        : G:\G\DATA\SG0319\G5027.D
Operator    : DPB
Acquired    : 11 Feb 2007   8:26 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5538-P-MS(12)
Misc Info   : GWP07S01 5-157 07-0010
Vial Number: 69
```



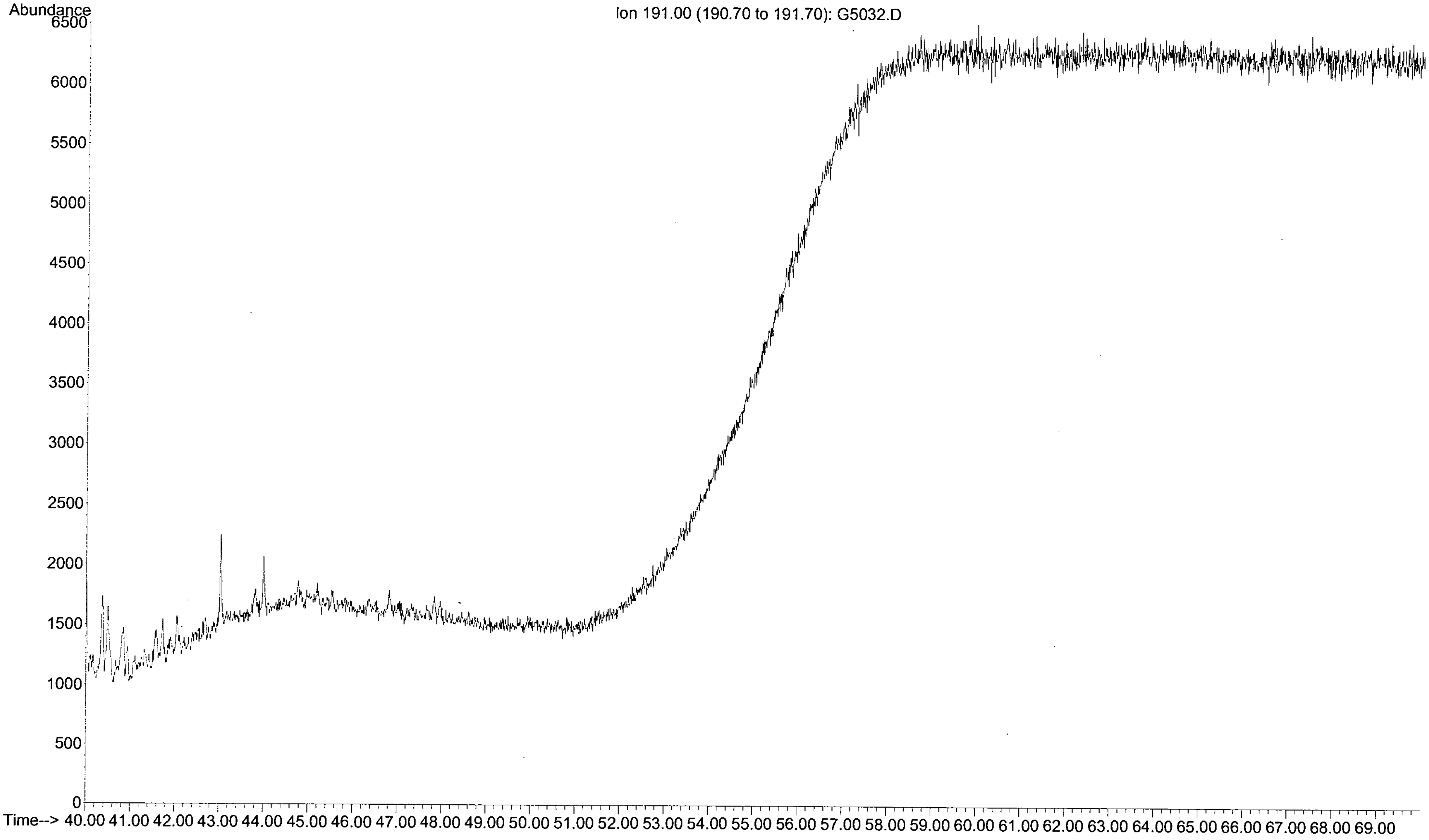
```
File        : G:\G\DATA\SG0319\G5030.D
Operator    : DPB
Acquired    : 12 Feb 2007  12:32 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5539-P-MS(12)
Misc Info   : GWP07S02 5-157 07-0010
Vial Number: 72
```



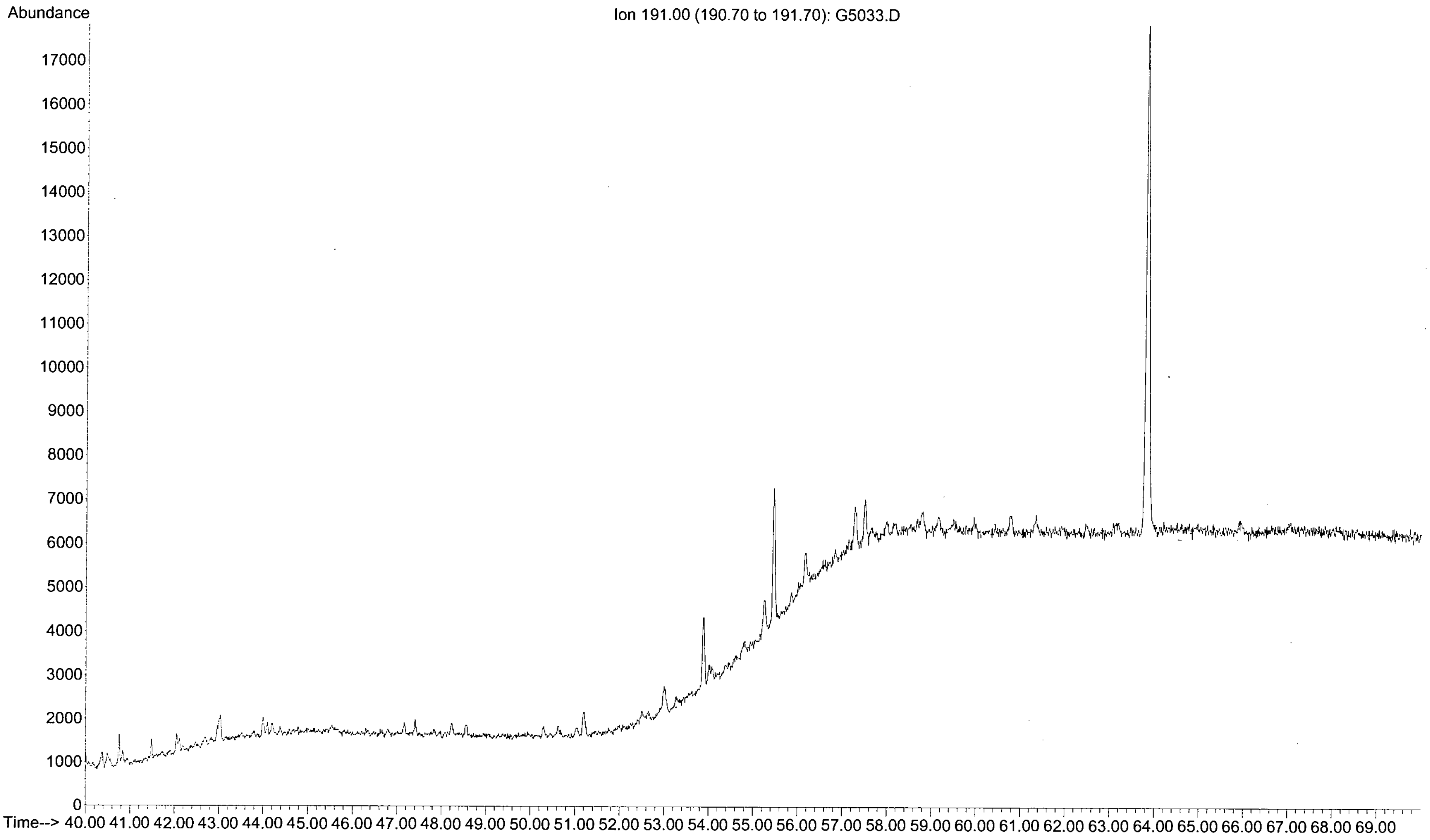
```
File        : G:\G\DATA\SG0319\G5031.D
Operator    : DPB
Acquired    : 12 Feb 2007   1:53 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5540-P-MS(12)
Misc Info   : GWP07S03 5-157 07-0010
Vial Number: 73
```



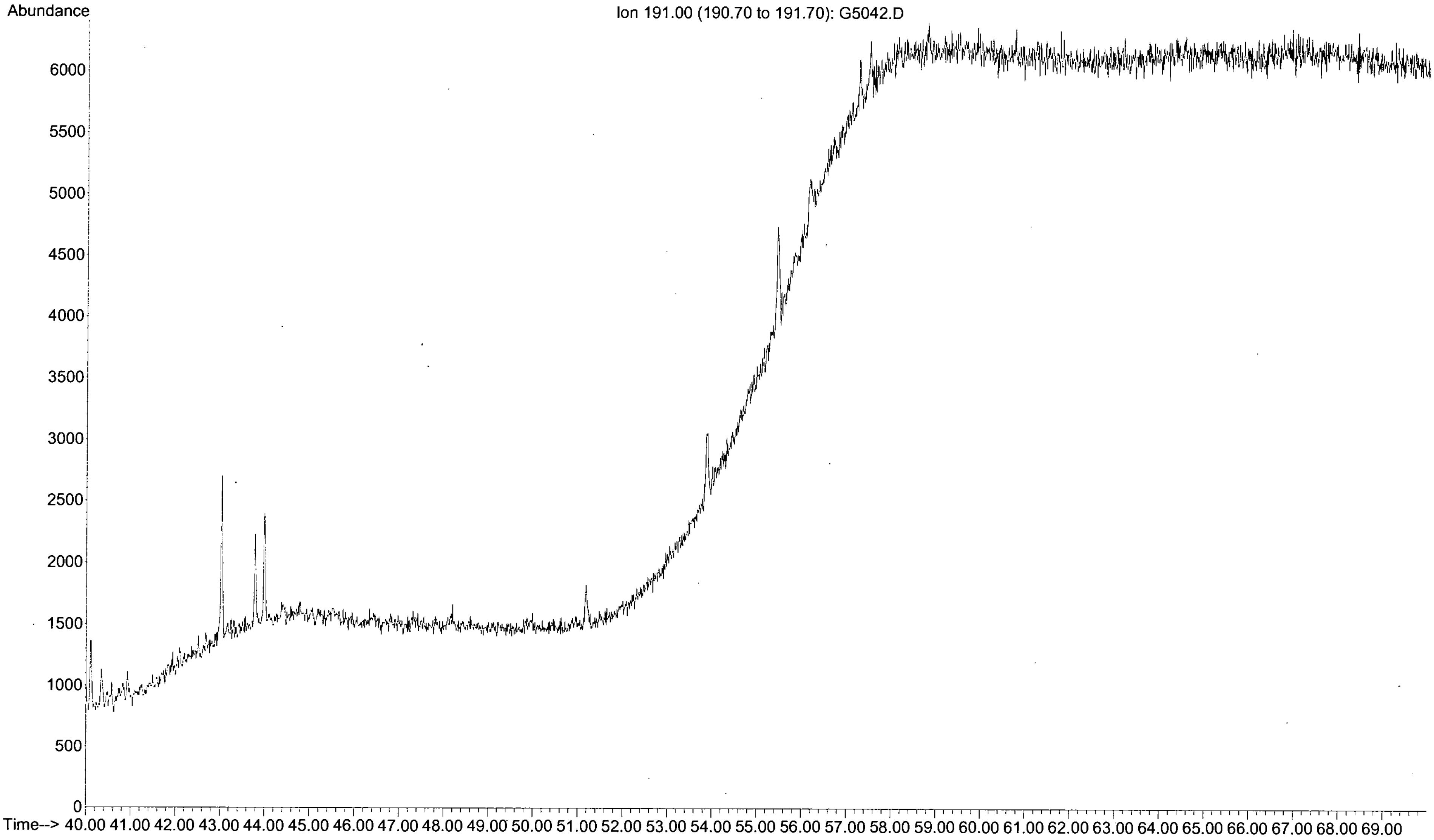
File   : G:\G\DATA\SG0319\G5032.D
Operator   : DPB
Acquired   : 12 Feb 2007   3:15 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5541-P-MS(12)
Misc Info   : GWP07S04 5-157 07-0010
Vial Number: 74


Ion 191.00 (190.70 to 191.70): G5032.D

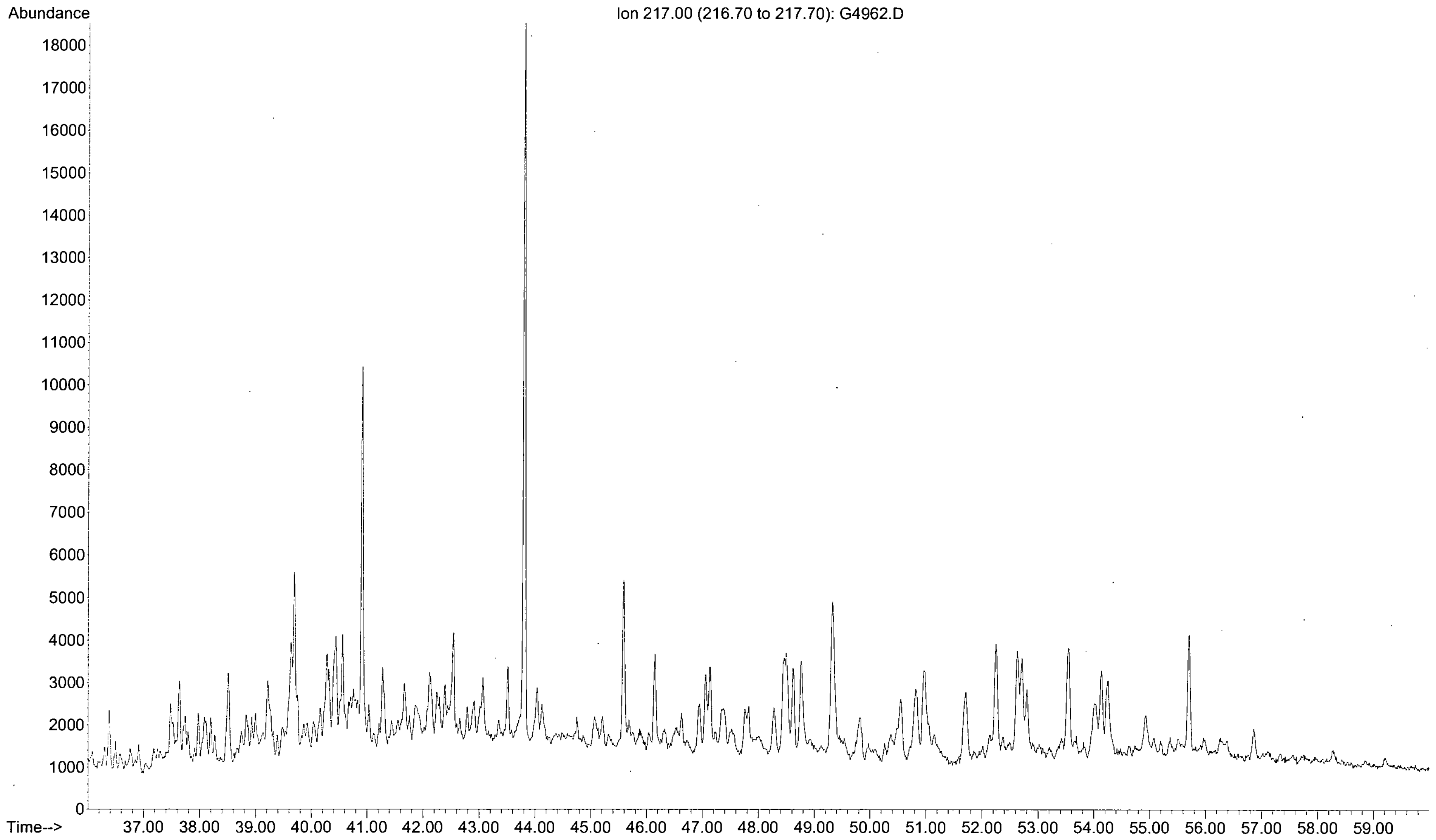
```
File        : G:\G\DATA\SG0319\G5033.D
Operator    : DPB
Acquired    : 12 Feb 2007   4:38 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5542-P-MS(12)
Misc Info   : TDW3-4.5 5-157 07-0010
Vial Number: 75
```



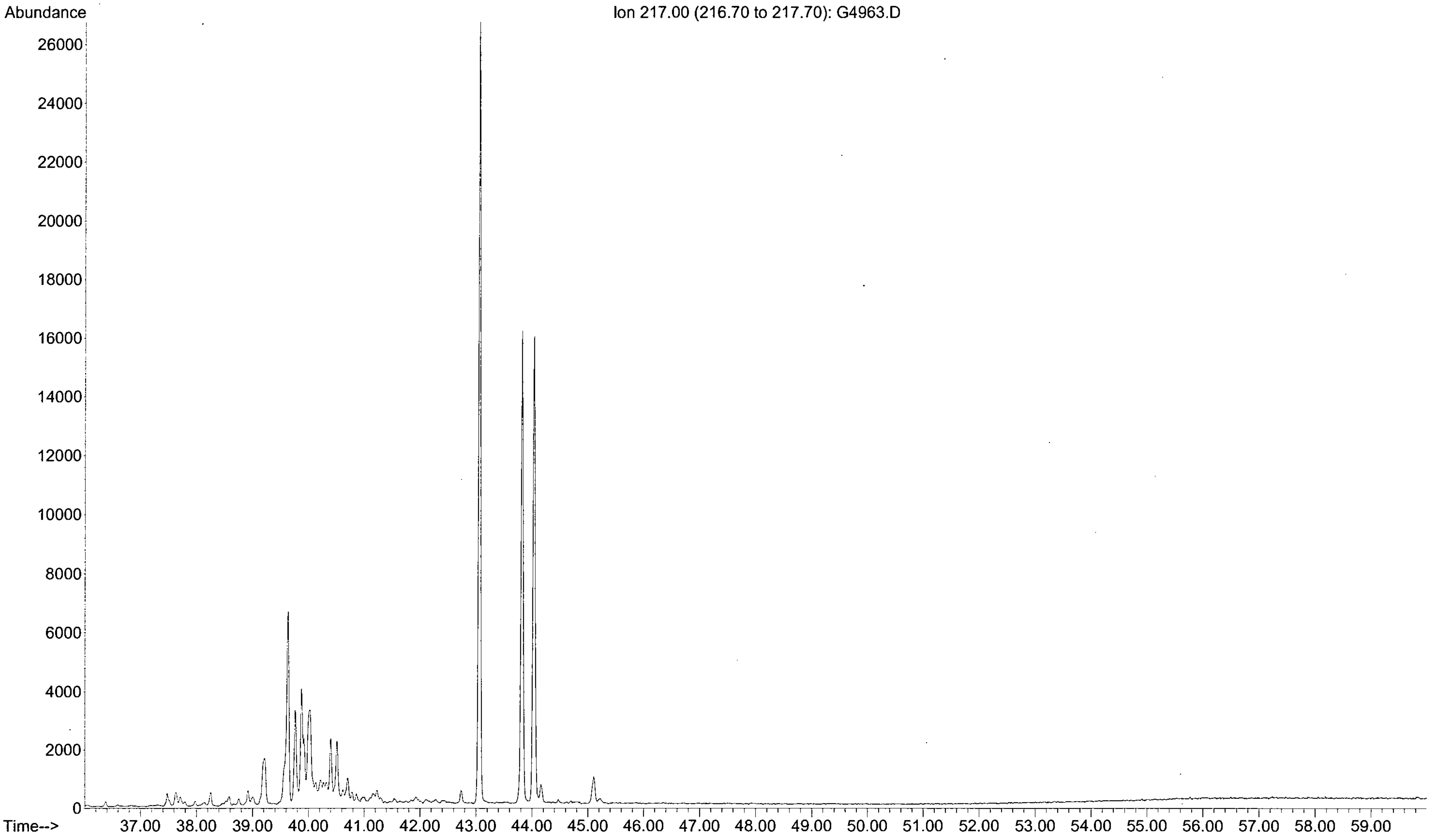
File   : G:\G\DATA\SG0319\G5042.D
Operator   : DPB
Acquired   : 12 Feb 2007   4:56 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5521-P-MS(12)
Misc Info   : GWP07T01 5-157 07-0010
Vial Number: 84



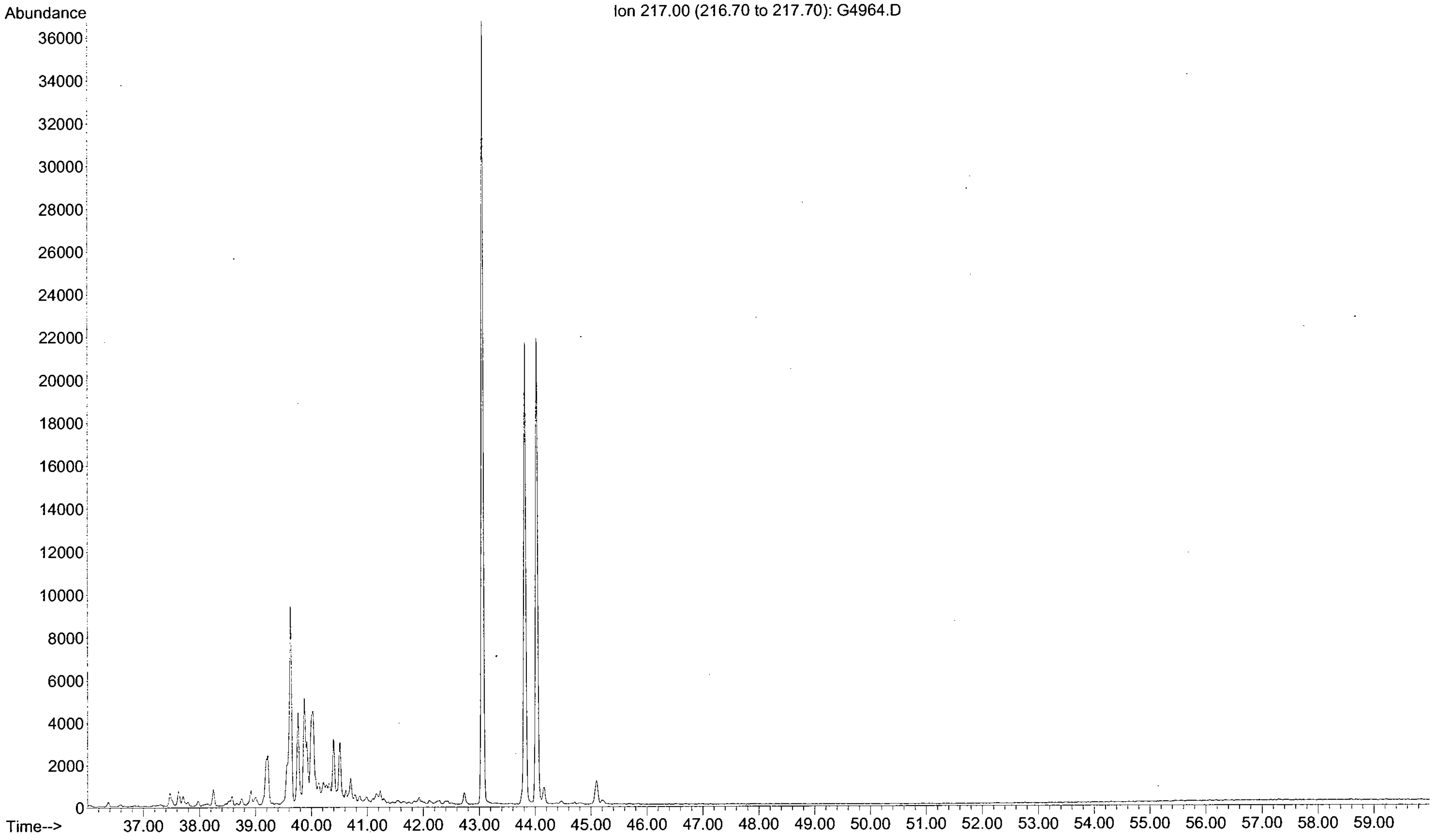
```
File        : G:\G\DATA\SG0319\G4962.D
Operator    : DPB
Acquired    :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info   : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4
```



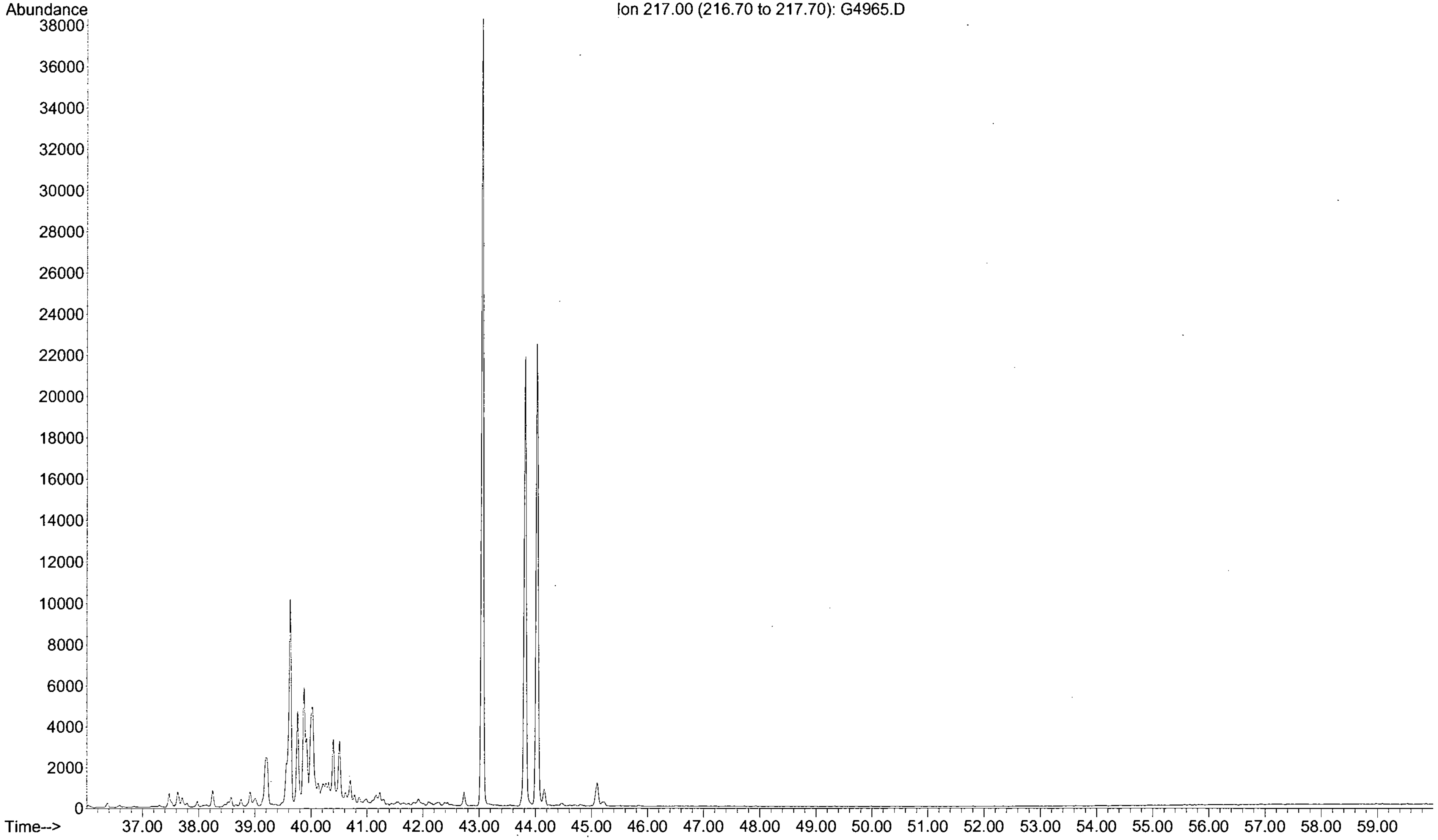
```
File       : G:\G\DATA\SG0319\G4963.D
Operator   : DPB
Acquired   :  8 Feb 2007  12:50 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5528-P-A-MS-D(15)
Misc Info  : GWP07T05 5-157 07-0010
Vial Number: 5
```



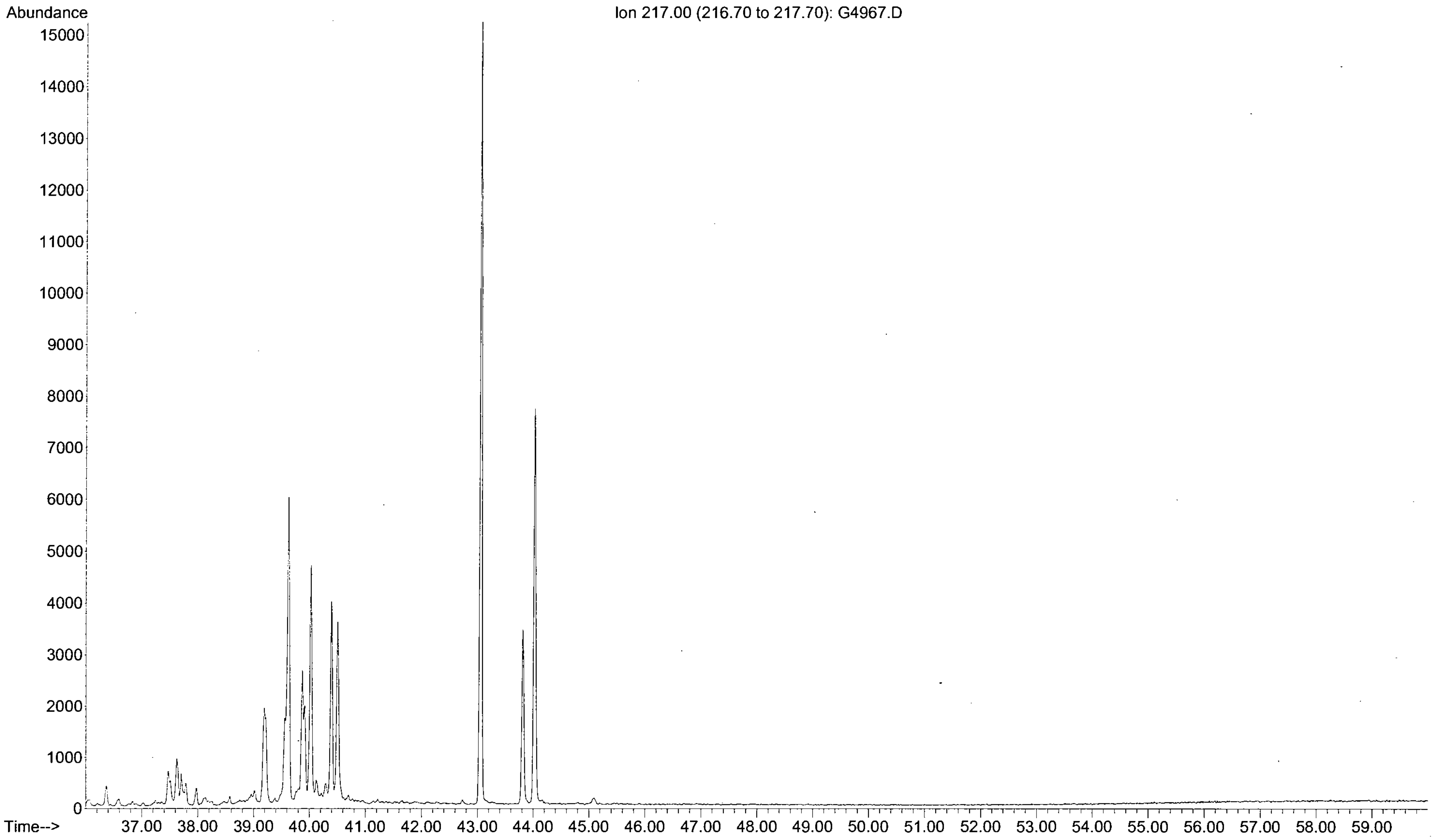
```
File       : G:\G\DATA\SG0319\G4964.D
Operator   : DPB
Acquired   :  8 Feb 2007   2:10 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5529-P-A-MS-D(15)
Misc Info  : GWP07T06 5-157 07-0010
Vial Number: 6
```



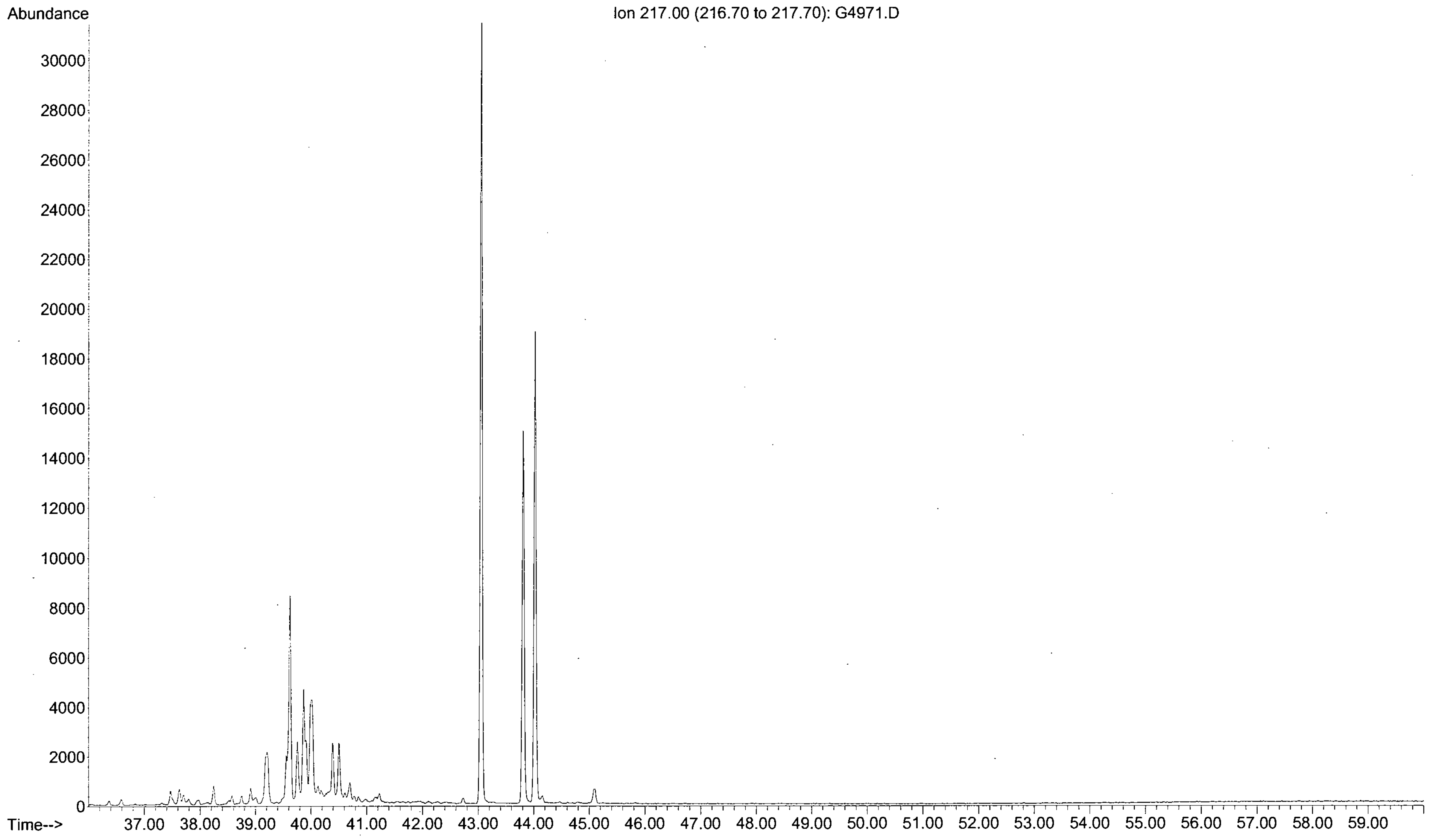
```
File        : G:\G\DATA\SG0319\G4965.D
Operator    : DPB
Acquired    :  8 Feb 2007   3:31 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5530-P-MS-D(13)
Misc Info   : GWP07T07 5-157 07-0010
Vial Number: 7
```



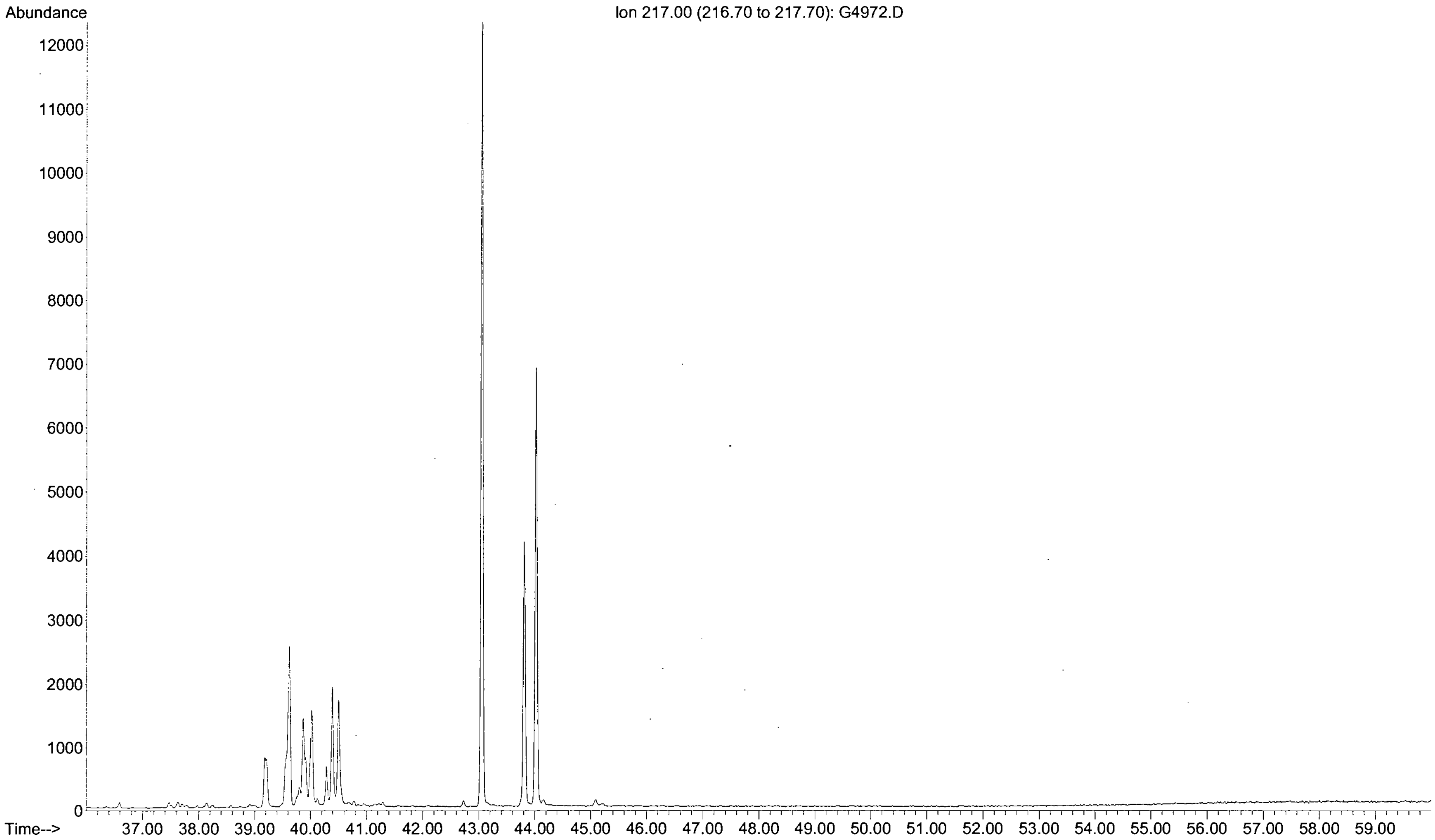
```
File       : G:\G\DATA\SG0319\G4967.D
Operator   : DPB
Acquired   :  8 Feb 2007   6:14 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5532-P-MS-D(13)
Misc Info  : GWP07T09 5-157 07-0010
Vial Number: 9
```



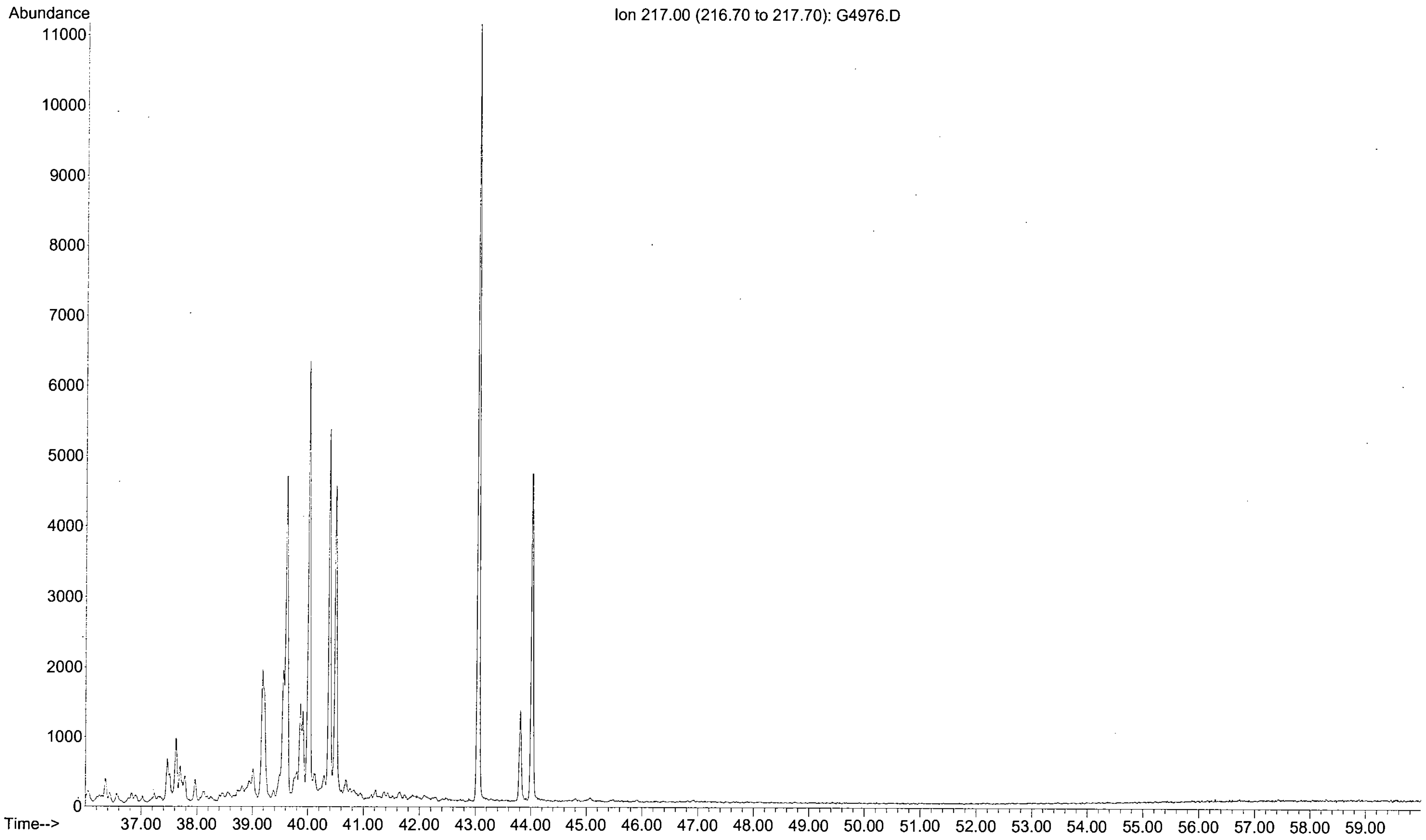
```
File        : G:\G\DATA\SG0319\G4971.D
Operator    : DPB
Acquired    :  8 Feb 2007  11:43 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5535-P-MS-D(13)
Misc Info   : GWP07T12 5-157 07-0010
Vial Number: 13
```



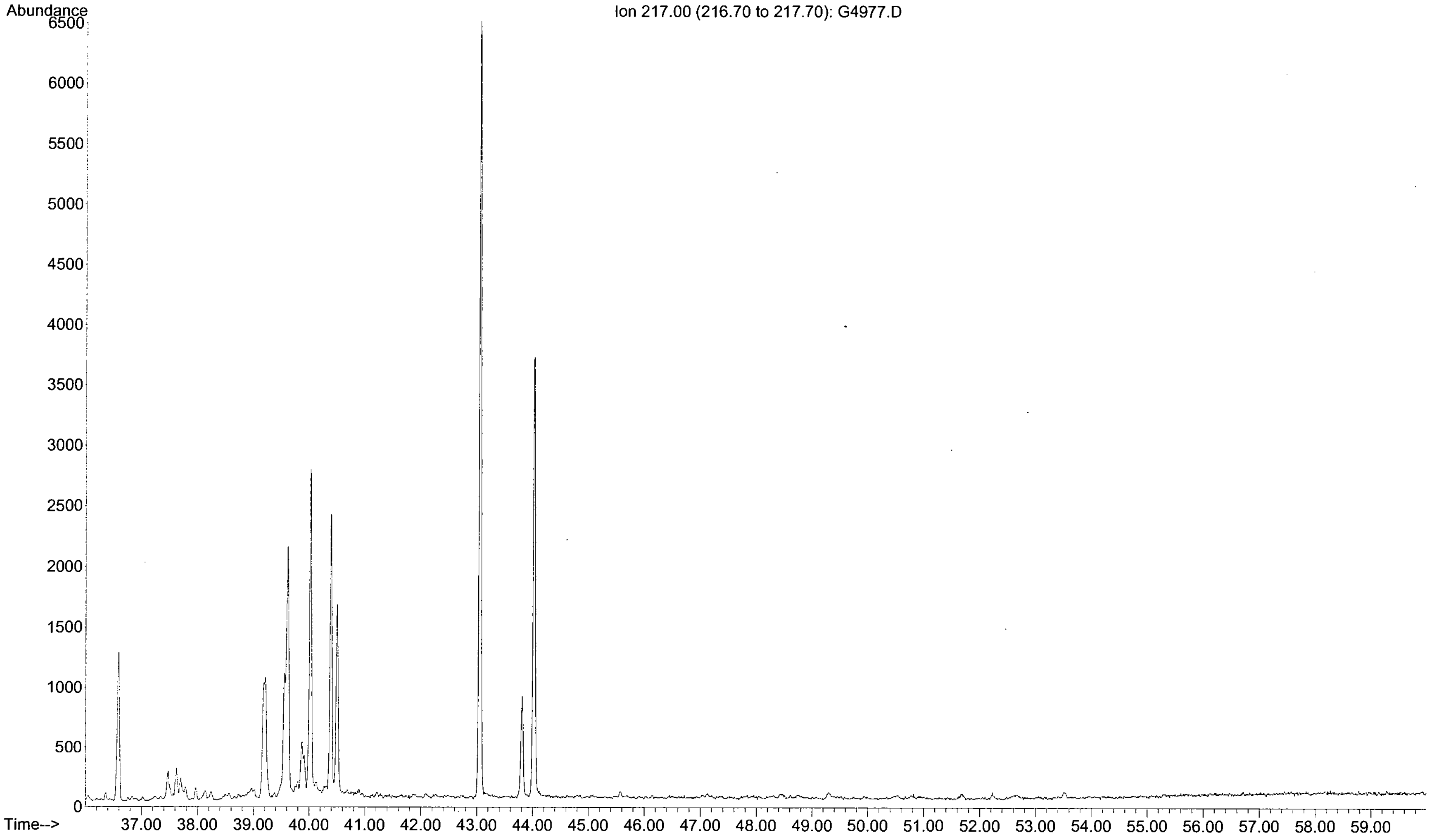
```
File       : G:\G\DATA\SG0319\G4972.D
Operator   : DPB
Acquired   :  8 Feb 2007   5:37 pm using AcqMethod BIOPLUS
Instrument :    Inst. G
Sample Name: R5539-P-MS-D(13)
Misc Info  : GWP07S02 5-157 07-0010
Vial Number: 14
```



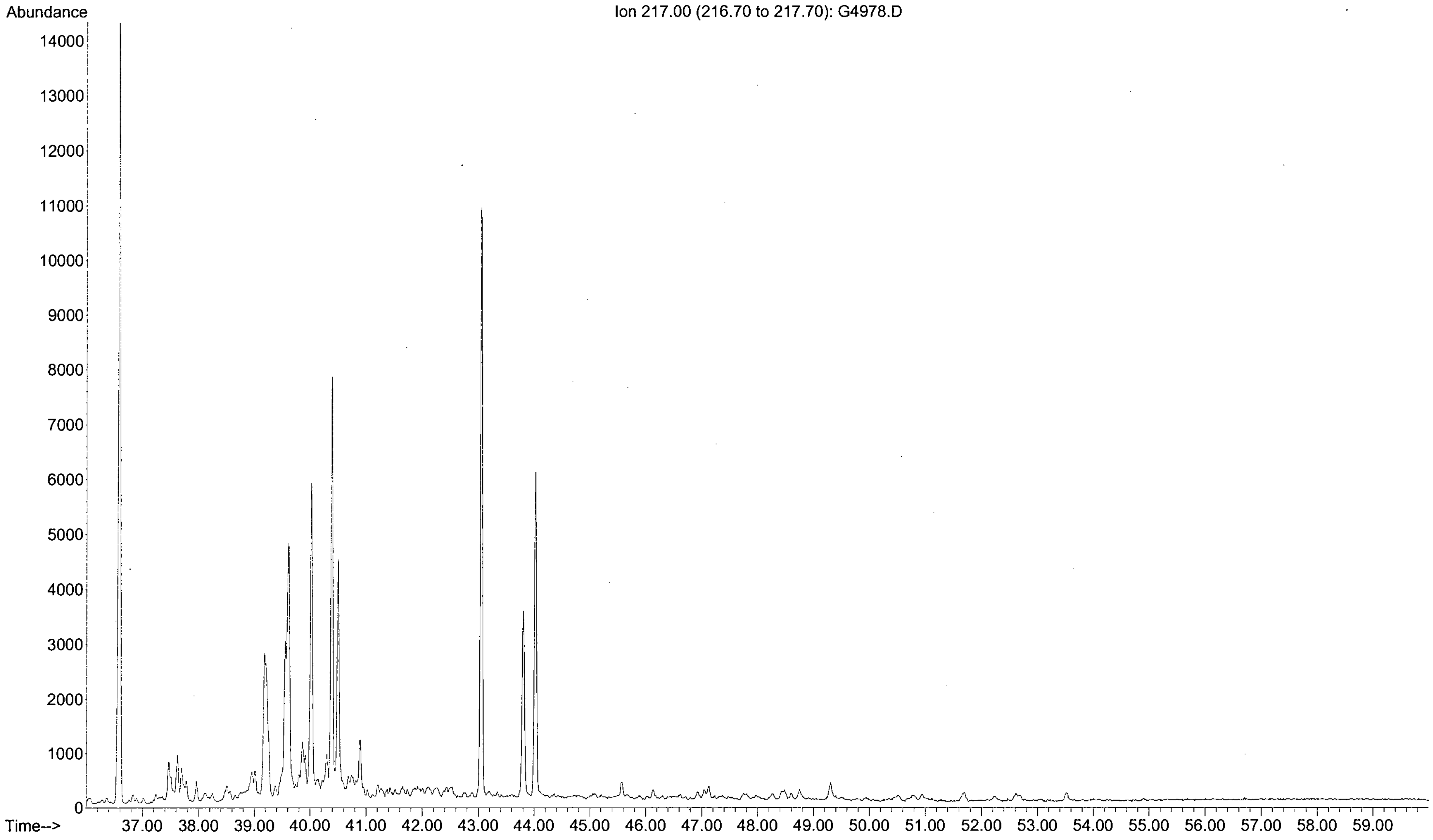
```
File       : G:\G\DATA\SG0319\G4976.D
Operator   : DPB
Acquired   :  8 Feb 2007  11:03 pm using AcqMethod BIOPLUS
Instrument :    Inst. G
Sample Name: R5541-P-MS-D(13)
Misc Info  : GWP07S04 5-157 07-0010
Vial Number: 18
```



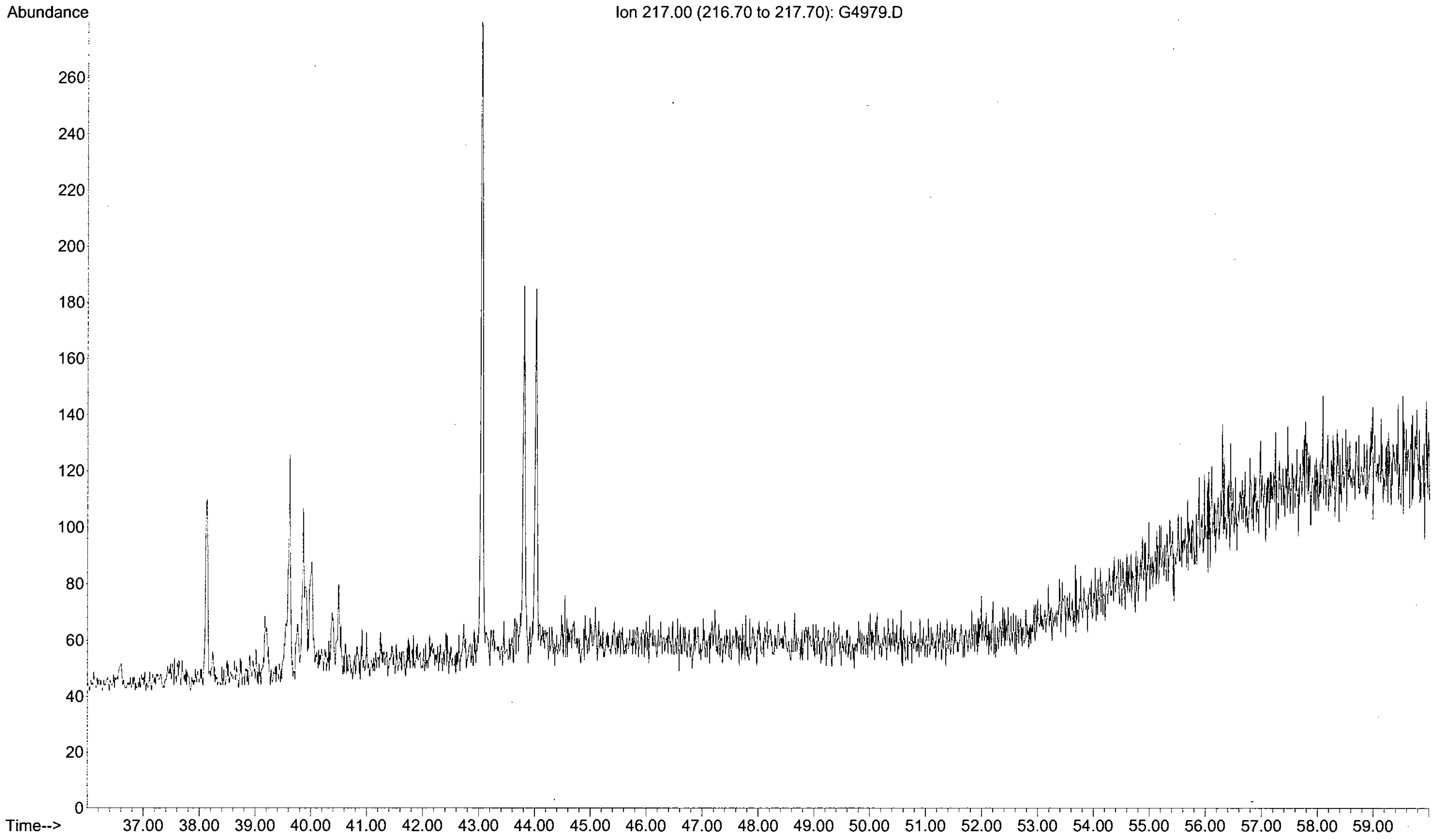
```
File       : G:\G\DATA\SG0319\G4977.D
Operator   : DPB
Acquired   :  9 Feb 2007  12:25 am using AcqMethod BIOPLUS
Instrument :    Inst. G
Sample Name: R5542-P-MS-D(13)
Misc Info  : TDW3-4.5 5-157 07-0010
Vial Number: 19
```



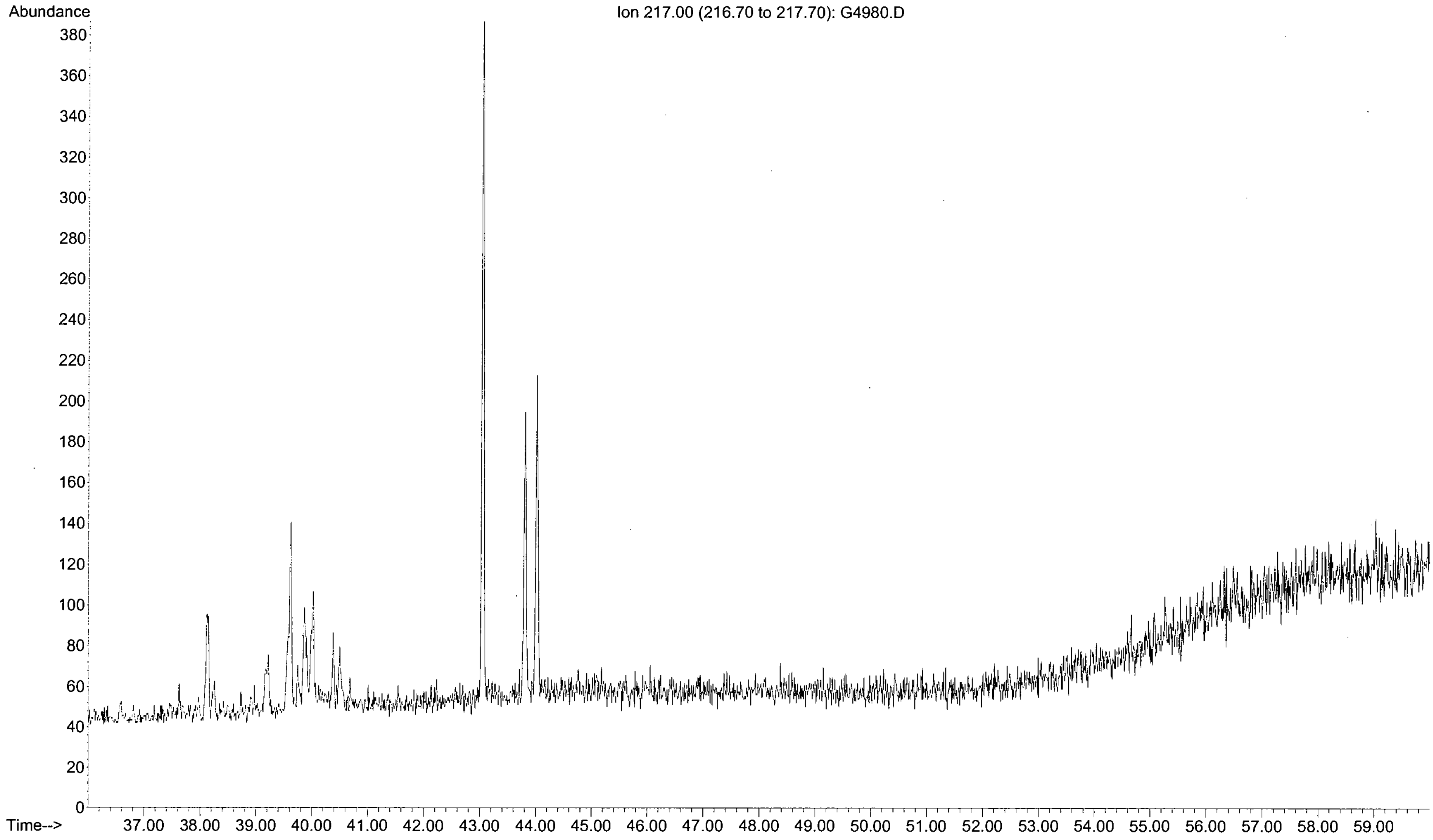
```
File        : G:\G\DATA\SG0319\G4978.D
Operator    : DPB
Acquired    :  9 Feb 2007   1:47 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5537-P-MS-D(11)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 20
```



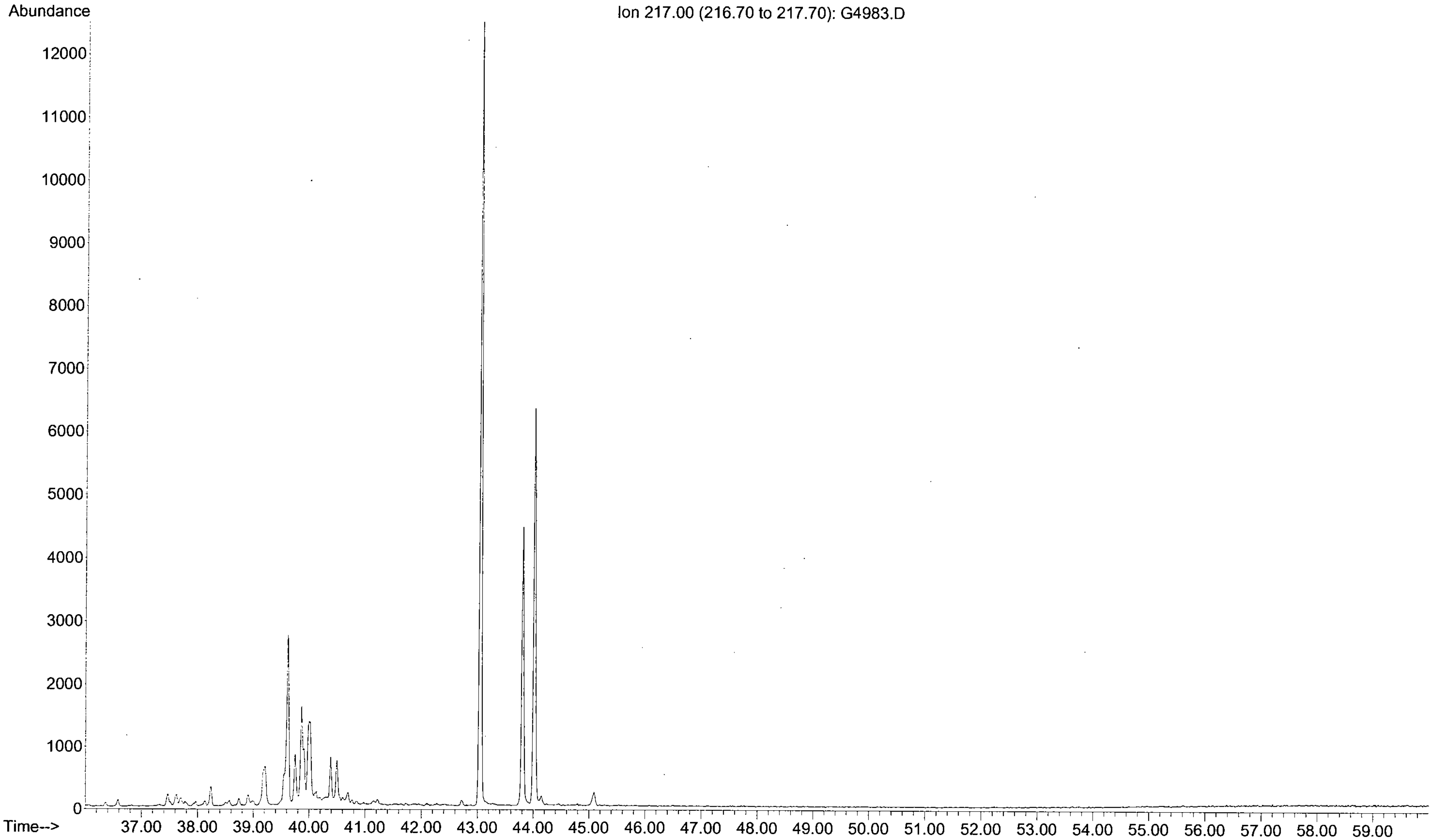
```
File       : G:\G\DATA\SG0319\G4979.D
Operator   : DPB
Acquired   :  9 Feb 2007   3:10 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5526-P-MS-D(15)
Misc Info  : GWP07T03 5-157 07-0010
Vial Number: 21
```



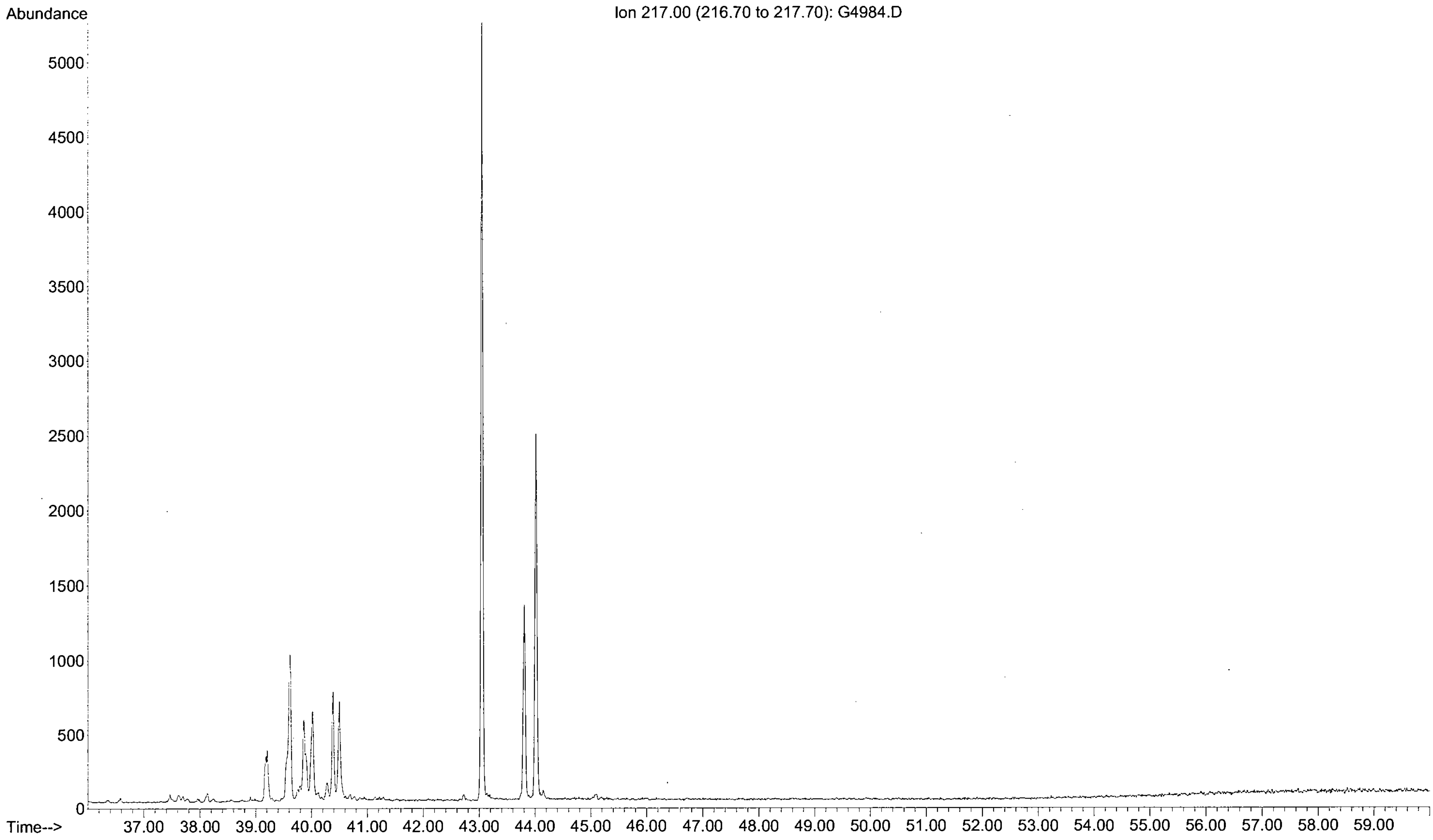
File   : G:\G\DATA\SG0319\G4980.D
Operator   : DPB
Acquired   : 9 Feb 2007   4:34 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS-D(15)
Misc Info   : GWP07T04 5-157 07-0010
Vial Number: 22


Ion 217.00 (216.70 to 217.70): G4980.D

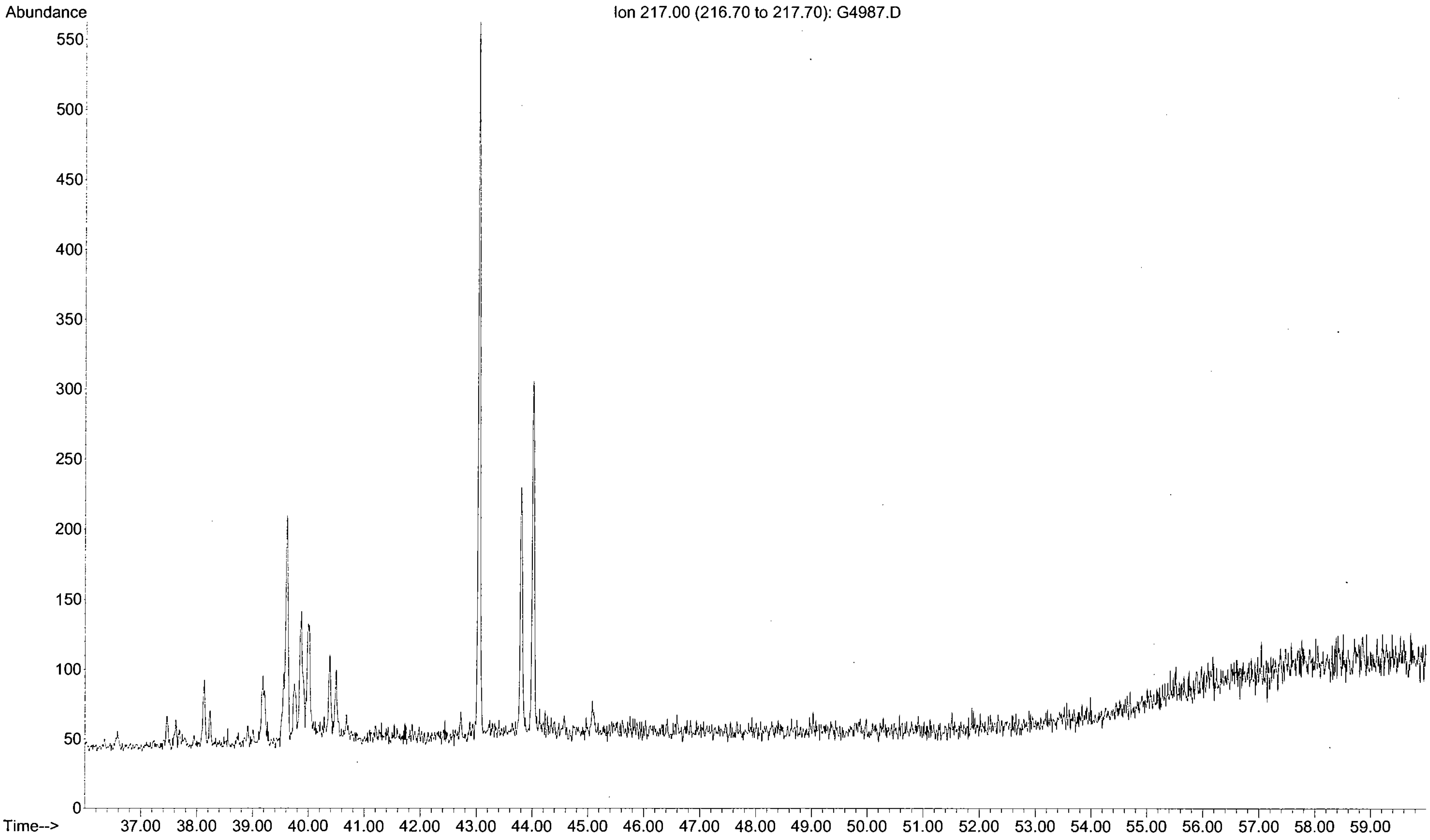
```
File       : G:\G\DATA\SG0319\G4983.D
Operator   : DPB
Acquired   :  9 Feb 2007   8:41 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5536-P-MS-D(13)
Misc Info  : GWP07T13 5-157 07-0010
Vial Number: 25
```



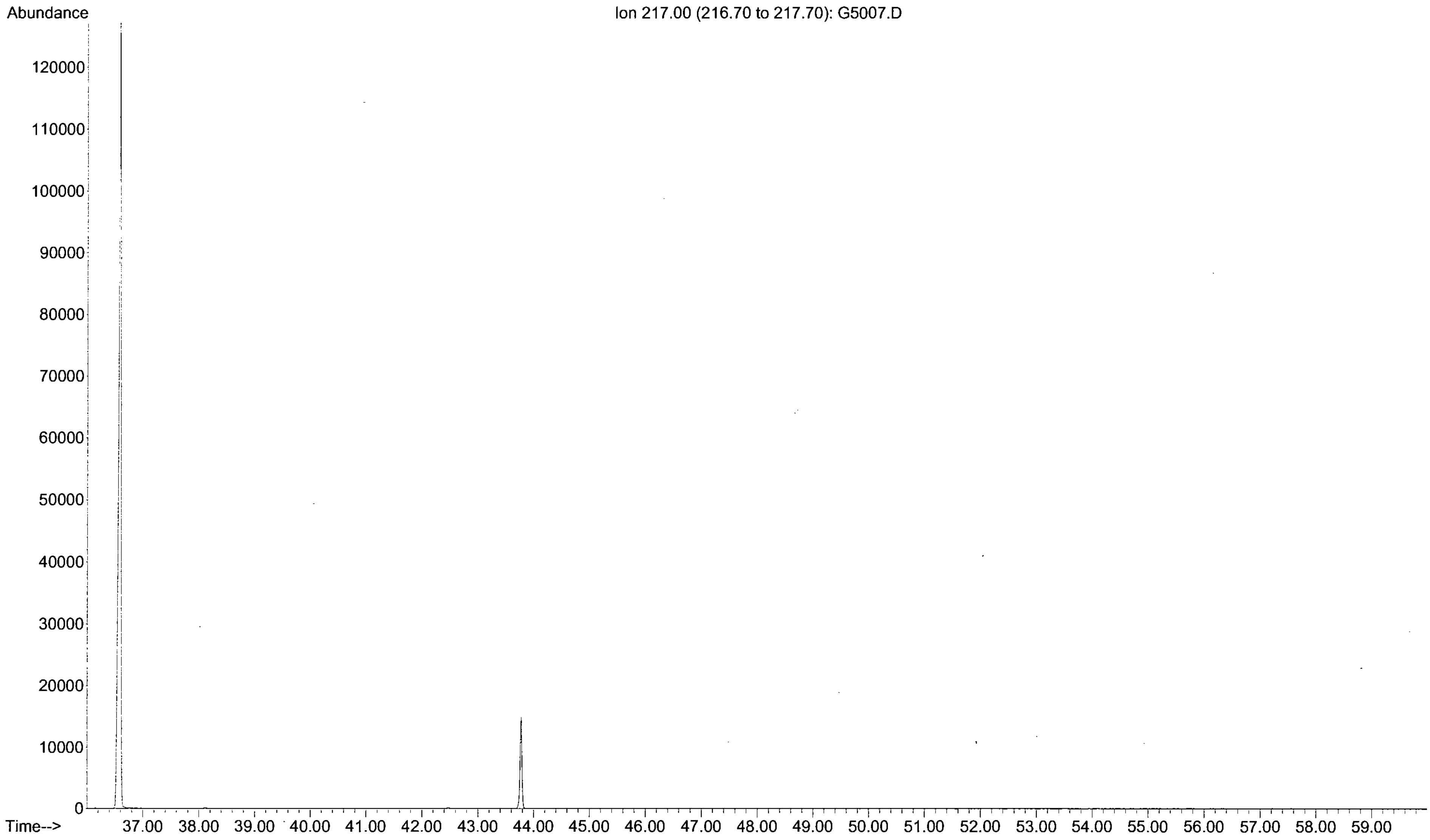
```
File        : G:\G\DATA\SG0319\G4984.D
Operator    : DPB
Acquired    :  9 Feb 2007  10:03 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5538-P-MS-D(13)
Misc Info   : GWP07S01 5-157 07-0010
Vial Number: 26
```



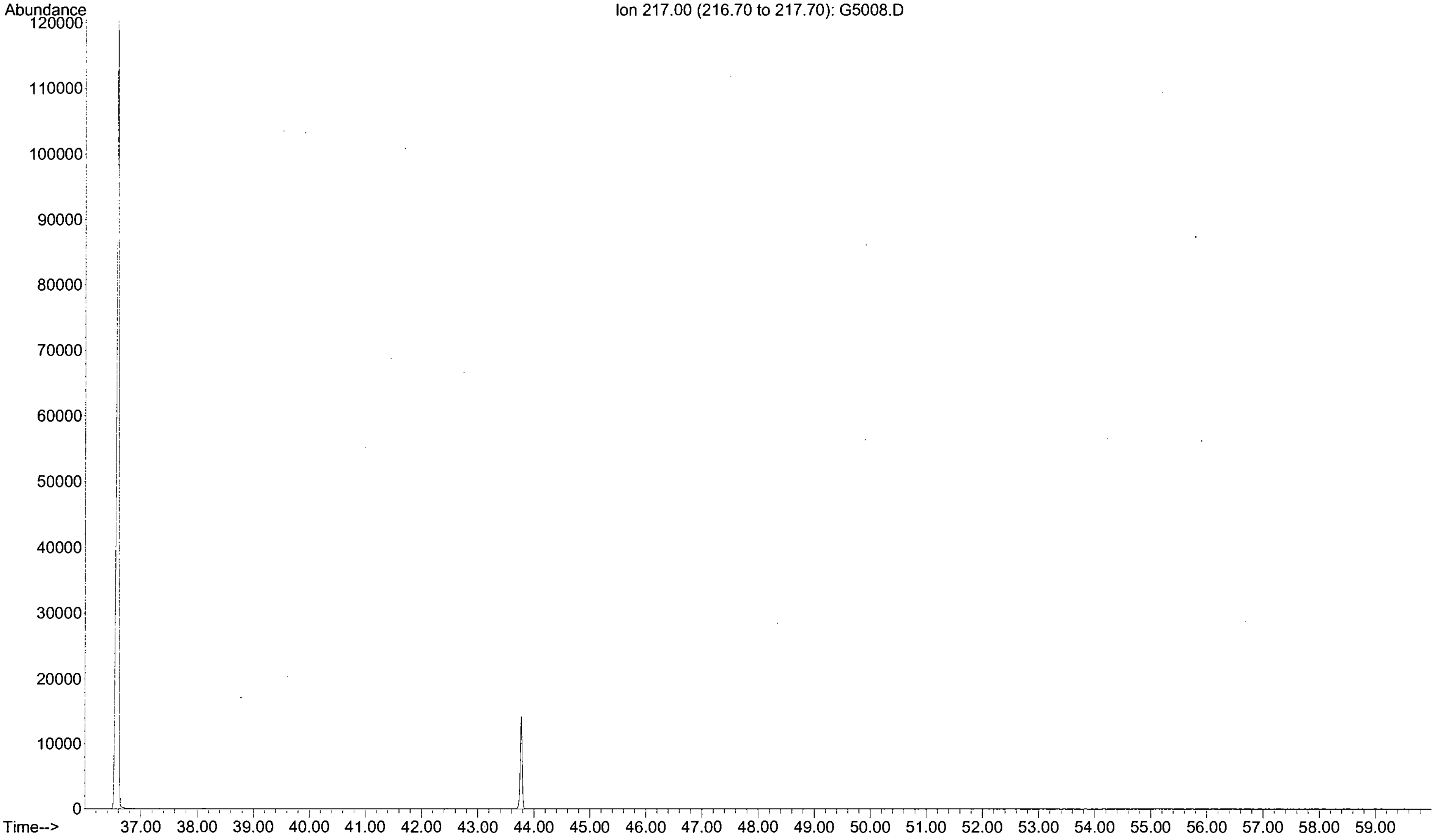
```
File        : G:\G\DATA\SG0319\G4987.D
Operator    : DPB
Acquired    :  9 Feb 2007   2:08 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5533-P-MS-D(13)
Misc Info   : GWP07T10 5-157 07-0010
Vial Number: 29
```



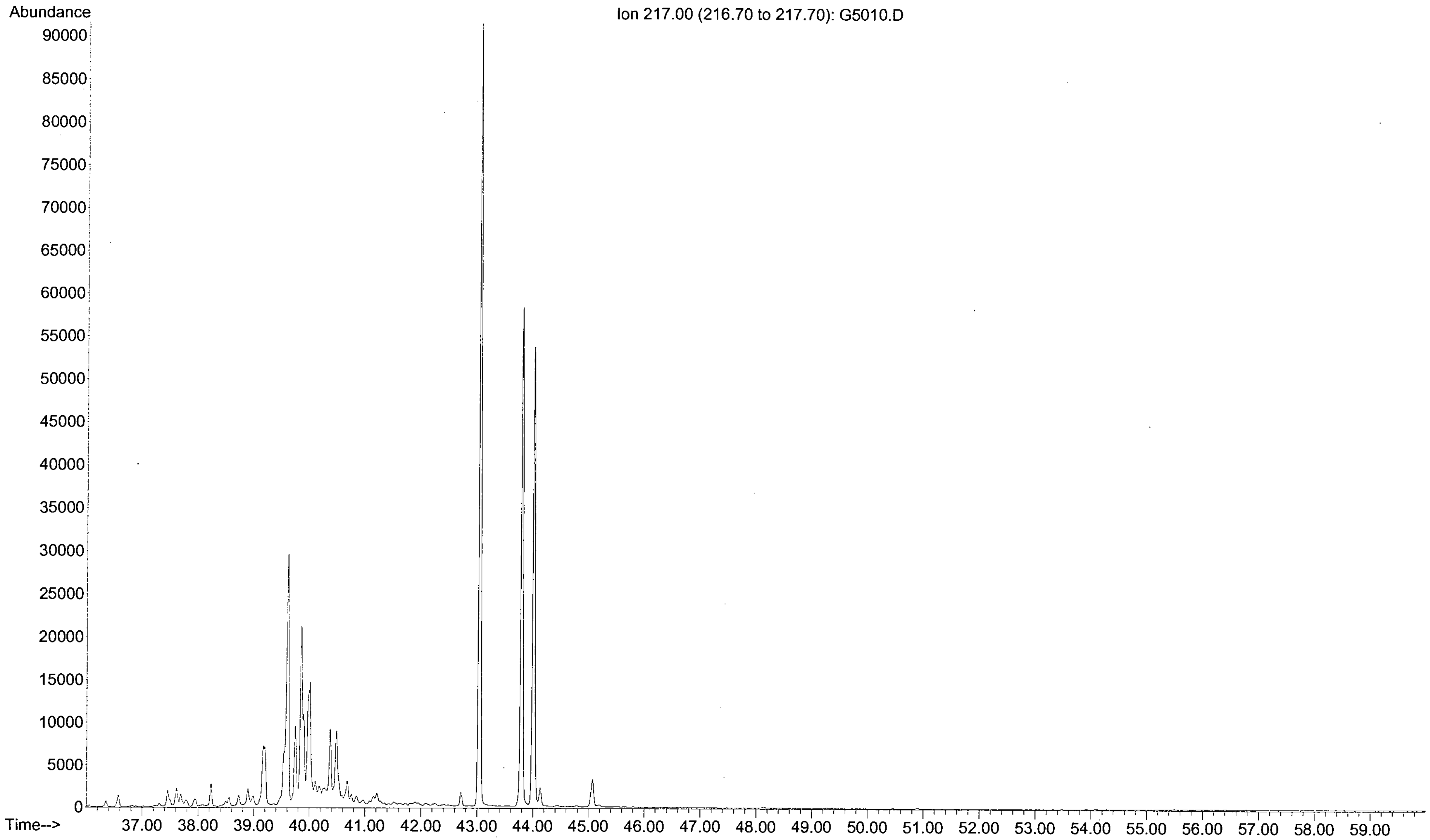
```
File       : G:\G\DATA\SG0319\G5007.D
Operator   : DPB
Acquired   : 10 Feb 2007   5:18 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ939PB-P-MS(5)
Misc Info  : Procedural Blank 5-157 07-0010
Vial Number: 49
```



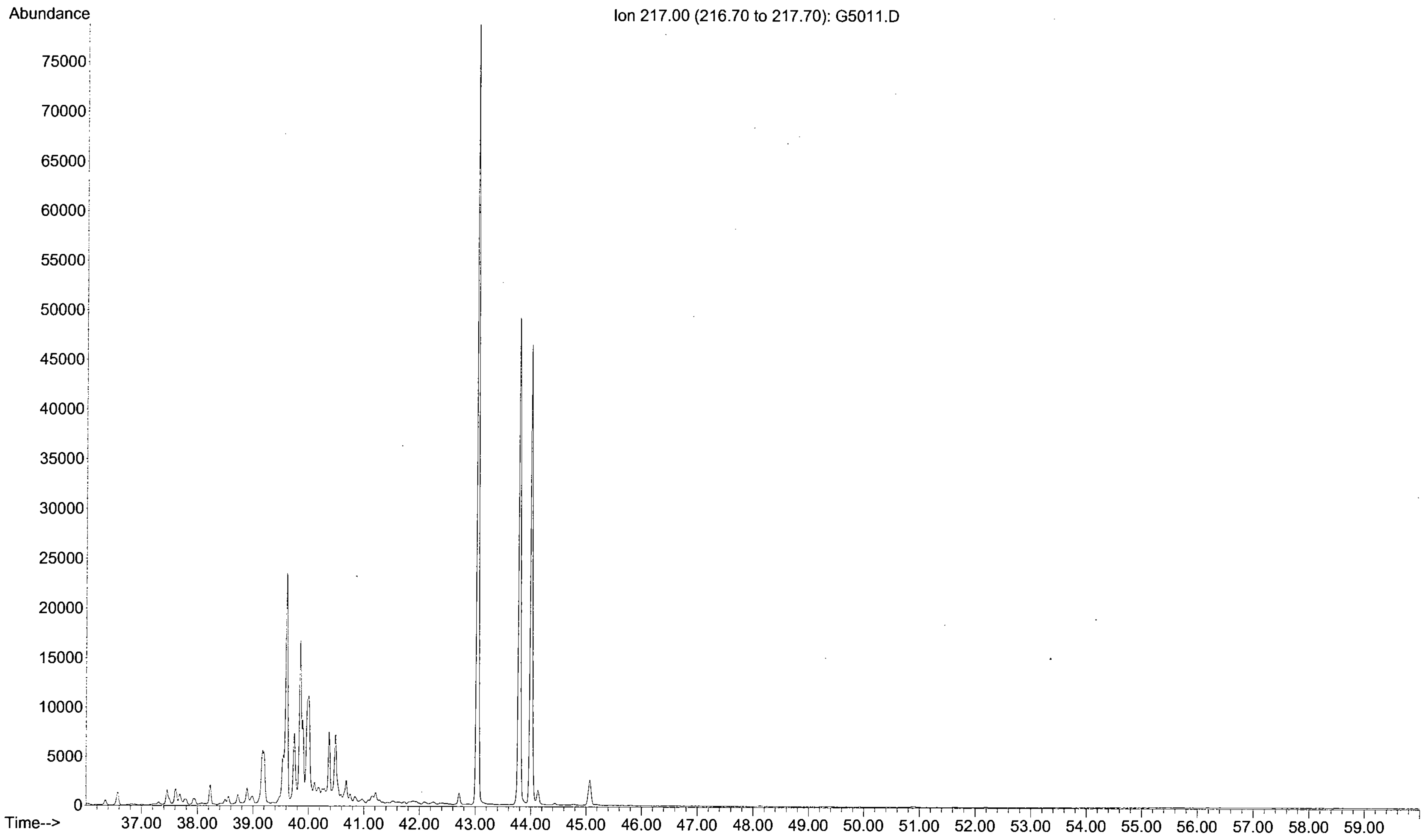
```
File        : G:\G\DATA\SG0319\G5008.D
Operator    : DPB
Acquired    : 10 Feb 2007   6:37 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ940LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0010
Vial Number: 50
```



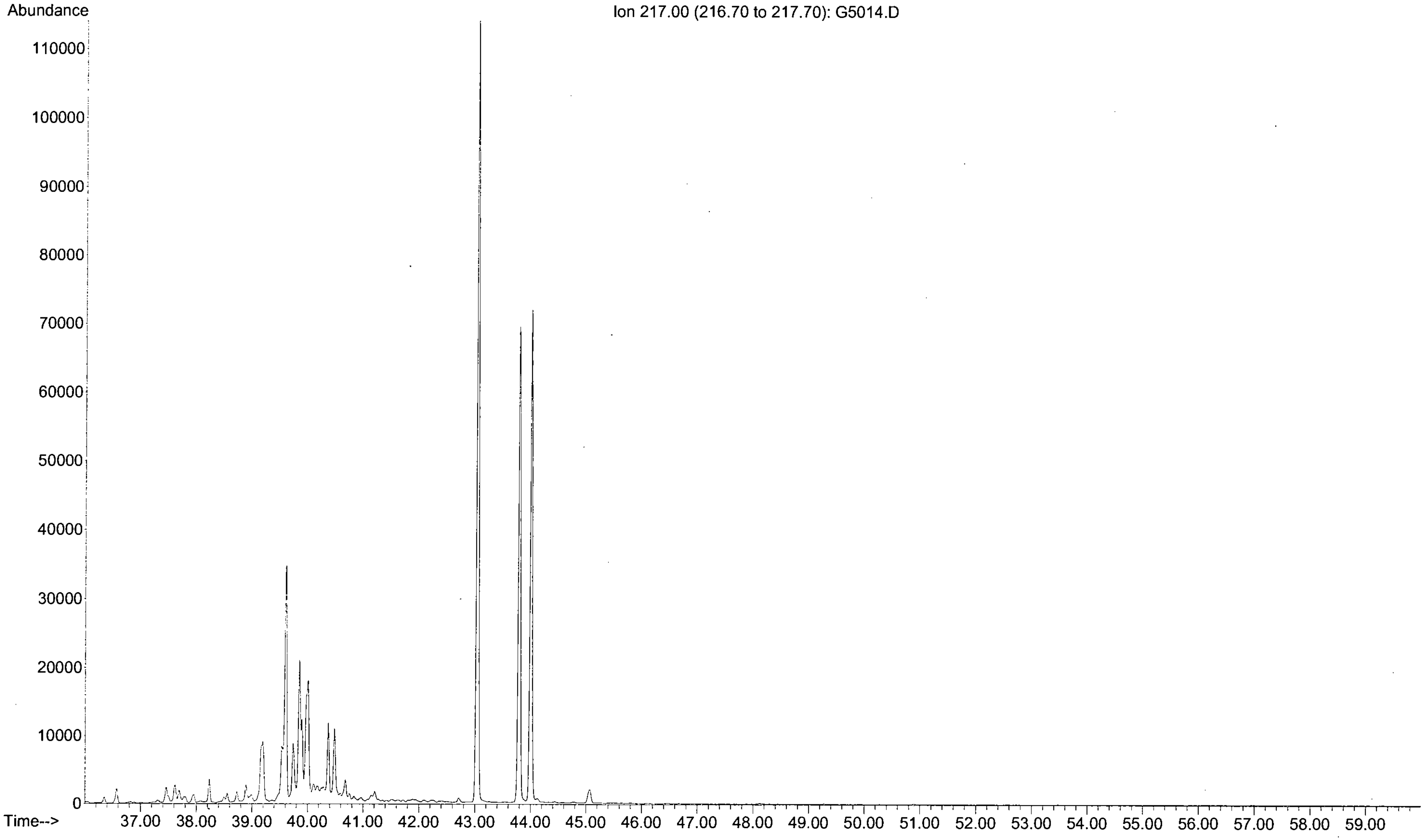
```
File       : G:\G\DATA\SG0319\G5010.D
Operator   : DPB
Acquired   : 10 Feb 2007   9:21 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5525-P-MS(12)
Misc Info  : GWP07T02 5-157 07-0010
Vial Number: 52
```



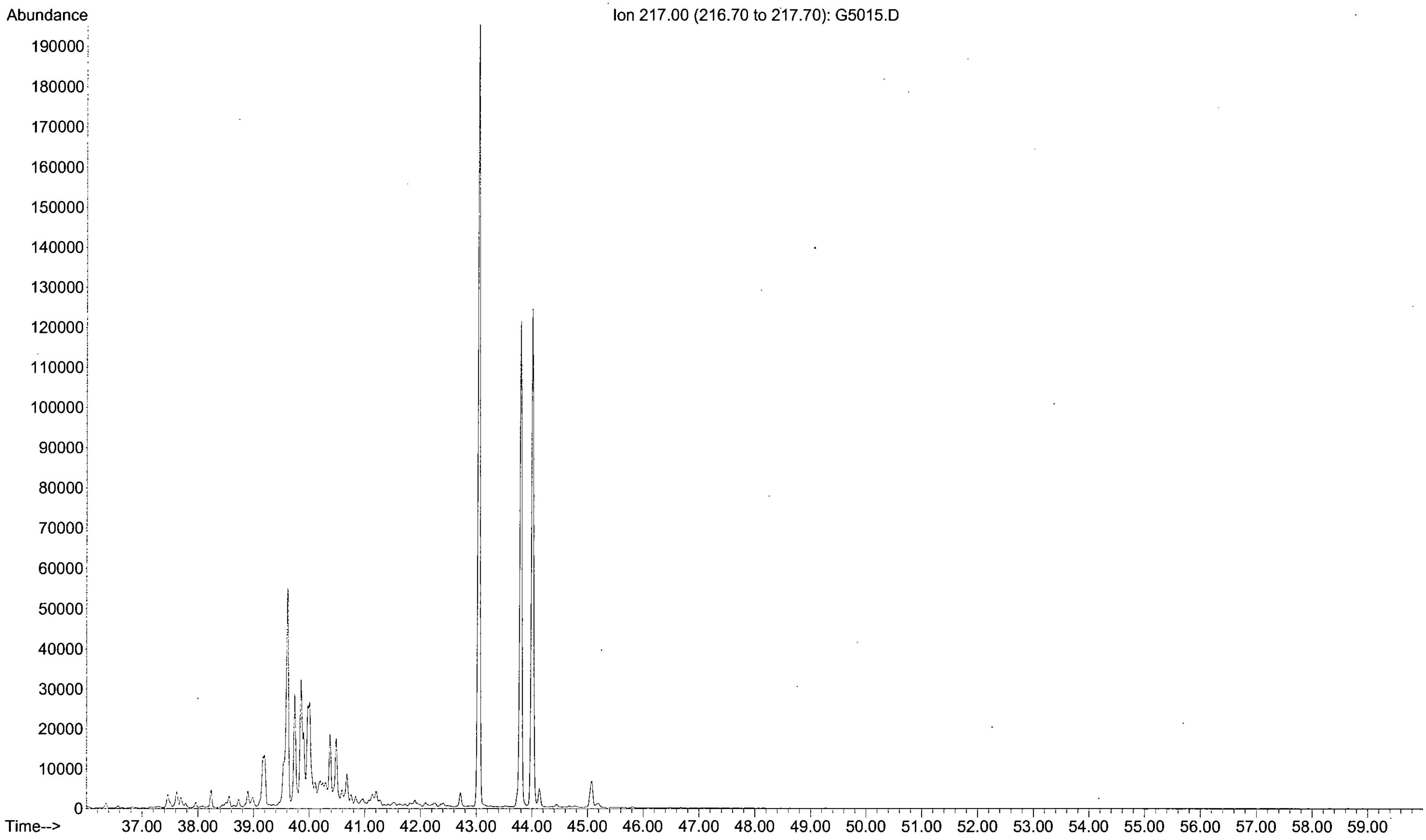
File : G:\G\DATA\SG0319\G5011.D
Operator : DPB
Acquired : 10 Feb 2007 10:43 pm using AcqMethod BIOPLUS
Instrument : Inst. G
Sample Name: R5526-P-MS(12)
Misc Info : GWP07T03 5-157 07-0010
Vial Number: 53



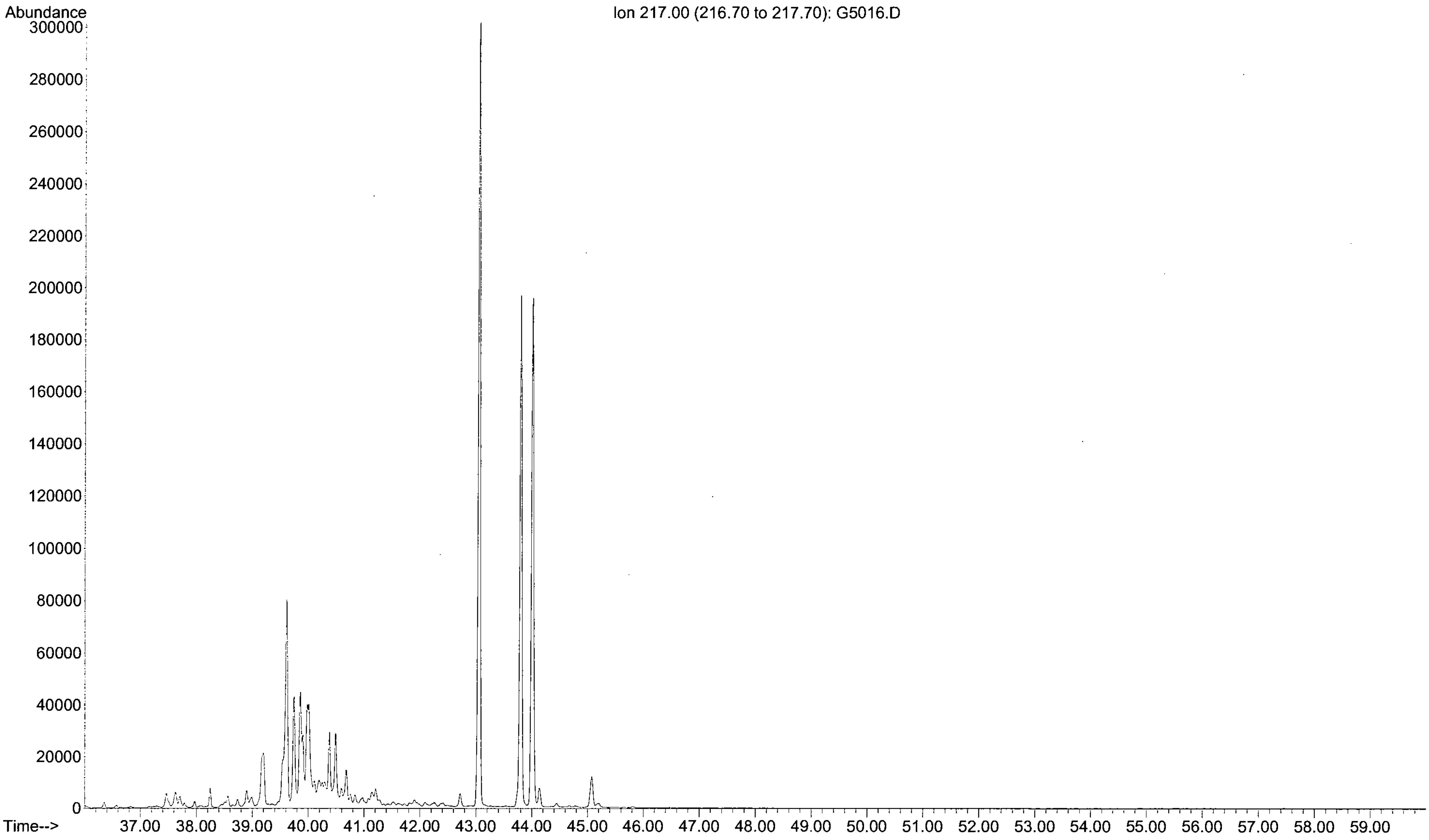
```
File       : G:\G\DATA\SG0319\G5014.D
Operator   : DPB
Acquired   : 11 Feb 2007   2:47 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS(12)
Misc Info  : GWP07T04 5-157 07-0010
Vial Number: 56
```



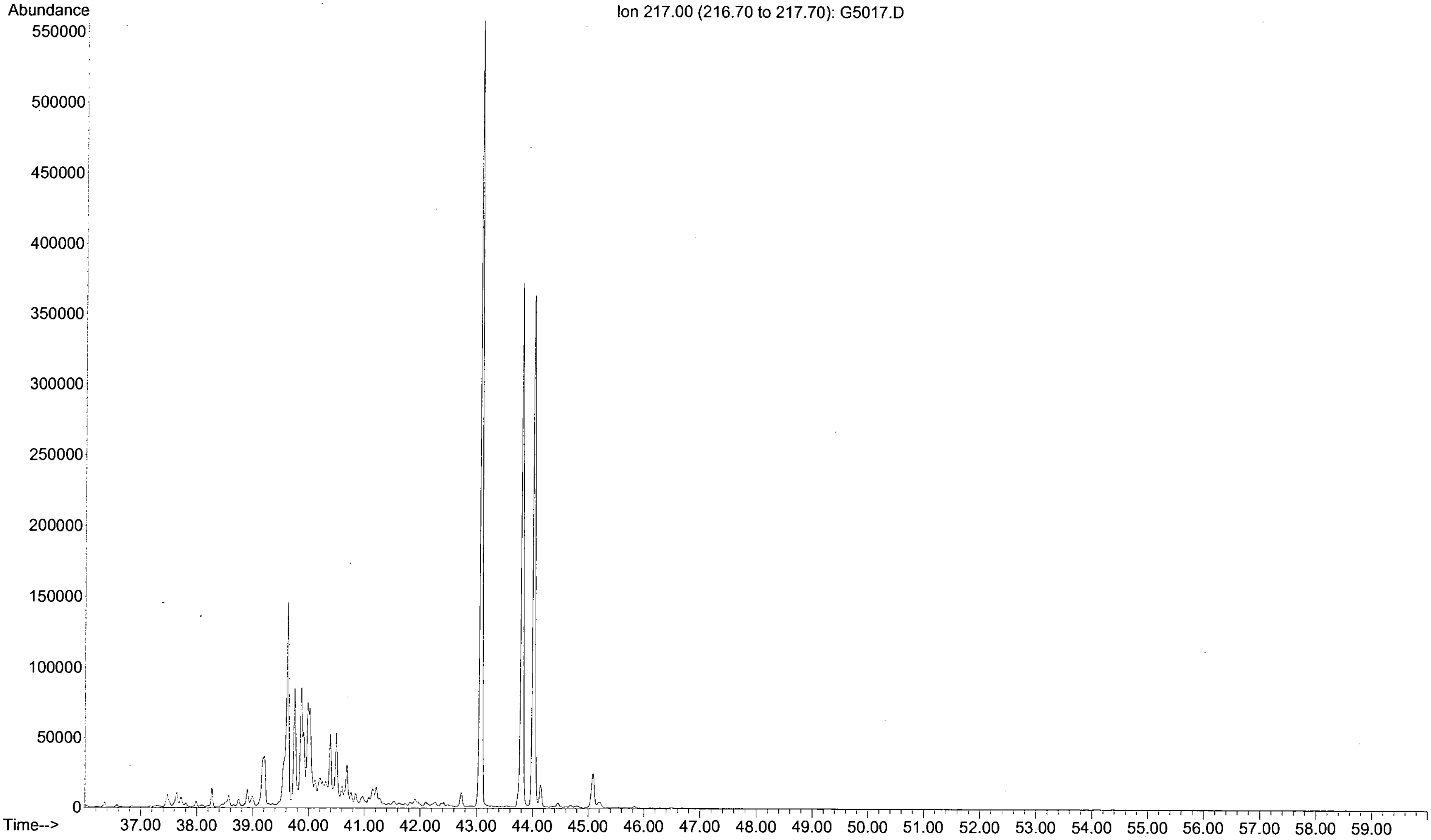
```
File       : G:\G\DATA\SG0319\G5015.D
Operator   : DPB
Acquired   : 11 Feb 2007   4:09 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5528-P-A-MS(14)
Misc Info  : GWP07T05 5-157 07-0010
Vial Number: 57
```



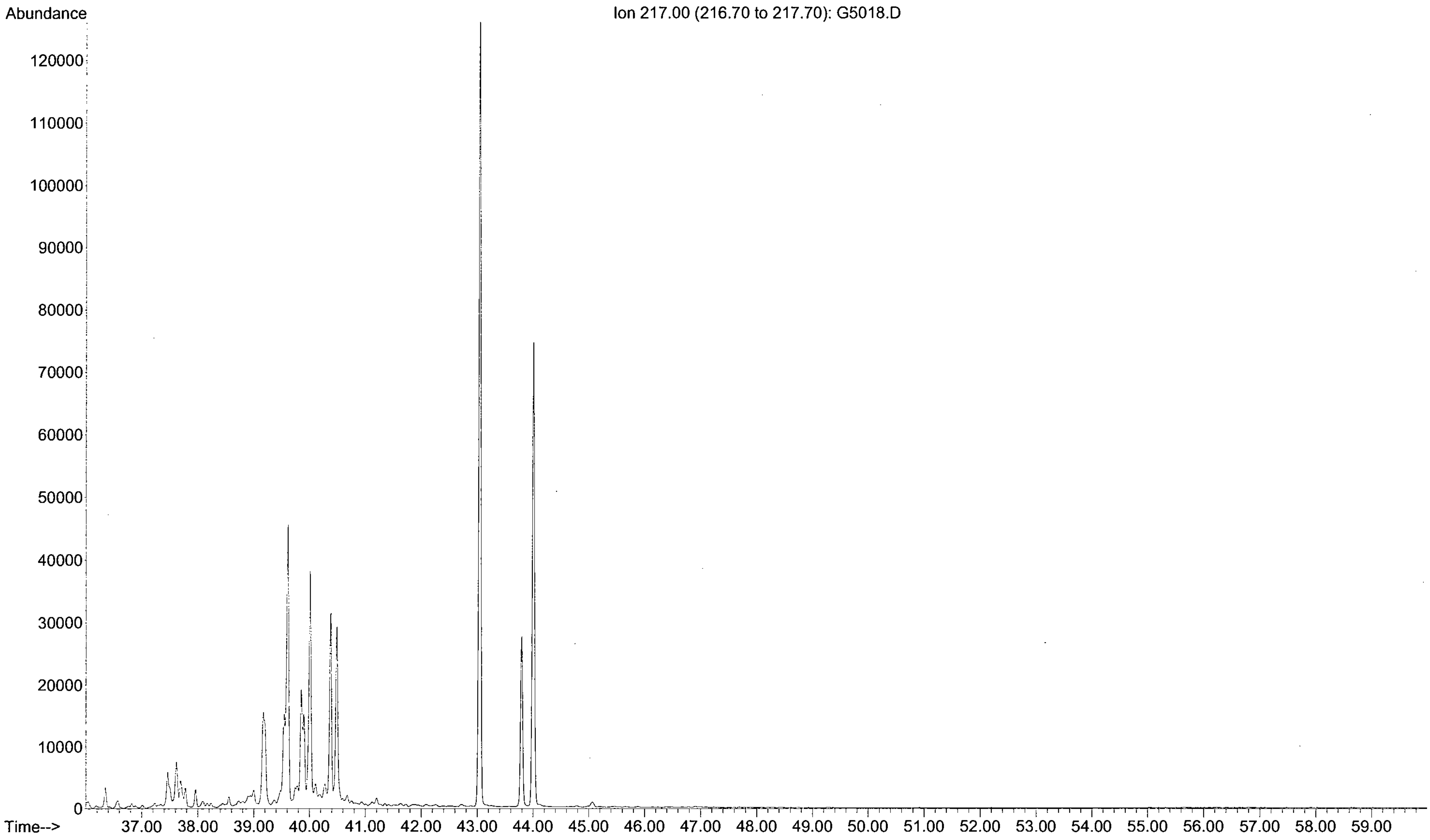
```
File        : G:\G\DATA\SG0319\G5016.D
Operator    : DPB
Acquired    : 11 Feb 2007   5:31 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5529-P-A-MS(14)
Misc Info   : GWP07T06 5-157 07-0010
Vial Number: 58
```



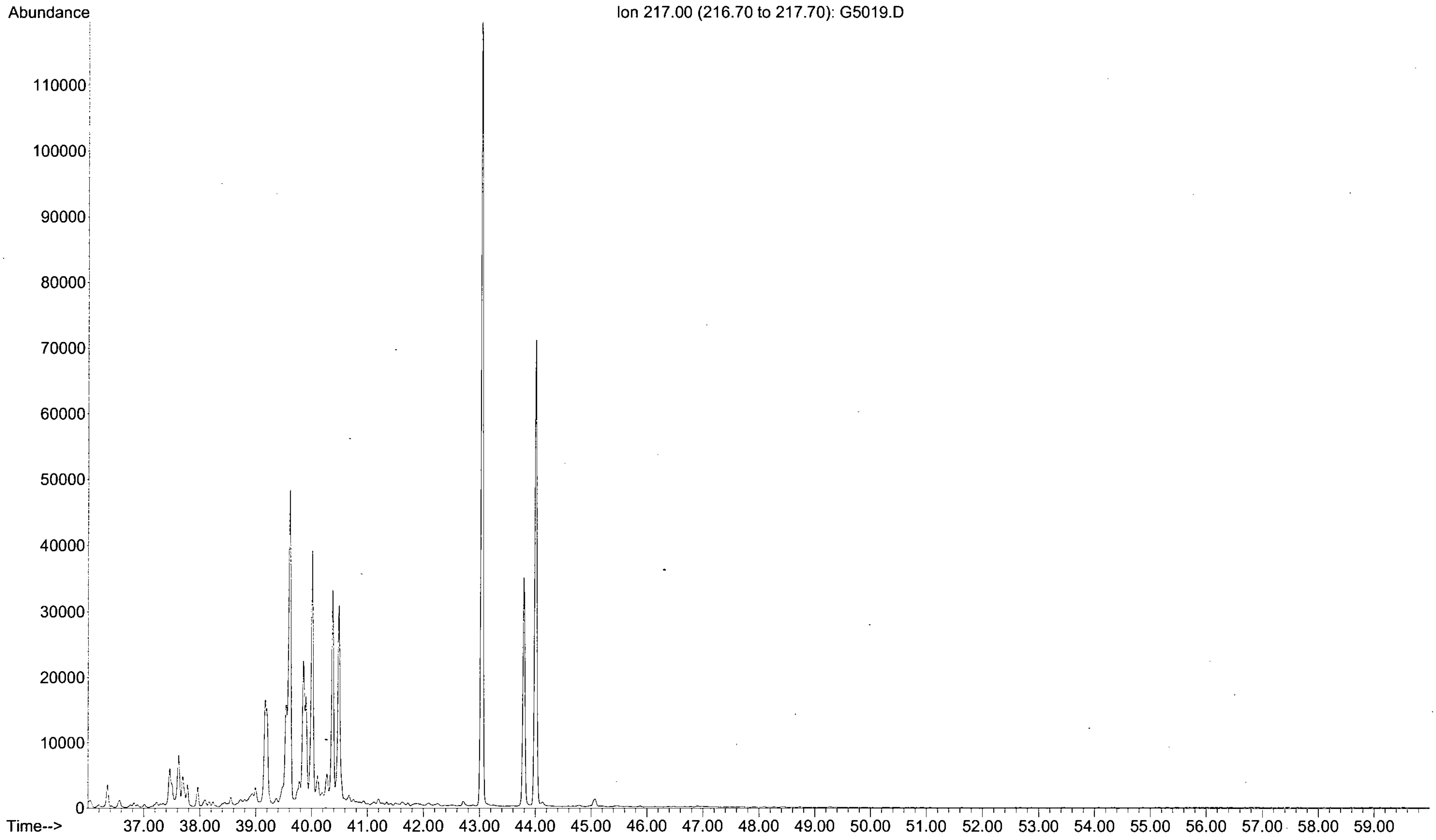
```
File       : G:\G\DATA\SG0319\G5017.D
Operator   : DPB
Acquired   : 11 Feb 2007   6:53 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5530-P-MS(12)
Misc Info  : GWP07T07 5-157 07-0010
Vial Number: 59
```



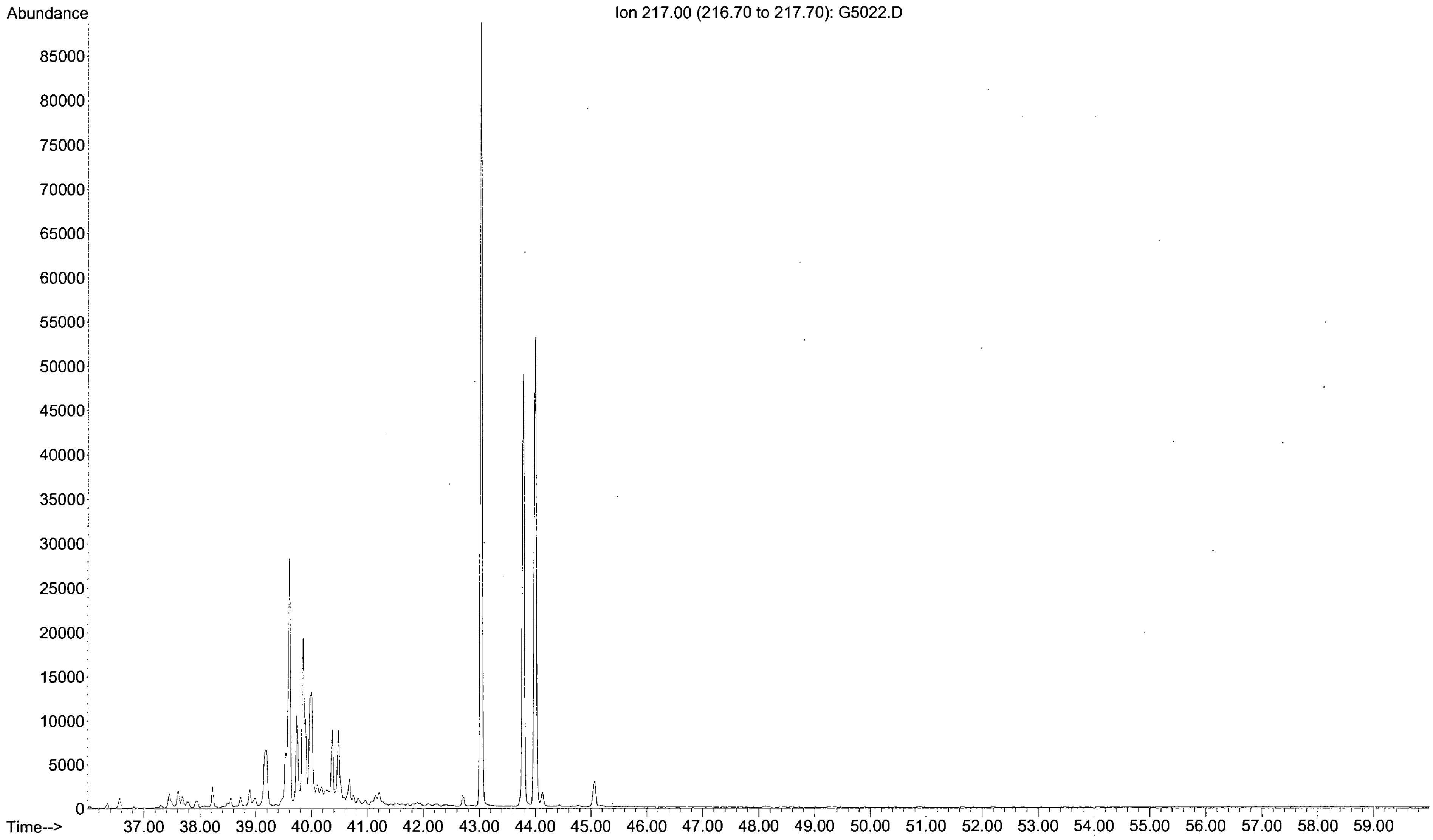
```
File       : G:\G\DATA\SG0319\G5018.D
Operator   : DPB
Acquired   : 11 Feb 2007   8:15 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5531-P-MS(12)
Misc Info  : GWP07T08 5-157 07-0010
Vial Number: 60
```



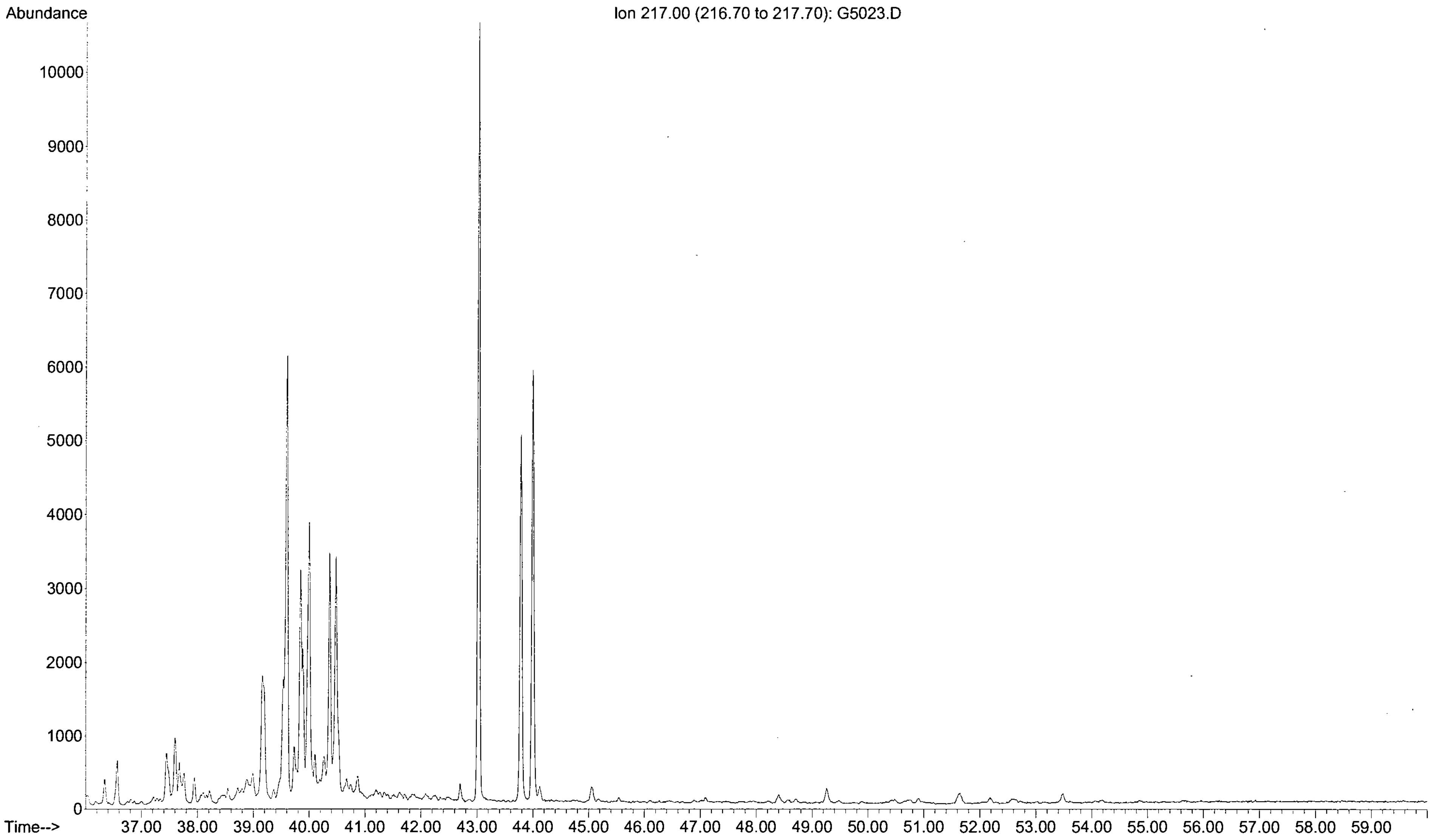
```
File       : G:\G\DATA\SG0319\G5019.D
Operator   : DPB
Acquired   : 11 Feb 2007   9:36 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5532-P-MS(12)
Misc Info  : GWP07T09 5-157 07-0010
Vial Number: 61
```



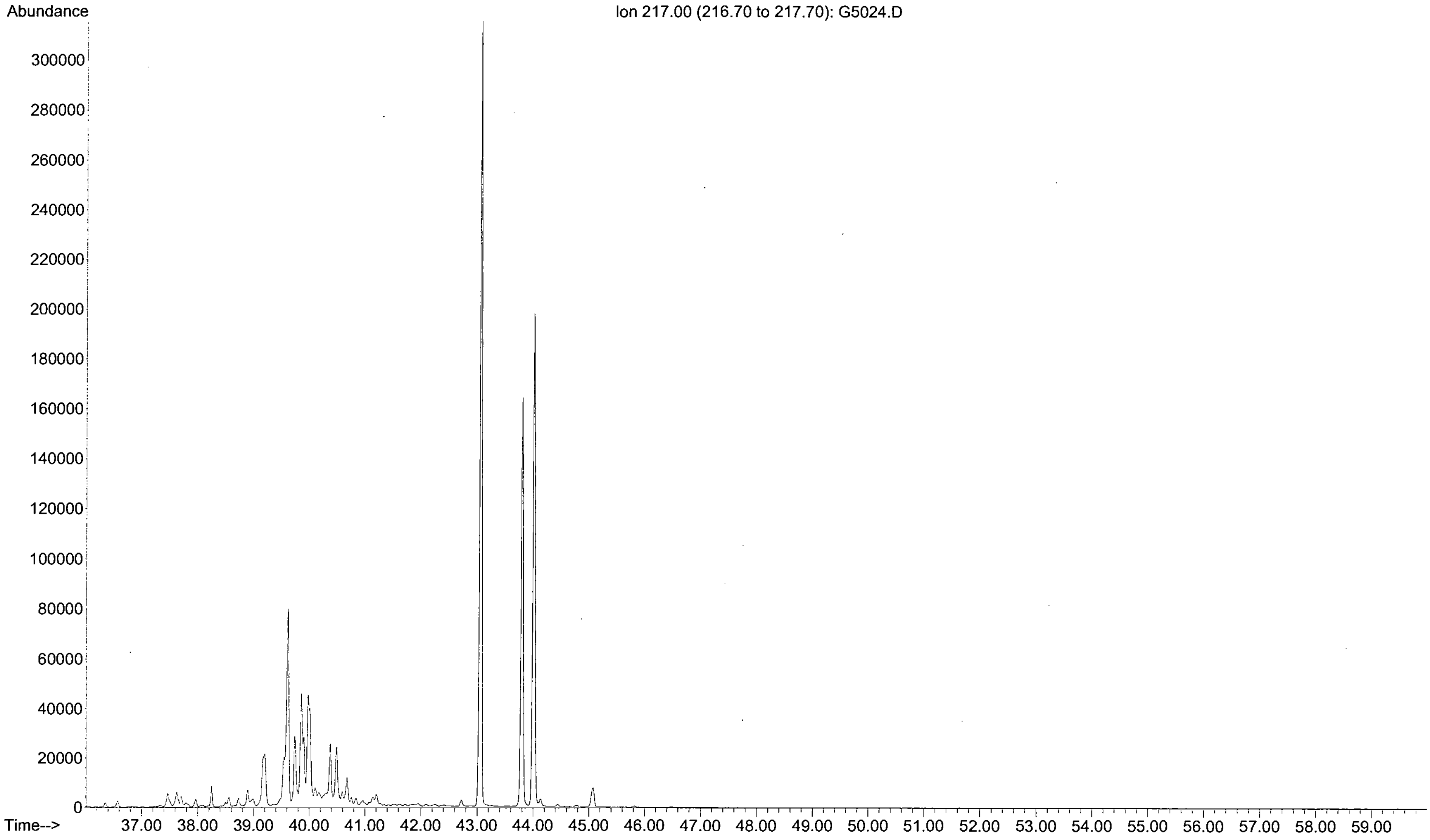
```
File        : G:\G\DATA\SG0319\G5022.D
Operator    : DPB
Acquired    : 11 Feb 2007   1:40 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5533-P-MS(12)
Misc Info   : GWP07T10 5-157 07-0010
Vial Number: 64
```



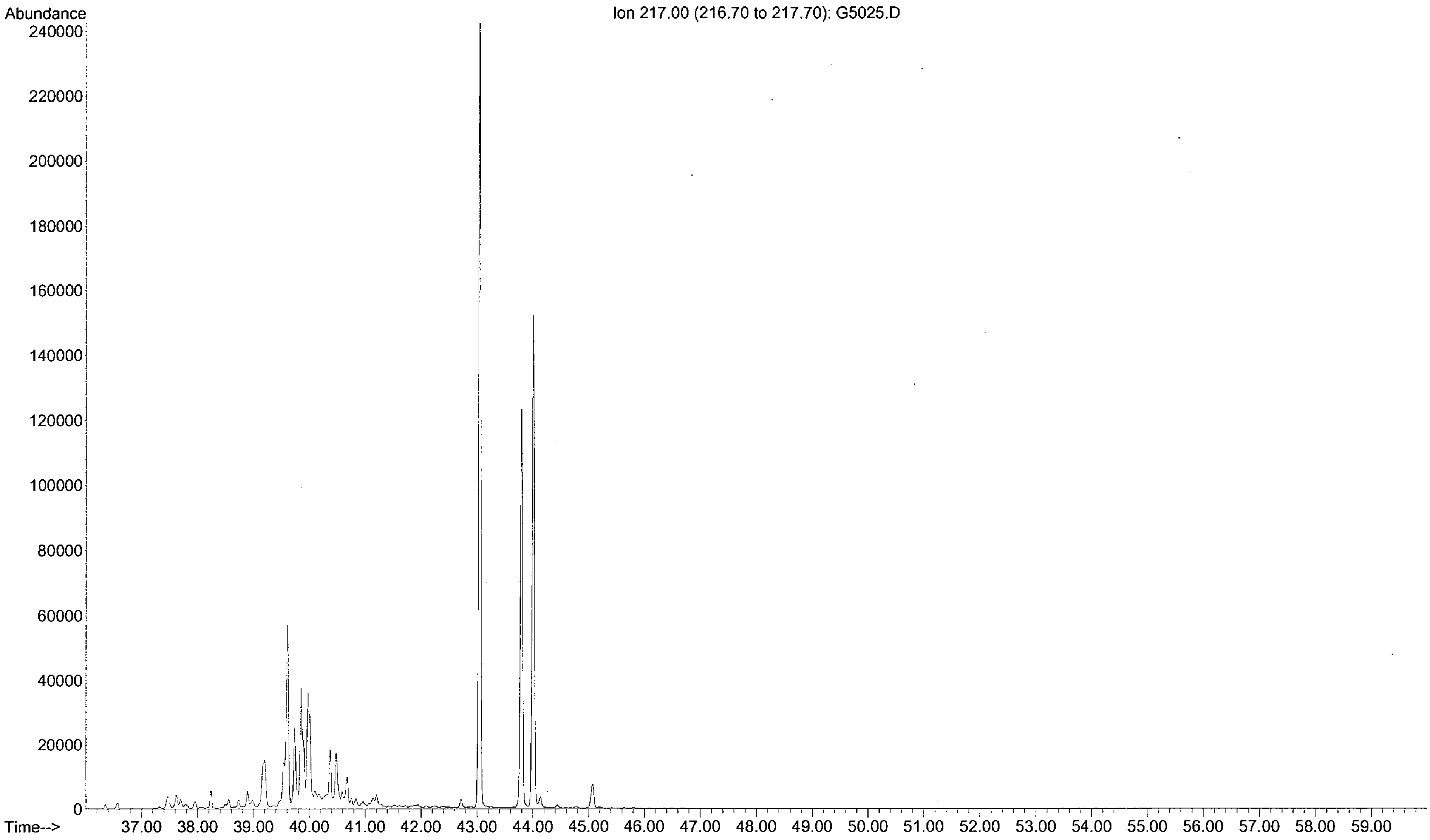
File   : G:\G\DATA\SG0319\G5023.D
Operator   : DPB
Acquired   : 11 Feb 2007   3:02 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5534-P-MS-D(13)
Misc Info   : GWP07T11 5-157 07-0010
Vial Number: 65


Ion 217.00 (216.70 to 217.70): G5023.D

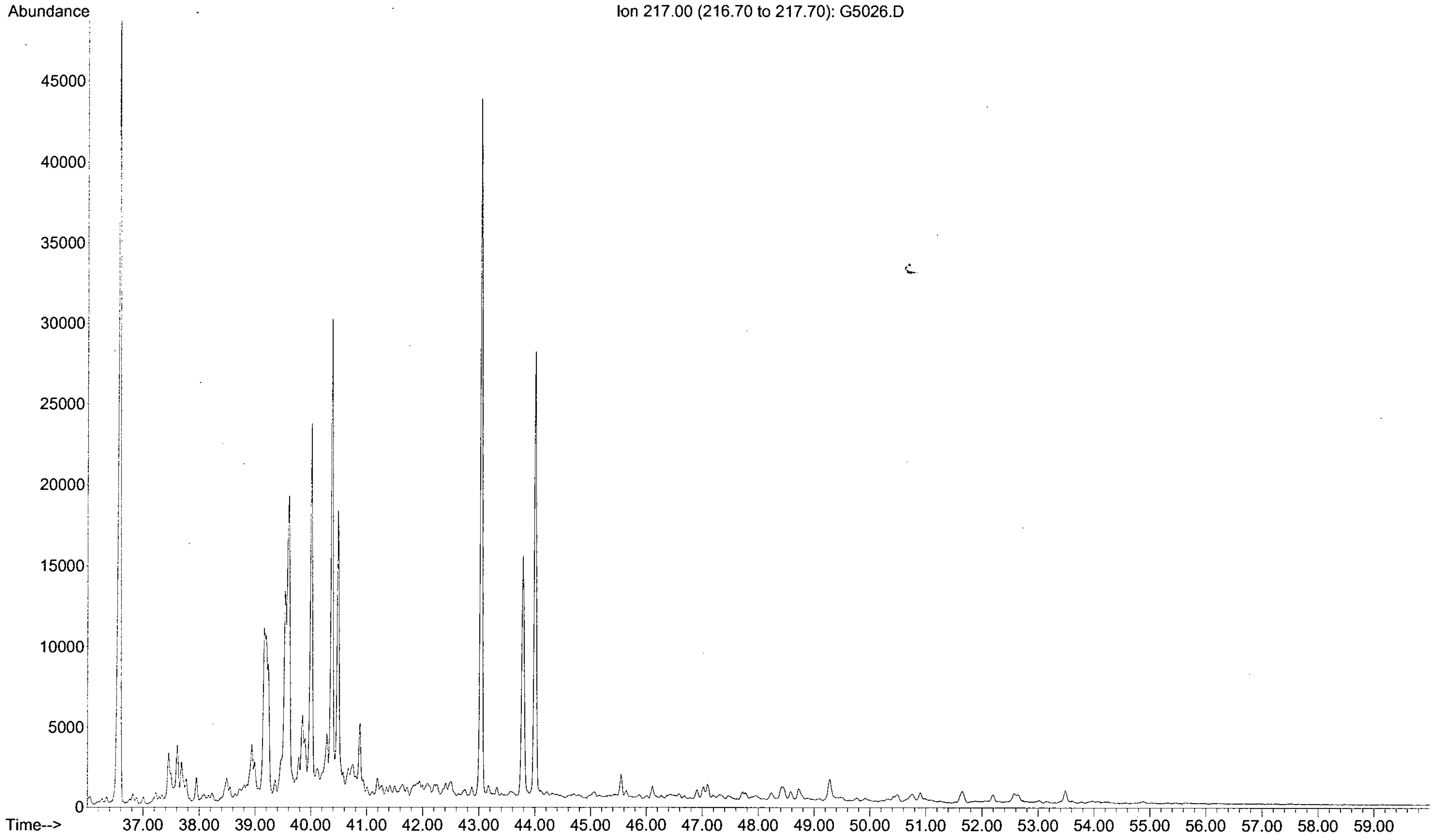
```
File       : G:\G\DATA\SG0319\G5024.D
Operator   : DPB
Acquired   : 11 Feb 2007   4:24 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5535-P-MS(12)
Misc Info  : GWP07T12 5-157 07-0010
Vial Number: 66
```



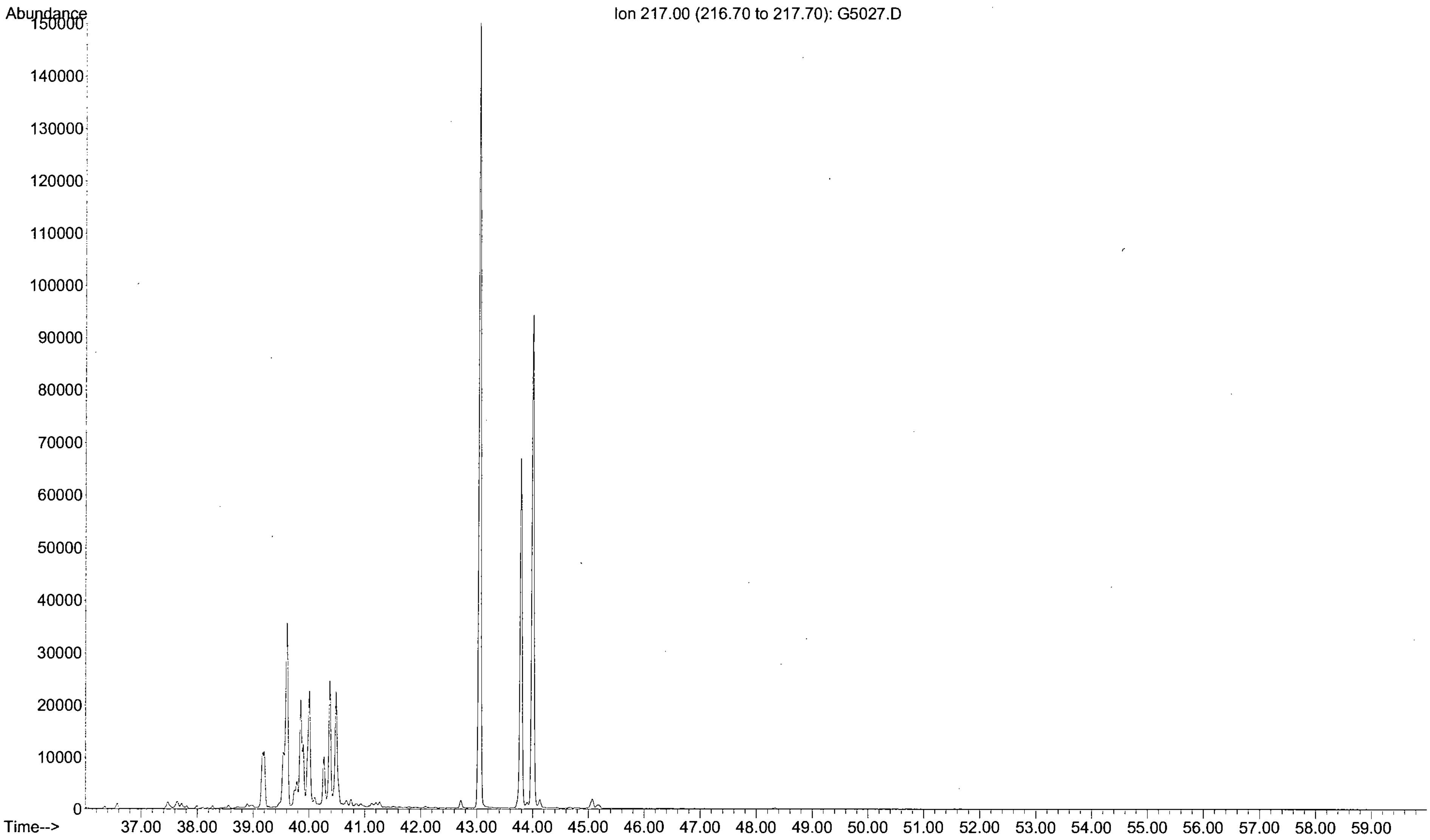
```
File       : G:\G\DATA\SG0319\G5025.D
Operator   : DPB
Acquired   : 11 Feb 2007   5:44 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5536-P-MS(12)
Misc Info  : GWP07T13 5-157 07-0010
Vial Number: 67
```



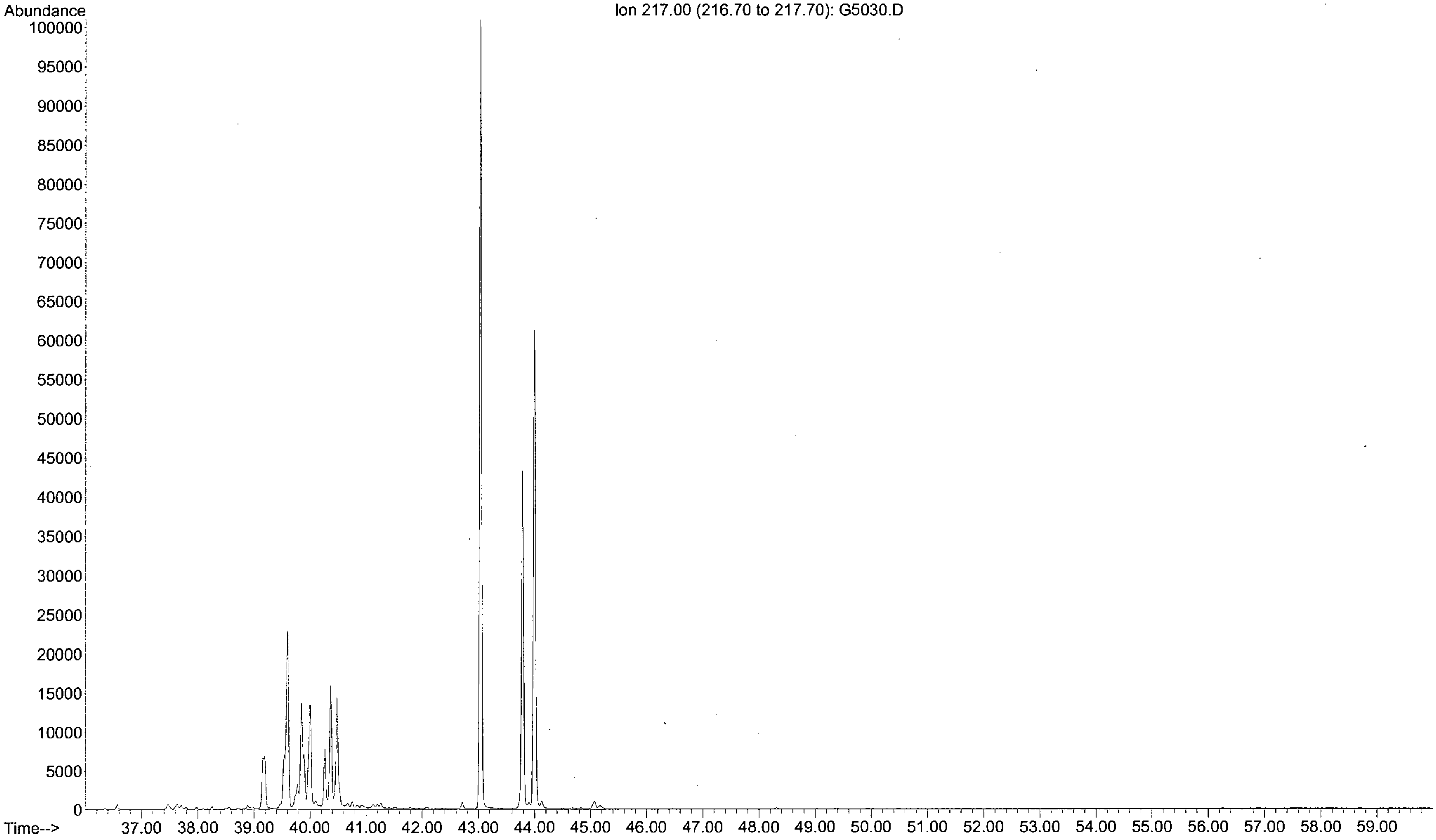
```
File        : G:\G\DATA\SG0319\G5026.D
Operator    : DPB
Acquired    : 11 Feb 2007   7:06 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5537-P-MS(10)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 68
```



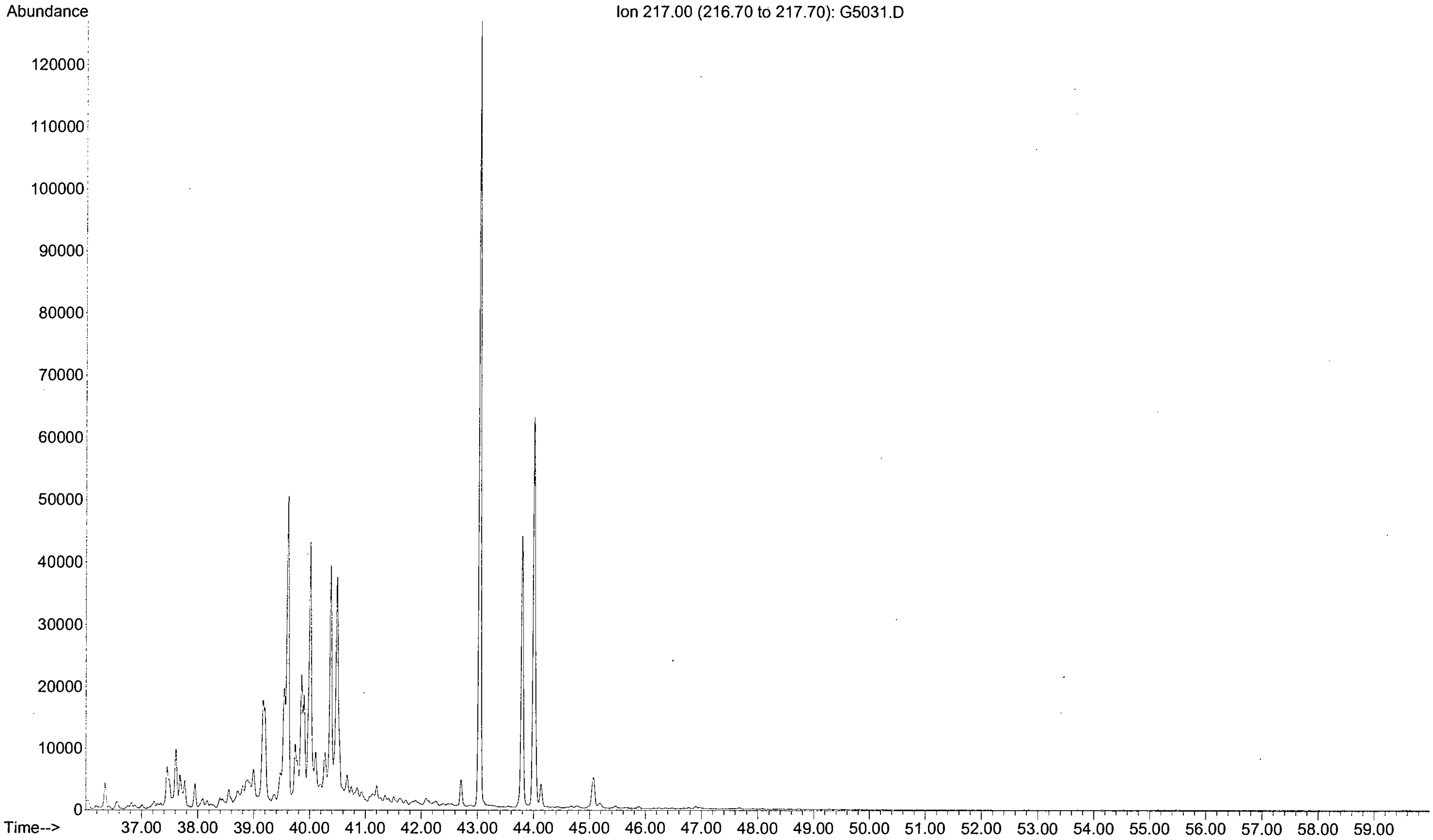
```
File       : G:\G\DATA\SG0319\G5027.D
Operator   : DPB
Acquired   : 11 Feb 2007   8:26 pm using AcqMethod BIOPLUS
Instrument :    Inst. G
Sample Name: R5538-P-MS(12)
Misc Info  : GWP07S01 5-157 07-0010
Vial Number: 69
```



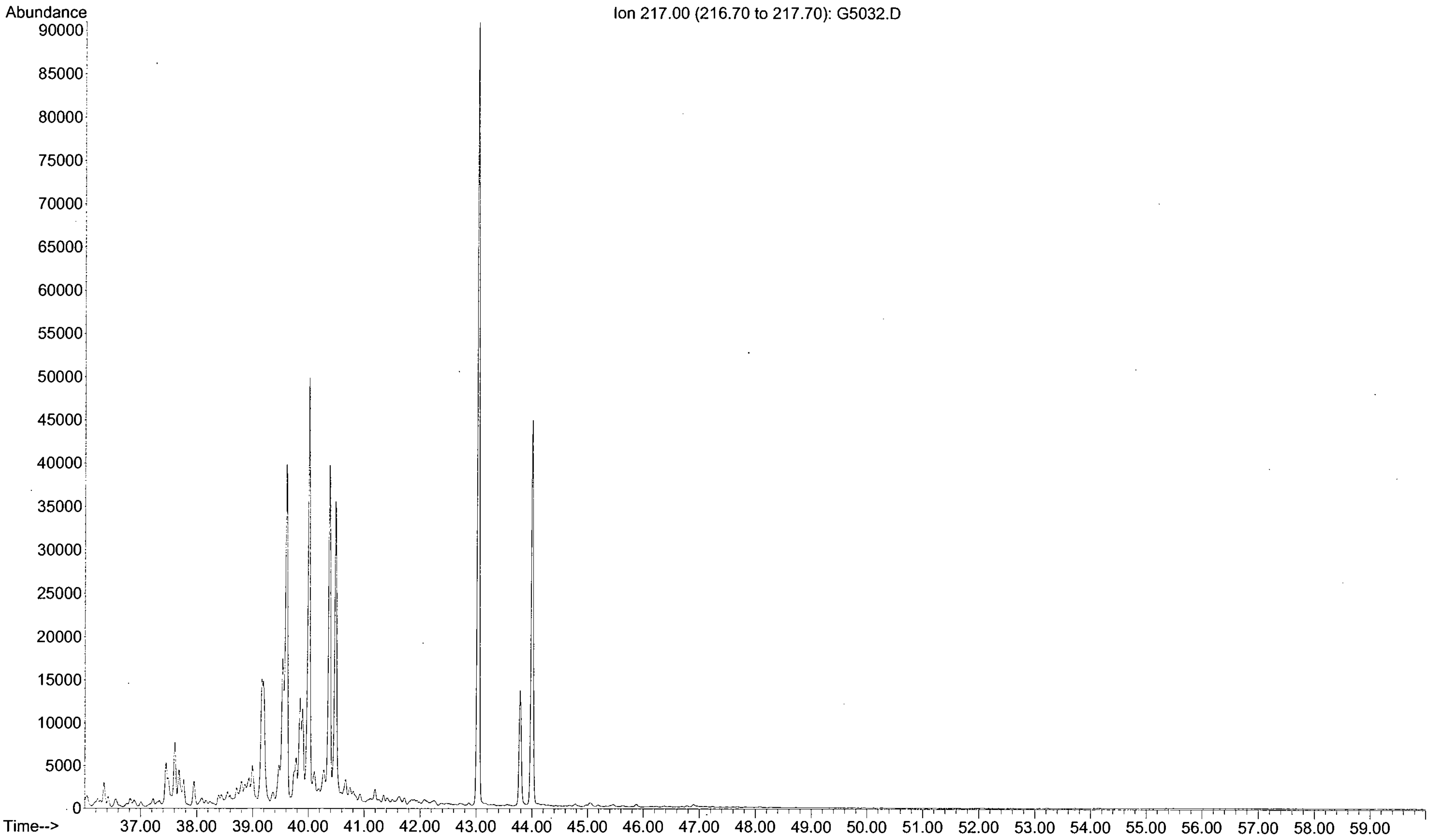
File : G:\G\DATA\SG0319\G5030.D
Operator : DPB
Acquired : 12 Feb 2007 12:32 am using AcqMethod BIOPLUS
Instrument : Inst. G
Sample Name: R5539-P-MS(12)
Misc Info : GWP07S02 5-157 07-0010
Vial Number: 72



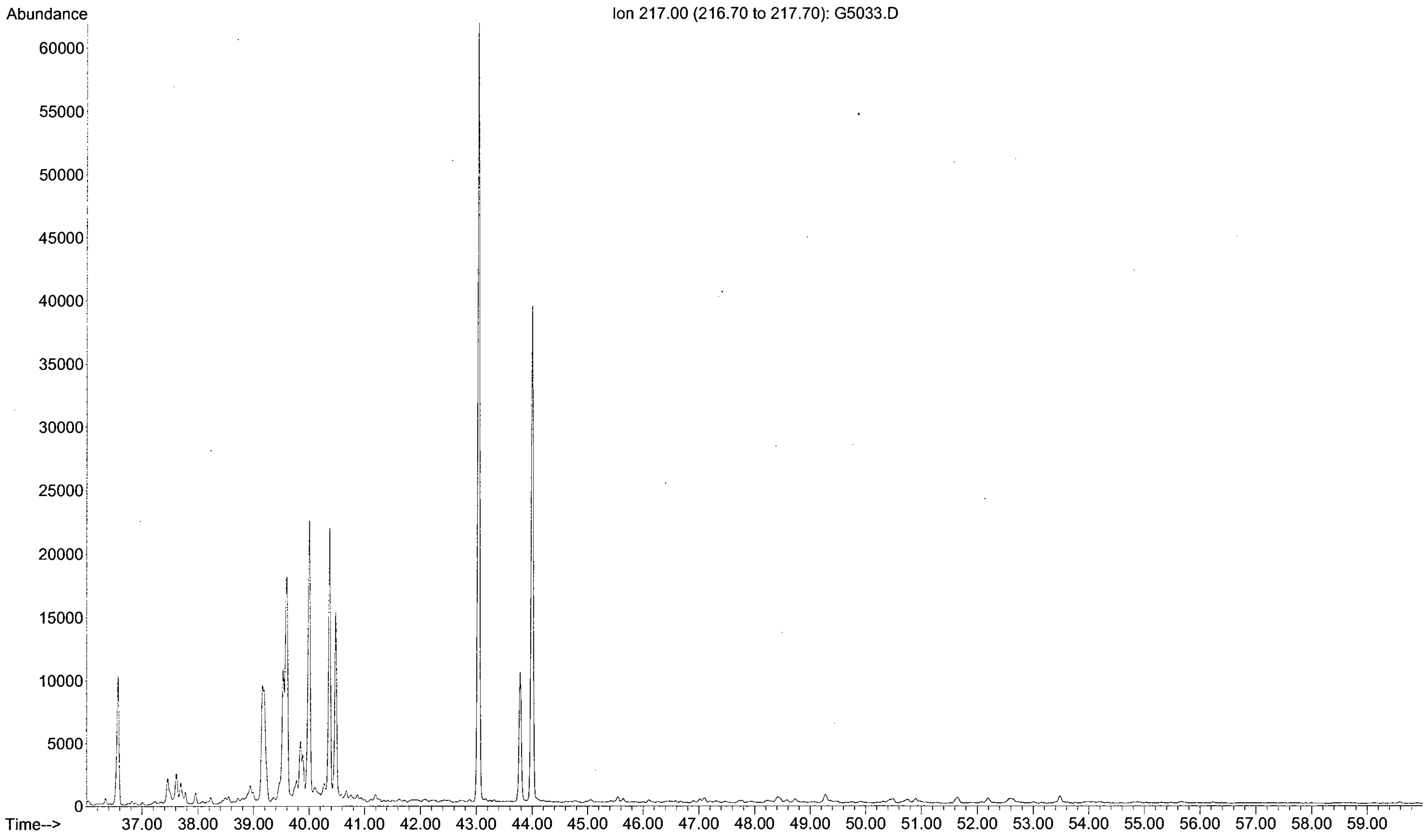
```
File        : G:\G\DATA\SG0319\G5031.D
Operator    : DPB
Acquired    : 12 Feb 2007   1:53 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5540-P-MS(12)
Misc Info   : GWP07S03 5-157 07-0010
Vial Number: 73
```



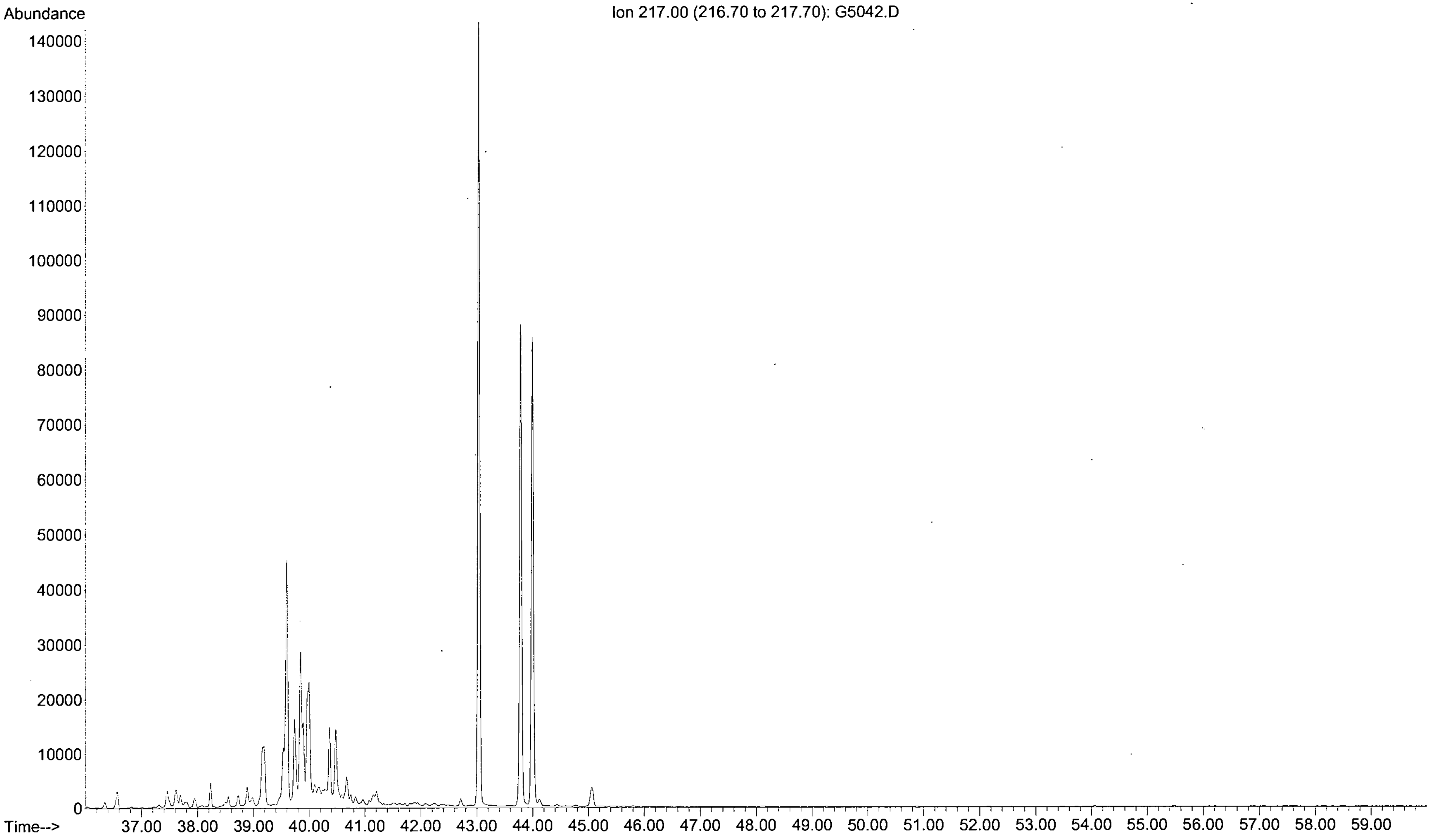
```
File        : G:\G\DATA\SG0319\G5032.D
Operator    : DPB
Acquired    : 12 Feb 2007   3:15 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5541-P-MS(12)
Misc Info   : GWP07S04 5-157 07-0010
Vial Number: 74
```



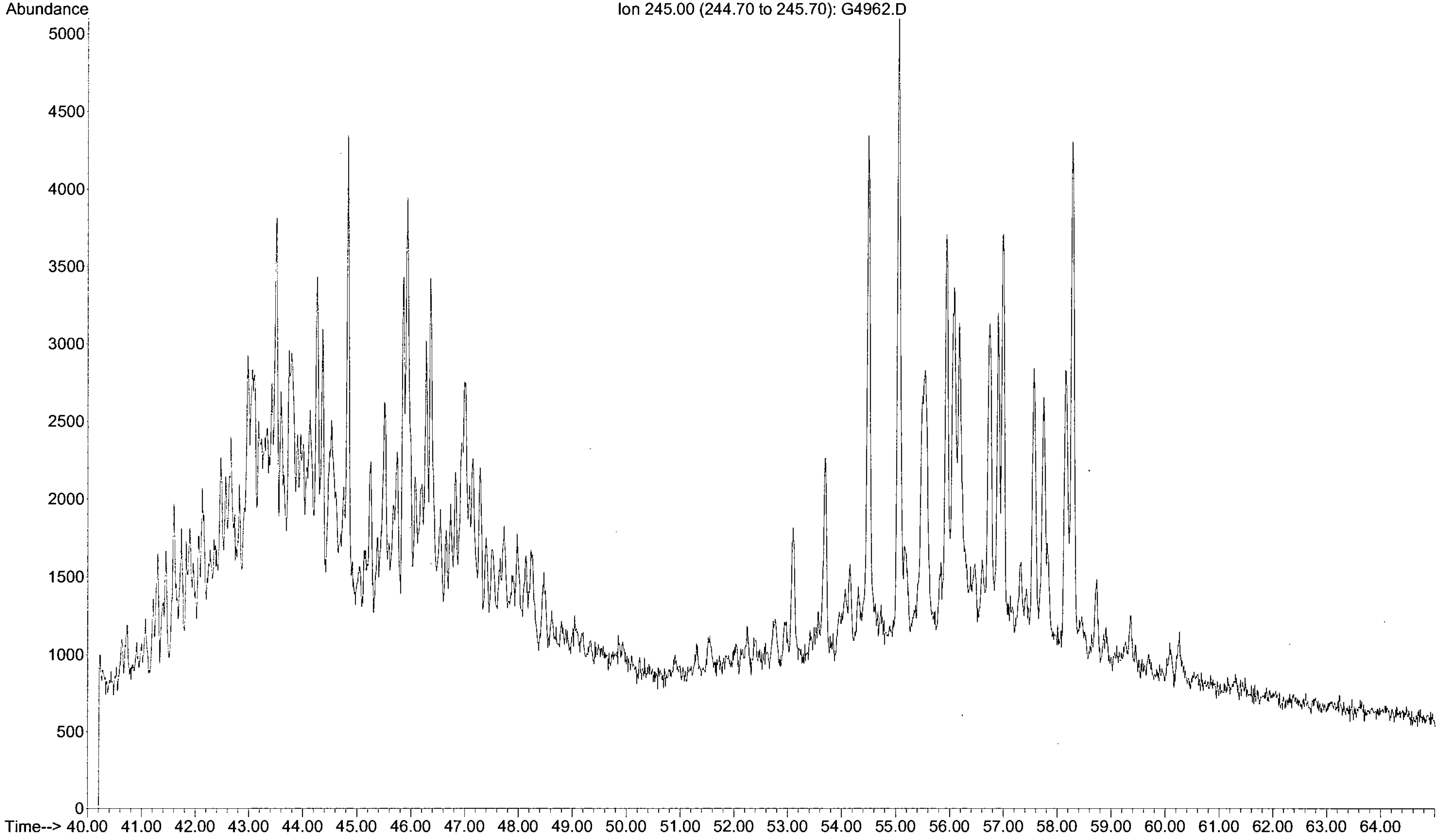
```
File        : G:\G\DATA\SG0319\G5033.D
Operator    : DPB
Acquired    : 12 Feb 2007   4:38 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5542-P-MS(12)
Misc Info   : TDW3-4.5 5-157 07-0010
Vial Number: 75
```



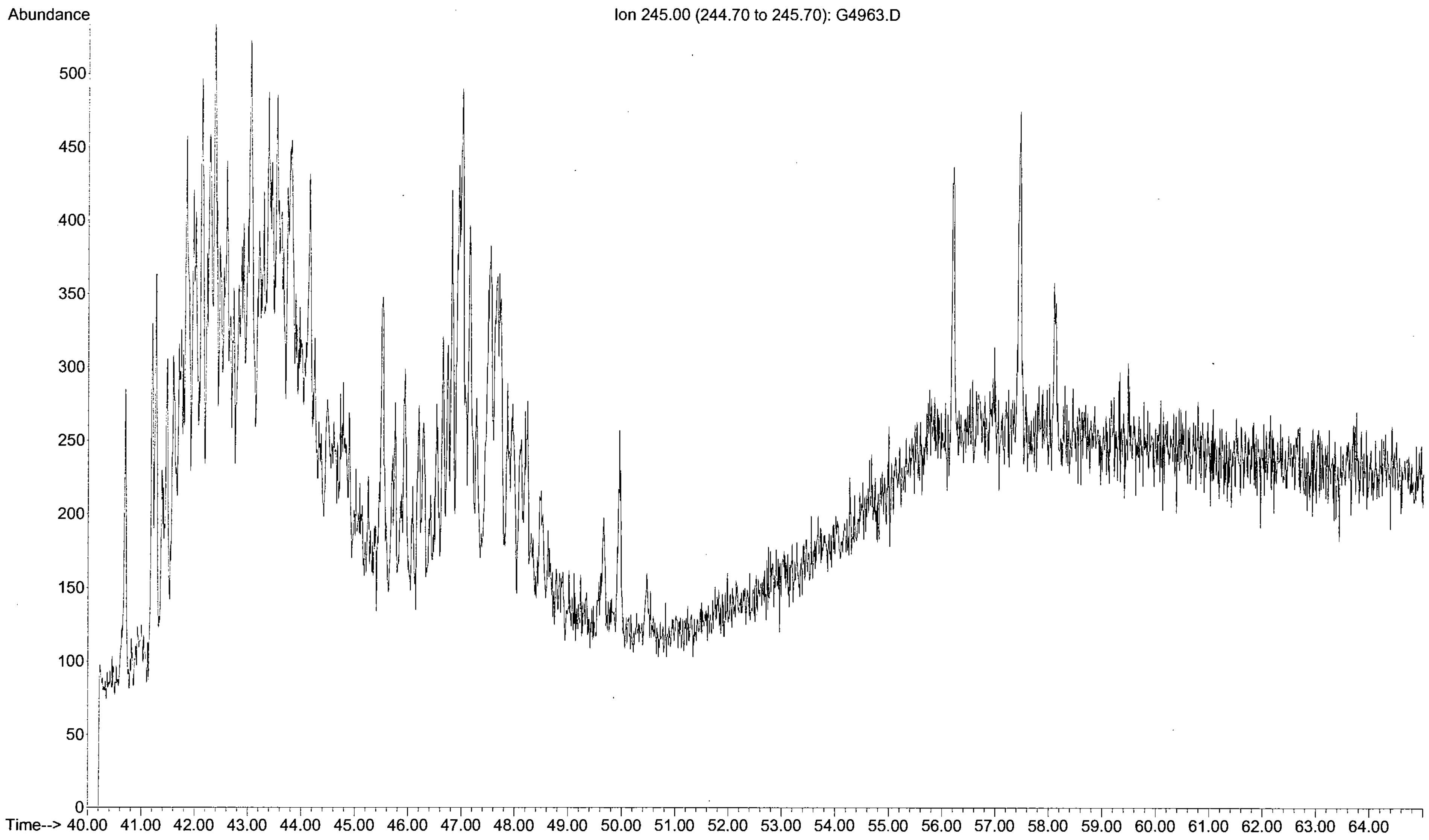
```
File        : G:\G\DATA\SG0319\G5042.D
Operator    : DPB
Acquired    : 12 Feb 2007   4:56 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5521-P-MS(12)
Misc Info   : GWP07T01 5-157 07-0010
Vial Number: 84
```



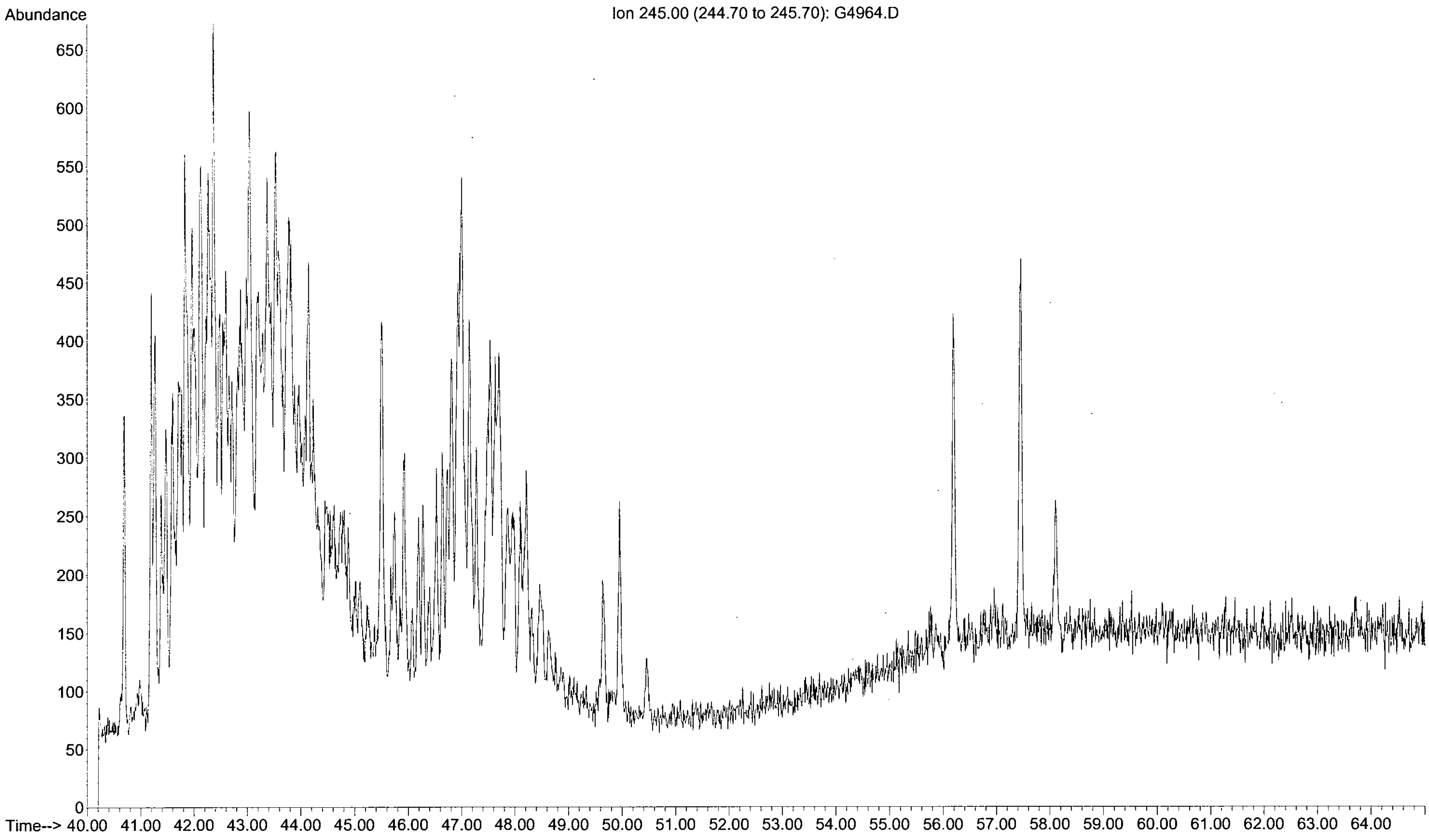
```
File        : G:\G\DATA\SG0319\G4962.D
Operator    : DPB
Acquired    :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info   : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4
```



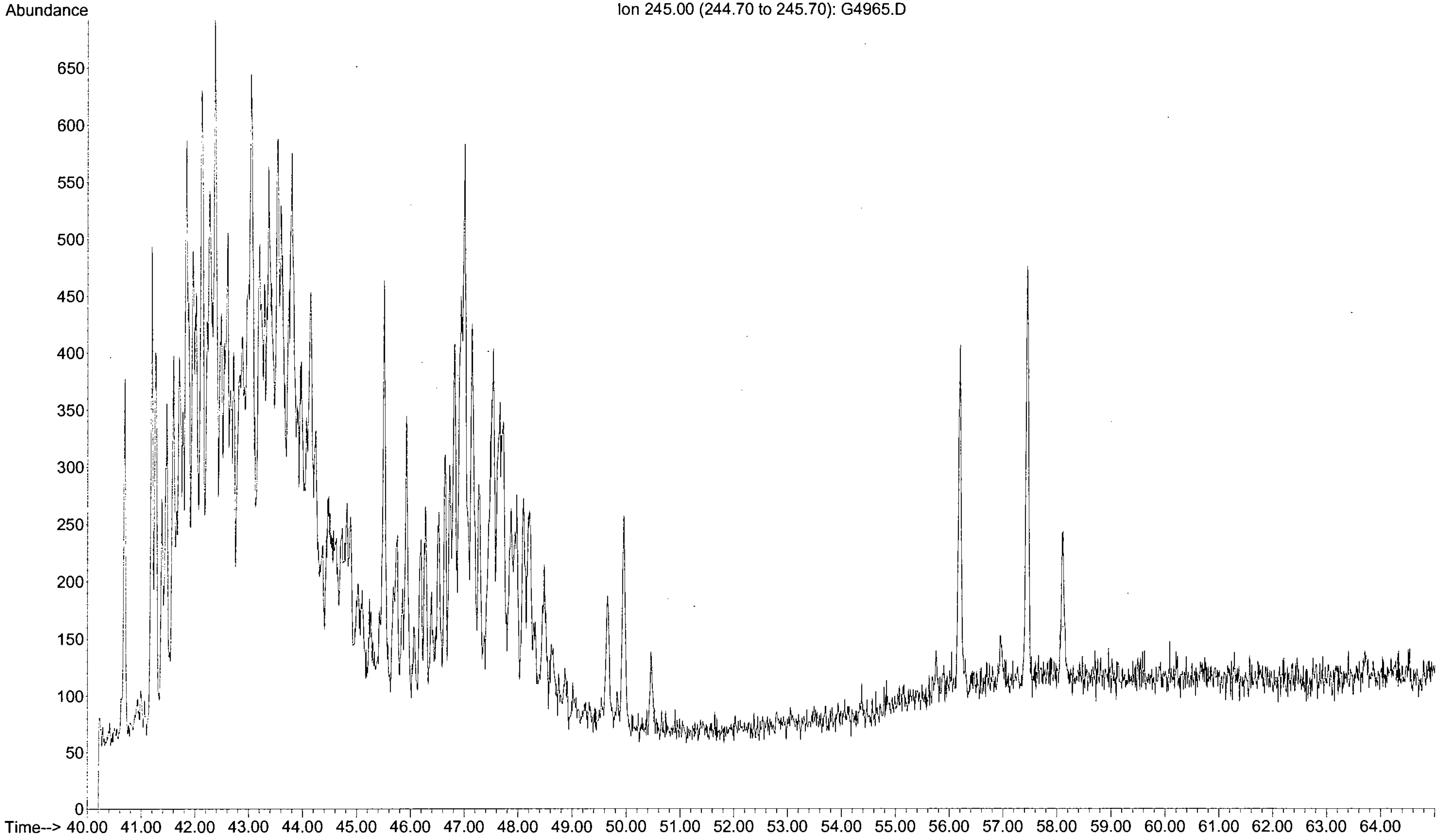
```
File       : G:\G\DATA\SG0319\G4963.D
Operator   : DPB
Acquired   :  8 Feb 2007  12:50 am using AcqMethod BIOPLUS
Instrument :    Inst. G
Sample Name: R5528-P-A-MS-D(15)
Misc Info  : GWP07T05 5-157 07-0010
Vial Number: 5
```



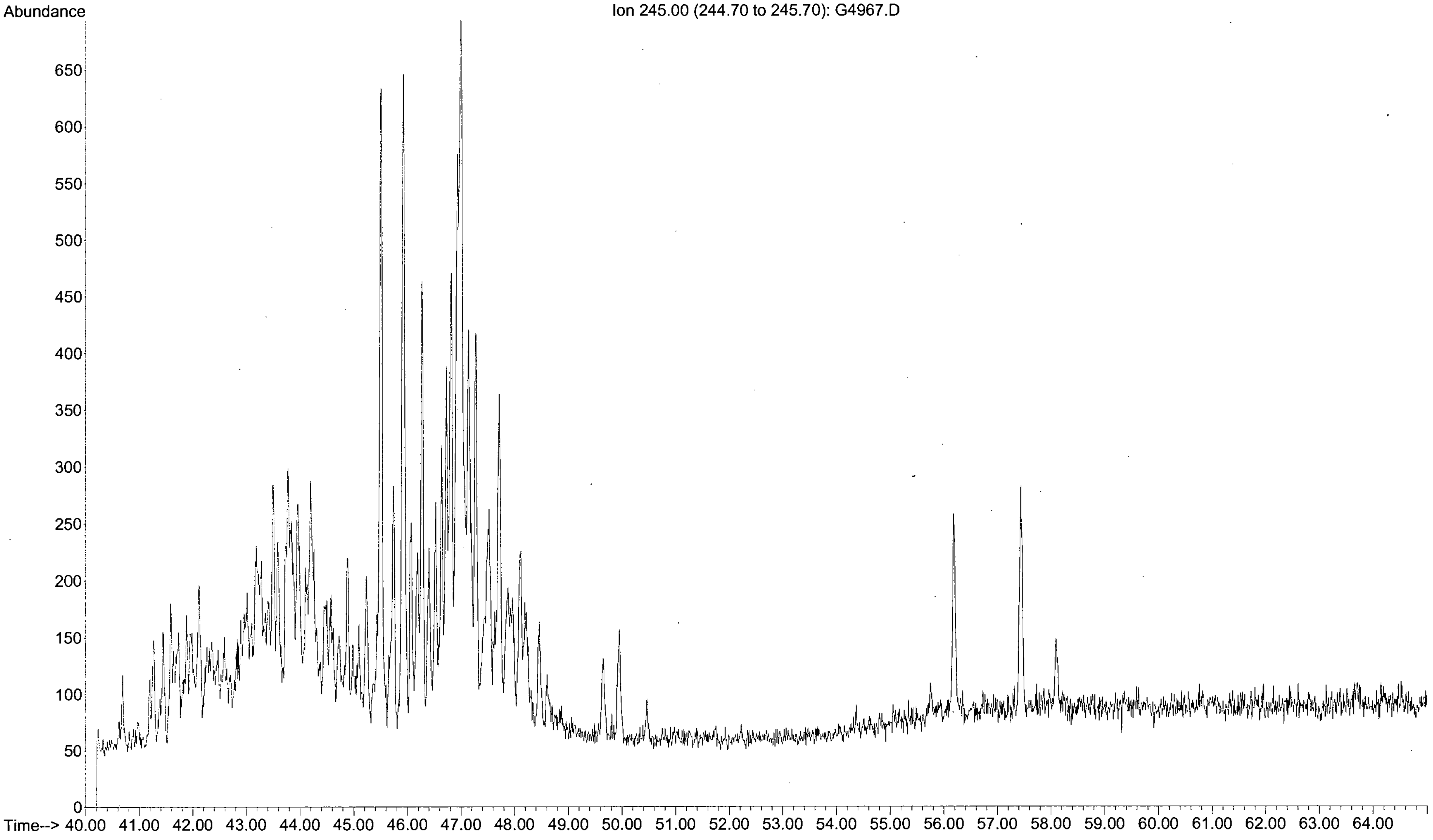
```
File        : G:\G\DATA\SG0319\G4964.D
Operator    : DPB
Acquired    :  8 Feb 2007   2:10 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5529-P-A-MS-D(15)
Misc Info   : GWP07T06 5-157 07-0010
Vial Number: 6
```



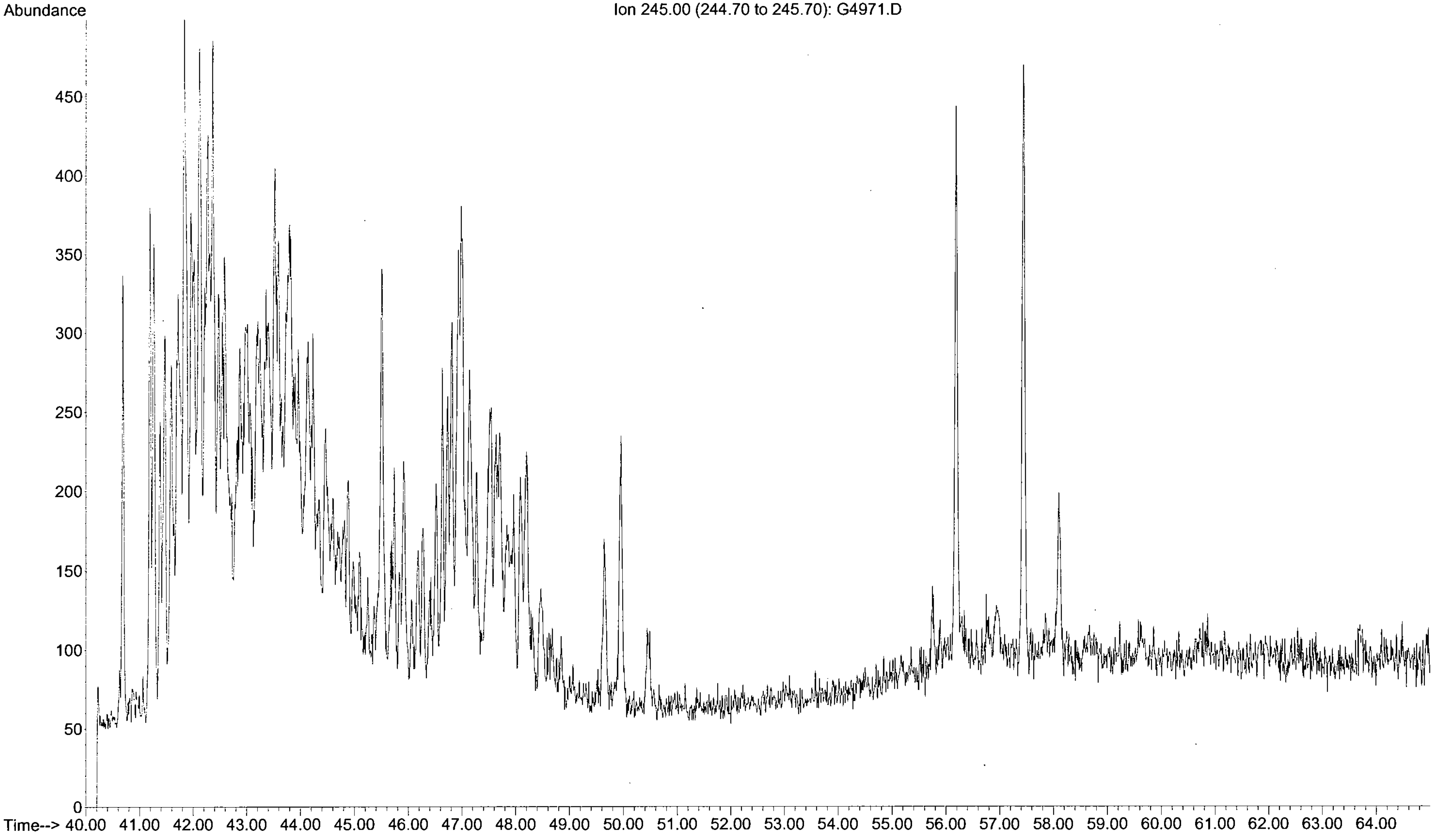
```
File        : G:\G\DATA\SG0319\G4965.D
Operator    : DPB
Acquired    :  8 Feb 2007   3:31 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5530-P-MS-D(13)
Misc Info   : GWP07T07 5-157 07-0010
Vial Number: 7
```



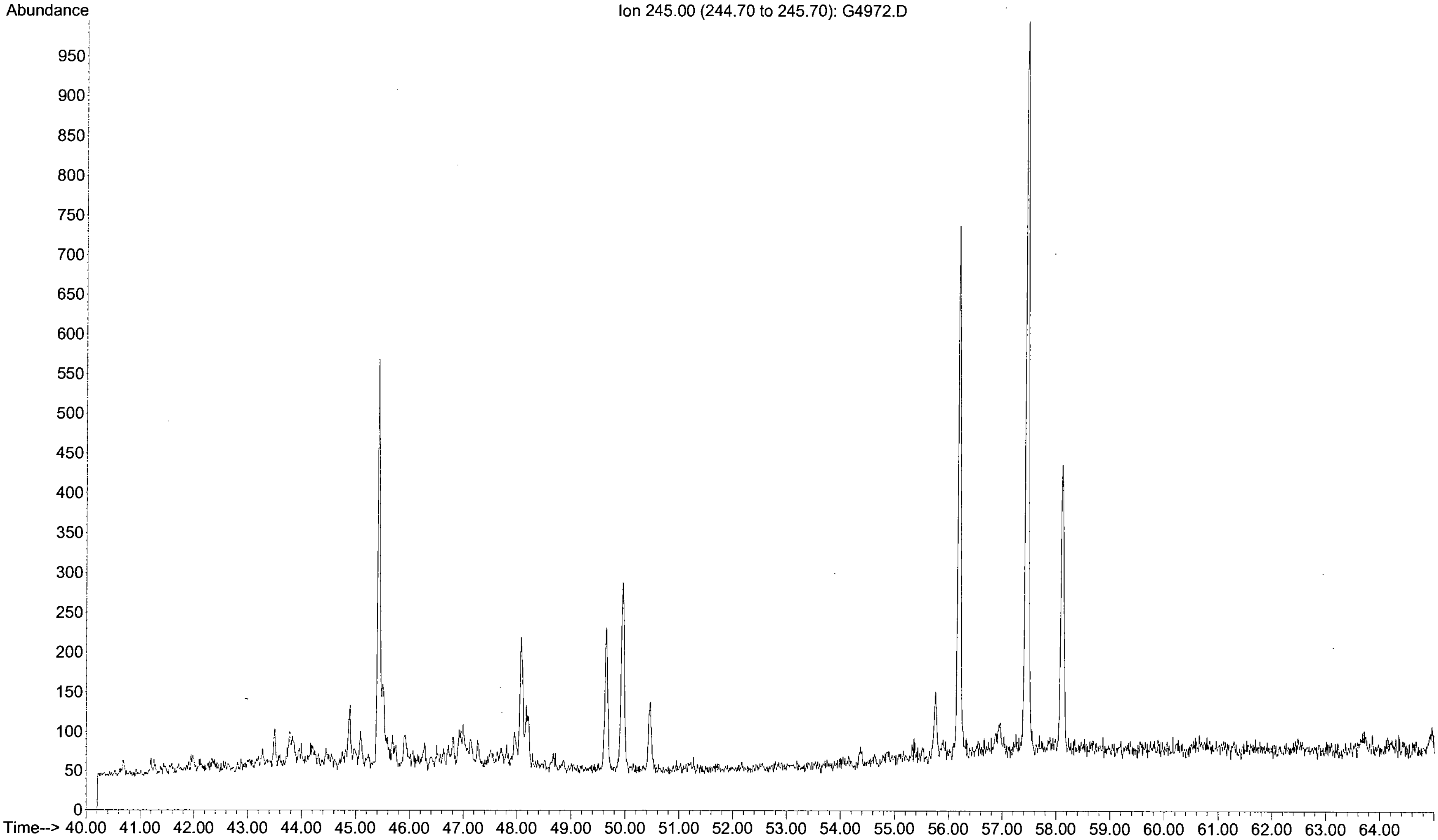
```
File        : G:\G\DATA\SG0319\G4967.D
Operator    : DPB
Acquired    :  8 Feb 2007   6:14 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5532-P-MS-D(13)
Misc Info   : GWP07T09 5-157 07-0010
Vial Number: 9
```



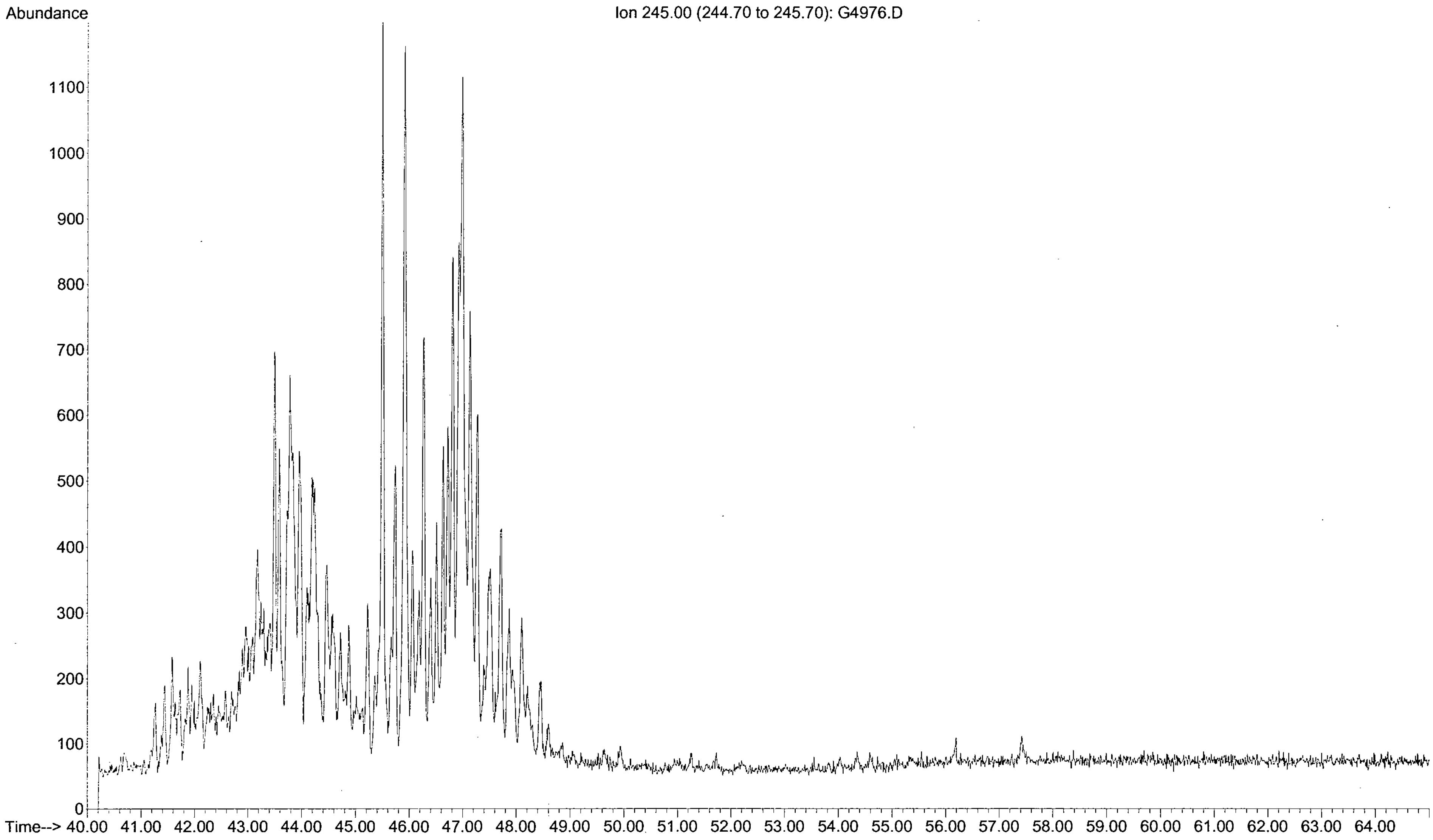
```
File       : G:\G\DATA\SG0319\G4971.D
Operator   : DPB
Acquired   :  8 Feb 2007  11:43 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5535-P-MS-D(13)
Misc Info  : GWP07T12 5-157 07-0010
Vial Number: 13
```



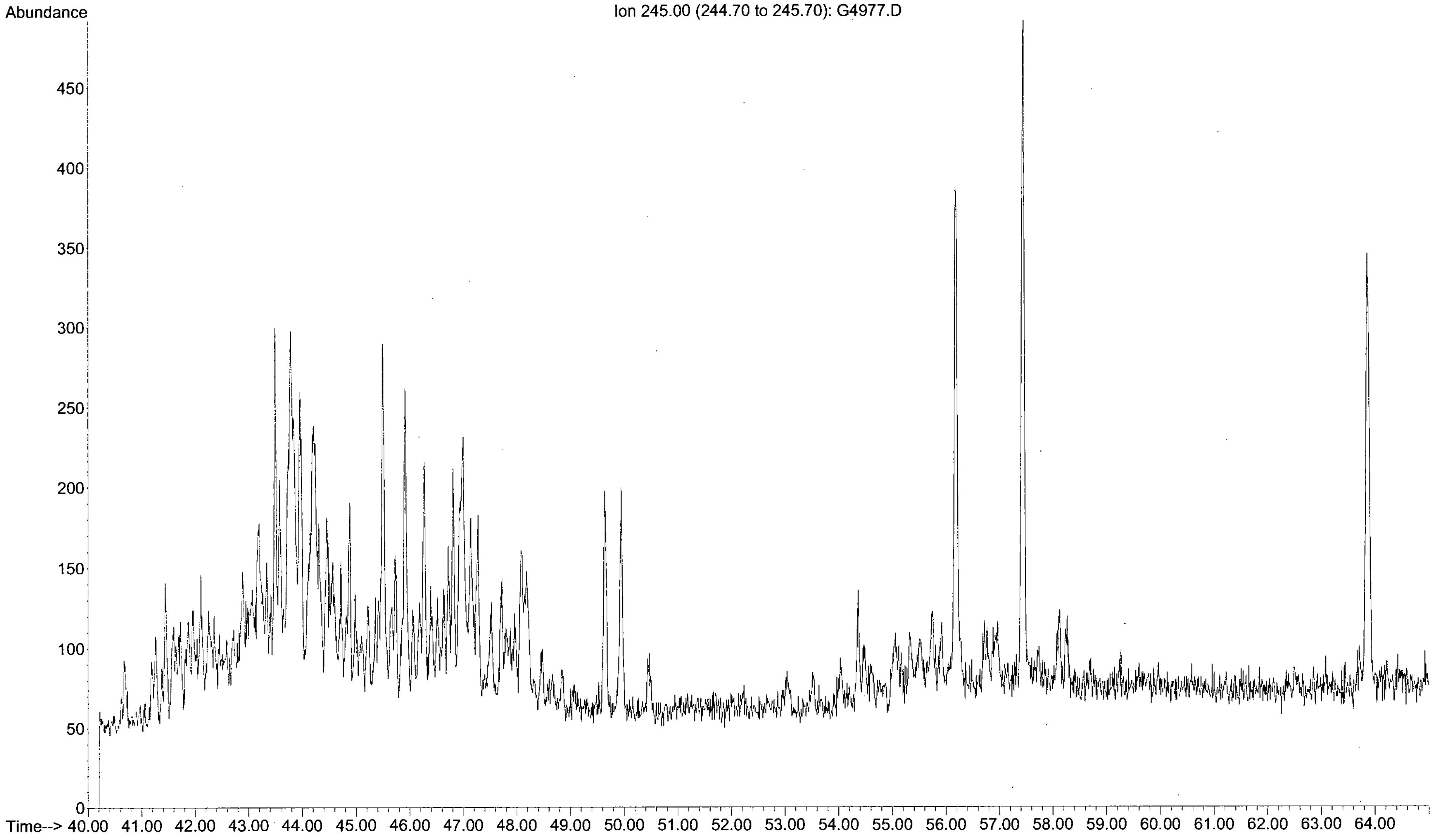
```
File       : G:\G\DATA\SG0319\G4972.D
Operator   : DPB
Acquired   :  8 Feb 2007   5:37 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5539-P-MS-D(13)
Misc Info  : GWP07S02 5-157 07-0010
Vial Number: 14
```



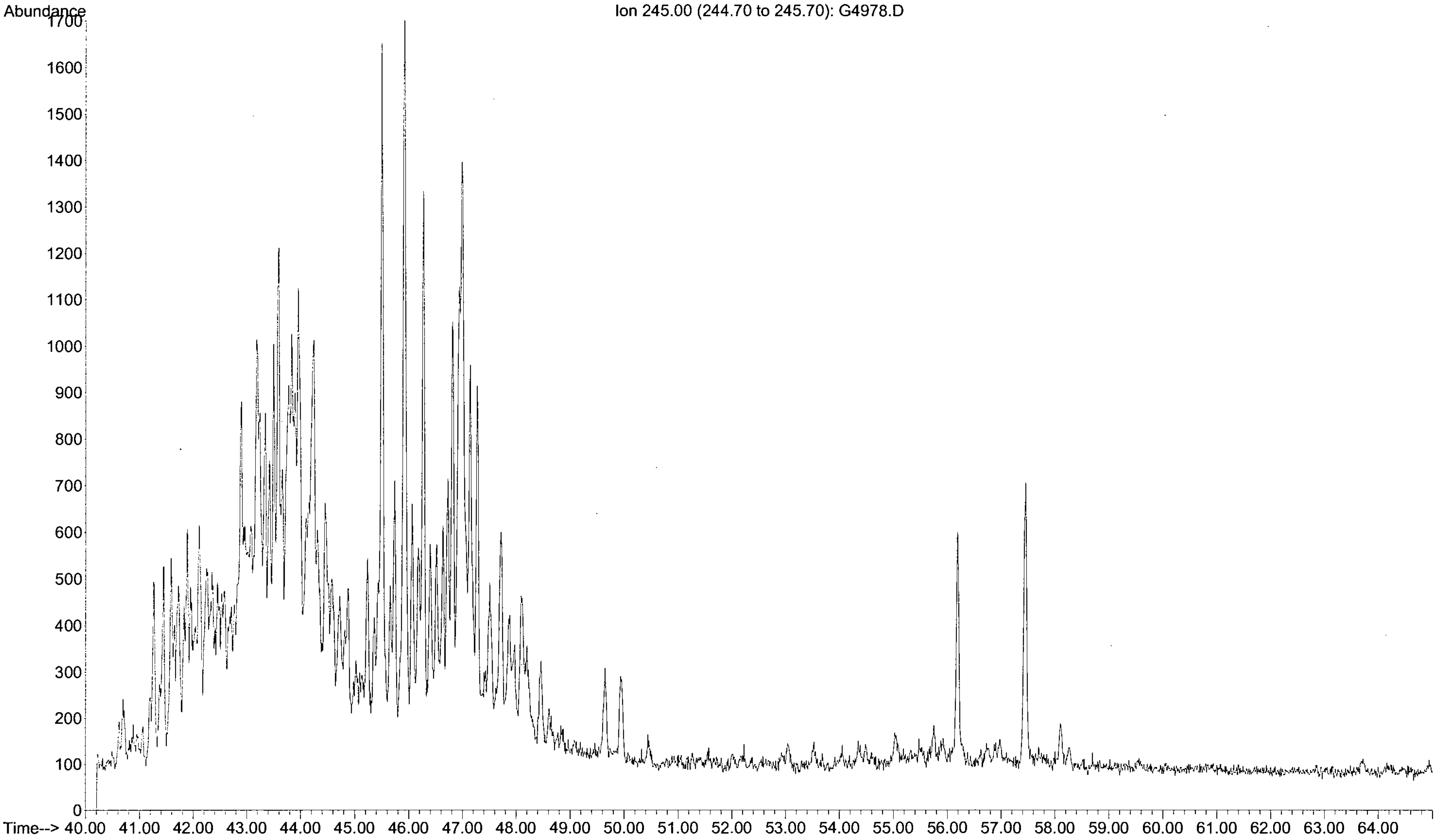
```
File        : G:\G\DATA\SG0319\G4976.D
Operator    : DPB
Acquired    :  8 Feb 2007  11:03 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5541-P-MS-D(13)
Misc Info   : GWP07S04 5-157 07-0010
Vial Number: 18
```



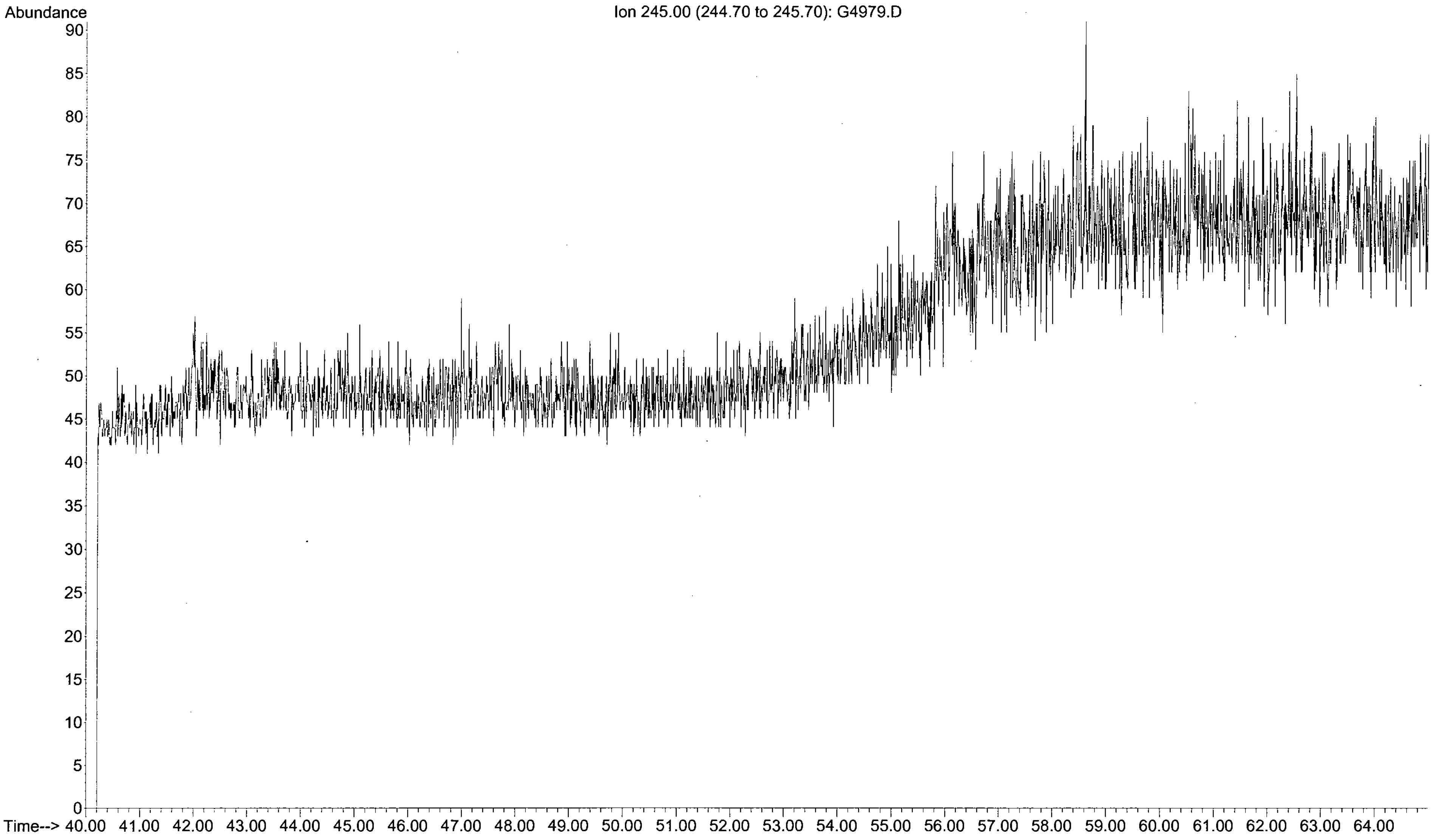
```
File        : G:\G\DATA\SG0319\G4977.D
Operator    : DPB
Acquired    :  9 Feb 2007  12:25 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5542-P-MS-D(13)
Misc Info   : TDW3-4.5 5-157 07-0010
Vial Number: 19
```



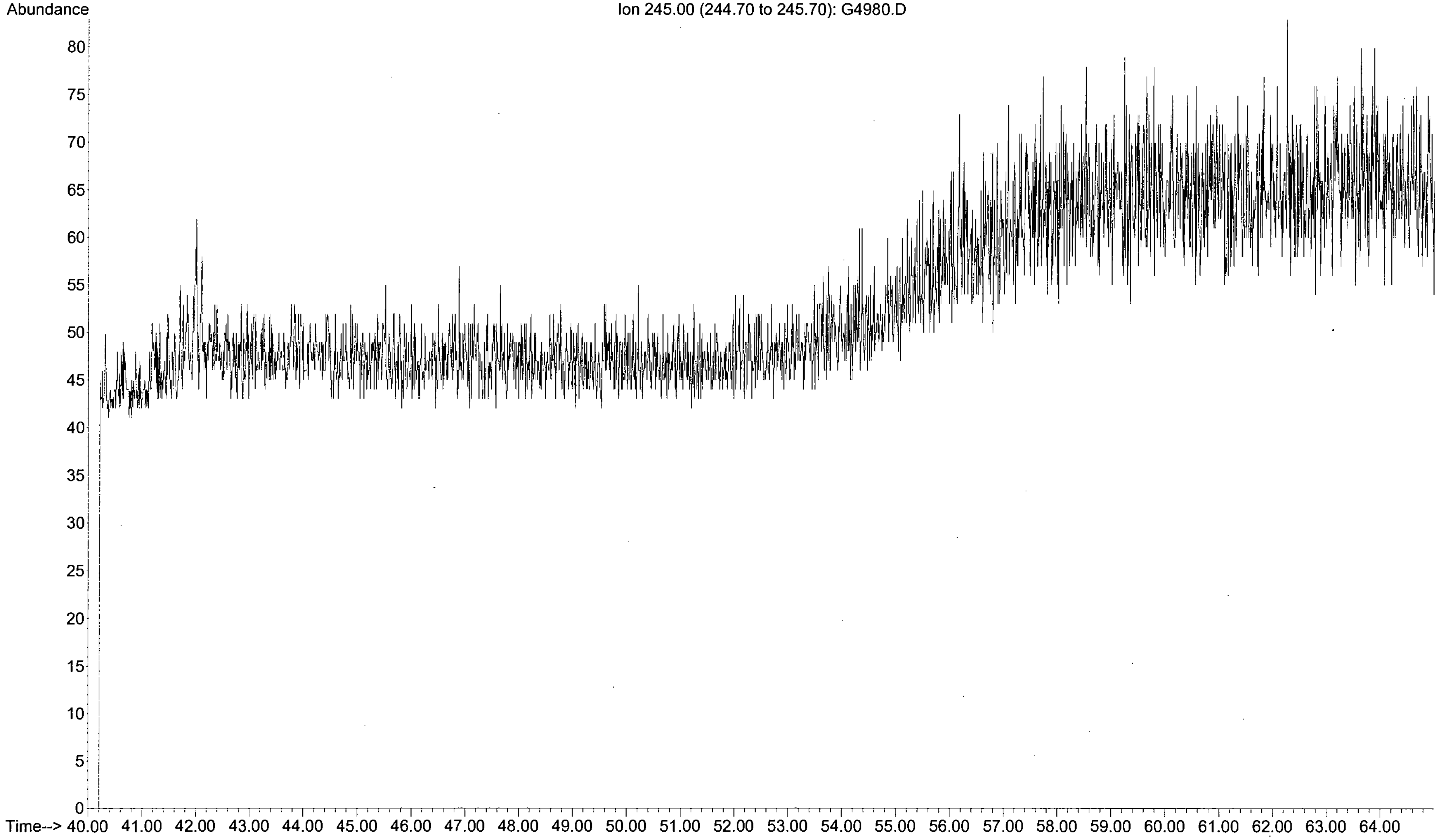
```
File        : G:\G\DATA\SG0319\G4978.D
Operator    : DPB
Acquired    :  9 Feb 2007   1:47 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5537-P-MS-D(11)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 20
```



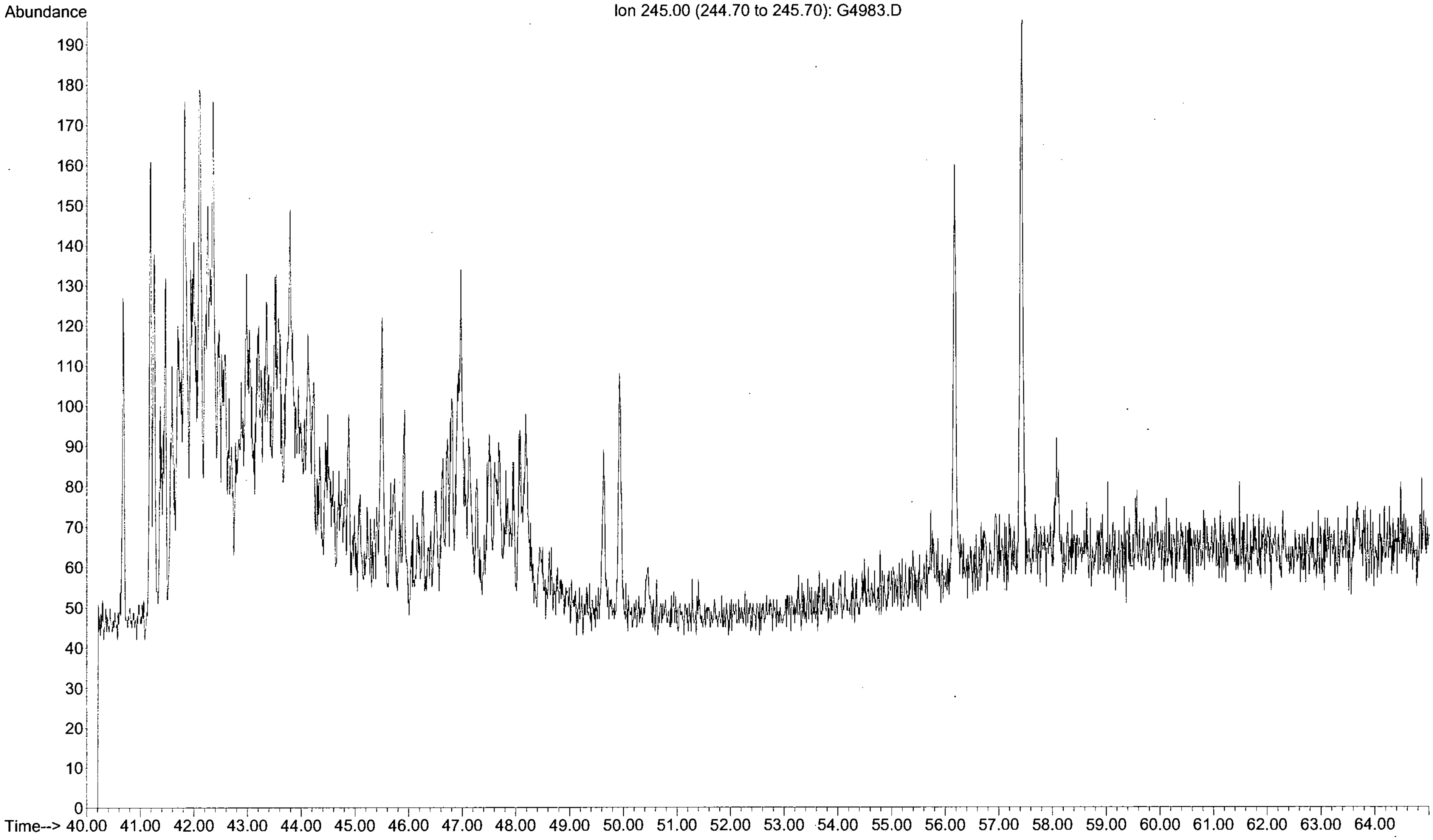
```
File        : G:\G\DATA\SG0319\G4979.D
Operator    : DPB
Acquired    :  9 Feb 2007   3:10 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5526-P-MS-D(15)
Misc Info   : GWP07T03 5-157 07-0010
Vial Number: 21
```



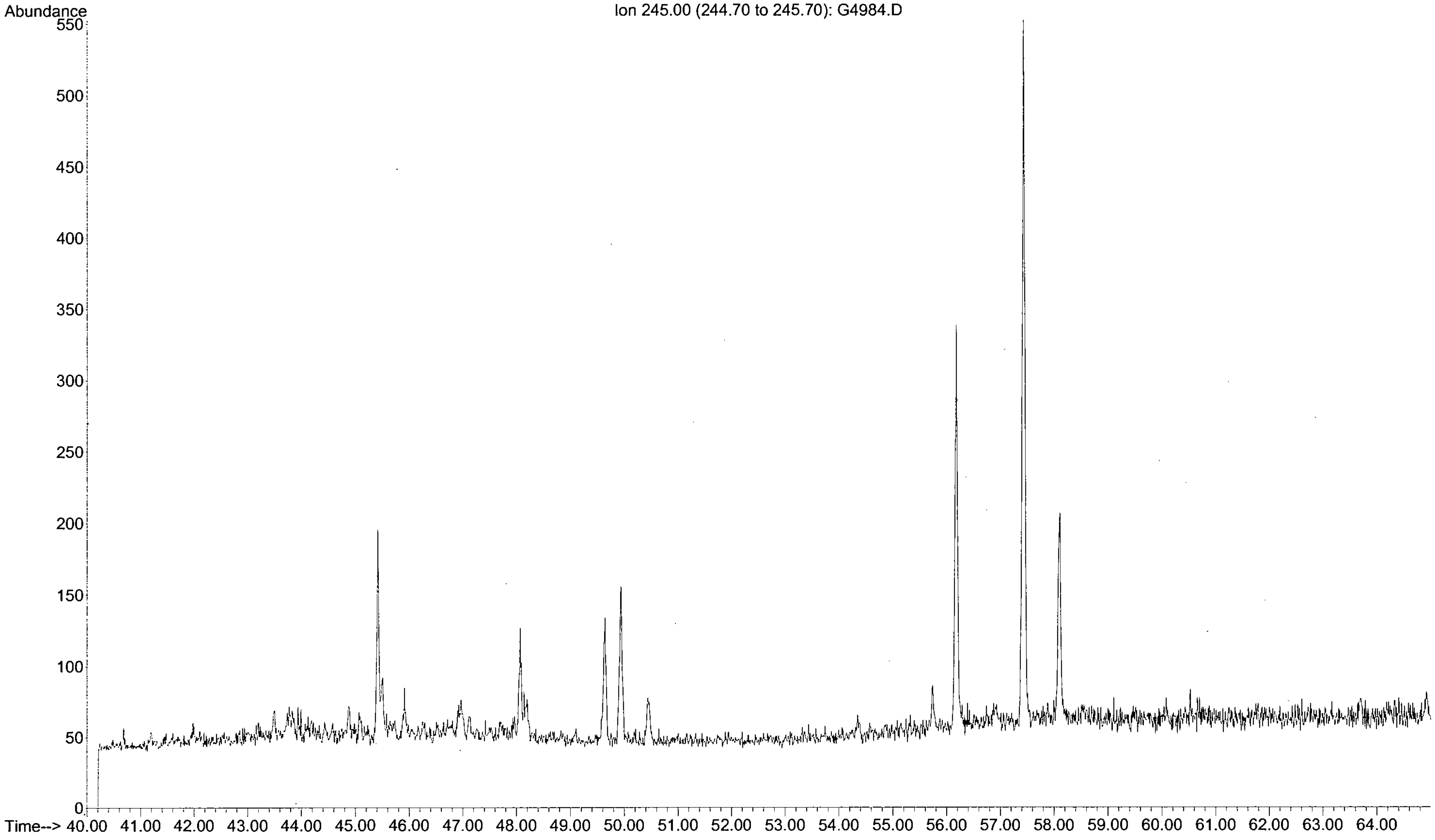
```
File       : G:\G\DATA\SG0319\G4980.D
Operator   : DPB
Acquired   :  9 Feb 2007   4:34 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS-D(15)
Misc Info  : GWP07T04 5-157 07-0010
Vial Number: 22
```



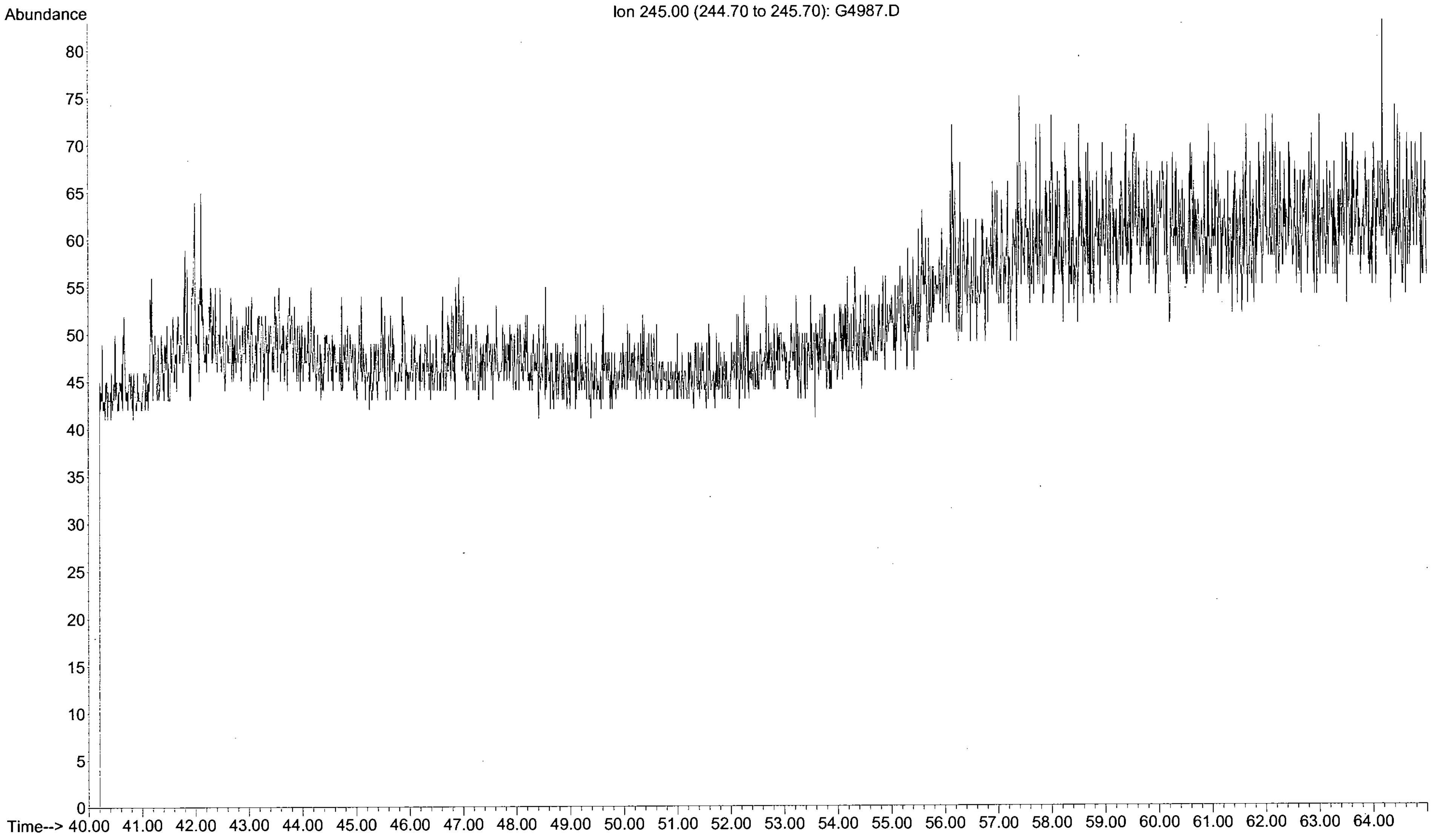
```
File        : G:\G\DATA\SG0319\G4983.D
Operator    : DPB
Acquired    :  9 Feb 2007   8:41 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5536-P-MS-D(13)
Misc Info   : GWP07T13 5-157 07-0010
Vial Number: 25
```



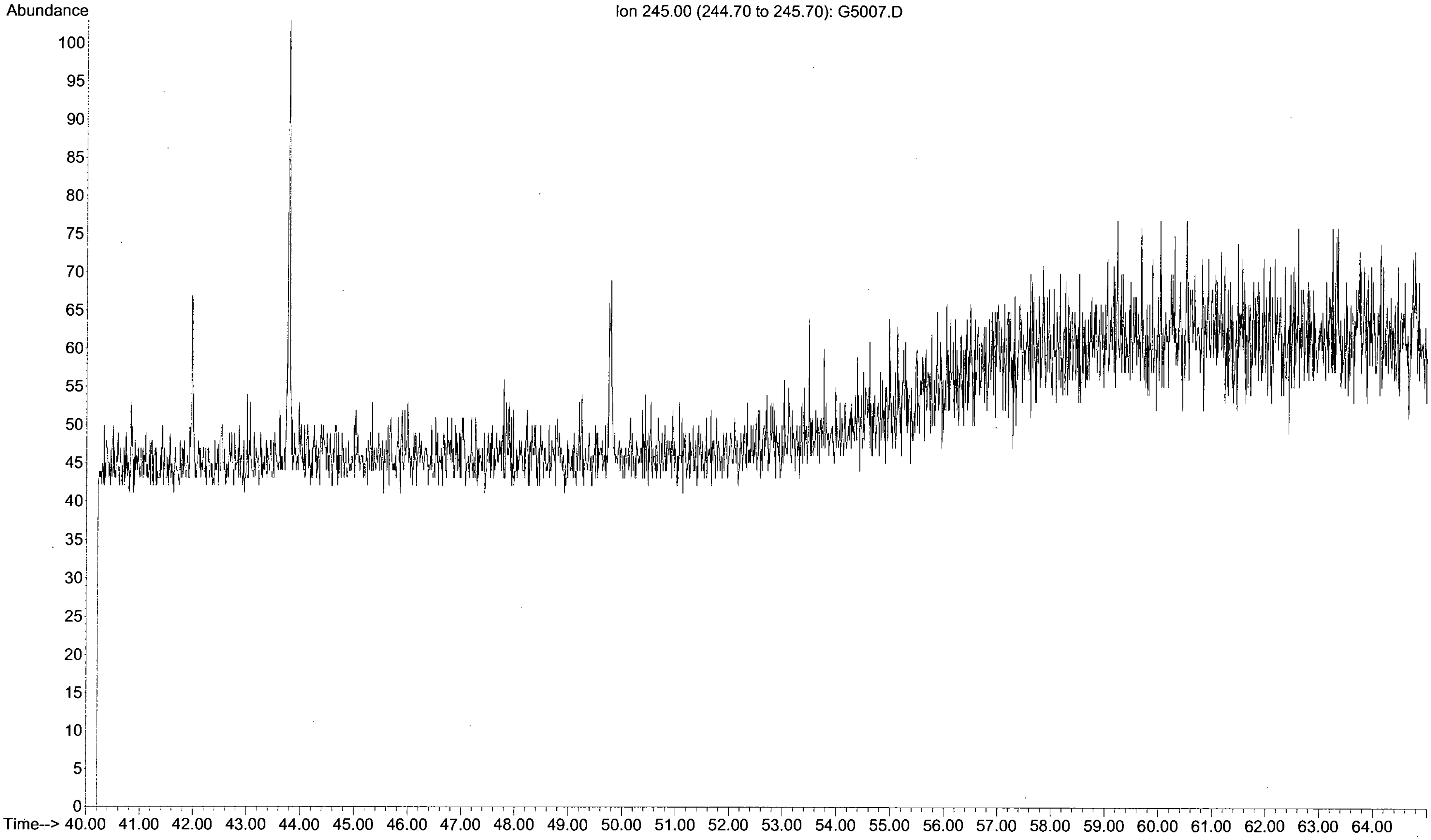
File   : G:\G\DATA\SG0319\G4984.D
Operator   : DPB
Acquired   : 9 Feb 2007 10:03 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5538-P-MS-D(13)
Misc Info   : GWP07S01 5-157 07-0010
Vial Number: 26



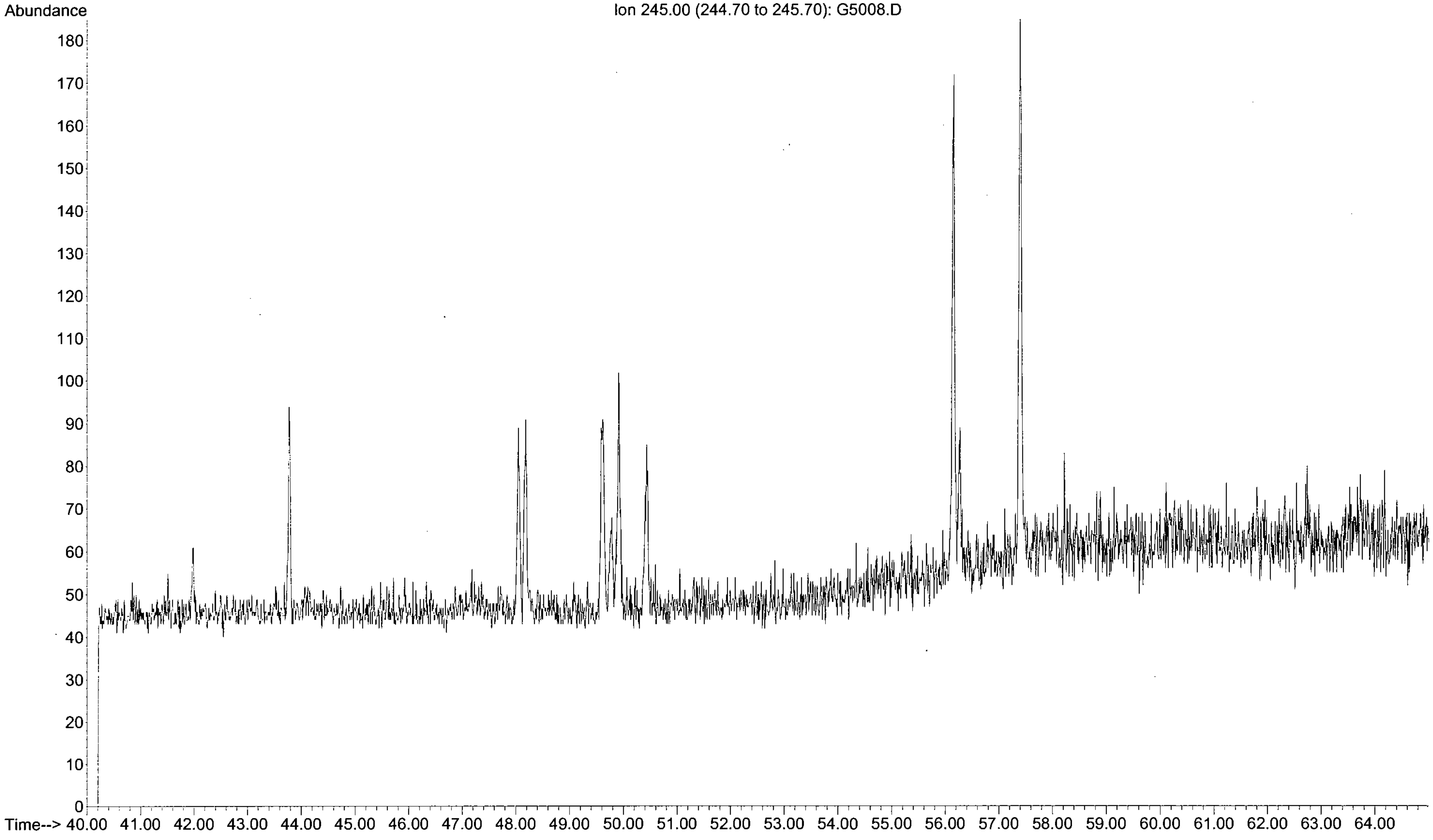
```
File        : G:\G\DATA\SG0319\G4987.D
Operator    : DPB
Acquired    :  9 Feb 2007   2:08 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5533-P-MS-D(13)
Misc Info   : GWP07T10 5-157 07-0010
Vial Number: 29
```



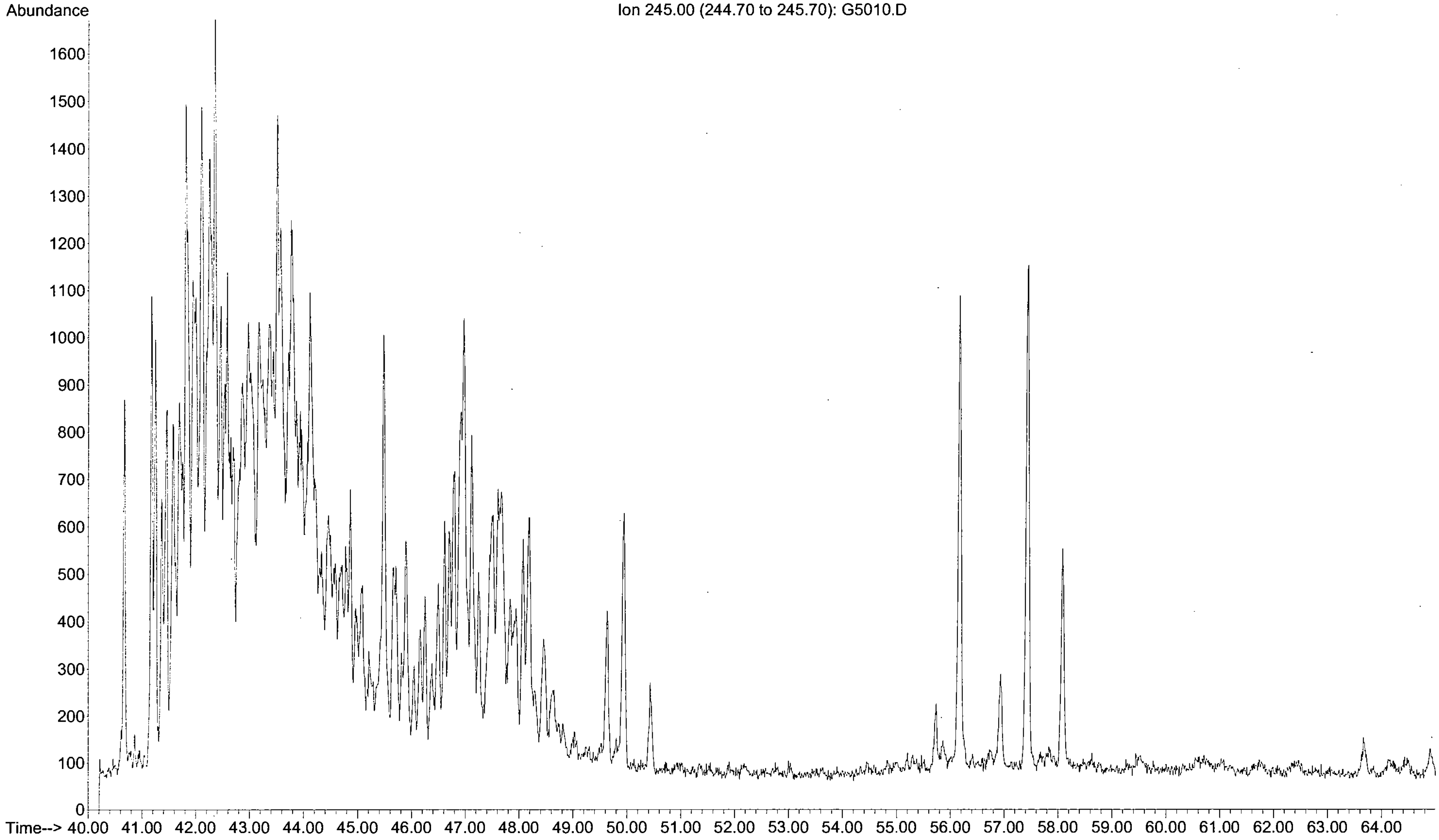
```
File        : G:\G\DATA\SG0319\G5007.D
Operator    : DPB
Acquired    : 10 Feb 2007   5:18 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ939PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0010
Vial Number: 49
```


Ion 245.00 (244.70 to 245.70): G5007.D

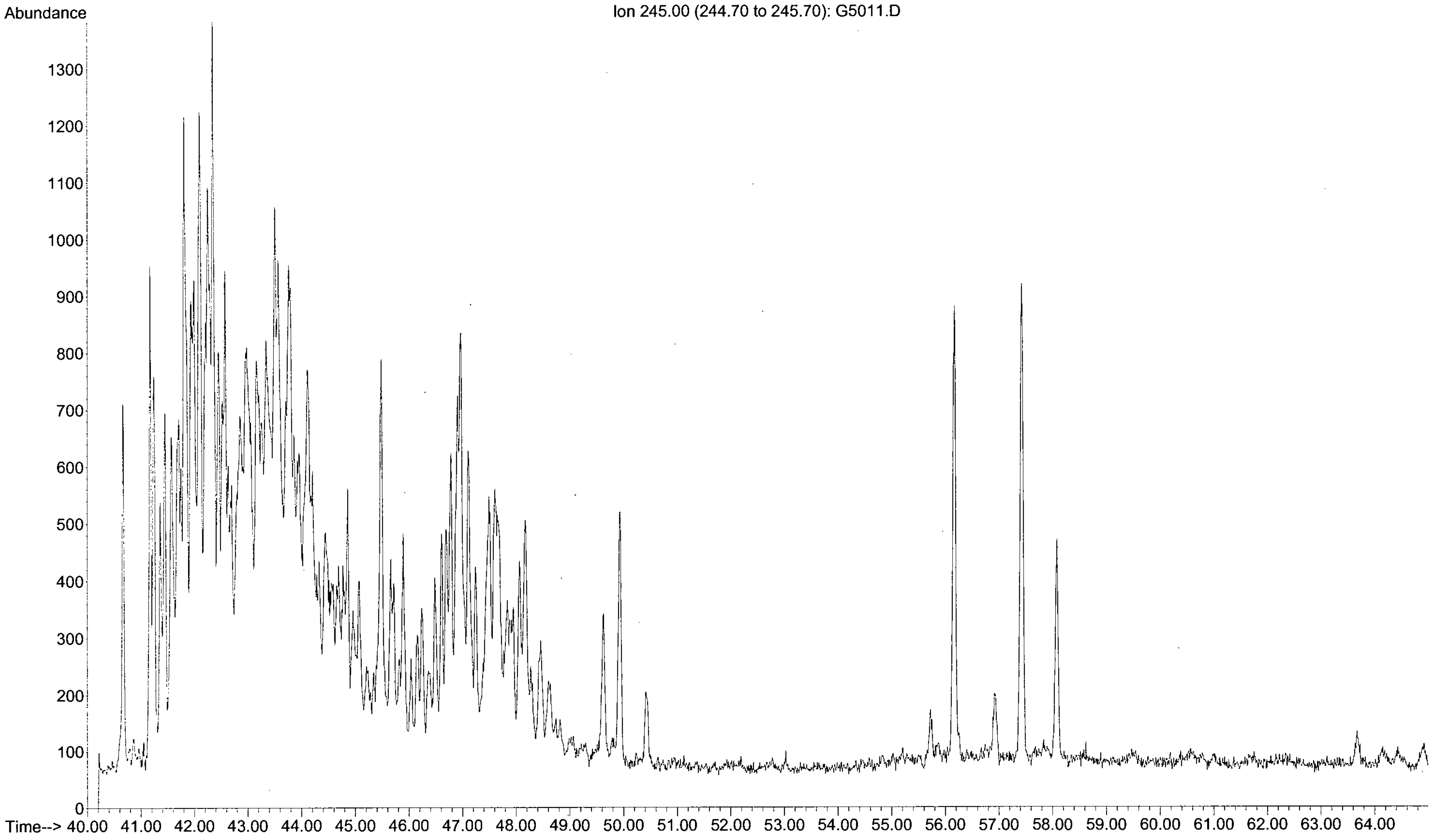
```
File       : G:\G\DATA\SG0319\G5008.D
Operator   : DPB
Acquired   : 10 Feb 2007   6:37 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ940LCS-P-MS(5)
Misc Info  : Laboratory Control Sample 5-157 07-0010
Vial Number: 50
```



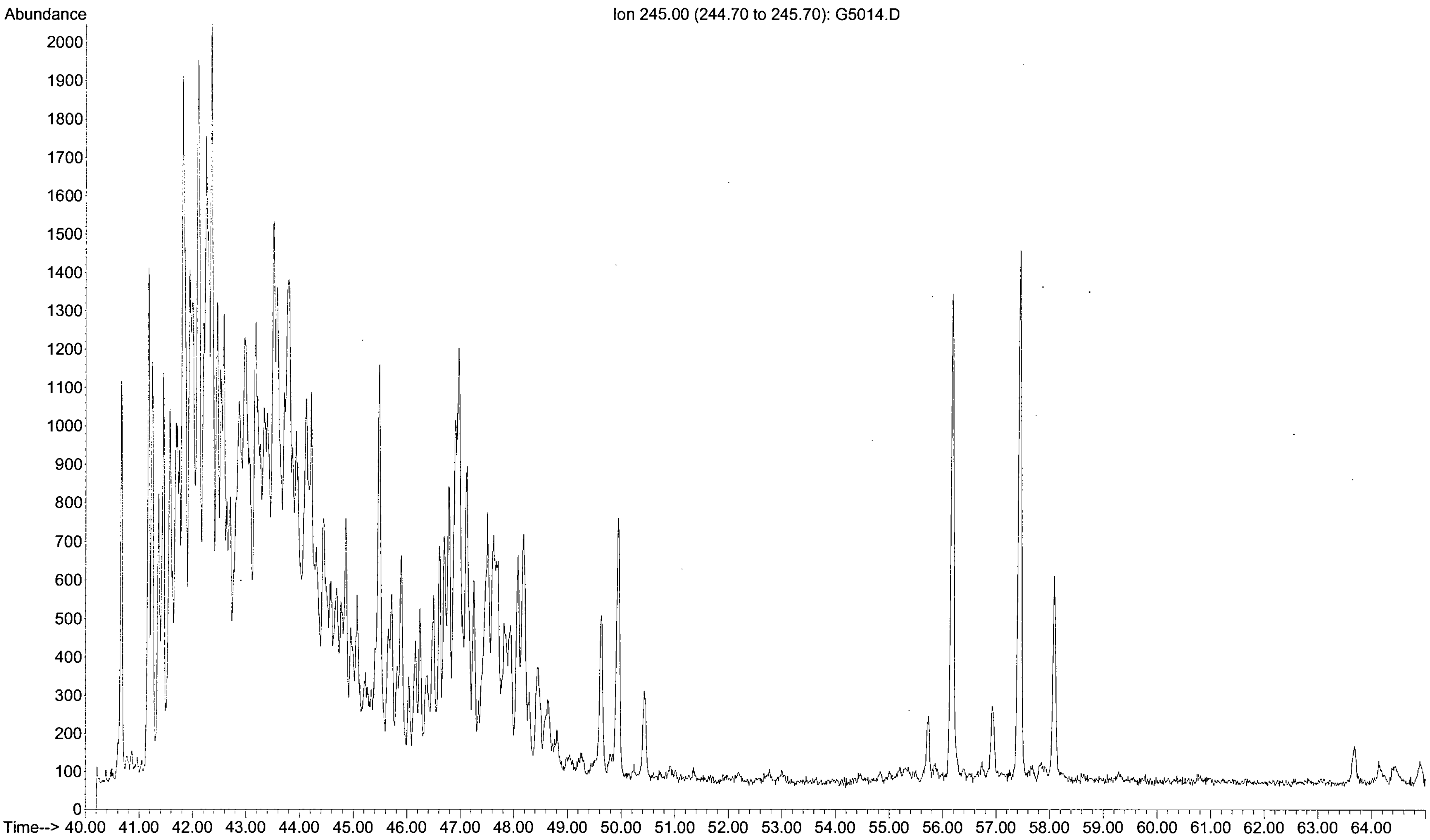
File   : G:\G\DATA\SG0319\G5010.D
Operator   : DPB
Acquired   : 10 Feb 2007   9:21 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5525-P-MS(12)
Misc Info   : GWP07T02 5-157 07-0010
Vial Number: 52



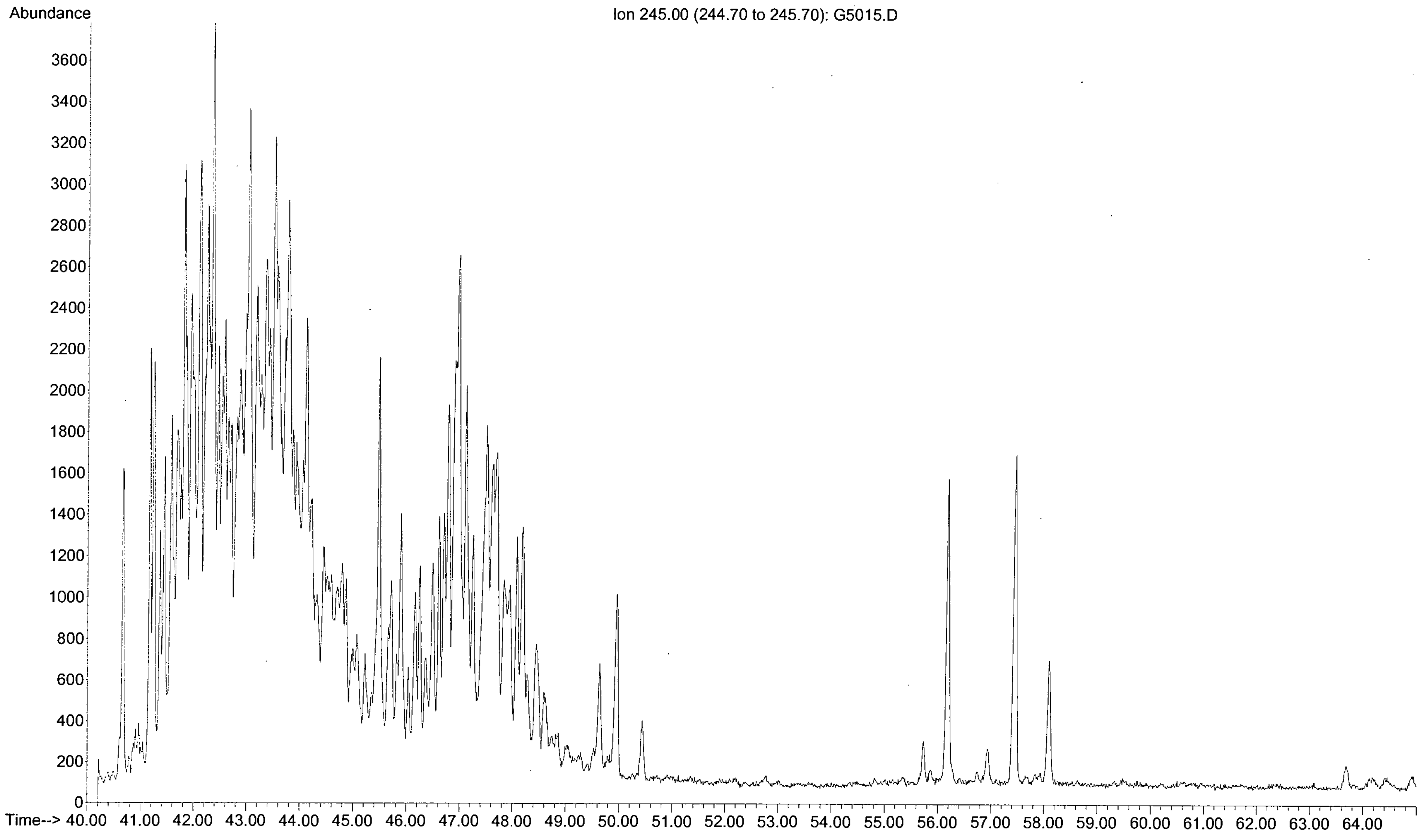
```
File        : G:\G\DATA\SG0319\G5011.D
Operator    : DPB
Acquired    : 10 Feb 2007  10:43 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5526-P-MS(12)
Misc Info   : GWP07T03 5-157 07-0010
Vial Number: 53
```



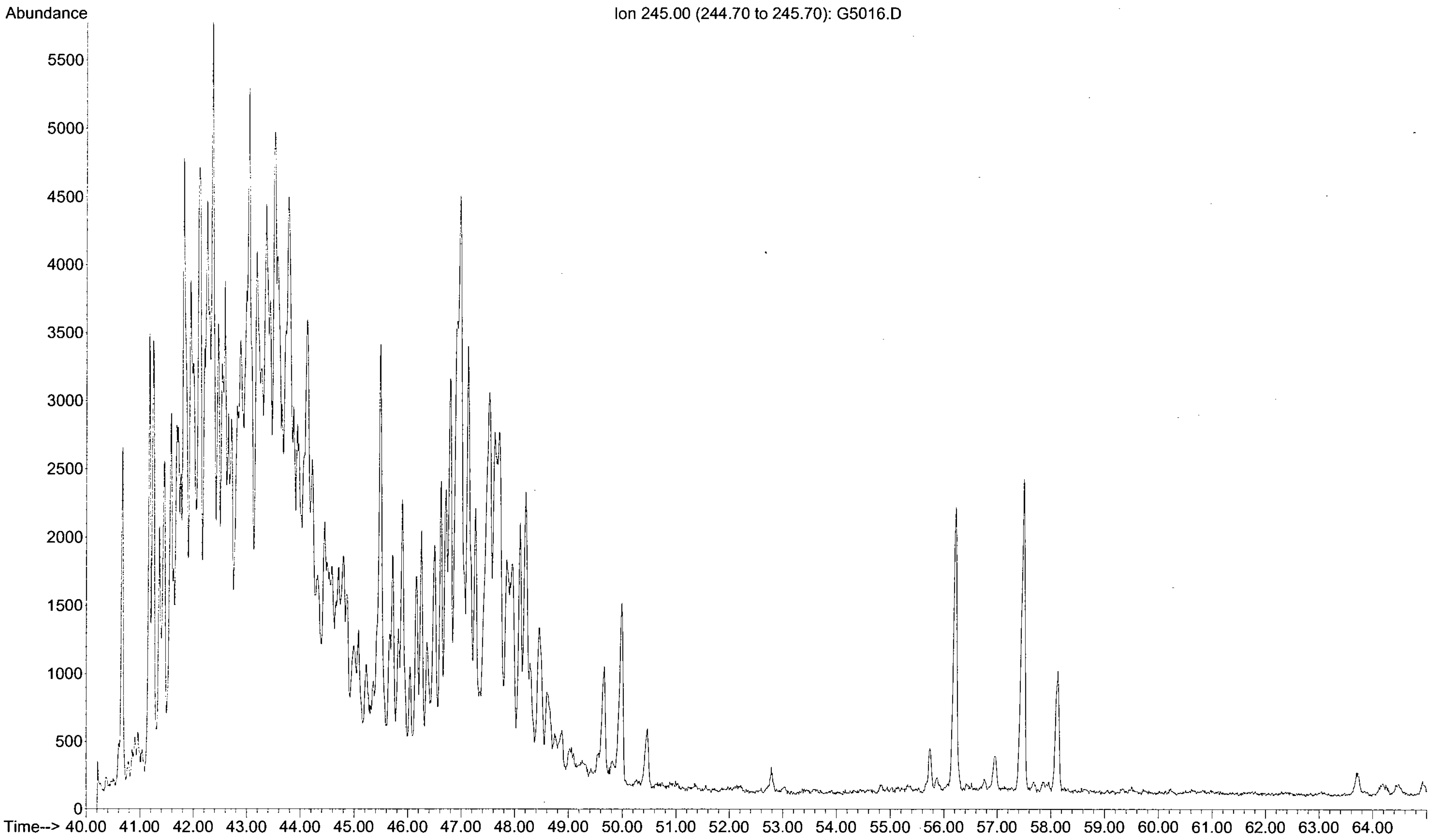
```
File       : G:\G\DATA\SG0319\G5014.D
Operator   : DPB
Acquired   : 11 Feb 2007   2:47 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS(12)
Misc Info  : GWP07T04 5-157 07-0010
Vial Number: 56
```



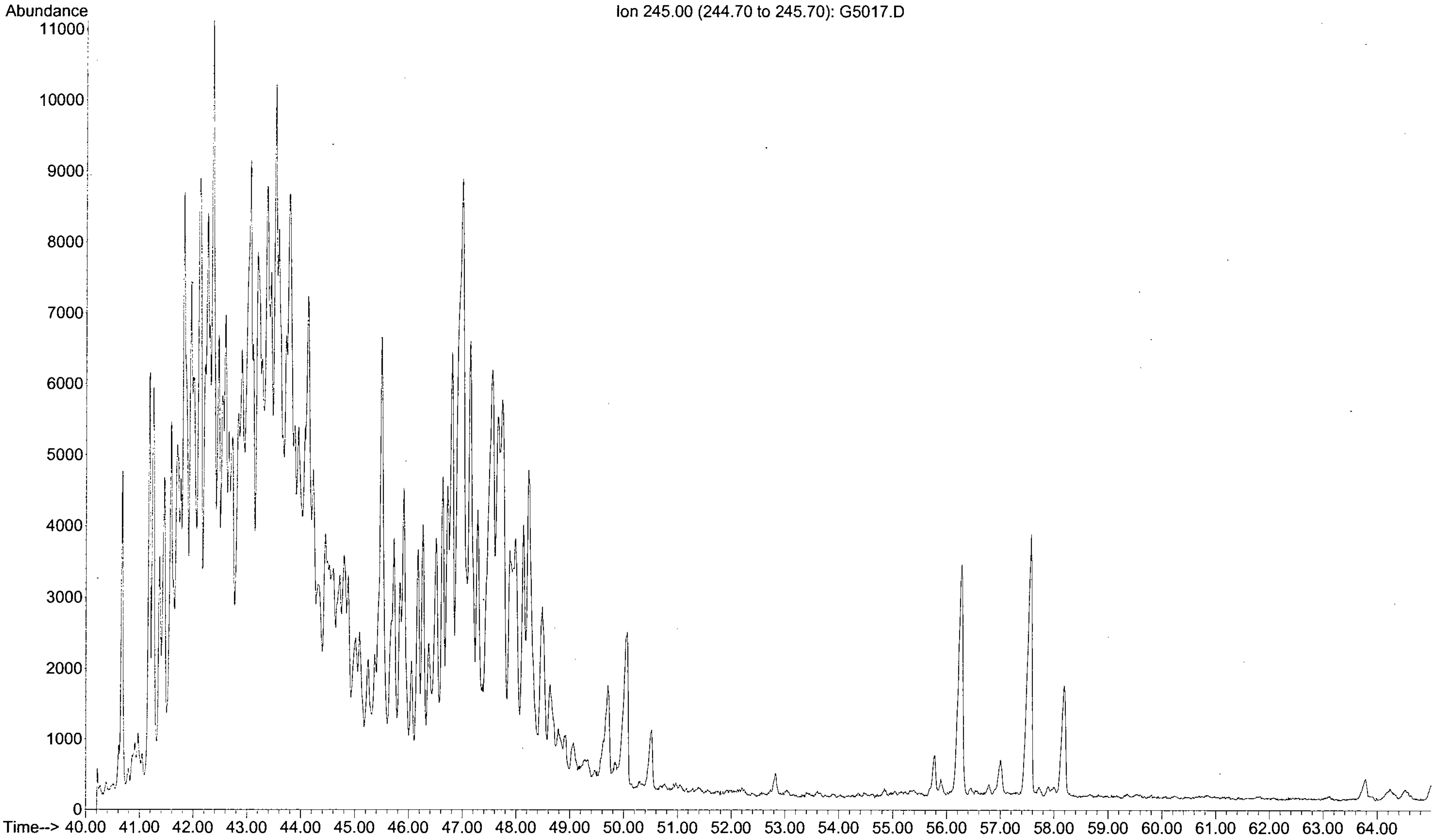
```
File        : G:\G\DATA\SG0319\G5015.D
Operator    : DPB
Acquired    : 11 Feb 2007   4:09 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5528-P-A-MS(14)
Misc Info   : GWP07T05 5-157 07-0010
Vial Number: 57
```



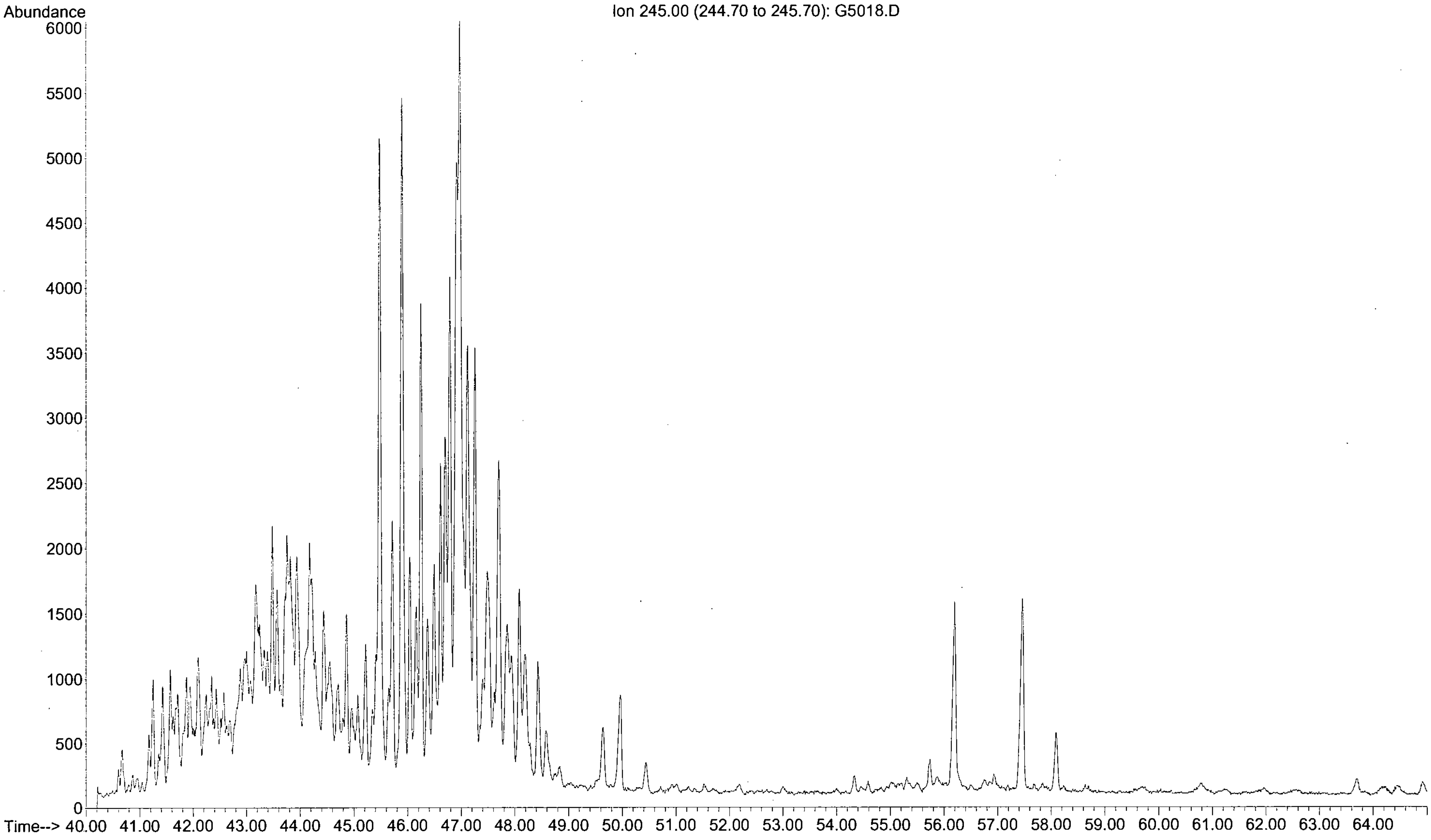
```
File       : G:\G\DATA\SG0319\G5016.D
Operator   : DPB
Acquired   : 11 Feb 2007   5:31 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5529-P-A-MS(14)
Misc Info  : GWP07T06 5-157 07-0010
Vial Number: 58
```



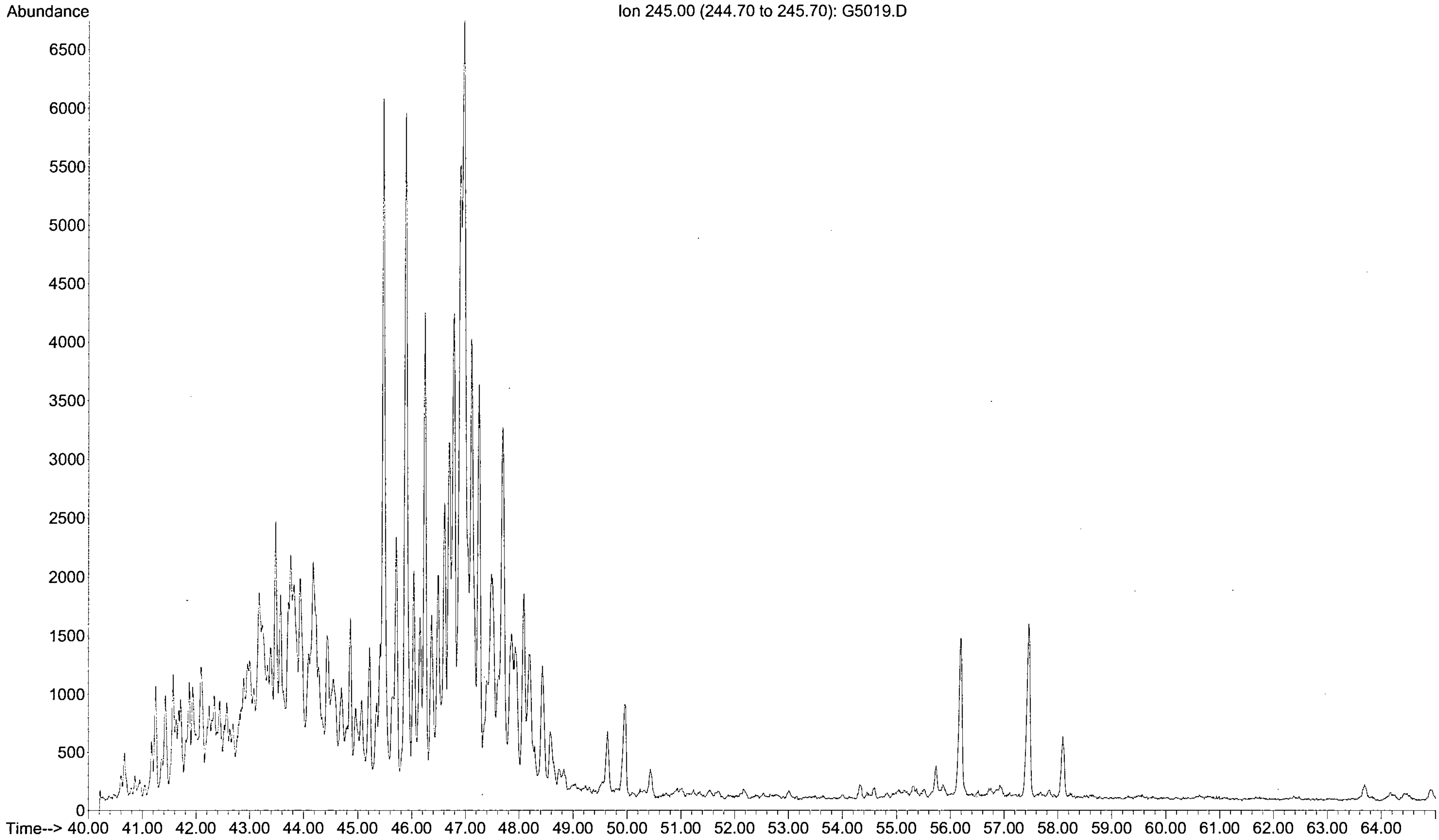
```
File        : G:\G\DATA\SG0319\G5017.D
Operator    : DPB
Acquired    : 11 Feb 2007   6:53 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5530-P-MS(12)
Misc Info   : GWP07T07 5-157 07-0010
Vial Number: 59
```



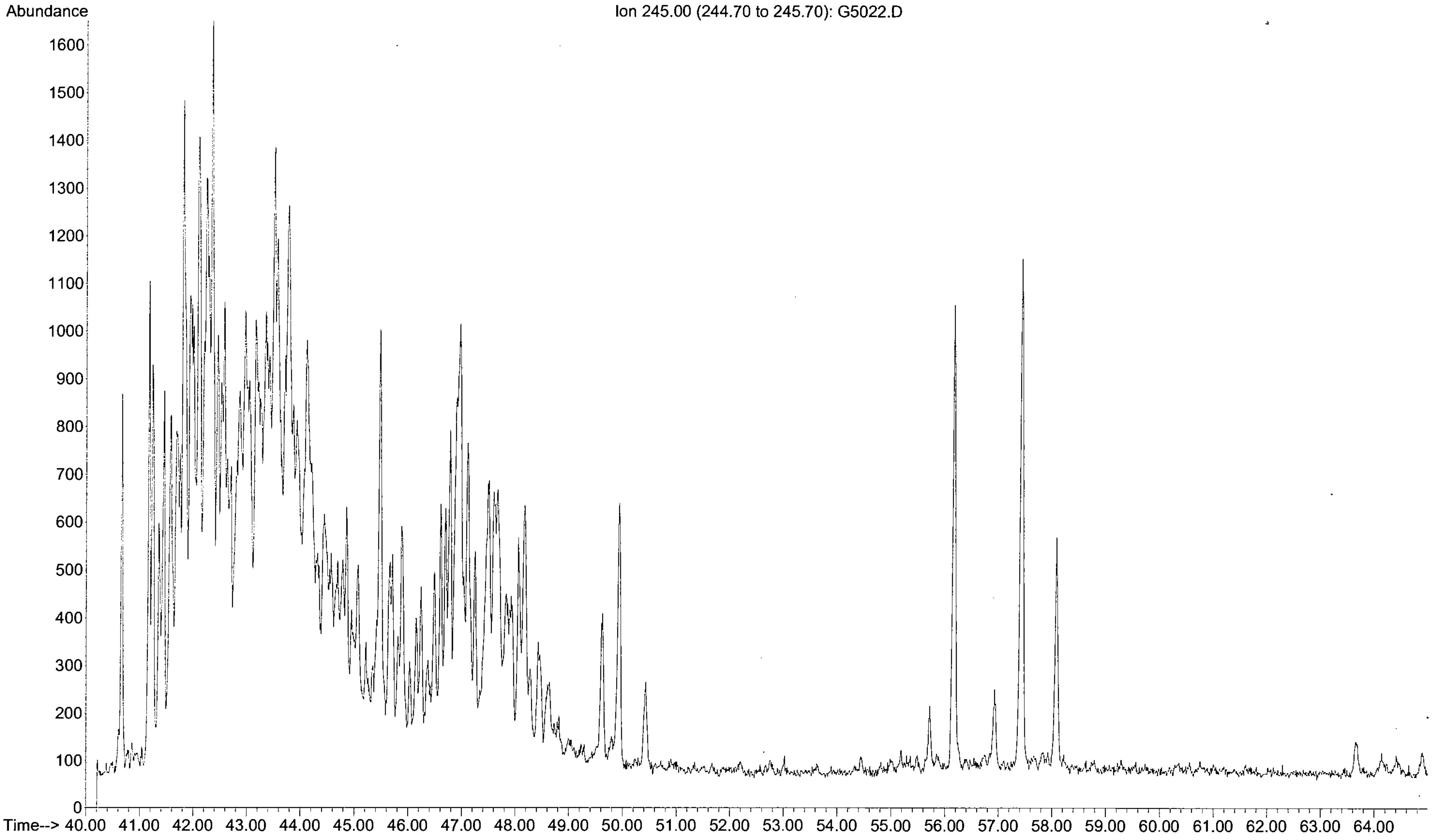
```
File       : G:\G\DATA\SG0319\G5018.D
Operator   : DPB
Acquired   : 11 Feb 2007   8:15 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5531-P-MS(12)
Misc Info  : GWP07T08 5-157 07-0010
Vial Number: 60
```



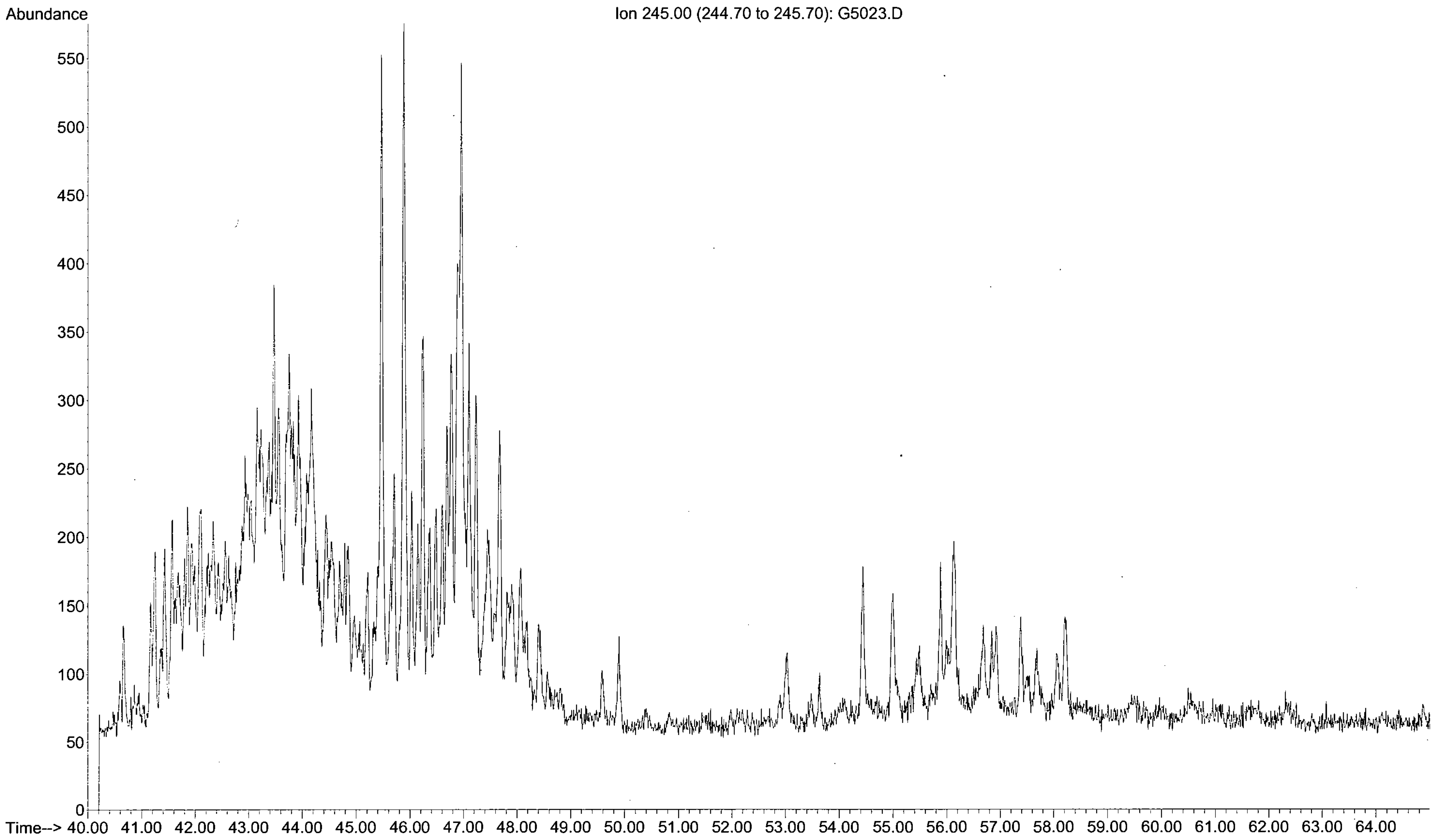
```
File        : G:\G\DATA\SG0319\G5019.D
Operator    : DPB
Acquired    : 11 Feb 2007   9:36 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5532-P-MS(12)
Misc Info   : GWP07T09 5-157 07-0010
Vial Number: 61
```



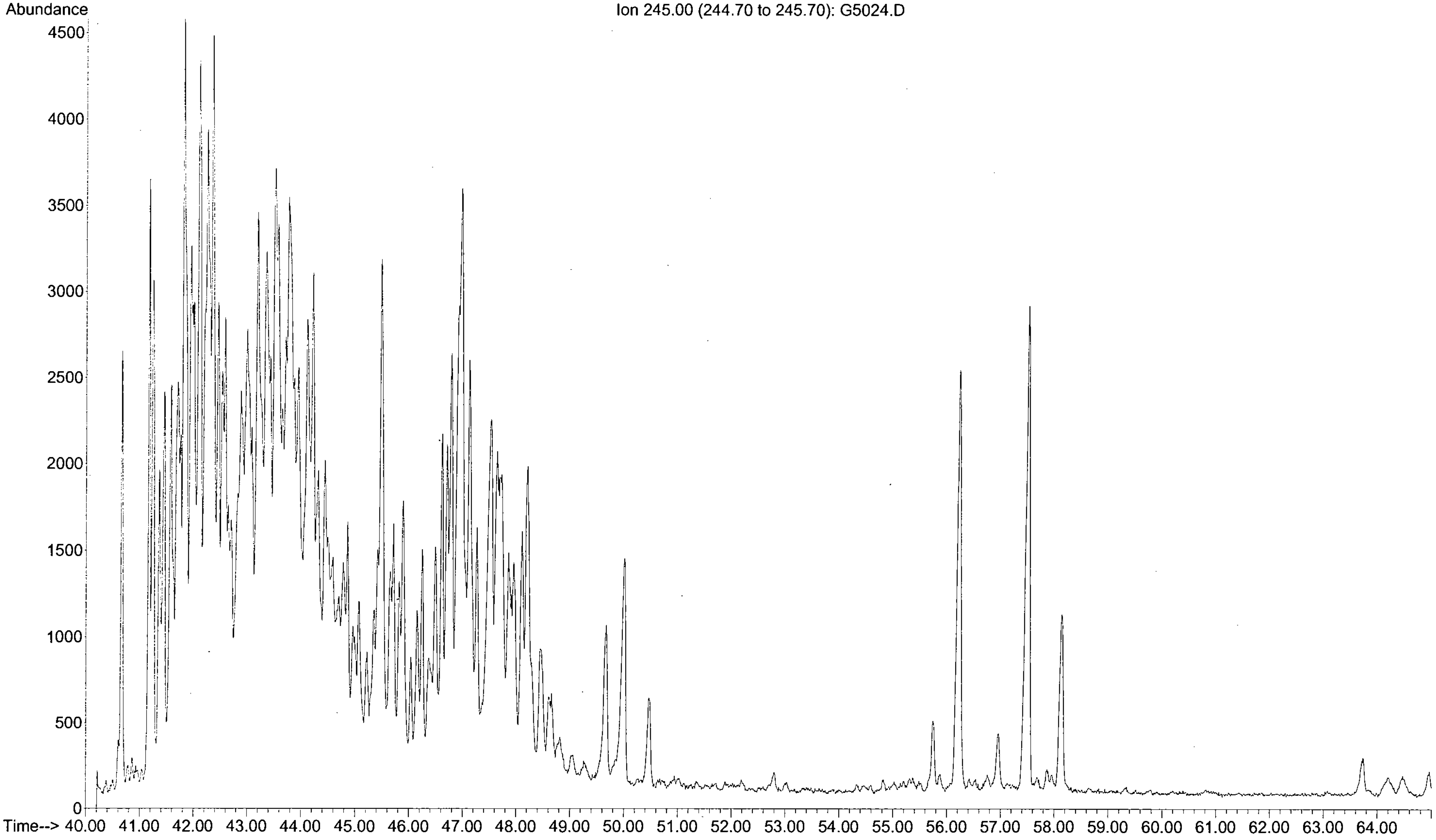
```
File       : G:\G\DATA\SG0319\G5022.D
Operator   : DPB
Acquired   : 11 Feb 2007   1:40 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5533-P-MS(12)
Misc Info  : GWP07T10 5-157 07-0010
Vial Number: 64
```



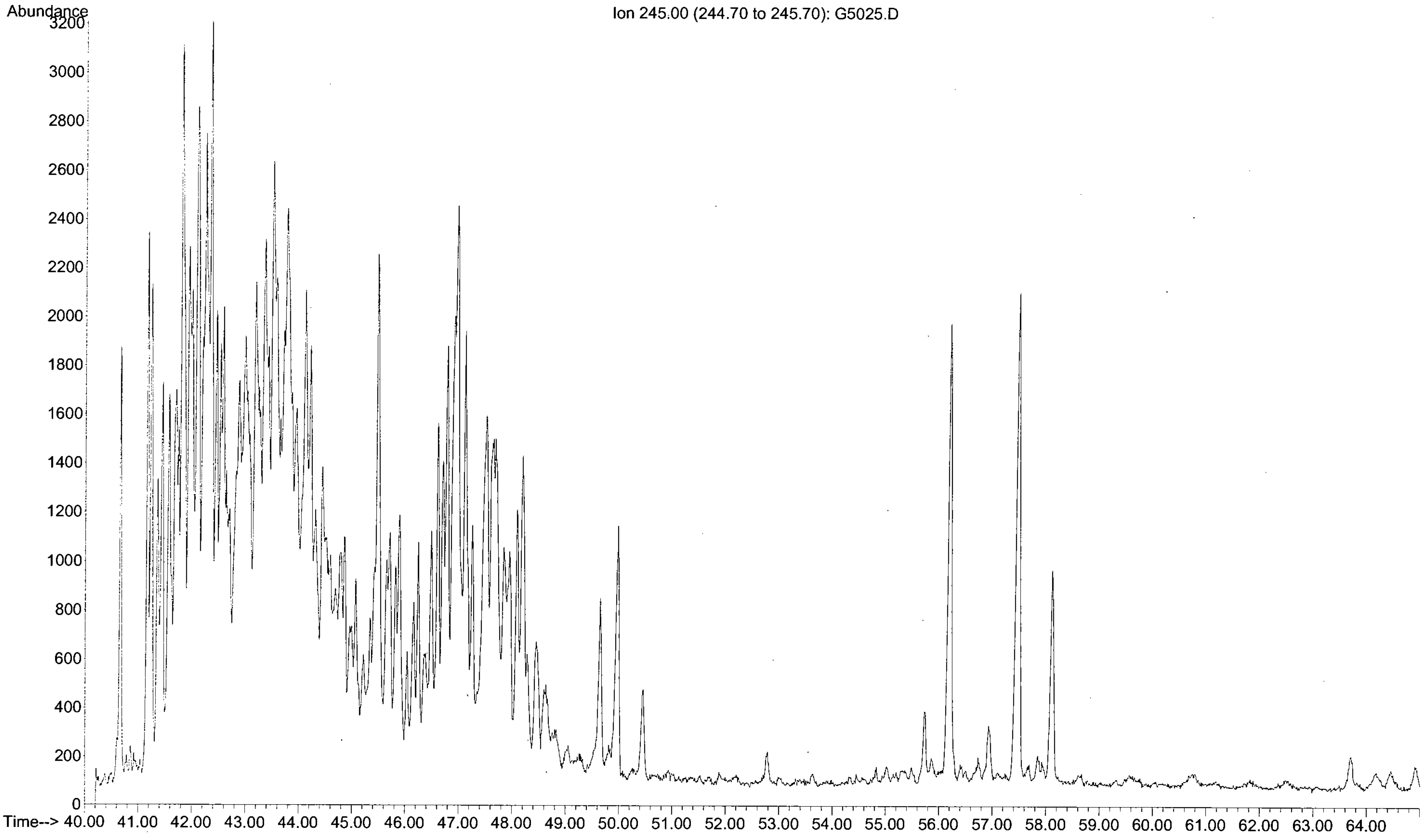
```
File        : G:\G\DATA\SG0319\G5023.D
Operator    : DPB
Acquired    : 11 Feb 2007   3:02 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5534-P-MS-D(13)
Misc Info   : GWP07T11 5-157 07-0010
Vial Number: 65
```



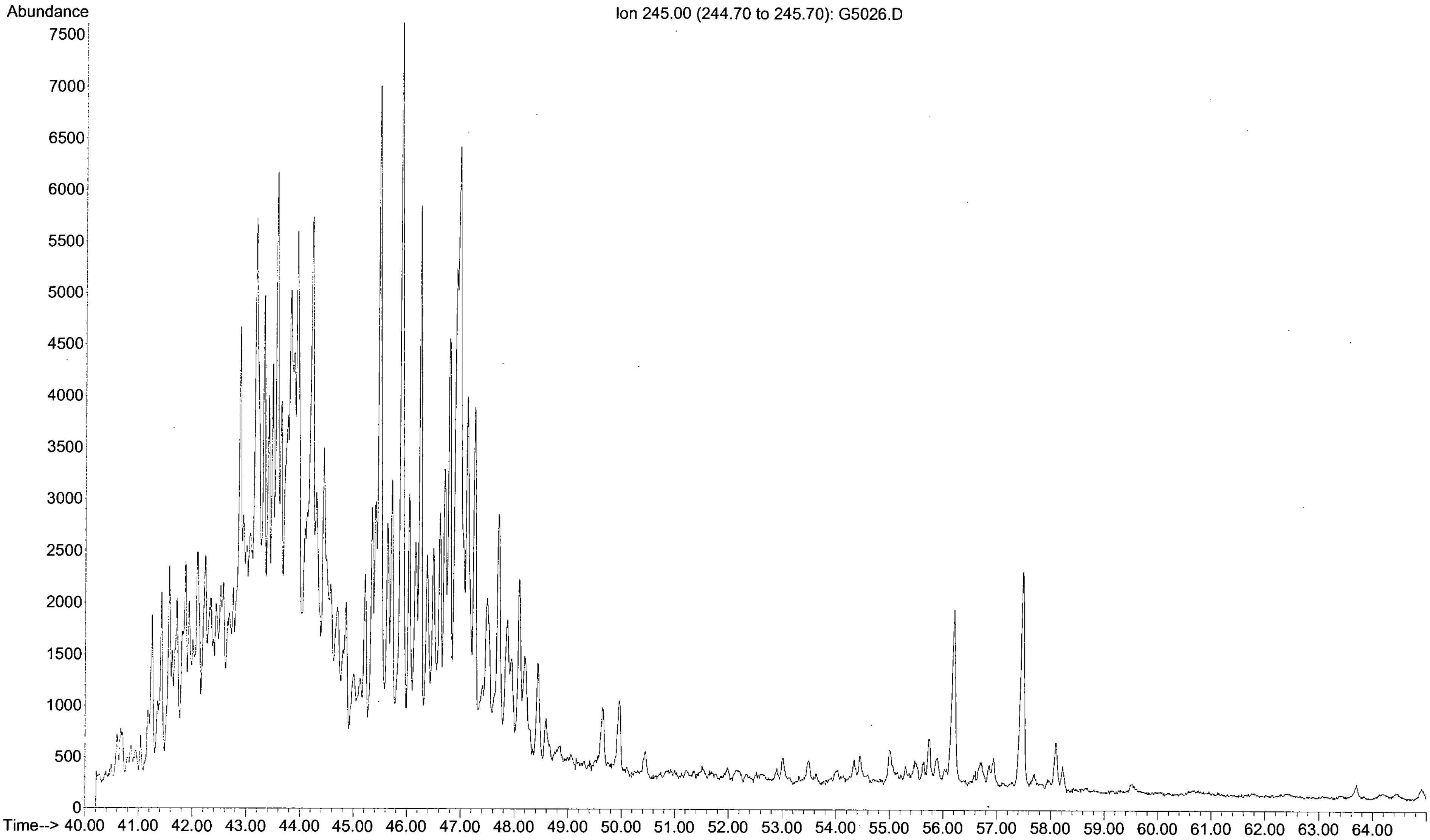
```
File       : G:\G\DATA\SG0319\G5024.D
Operator   : DPB
Acquired   : 11 Feb 2007   4:24 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5535-P-MS(12)
Misc Info  : GWP07T12 5-157 07-0010
Vial Number: 66
```


Ion 245.00 (244.70 to 245.70): G5024.D

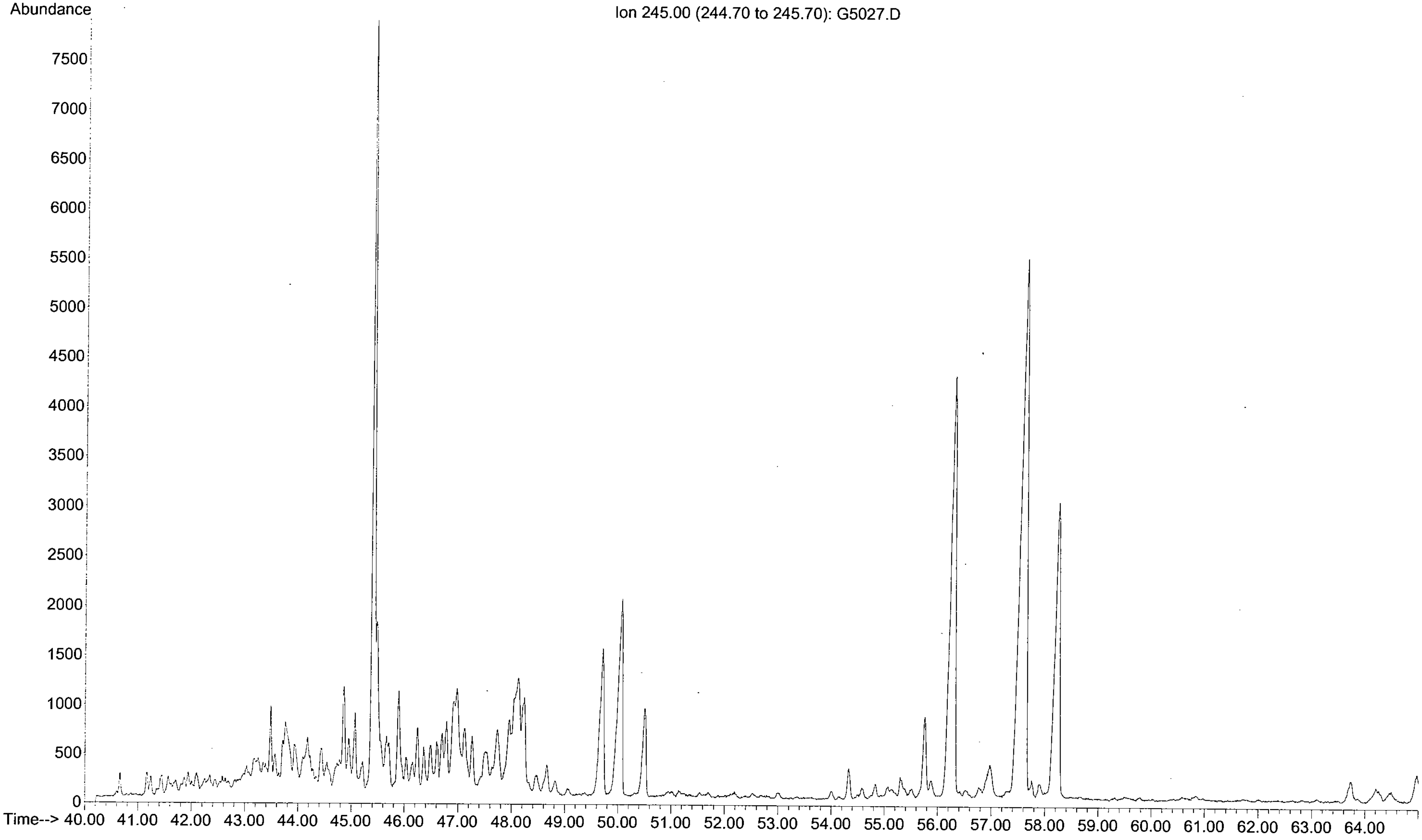
File : G:\G\DATA\SG0319\G5025.D
Operator : DPB
Acquired : 11 Feb 2007 5:44 pm using AcqMethod BIOPLUS
Instrument : Inst. G
Sample Name: R5536-P-MS(12)
Misc Info : GWP07T13 5-157 07-0010
Vial Number: 67



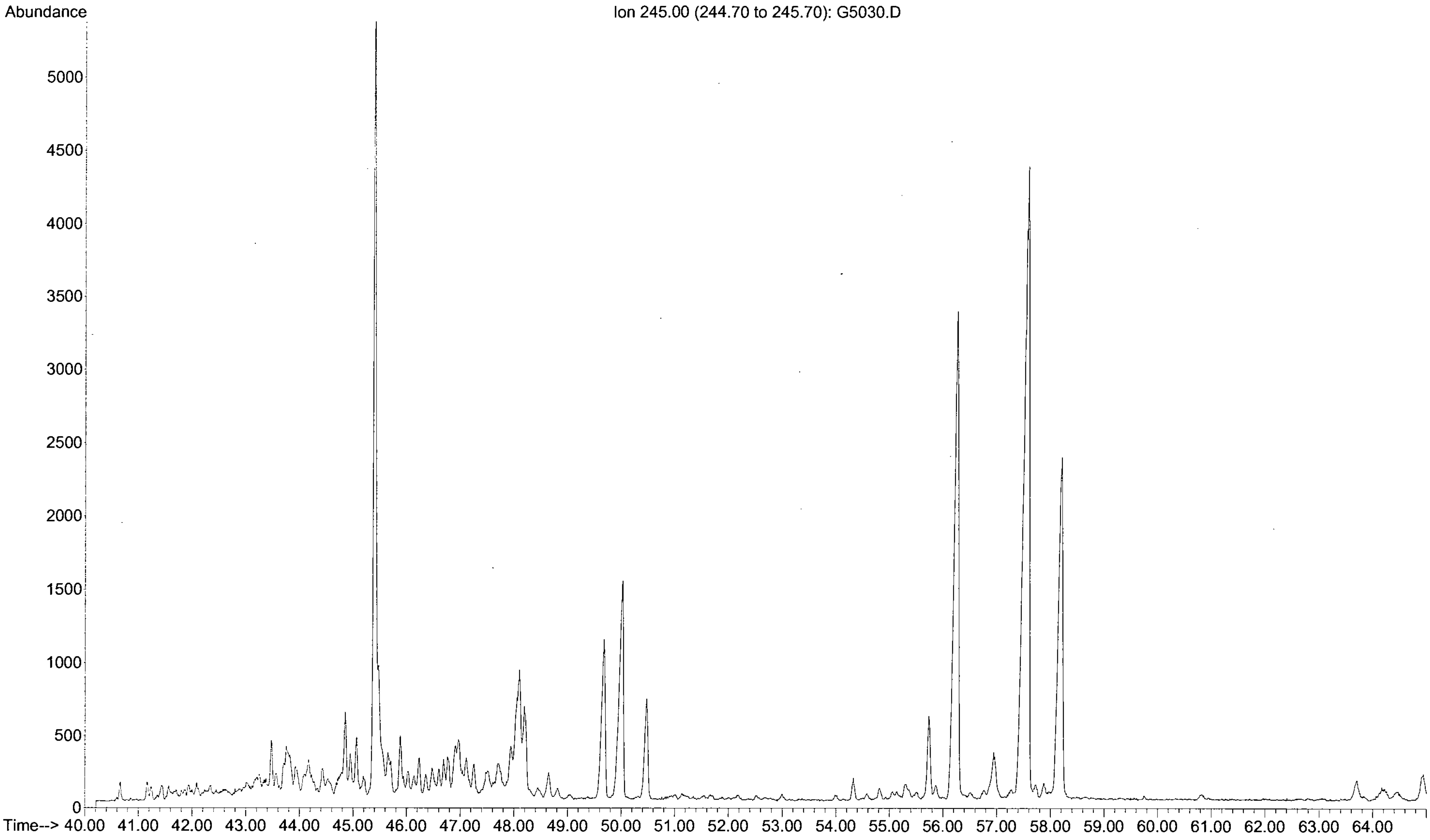
```
File        : G:\G\DATA\SG0319\G5026.D
Operator    : DPB
Acquired    : 11 Feb 2007   7:06 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5537-P-MS(10)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 68
```



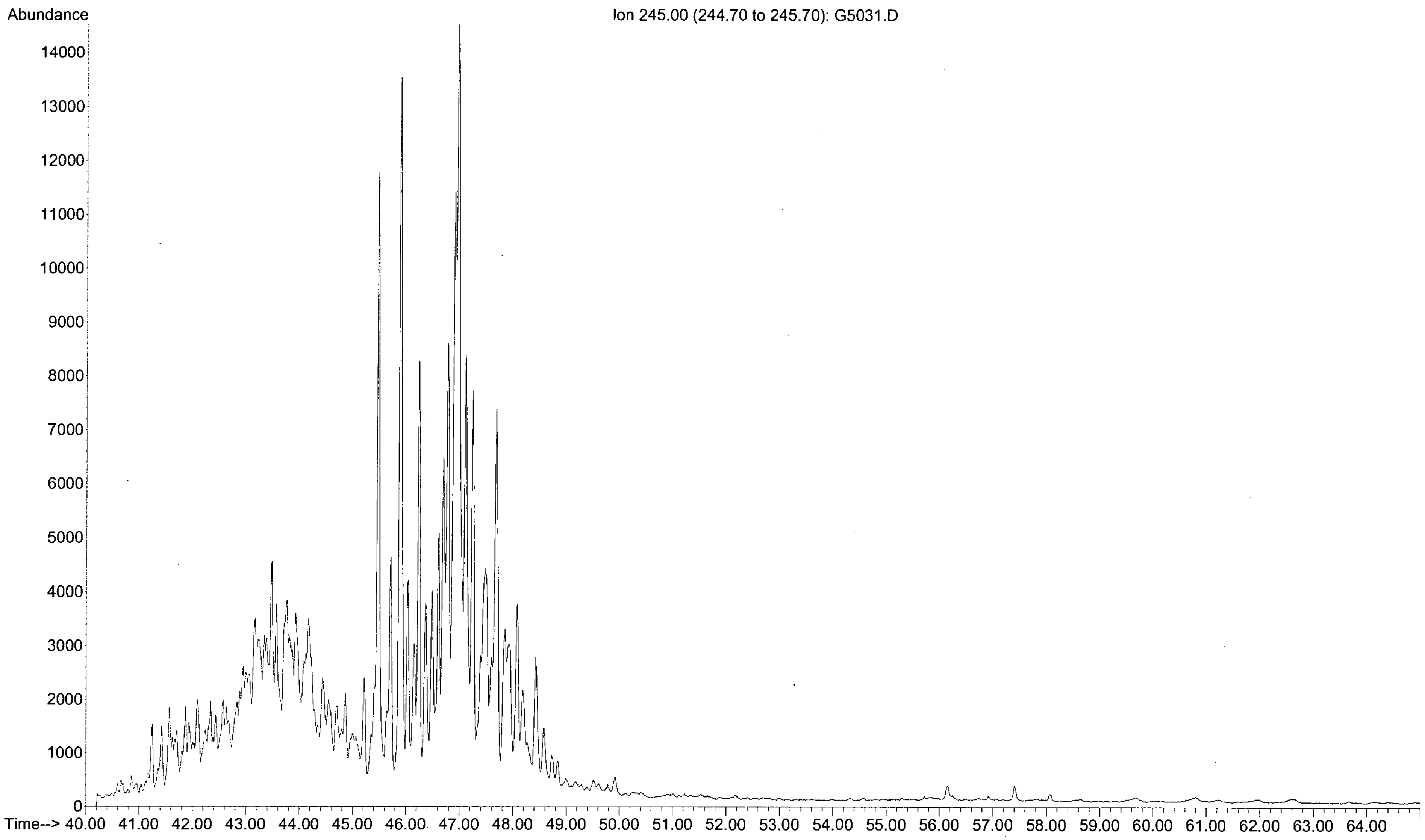
```
File        : G:\G\DATA\SG0319\G5027.D
Operator    : DPB
Acquired    : 11 Feb 2007   8:26 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5538-P-MS(12)
Misc Info   : GWP07S01 5-157 07-0010
Vial Number: 69
```



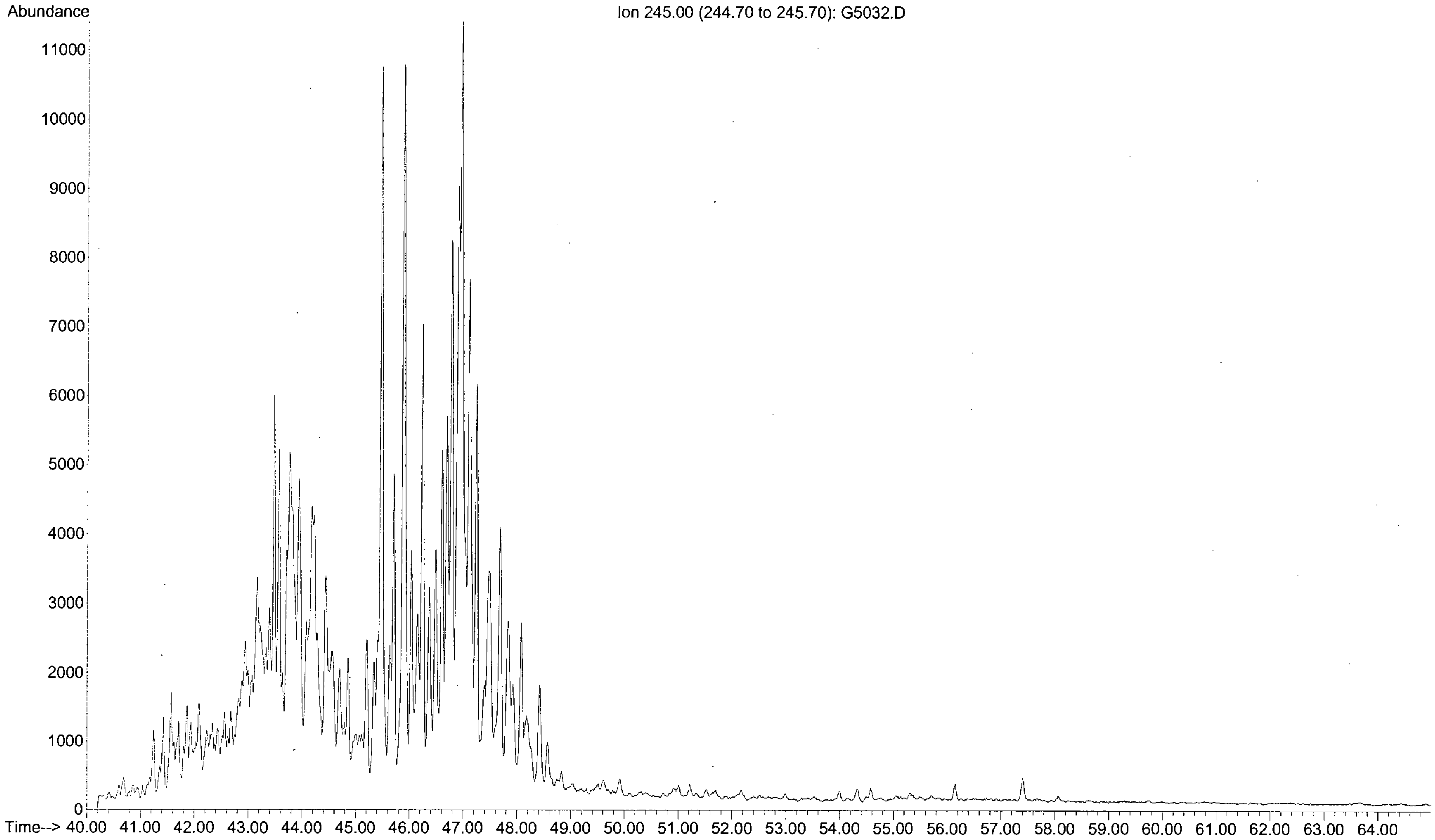
```
File       : G:\G\DATA\SG0319\G5030.D
Operator   : DPB
Acquired   : 12 Feb 2007  12:32 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5539-P-MS(12)
Misc Info  : GWP07S02 5-157 07-0010
Vial Number: 72
```



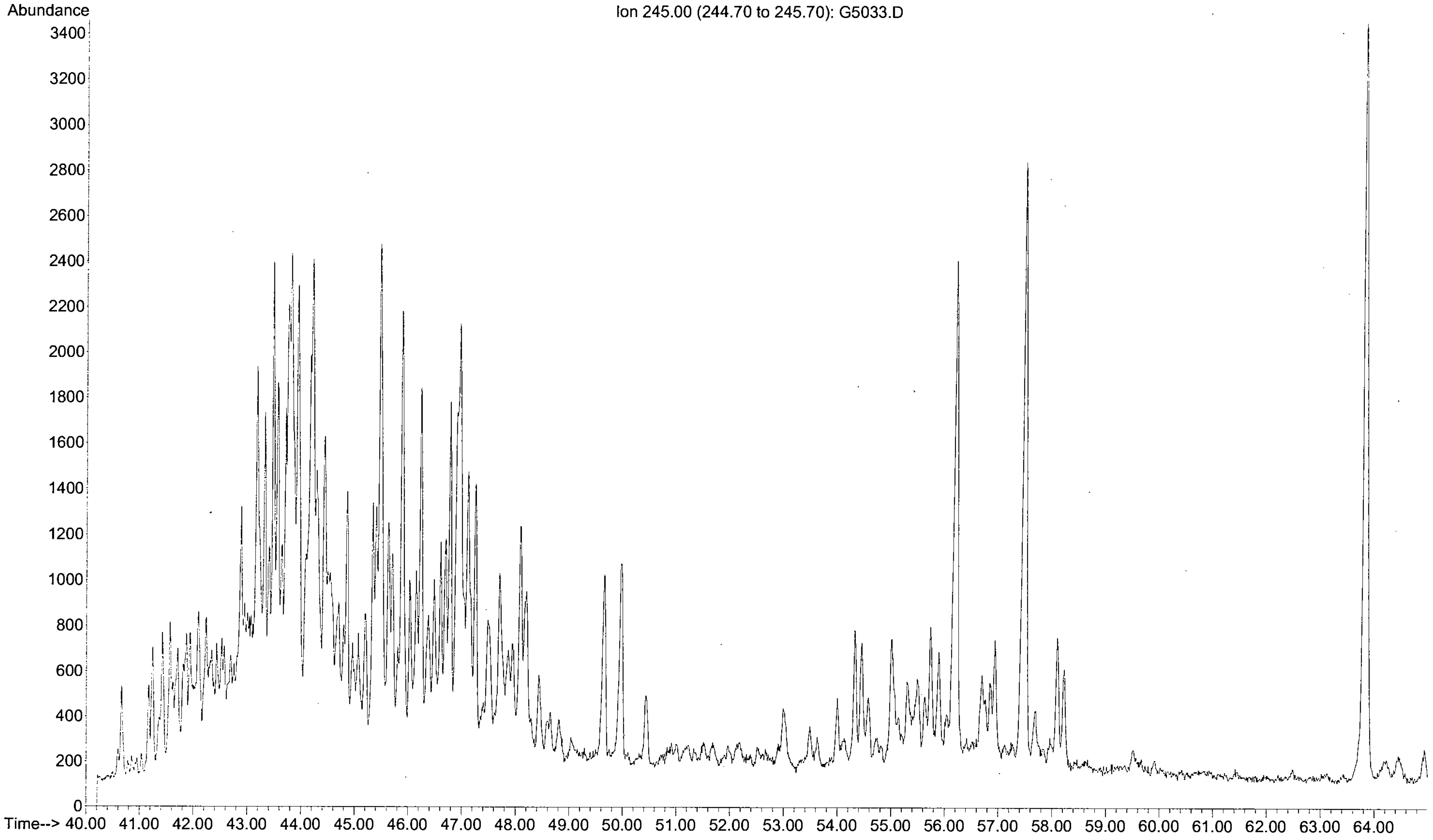
```
File        : G:\G\DATA\SG0319\G5031.D
Operator    : DPB
Acquired    : 12 Feb 2007   1:53 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5540-P-MS(12)
Misc Info   : GWP07S03 5-157 07-0010
Vial Number: 73
```



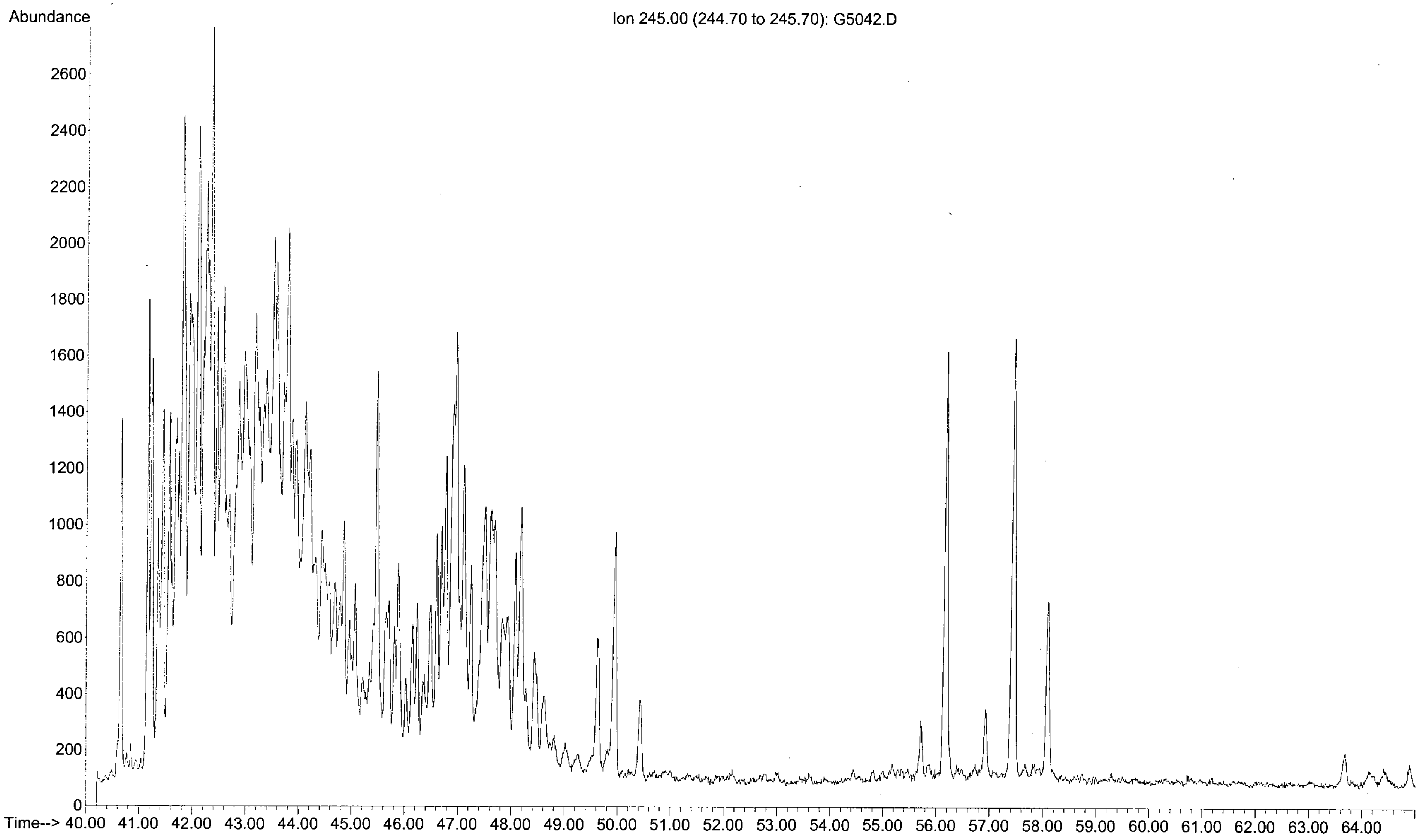
```
File        : G:\G\DATA\SG0319\G5032.D
Operator    : DPB
Acquired    : 12 Feb 2007   3:15 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5541-P-MS(12)
Misc Info   : GWP07S04 5-157 07-0010
Vial Number: 74
```



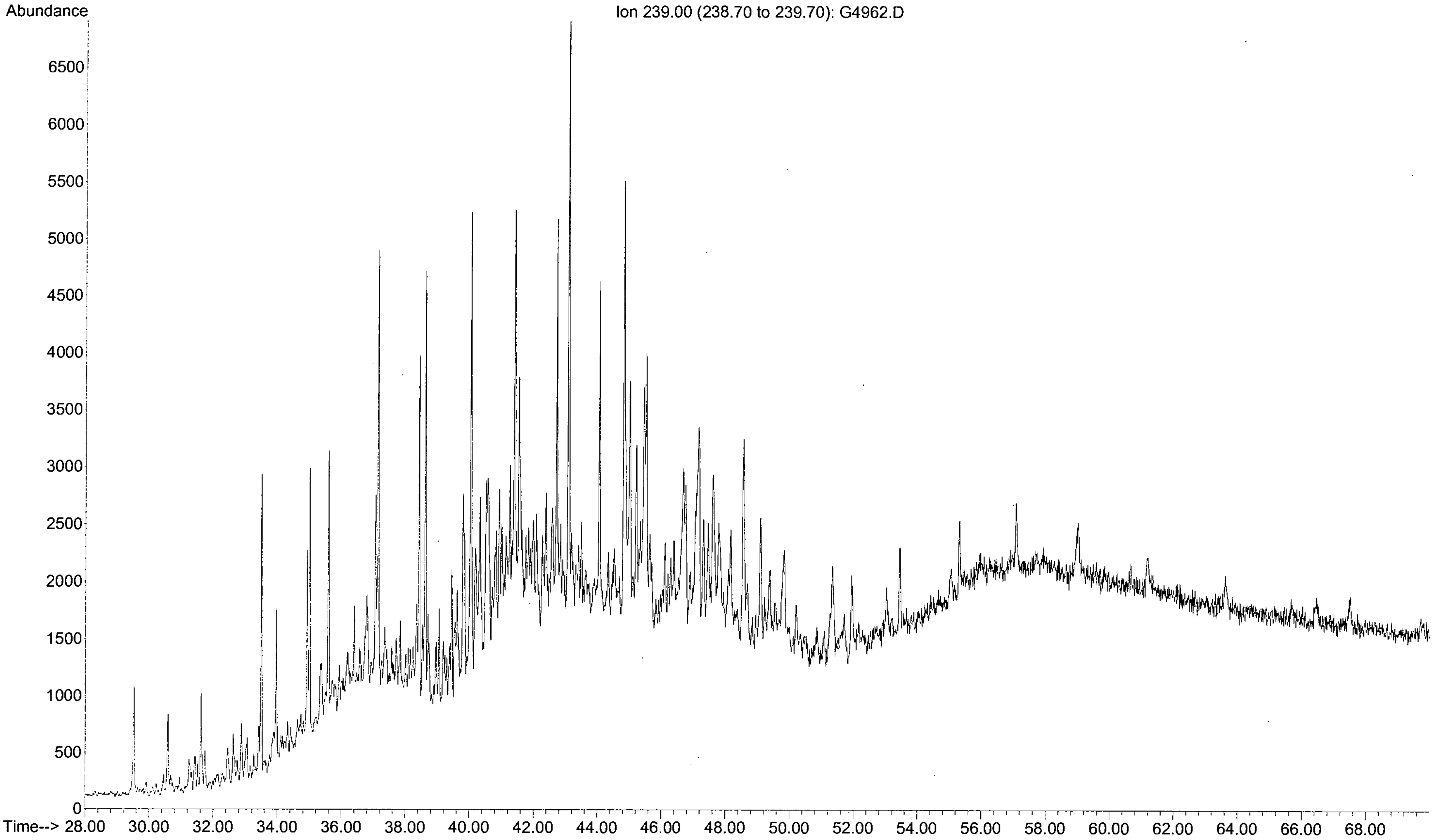
```
File       : G:\G\DATA\SG0319\G5033.D
Operator   : DPB
Acquired   : 12 Feb 2007   4:38 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5542-P-MS(12)
Misc Info  : TDW3-4.5 5-157 07-0010
Vial Number: 75
```



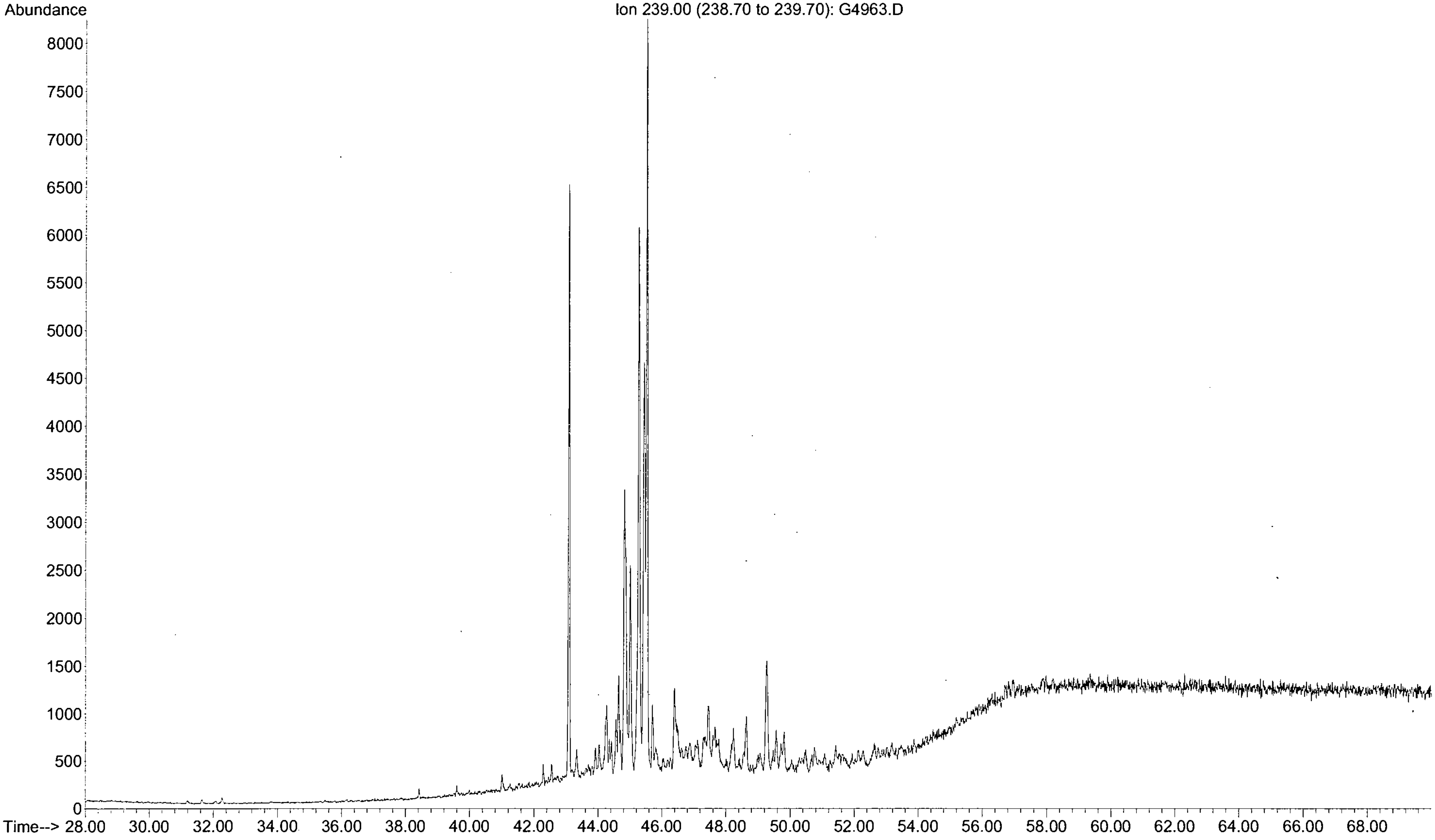
```
File        : G:\G\DATA\SG0319\G5042.D
Operator    : DPB
Acquired    : 12 Feb 2007   4:56 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5521-P-MS(12)
Misc Info   : GWP07T01 5-157 07-0010
Vial Number: 84
```



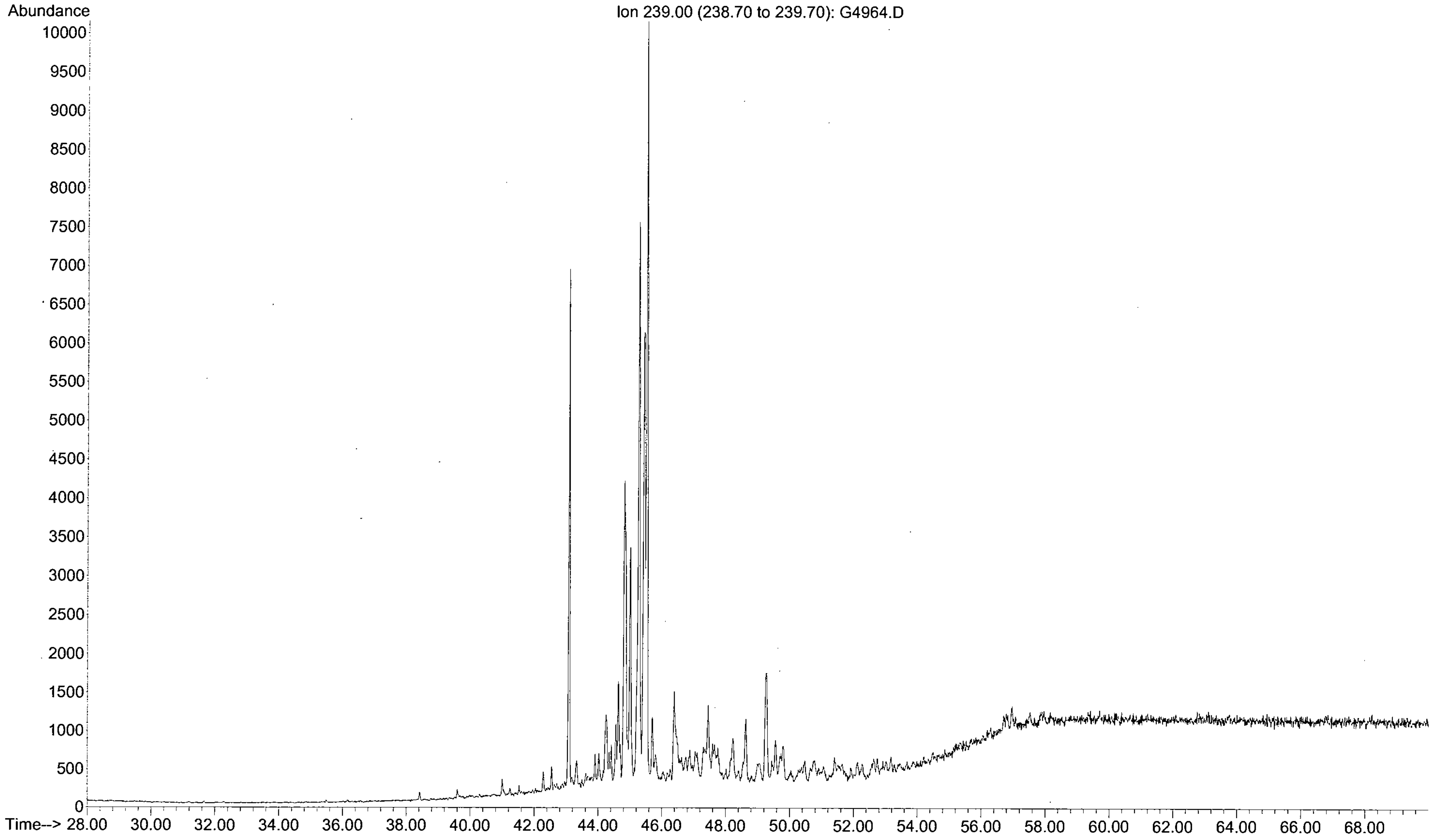
```
File        : G:\G\DATA\SG0319\G4962.D
Operator    : DPB
Acquired    :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info   : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4
```



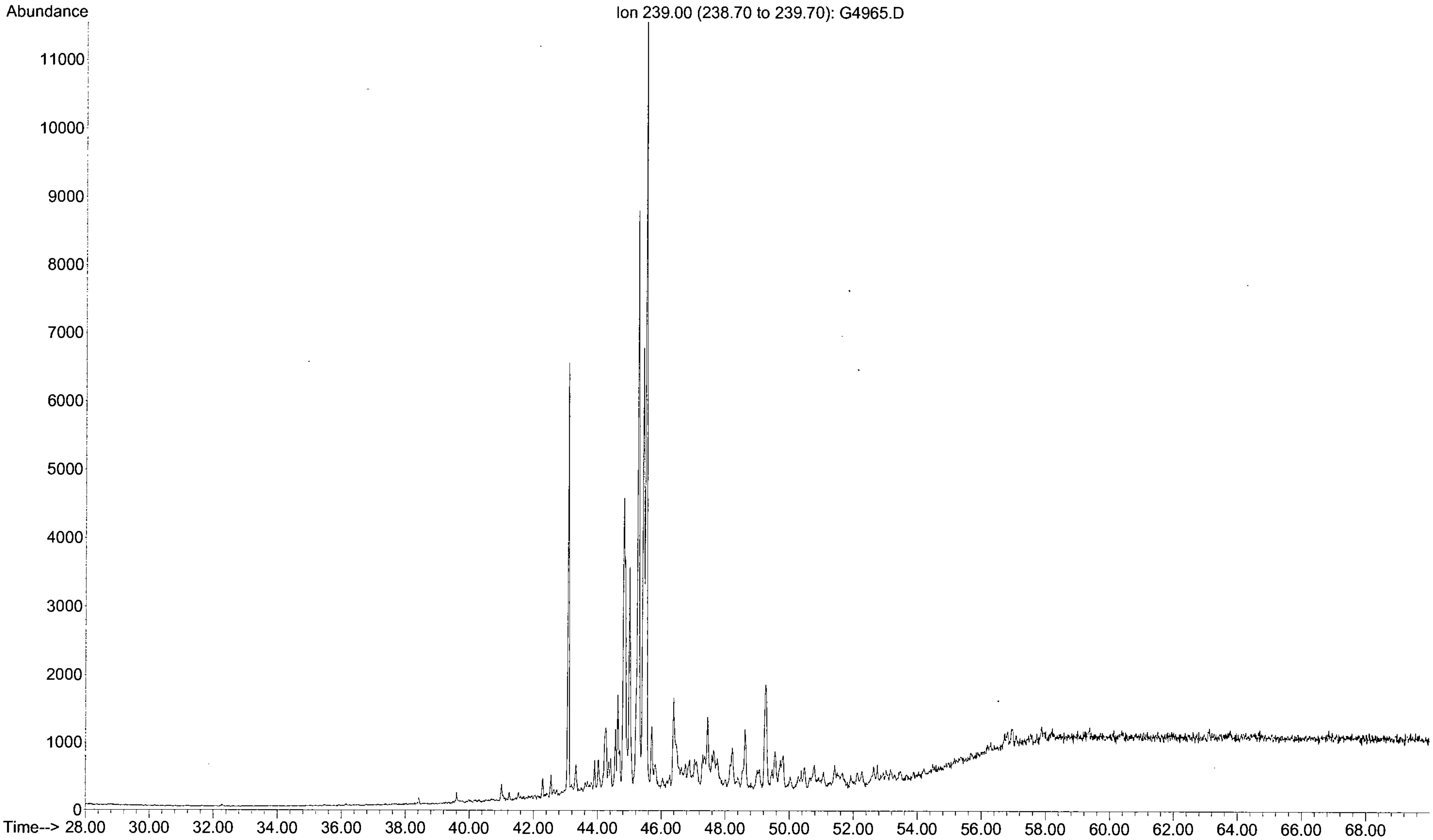
```
File        : G:\G\DATA\SG0319\G4963.D
Operator    : DPB
Acquired    :  8 Feb 2007  12:50 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5528-P-A-MS-D(15)
Misc Info   : GWP07T05 5-157 07-0010
Vial Number: 5
```



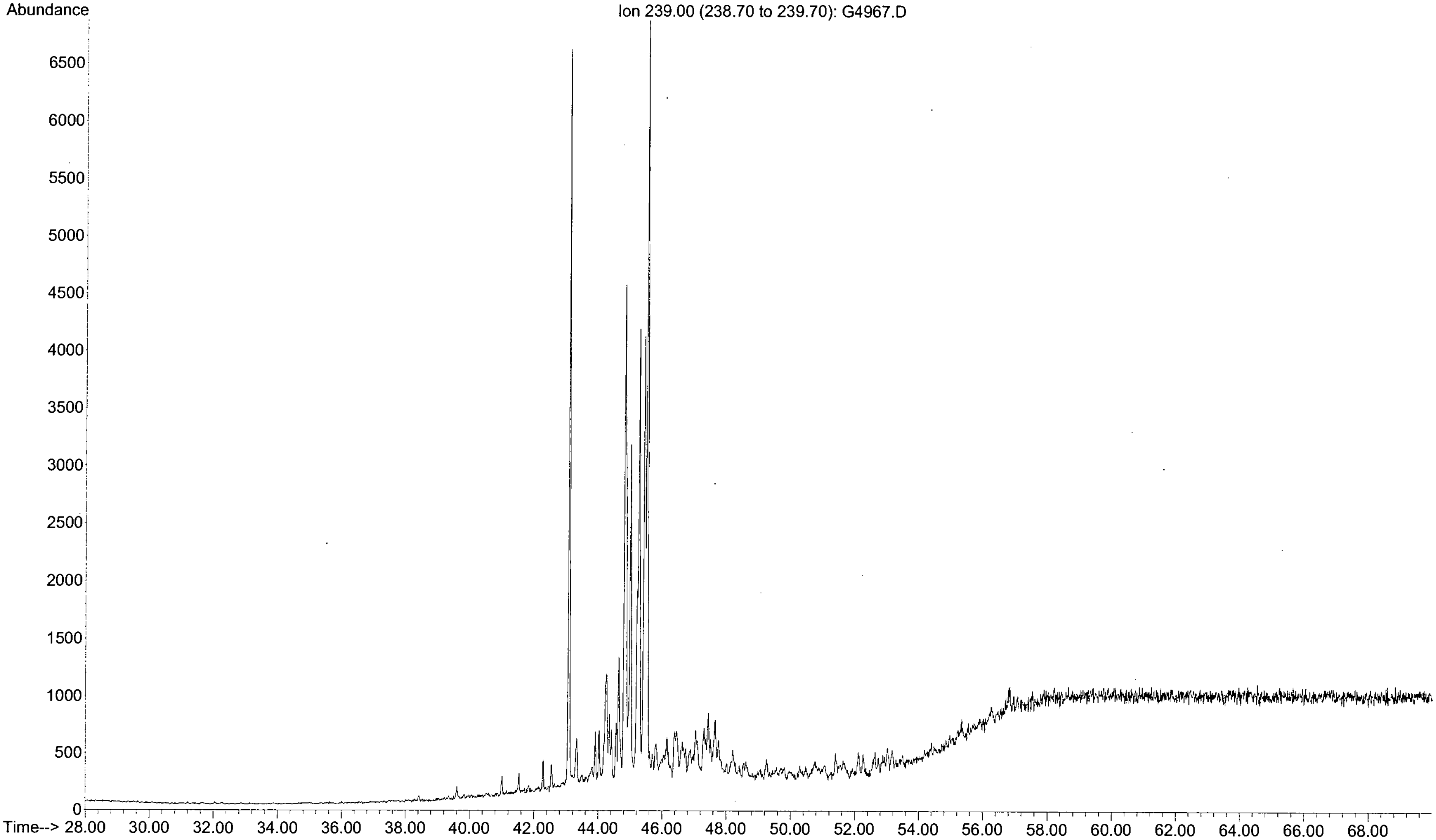
File   : G:\G\DATA\SG0319\G4964.D
Operator   : DPB
Acquired   : 8 Feb 2007   2:10 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5529-P-A-MS-D(15)
Misc Info   : GWP07T06 5-157 07-0010
Vial Number: 6


Ion 239.00 (238.70 to 239.70): G4964.D

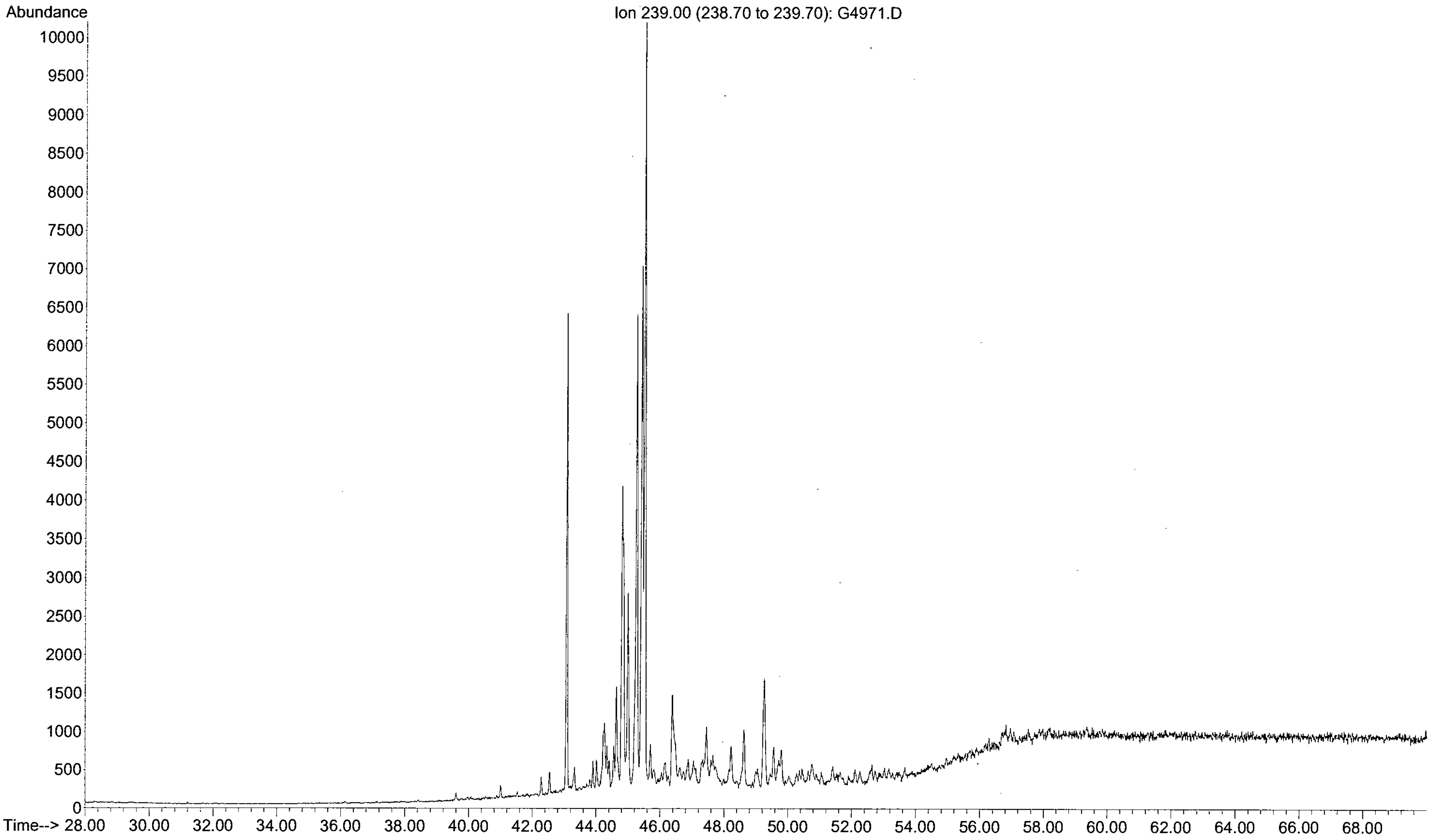
```
File       : G:\G\DATA\SG0319\G4965.D
Operator   : DPB
Acquired   :  8 Feb 2007   3:31 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5530-P-MS-D(13)
Misc Info  : GWP07T07 5-157 07-0010
Vial Number: 7
```



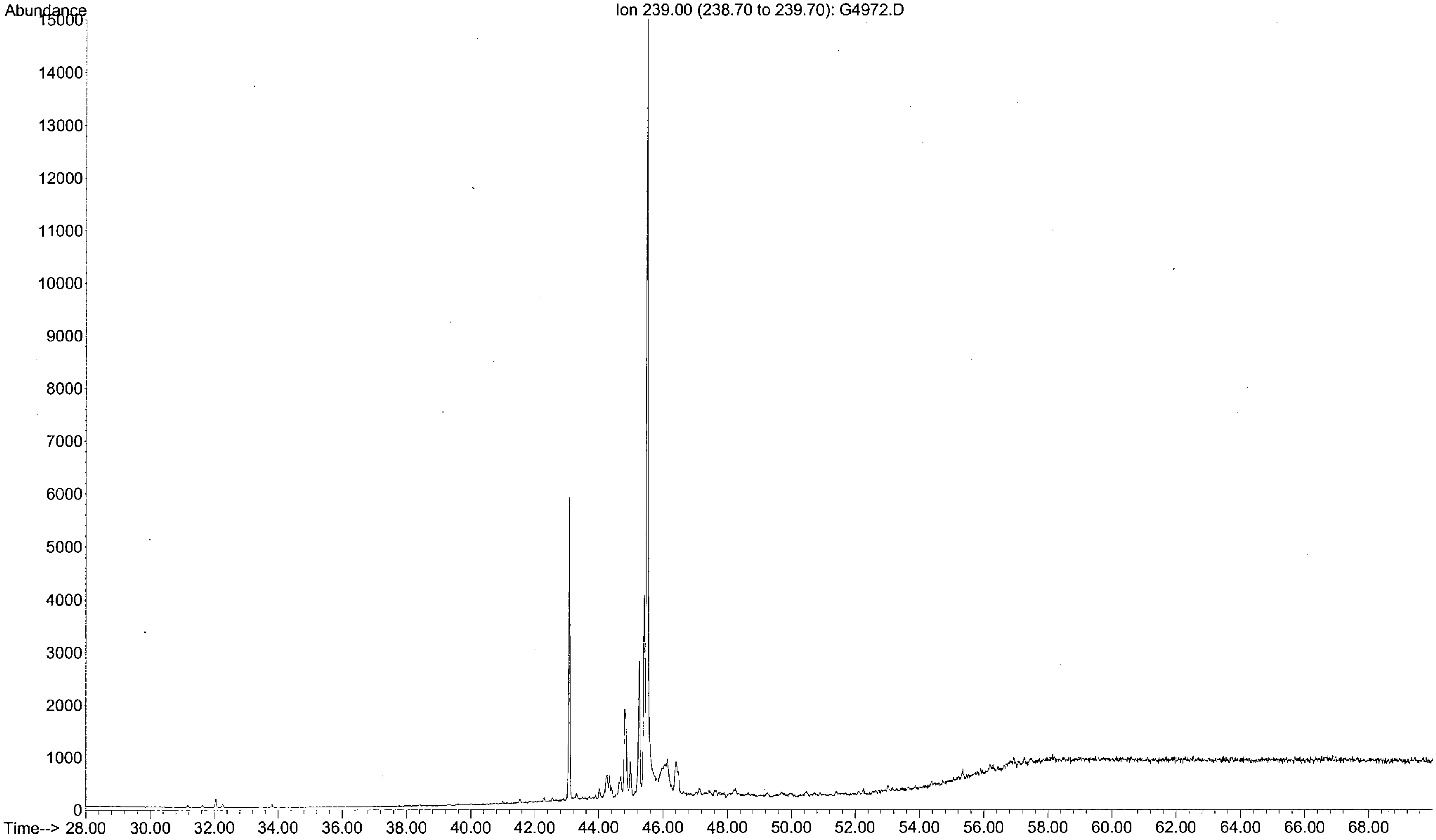
```
File       : G:\G\DATA\SG0319\G4967.D
Operator   : DPB
Acquired   :  8 Feb 2007   6:14 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5532-P-MS-D(13)
Misc Info  : GWP07T09 5-157 07-0010
Vial Number: 9
```



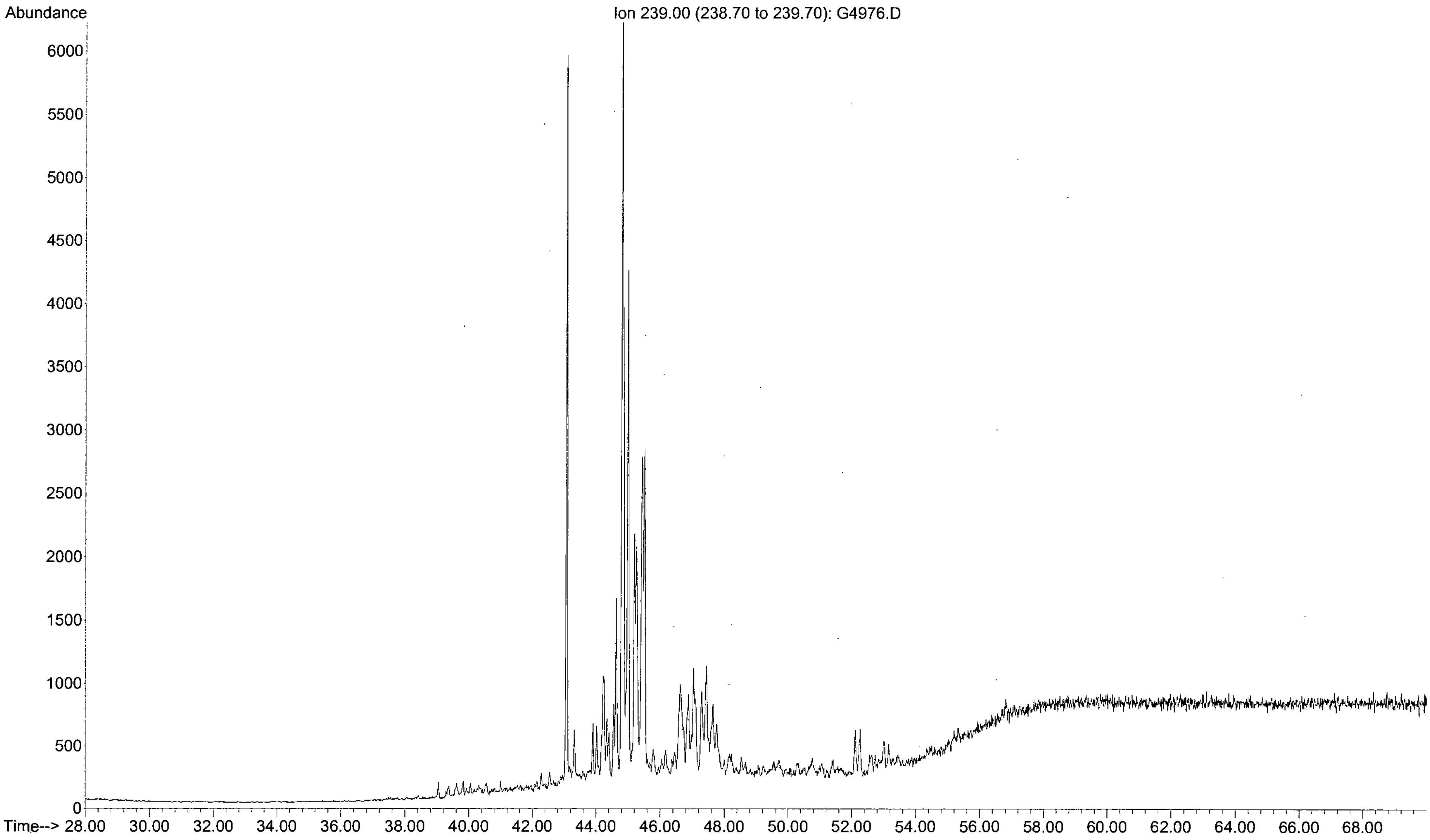
```
File        : G:\G\DATA\SG0319\G4971.D
Operator    : DPB
Acquired    :  8 Feb 2007  11:43 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5535-P-MS-D(13)
Misc Info   : GWP07T12 5-157 07-0010
Vial Number: 13
```



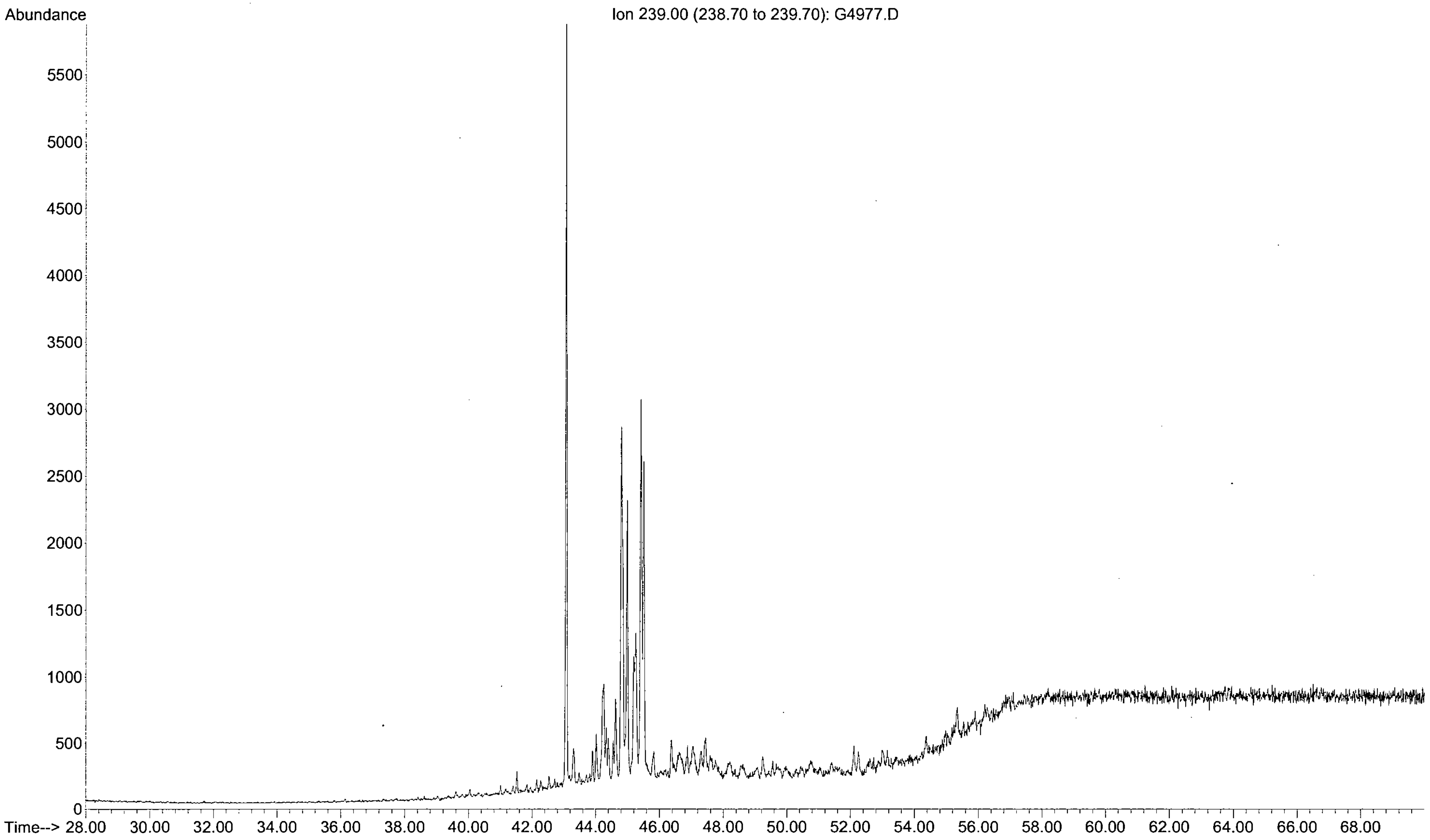
```
File       : G:\G\DATA\SG0319\G4972.D
Operator   : DPB
Acquired   :  8 Feb 2007   5:37 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5539-P-MS-D(13)
Misc Info  : GWP07S02 5-157 07-0010
Vial Number: 14
```



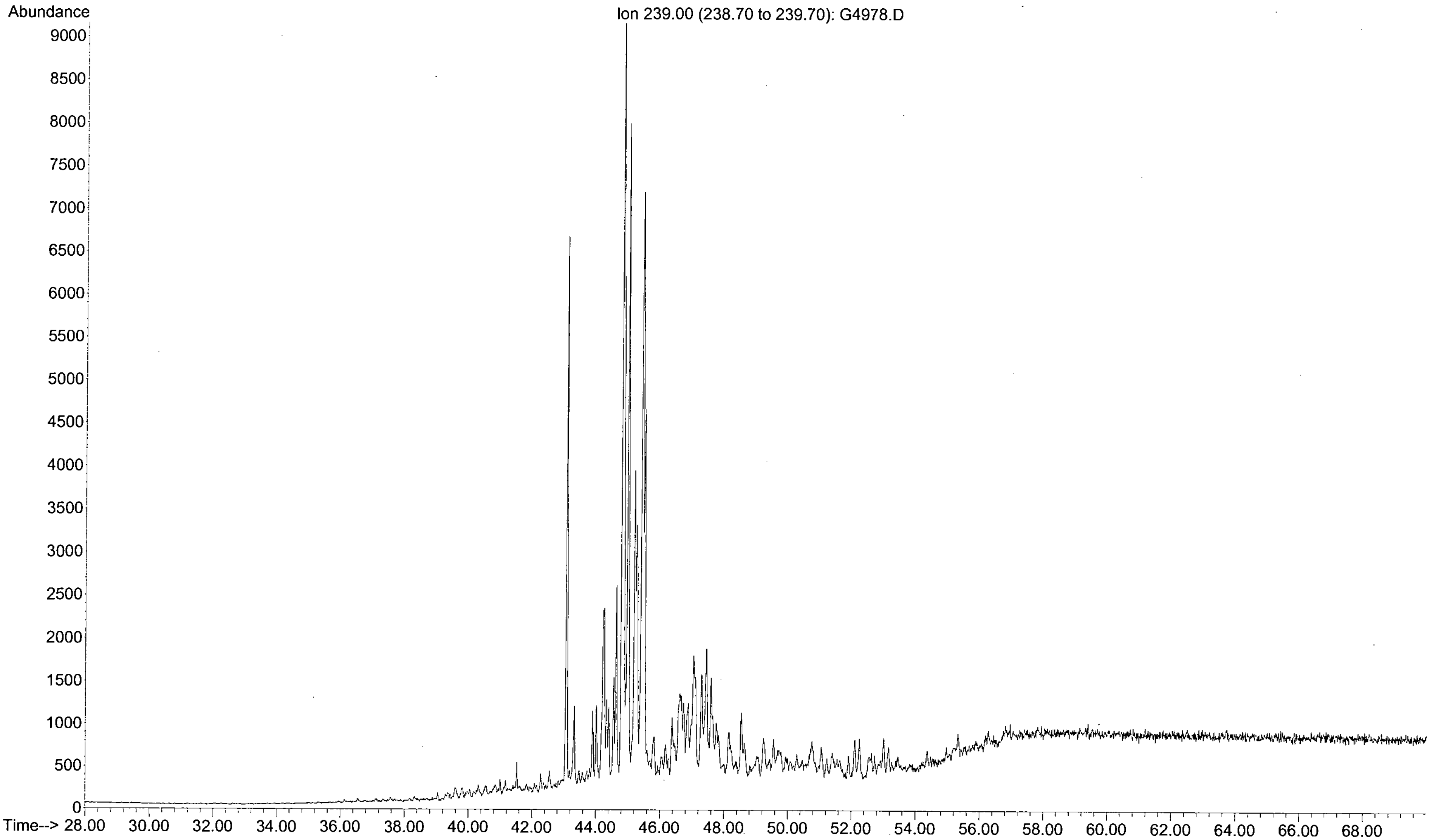
File : G:\G\DATA\SG0319\G4976.D
Operator : DPB
Acquired : 8 Feb 2007 11:03 pm using AcqMethod BIOPLUS
Instrument : Inst. G
Sample Name: R5541-P-MS-D(13)
Misc Info : GWP07S04 5-157 07-0010
Vial Number: 18



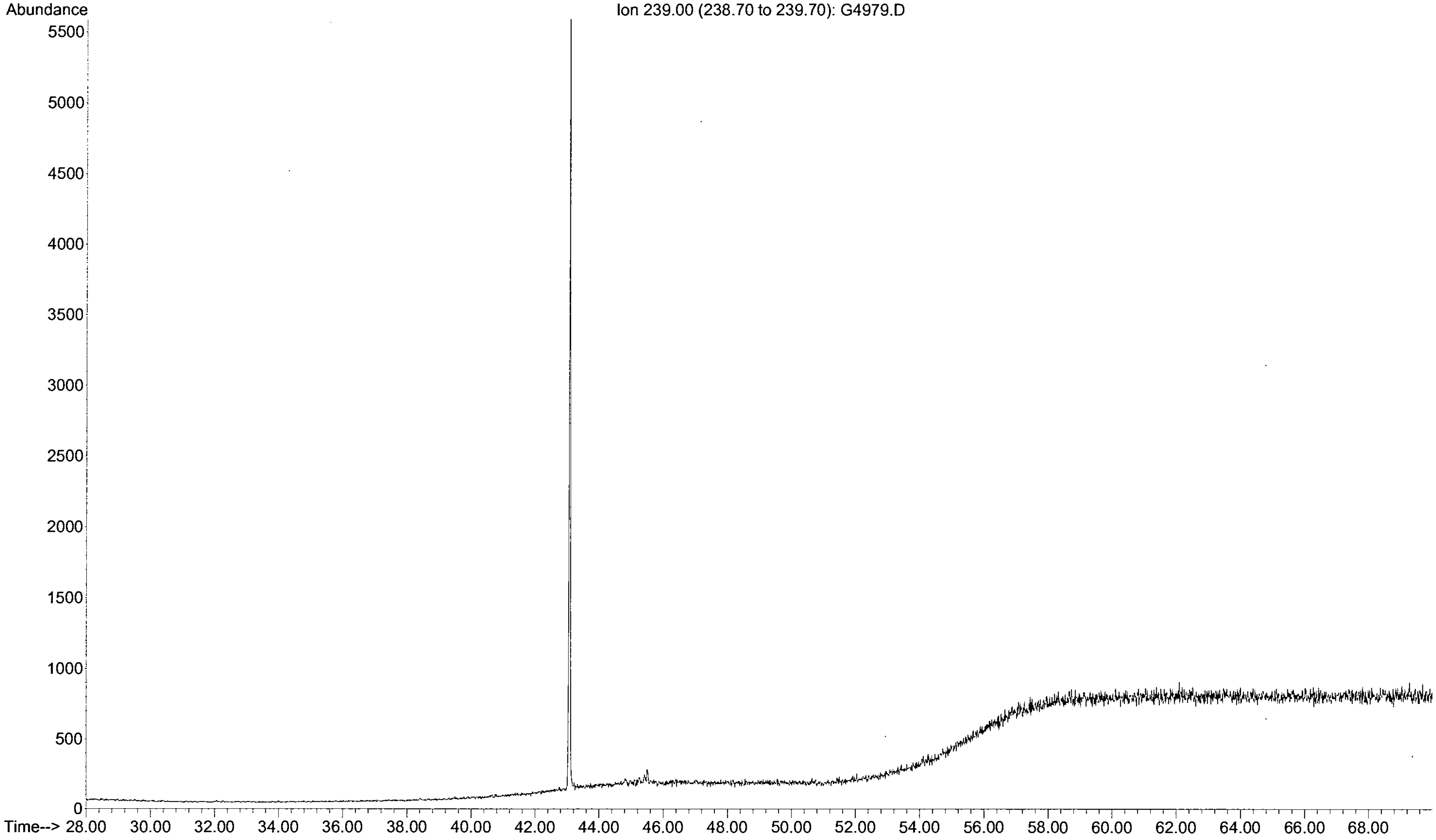
```
File       : G:\G\DATA\SG0319\G4977.D
Operator   : DPB
Acquired   :  9 Feb 2007  12:25 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5542-P-MS-D(13)
Misc Info  : TDW3-4.5 5-157 07-0010
Vial Number: 19
```



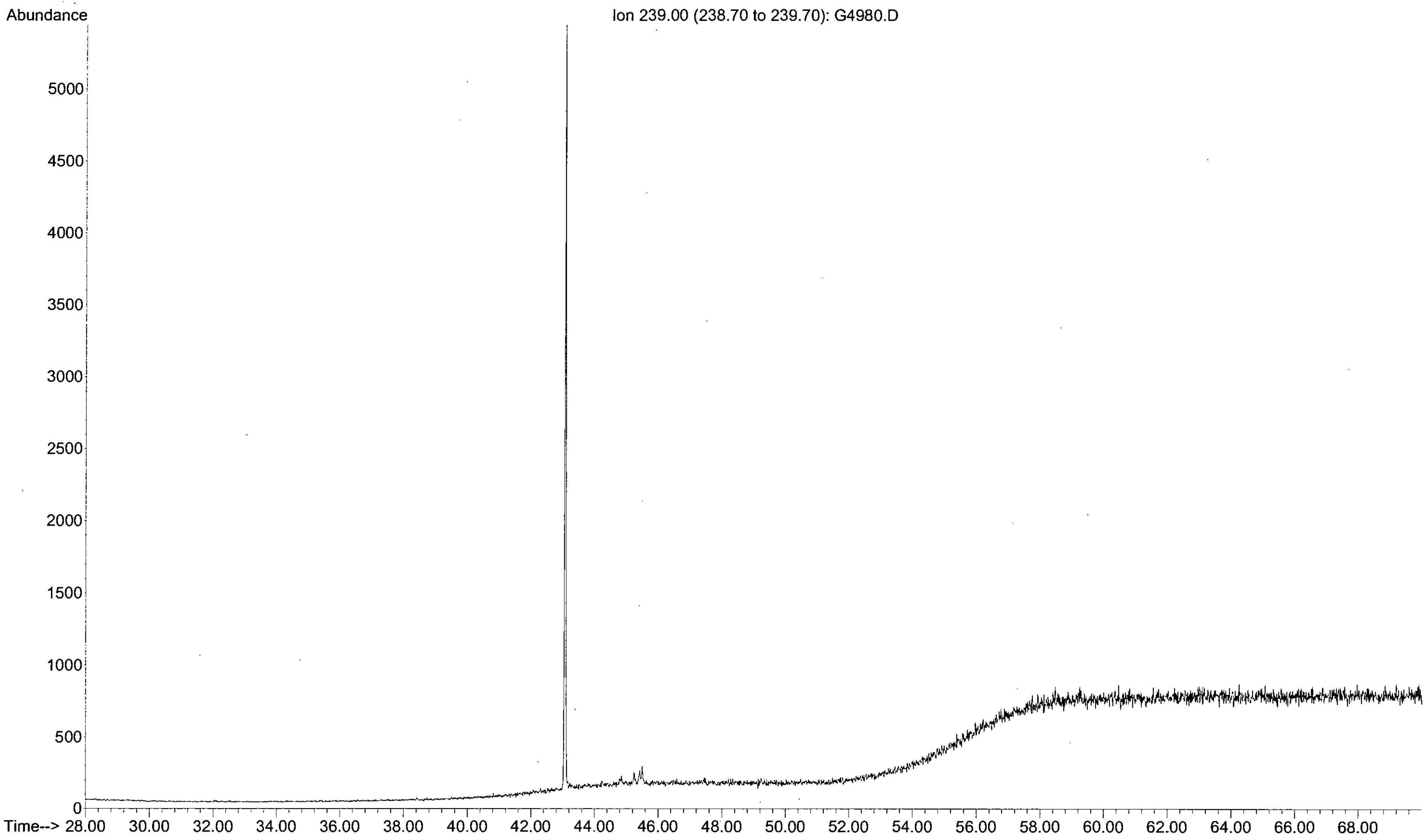
```
File        : G:\G\DATA\SG0319\G4978.D
Operator    : DPB
Acquired    :  9 Feb 2007   1:47 am using AcqMethod BIOPLUS
Instrument :    Inst. G
Sample Name: R5537-P-MS-D(11)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 20
```



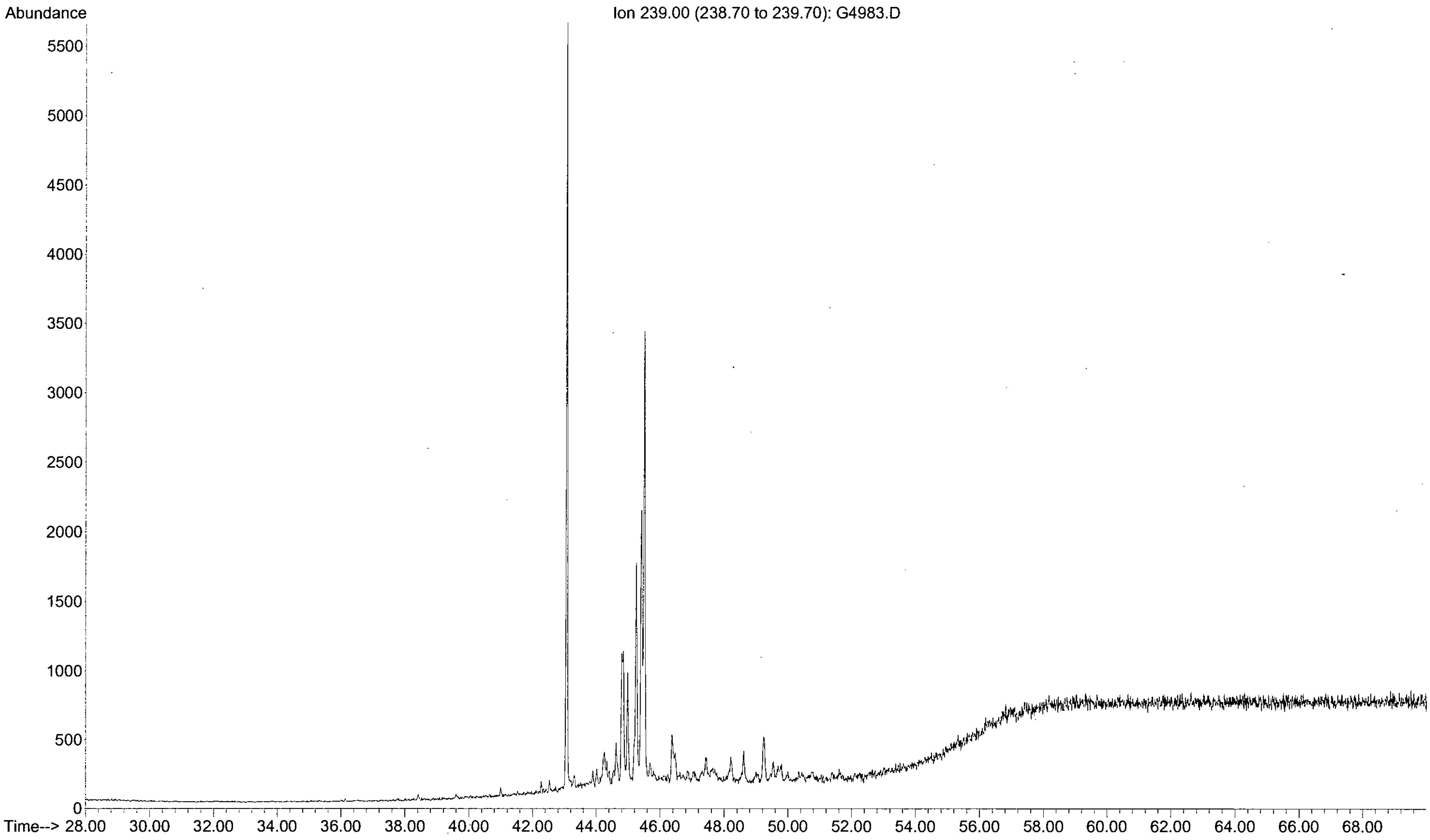
```
File       : G:\G\DATA\SG0319\G4979.D
Operator   : DPB
Acquired   :  9 Feb 2007   3:10 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5526-P-MS-D(15)
Misc Info  : GWP07T03 5-157 07-0010
Vial Number: 21
```



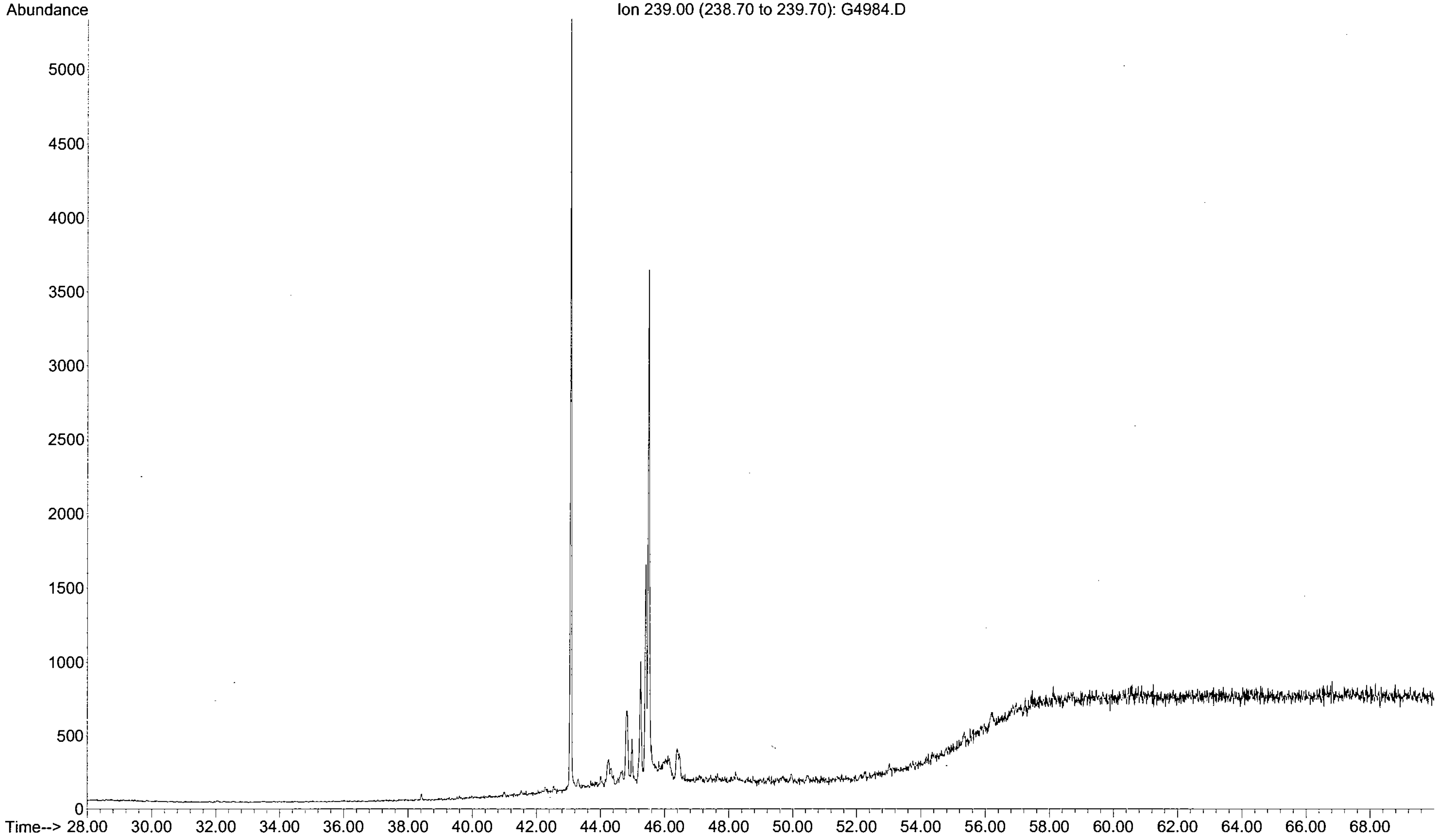
File : G:\G\DATA\SG0319\G4980.D
Operator : DPB
Acquired : 9 Feb 2007 4:34 am using AcqMethod BIOPLUS
Instrument : Inst. G
Sample Name: R5527-P-MS-D(15)
Misc Info : GWP07T04 5-157 07-0010
Vial Number: 22



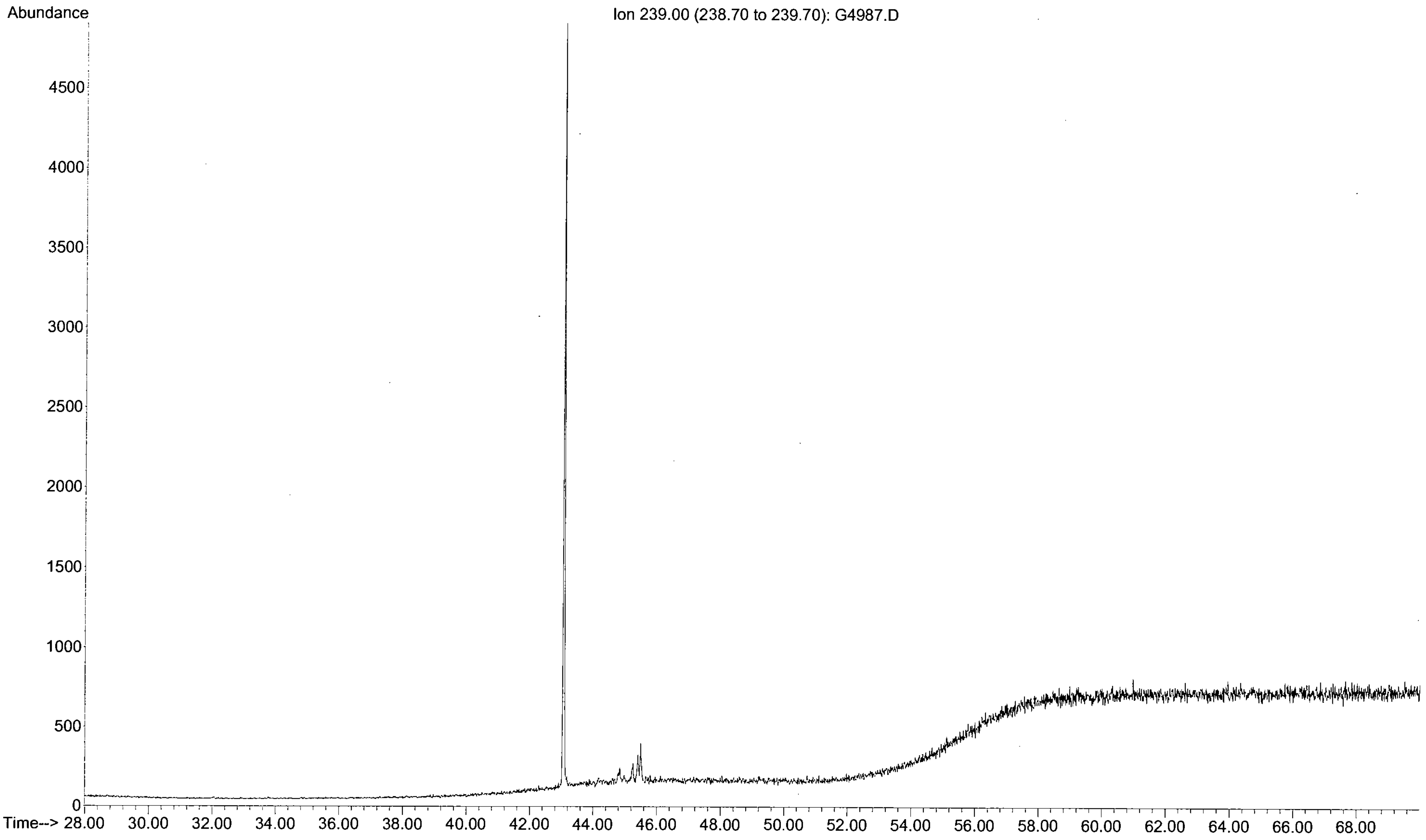
```
File        : G:\G\DATA\SG0319\G4983.D
Operator    : DPB
Acquired    :  9 Feb 2007   8:41 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5536-P-MS-D(13)
Misc Info   : GWP07T13 5-157 07-0010
Vial Number: 25
```



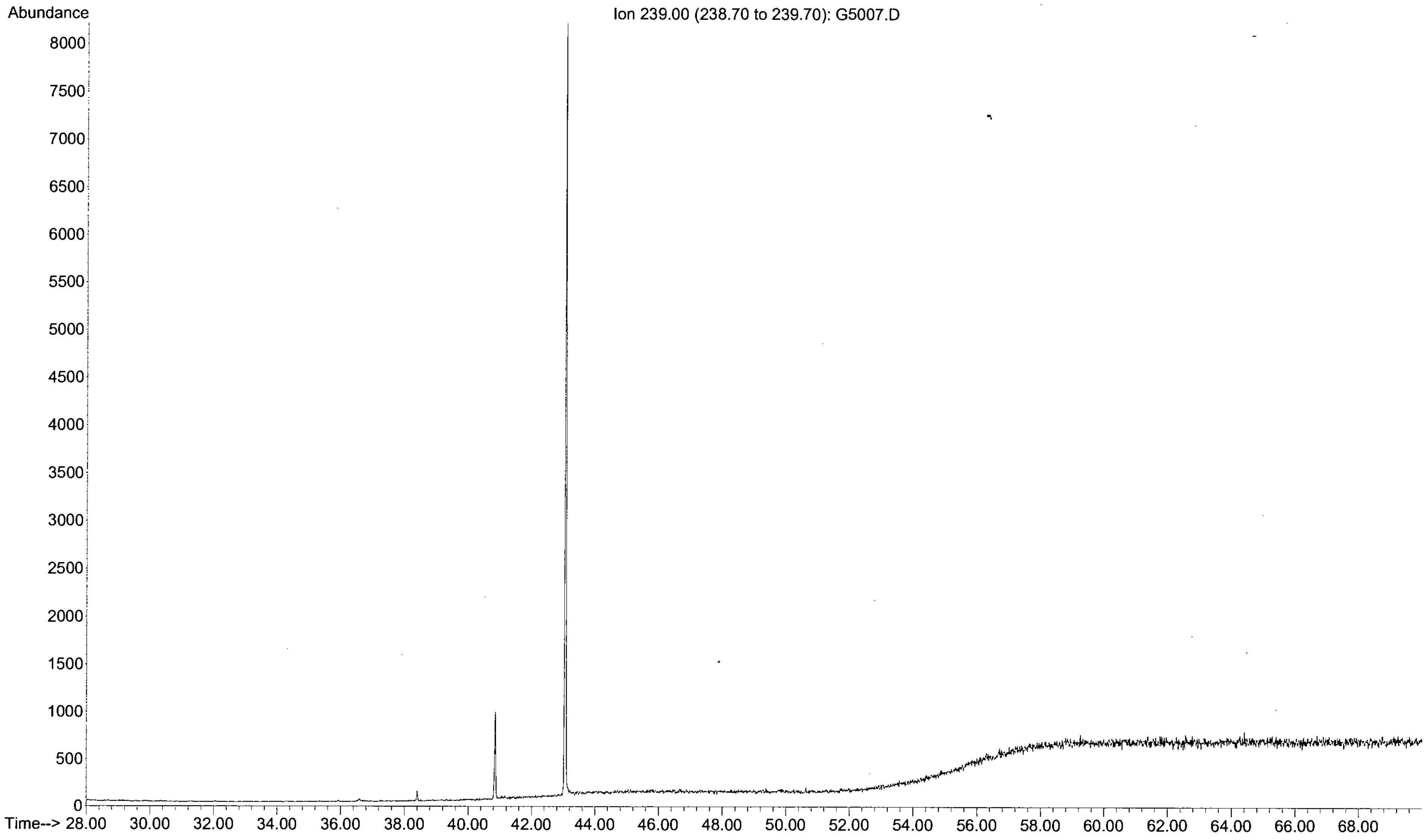
```
File       : G:\G\DATA\SG0319\G4984.D
Operator   : DPB
Acquired   :  9 Feb 2007  10:03 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5538-P-MS-D(13)
Misc Info  : GWP07S01 5-157 07-0010
Vial Number: 26
```



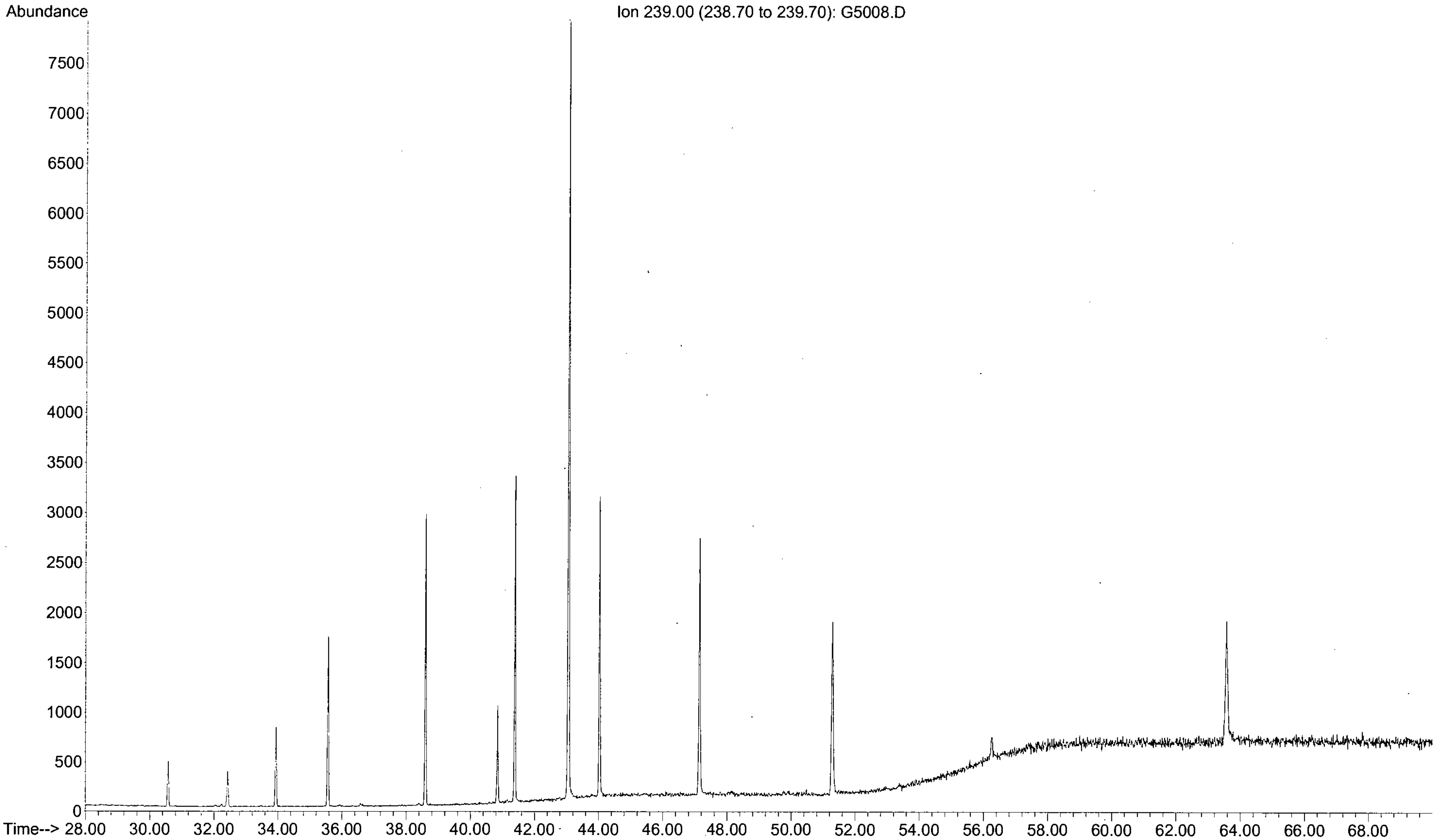
```
File       : G:\G\DATA\SG0319\G4987.D
Operator   : DPB
Acquired   :  9 Feb 2007   2:08 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5533-P-MS-D(13)
Misc Info  : GWP07T10 5-157 07-0010
Vial Number: 29
```



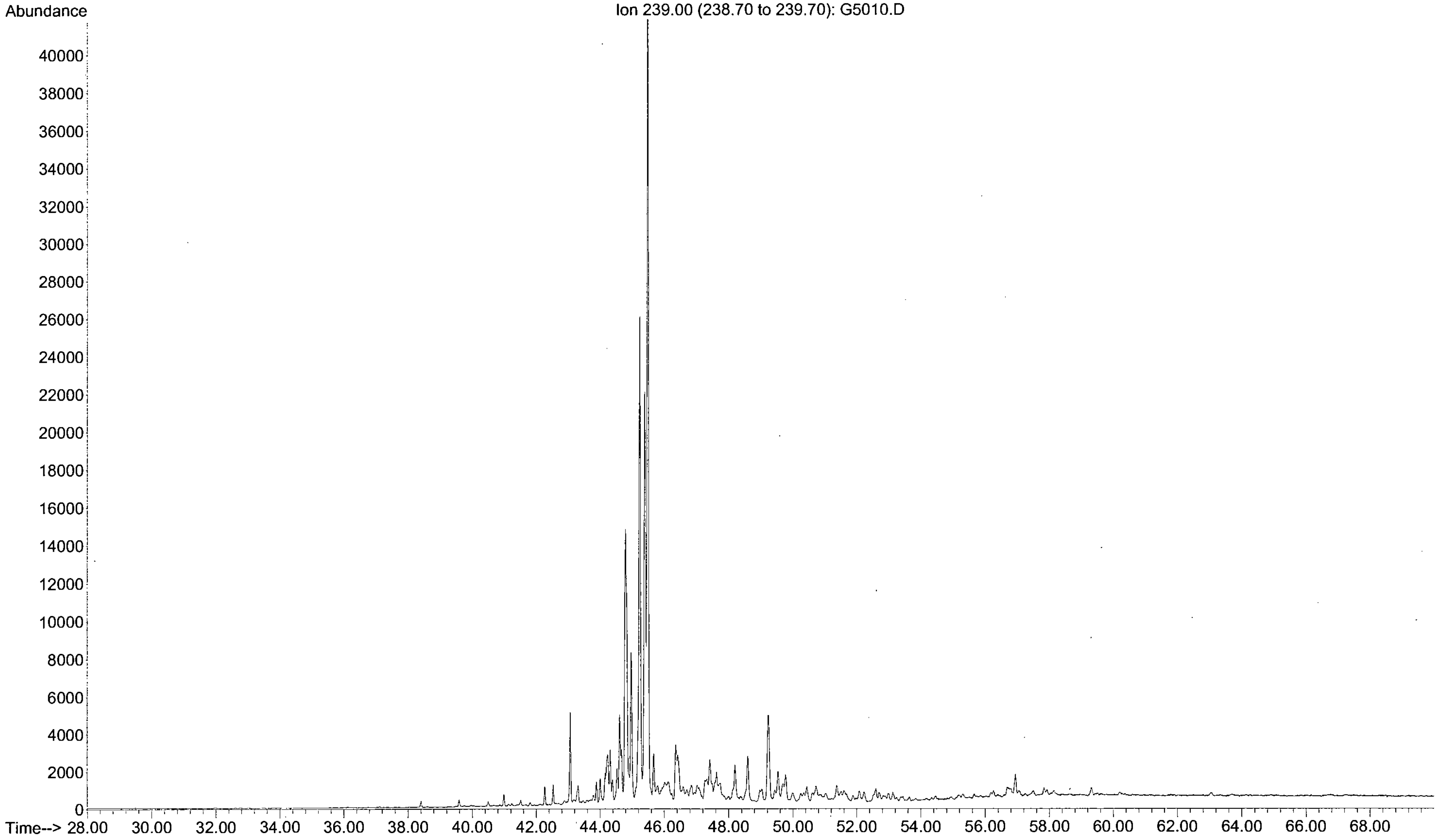
```
File        : G:\G\DATA\SG0319\G5007.D
Operator    : DPB
Acquired    : 10 Feb 2007   5:18 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ939PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0010
Vial Number: 49
```



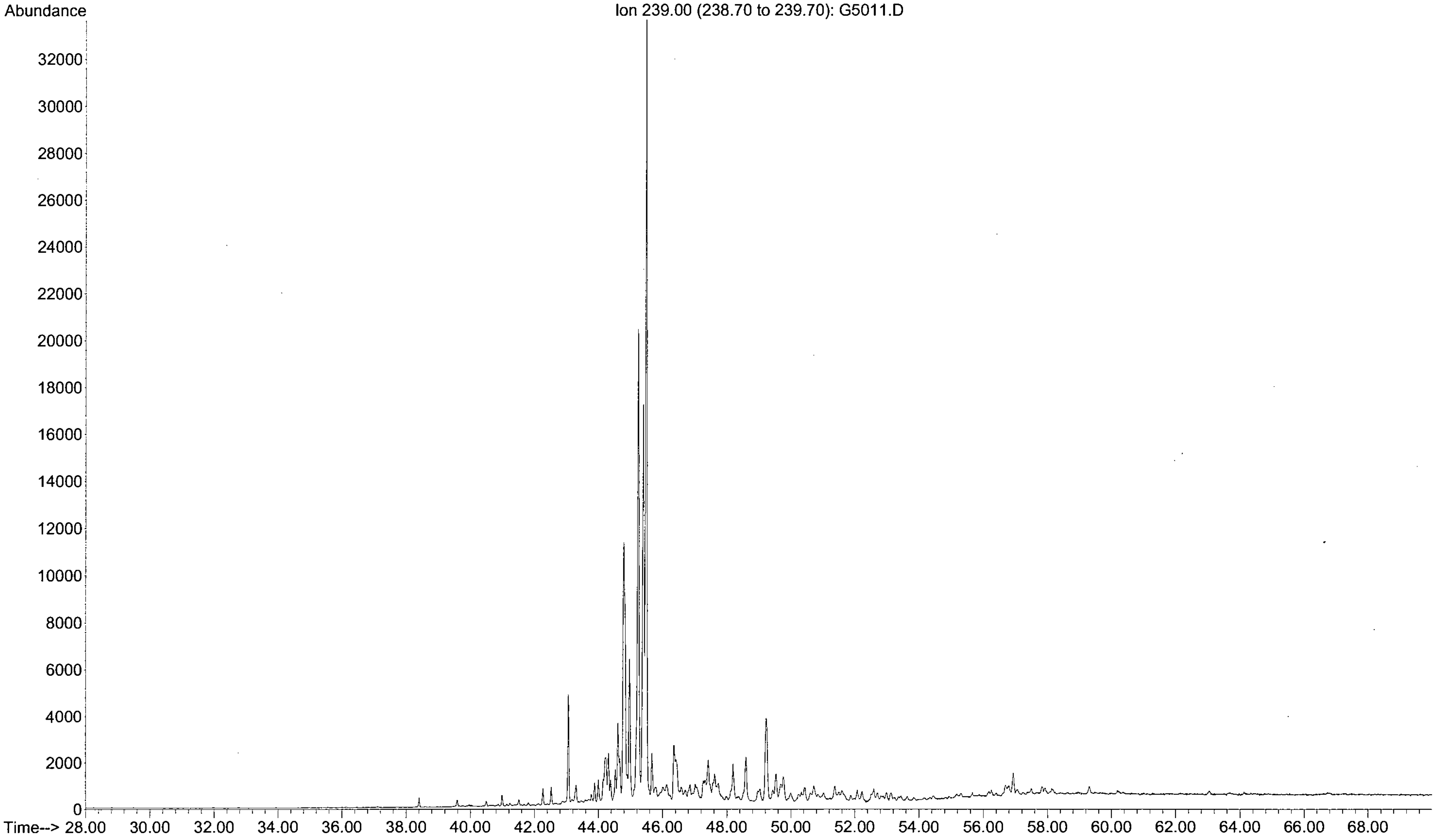
```
File       : G:\G\DATA\SG0319\G5008.D
Operator   : DPB
Acquired   : 10 Feb 2007   6:37 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ940LCS-P-MS(5)
Misc Info  : Laboratory Control Sample 5-157 07-0010
Vial Number: 50
```



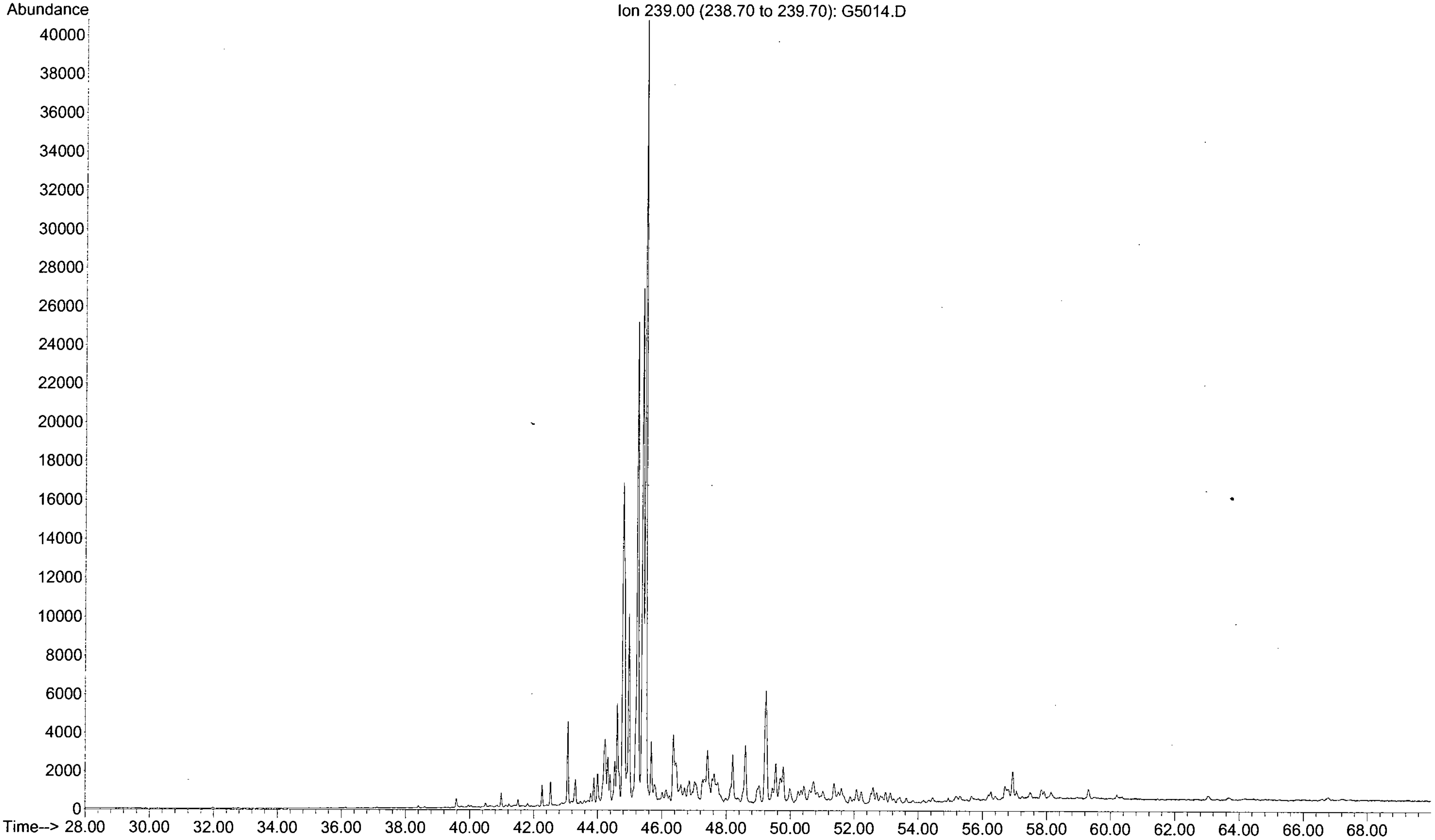
File   : G:\G\DATA\SG0319\G5010.D
Operator   : DPB
Acquired   : 10 Feb 2007   9:21 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5525-P-MS(12)
Misc Info   : GWP07T02 5-157 07-0010
Vial Number: 52



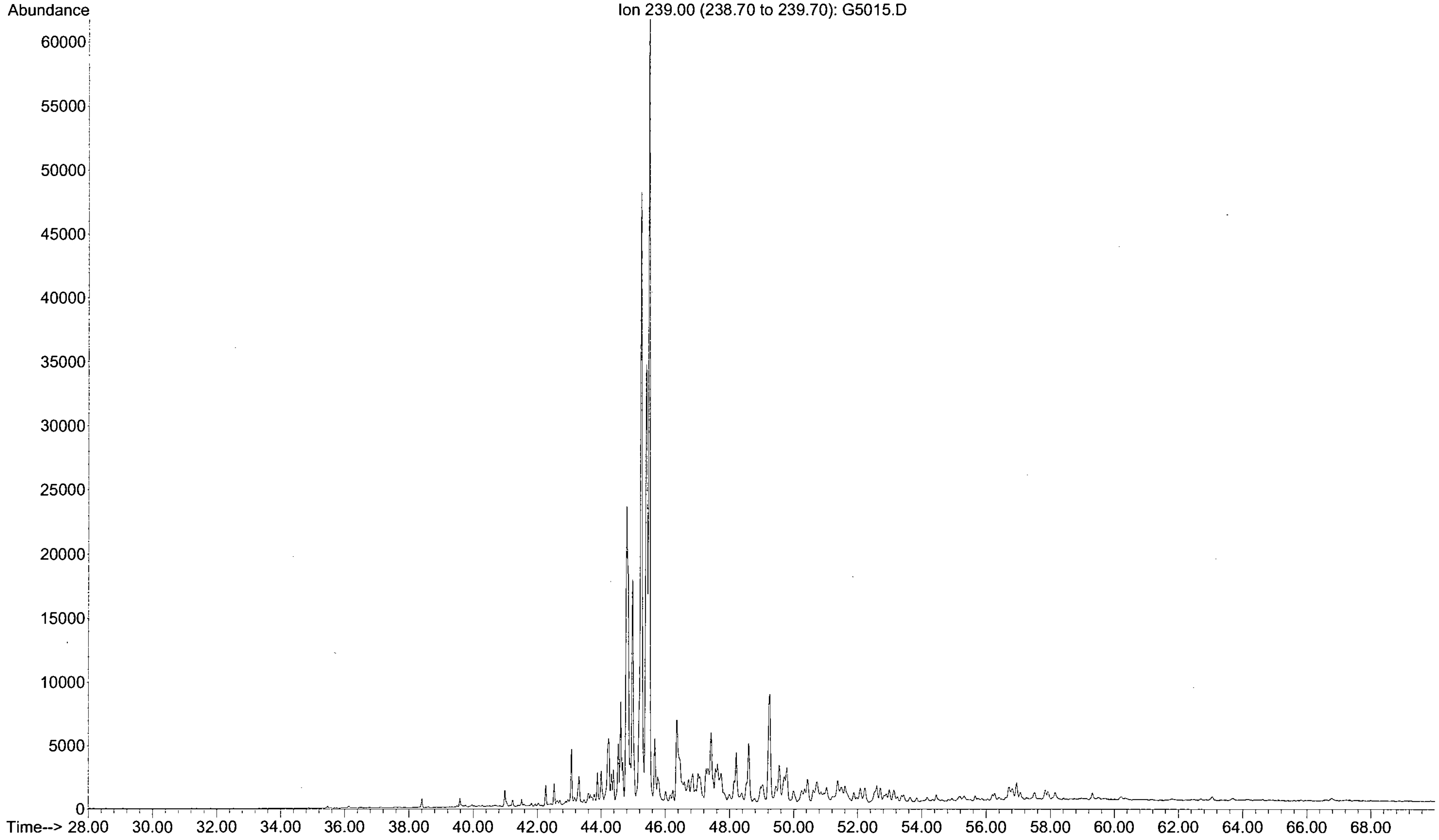
```
File       : G:\G\DATA\SG0319\G5011.D
Operator   : DPB
Acquired   : 10 Feb 2007  10:43 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5526-P-MS(12)
Misc Info  : GWP07T03 5-157 07-0010
Vial Number: 53
```



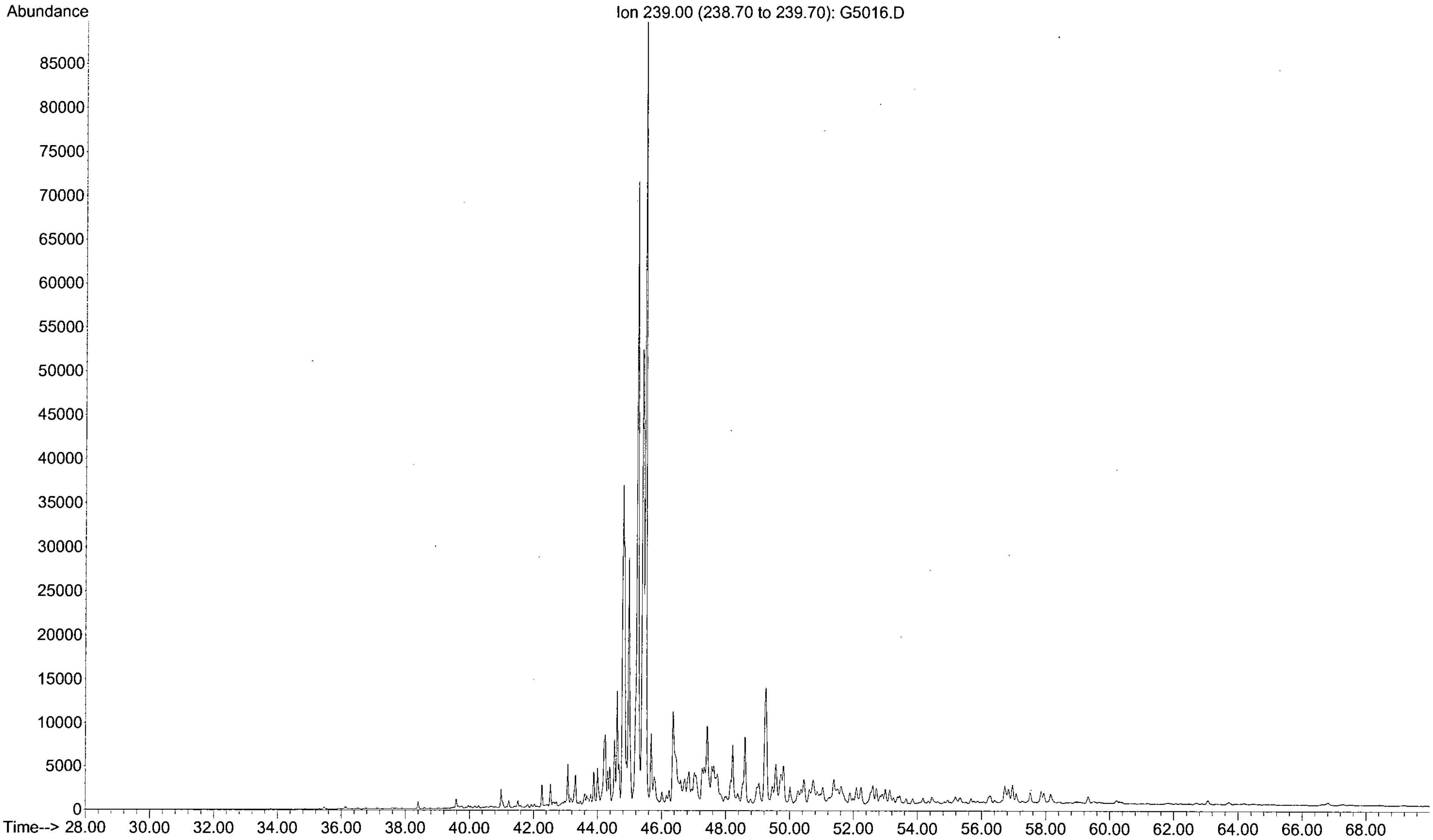
```
File       : G:\G\DATA\SG0319\G5014.D
Operator   : DPB
Acquired   : 11 Feb 2007   2:47 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5527-P-MS(12)
Misc Info  : GWP07T04 5-157 07-0010
Vial Number: 56
```


Ion 239.00 (238.70 to 239.70): G5014.D

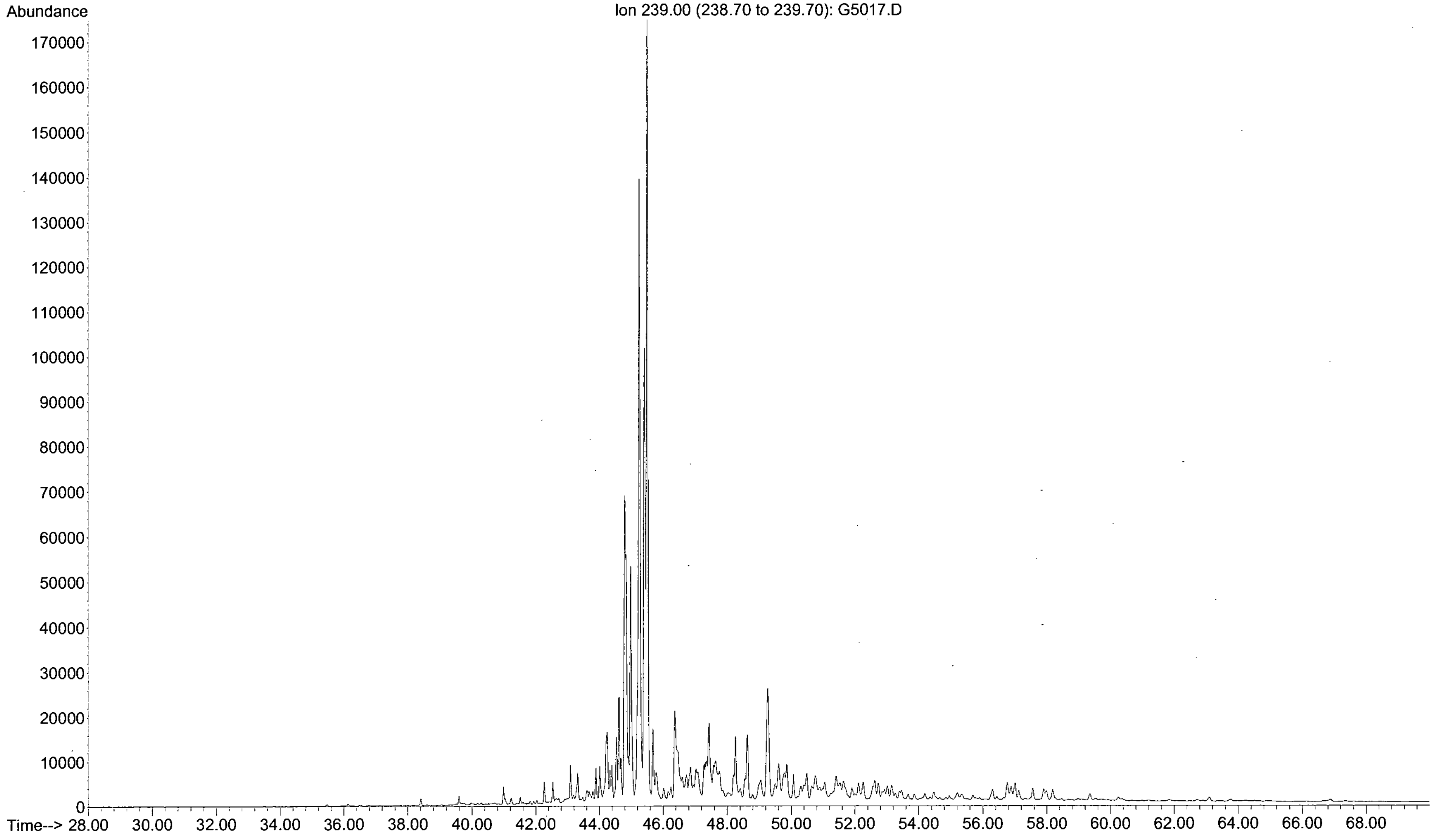
```
File        : G:\G\DATA\SG0319\G5015.D
Operator    : DPB
Acquired    : 11 Feb 2007   4:09 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5528-P-A-MS(14)
Misc Info   : GWP07T05 5-157 07-0010
Vial Number: 57
```



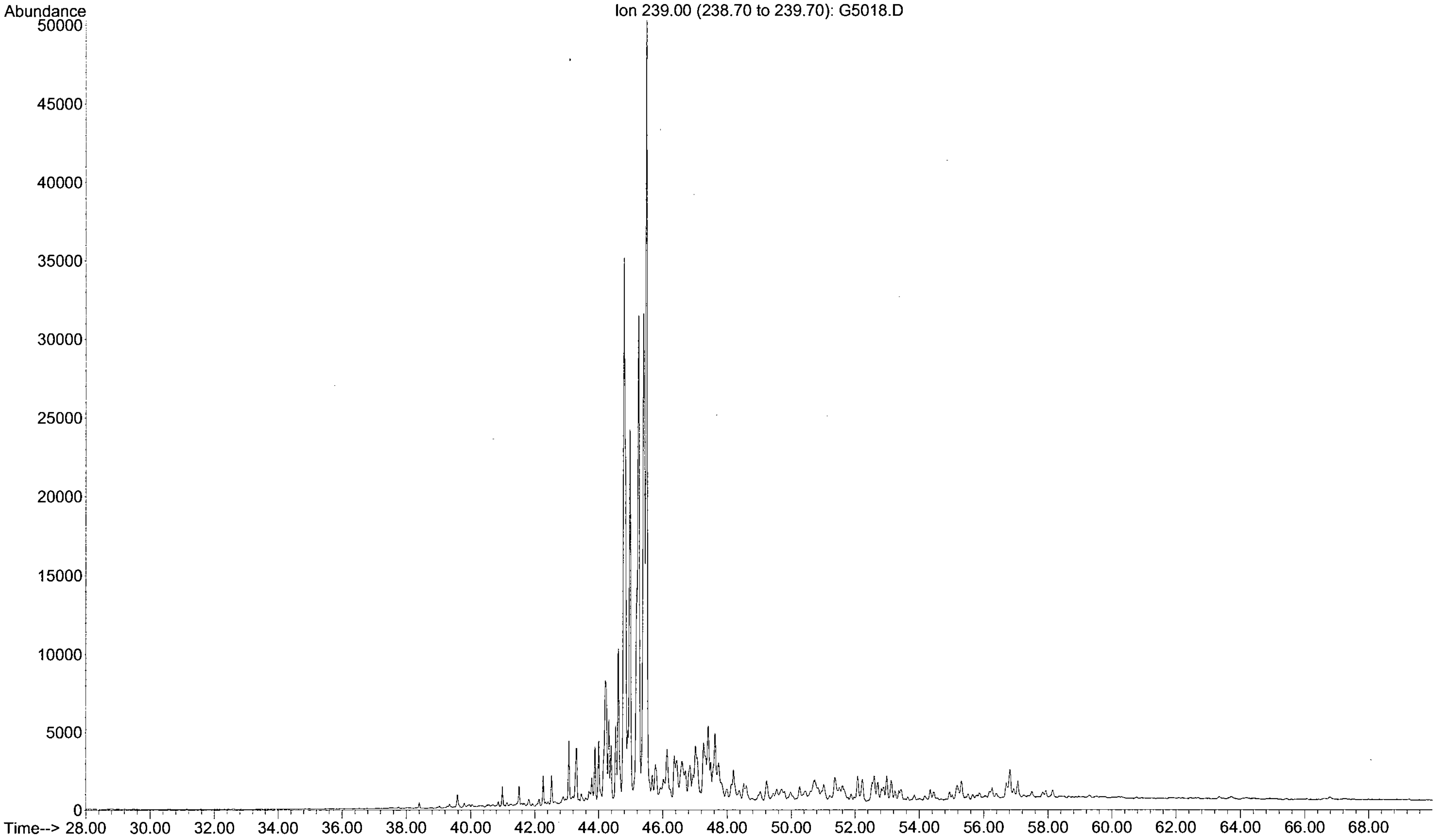
```
File        : G:\G\DATA\SG0319\G5016.D
Operator    : DPB
Acquired    : 11 Feb 2007   5:31 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5529-P-A-MS(14)
Misc Info   : GWP07T06 5-157 07-0010
Vial Number: 58
```



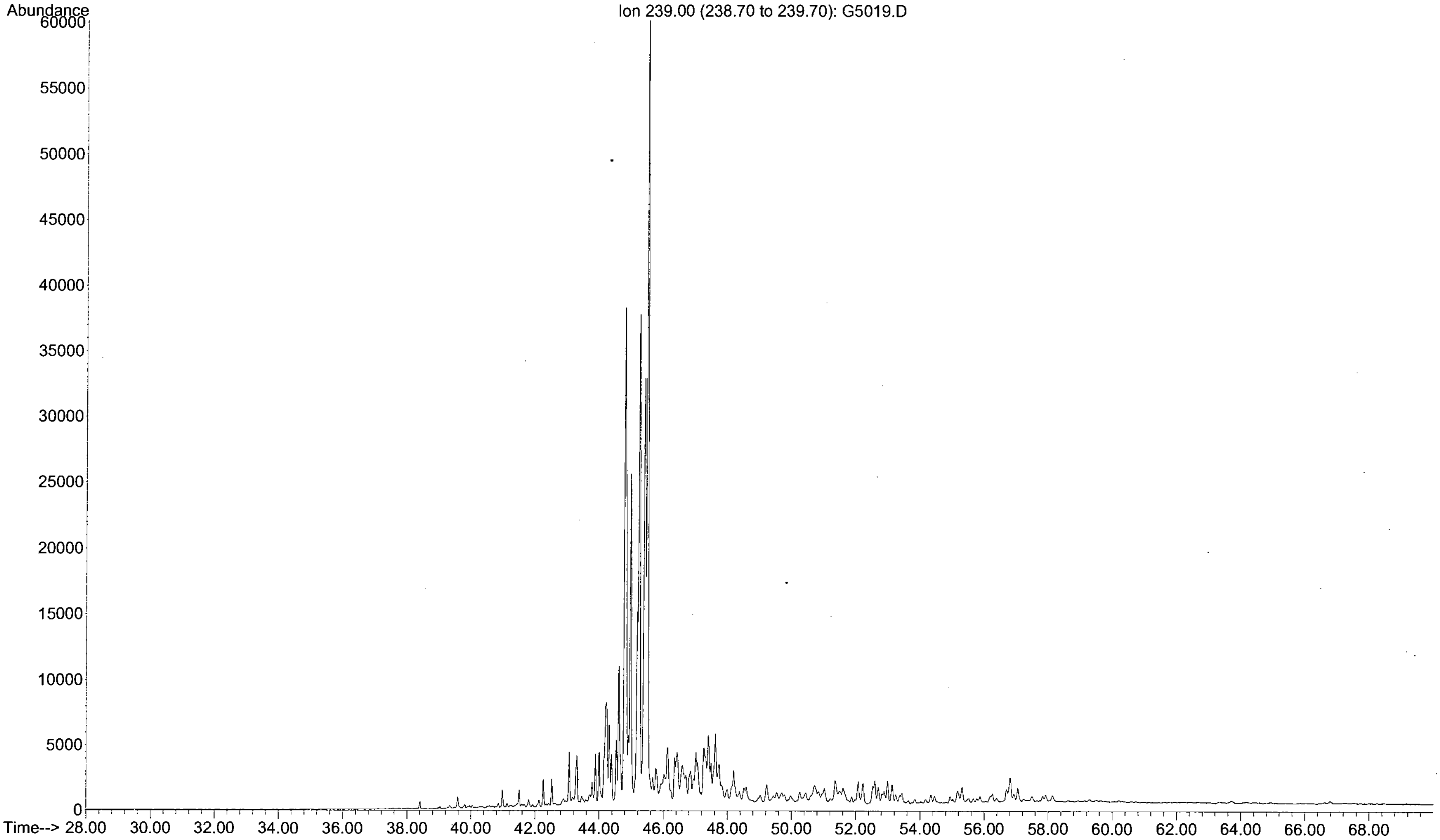
File   : G:\G\DATA\SG0319\G5017.D
Operator   : DPB
Acquired   : 11 Feb 2007   6:53 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5530-P-MS(12)
Misc Info : GWP07T07 5-157 07-0010
Vial Number: 59



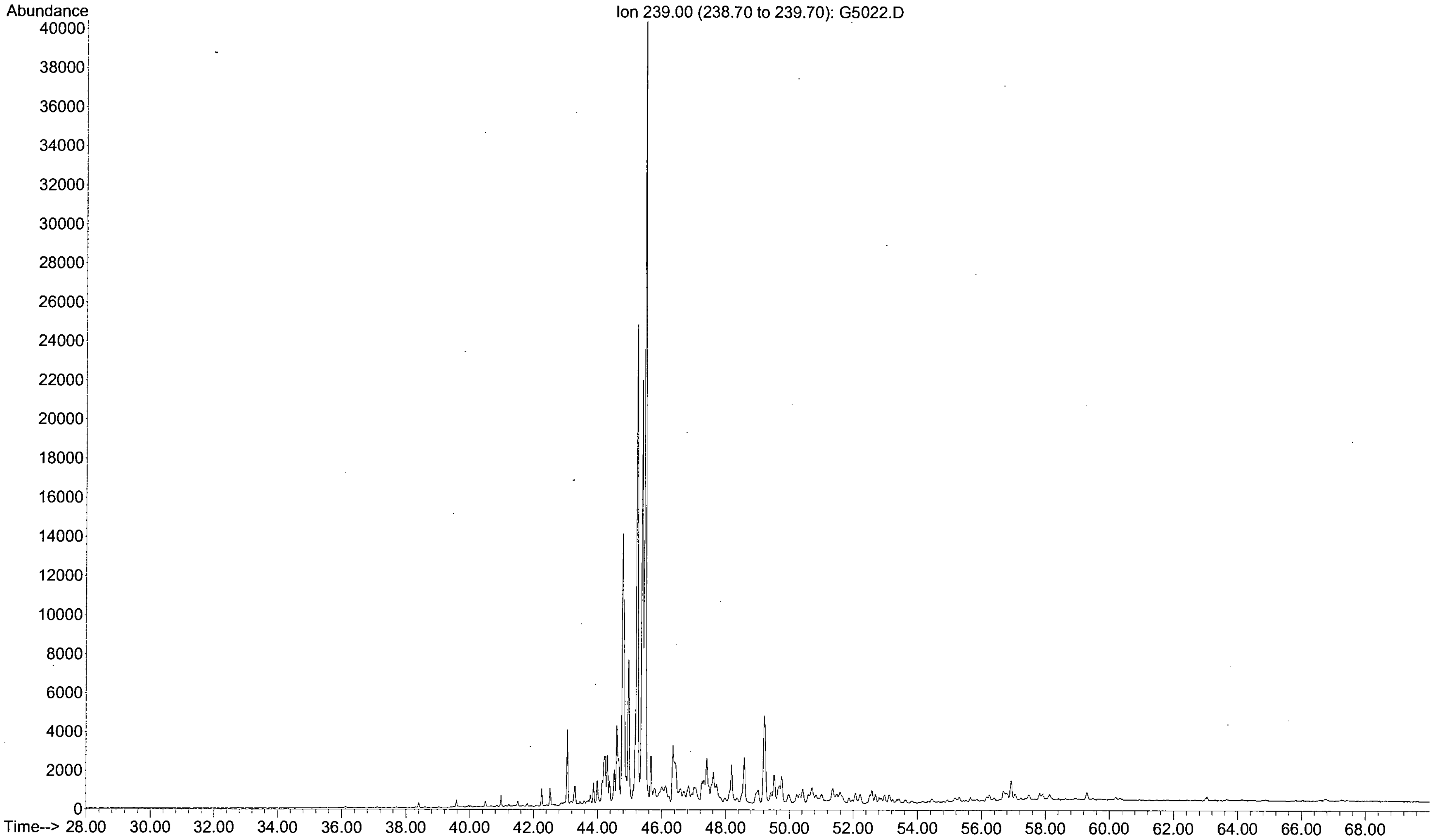
```
File       : G:\G\DATA\SG0319\G5018.D
Operator   : DPB
Acquired   : 11 Feb 2007   8:15 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5531-P-MS(12)
Misc Info  : GWP07T08 5-157 07-0010
Vial Number: 60
```



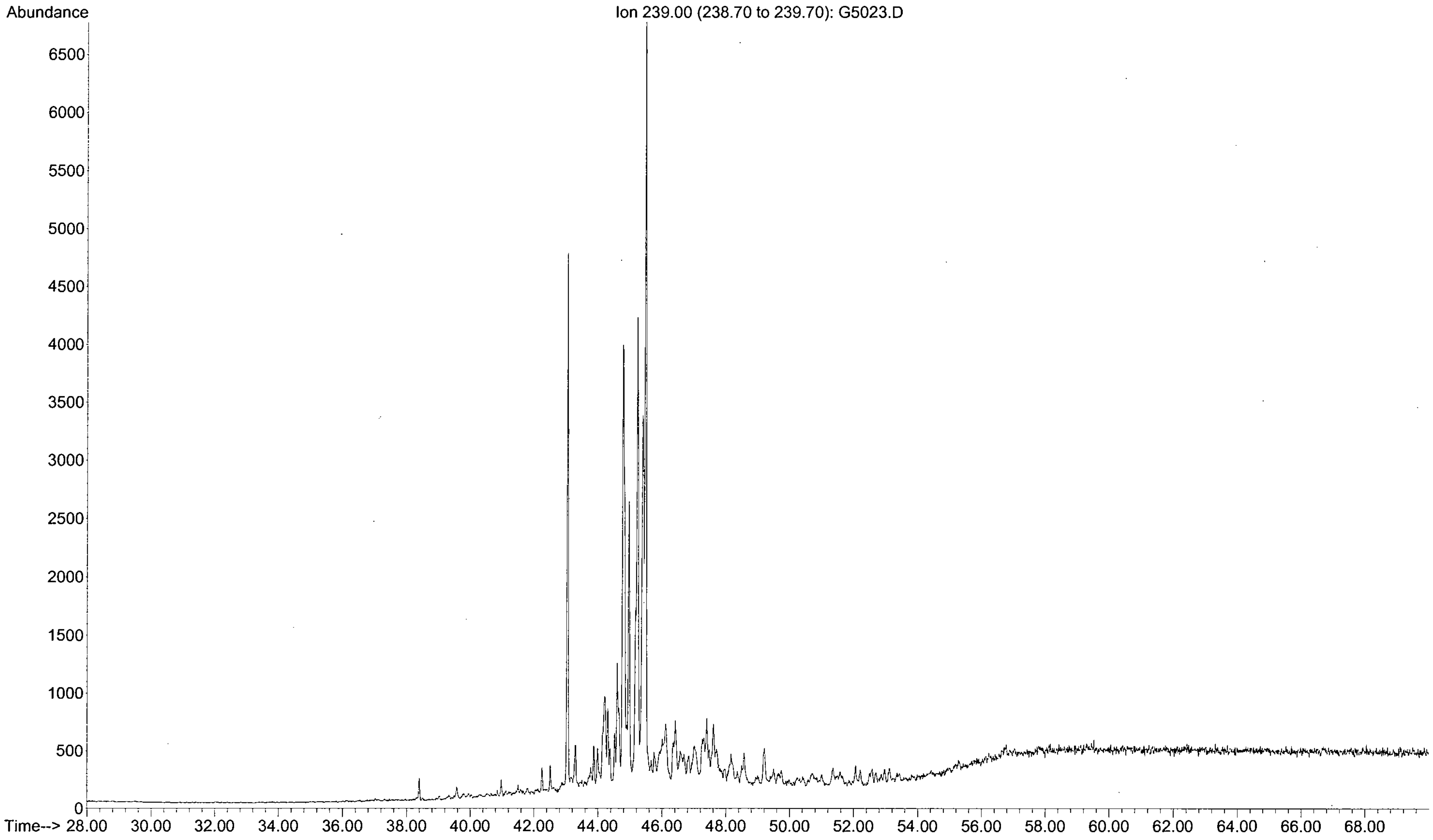
File   : G:\G\DATA\SG0319\G5019.D
Operator   : DPB
Acquired   : 11 Feb 2007   9:36 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5532-P-MS(12)
Misc Info : GWP07T09 5-157 07-0010
Vial Number: 61


Ion 239.00 (238.70 to 239.70): G5019.D

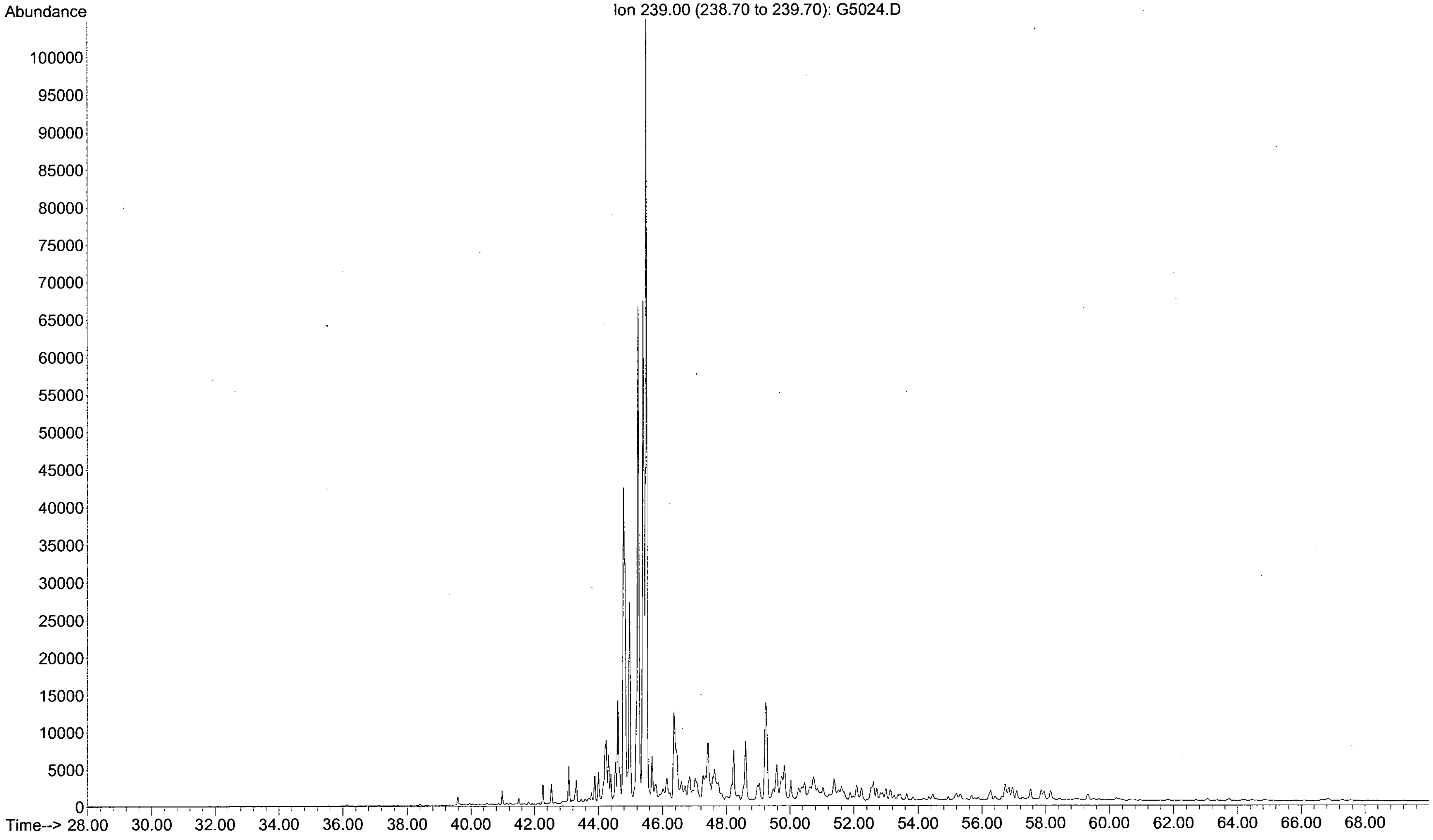
```
File        : G:\G\DATA\SG0319\G5022.D
Operator    : DPB
Acquired    : 11 Feb 2007   1:40 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5533-P-MS(12)
Misc Info   : GWP07T10 5-157 07-0010
Vial Number: 64
```



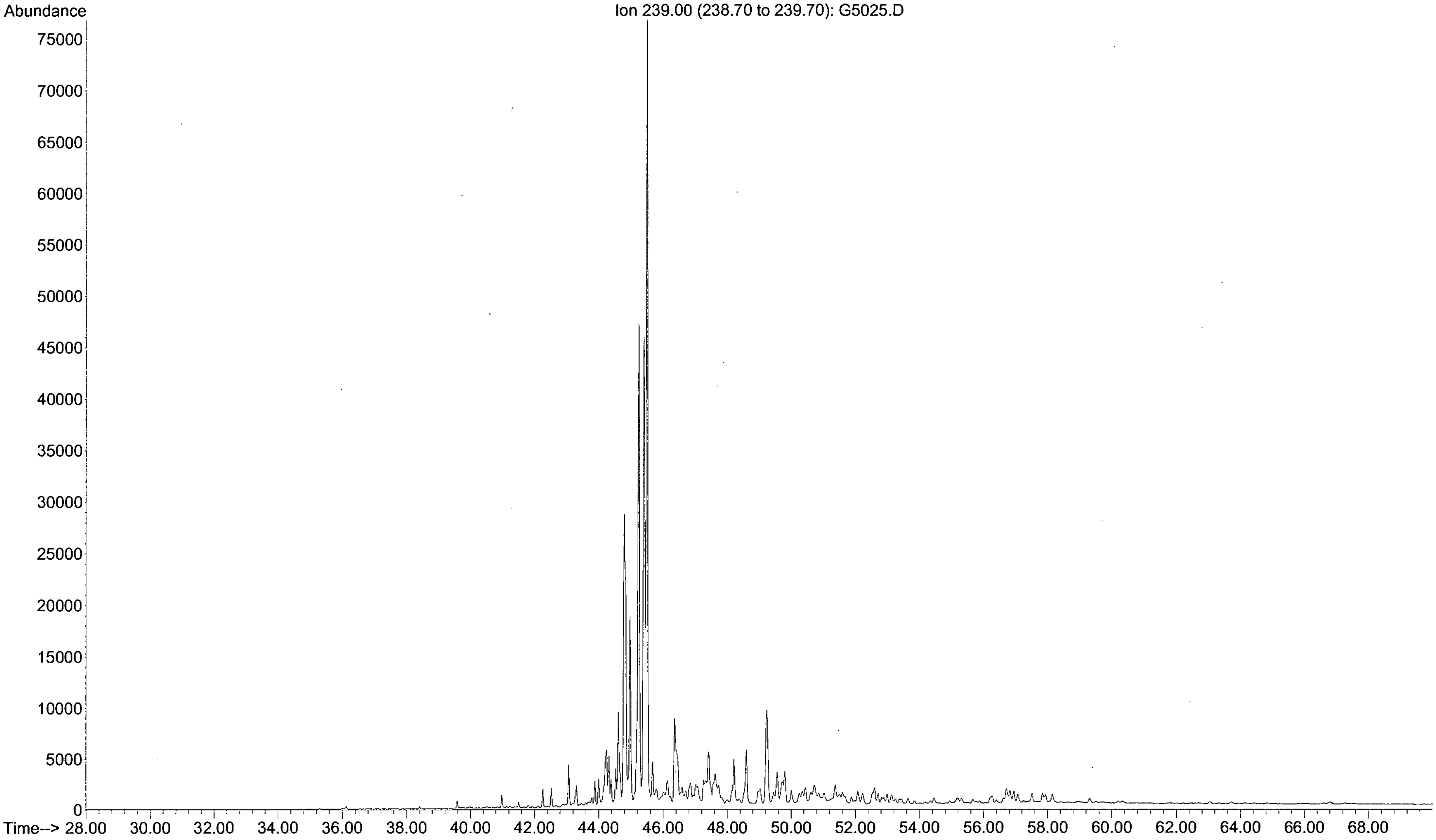
```
File        : G:\G\DATA\SG0319\G5023.D
Operator    : DPB
Acquired    : 11 Feb 2007   3:02 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5534-P-MS-D(13)
Misc Info   : GWP07T11 5-157 07-0010
Vial Number: 65
```



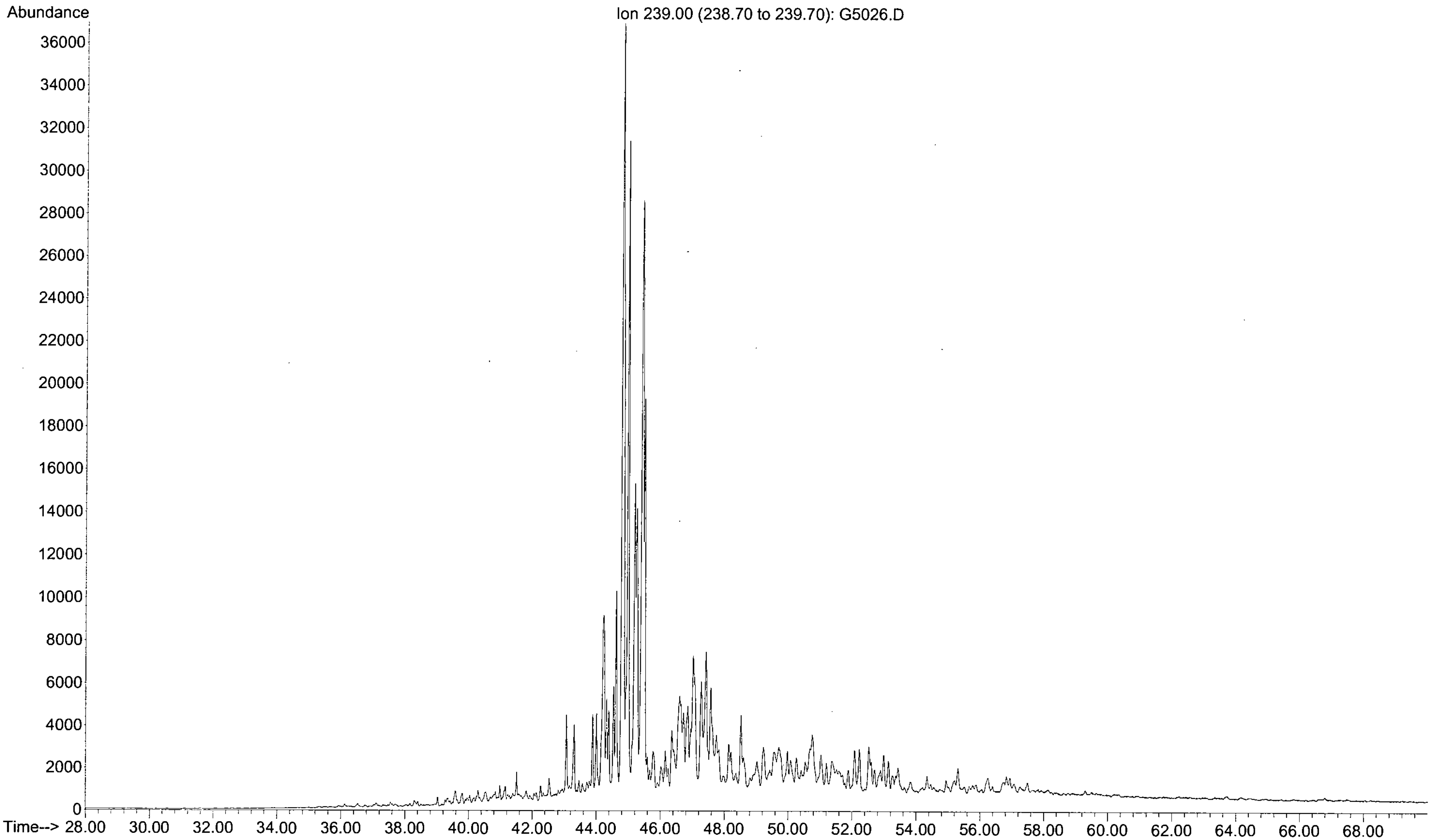
```
File        : G:\G\DATA\SG0319\G5024.D
Operator    : DPB
Acquired    : 11 Feb 2007   4:24 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5535-P-MS(12)
Misc Info   : GWP07T12 5-157 07-0010
Vial Number: 66
```



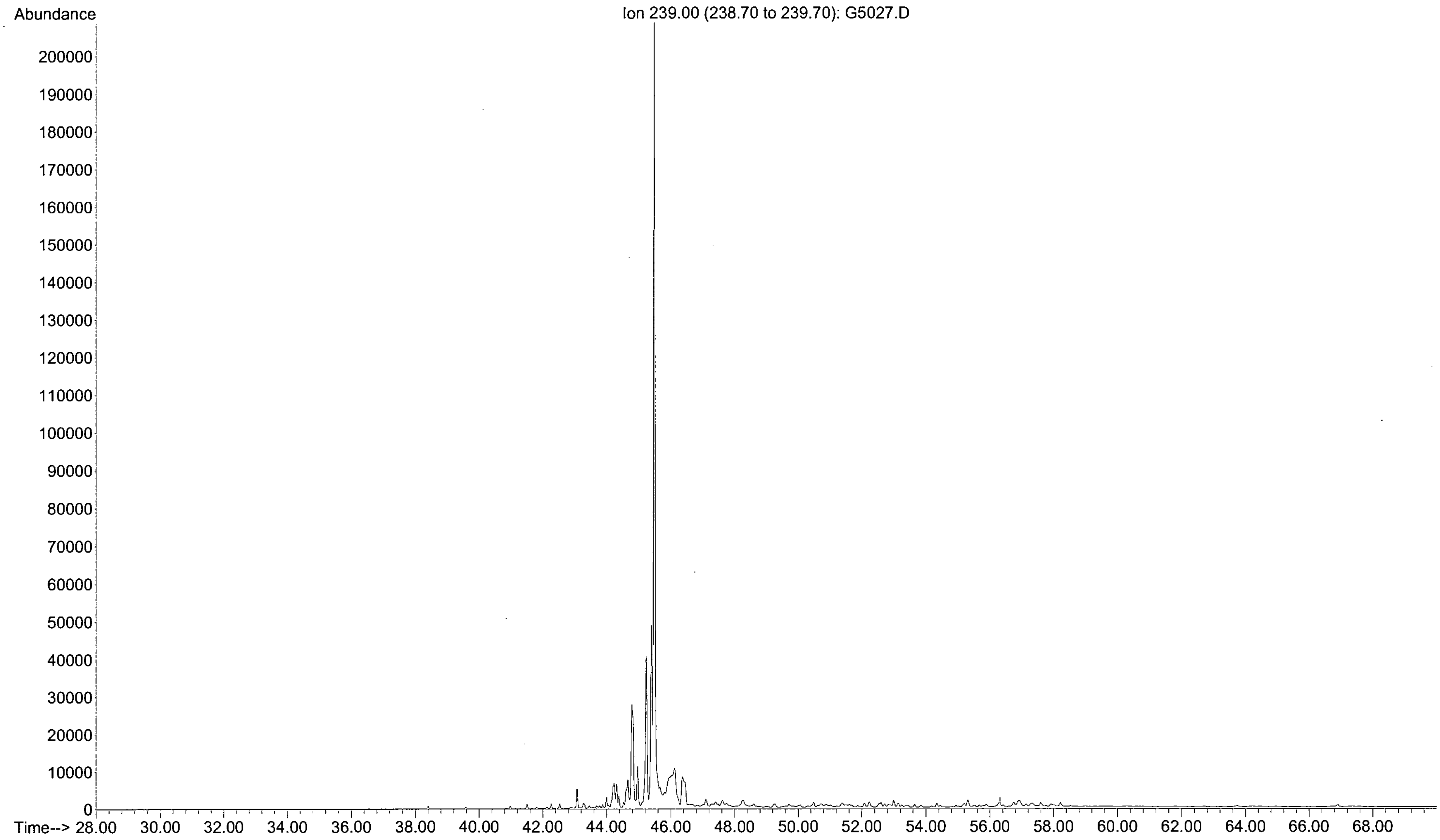
```
File        : G:\G\DATA\SG0319\G5025.D
Operator    : DPB
Acquired    : 11 Feb 2007   5:44 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5536-P-MS(12)
Misc Info   : GWP07T13 5-157 07-0010
Vial Number: 67
```



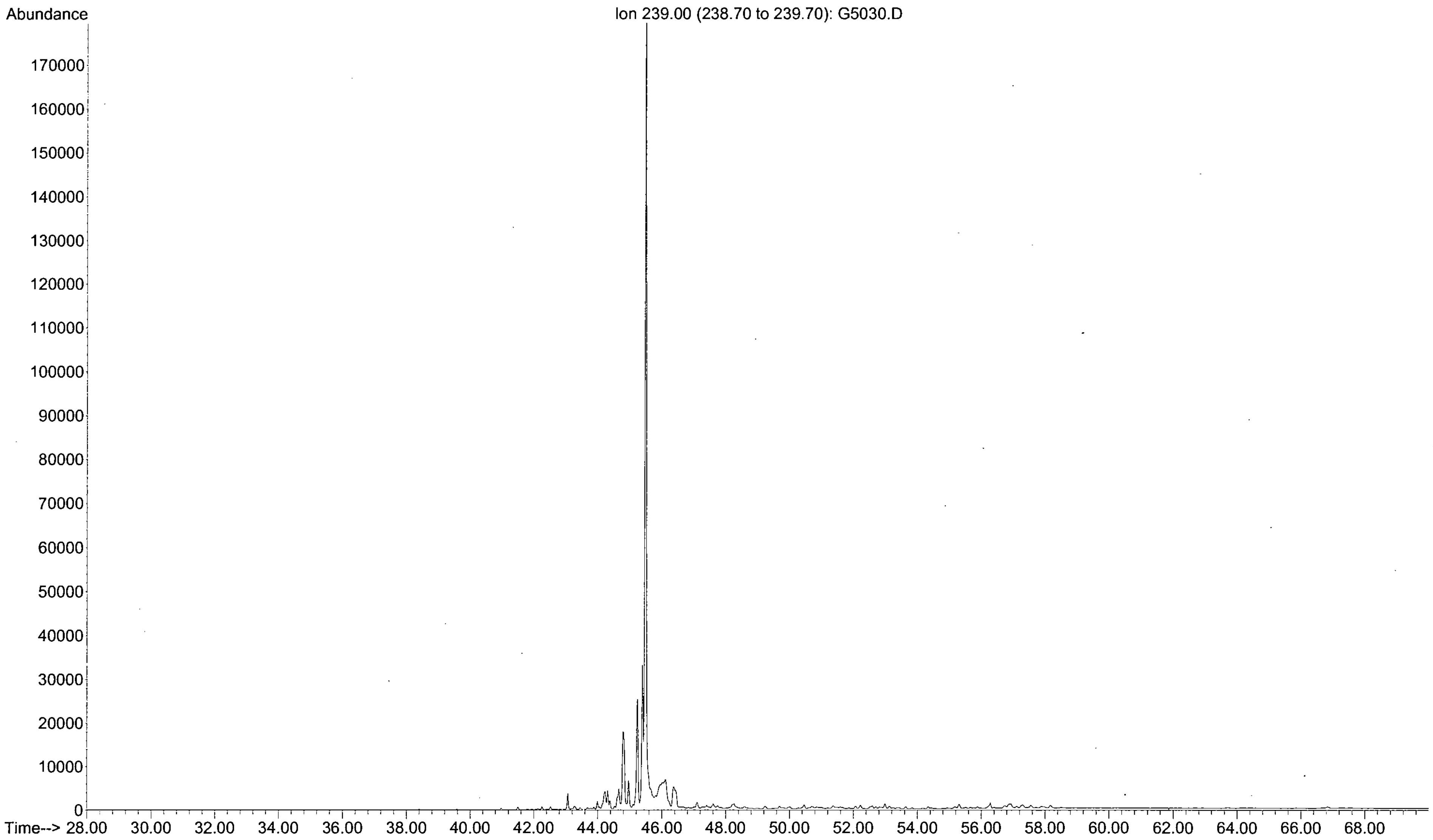
```
File        : G:\G\DATA\SG0319\G5026.D
Operator    : DPB
Acquired    : 11 Feb 2007   7:06 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5537-P-MS(10)
Misc Info   : GWP07T14 5-157 07-0010
Vial Number: 68
```



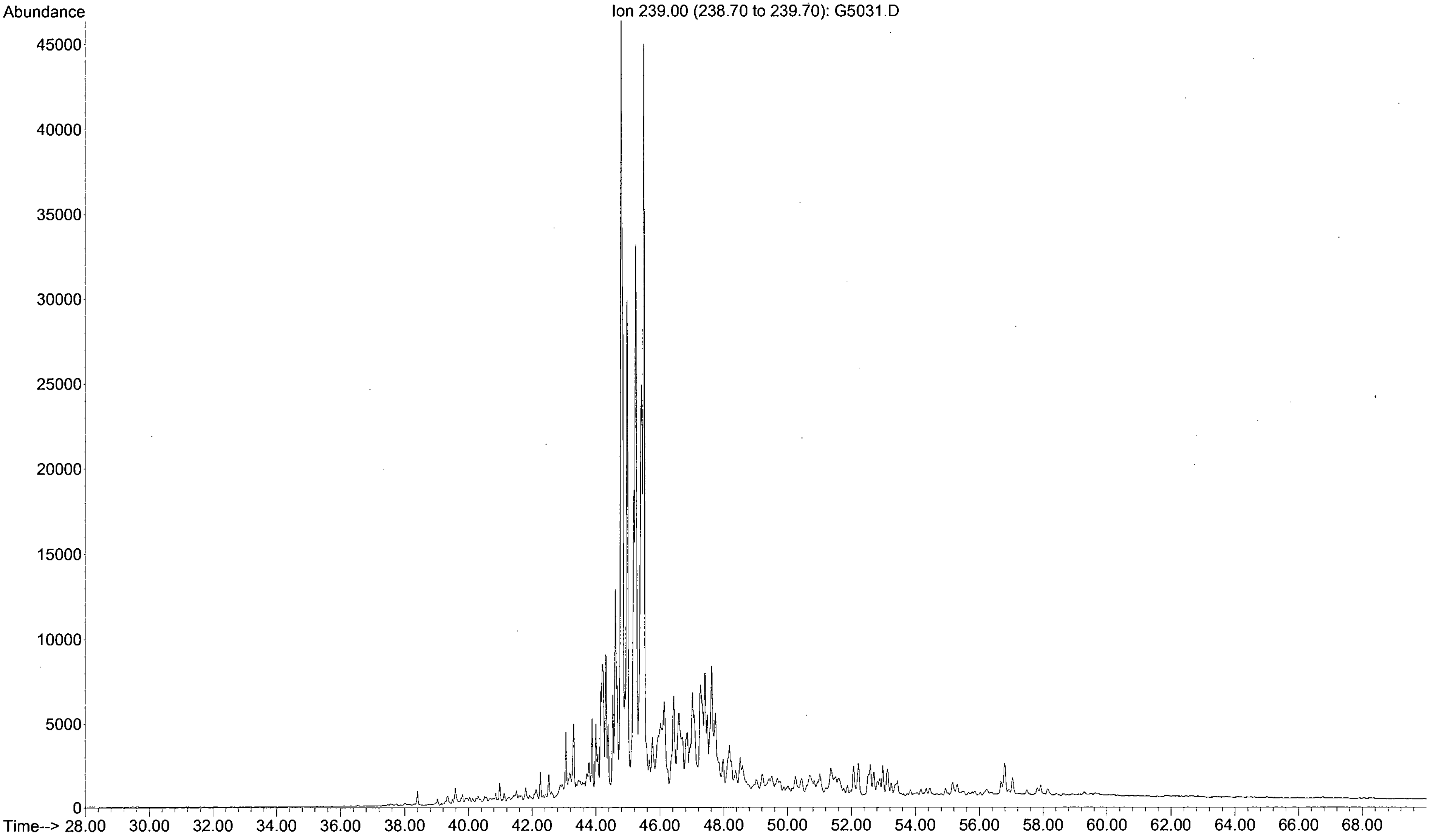
```
File       : G:\G\DATA\SG0319\G5027.D
Operator   : DPB
Acquired   : 11 Feb 2007   8:26 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5538-P-MS(12)
Misc Info  : GWP07S01 5-157 07-0010
Vial Number: 69
```



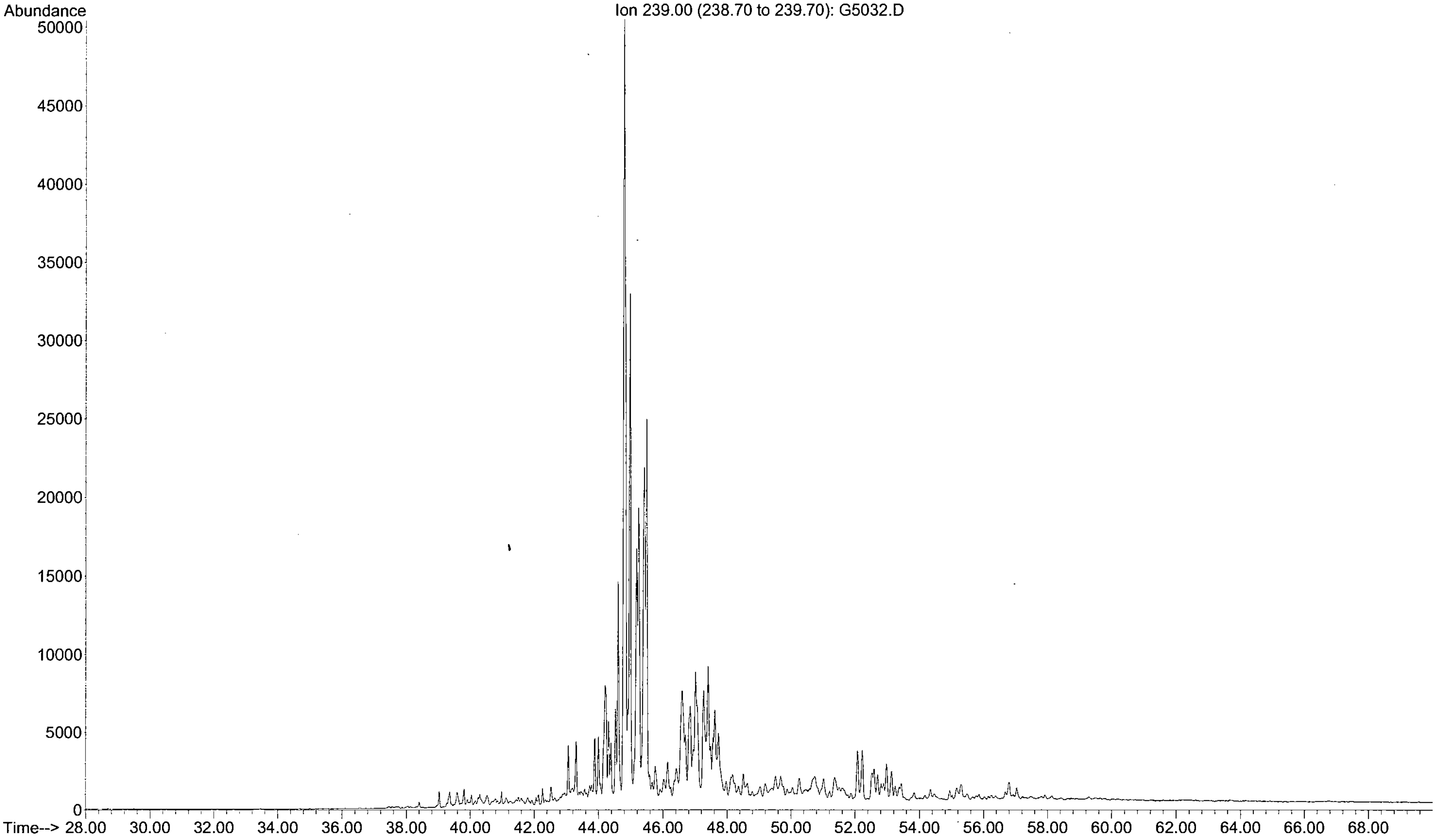
```
File       : G:\G\DATA\SG0319\G5030.D
Operator   : DPB
Acquired   : 12 Feb 2007  12:32 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5539-P-MS(12)
Misc Info  : GWP07S02 5-157 07-0010
Vial Number: 72
```



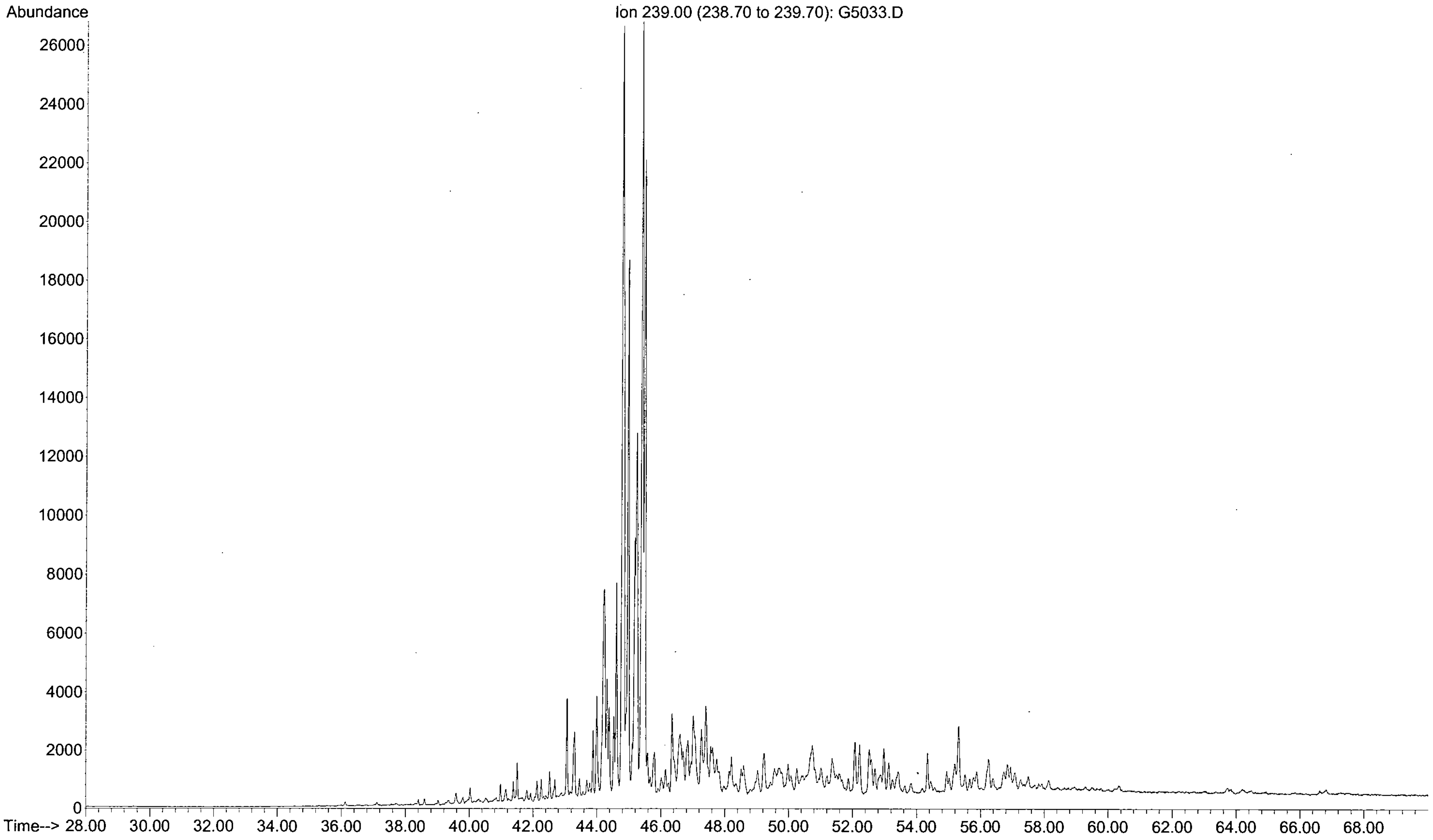
File   : G:\G\DATA\SG0319\G5031.D
Operator   : DPB
Acquired   : 12 Feb 2007   1:53 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5540-P-MS(12)
Misc Info   : GWP07S03 5-157 07-0010
Vial Number: 73


Ion 239.00 (238.70 to 239.70): G5031.D

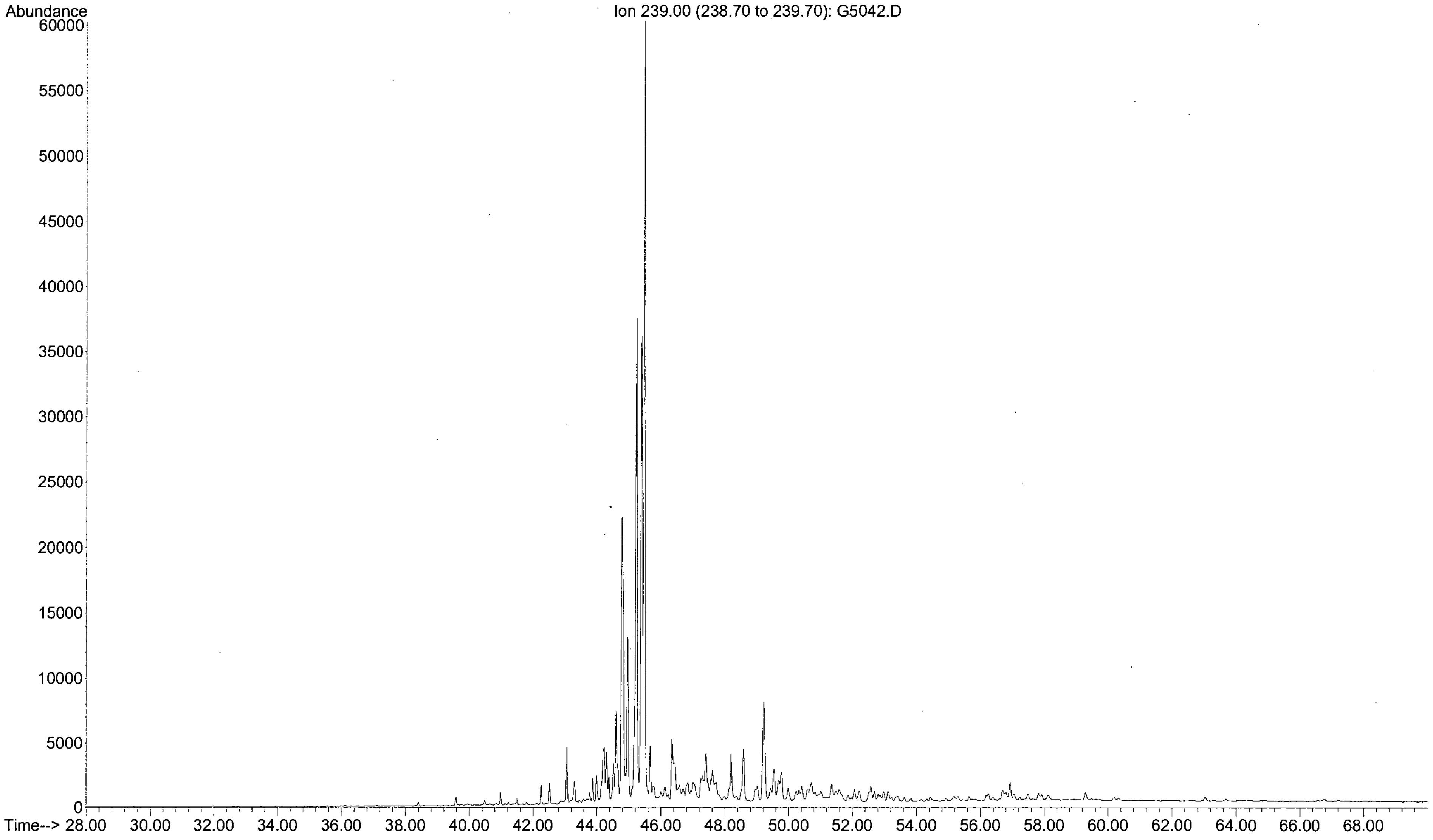
```
File       : G:\G\DATA\SG0319\G5032.D
Operator   : DPB
Acquired   : 12 Feb 2007   3:15 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5541-P-MS(12)
Misc Info  : GWP07S04 5-157 07-0010
Vial Number: 74
```



File   : G:\G\DATA\SG0319\G5033.D
Operator   : DPB
Acquired   : 12 Feb 2007   4:38 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5542-P-MS(12)
Misc Info   : TDW3-4.5 5-157 07-0010
Vial Number: 75



```
File        : G:\G\DATA\SG0319\G5042.D
Operator    : DPB
Acquired    : 12 Feb 2007   4:56 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5521-P-MS(12)
Misc Info   : GWP07T01 5-157 07-0010
Vial Number: 84
```



PAH and Biomarker – NAPL QA/QC Summary
Batches 07-0011

PROJECT:	Exponent – Gas Works Park
PARAMETER:	Polycyclic Aromatic Hydrocarbons and Biomarkers
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Non-aqueous phase liquid (NAPL) and Filter/NAPL samples
SAMPLE CUSTODY:	Eighteen tar samples, three NAPLs samples, and 1 soil sample were received at the Battelle Duxbury Operations (BDO) Laboratory on 1/16/2007. Upon receipt of samples, the temperatures of the coolers were taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was within the acceptable range. Samples were either stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin. The NAPL samples were extracted together in one analytical batch, batch 07-0011.

QA/QC DATA QUALITY OBJECTIVES:

	Reference Method	Blank	Surrogate Recovery	LCS/MS Recovery	Control Oil % Diff.
PAH and petroleum biomarkers	EPA 8270 modified	< 5x MDL	40-120% Recovery	40-120% Recovery MS target spike must be > 5 x background	PD < 30% for 90% of the analytes

METHOD: NAPL samples were prepared for analysis by weighing approximately 50 mg of oil and diluting with 10 mL of hexane. A portion of the extract was removed and spiked with SIS and IS. One extract was submitted for PAH and petroleum biomarker analysis, and the second extract was submitted for SHC and TPH analysis. NAPL sample data is reported on an oil weight basis.

PAH and petroleum biomarkers were measured by gas chromatography-mass spectrometry (GC/MS) in the selected ion mode (SIM) using a modified EPA Method 8270. An initial calibration consisting of target analytes was analyzed prior to analysis to demonstrate the linear range of analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of PAH and petroleum biomarkers were calculated versus internal standards. Target PAH were quantified using the average response factors (RF) generated from the initial calibration. The alkyl homolgue PAH series were assigned the RF of the parent PAH, steranes were assigned the RF of cholestane, and triterpanes were assigned the RF of moretane.

Note: the reporting limit for alkylbenzene compounds is orders of magnitude higher than the reporting limit for the rest of the PAH compounds.

HOLDING TIMES: Samples were stored cool at approximately 4°C until extraction.

Samples were prepared for analysis in one analytical batch and analyzed within 40 days of extraction.

Batch ID	Extraction Date	Analysis Date(s)
07-0011	1/30/2007	2/7/2007 – 2/12/2007

PAH and Biomarker – NAPL QA/QC Summary
Batches 07-0011

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. The blank was analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0011 – No exceedences noted.

Comments- None.

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0011 – No exceedences noted.

Comments- None.

SURROGATE RECOVERY:

Five surrogate compounds were added prior to extraction, including d8-naphthalene, d10-acenaphthene, d10-phenanthrene, d12-benzo(a)pyrene, and 5(b)H-cholane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0011 – 4 exceedences noted.

Comments –d10-acenaphthtene and 5b(H)-cholane was over-recovered in the following samples: GWP07DW401 and GWP07DW402. These over-recoveries are due to an interfering peak. The exceedences were qualified with an "NME" to indicate the exceedence is an estimate due to matrix interference.

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0011 – No exceedences noted.

Comments – None.

CALIBRATIONS:

The GC/MS is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (%RSD) between RF for the individual target analytes must be ≤30%, and the mean RSD of all target analytes must be <15%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be <25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be <25%.

07-0011 – No exceedences noted.

Comments – None.

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07DW401	GWP07DW402	GWP07MW9
Battelle ID	R5522-P	R5523-P	R5524-P
Sample Type	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07
Extraction Date	01/30/07	01/30/07	01/30/07
Analysis Date	02/09/07	02/09/07	02/09/07
Analytical Instrument	MS	MS	MS
% Moisture	NA	NA	NA
% Lipid	NA	NA	NA
Matrix	NAPL	NAPL	NAPL
Sample Size	49.50	47.40	45.80
Size Unit-Basis	MG_OIL	MG_OIL	MG_OIL
Minimum Reporting Limit	1.38	1.45	1.35
Units	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL
C3-Alkylbenzenes	2138.94	2176.03	872.5
C4-Alkylbenzenes	1395.75	1403.29	1048.71
C5-Alkylbenzenes	333.04	331.6	405.07
C6-Alkylbenzenes	122.64 J	125.34 J	443.22
Benzo(b)thiophene	2816.79	2829.81	198.62
C1-benzo(b)thiophenes	2034.58	2036.28	493.55
C2-benzo(b)thiophenes	1687.46	1685.17	621.88
C3-benzo(b)thiophenes	728.13	717.84	533.11
C4-benzo(b)thiophenes	211.42	211.15	306.86
Naphthalene	80881 D	83156.26 D	11835.73 D
C1-Naphthalenes	32020.01	32249.35	9666.3
C2-Naphthalenes	17923.86	17857.55	7679.23
C3-Naphthalenes	6609.39	6549.99	4057.14
C4-Naphthalenes	1605.29	1593.48	1767.19
C1-Biphenyls + Dibenzofuran	7569.69	7549.04	917.96
Biphenyl	4858.56	4845.03	626.06
C2-Biphenyls + C1-Dibenzofurans	3603.81	3590.56	1299.63
Acenaphthylene	5833.45	5845.03	546.25
Acenaphthene	7215.98	7207.79	1882.87
Dibenzofuran	4859.52	4833.66	216.65
Fluorene	7591.66 D	7806.98 D	1491.6
C1-Fluorenes	2673.78	2621.67	1231.7
C2-Fluorenes	1131.96	1102.6	883.48
C3-Fluorenes	369.59	373.58	445.92
C4-Fluorenes	312.01	311.66	429.99
Anthracene	7275.9	7158.32	877.01
Phenanthrene	22250.58 D	22825.88 D	3626.27
C1-Phenanthrenes/Anthracenes	8916.84	8704.98	2830.13
C2-Phenanthrenes/Anthracenes	3174.56	3075.38	1432.77
C3-Phenanthrenes/Anthracenes	821.77	783.37	566.25
C4-Phenanthrenes/Anthracenes	184.59	186.81	149.46
Retene	187.75	182.9	82.04
Dibenzothiophene	1693.56	1658.84	339.8
C1-Dibenzothiophenes	1123.6	1096.14	475.18
C2-Dibenzothiophenes	592.49	569.64	399.12
C3-Dibenzothiophenes	218.44	218.21	221.59
C4-Dibenzothiophenes	59.24	56.66	78.75
Fluoranthene	7751.27 D	7953.79 D	969.93
Pyrene	8050.52 D	8352.58 D	1497.93
C1-Fluoranthenes/Pyrenes	5167.6	5008.93	1405.69
C2-Fluoranthenes/Pyrenes	1387.61	1373.09	541.28
C3-Fluoranthenes/Pyrenes	427.01	417.1	202.56
C4-Fluoranthenes/Pyrenes	146.9	142.48	71.92
C0-Benzo(b)naphthothiophenes	271.49	262.16	47.51
C1-Benzo(b)naphthothiophenes	221.3	231.36	76.72
C2-Benzo(b)naphthothiophenes	92.05	88.89	46.1
C3-Benzo(b)naphthothiophenes	52.73	53.85	26.65
C4-Benzo(b)naphthothiophenes	13.7	16.28	8.88
Benzo(a)anthracene	3227.37	3279.55	547.84
Chrysene	3000.92	3054.96	535.57

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07DW401	GWP07DW402	GWP07MW9
Battelle ID	R5522-P	R5523-P	R5524-P
Sample Type	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07
Extraction Date	01/30/07	01/30/07	01/30/07
Analysis Date	02/09/07	02/09/07	02/09/07
Analytical Instrument	MS	MS	MS
% Moisture	NA	NA	NA
% Lipid	NA	NA	NA
Matrix	NAPL	NAPL	NAPL
Sample Size	49.50	47.40	45.80
Size Unit-Basis	MG_OIL	MG_OIL	MG_OIL
Minimum Reporting Limit	1.38	1.45	1.35
Units	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL
C1-Chrysenes	1471.93	1508.6	414.23
C2-Chrysenes	507.39	517.36	176.04
C3-Chrysenes	282.15	300.06	87.51
C4-Chrysenes	43.48	46.28	12.88
Benzo(b)fluoranthene	1546.11	1593.49	187.89
Benzo(k)fluoranthene	2222.36	2223.93	276.86
Benzo(e)pyrene	1581.81	1618.3	213.72
Benzo(a)pyrene	3163.62	3212.24	454.19
Perylene	705.74	721.08	73.34
Indeno(1,2,3-cd)pyrene	1555.21	1595.97	170.51
Dibenz(a,h)anthracene	326.56	337.24	47.31
Benzo(g,h,i)perylene	1437.13	1473.18	165.02
Total PAH	263741.41	266964.93	61306.75

Surrogate Recoveries (%)

Naphthalene-d8	102	100	91
Acenaphthene-d10	132 NME	128 NME	99
Phenanthrene-d10	96	93	89
Benzo(a)pyrene-d12	104	107	112

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Battelle
The Business of Innovation

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank	
Battelle ID	BJ941PB-P	
Sample Type	PB	
Collection Date	01/30/07	
Extraction Date	01/30/07	
Analysis Date	02/12/07	
Analytical Instrument	MS	
% Moisture	NA	
% Lipid	NA	
Matrix	NAPL	
Sample Size	5.00	
Size Unit-Basis	MG_OIL	
Minimum reporting Limit	1.3	
Units	MG/KG_OIL	
C3-Alkylbenzenes		U
C4-Alkylbenzenes		U
C5-Alkylbenzenes		U
C6-Alkylbenzenes		U
Benzo(b)thiophene		U
C1-benzo(b)thiophenes		U
C2-benzo(b)thiophenes		U
C3-benzo(b)thiophenes		U
C4-benzo(b)thiophenes		U
Naphthalene	0.44	J
C1-Naphthalenes		U
C2-Naphthalenes		U
C3-Naphthalenes		U
C4-Naphthalenes		U
C1-Biphenyls + Dibenzofuran		U
Biphenyl		U
C2-Biphenyls + C1-Dibenzofurans		U
Acenaphthylene		U
Acenaphthene		U
Dibenzofuran		U
Fluorene		U
C1-Fluorenes		U
C2-Fluorenes		U
C3-Fluorenes		U
C4-Fluorenes		U
Anthracene		U
Phenanthrene	0.14	J
C1-Phenanthrenes/Anthracenes		U
C2-Phenanthrenes/Anthracenes		U
C3-Phenanthrenes/Anthracenes		U
C4-Phenanthrenes/Anthracenes		U
Retene		U
Dibenzothiophene		U
C1-Dibenzothiophenes		U
C2-Dibenzothiophenes		U
C3-Dibenzothiophenes		U
C4-Dibenzothiophenes		U
Fluoranthene	0.07	J
Pyrene	0.06	J
C1-Fluoranthenes/Pyrenes		U
C2-Fluoranthenes/Pyrenes		U
C3-Fluoranthenes/Pyrenes		U
C4-Fluoranthenes/Pyrenes		U
C0-Benzo(b)naphthothiophenes		U
C1-Benzo(b)naphthothiophenes		U
C2-Benzo(b)naphthothiophenes		U
C3-Benzo(b)naphthothiophenes		U
C4-Benzo(b)naphthothiophenes		U
Benzo(a)anthracene		U
Chrysene		U

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank
Battelle ID	BJ941PB-P
Sample Type	PB
Collection Date	01/30/07
Extraction Date	01/30/07
Analysis Date	02/12/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	NAPL
Sample Size	5.00
Size Unit-Basis	MG_OIL
Minimum reporting Limit	1.3
Units	MG/KG_OIL
C1-Chrysenes	U
C2-Chrysenes	U
C3-Chrysenes	U
C4-Chrysenes	U
Benzo(b)fluoranthene	U
Benzo(k)fluoranthene	U
Benzo(e)pyrene	U
Benzo(a)pyrene	U
Perylene	U
Indeno(1,2,3-cd)pyrene	U
Dibenz(a,h)anthracene	U
Benzo(g,h,i)perylene	U
Total PAH	0.71 J

Surrogate Recoveries (%)

Naphthalene-d8	118
Acenaphthene-d10	109
Phenanthrene-d10	105
Benzo(a)pyrene-d12	93

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Laboratory Control Sample				
Battelle ID	BJ942LCS-P				
Sample Type	LCS				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/12/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	NAPL				
Sample Size	NA				
Size Unit-Basis	NA				
Minimum reporting Limit	7.01				
Units	NG		Target	% Recovery	Qualifier
C3-Alkylbenzenes		U			
C4-Alkylbenzenes		U			
C5-Alkylbenzenes		U			
C6-Alkylbenzenes		U			
Benzo(b)thiophene	1160.46		1000.70	116	
C1-benzo(b)thiophenes		U			
C2-benzo(b)thiophenes		U			
C3-benzo(b)thiophenes		U			
C4-benzo(b)thiophenes		U			
Naphthalene	1182.31		1000.20	118	
C1-Naphthalenes		U			
C2-Naphthalenes		U			
C3-Naphthalenes		U			
C4-Naphthalenes		U			
C1-Biphenyls + Dibenzofuran		U			
Biphenyl	1170.82		1001.70	117	
C2-Biphenyls + C1-Dibenzofurans		U			
Acenaphthylene	1139.35		1000.90	114	
Acenaphthene	1186.2		1000.65	119	
Dibenzofuran	1172.15		1001.90	117	
Fluorene	1152.67		1000.55	115	
C1-Fluorenes		U			
C2-Fluorenes		U			
C3-Fluorenes		U			
C4-Fluorenes		U			
Anthracene	1124.71		1000.15	112	
Phenanthrene	1181.82		1000.50	118	
C1-Phenanthrenes/Anthracenes		U			
C2-Phenanthrenes/Anthracenes		U			
C3-Phenanthrenes/Anthracenes		U			
C4-Phenanthrenes/Anthracenes		U			
Retene		U			
Dibenzothiophene	1155.88		1004.60	115	
C1-Dibenzothiophenes		U			
C2-Dibenzothiophenes		U			
C3-Dibenzothiophenes		U			
C4-Dibenzothiophenes		U			
Fluoranthene	1128.95		1000.50	113	
Pyrene	1092.09		1000.35	109	
C1-Fluoranthenes/Pyrenes		U			
C2-Fluoranthenes/Pyrenes		U			
C3-Fluoranthenes/Pyrenes		U			
C4-Fluoranthenes/Pyrenes		U			
C0-Benzo(b)naphthothiophenes		U			
C1-Benzo(b)naphthothiophenes		U			
C2-Benzo(b)naphthothiophenes		U			
C3-Benzo(b)naphthothiophenes		U			
C4-Benzo(b)naphthothiophenes		U			
Benzo(a)anthracene	909.06		1000.25	91	

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Laboratory Control Sample				
Battelle ID	BJ942LCS-P				
Sample Type	LCS				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/12/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	NAPL				
Sample Size	NA				
Size Unit-Basis	NA				
Minimum reporting Limit	7.01				
Units	NG		Target	% Recovery	Qualifier
Chrysene	1014.88		1000.40	101	
C1-Chrysenes		U			
C2-Chrysenes		U			
C3-Chrysenes		U			
C4-Chrysenes		U			
Benzo(b)fluoranthene	916.03		1000.85	92	
Benzo(k)fluoranthene	1033.98		1000.55	103	
Benzo(e)pyrene	971.81		1002.50	97	
Benzo(a)pyrene	983.44		1000.80	98	
Perylene	915.48		1002.05	91	
Indeno(1,2,3-cd)pyrene	910.17		1000.50	91	
Dibenz(a,h)anthracene	986.83		1000.55	99	
Benzo(g,h,i)perylene	933.19		1000.30	93	

Surrogate Recoveries (%)

Naphthalene-d8	120
Acenaphthene-d10	112
Phenanthrene-d10	108
Benzo(a)pyrene-d12	87

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude
Battelle ID	BJ959NSC-P
Sample Type	NSC
Collection Date	01/30/07
Extraction Date	01/30/07
Analysis Date	02/07/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	5.01
Size Unit-Basis	MG_OIL
Minimum reporting Limit	1.3

Units	MG/KG_OIL		Target	% Difference	Qualifier
C3-Alkylbenzenes	2027.44				
C4-Alkylbenzenes	1510.05				
C5-Alkylbenzenes	795.79				
C6-Alkylbenzenes	488.99				
Benzo(b)thiophene	13.52				
C1-benzo(b)thiophenes	45				
C2-benzo(b)thiophenes	79.93		95.74	16.5	
C3-benzo(b)thiophenes	141.48		132.67	6.6	
C4-benzo(b)thiophenes	96.21		96.72	0.5	
Naphthalene	806.17		740.29	8.9	
C1-Naphthalenes	1634.24		1516.04	7.8	
C2-Naphthalenes	2010.9		2000.10	0.5	
C3-Naphthalenes	1445.89		1526.96	5.3	
C4-Naphthalenes	785.13		898.03	12.6	
C1-Biphenyls + Dibenzofuran	371.59				
Biphenyl	240.71		220.82	9.0	
C2-Biphenyls + C1-Dibenzofurans	514.5				
Acenaphthylene		U			
Acenaphthene	13.75		14.50	5.2	
Dibenzofuran	77.57		77.75	0.2	
Fluorene	96.04		92.51	3.8	
C1-Fluorenes	223.14		227.01	1.7	
C2-Fluorenes	345.32		367.09	5.9	
C3-Fluorenes	295.4		326.32	9.5	
C4-Fluorenes	212.42				
Anthracene		U			
Phenanthrene	285.03		249.49	14.2	
C1-Phenanthrenes/Anthracenes	584.34		549.17	6.4	
C2-Phenanthrenes/Anthracenes	669.09		642.72	4.1	
C3-Phenanthrenes/Anthracenes	453.02		446.11	1.5	
C4-Phenanthrenes/Anthracenes	176.09		180.02	2.2	
Retene	74.51				
Dibenzothiophene	241.56		210.35	14.8	
C1-Dibenzothiophenes	440.7		409.03	7.7	
C2-Dibenzothiophenes	573.69		551.46	4.0	
C3-Dibenzothiophenes	483.6		471.36	2.6	
C4-Dibenzothiophenes	261.9		243.11	7.7	
Fluoranthene		U			
Pyrene	14.53		12.99	11.9	
C1-Fluoranthenes/Pyrenes	84.98		70.92	19.8	
C2-Fluoranthenes/Pyrenes	145.97		117.89	23.8	
C3-Fluoranthenes/Pyrenes	154.91		137.25	12.9	
C4-Fluoranthenes/Pyrenes	123.35				
C0-Benzo(b)naphthothiophenes	46.42				
C1-Benzo(b)naphthothiophenes	162.78				
C2-Benzo(b)naphthothiophenes	204.91				
C3-Benzo(b)naphthothiophenes	163.24				
C4-Benzo(b)naphthothiophenes	66.74				
Benzo(a)anthracene		U			

Battelle
The Business of Innovation

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude				
Battelle ID	BJ959NSC-P				
Sample Type	NSC				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/07/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.01				
Size Unit-Basis	MG_OIL				
Minimum reporting Limit	1.3				
Units	MG/KG_OIL		Target	% Difference	Qualifier
Chrysene	51.12		47.18	8.4	
C1-Chrysenes	85.28		78.82	8.2	
C2-Chrysenes	113.52		102.67	10.6	
C3-Chrysenes	97.23		85.36	13.9	
C4-Chrysenes	62.06		61.99	0.1	
Benzo(b)fluoranthene	6.18		6.08	1.6	
Benzo(k)fluoranthene		U			
Benzo(e)pyrene	13.86		12.88	7.6	
Benzo(a)pyrene		U			
Perylene		U			
Indeno(1,2,3-cd)pyrene		U			
Dibenz(a,h)anthracene	1.1	J			
Benzo(g,h,i)perylene	3.86		3.44	12.2	
Total PAH	12977.88				

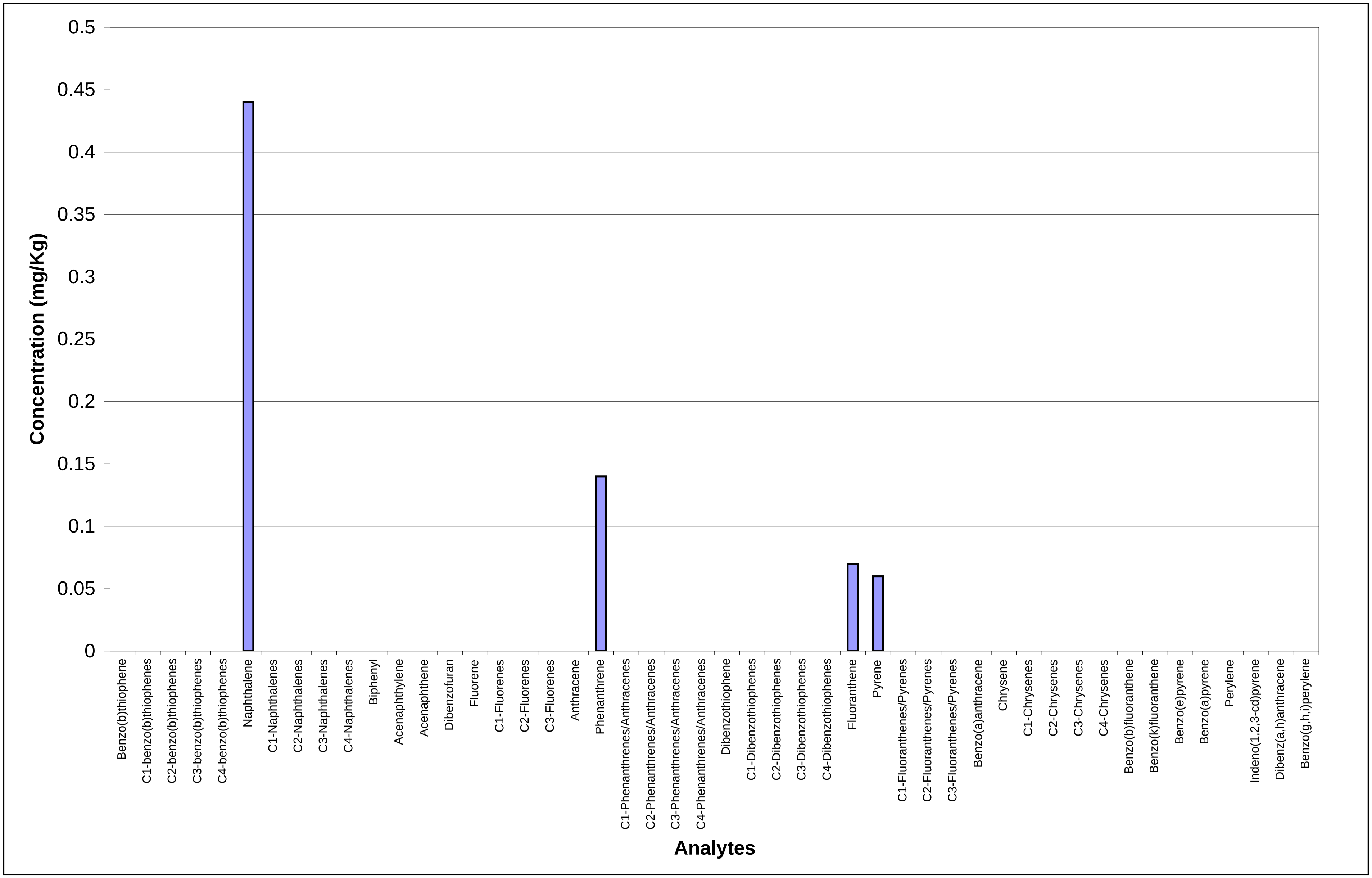
Surrogate Recoveries (%)

Naphthalene-d8	109
Acenaphthene-d10	106
Phenanthrene-d10	97
Benzo(a)pyrene-d12	119

Not Surrogate Corrected

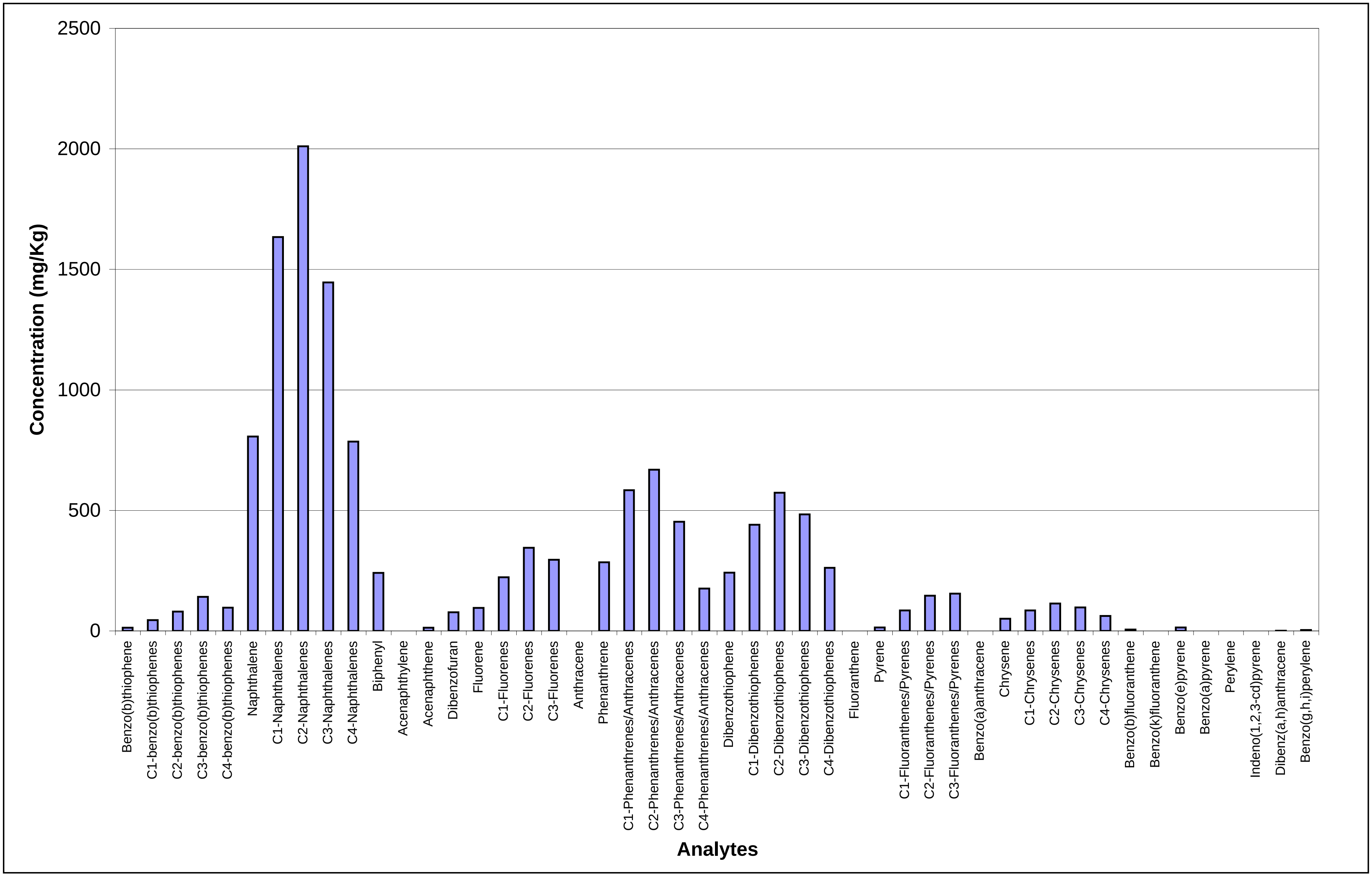
Analyzed by Lizotte Jr, Robert
2/20/2007

Procedural Blank (BJ941PB-P)

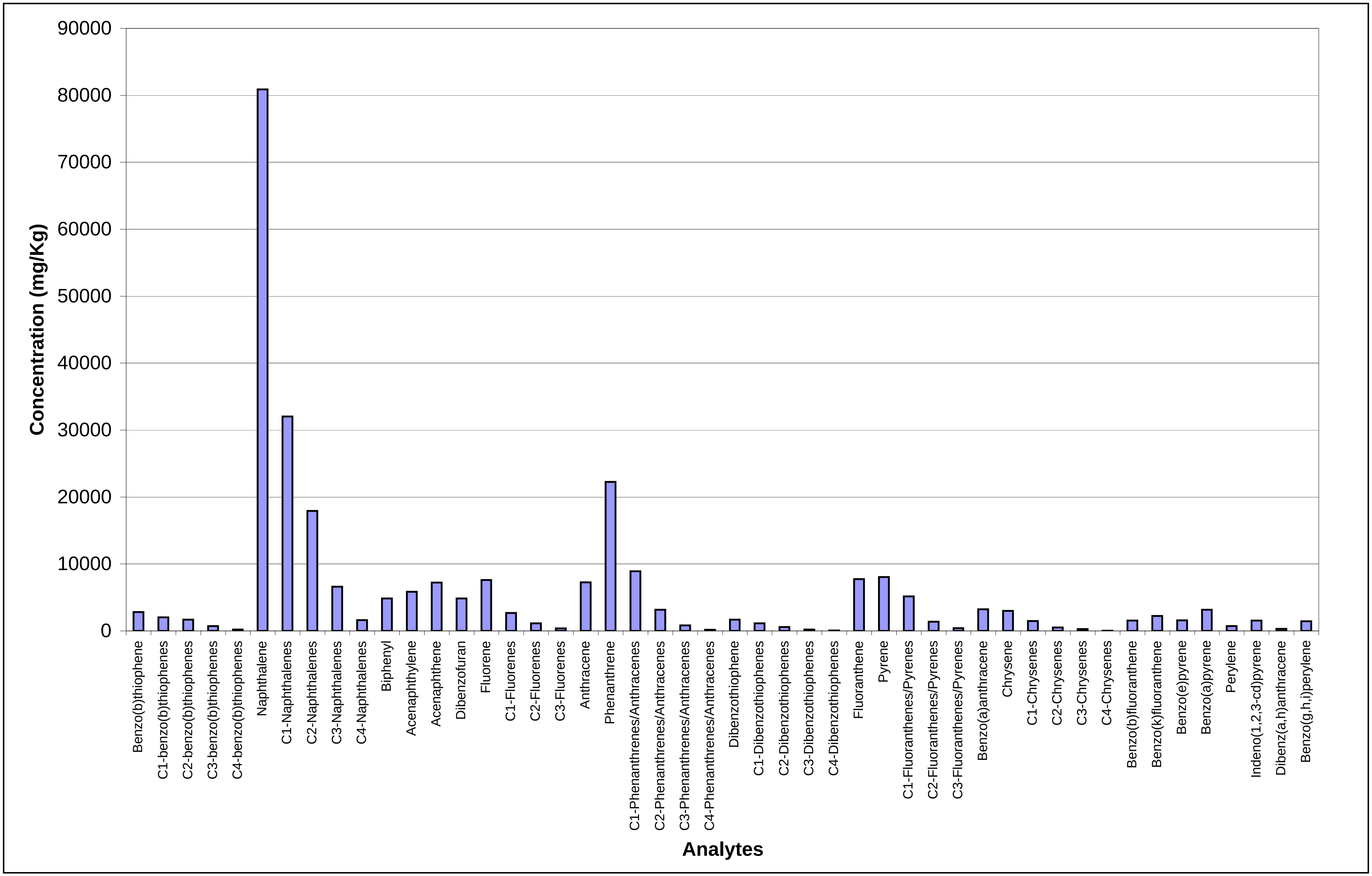


Battelle
The Business of Innovation

GN62: North Slope Crude (BJ959NSC-P)

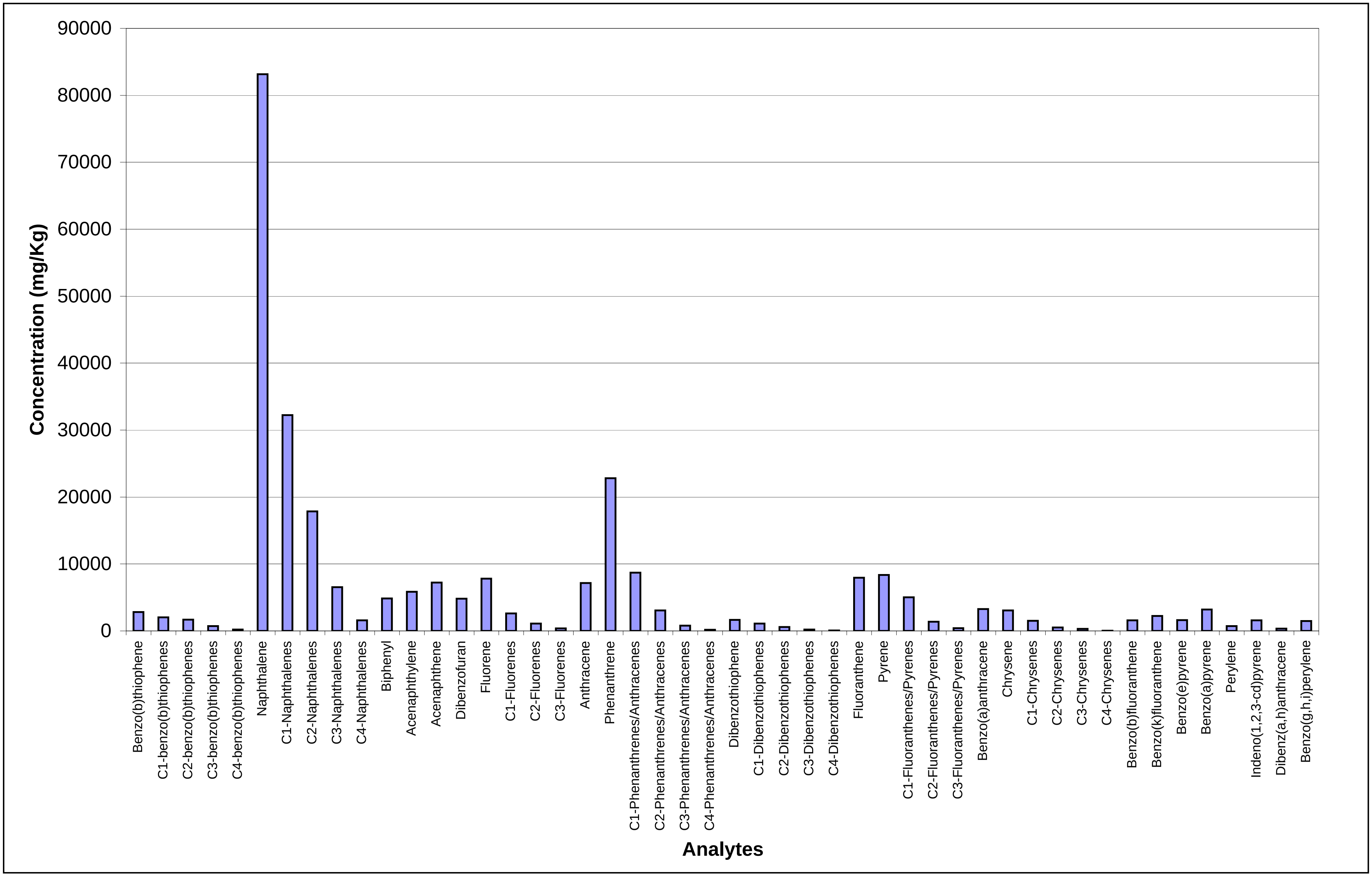


GWP07DW401 (R5522-P)

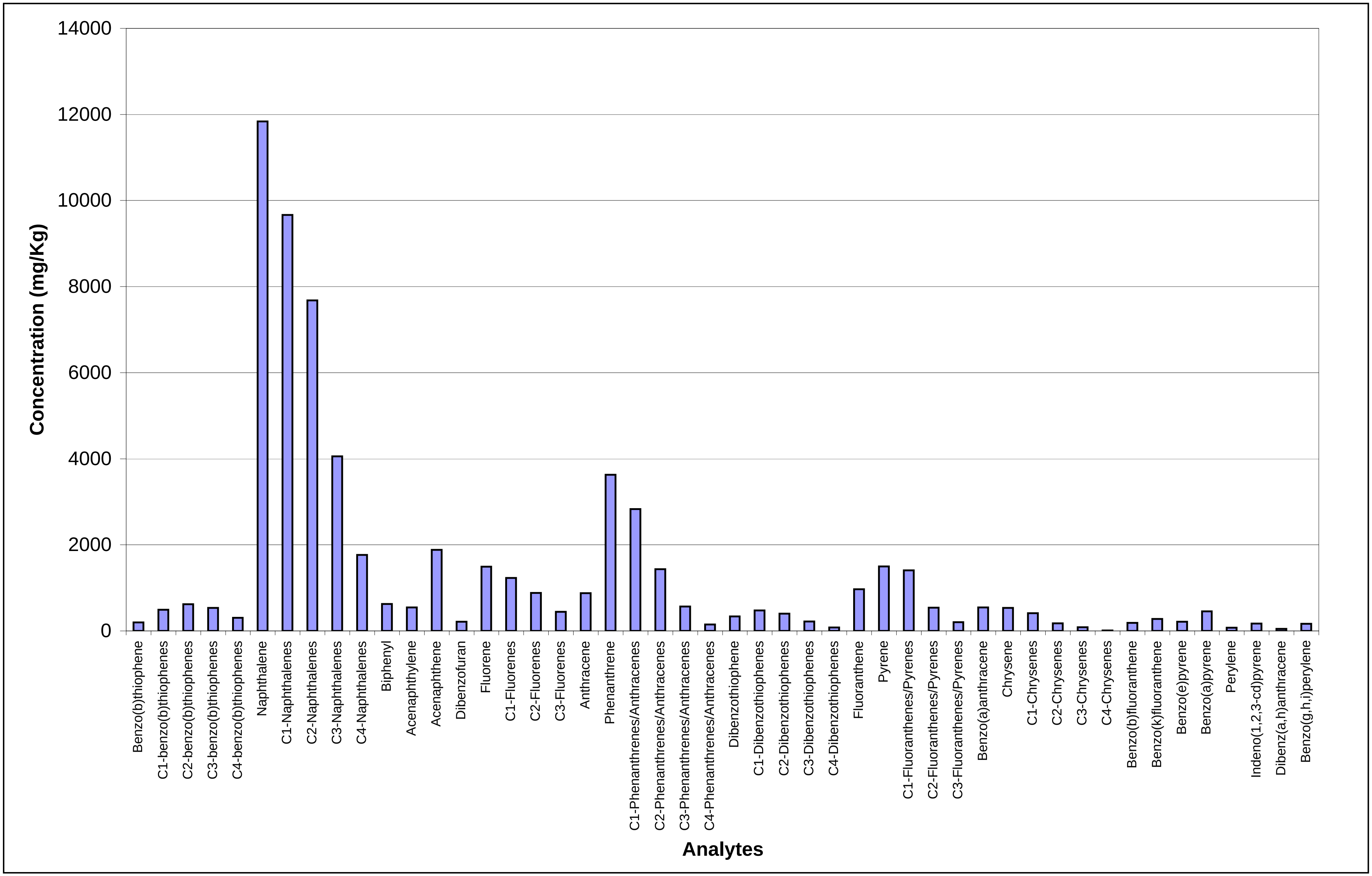


The Business of Innovation

GWP07DW402 (R5523-P)



GWP07MW9 (R5524-P)



Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GWP07DW401	GWP07DW402	GWP07MW9
Battelle ID	R5522-P	R5523-P	R5524-P
Sample Type	SA	SA	SA
Collection Date	01/11/07	01/11/07	01/12/07
Extraction Date	01/30/07	01/30/07	01/30/07
Analysis Date	02/09/07	02/09/07	02/09/07
Analytical Instrument	MS	MS	MS
% Moisture	NA	NA	NA
% Lipid	NA	NA	NA
Matrix	NAPL	NAPL	NAPL
Sample Size	49.50	47.40	45.80
Size Unit-Basis	MG_OIL	MG_OIL	MG_OIL
Minimum Reporting Limit	1.39	1.45	1.36
Units	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL
C23 Tricyclic Terpane	U	U	40.62
C29 Tricyclic Terpane -22S	U	U	12.03
C29 Tricyclic Terpane -22R	U	U	11.13
18a(H)-22,29,30-Trisnorneohopane -TS	U	U	7.86
17a(H)-22,29,30-Trisnorhopane -TM	U	U	10.84
30-Norhopane	6.51	6.04	29.84
18a(H) & 18b(H)-Oleananes	U	U	12.11
Hopane	10.38	11.12	57.14
30-Homohopane -22S	U	U	13.98
30-Homohopane -22R	U	U	10.97
13b(H),17a(H)-20S-Diacholestane	U	U	65.16
13b(H),17a(H)-20R-Diacholestane	U	U	40.91
14a(H),17a(H)-20R-methylcholestane	6.86	7.91	86.78
14a(H),17a(H)-20S-Ethylcholestane	3.58	3.08	29.66
14a(H),17a(H)-20R-Ethylcholestane	3.39	4.74	47.85
C21-TAS	U	U	9.32
C26-TAS(20S)	1.44	1.6	14.27
C26,C27-TAS	4.78	5	46.72
C27-TAS(20R)	2.36	2.57	25.18
C28-TAS(20S)	1.6	1.68	13.93
C28-TAS(20R)	1.38 J	1.71	11.88
C21-MAS	U	U	U
C22-MAS	U	U	U
C27-MAS	U	U	U
C27-20R-MAS	U	U	10.16
C27-20S-MAS	U	U	9.31
C28-20S-MAS	U	U	21.72
C27-C2920S/R-MAS	U	U	27.59
C29-20S-MAS	U	U	7.49
C29-20R-MAS	U	U	17.37
TAS_245	NA	NA	NA
MAS_239	NA	NA	NA

Surrogate Recoveries (%)

5b(H)-Cholane	570 NME	568 NME	112

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Procedural Blank
Battelle ID	BJ941PB-P
Sample Type	PB
Collection Date	01/30/07
Extraction Date	01/30/07
Analysis Date	02/12/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	NAPL
Sample Size	5.00
Size Unit-Basis	MG_OIL
Minimum Reporting Limit	1.31
Units	MG/KG_OIL
C23 Tricyclic Terpane	U
C29 Tricyclic Terpane -22S	U
C29 Tricyclic Terpane -22R	U
18a(H)-22,29,30-Trisnorneohopane -TS	U
17a(H)-22,29,30-Trisnorhopane -TM	U
30-Norhopane	U
18a(H) & 18b(H)-Oleananes	U
Hopane	U
30-Homohopane -22S	U
30-Homohopane -22R	U
13b(H),17a(H)-20S-Diacholestane	U
13b(H),17a(H)-20R-Diacholestane	U
14a(H),17a(H)-20R-methylcholestane	U
14a(H),17a(H)-20S-Ethylcholestane	U
14a(H),17a(H)-20R-Ethylcholestane	U
C21-TAS	U
C26-TAS(20S)	U
C26,C27-TAS	U
C27-TAS(20R)	U
C28-TAS(20S)	U
C28-TAS(20R)	U
C21-MAS	U
C22-MAS	U
C27-MAS	U
C27-20R-MAS	U
C27-20S-MAS	U
C28-20S-MAS	U
C27-C2920S/R-MAS	U
C29-20S-MAS	U
C29-20R-MAS	U
TAS_245	NA
MAS_239	NA

Surrogate Recoveries (%)

5b(H)-Cholane	85

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	Laboratory Control Sample		Target	% Recovery	Qualifier
Battelle ID	BJ942LCS-P				
Sample Type	LCS				
Collection Date	01/30/07				
Extraction Date	01/30/07				
Analysis Date	02/12/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	NAPL				
Sample Size	NA				
Size Unit-Basis	NA				
Minimum Reporting Limit	7.03				
Units	NG				
C23 Tricyclic Terpane		U			
C29 Tricyclic Terpane -22S		U			
C29 Tricyclic Terpane -22R		U			
18a(H)-22,29,30-Trisnorneohopane -TS		U			
17a(H)-22,29,30-Trisnorhopane -TM		U			
30-Norhopane		U			
18a(H) & 18b(H)-Oleananes		U			
Hopane		U			
30-Homohopane -22S		U			
30-Homohopane -22R		U			
13b(H),17a(H)-20S-Diacholestane		U			
13b(H),17a(H)-20R-Diacholestane		U			
14a(H),17a(H)-20R-methylcholestane		U			
14a(H),17a(H)-20S-Ethylcholestane		U			
14a(H),17a(H)-20R-Ethylcholestane		U			
C21-TAS		U			
C26-TAS(20S)		U			
C26,C27-TAS		U			
C27-TAS(20R)		U			
C28-TAS(20S)		U			
C28-TAS(20R)		U			
C21-MAS		U			
C22-MAS		U			
C27-MAS		U			
C27-20R-MAS		U			
C27-20S-MAS		U			
C28-20S-MAS		U			
C27-C2920S/R-MAS		U			
C29-20S-MAS		U			
C29-20R-MAS		U			
TAS_245	NA				
MAS_239	NA				

Surrogate Recoveries (%)

5b(H)-Cholane	77

Project Client: Exponent, Inc.
Project Name: Exponent - Gas Works Park
Project Number: N106746-0001

Client ID	GN62: North Slope Crude			
Battelle ID	BJ959NSC-P			
Sample Type	NSC			
Collection Date	01/30/07			
Extraction Date	01/30/07			
Analysis Date	02/07/07			
Analytical Instrument	MS			
% Moisture	NA			
% Lipid	NA			
Matrix	OIL			
Sample Size	5.01			
Size Unit-Basis	MG_OIL			
Minimum Reporting Limit	1.3			
Units	MG/KG_OIL	Target	% Difference	Qualifier
C21-TAS	18.59			
C26-TAS(20S)	15.53			
C26,C27-TAS	55.26			
C27-TAS(20R)	37.91			
C28-TAS(20S)	31.48			
C28-TAS(20R)	31.26			
C21-MAS	6.09			
C22-MAS	3.54			
C27-MAS	4.73			
C27-20R-MAS	5.98			
C27-20S-MAS	2.57			
C28-20S-MAS	14.9			
C27-C2920S/R-MAS	12.33			
C29-20S-MAS	4.08			
C29-20R-MAS	9.14			
TAS_245	NA			
MAS_239	NA			

Surrogate Recoveries (%)

5b(H)-Cholane	93

Not Surrogate Corrected

Analyzed by Lizotte Jr, Robert
2/20/2007

```
File        : G:\G\DATA\SG0319\G4962.D
Operator    : DPB
Acquired    :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info   : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4
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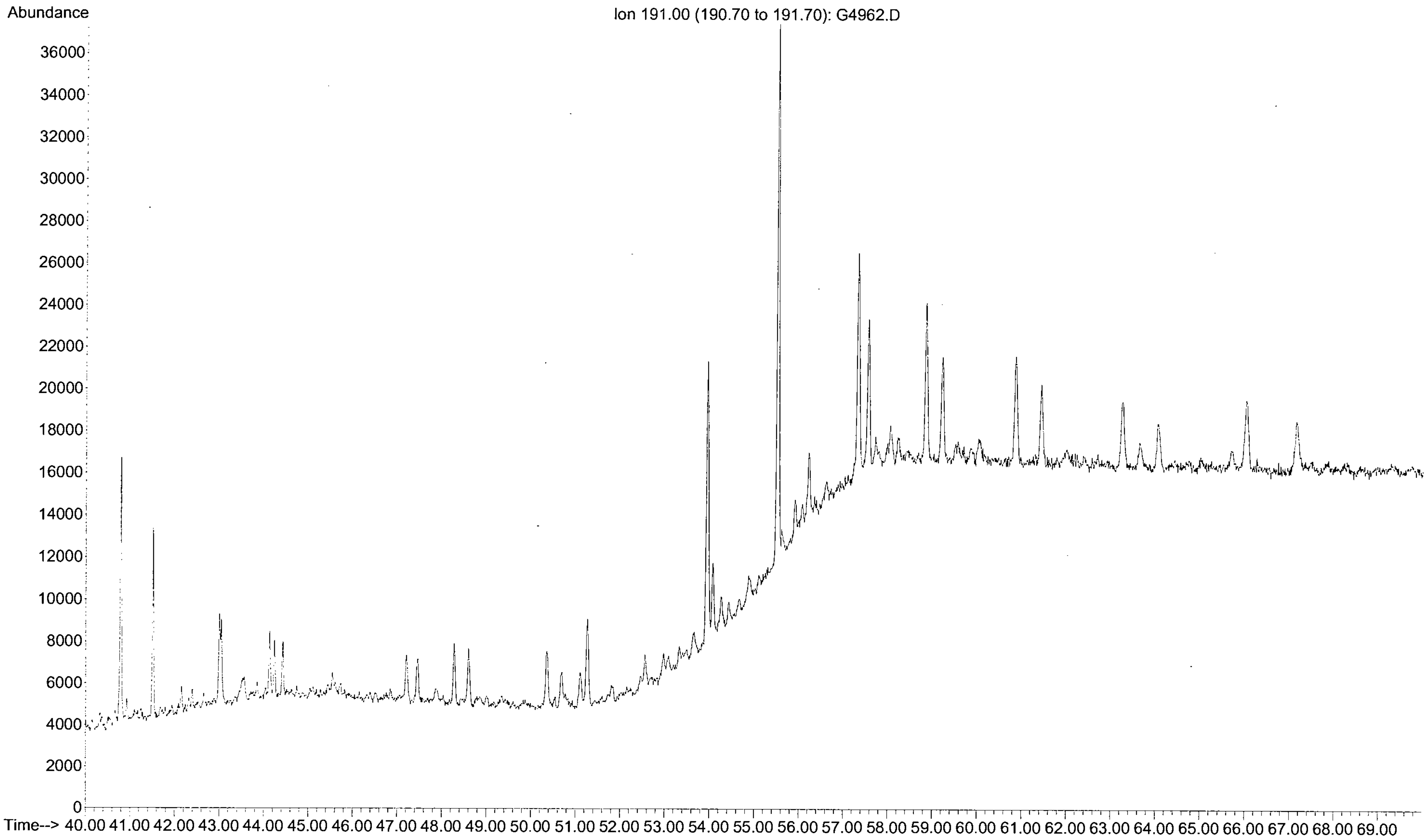

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File       : G:\G\DATA\SG0319\G5037.D
Operator   : DPB
Acquired   : 12 Feb 2007  10:06 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ941PB-P(0)
Misc Info  : Procedural Blank 5-157 07-0011
Vial Number: 79
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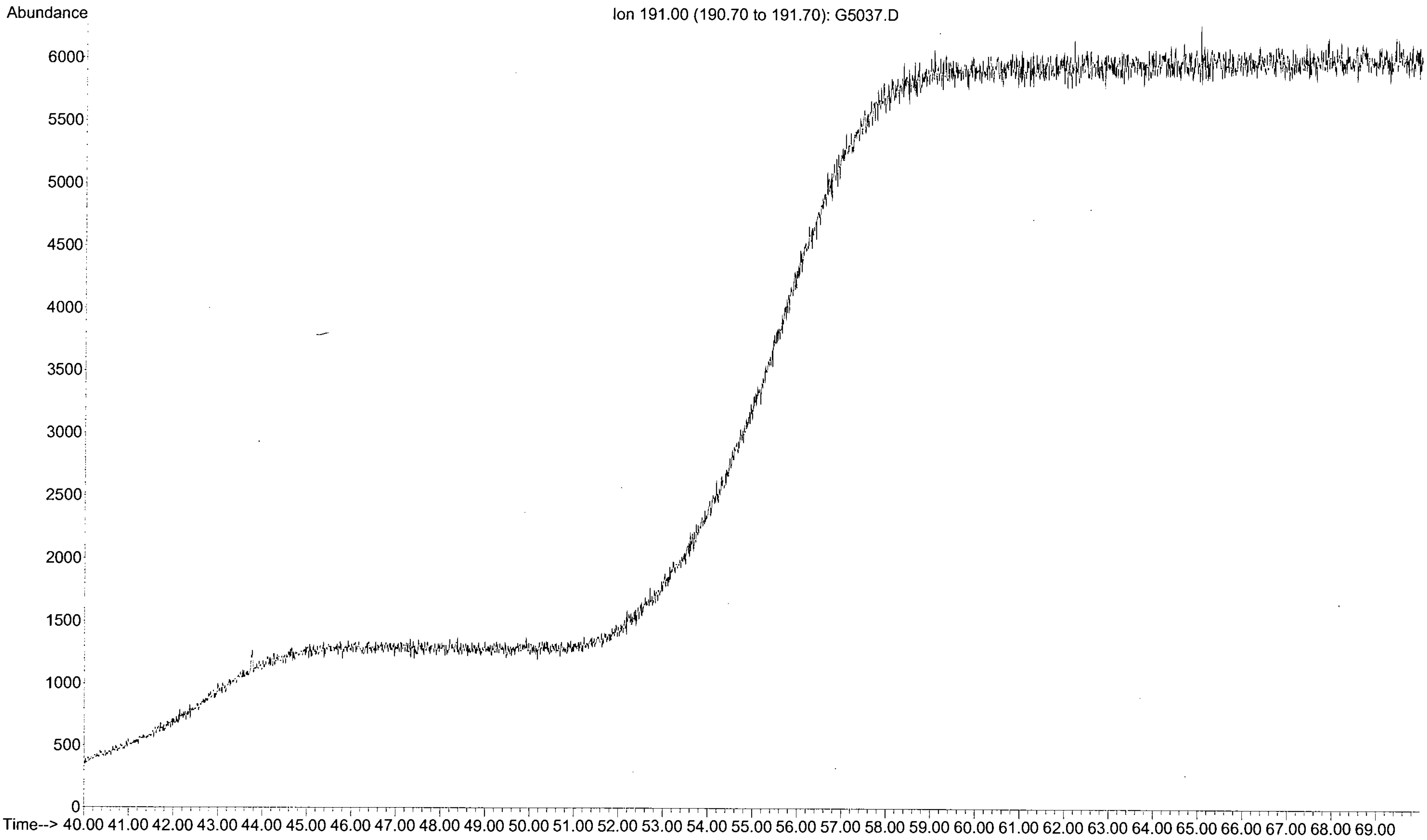

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File        : G:\G\DATA\SG0319\G5038.D
Operator    : DPB
Acquired    : 12 Feb 2007  11:28 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ942LCS-P(0)
Misc Info   : Laboratory Control Sample 5-157 07-0011
Vial Number: 80
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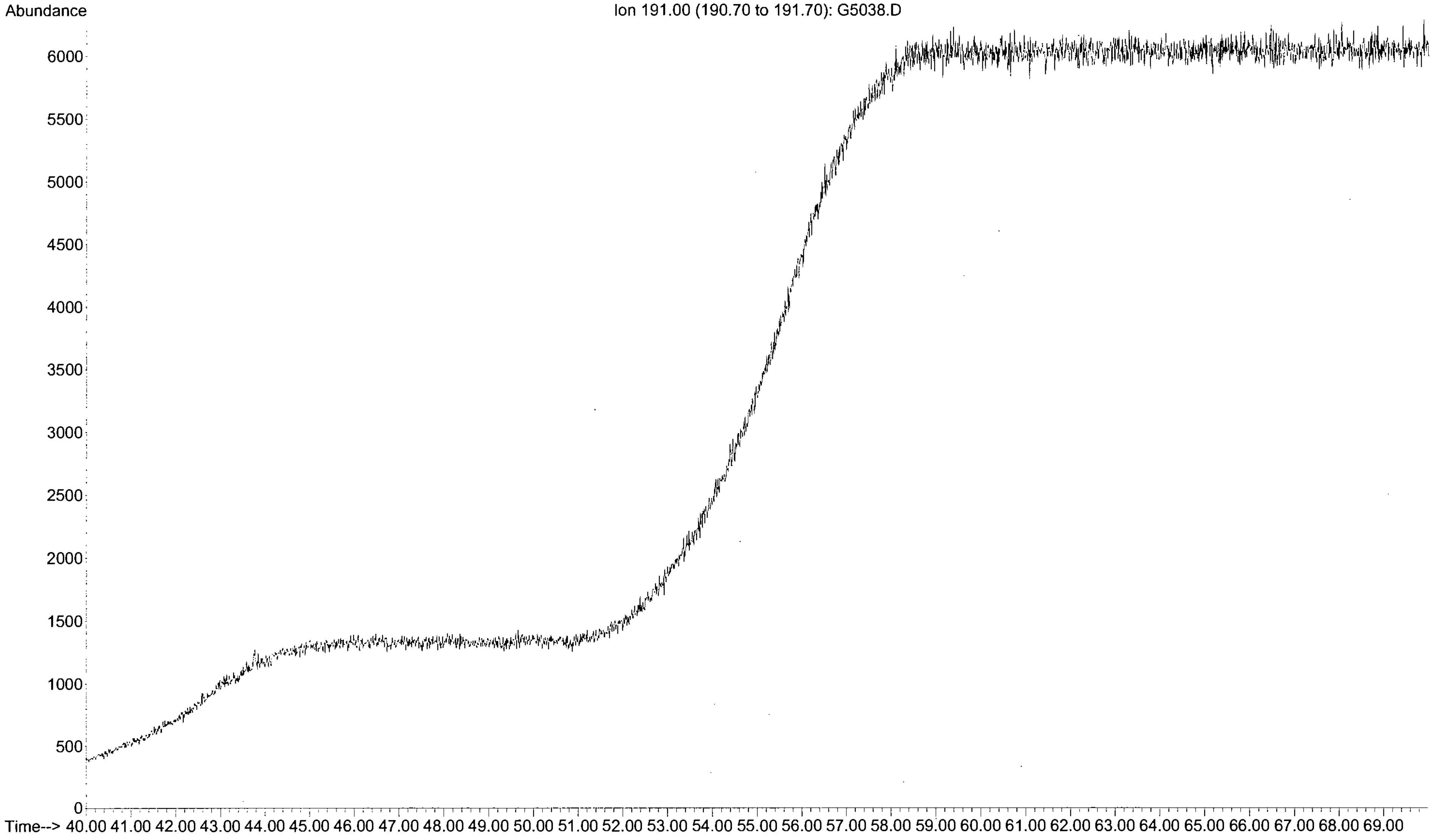
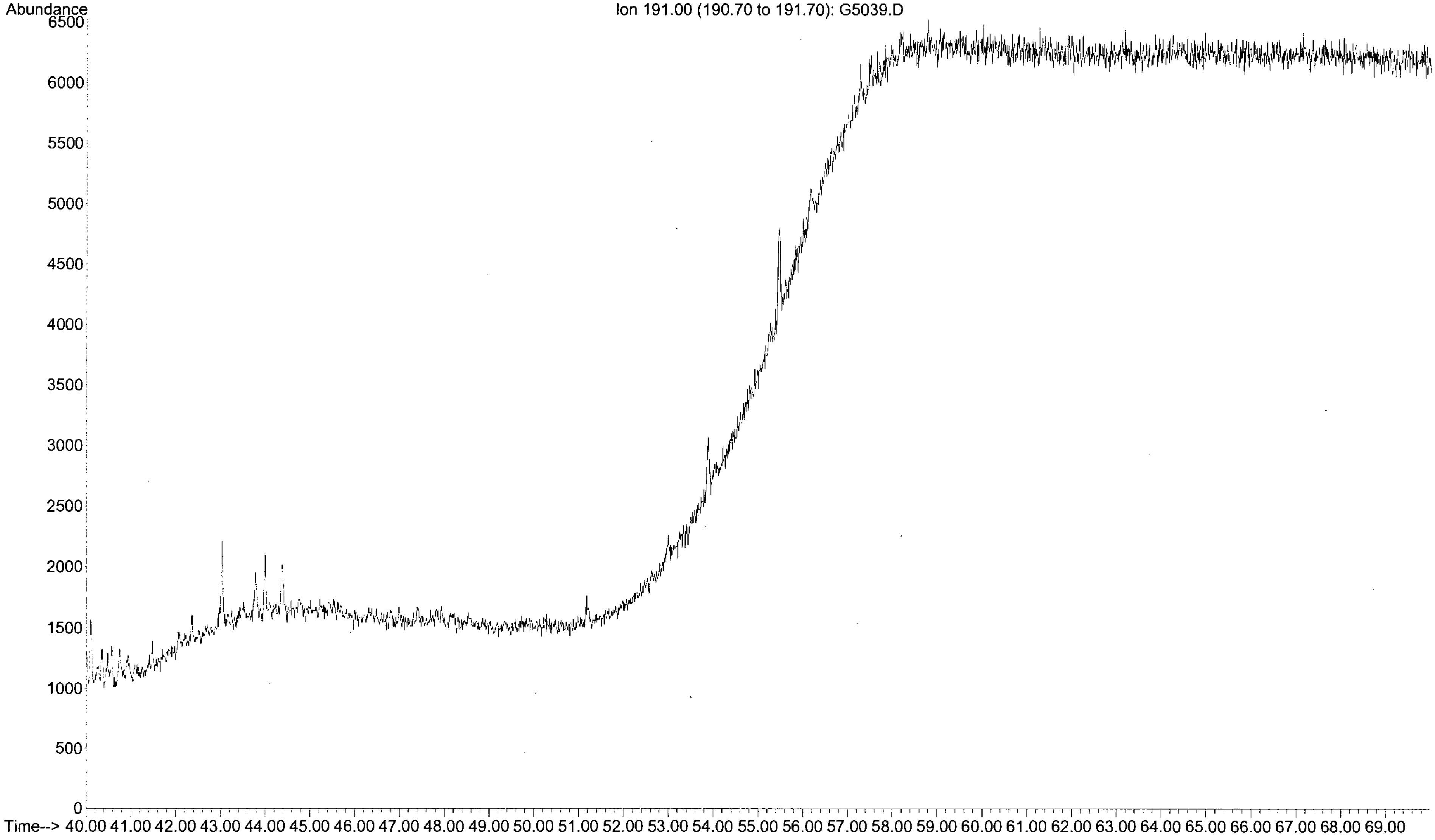


File : G:\G\DATA\SG0319\G5039.D
Operator : DPB
Acquired : 12 Feb 2007 12:49 pm using AcqMethod BIOPLUS
Instrument : Inst. G
Sample Name: R5522-P-MS(8)
Misc Info : GWP07DW401 5-157 07-0011
Vial Number: 81



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File        : G:\G\DATA\SG0319\G5040.D
Operator    : DPB
Acquired    : 12 Feb 2007   2:10 pm using AcqMethod BIOPLUS
Instrument  :    Inst. G
Sample Name: R5523-P-MS(8)
Misc Info   : GWP07DW402 5-157 07-0011
Vial Number: 82
```

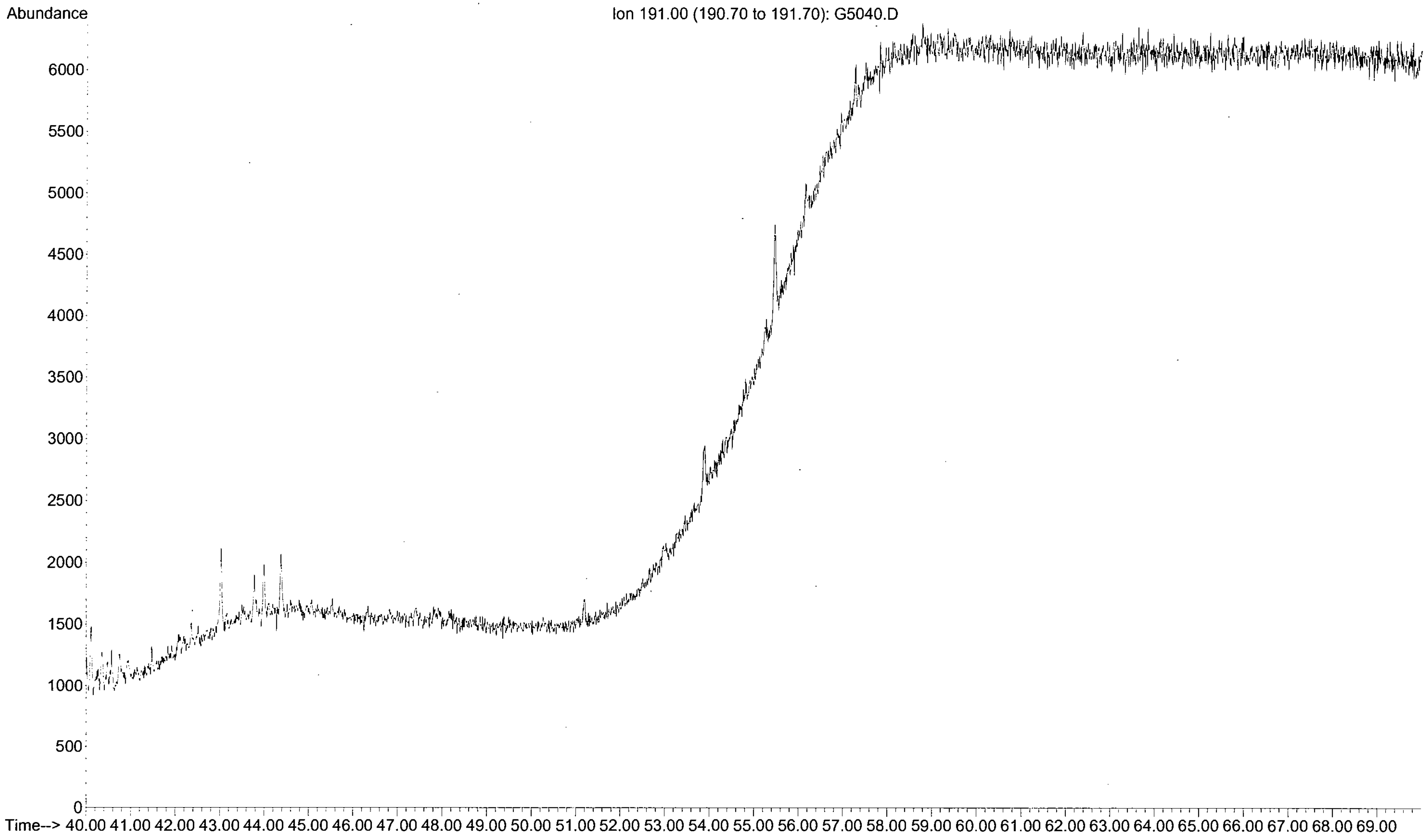

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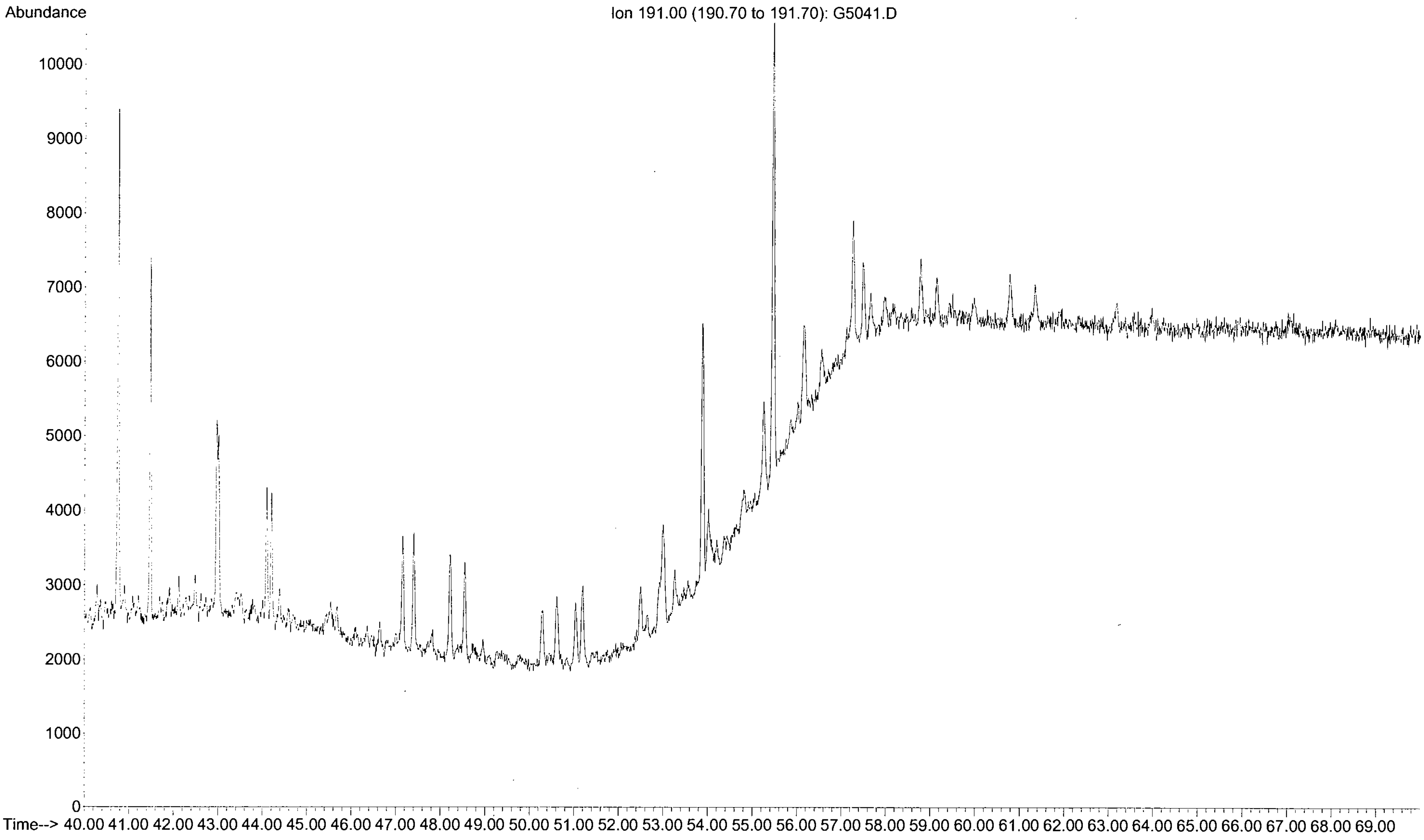
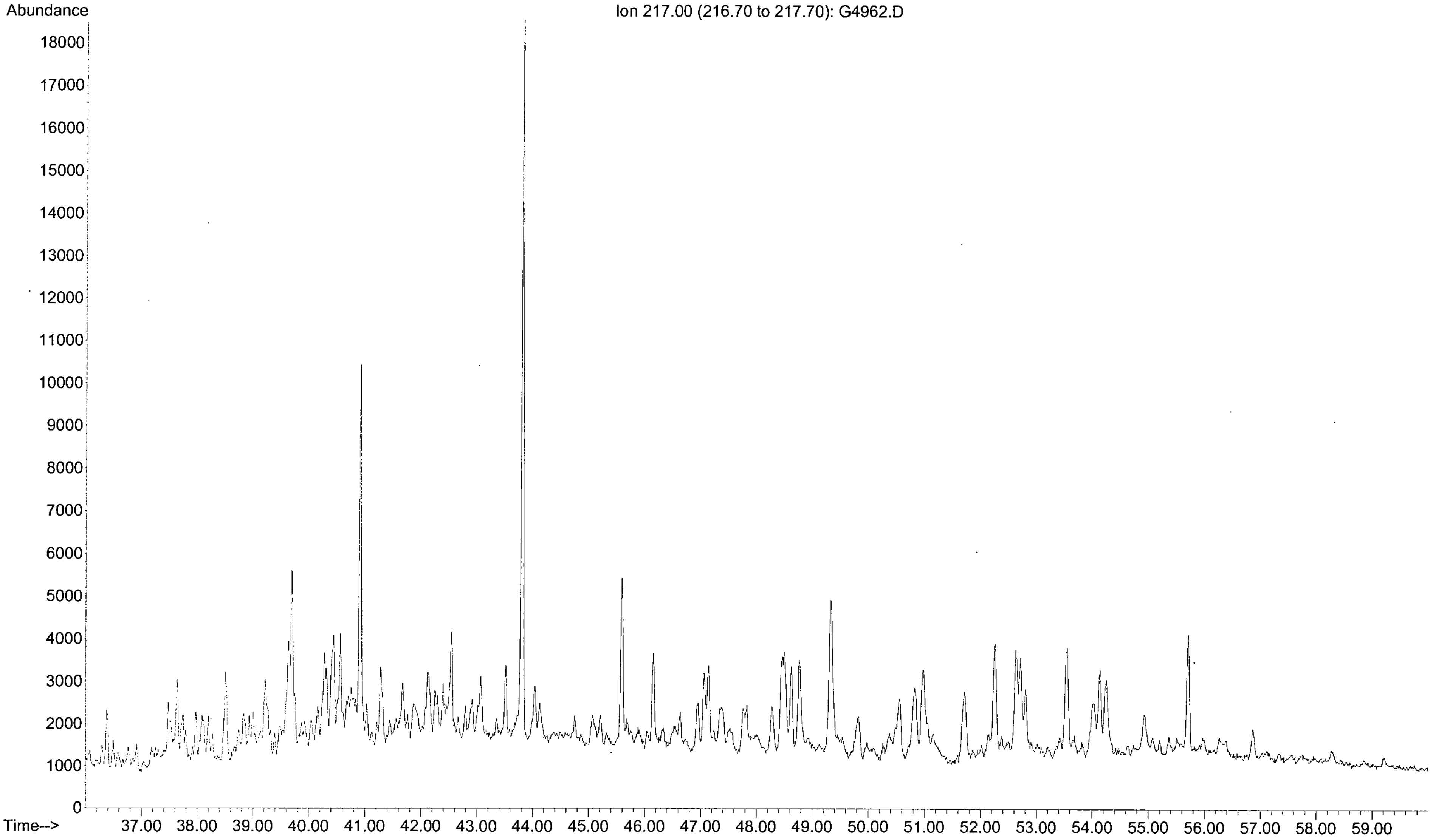
File        : G:\G\DATA\SG0319\G5041.D
Operator    : DPB
Acquired    : 12 Feb 2007   3:33 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5524-P-MS(6)
Misc Info   : GWP07MW9 5-157 07-0011
Vial Number: 83
```

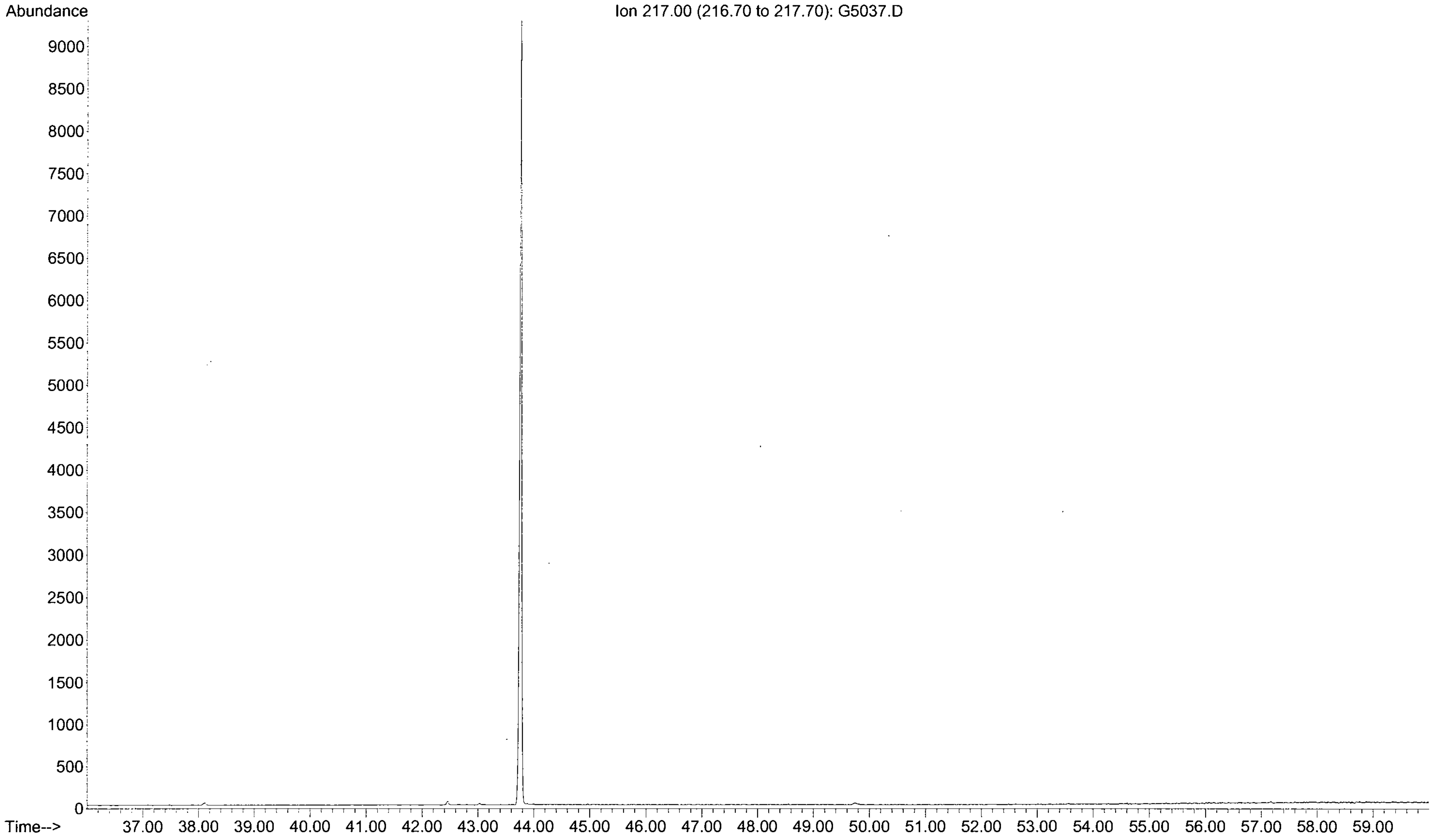


Ion 191.00 (190.70 to 191.70): G5041.D

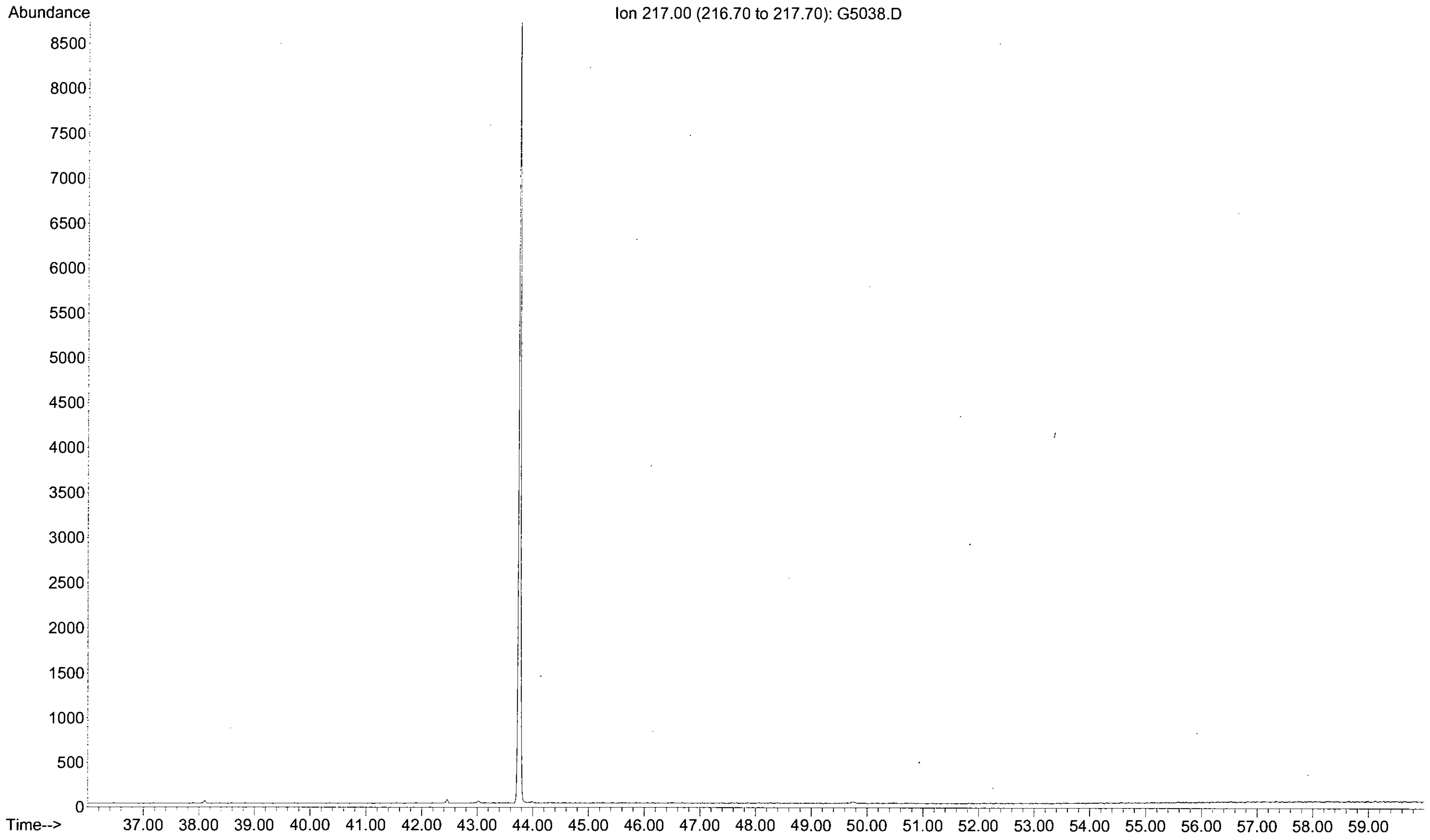
```
File        : G:\G\DATA\SG0319\G4962.D
Operator    : DPB
Acquired    :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info   : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4
```



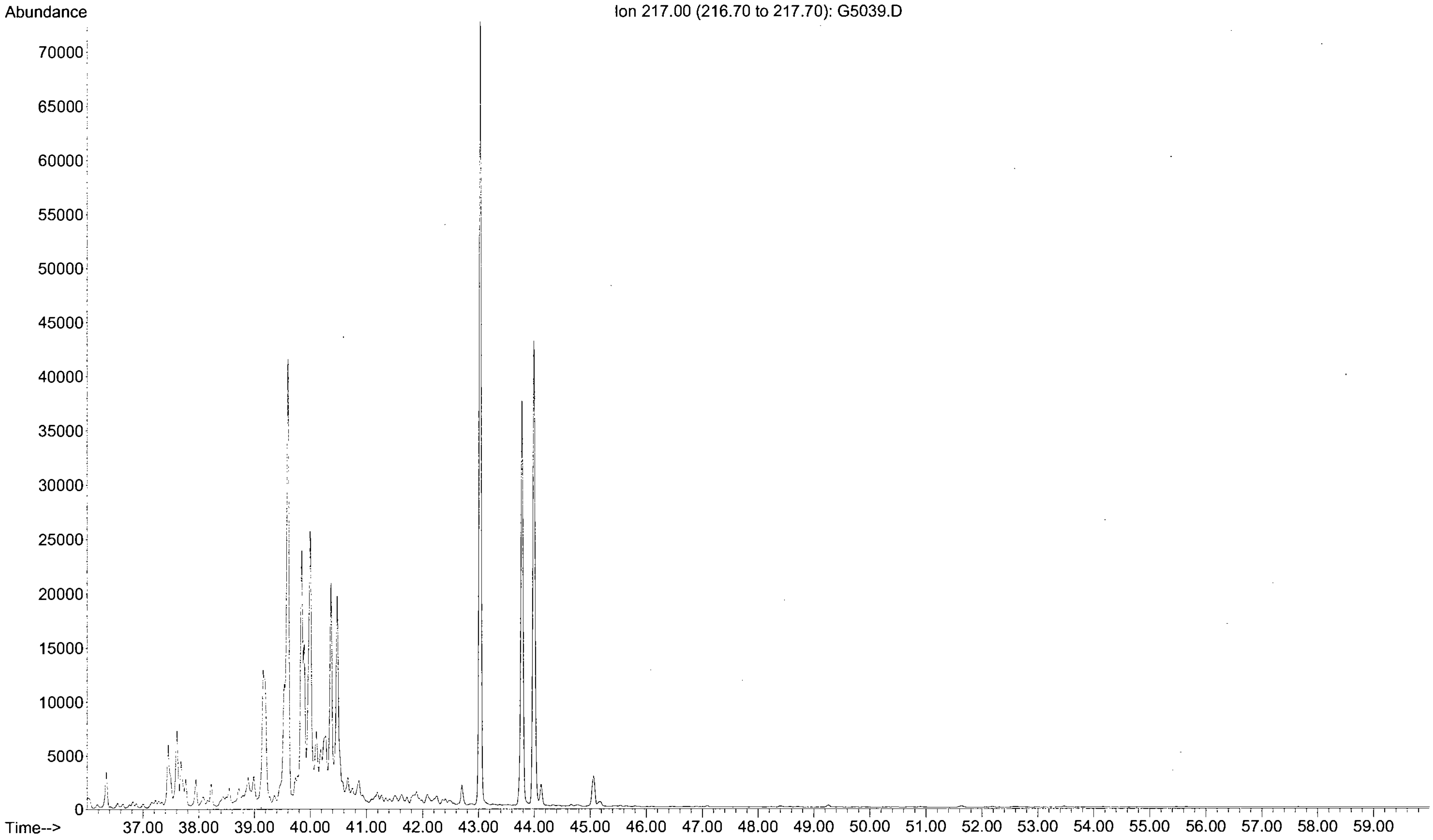
```
File       : G:\G\DATA\SG0319\G5037.D
Operator   : DPB
Acquired   : 12 Feb 2007  10:06 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ941PB-P(0)
Misc Info  : Procedural Blank 5-157 07-0011
Vial Number: 79
```



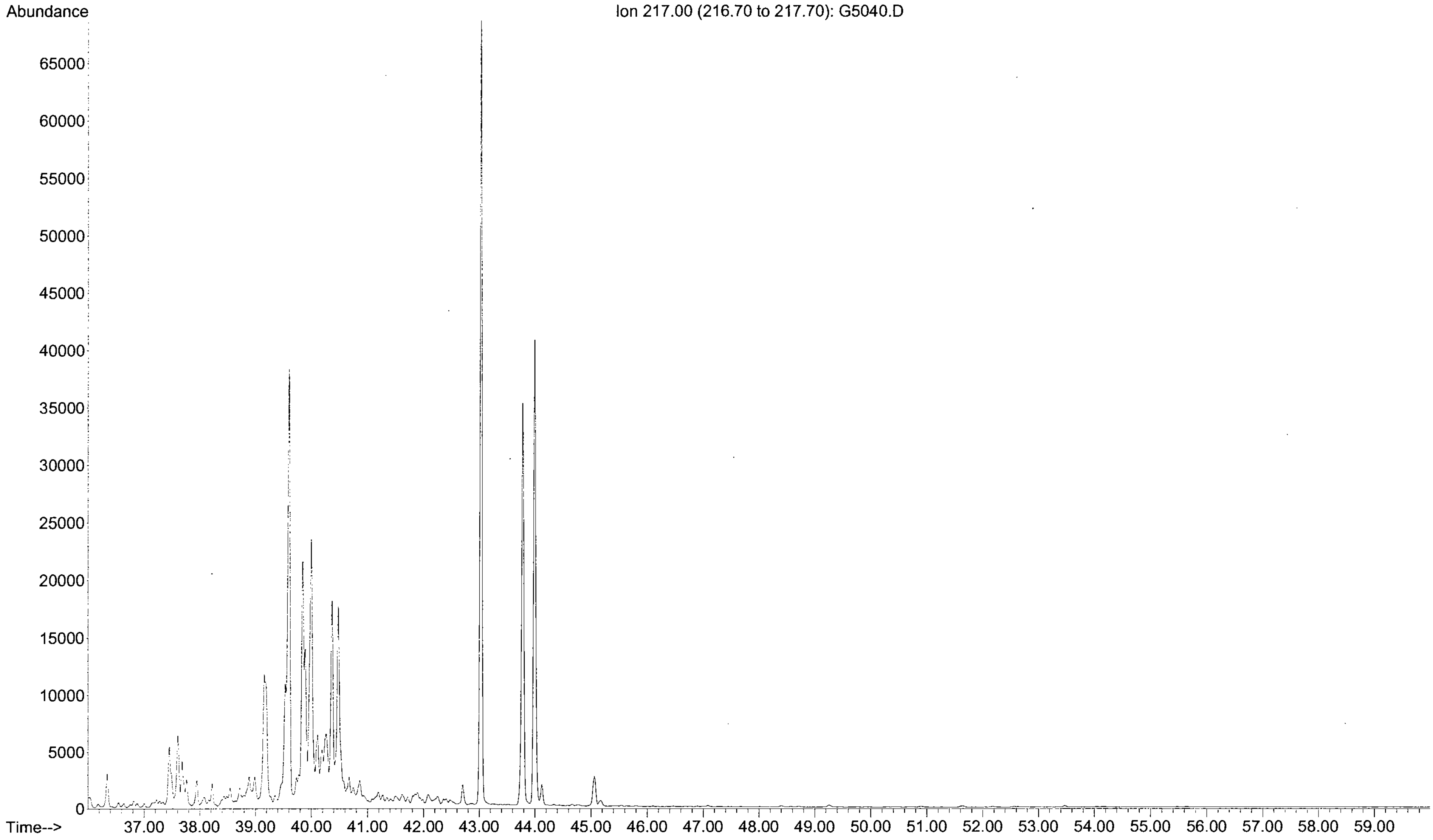
```
File       : G:\G\DATA\SG0319\G5038.D
Operator   : DPB
Acquired   : 12 Feb 2007  11:28 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ942LCS-P(0)
Misc Info  : Laboratory Control Sample 5-157 07-0011
Vial Number: 80
```



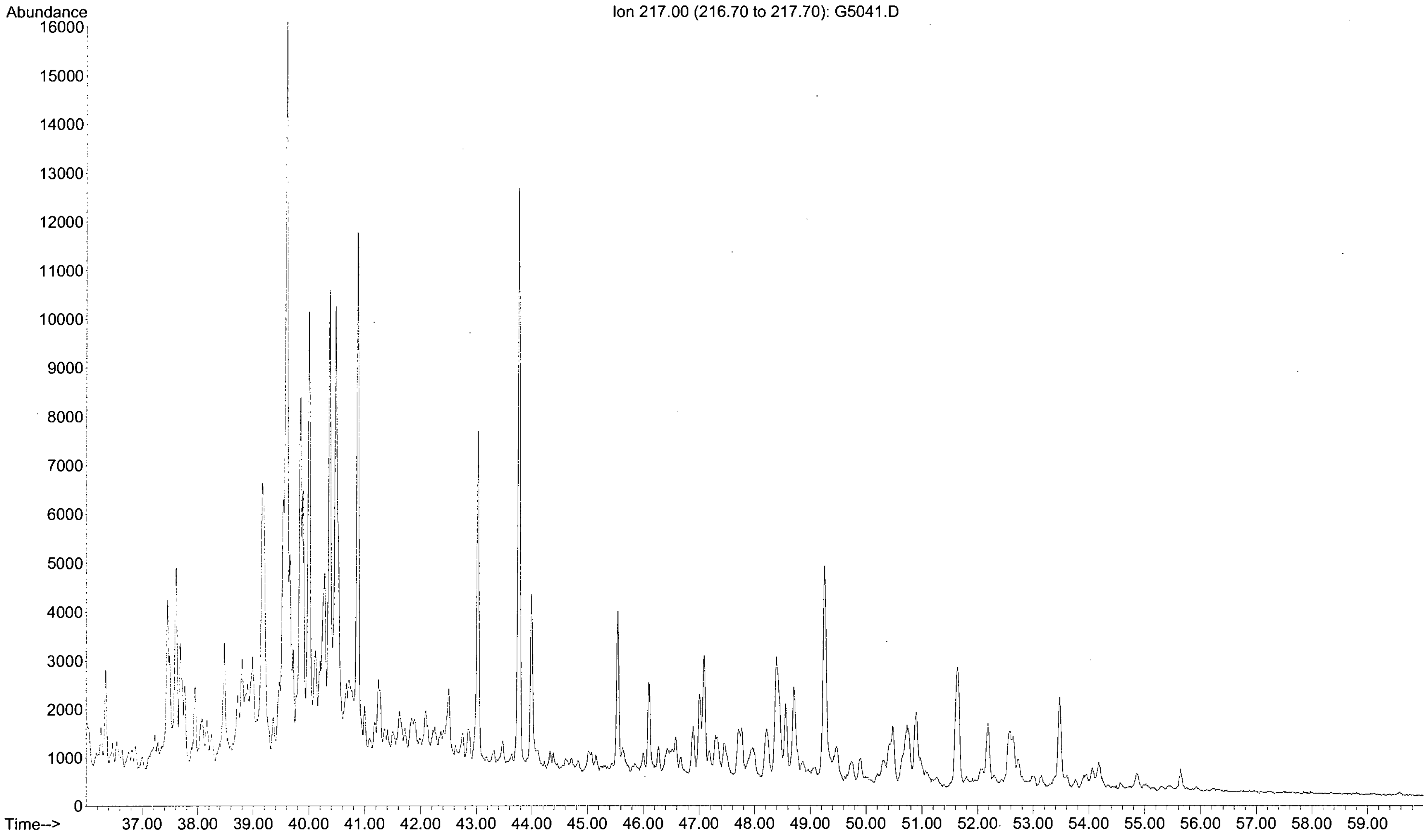
```
File        : G:\G\DATA\SG0319\G5039.D
Operator    : DPB
Acquired    : 12 Feb 2007  12:49 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5522-P-MS(8)
Misc Info   : GWP07DW401 5-157 07-0011
Vial Number: 81
```



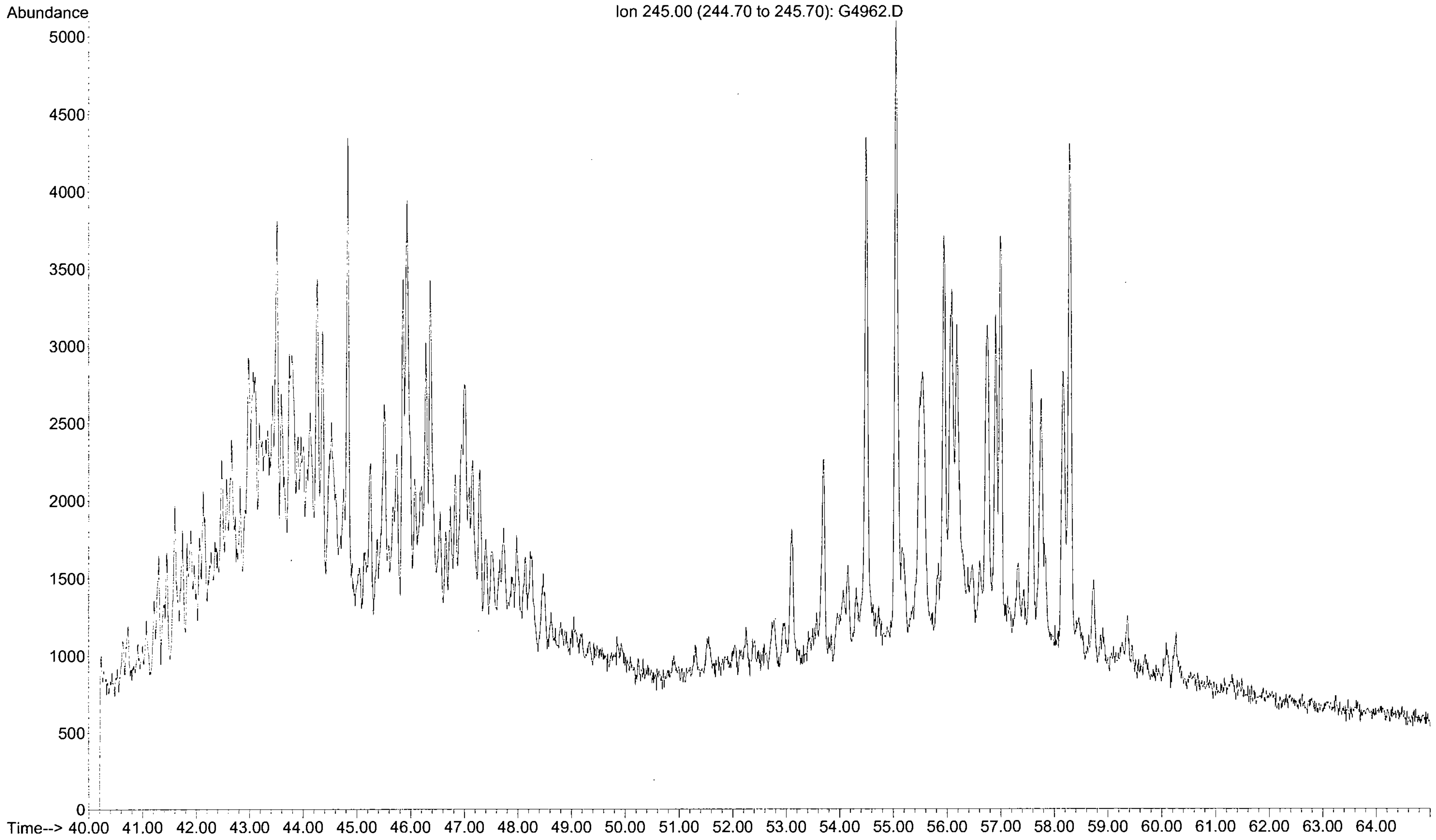
```
File       : G:\G\DATA\SG0319\G5040.D
Operator   : DPB
Acquired   : 12 Feb 2007   2:10 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5523-P-MS(8)
Misc Info  : GWP07DW402 5-157 07-0011
Vial Number: 82
```



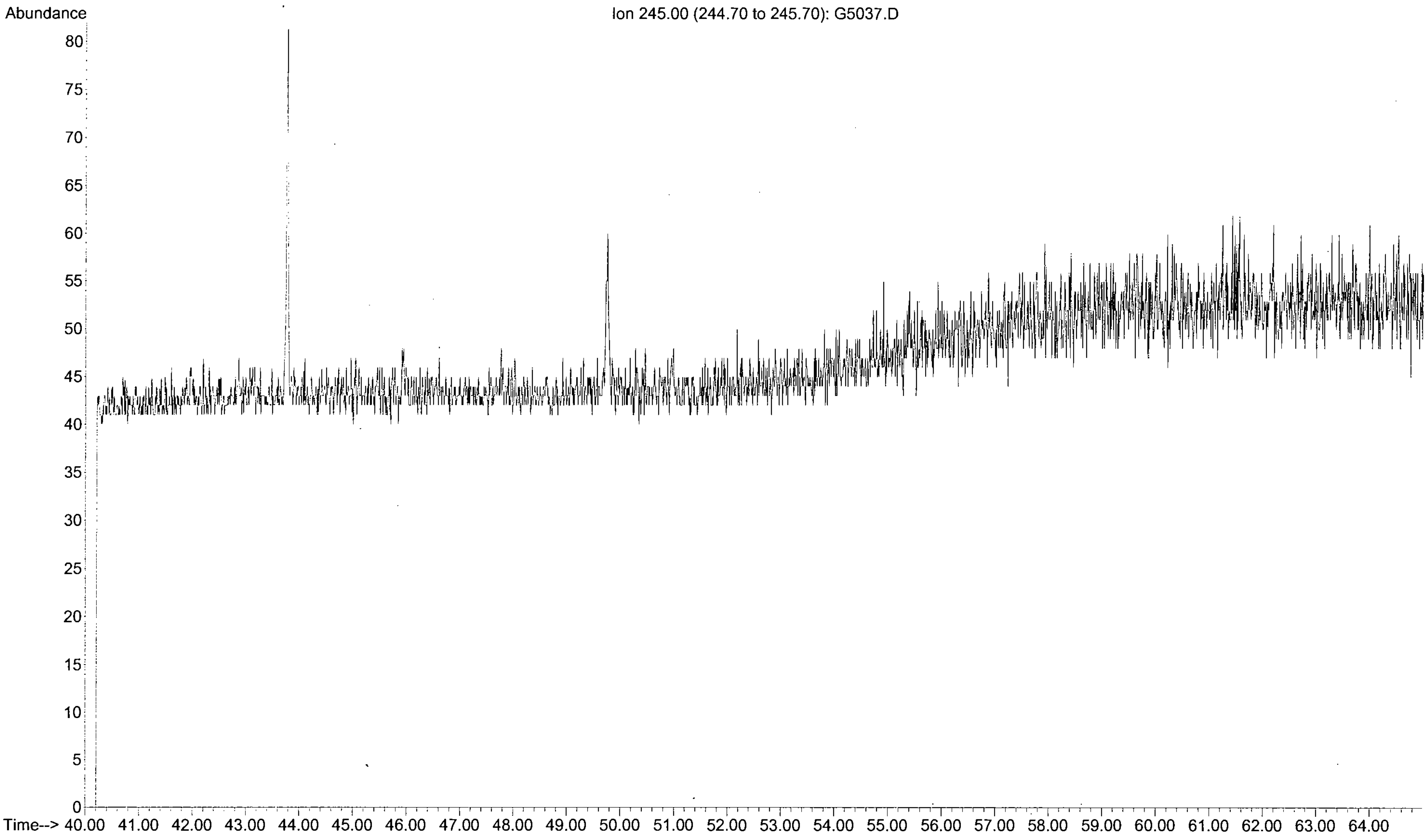
```
File       : G:\G\DATA\SG0319\G5041.D
Operator   : DPB
Acquired   : 12 Feb 2007   3:33 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5524-P-MS(6)
Misc Info  : GWP07MW9 5-157 07-0011
Vial Number: 83
```



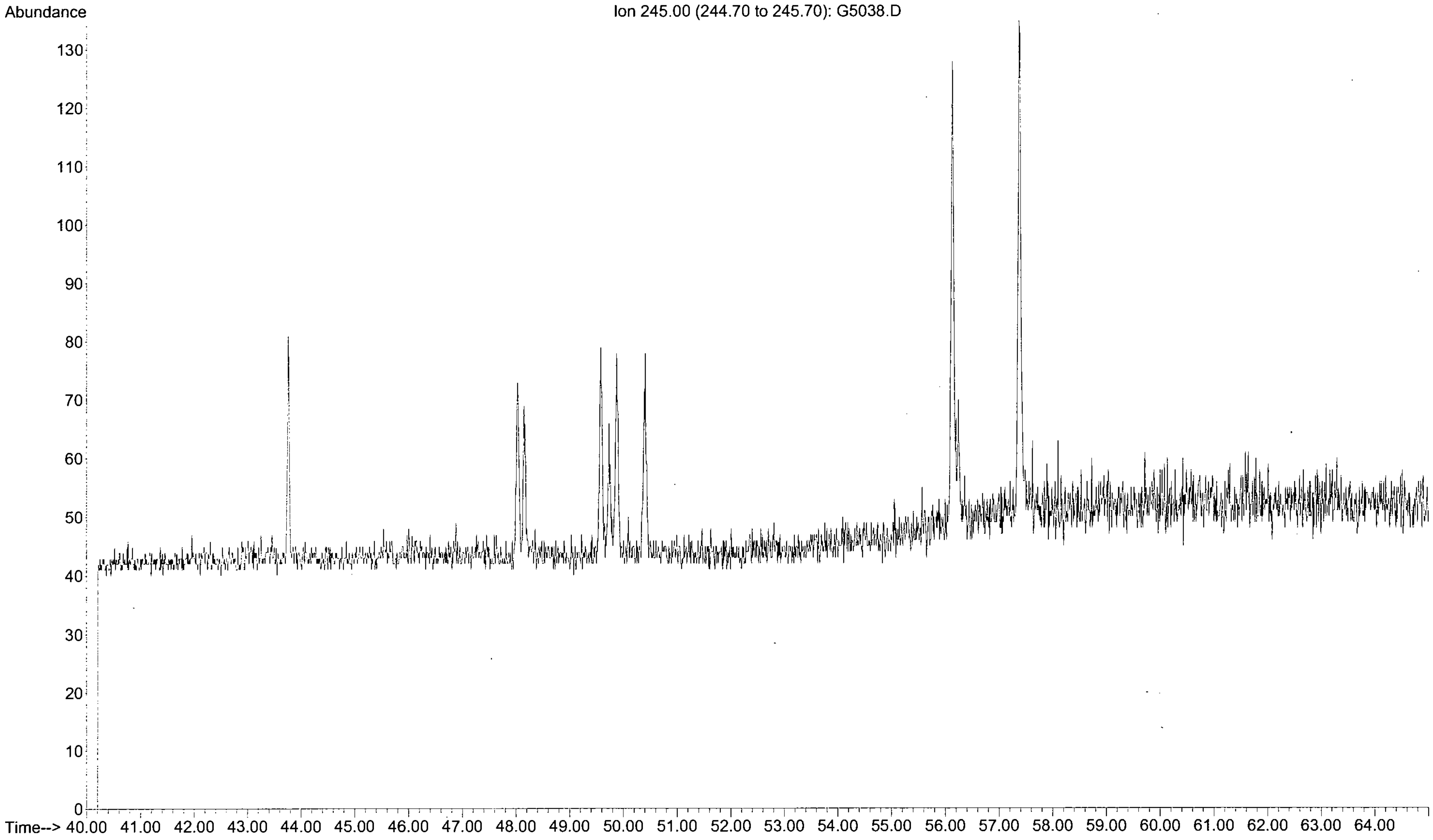
```
File       : G:\G\DATA\SG0319\G4962.D
Operator   : DPB
Acquired   :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ959NSC-P(0)
Misc Info  : North Slope Crude GC/MS 5-157 07-0011
Vial Number: 4
```



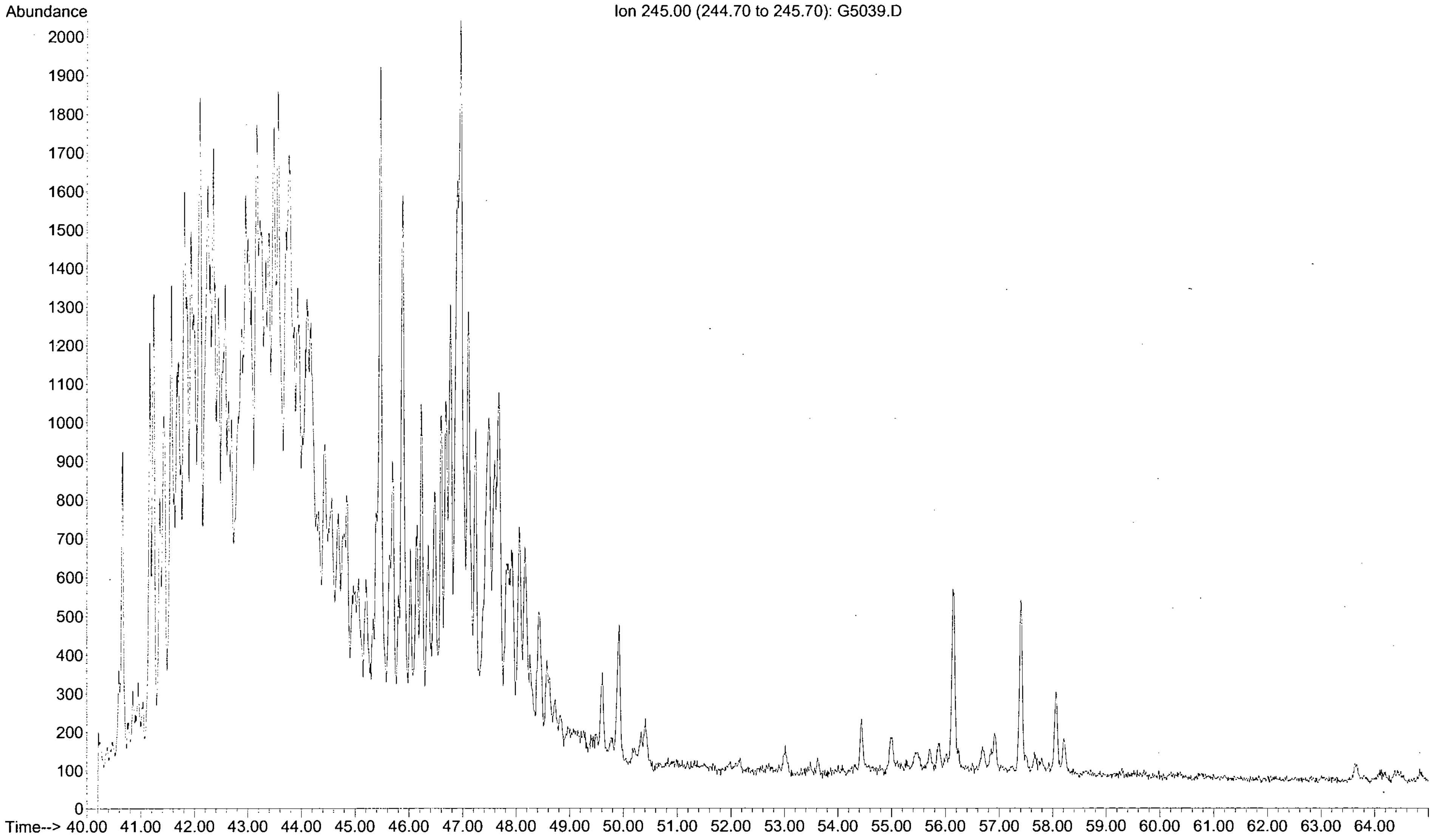
```
File        : G:\G\DATA\SG0319\G5037.D
Operator    : DPB
Acquired    : 12 Feb 2007  10:06 am using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: BJ941PB-P(0)
Misc Info   : Procedural Blank 5-157 07-0011
Vial Number: 79
```



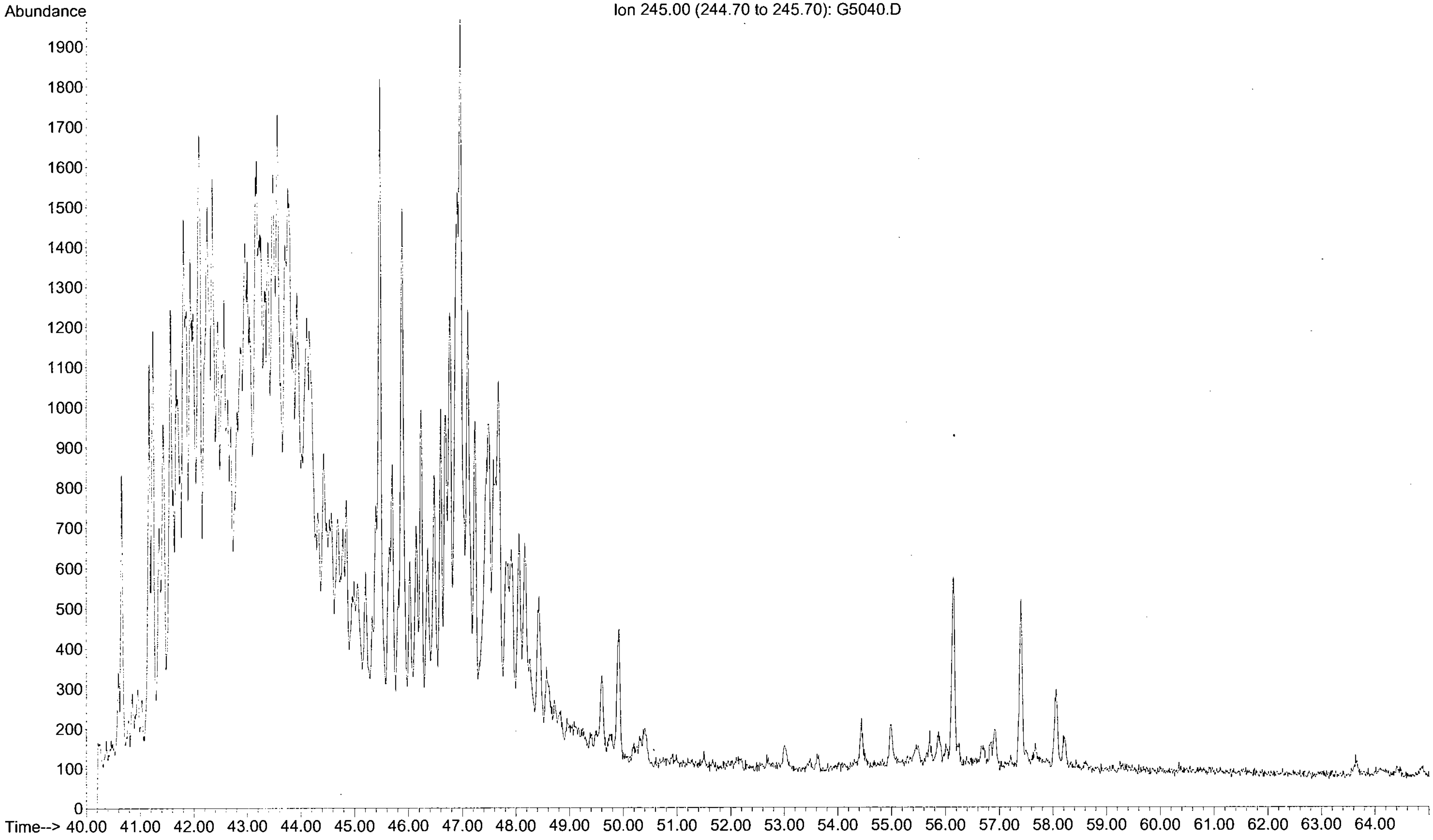
File   : G:\G\DATA\SG0319\G5038.D
Operator   : DPB
Acquired   : 12 Feb 2007 11:28 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ942LCS-P(0)
Misc Info   : Laboratory Control Sample 5-157 07-0011
Vial Number: 80


Ion 245.00 (244.70 to 245.70): G5038.D

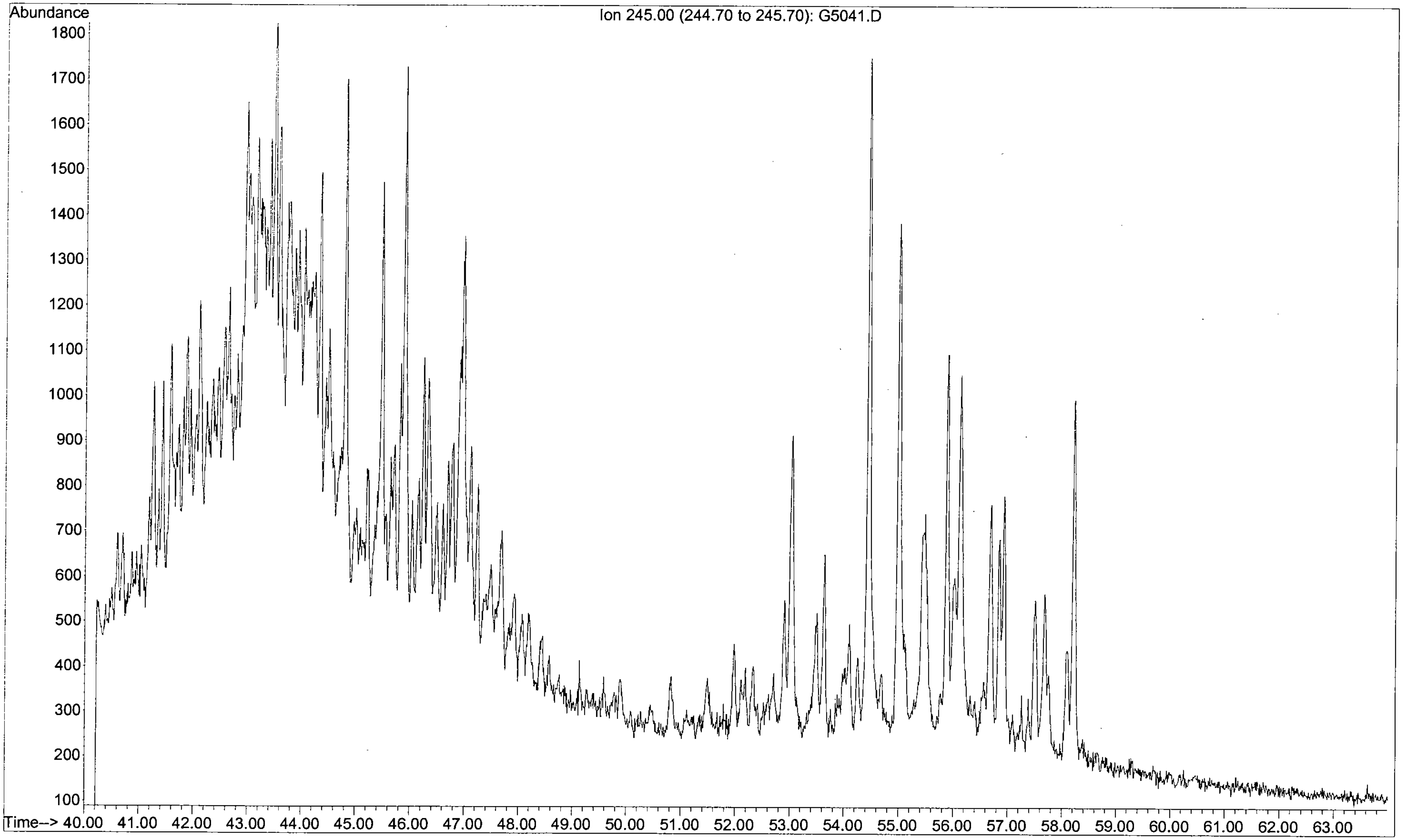
```
File        : G:\G\DATA\SG0319\G5039.D
Operator    : DPB
Acquired    : 12 Feb 2007  12:49 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5522-P-MS(8)
Misc Info   : GWP07DW401 5-157 07-0011
Vial Number: 81
```



```
File        : G:\G\DATA\SG0319\G5040.D
Operator    : DPB
Acquired    : 12 Feb 2007   2:10 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5523-P-MS(8)
Misc Info   : GWP07DW402 5-157 07-0011
Vial Number: 82
```



```
File        : G:\G\DATA\SG0319\G5041.D
Operator    : DPB
Acquired    : 12 Feb 2007   3:33 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5524-P-MS(6)
Misc Info   : GWP07MW9 5-157 07-0011
Vial Number: 83
```



```
File        : G:\G\DATA\SG0319\G4962.D
Operator    : DPB
Acquired    :  7 Feb 2007  10:57 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
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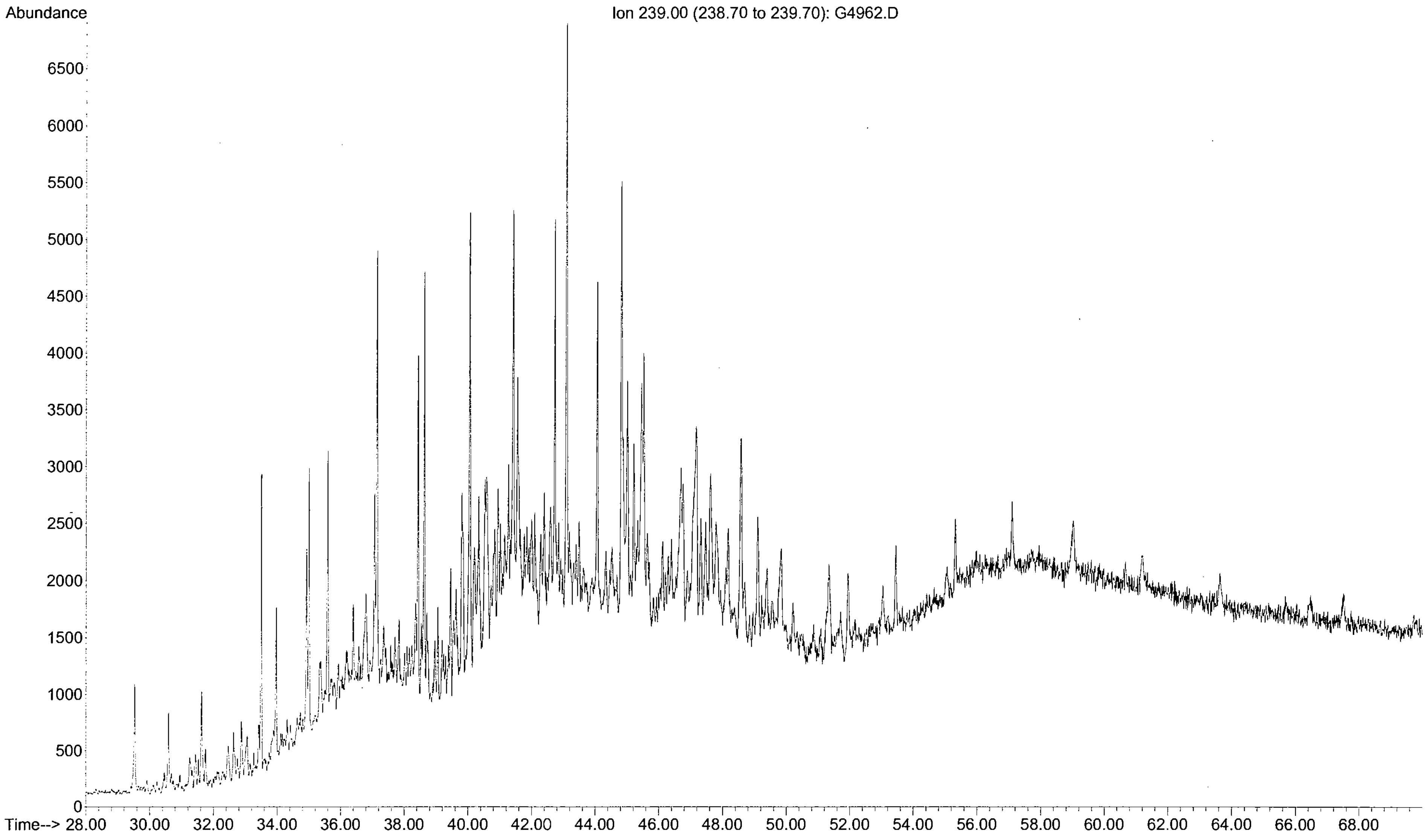
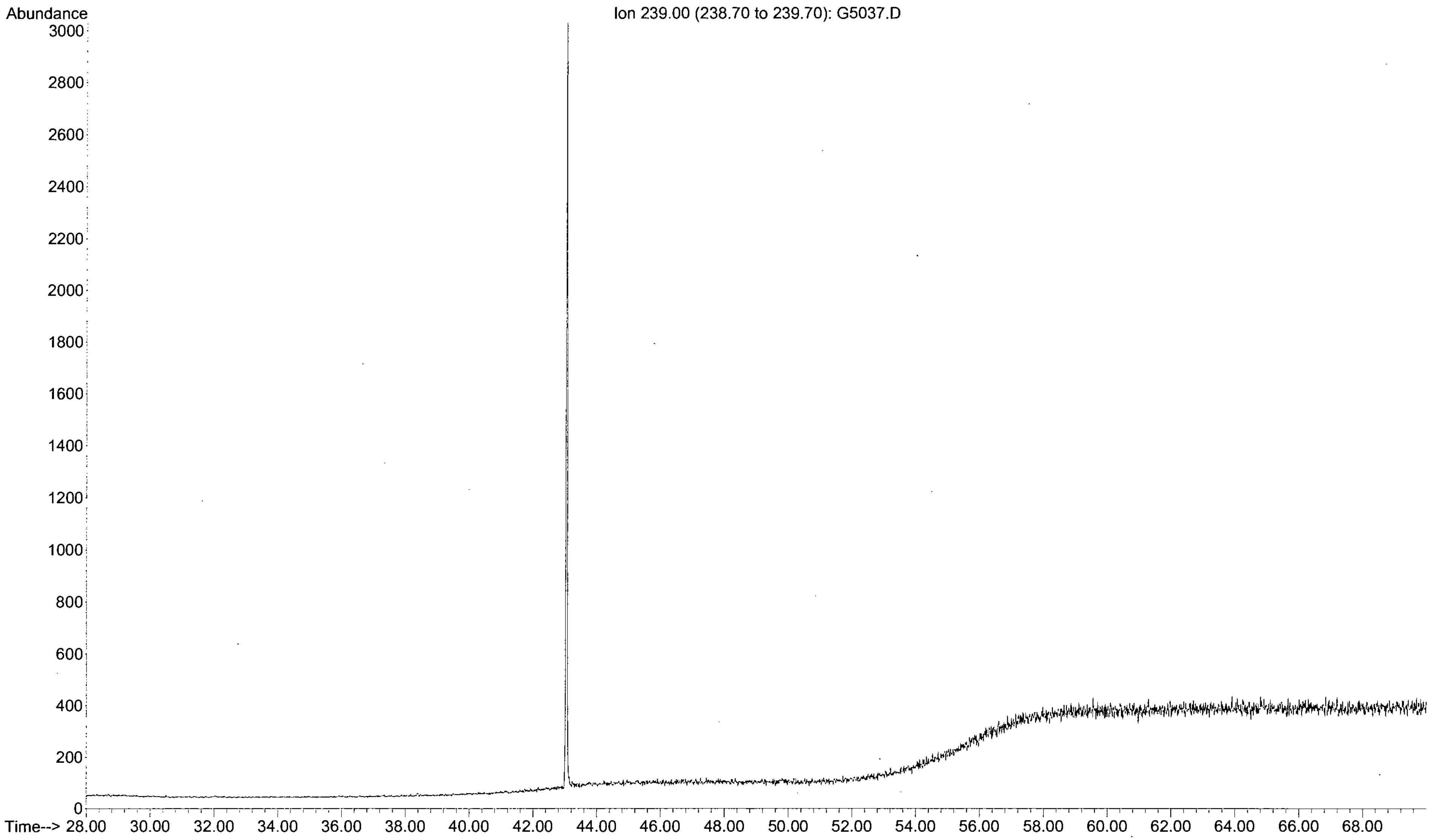
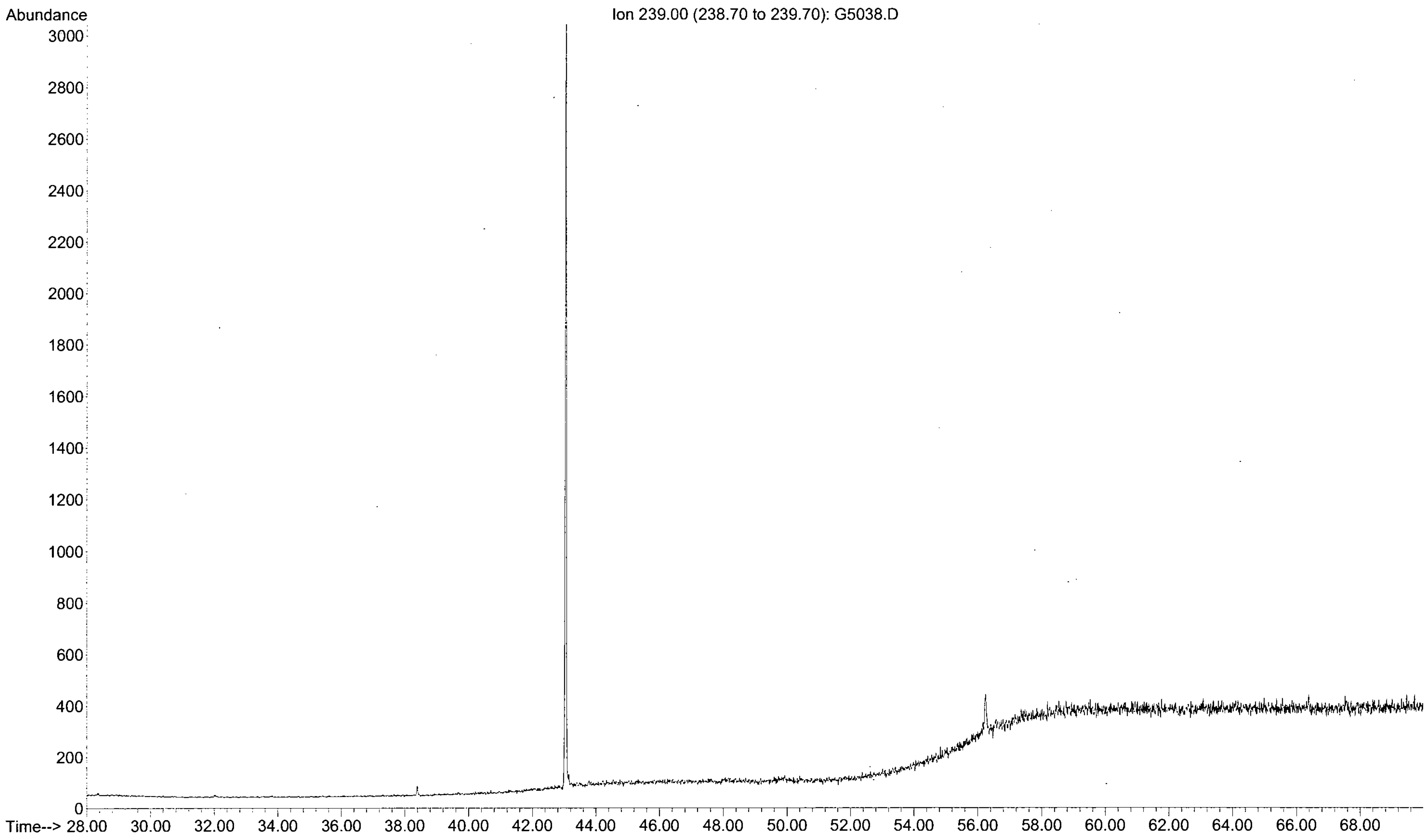
Vial Number: 4
```



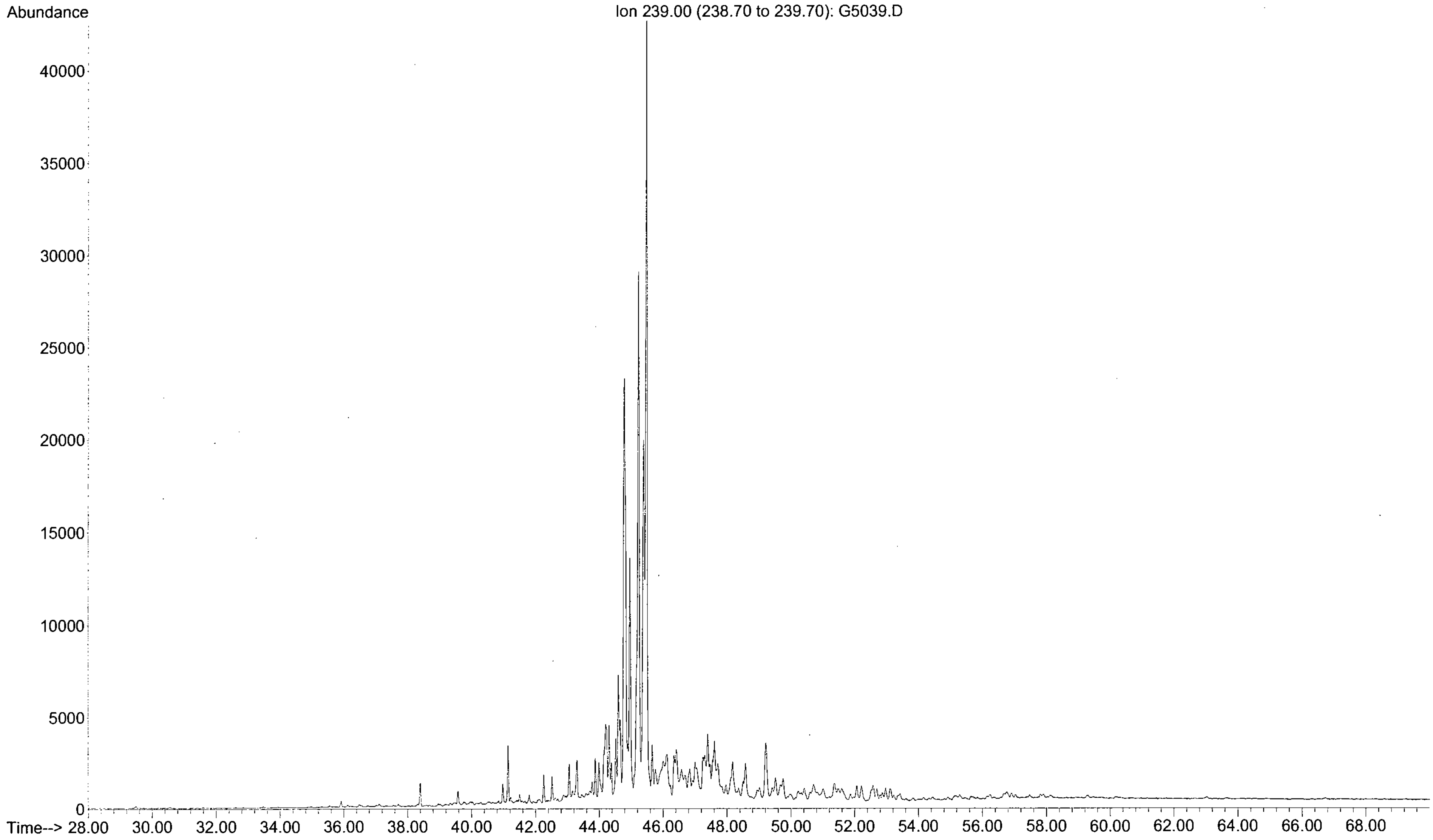
```
File       : G:\G\DATA\SG0319\G5037.D
Operator   : DPB
Acquired   : 12 Feb 2007  10:06 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ941PB-P(0)
Misc Info  : Procedural Blank 5-157 07-0011
Vial Number: 79
```



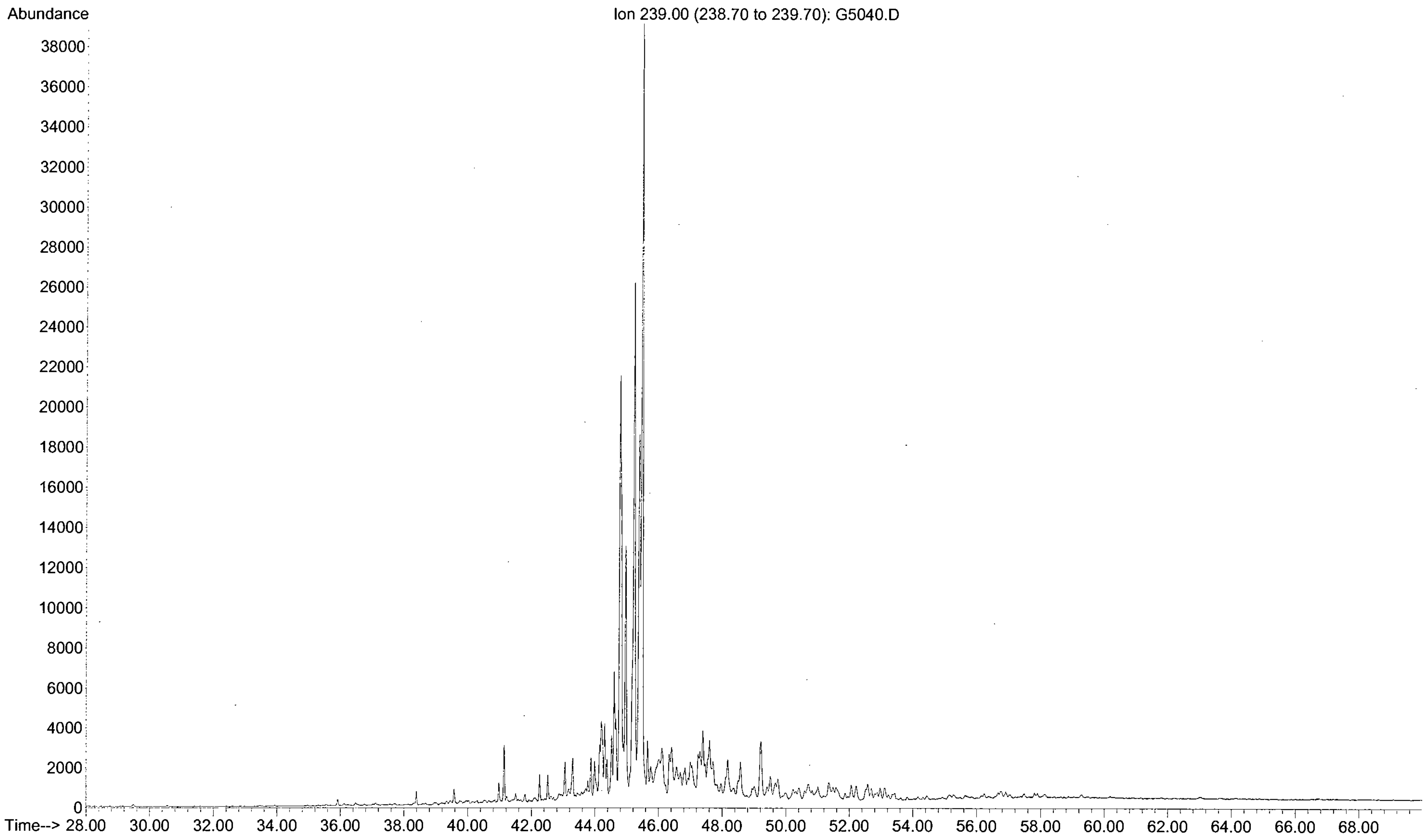
File   : G:\G\DATA\SG0319\G5038.D
Operator   : DPB
Acquired   : 12 Feb 2007 11:28 am using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: BJ942LCS-P(0)
Misc Info   : Laboratory Control Sample 5-157 07-0011
Vial Number: 80



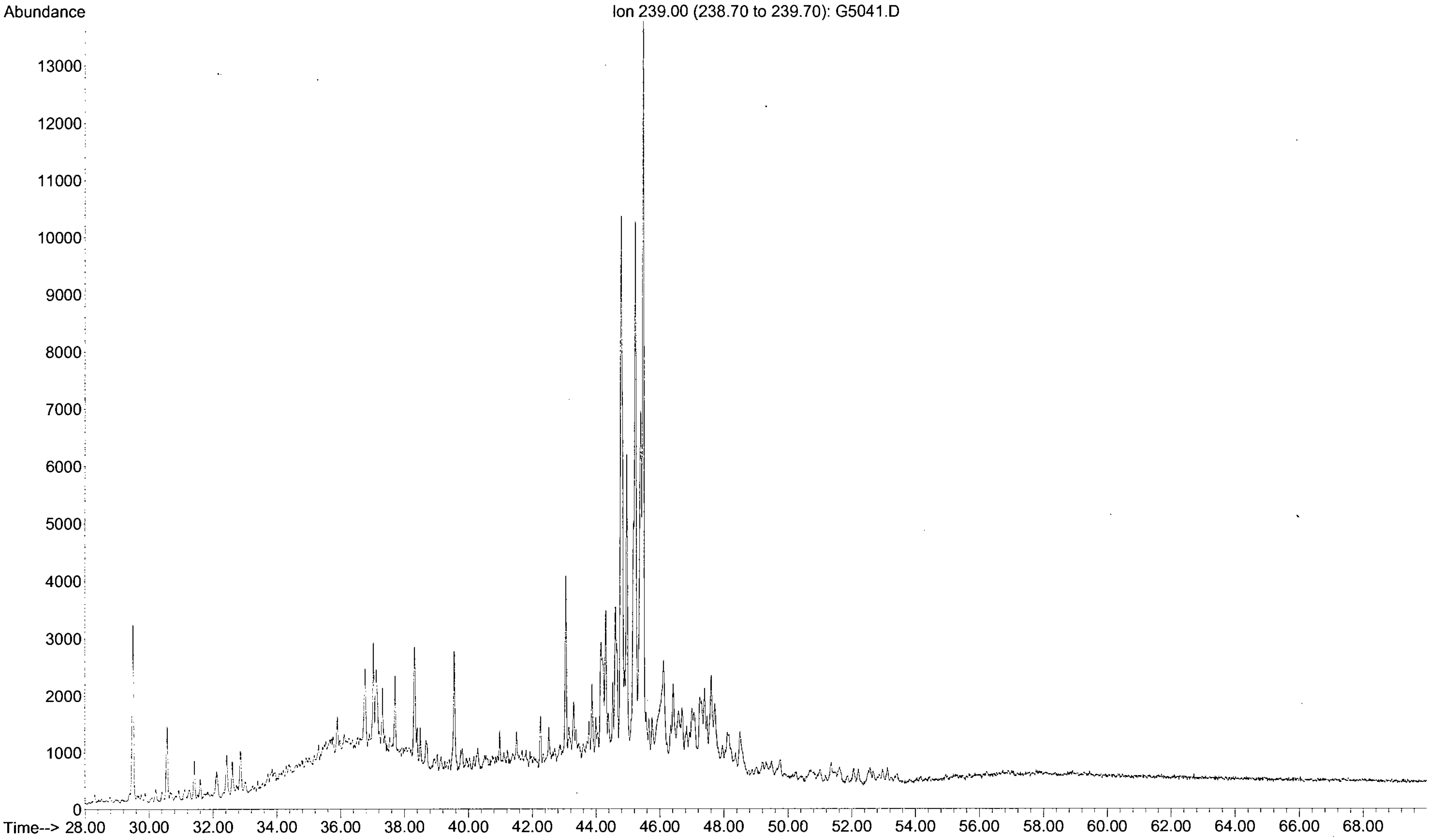
```
File        : G:\G\DATA\SG0319\G5039.D
Operator    : DPB
Acquired    : 12 Feb 2007  12:49 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5522-P-MS(8)
Misc Info   : GWP07DW401 5-157 07-0011
Vial Number: 81
```



```
File       : G:\G\DATA\SG0319\G5040.D
Operator   : DPB
Acquired   : 12 Feb 2007   2:10 pm using AcqMethod BIOPLUS
Instrument :   Inst. G
Sample Name: R5523-P-MS(8)
Misc Info  : GWP07DW402 5-157 07-0011
Vial Number: 82
```



```
File        : G:\G\DATA\SG0319\G5041.D
Operator    : DPB
Acquired    : 12 Feb 2007   3:33 pm using AcqMethod BIOPLUS
Instrument  :   Inst. G
Sample Name: R5524-P-MS(6)
Misc Info   : GWP07MW9 5-157 07-0011
Vial Number: 83
```



Data Qualifiers

Glossary of Data Qualifiers

Flag:	Application:
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank.
D	Dilution Run. Initial run outside linear range of instrument.
E	Estimate, result is greater than the highest concentration level in the calibration.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
J	Analyte detected below the sample-specific Reporting Limit (RL).
ME	Significant Matrix Interference - Estimated value.
MI	Significant Matrix Interference - value could not be determined or estimated.
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria.
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
T	Holding Time (HT) exceeded.
U	Analyte not detected at 3:1 signal:noise ratio. The sample-specific method detection limit (MDL) reported.

Tar Removal and Source Sampling Description Table

Sampling Location	Sample ID	Sample Type	Comments
DW-04	GWP07-DW4	Physical	Well located in Harbor Patrol parking lot
	GWP07-DW401	Forensics	
	GWP07-DW402	Forensics-duplicate	
Station 1	GWP07-T01	Physical	Station east of play barn near blackberry bushes, location with strong naphthalene odor noticed during warmer temperatures. During sampling PID reading of 541 units. Solidified tar removed by Parks.
	GWP07-T01	Forensics	
	GWP07-T02	Forensics	
	GWP07-T03	Forensics-duplicate of T02	
	GWP07-T04	Forensics	
Station 2	GWP07-T05	Physical	Solidified tar seep previously covered with gravel by Parks. Approx. 3' by 3', PID reading around 7 units. Solidified tar removed by Parks.
	GWP07-T05	Forensics	
	GWP07-T06	Forensics	
	GWP07-T07	Forensics	
	GWP07-T10	Physical	Soft vein of tar identified by Jodi and Parks
	GWP07-T10	Forensics	
Station 3	GWP07-T08	Physical	Station NW corner, roots of birch tree on shoreline
	GWP07-T08	Forensics	
	GWP07-T09	Forensics	
Station 4	GWP07-T11	Physical	Aged solidified tar sample east of southerly play barn building. Tar between large pieces of clinker.
	GWP07-T11	Forensics	
Station 5	GWP07-T12	Physical	Aged solidified tar sample embedded with gravel and some clinker. Slightly pliable, in August/September during site visit with Marya
	GWP07-T12	Forensics	
	GWP07-T13	Forensics	
Station 6	GWP07-T14	Forensics	Possible solidified tar intermixed with dirt and gravel, faint naphthalene odor, small quantity collected (~1 oz).
Structure 1	GWP07-S01	Physical	Structure is a historical scrubber located in the secured/fenced "Cracking Towers" area.
	GWP07-S01	Forensics	
	GWP07-S02	Forensics	
Structure 2	GWP07-S03	Forensics	Structure is a historical scrubber located west of the play barn in fenced area, not locked. Only small quantity of tar available.
Structure 3	GWP07-S04	Physical	Structure is a historical scrubber located west of structure 2 and the play barn in fenced area, not
	GWP07-S04	Forensics	
MW-9	GWP07-MW9	Physical	Well located SW of play barn and SE of structures 2 and 3
	GWP07-MW9	Forensics	

ATTACHMENT 2D-6

Battelle November 2007 Data Report

Battelle
The Business *of* Innovation

Duxbury Operations
397 Washington Street
Duxbury, Massachusetts 02332
Telephone 781-934-0571
Fax: 781-934-2124

RECEIVED
NOV 16 2007
BY:

November 15, 2007

Ms. Lisa Meoli
Floyd/Snyder
Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101

Subject: Data Delivery – Gas Works Park

Dear Ms. Meoli:

Enclosed please find analytical data associated with the Gas Works Park project. The deliverable includes sample custody records, all analytical data tables (including QC data), GC chromatograms, PAH histograms, biomarker EICPs, and a data quality narratives associated with the data set. The narrative includes custody information, a summary of the processing and analysis methods, holding time information, and a discussion of issues related to quality control samples analyzed with the sample batch.

Please call me at (781) 952-5235 if you have any questions or you need additional information.

Sincerely,

Robert Lizotte, Jr.
Research Scientist

Chain of Custody Record & Laboratory Analysis Request

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

ARI Assigned Number: CS43
Turn-around Requested: Normal TAT
Page: 1 of 1
ARI Client Company: Floyd | Snider
Phone: 206·292·2078
Date: 10/3/07
Ice Present? √
Client Contact: Jessi Massingale
No. of Coolers: —
Cooler Temps: Amb
Client Project Name: Gasworks
Client Project #: COS-LCES
Samplers: L. Meoli; M. King

Sample ID	Date	Time	Matrix	No. Containers	[illegible]	Dx	Split volume to bottle						Notes/Comments
MW-9	10/3/07	14:00	product	2	✓	✓	✓						LNAPL

Analysis Requested

Comments/Special Instructions

Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
Printed Name: Lisa Meoli	Printed Name: Brian Kehel	Printed Name:	Printed Name:
Company: Floyd Snider	Company: ARI	Company:	Company:
Date & Time: 1430 10/3/07	Date & Time: 1430 10/3/7	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: CR81
Turn-around Requested: Standard
ARI Client Company: Floyd|Snider
Phone: (206) 292-2078
Client Contact: Jessi Massingale
Client Project Name: COS-LCES
Client Project #: COS-LCES
Samplers:

Date: September 28, 2007
Page: 1 of 1
No. of Coolers:
Cooler Temps: 2.6

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

					Analysis Requested								
Sample ID	Date	Time	Matrix	No. Containers	Method 8270	8270 by Extraction from SPLP	Method 8260	NWTPH-Dx					Notes/Comments
SB-2 S5 8-9.5	09/28/07		Soil				✓	✓					Please only use 2.5 oz and archive the remainder for forensic analysis.
SB-8 S5 9-10.5	09/28/07		Soil				✓	✓					Please only use 2.5 oz and archive the remainder for forsenic analysis.
SB-13 25-4.0	09/28/07		Soil		✓	✓							
SB-12A S3 5-6.5	09/28/07		Soil										Please archive total sample volume for forensic analysis.

Comments/Special Instructions
Please see comments regarding sample volume. Hold partial volume for SB-2 and SB-8 until further instruction. Hold total volume for SB-12A until further instruction.

Relinquished by:	Received by:	Relinquished by:	Received by:
(Signature)	(Signature)	(Signature)	(Signature)
Printed Name: Lisa Meoli	Printed Name:	Printed Name:	Printed Name:
Company: Floyd|Snider	Company:	Company:	Company:
Date & Time: 9.28.07 11:30	Date & Time:	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: LR80
Turn-around Requested: Standard
ARI Client Company: Floyd|Snider
Phone: (206) 292-2078
Client Contact: Jessi Massingale
Client Project Name: Gas Works Park - COS (NE Corner)
Client Project #: Gas Works Park - COS
Samplers:

Date: September 28, 2007
Page: 1 of 1
No. of Coolers:
Cooler Temps: 2.6

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

					Analysis Requested								Notes/Comments
Sample ID	Date	Time	Matrix	No. Containers	Method 8270	Method 8260	8270 by Extraction from SPLP	NWTPH-Dx					
SB-3 S5 10-11.5	09/28/07		Soil		✓								
SB-6 S2 1-2.0	09/28/07		Soil		✓		✓						
SB-10 S7 15-16.5	09/28/07		Soil		✓								
GP-12 S2 23-24	09/28/07		Soil		✓	✓							
GP-1 12.5-13	09/28/07		Soil		✓								
GP-11 14-14.5	09/28/07		Soil		✓	✓							
GP-12 S1 8-12	09/28/07		Soil			✓							Please only use 1 oz of sample and archive remainder.
GP-9 7-8	09/28/07		Soil			✓		✓					Please only use 2 oz of sample and archive remainder

Comments/Special Instructions
Please see comments regarding sample volume.

Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
Printed Name: Lisa Reel	Printed Name:	Printed Name:	Printed Name:
Company: Floyd|Snider	Company:	Company:	Company:
Date & Time: 9.28.07 11:30	Date & Time:	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Battelle
The Business of Innovation

Data Report

Gas Works Park
November 2007

Prepared For:

Lisa Meoli
Floyd/Snider
Two Union Square
601 Union Street
Seattle, WA 98101

Prepared By:

Battelle
397 Washington Street
Duxbury, Massachusetts 02332

Chain of Custody

Battelle
The Business of Innovation

ShpNo SHP-071009-02

Battelle Project No: **OP47854**

Sample Receipt Form

Approved: ☑ ☐

Project Number:

Client: ARI / Floyd-Snider

Received by: Seyfert, Jeannine

Date/Time Received: Tuesday, October 09, 2007 12:00 AM

No. of Shipping Containers: 1

SHIPMENT

Method of Delivery: Commercial Carrier

Tracking Number: 1Z-832-695-01-4511-8864

COC Forms: ☑ **Shipped with samples** ☐ **No Forms**

Cooler(s)/Box(es)

Cntr	Type	Tracking No.	Seal	Seal Condition	Container Condition	Temp C	Smps
1 of 1	Cardboard Bo	1Z-832-695-01-4511-8864	Tape	Intact	Intact	0.6	7

Samples

Sample Labels:
☑ Sample labels agree with COC forms
☐ Discrepancies (see Sample Custody Corrective Action Form)

Container Seals:
☐ Tape ☐ Custody Seals ☐ Other Seals (See sample Log)
☑ Seals intact for each shipping container
☐ Seals broken (See sample log for impacted samples)

Condition of Samples:
☐ Sample containers intact
☑ Sample containers broken/leaking (See Custody Corrective Action Form)

Temperature upon receipt (°C): 0.6 Temperature Blank used ☐ Yes ☑ No
(Note: If temperature upon receipt differs from required conditions, see sample log comment field)

Samples Acidified: ☐ Yes ☐ No ☑ Unknown

Initial pH 5-9?: ☐ Yes ☐ No ☑ NA
If no, individual sample adjustments on the Auxiliary Sample Receipt Form

Total Residual Chlorine Present?: ☐ Yes ☐ No ☑ NA
If yes, individual sample adjustments on the Auxiliary Sample Receipt Form

Head Space <1% in samples for water VOC analysis: ☐ Yes ☐ No ☑ NA
Individual sample deviations noted on sample log

Samples Containers:
Samples returned in PC-grade jars: ☑ Yes ☐ No ☐ Unknown /Lot No.: UnKnown

Storage Location: Chem North: Freezer - F0002 (Walk-in) **BDO IDs Assigned:** Q0540 - Q0546

Samples logged in by: Seyfert, Jeannine **Date/Time:** 10/09/2007 12:00 AM

Approved By: Brackett, Roxanne **Approved On:** 11/12/2007 12:

Authorized By: **Authorized On:**

Battelle
The Business of Innovation

ShpNo: SHP-071009-02
Battelle Project No: OP47854

Report Corrective Actions

Corrective Action No: 1 of 1
☐ **Approved:** ☑

COC Client: ARI / Floyd-Snider
COC Project: Gasworks Park
COC Date: 10/9/2007 1:42:00 PM

	Description of Problem:	**Explanation:**
Sample Container Integrity	Sample leaking	Sample Q0540 (MW-9) had some oil residue on the outside of the container as well as on the inner side of the bubble wrap it was wrapped in. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples.
Temperature and Preservation	Receipt temperature outside of acceptability	The cooler temperature upon receipt was outside of the 4+/- 2 degree range of acceptibility.

Documentation of project manager notification

Sample Custodian Seyfert, Jeannine **Date:** 10/9/2007 1:58:00 PM
Laboratory Manager: Thorn, Jonathan **Date:** 11/6/2007 7:33:00 AM
Project Manager: Krahforst, Kerylynn **Date:** 11/12/2007 12:00:00 P

Documentation of client notification (should be completed by project manager within 24 hrs):

On 16-Oct-07 **I contacted** Meoli, Lisa **at** Floyde|Snider

Results of communication with client (Describe any corrective action directed by the client):

The client was notified of the corrective action. Proceed with analysis.

Date this form was received back to the custodian: ________
Reference Number: ________

Battelle
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ShpNo SHP-071009-02

Battelle Project No: OP47854

Sample Receipt Form Details

Approved: ☑ Authorized ☐

Project Number:

Client: ARI / Floyd-Snider

Received by: Seyfert, Jeannine

Date/Time Received: Tuesday, October 09, 2007 12:00 AM

No. of Shipping Containers: 1

BDO Id:	Client Sample ID:	Collection Date:	Login Date:	Ctrs:	Matrix:	Temp:	pH:	TRC:	VOC:	Stored In:	Loc:	No:	Comments:
Q0540	MW-9	10/03/07 0:00	10/09/07 13:47	1	NAPL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-21114-LS43A
Q0541	SB-2 S5 8-9.5	09/17/07 0:00	10/09/07 13:47	1	SOIL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-20838-LR81A
Q0542	SB-8 S5 9-10.5	09/18/07 0:00	10/09/07 13:48	1	SOIL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-20839-LR81B
Q0543	SB-13 2.5-4.0	09/20/07 0:00	10/09/07 13:49	1	SOIL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-20840-LR81C
Q0544	SB-12A S3 5-6.5	09/20/07 0:00	10/09/07 13:50	1	SOIL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-20842-LR81E
Q0545	GP-12 S2 23-24	09/20/07 0:00	10/09/07 13:52	1	SOIL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-20828-LR80D
Q0546	GP-9 7-8	09/18/07 0:00	10/09/07 13:53	1	SOIL	0.6	NA	NA	NA	F0002 (Walk-in)	BIN	87	07-20832-LR80H

Total Samples: 7

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 10/04/07

ANALYTICAL RESOURCES INCORPORATED

ARI Project: LS43

Laboratory: Battelle Laboratories Duxbury
Lab Contact: Kerylynn Krahforst
Lab Address: 397 Washington Street
Duxbury, MA 02332
Phone:
Fax:

ARI Client: Floyd-Snider
Project ID: Gasworks
ARI PM: Sue Dunnihoo
Phone: 206-695-6207
Fax: 206-695-6201

Analytical Protocol: In-house
Special Instructions:

Requested Turn Around: **10/17/07**
Fax Results (Y/N): **Y**

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses	Battelle ID
07-21114-LS43A	MW-9	10/03/07	Product	1	WILDCARD	QC540

Special Instructions: None

Carrier UPS	Airbill 1Z832695 01 4511 8864		Date 10/8/7
Relinquished by	Company ARI	Date 10/8/7	Time 1600
Received by Jeannine Seyfert	Company Battelle Duxbury	Date 10/9/07	Time 1300

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 10/04/07

ANALYTICAL RESOURCES INCORPORATED

ARI Project: LR81

Laboratory: Battelle Laboratories Duxbury
Lab Contact: Kerylynn Krahforst
Lab Address: 397 Washington Street
Duxbury, MA 02332
Phone:
Fax:

ARI Client: Floyd-Snider
Project ID: COS-LCES
ARI PM: Sue Dunnihoo
Phone: 206-695-6207
Fax: 206-695-6201

Analytical Protocol: In-house
Special Instructions:

Requested Turn Around: **10/17/07**
Fax Results (Y/N): **Yes**

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses	Battelle ID
07-20838-LR81A	SB-2 S5 8-9.5	09/17/07	Soil	1	WILDCARD	Q0541
Special Instructions: None						
07-20839-LR81B	SB-8 S5 9-10.5	09/18/07	Soil	1	WILDCARD	Q0542
Special Instructions: None						
07-20840-LR81C	SB-13 2.5-4.0	09/20/07	Soil	1	WILDCARD	Q0543
Special Instructions: None						
07-20842-LR81E	SB-12A S3 5-6.5	09/20/07	Soil	1	WILDCARD	Q0544
Special Instructions: None						

Carrier UPS	Airbill		Date
Relinquished by	Company ARI	Date 10/8/7	Time 1600
Received by Jeannine Haight	Company Battelle Duxbury	Date 10/9/7	Time 13:00

SUBCONTRACTOR ANALYSIS REQUEST
CUSTODY TRANSFER 10/04/07

ANALYTICAL RESOURCES INCORPORATED

ARI Project: LR80

Laboratory: Battelle Laboratories Duxbury
Lab Contact: Kerylynn Krahforst
Lab Address: 397 Washington Street
Duxbury, MA 02332
Phone:
Fax:

ARI Client: Floyd-Snider
Project ID: Gas Works Park-COS (NE Corner)
ARI PM: Sue Dunnihoo
Phone: 206-695-6207
Fax: 206-695-6201

Analytical Protocol: In-house
Special Instructions:

Requested Turn Around: **10/17/07**
Fax Results (Y/N): **Yes**

Limits of Liability. *Subcontractor is expected to perform all requested services in accordance with appropriate methodology following Standard Operating Procedures that meet standards for the industry. The total liability of ARI, its officers, agents, employees, or sucessors, arising out of or in connection with the requested services, shall not exceed the negotiated amount for said services. The agreement by the Subcontractor to perform services requested by ARI releases ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Subcontractor.*

ARI ID	Client ID/ Add'l ID	Sampled	Matrix	Bottles	Analyses	
07-20828-LR80D	GP-12 S2 23-24	09/20/07	Soil	1	WILDCARD	Q0545
Special Instructions: None						
07-20832-LR80H	GP-9 7-8	09/18/07	Soil	1	WILDCARD	Q0546
Special Instructions: None						

Carrier UPS	Airbill		Date
Relinquished by	Company ARI	Date 10/8/7	Time 1600
Received by Jeannine	Company Battelle Duxbury	Date 10/9/07	Time 13:00

Subcontractor Custody Form - **LR80**
Page 1 of 1

SHC Data and Chromatograms

SHC and TPH – SEDIMENT QA/QC SUMMARY
Batch 07-0259

PROJECT:	Floyd/Snyder – Gas Works Park
PARAMETER:	Saturated Hydrocarbons (SHC) and Total Petroleum Hydrocarbons (TPH)
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Sediment
SAMPLE CUSTODY:	Six soil samples and 1 NAPL were received at Battelle Duxbury Operations (BDO) Laboratory on 10/9/07. Upon Receipt of the samples, the temperature of the cooler was taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was slightly below the acceptable range (4°C ± 2°) at 0.6°C. Also, it was noted that sample Q0540 (MW-9) had some oil residue on the outside of the container as well as the inner side of the bubble wrap. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples. The client was notified on 10/16/07. The laboratory was instructed to proceed with the analysis. Samples were stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS Recovery	MS/MSD Precision	Control Oil % Diff
SHC and TPH	General NS&T	<5xMDL	40-120% Recovery	40-120% Recovery	40-120% Recovery MS target spike must be >5x background	≤30% RPD	PD,30% for 90% of the analytes

METHOD:

Soil samples were extracted following general NS&T methods. Approximately 5-8 g of sample was spiked with SHC and PAH surrogates and serial extracted three times with dichloromethane using orbital shaker table techniques. The combined extracts were dried over anhydrous sodium sulfate and concentrated by Kuderna-Danish and nitrogen evaporation techniques. The sample extracts were split in half: one-half of the extract was removed for archiving; the other half was processed through an alumina gravity column to isolate the hydrocarbon fractions of interest. The weights of the resulting extracts were determined gravimetrically. The extracts were concentrated to 1 mL, split, and spiked with internal standard (IS). The pre-injection volume and/or extract split were adjusted to 5mg/mL. One extract was submitted for PAH and the second extract was submitted for SHC and TPH analysis.

SHC and TPH were measured by gas chromatography with flame ionization detection (GC/FID). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of the analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of SHC and TPH were calculated by the internal standard method. Normal alkanes were quantified using the average RF generated from the initial calibration. TPH concentrations were quantified suing the average RF of nC8 through nC40. Isoprenoid hydrocarbon concentrations were quantified using the average RF of the n-alkanes immediately preceding and immediately following each target isoprenoid hydrocarbon.

HOLDING TIMES:

Samples were prepared for analysis in three analytical batches and were extracted within 30 days of sample collection analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0259	10/15/2007	10/18/2007 – 10/19/2007

SHC and TPH – SEDIMENT QA/QC SUMMARY

Batch 07-0259

PROCEDURAL BLANK (PB): A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0259 – No exceedences noted.

Comments – None.

LABORATORY CONTROL SAMPLE (LCS): A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0259 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY: Two surrogate compounds were added prior to extraction, including o-terphenyl and 5a-androstane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0259 – No exceedences noted.

Comments – None.

CONTROL OIL: A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0259 – No exceedences noted.

Comments – None.

CALIBRATIONS: The GC/FID is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (% RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be ≤20%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be ≤25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be ≤25%.

07-0259 – No exceedences noted.

Comments – None.

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-2 S5 8-9.5	GP-12 S2 23-24
Battelle ID	Q0541-P	Q0545-P
Sample Type	SA	SA
Collection Date	09/17/07	09/20/07
Extraction Date	10/15/07	10/15/07
Analysis Date	10/18/07	10/19/07
Analytical Instrument	FID	FID
% Moisture	18.05	26.35
% Lipid	NA	NA
Matrix	SOIL	SOIL
Sample Size	4.59	3.93
Size Unit-Basis	G_DRY	G_DRY
Units	UG/G_DRY	UG/G_DRY
n-Nonane	U	U
n-Decane	U	U
n-Undecane	U	U
n-Dodecane	U	U
n-Tridecane	U	U
Isoprenoid RRT 1380	U	U
n-Tetradecane	U	U
Isoprenoid RRT 1470	U	U
n-Pentadecane	165.07	9.04
n-Hexadecane	86.55	28.62
Norpristane (1650)	U	U
n-Heptadecane	U	U
Pristane	213.07	U
n-Octadecane	228.64	82.21
Phytane	180.99	22.17
n-Nonadecane	4.97	1.05 J
n-Eicosane	U	U
n-Heneicosane	U	9.78
n-Docosane	U	U
n-Tricosane	U	U
n-Tetracosane	U	U
n-Pentacosane	U	U
n-Hexacosane	U	U
n-Heptacosane	U	U
n-Octacosane	U	U
n-Nonacosane	U	11.65
n-Triacontane	U	U
n-Hentriacontane	U	U
n-Dotriacontane	U	2.18
n-Tritriacontane	U	6.11
n-Tetratriacontane	U	3.08
n-Pentatriacontane	U	U
n-Hexatriacontane	U	U
n-Heptatriacontane	U	U
n-Octatriacontane	U	U
n-Nonatriacontane	U	U
n-Tetracontane	U	U
TPH(total)	19288.58	2228.21

Surrogate Recoveries (%)

O-Terphenyl	113	96
5a-androstane	117	101

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL033PB-P
Sample Type	PB
Collection Date	10/15/07
Extraction Date	10/15/07
Analysis Date	10/18/07
Analytical Instrument	FID
% Moisture	22.07
% Lipid	NA
Matrix	SEDIMENT
Sample Size	11.03
Size Unit-Basis	G_DRY
Units	UG/G_DRY
n-Nonane	U
n-Decane	U
n-Undecane	U
n-Dodecane	U
n-Tridecane	U
Isoprenoid RRT 1380	U
n-Tetradecane	U
Isoprenoid RRT 1470	U
n-Pentadecane	U
n-Hexadecane	U
Norpristane (1650)	U
n-Heptadecane	U
Pristane	U
n-Octadecane	U
Phytane	U
n-Nonadecane	U
n-Eicosane	U
n-Heneicosane	U
n-Docosane	U
n-Tricosane	U
n-Tetracosane	U
n-Pentacosane	U
n-Hexacosane	U
n-Heptacosane	U
n-Octacosane	U
n-Nonacosane	U
n-Triacontane	U
n-Hentriacontane	U
n-Dotriacontane	U
n-Tritriacontane	U
n-Tetratriacontane	U
n-Pentatriacontane	U
n-Hexatriacontane	U
n-Heptatriacontane	U
n-Octatriacontane	U
n-Nonatriacontane	U
n-Tetracontane	U
TPH(total)	U

Surrogate Recoveries (%)

O-Terphenyl	91
5a-androstane	94

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70				
Battelle ID	BL034LCS-P				
Sample Type	LCS				
Collection Date	10/15/07				
Extraction Date	10/15/07				
Analysis Date	10/18/07				
Analytical Instrument	FID				
% Moisture	NA				
% Lipid	NA				
Matrix	SEDIMENT				
Sample Size	NA				
Size Unit-Basis	NA				
Units	UG		Target	% Recovery	Qualifier
n-Nonane	70.5		100.00	71	
n-Decane	79.72		100.00	80	
n-Undecane	74.9		100.00	75	
n-Dodecane	79		100.00	79	
n-Tridecane	78.16		100.00	78	
Isoprenoid RRT 1380		U			
n-Tetradecane	79.07		100.00	79	
Isoprenoid RRT 1470		U			
n-Pentadecane	81.89		100.00	82	
n-Hexadecane	82.76		100.00	83	
Norpristane (1650)		U			
n-Heptadecane	81.82		100.00	82	
Pristane	83.15		100.00	83	
n-Octadecane	83.37		100.00	83	
Phytane	82.3		100.00	82	
n-Nonadecane	83.61		100.00	84	
n-Eicosane	84.32		100.00	84	
n-Heneicosane	83.54		100.00	84	
n-Docosane	86.84		100.00	87	
n-Tricosane	84.72		100.00	85	
n-Tetracosane	85.21		100.00	85	
n-Pentacosane	86.59		100.00	87	
n-Hexacosane	84.71		100.00	85	
n-Heptacosane	85.55		100.00	86	
n-Octacosane	82.19		100.00	82	
n-Nonacosane	87.14		100.00	87	
n-Triacontane	82.99		100.00	83	
n-Hentriacontane	81.33		100.00	81	
n-Dotriacontane	82.94		100.00	83	
n-Tritriacontane	81.16		100.00	81	
n-Tetratriacontane	78.57		100.00	79	
n-Pentatriacontane	79.91		100.00	80	
n-Hexatriacontane	71.72		100.00	72	
n-Heptatriacontane	67.74		100.00	68	
n-Octatriacontane	65.06		100.00	65	
n-Nonatriacontane	58.22		100.00	58	
n-Tetracontane	53.38		100.00	53	
TPH(total)		U			

Surrogate Recoveries (%)

O-Terphenyl	82
5a-androstane	86

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude			
Battelle ID	BL041NSC-P			
Sample Type	NSC			
Collection Date	10/17/07			
Extraction Date	10/17/07			
Analysis Date	10/18/07			
Analytical Instrument	FID			
% Moisture	NA			
% Lipid	NA			
Matrix	OIL			
Sample Size	5.04			
Size Unit-Basis	G_OIL			
Units	UG/G_OIL	Target	% Difference	Qualifier
n-Nonane	5.03	4.67	7.7	
n-Decane	4.79	4.95	3.3	
n-Undecane	4.31	4.51	4.4	
n-Dodecane	4.17	4.58	8.9	
n-Tridecane	4.02	4.19	4.0	
Isoprenoid RRT 1380	0.9	0.96	6.4	
n-Tetradecane	3.85	3.92	1.8	
Isoprenoid RRT 1470	1.5	1.53	2.1	
n-Pentadecane	3.86	3.99	3.3	
n-Hexadecane	3.34	3.64	8.2	
Norpristane (1650)	1.16	1.14	1.6	
n-Heptadecane	3.11	3.08	1.0	
Pristane	2.23	2.28	2.2	
n-Octadecane	2.88	2.80	3.0	
Phytane	1.4	1.66	15.7	
n-Nonadecane	2.56	2.54	0.8	
n-Eicosane	2.53	2.50	1.1	
n-Heneicosane	2.24	2.42	7.4	
n-Docosane	2.21	2.25	1.9	
n-Tricosane	1.98	2.05	3.4	
n-Tetracosane	1.89	1.95	3.0	
n-Pentacosane	1.71	1.80	4.8	
n-Hexacosane	1.58	1.64	3.6	
n-Heptacosane	1.18	1.23	4.1	
n-Octacosane	0.94	1.00	6.4	
n-Nonacosane	0.8	0.87	8.3	
n-Triacontane	0.67	0.67	0.1	
n-Hentriacontane	0.66	0.61	8.8	
n-Dotriacontane	0.42	0.47	9.9	
n-Tritriacontane	0.43	0.40	7.8	
n-Tetratriacontane	0.34	0.37	8.5	
n-Pentatriacontane	0.4	0.38	5.8	
n-Hexatriacontane	0.23 J	0.24	2.4	
n-Heptatriacontane	0.2 J	0.21	4.8	
n-Octatriacontane	0.21 J	0.21	2.1	
n-Nonatriacontane	0.16 J	0.15	4.0	
n-Tetracontane	0.15 J	0.16	7.2	
TPH(total)	475.83	578.97	17.8	

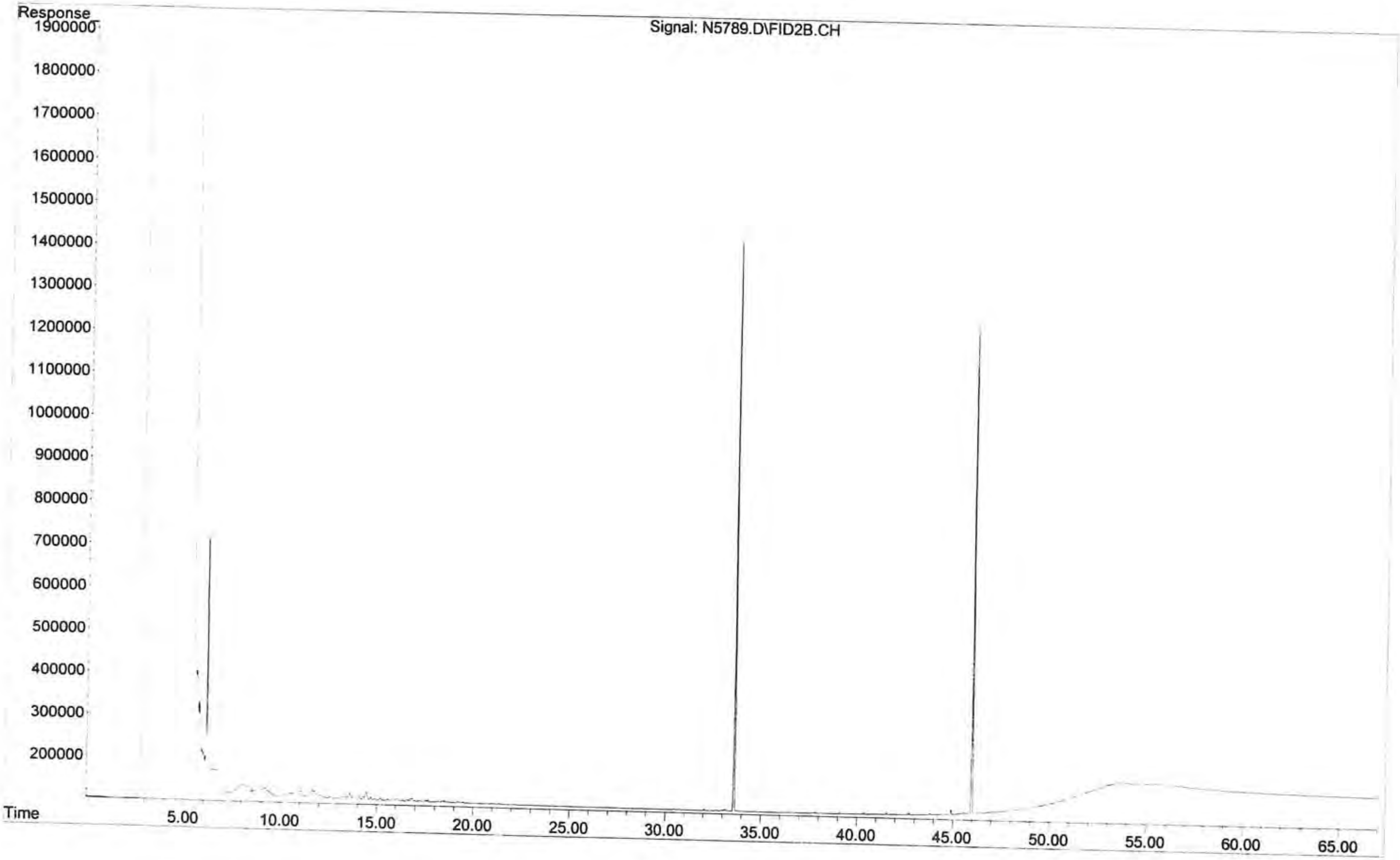
Surrogate Recoveries (%)

O-Terphenyl	95
5a-androstane	100

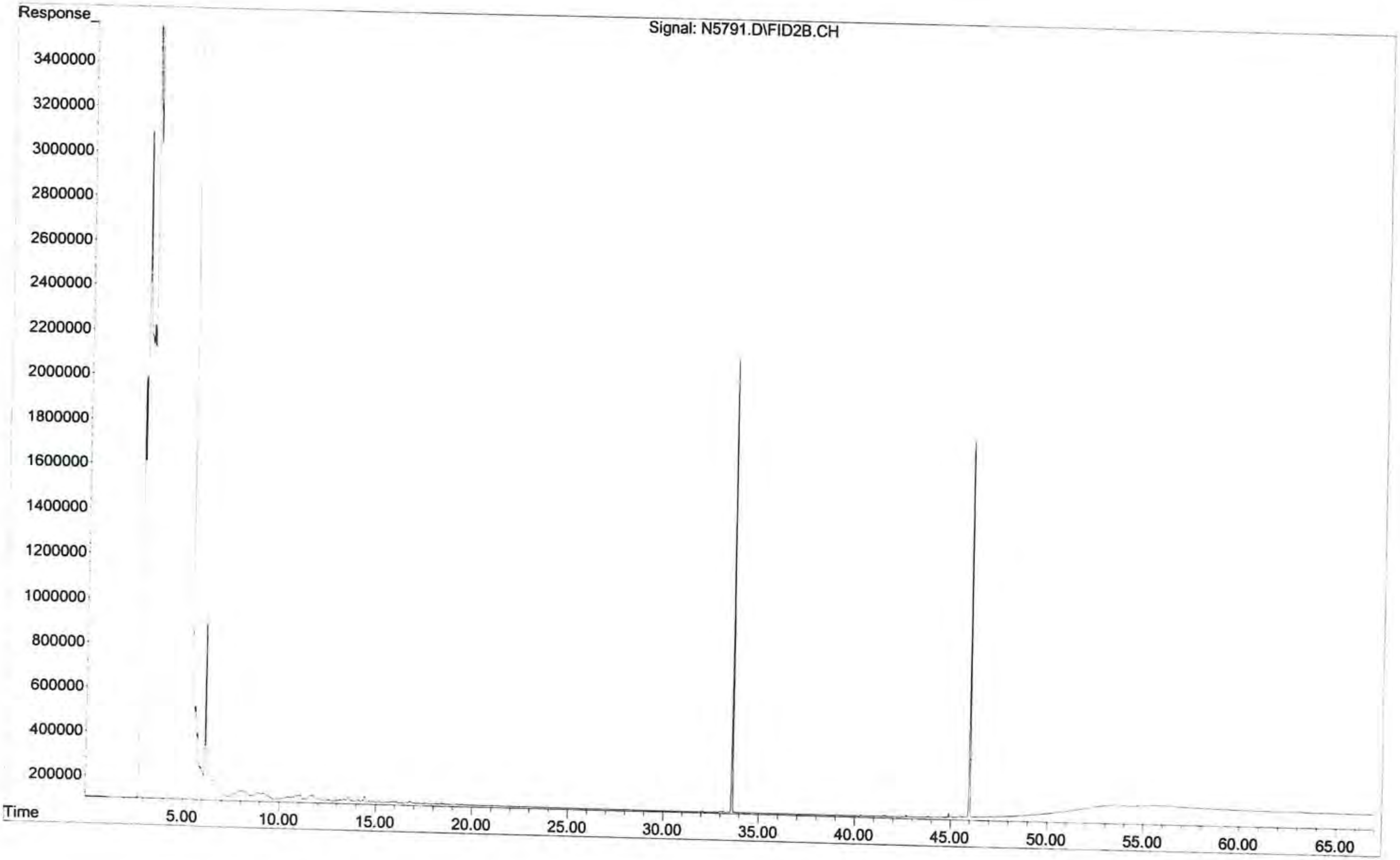
Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

```
File          : F:\N\DATA\SN0256.SEC\N5789.D
Operator      : MM
Acquired      : 10-18-2007 01:09:38 PM using AcqMethod TPH.M
Instrument    :   Inst. N
Sample Name:  BL044SOL-P(0)
Misc Info     : Solvent blank. 5-202 07-0259
Vial Number: 4
```



```
File        : F:\N\DATA\SN0256.SEC\N5791.D
Operator    : MM
Acquired    : 10-18-2007 02:29:27 PM using AcqMethod TPH.M
Instrument  :    Inst. N
Sample Name: BL045SOL-P(0)
Misc Info   : Solvent blank. 5-202 07-0259
Vial Number: 5
```



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File        : F:\N\DATA\SN0256.SEC\N5793.D
Operator    : MM
Acquired    : 10-18-2007 03:49:20 PM using AcqMethod TPH.M
Instrument  :   Inst. N
Sample Name: BL033PB-P-FID(4)
Misc Info   : Procedural Blank 5-202 07-0259
Vial Number: 6
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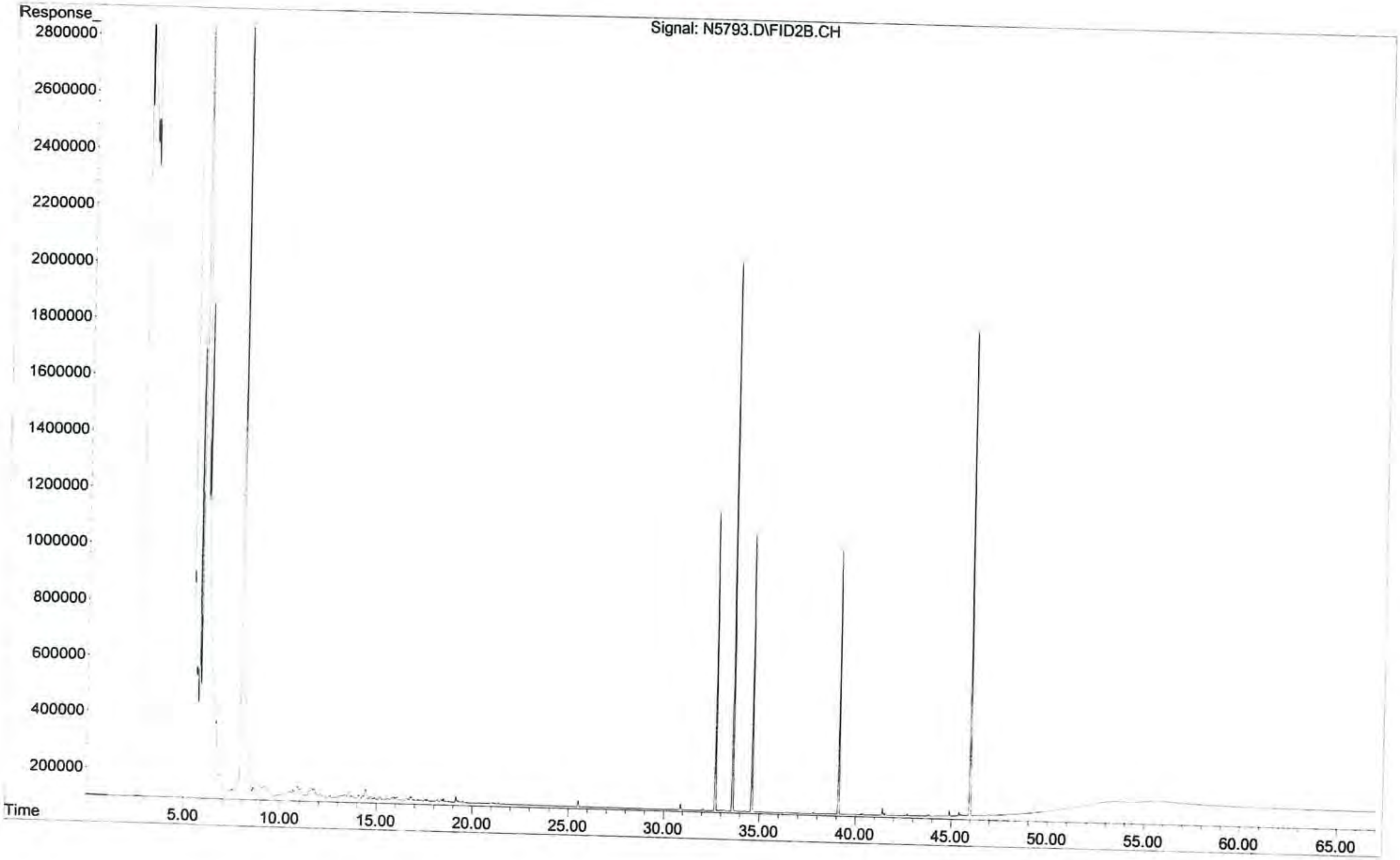
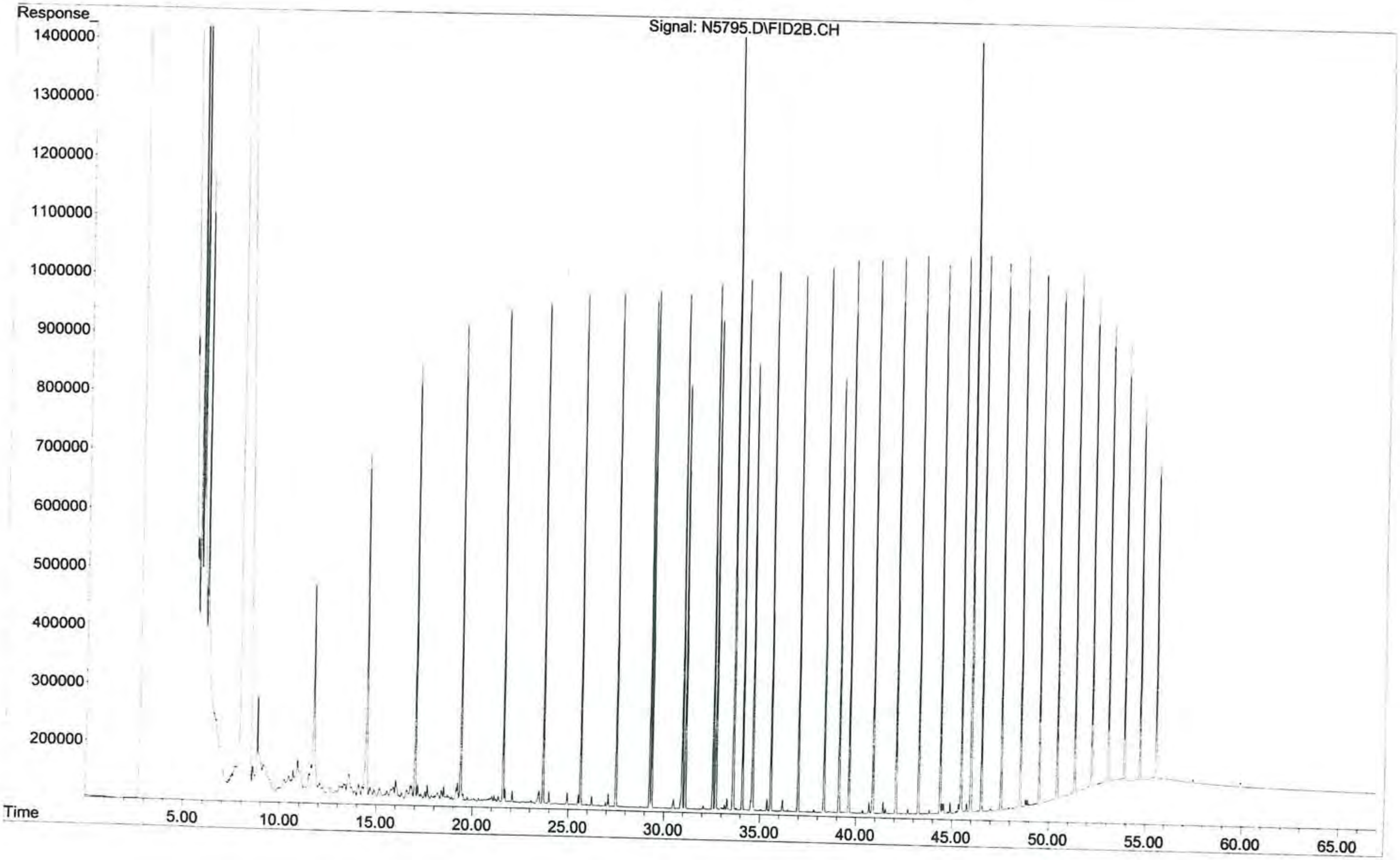
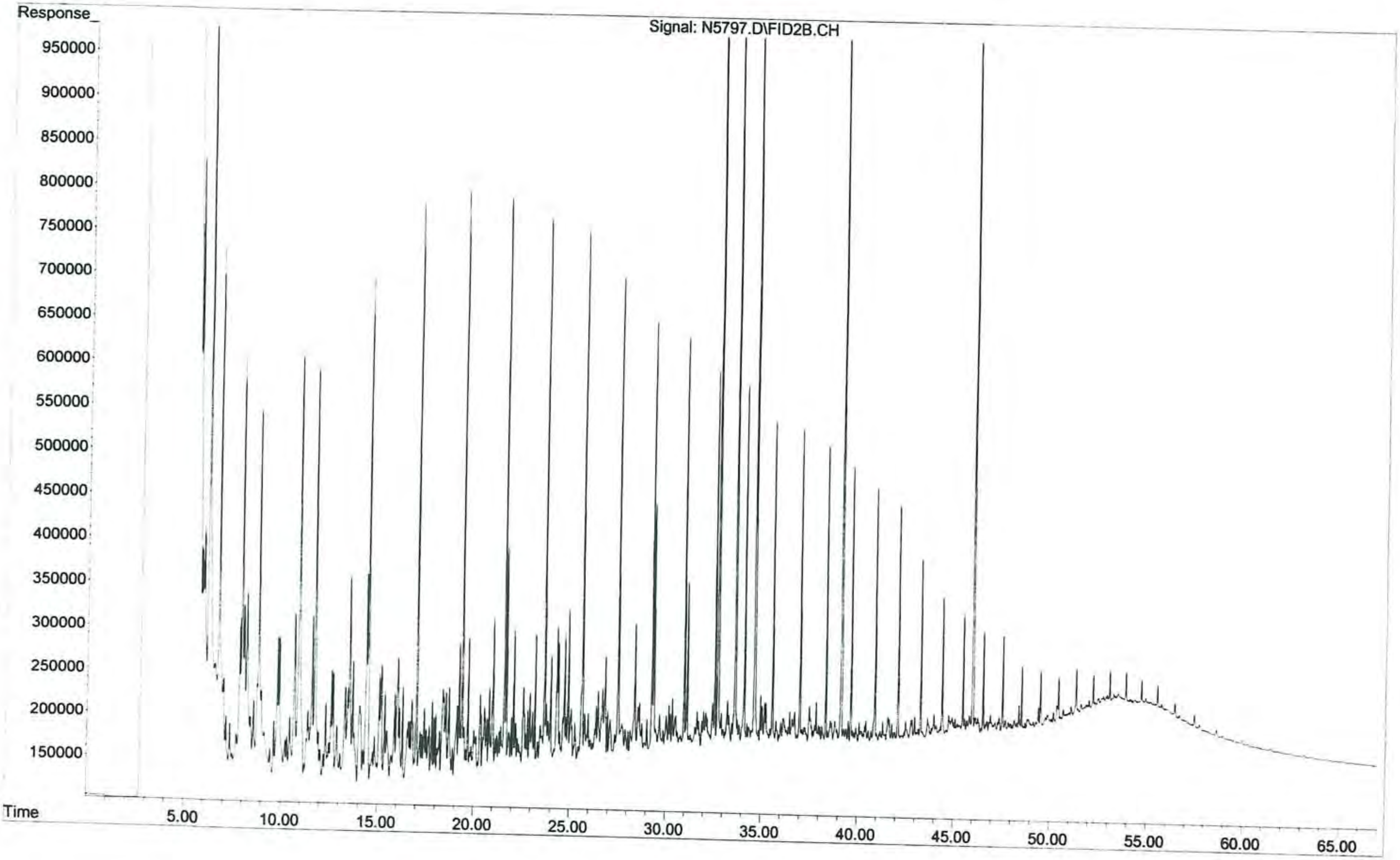


File : F:\N\DATA\SN0256.SEC\N5795.D
Operator : MM
Acquired : 10-18-2007 05:09:34 PM using AcqMethod TPH.M
Instrument : Inst. N
Sample Name: BL034LCS-P-FID(4)
Misc Info : Laboratory Control Sample 5-202 07-0259
Vial Number: 7



```
File         : F:\N\DATA\SN0256.SEC\N5797.D
Operator     : MM
Acquired     : 10-18-2007 06:29:05 PM using AcqMethod TPH.M
Instrument :    Inst. N
Sample Name: BL041NSC-P(0)
Misc Info    : North Slope Crude  07-0259
Vial Number: 8
```



```
File         : F:\N\DATA\SN0256.SEC\N5799.D
Operator     : MM
Acquired     : 10-18-2007 07:48:56 PM using AcqMethod TPH.M
Instrument   :   Inst. N
Sample Name: Q0541-P-FID(11)
Misc Info    : SB-2 S5 8-9.5 5-202 07-0259
Vial Number: 9
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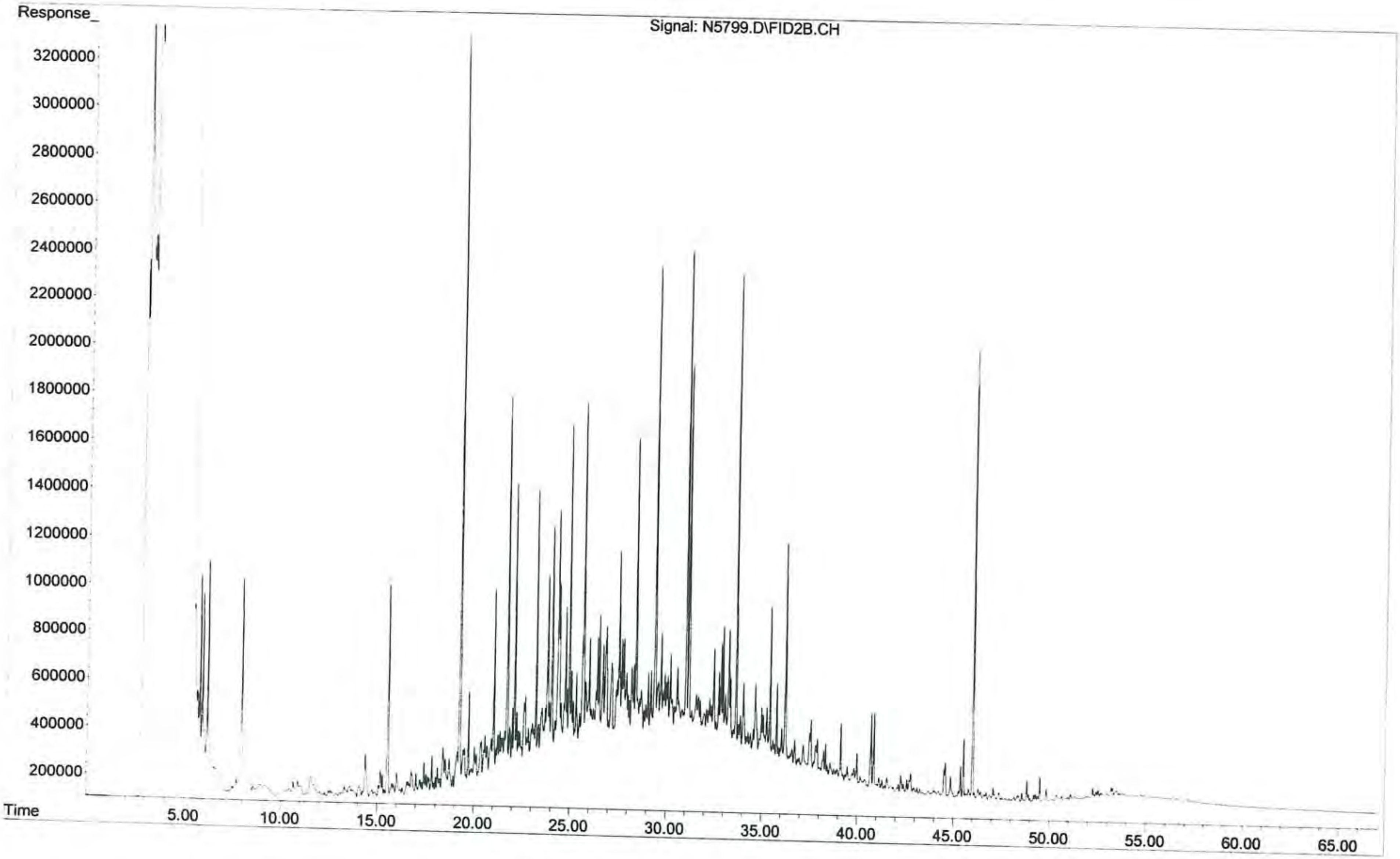
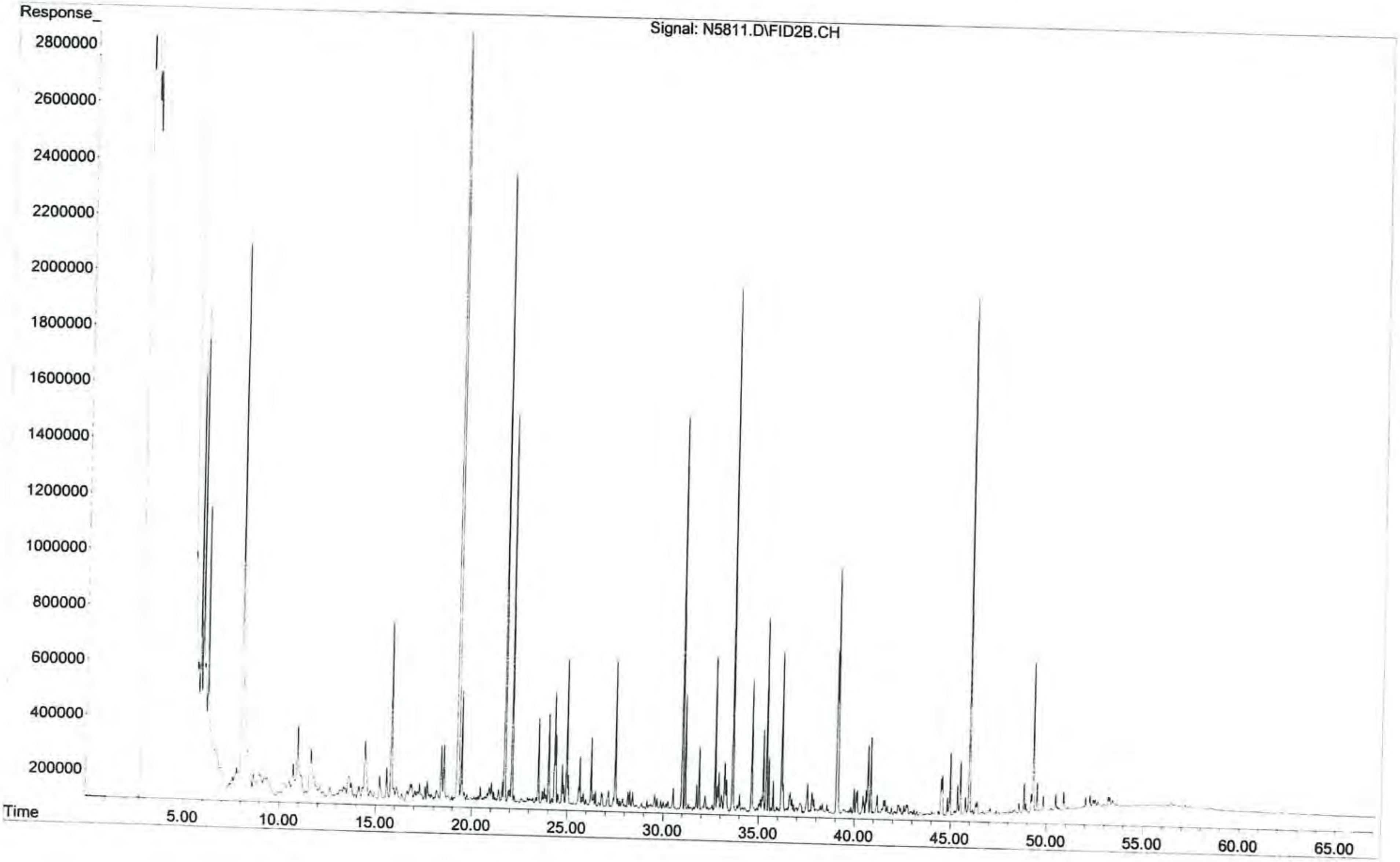


File : F:\N\DATA\SN0256.SEC\N5811.D
Operator : MM
Acquired : 10-19-2007 03:50:14 AM using AcqMethod TPH.M
Instrument : Inst. N
Sample Name: Q0545-P-FID(11)
Misc Info : GP-12 S2 23-24 5-202 07-0259
Vial Number: 15



SHC and TPH – SEDIMENT QA/QC SUMMARY
Batch 07-0264

PROJECT:	Floyd/Snyder – Gas Works Park
PARAMETER:	Saturated Hydrocarbons (SHC) and Total Petroleum Hydrocarbons (TPH)
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Non-aqueous phase liquid (NAPL)
SAMPLE CUSTODY:	Six soil samples and 1 NAPL were received at Battelle Duxbury Operations (BDO) Laboratory on 10/9/07. Upon Receipt of the samples, the temperature of the cooler was taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was slightly below the acceptable range (4°C ± 2°) at 0.6°C. Also, it was noted that sample Q0540 (MW-9) had some oil residue on the outside of the container as well as the inner side of the bubble wrap. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples. The client was notified on 10/16/07. The laboratory was instructed to proceed with the analysis. Samples were stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS Recovery	MS/MSD Precision	Control Oil % Diff
SHC and TPH	General NS&T	<5xMDL	40-120% Recovery	40-120% Recovery	40-120% Recovery MS target spike must be >5x background	≤30% RPD	PD,30% for 90% of the analytes

METHOD:

The NAPL sample was extracted following general NS&T methods. Approximately 50 mg of oil was weighed and diluted with 10mL of hexane. A portion of the extract was removed and spiked with SIS and IS. One extract was submitted for PAH and the second extract was submitted for SHC and TPH analysis. NAPL sample data is reported on an oil weight basis.

SHC and TPH were measured by gas chromatography with flame ionization detection (GC/FID). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of the analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of SHC and TPH were calculated by the internal standard method. Normal alkanes were quantified using the average RF generated from the initial calibration. TPH concentrations were quantified suing the average RF of nC8 through nC40. Isoprenoid hydrocarbon concentrations were quantified using the average RF of the n-alkanes immediately preceding and immediately following each target isoprenoid hydrocarbon.

HOLDING TIMES:

Samples were prepared for analysis in three analytical batches and were extracted within 15 days of sample collection analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0264	10/18/2007	10/19/2007

SHC and TPH – SEDIMENT QA/QC SUMMARY

Batch 07-0264

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0264 – No exceedences noted.

Comments – None.

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0264 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY:

Two surrogate compounds were added prior to extraction, including o-terphenyl and 5a-androstane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0264 – No exceedences noted.

Comments – None.

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0264 – No exceedences noted.

Comments – None.

CALIBRATIONS:

The GC/FID is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (% RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be ≤20%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be ≤25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be ≤25%.

07-0264 – No exceedences noted.

Comments – None.

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	MW-9	
Battelle ID	Q0540-P	
Sample Type	SA	
Collection Date	10/03/07	
Extraction Date	10/18/07	
Analysis Date	10/19/07	
Analytical Instrument	FID	
% Moisture	NA	
% Lipid	NA	
Matrix	NAPL	
Sample Size	53.70	
Size Unit-Basis	MG_OIL	
Units	UG/MG_OIL	
n-Nonane		U
n-Decane		U
n-Undecane		U
n-Dodecane		U
n-Tridecane		U
Isoprenoid RRT 1380		U
n-Tetradecane		U
Isoprenoid RRT 1470		U
n-Pentadecane		U
n-Hexadecane		U
Norpristane (1650)		U
n-Heptadecane		U
Pristane	12.89	
n-Octadecane	5.95	
Phytane	8.62	
n-Nonadecane		U
n-Eicosane		U
n-Heneicosane		U
n-Docosane		U
n-Tricosane		U
n-Tetracosane		U
n-Pentacosane		U
n-Hexacosane		U
n-Heptacosane		U
n-Octacosane		U
n-Nonacosane		U
n-Triacontane		U
n-Hentriacontane		U
n-Dotriacontane		U
n-Tritriacontane		U
n-Tetratriacontane		U
n-Pentatriacontane		U
n-Hexatriacontane		U
n-Heptatriacontane		U
n-Octatriacontane		U
n-Nonatriacontane		U
n-Tetracontane		U
TPH(total)	1035.45	

Surrogate Recoveries (%)

O-Terphenyl	100
5a-androstane	111

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL057PB-P
Sample Type	PB
Collection Date	10/18/07
Extraction Date	10/18/07
Analysis Date	10/19/07
Analytical Instrument	FID
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	50.00
Size Unit-Basis	MG_OIL
Units	UG/MG_OIL
n-Nonane	U
n-Decane	U
n-Undecane	U
n-Dodecane	U
n-Tridecane	U
Isoprenoid RRT 1380	U
n-Tetradecane	U
Isoprenoid RRT 1470	U
n-Pentadecane	U
n-Hexadecane	U
Norpristane (1650)	U
n-Heptadecane	U
Pristane	U
n-Octadecane	U
Phytane	U
n-Nonadecane	U
n-Eicosane	U
n-Heneicosane	U
n-Docosane	U
n-Tricosane	U
n-Tetracosane	U
n-Pentacosane	U
n-Hexacosane	U
n-Heptacosane	U
n-Octacosane	U
n-Nonacosane	U
n-Triacontane	U
n-Hentriacontane	U
n-Dotriacontane	U
n-Tritriacontane	U
n-Tetratriacontane	U
n-Pentatriacontane	U
n-Hexatriacontane	U
n-Heptatriacontane	U
n-Octatriacontane	U
n-Nonatriacontane	U
n-Tetracontane	U
TPH(total)	U

Surrogate Recoveries (%)

O-Terphenyl	98
5a-androstane	103

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Laboratory Control Sample			
Battelle ID	BL058LCS-P			
Sample Type	LCS			
Collection Date	10/18/07			
Extraction Date	10/18/07			
Analysis Date	10/19/07			
Analytical Instrument	FID			
% Moisture	NA			
% Lipid	NA			
Matrix	OIL			
Sample Size	NA			
Size Unit-Basis	NA			
Units	UG	Target	% Recovery	Qualifier
n-Nonane	38.26	40.00	96	
n-Decane	38.3	40.00	96	
n-Undecane	37.71	40.00	94	
n-Dodecane	36.73	40.00	92	
n-Tridecane	36.4	40.00	91	
Isoprenoid RRT 1380	U			
n-Tetradecane	36.42	40.00	91	
Isoprenoid RRT 1470	U			
n-Pentadecane	36.18	40.00	90	
n-Hexadecane	36.07	40.00	90	
Norpristane (1650)	U			
n-Heptadecane	36.22	40.00	91	
Pristane	36.94	40.00	92	
n-Octadecane	35.13	40.00	88	
Phytane	35.29	40.00	88	
n-Nonadecane	36.27	40.00	91	
n-Eicosane	36.3	40.00	91	
n-Heneicosane	35.77	40.00	89	
n-Docosane	36.9	40.00	92	
n-Tricosane	35.92	40.00	90	
n-Tetracosane	36.03	40.00	90	
n-Pentacosane	35.68	40.00	89	
n-Hexacosane	35.43	40.00	89	
n-Heptacosane	35.89	40.00	90	
n-Octacosane	34.39	40.00	86	
n-Nonacosane	35.09	40.00	88	
n-Triacontane	34.88	40.00	87	
n-Hentriacontane	34.33	40.00	86	
n-Dotriacontane	35.38	40.00	88	
n-Tritriacontane	34.61	40.00	87	
n-Tetratriacontane	34.9	40.00	87	
n-Pentatriacontane	36.01	40.00	90	
n-Hexatriacontane	33.65	40.00	84	
n-Heptatriacontane	28.76	40.00	72	
n-Octatriacontane	27.14	40.00	68	
n-Nonatriacontane	23.62	40.00	59	
n-Tetracontane	21.25	40.00	53	
TPH(total)	U			

Surrogate Recoveries (%)

O-Terphenyl	96
5a-androstane	100

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

LCS: O07-0264FID-Master_202-Final.xls

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude			
Battelle ID	BL059NSC-P			
Sample Type	NSC			
Collection Date	10/18/07			
Extraction Date	10/18/07			
Analysis Date	10/19/07			
Analytical Instrument	FID			
% Moisture	NA			
% Lipid	NA			
Matrix	OIL			
Sample Size	5.04			
Size Unit-Basis	MG_OIL			
Units	UG/MG_OIL	Target	% Difference	Qualifier
n-Nonane	4.65	4.67	0.4	
n-Decane	4.65	4.95	6.1	
n-Undecane	4.41	4.51	2.1	
n-Dodecane	4.13	4.58	9.8	
n-Tridecane	4.13	4.19	1.4	
Isoprenoid RRT 1380	0.96	0.96	0.2	
n-Tetradecane	3.86	3.92	1.5	
Isoprenoid RRT 1470	1.48	1.53	3.4	
n-Pentadecane	3.98	3.99	0.3	
n-Hexadecane	3.53	3.64	3.0	
Norpristane (1650)	1.12	1.14	1.9	
n-Heptadecane	3.12	3.08	1.4	
Pristane	2.32	2.28	1.7	
n-Octadecane	2.96	2.80	5.8	
Phytane	1.44	1.66	13.2	
n-Nonadecane	2.61	2.54	2.7	
n-Eicosane	2.58	2.50	3.1	
n-Heneicosane	2.27	2.42	6.2	
n-Docosane	2.31	2.25	2.6	
n-Tricosane	2.05	2.05	0.0	
n-Tetracosane	1.95	1.95	0.1	
n-Pentacosane	1.78	1.80	0.9	
n-Hexacosane	1.64	1.64	0.0	
n-Heptacosane	1.25	1.23	1.5	
n-Octacosane	0.98	1.00	2.4	
n-Nonacosane	0.79	0.87	9.4	
n-Triacontane	0.67	0.67	0.1	
n-Hentriacontane	0.64	0.61	5.5	
n-Dotriacontane	0.43	0.47	7.7	
n-Tritriacontane	0.43	0.40	7.8	
n-Tetratriacontane	0.34	0.37	8.5	
n-Pentatriacontane	0.41	0.38	8.4	
n-Hexatriacontane	0.25 J	0.24	6.1	
n-Heptatriacontane	0.21 J	0.21	0.0	
n-Octatriacontane	0.2 J	0.21	2.8	
n-Nonatriacontane	0.15 J	0.15	2.5	
n-Tetracontane	0.16 J	0.16	1.0	
TPH(total)	478.35	578.97	17.4	

Surrogate Recoveries (%)

O-Terphenyl	97
5a-androstane	104

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

NSC: O07-0264FID-Master_202-Final.xls

```
File        : F:\N\DATA\SN0256.SEC\N5819.D
Operator    : MM
Acquired    : 10-19-2007 09:12:17 AM using AcqMethod TPH.M
Instrument  :    Inst. N
Sample Name: BL061SOL-P(0)
Misc Info   : Solvent blank. 5-202 07-0264
Vial Number: 27
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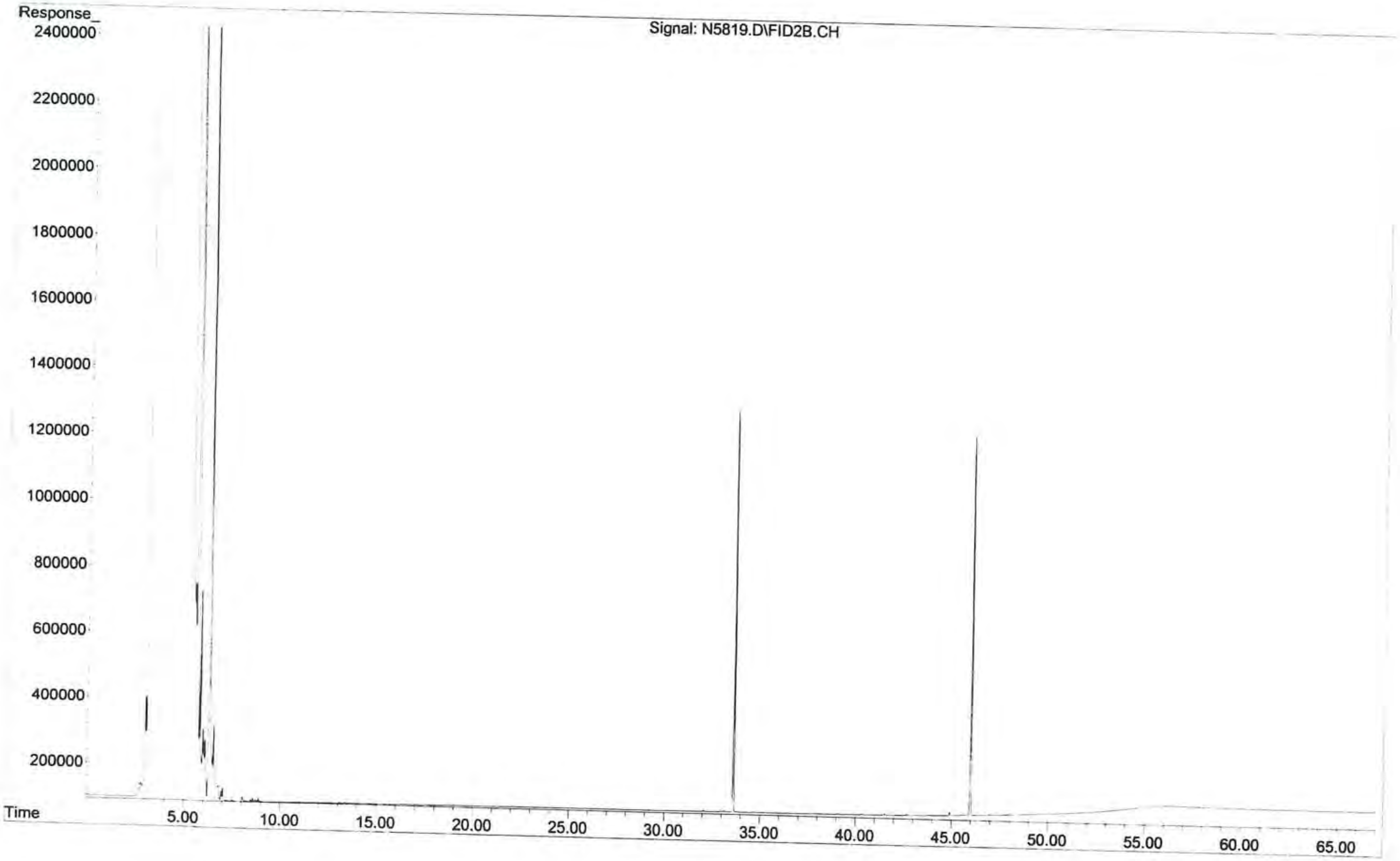
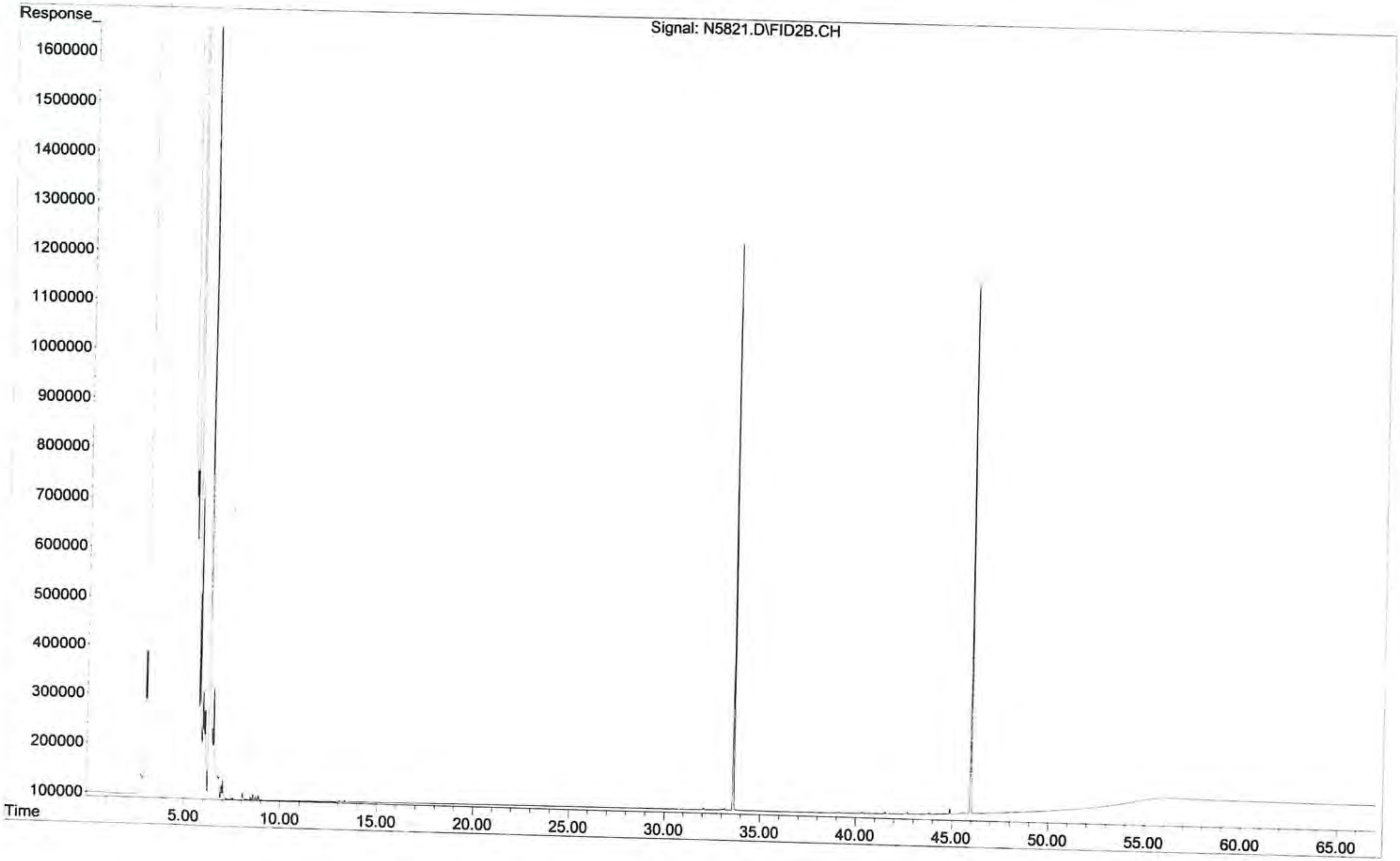
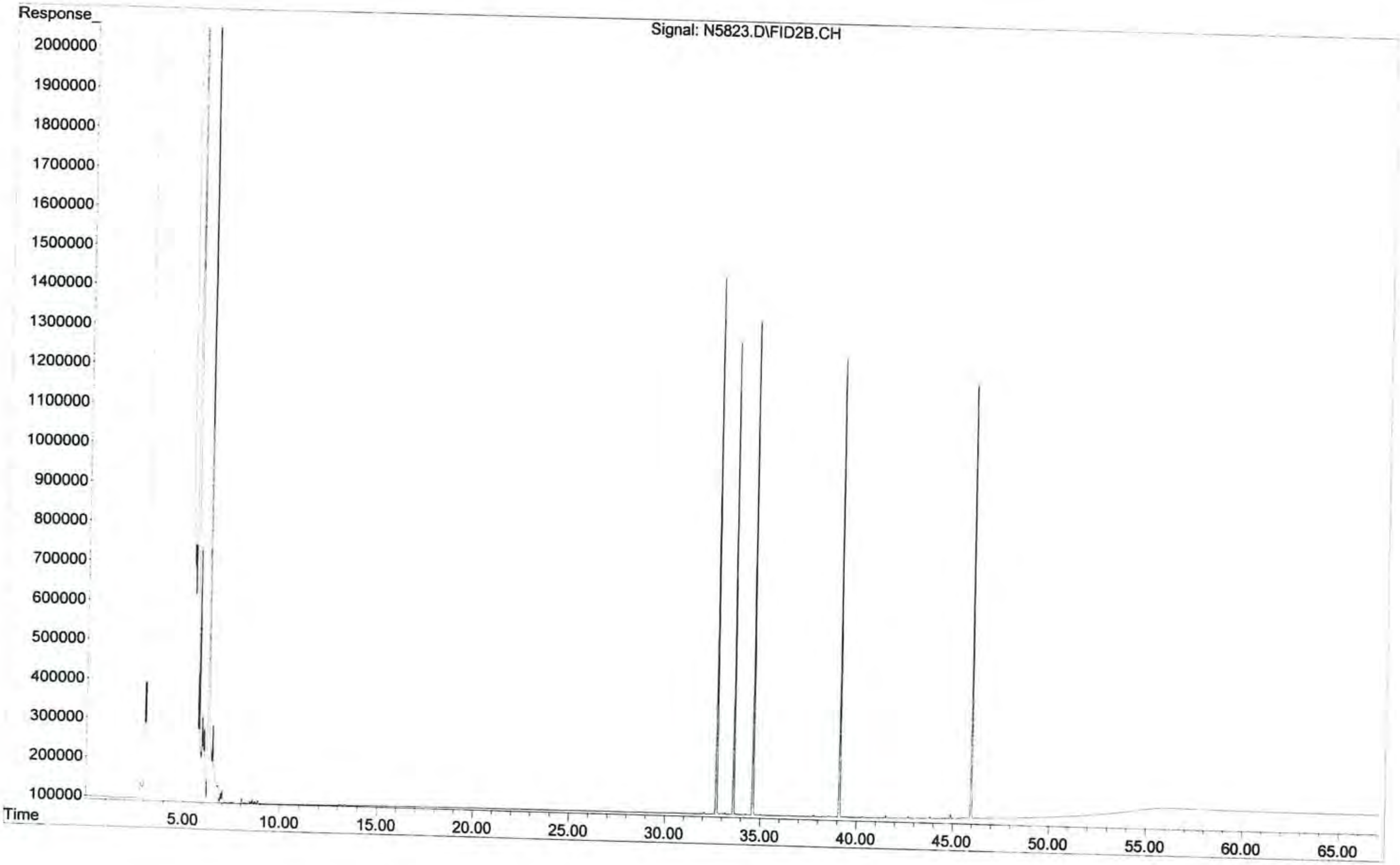


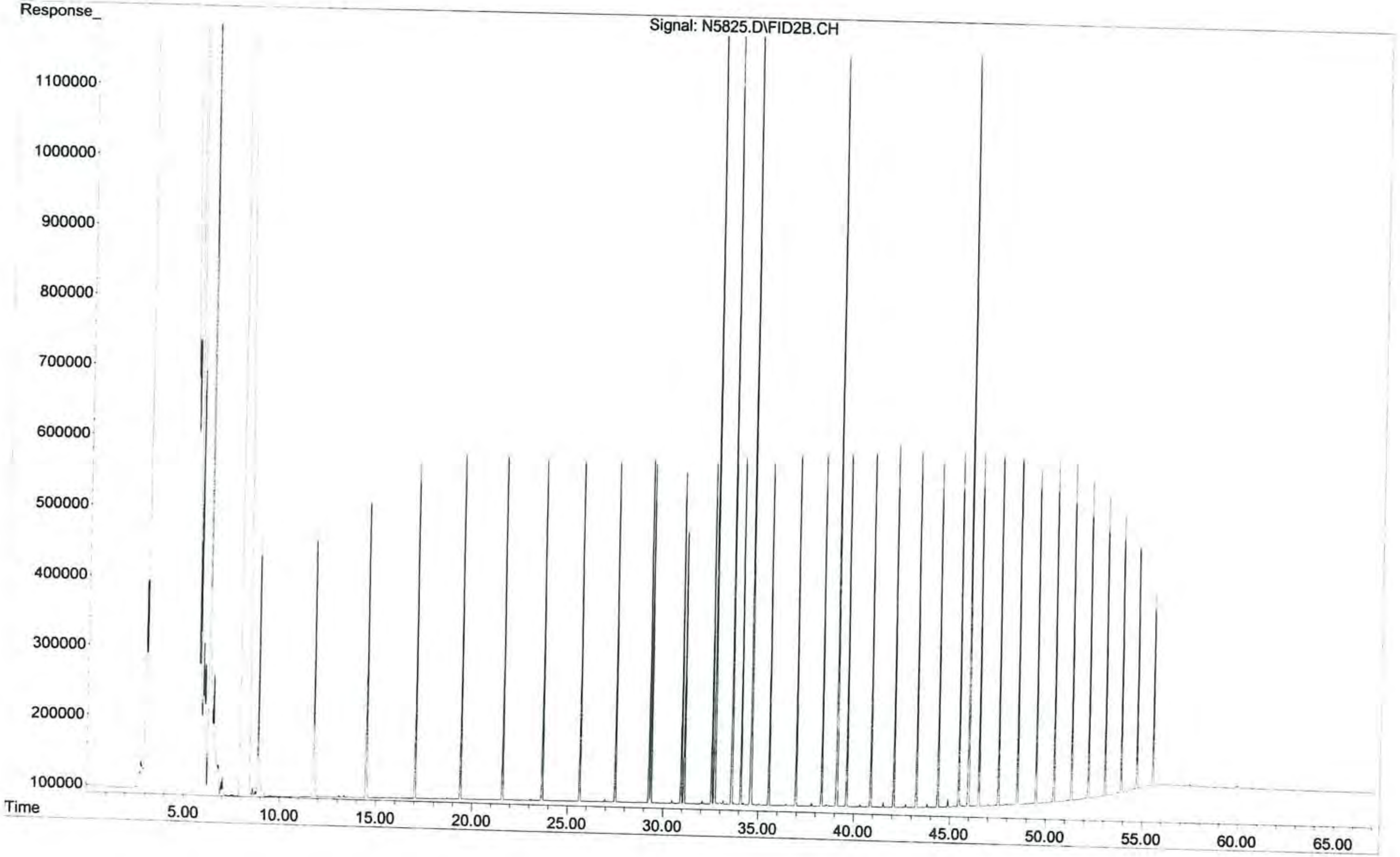
```
File       : F:\N\DATA\SN0256.SEC\N5821.D
Operator   : MM
Acquired   : 19 Oct 2007  10:31 am using AcqMethod TPH.M
Instrument :    Inst. N
Sample Name: BL062SOL-P(0)
Misc Info  : Solvent blank. 5-202 07-0264
Vial Number: 28
```



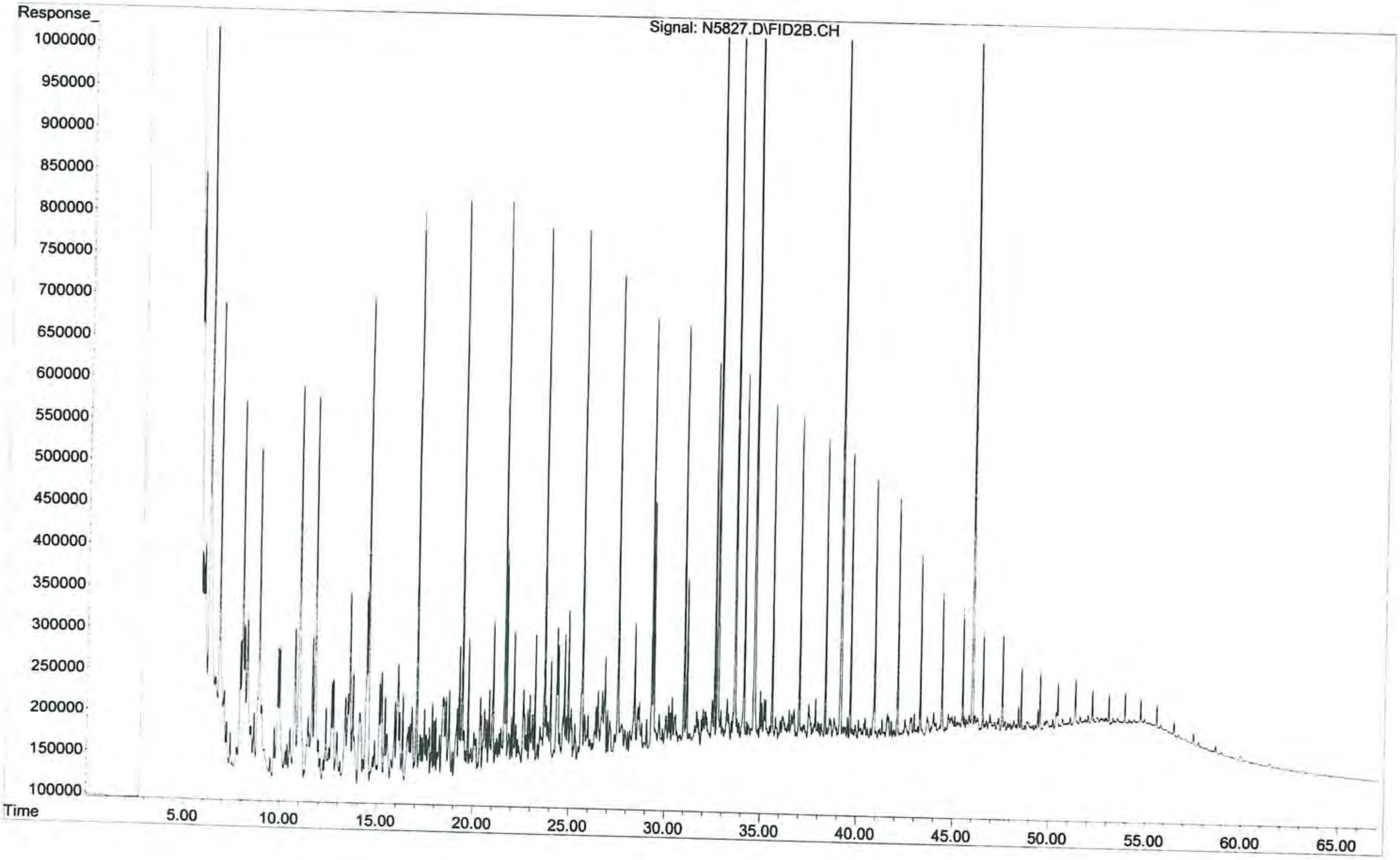
```
File       : F:\N\DATA\SN0256.SEC\N5823.D
Operator   : MM
Acquired   : 19 Oct 2007  11:51 am using AcqMethod TPH.M
Instrument :    Inst. N
Sample Name: BL057PB-P-FID(2)
Misc Info  : Procedural Blank 5-202 07-0264
Vial Number: 29
```



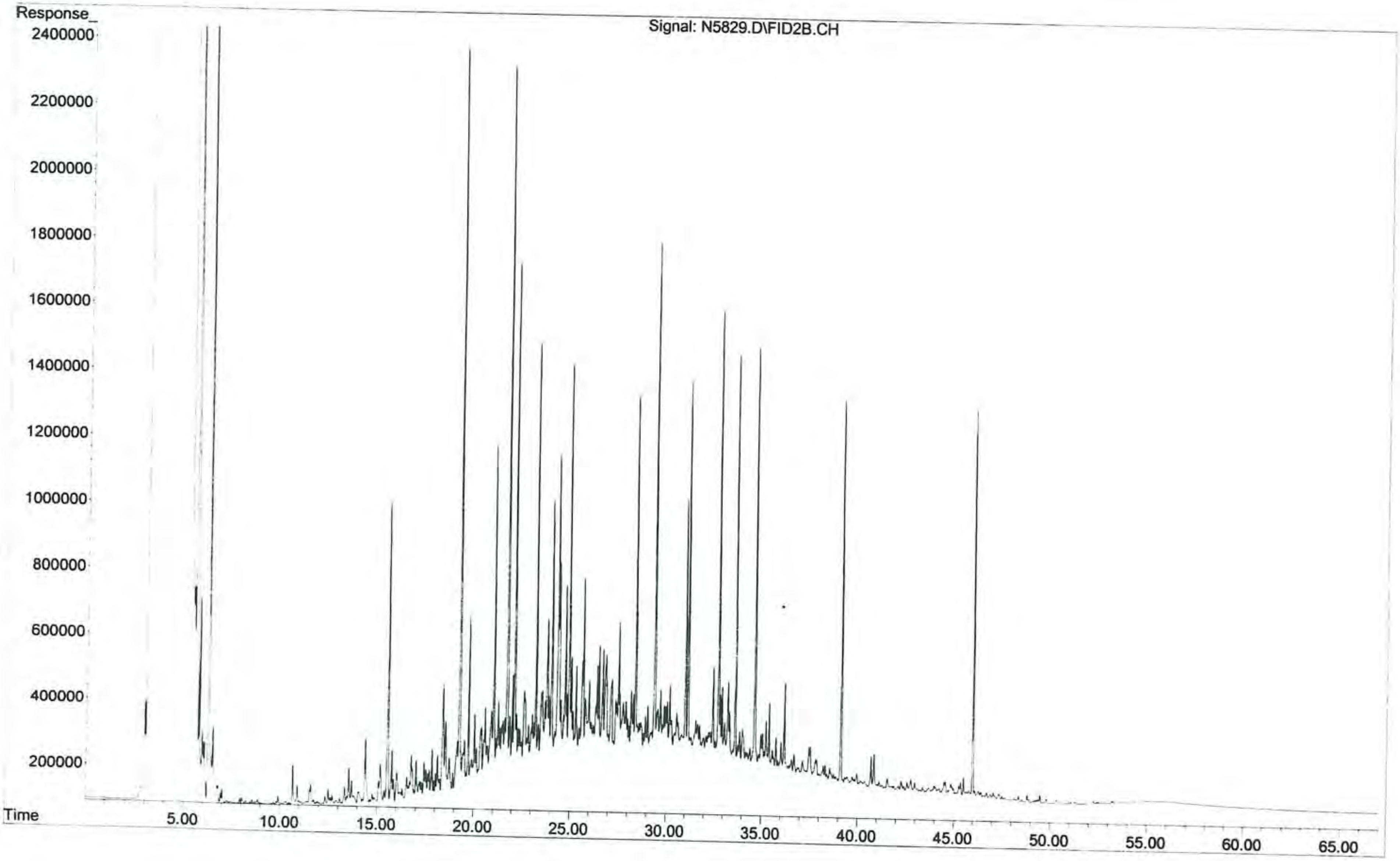
File : F:\N\DATA\SN0256.SEC\N5825.D
Operator : MM
Acquired : 10-19-2007 01:12:46 PM using AcqMethod TPH.M
Instrument : Inst. N
Sample Name: BL058LCS-P-FID(2)
Misc Info : Laboratory Control Sample 5-202 07-0264
Vial Number: 30



```
File        : F:\N\DATA\SN0256.SEC\N5827.D
Operator    : MM
Acquired    : 10-19-2007 02:32:15 PM using AcqMethod TPH.M
Instrument  :    Inst. N
Sample Name: BL059NSC-P(0)
Misc Info   : North Slope Crude 5-202 07-0264
Vial Number: 31
```



File : F:\N\DATA\SN0256.SEC\N5829.D
Operator : MM
Acquired : 10-19-2007 03:53:05 PM using AcqMethod TPH.M
Instrument : Inst. N
Sample Name: Q0540-P-A-FID(5)
Misc Info : MW-9 5-202 07-0264
Vial Number: 32



SHC and TPH – SEDIMENT QA/QC SUMMARY

Batch 07-0266

PROJECT: Floyd/Snyder – Gas Works Park

PARAMETER: Saturated Hydrocarbons (SHC) and Total Petroleum Hydrocarbons (TPH)

LABORATORY: Battelle, Duxbury, MA

MATRIX: Sediment

SAMPLE CUSTODY: Six soil samples and 1 NAPL were received at Battelle Duxbury Operations (BDO) Laboratory on 10/9/07. Upon Receipt of the samples, the temperature of the cooler was taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was slightly below the acceptable range (4°C ± 2°) at 0.6°C. Also, it was noted that sample Q0540 (MW-9) had some oil residue on the outside of the container as well as the inner side of the bubble wrap. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples. The client was notified on 10/16/07. The laboratory was instructed to proceed with the analysis. Samples were stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS Recovery	MS/MSD Precision	Control Oil % Diff
SHC and TPH	General NS&T	<5xMDL	40-120% Recovery	40-120% Recovery	40-120% Recovery MS target spike must be >5x background	≤30% RPD	PD,30% for 90% of the analytes

METHOD: Soil samples were extracted following general NS&T methods. Approximately 5-8 g of sample was spiked with SHC and PAH surrogates and serial extracted three times with dichloromethane using orbital shaker table techniques. The combined extracts were dried over anhydrous sodium sulfate and concentrated by Kuderna-Danish and nitrogen evaporation techniques. The sample extracts were split in half: one-half of the extract was removed for archiving; the other half was processed through an alumina gravity column to isolate the hydrocarbon fractions of interest. The weights of the resulting extracts were determined gravimetrically. The extracts were concentrated to 1 mL, split, and spiked with internal standard (IS). The pre-injection volume and/or extract split were adjusted to 5mg/mL. One extract was submitted for PAH and the second extract was submitted for SHC and TPH analysis.

SHC and TPH were measured by gas chromatography with flame ionization detection (GC/FID). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of the analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of SHC and TPH were calculated by the internal standard method. Normal alkanes were quantified using the average RF generated from the initial calibration. TPH concentrations were quantified suing the average RF of nC8 through nC40. Isoprenoid hydrocarbon concentrations were quantified using the average RF of the n-alkanes immediately preceding and immediately following each target isoprenoid hydrocarbon.

HOLDING TIMES: Samples were prepared for analysis in three analytical batches and were extracted within 30 days of sample collection analyzed within 40 days of extraction. The samples from this batch were re-extracted from 07-0259 because of poor surrogate recoveries.

Batch	Extraction Date	Analysis Date
07-0266	10/23/2007	10/30/2007 – 10/31/2007

SHC and TPH – SEDIMENT QA/QC SUMMARY
Batch 07-0266

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0266 – No exceedences noted.

Comments – None.

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0266 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY:

Two surrogate compounds were added prior to extraction, including o-terphenyl and 5a-androstane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0266 – Three of the four samples extracted in this batch failed SIS recovery criteria with high recoveries. .

Comments – These samples have been extracted twice with similar results. The issue appears to be matrix related rather than extraction related as the PB and LCS (samples without matrix) did not exhibit similar trends.

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0266 – nC13 had a PD of 48%, but was "ME" qualified indicating that an interferent was identified. The control oil still passed the MQO of the PD being ≤30% for 90% of the analytes.

Comments – None.

CALIBRATIONS:

The GC/FID is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (% RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be ≤20%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be ≤25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be ≤25%.

07-0266 – No exceedences noted.

Comments – None.

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-8 S5 9-10.5	SB-13 2.5-4.0	SB-12A S3 5-6.5	GP-9 7-8
Battelle ID	Q0542-P1	Q0543-P1	Q0544-P1	Q0546-P1
Sample Type	SA	SA	SA	SA
Collection Date	09/18/07	09/20/07	09/20/07	09/18/07
Extraction Date	10/23/07	10/23/07	10/23/07	10/23/07
Analysis Date	10/30/07	10/31/07	10/31/07	10/31/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	8.06	16.77	13.98	49.24
% Lipid	NA	NA	NA	NA
Matrix	SOIL	SOIL	SOIL	SOIL
Sample Size	4.78	4.45	4.63	2.84
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	UG/G_DRY	UG/G_DRY	UG/G_DRY	UG/G_DRY
n-Nonane	U	U	U	U
n-Decane	U	U	U	U
n-Undecane	U	U	U	U
n-Dodecane	U	U	U	U
n-Tridecane	U	U	U	U
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	28.63	U	U	U
n-Heptadecane	U	U	U	U
Pristane	41.71	U	U	U
n-Octadecane	U	U	U	U
Phytane	25.27	U	U	U
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	U	U	U	U
n-Docosane	U	U	U	U
n-Tricosane	U	U	U	U
n-Tetracosane	U	U	U	U
n-Pentacosane	U	U	U	U
n-Hexacosane	U	U	U	U
n-Heptacosane	U	U	U	U
n-Octacosane	U	U	U	U
n-Nonacosane	U	U	U	U
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	4533.08	10664.19	45954.94	53535.09

Surrogate Recoveries (%)

O-Terphenyl	150 N	63	165 N	148 N
5a-androstane	142 N	52	150 N	152 N

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL065PB-P
Sample Type	PB
Collection Date	10/23/07
Extraction Date	10/23/07
Analysis Date	10/30/07
Analytical Instrument	FID
% Moisture	22.01
% Lipid	NA
Matrix	SEDIMENT
Sample Size	4.20
Size Unit-Basis	G_DRY
Units	UG/G_DRY
n-Nonane	U
n-Decane	U
n-Undecane	U
n-Dodecane	U
n-Tridecane	U
Isoprenoid RRT 1380	U
n-Tetradecane	U
Isoprenoid RRT 1470	U
n-Pentadecane	U
n-Hexadecane	U
Norpristane (1650)	U
n-Heptadecane	U
Pristane	U
n-Octadecane	U
Phytane	U
n-Nonadecane	U
n-Eicosane	U
n-Heneicosane	U
n-Docosane	U
n-Tricosane	U
n-Tetracosane	U
n-Pentacosane	U
n-Hexacosane	U
n-Heptacosane	U
n-Octacosane	U
n-Nonacosane	U
n-Triacontane	U
n-Hentriacontane	U
n-Dotriacontane	U
n-Tritriacontane	U
n-Tetratriacontane	U
n-Pentatriacontane	U
n-Hexatriacontane	U
n-Heptatriacontane	U
n-Octatriacontane	U
n-Nonatriacontane	U
n-Tetracontane	U
TPH(total)	U

Surrogate Recoveries (%)

O-Terphenyl	106
5a-androstane	102

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70				
Battelle ID	BL066LCS-P				
Sample Type	LCS				
Collection Date	10/23/07				
Extraction Date	10/23/07				
Analysis Date	10/30/07				
Analytical Instrument	FID				
% Moisture	NA				
% Lipid	NA				
Matrix	SEDIMENT				
Sample Size	NA				
Size Unit-Basis	NA				
Units	UG		Target	% Recovery	Qualifier
n-Nonane	101.24		100.00	101	
n-Decane	101.13		100.00	101	
n-Undecane	102.74		100.00	103	
n-Dodecane	101.86		100.00	102	
n-Tridecane	105.12		100.00	105	
Isoprenoid RRT 1380		U			
n-Tetradecane	101.67		100.00	102	
Isoprenoid RRT 1470		U			
n-Pentadecane	100.17		100.00	100	
n-Hexadecane	100.23		100.00	100	
Norpristane (1650)		U			
n-Heptadecane	101.57		100.00	102	
Pristane	101.94		100.00	102	
n-Octadecane	100.88		100.00	101	
Phytane	98.48		100.00	98	
n-Nonadecane	102.23		100.00	102	
n-Eicosane	101.96		100.00	102	
n-Heneicosane	100.28		100.00	100	
n-Docosane	102.83		100.00	103	
n-Tricosane	99.87		100.00	100	
n-Tetracosane	100.28		100.00	100	
n-Pentacosane	99.02		100.00	99	
n-Hexacosane	99.28		100.00	99	
n-Heptacosane	100.24		100.00	100	
n-Octacosane	101.45		100.00	101	
n-Nonacosane	98		100.00	98	
n-Triacontane	97.65		100.00	98	
n-Hentriacontane	95.49		100.00	95	
n-Dotriacontane	96.81		100.00	97	
n-Tritriacontane	93.15		100.00	93	
n-Tetratriacontane	91.62		100.00	92	
n-Pentatriacontane	93.43		100.00	93	
n-Hexatriacontane	86.24		100.00	86	
n-Heptatriacontane	84		100.00	84	
n-Octatriacontane	84.54		100.00	85	
n-Nonatriacontane	77.68		100.00	78	
n-Tetracontane	74.91		100.00	75	
TPH(total)		U			

Surrogate Recoveries (%)

O-Terphenyl	118
5a-androstane	119

Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude
Battelle ID	BL087NSC-P
Sample Type	NSC
Collection Date	10/30/07
Extraction Date	10/30/07
Analysis Date	10/30/07
Analytical Instrument	FID
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	5.04
Size Unit-Basis	MG_OIL

Units	UG/MG_OIL		Target	% Difference	Qualifier
n-Nonane	4.93		4.67	5.6	
n-Decane	4.62		4.95	6.7	
n-Undecane	4.48		4.51	0.6	
n-Dodecane	4.54		4.58	0.8	
n-Tridecane	6.2	ME	4.19	48.0	N
Isoprenoid RRT 1380	0.92		0.96	4.3	
n-Tetradecane	4.23		3.92	7.9	
Isoprenoid RRT 1470	1.59		1.53	3.7	
n-Pentadecane	3.88		3.99	2.8	
n-Hexadecane	3.76		3.64	3.3	
Norpristane (1650)	1.08		1.14	5.4	
n-Heptadecane	3.33		3.08	8.2	
Pristane	2.28		2.28	0.0	
n-Octadecane	2.76		2.80	1.3	
Phytane	1.52		1.66	8.4	
n-Nonadecane	2.7		2.54	6.3	
n-Eicosane	2.43		2.50	2.9	
n-Heneicosane	2.35		2.42	2.9	
n-Docosane	2.29		2.25	1.7	
n-Tricosane	2.01		2.05	2.0	
n-Tetracosane	1.96		1.95	0.6	
n-Pentacosane	1.65		1.80	8.1	
n-Hexacosane	1.53		1.64	6.7	
n-Heptacosane	1.24		1.23	0.7	
n-Octacosane	1.01		1.00	0.6	
n-Nonacosane	0.84		0.87	3.7	
n-Triacontane	0.67		0.67	0.1	
n-Hentriacontane	0.59		0.61	2.8	
n-Dotriacontane	0.49		0.47	5.2	
n-Tritriacontane	0.38		0.40	4.8	
n-Tetratriacontane	0.34		0.37	8.5	
n-Pentatriacontane	0.35		0.38	7.4	
n-Hexatriacontane	0.24	J	0.24	1.8	
n-Heptatriacontane	0.21	J	0.21	0.0	
n-Octatriacontane	0.23	J	0.21	11.8	
n-Nonatriacontane	0.17	J	0.15	10.4	
n-Tetracontane	0.18	J	0.16	11.4	
TPH(total)	495.56		578.97	14.4	

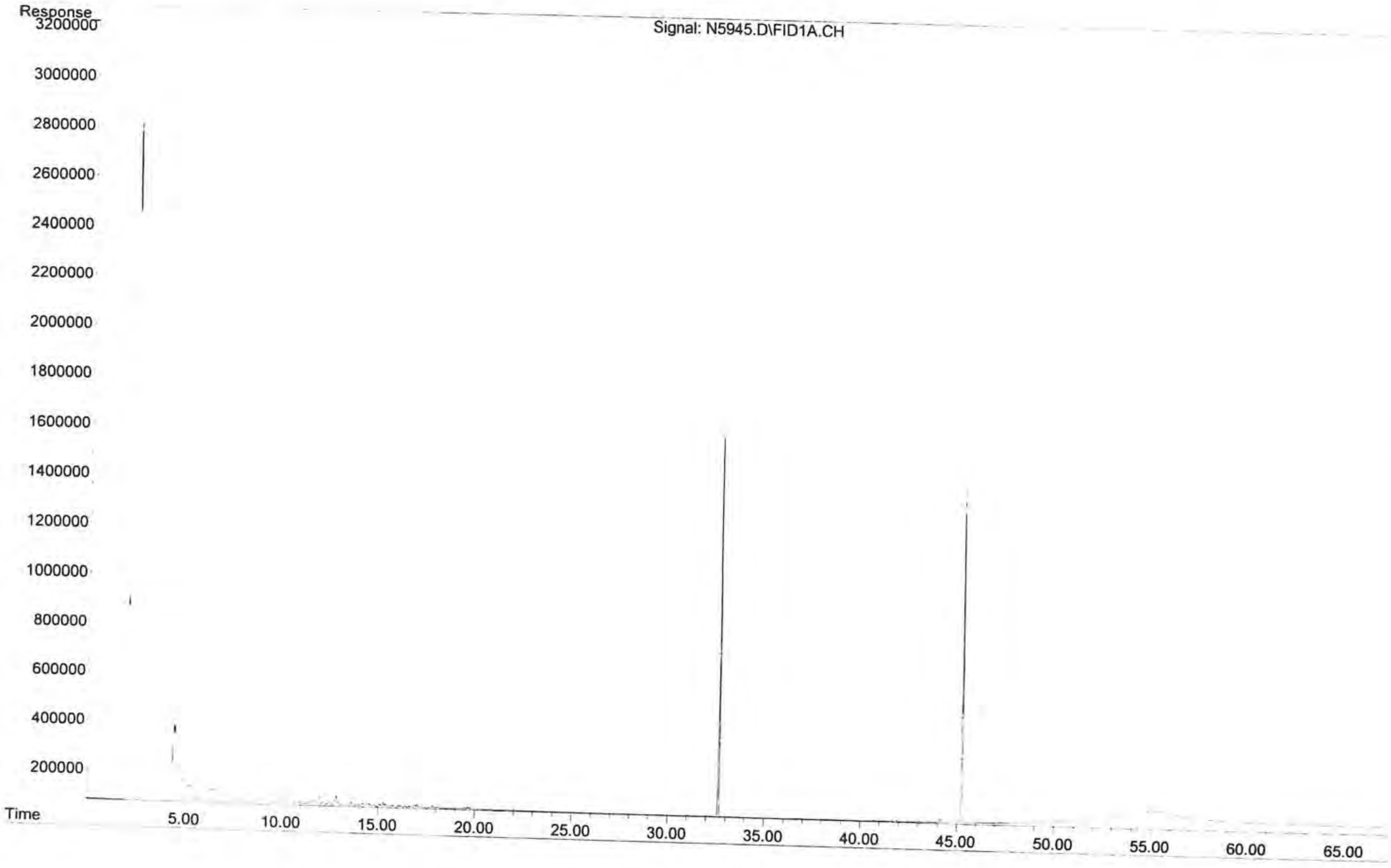
Surrogate Recoveries (%)

O-Terphenyl	114
5a-androstane	110

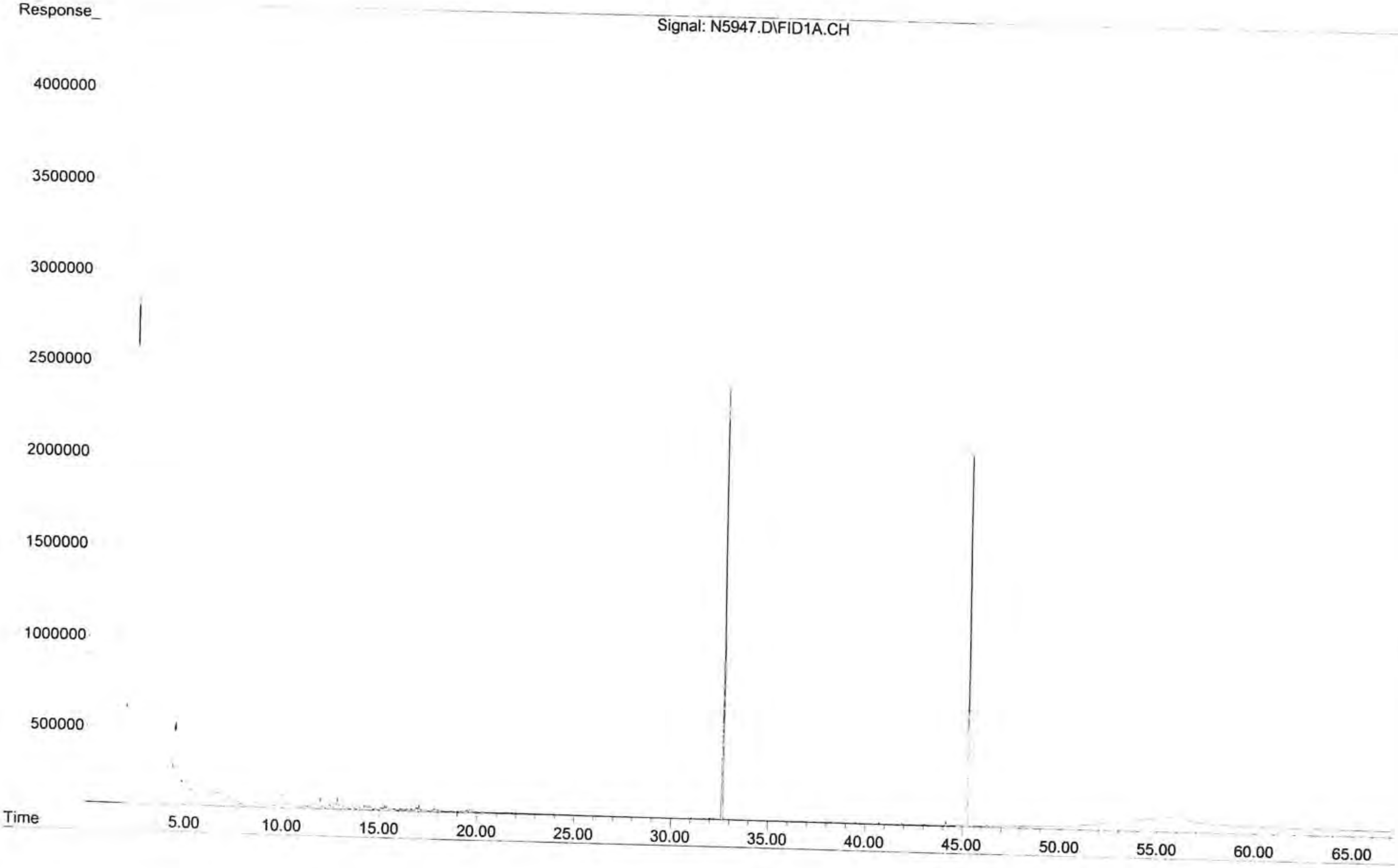
Not Surrogate Corrected

Analyzed by Meara, Michael
11/15/2007

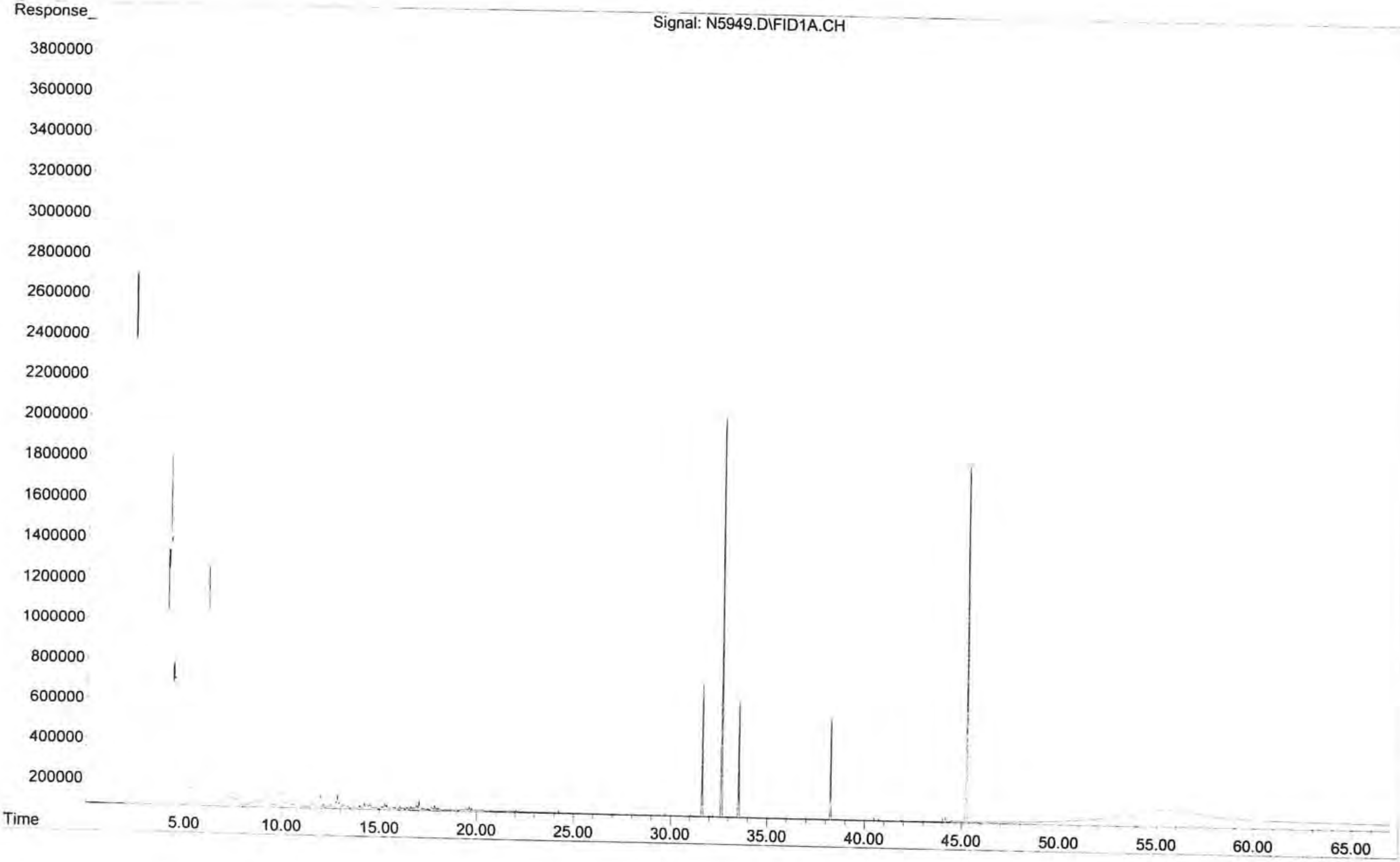
```
File          : F:\N\DATA\SN0260\N5945.D
Operator      : MM
Acquired      : 10-30-2007 03:57:23 PM using AcqMethod TPH.M
Instrument    :   Inst. N
Sample Name: BL089SOL-P(0)
Misc Info     : Solvent blank. 5-202 07-0266
Vial Number: 29
```



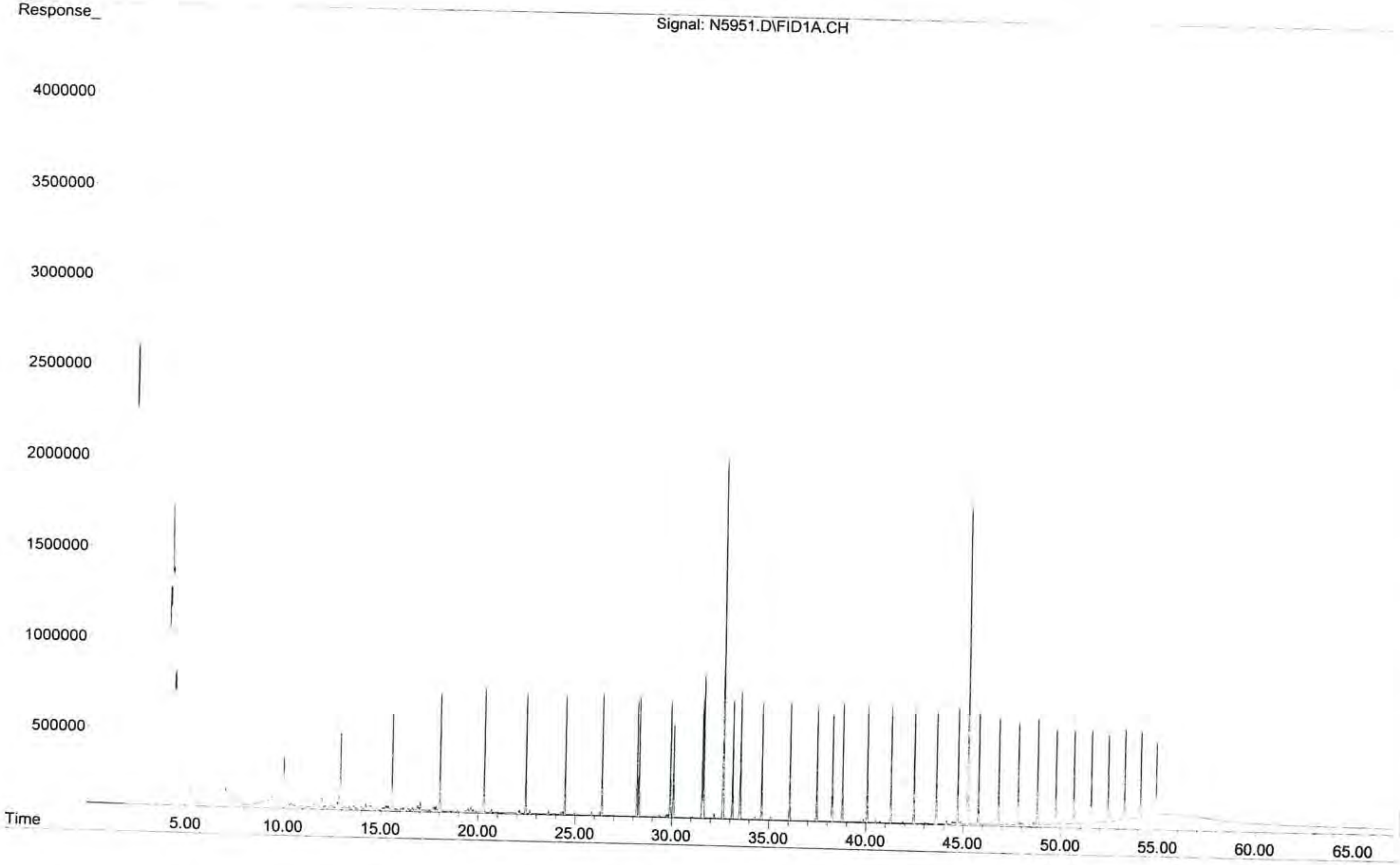
```
File          : F:\N\DATA\SN0260\N5947.D
Operator      : MM
Acquired      : 10-30-2007 05:18:35 PM using AcqMethod TPH.M
Instrument    :   Inst. N
Sample Name: BL090SOL-P(0)
Misc Info     : Solvent blank. 5-202 07-0266
Vial Number: 30
```



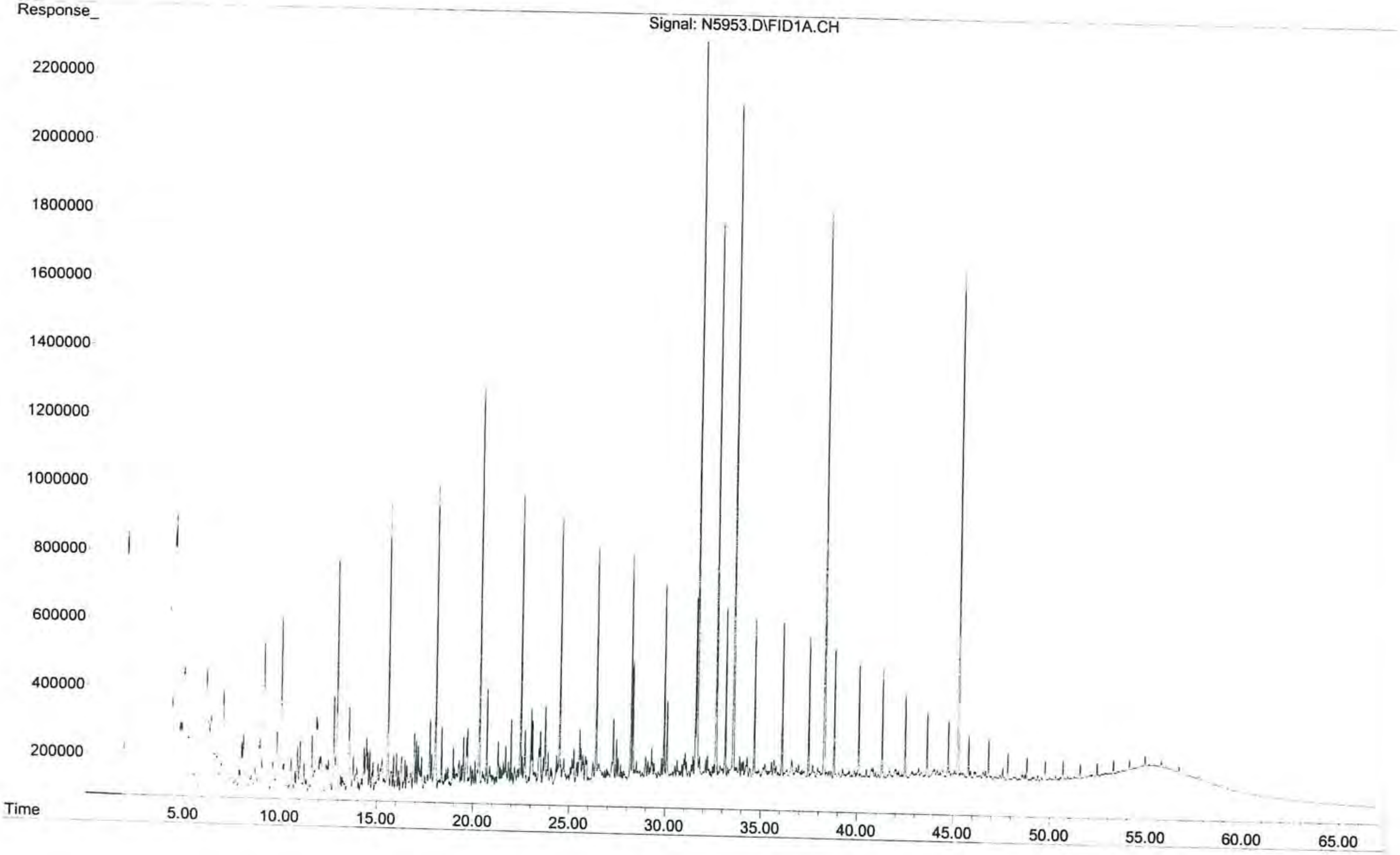
File   : F:\N\DATA\SN0260\N5949.D
Operator   : MM
Acquired   : 10-30-2007 06:39:52 PM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: BL065PB-P-FID(7)
Misc Info   : Procedural Blank 5-202 07-0266
Vial Number: 31



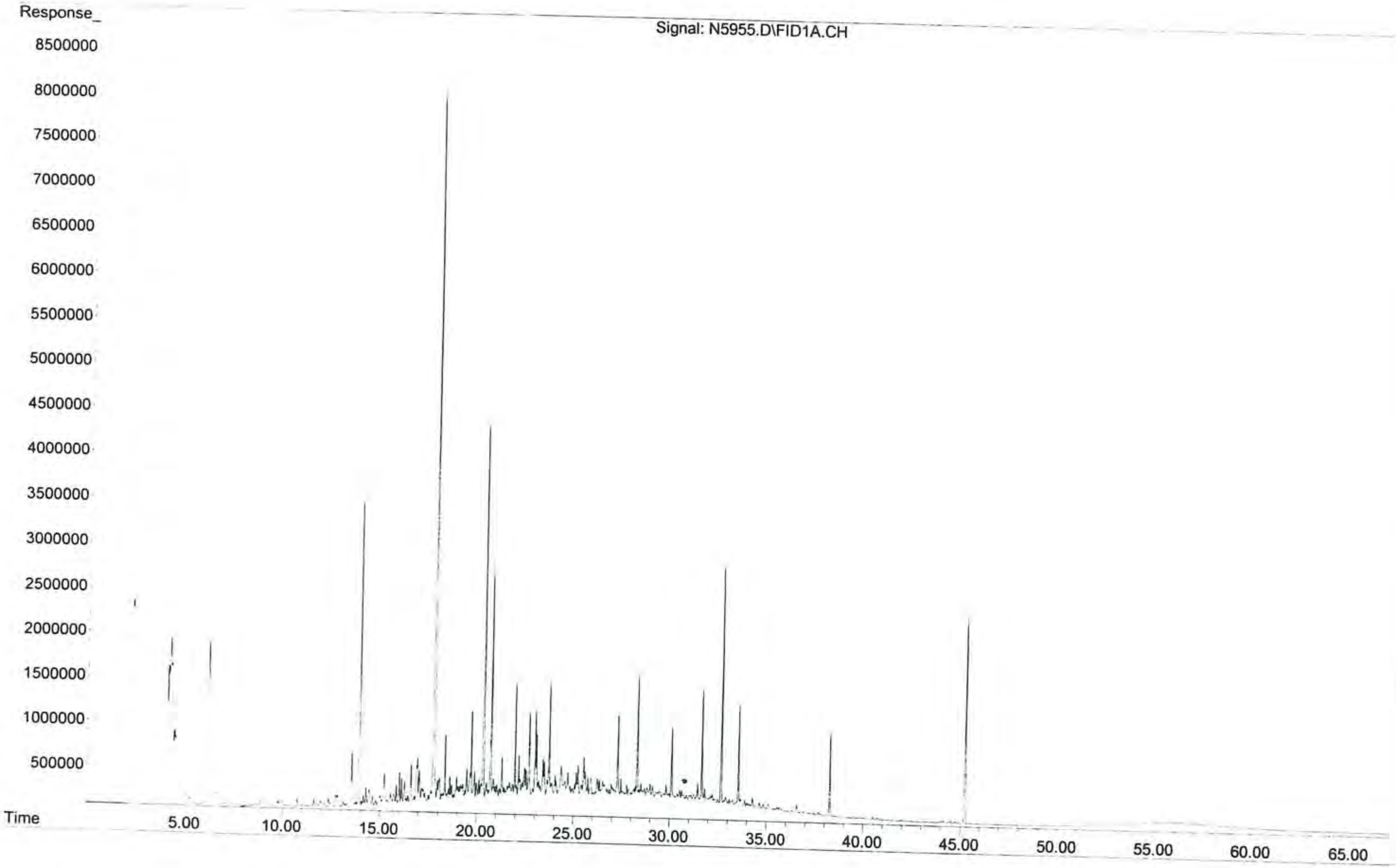
```
File        : F:\N\DATA\SN0260\N5951.D
Operator    : MM
Acquired    : 10-30-2007 08:00:34 PM using AcqMethod TPH.M
Instrument  :    Inst. N
Sample Name: BL066LCS-P-FID(7)
Misc Info   : Laboratory Control Sample 5-202 07-0266
Vial Number: 32
```



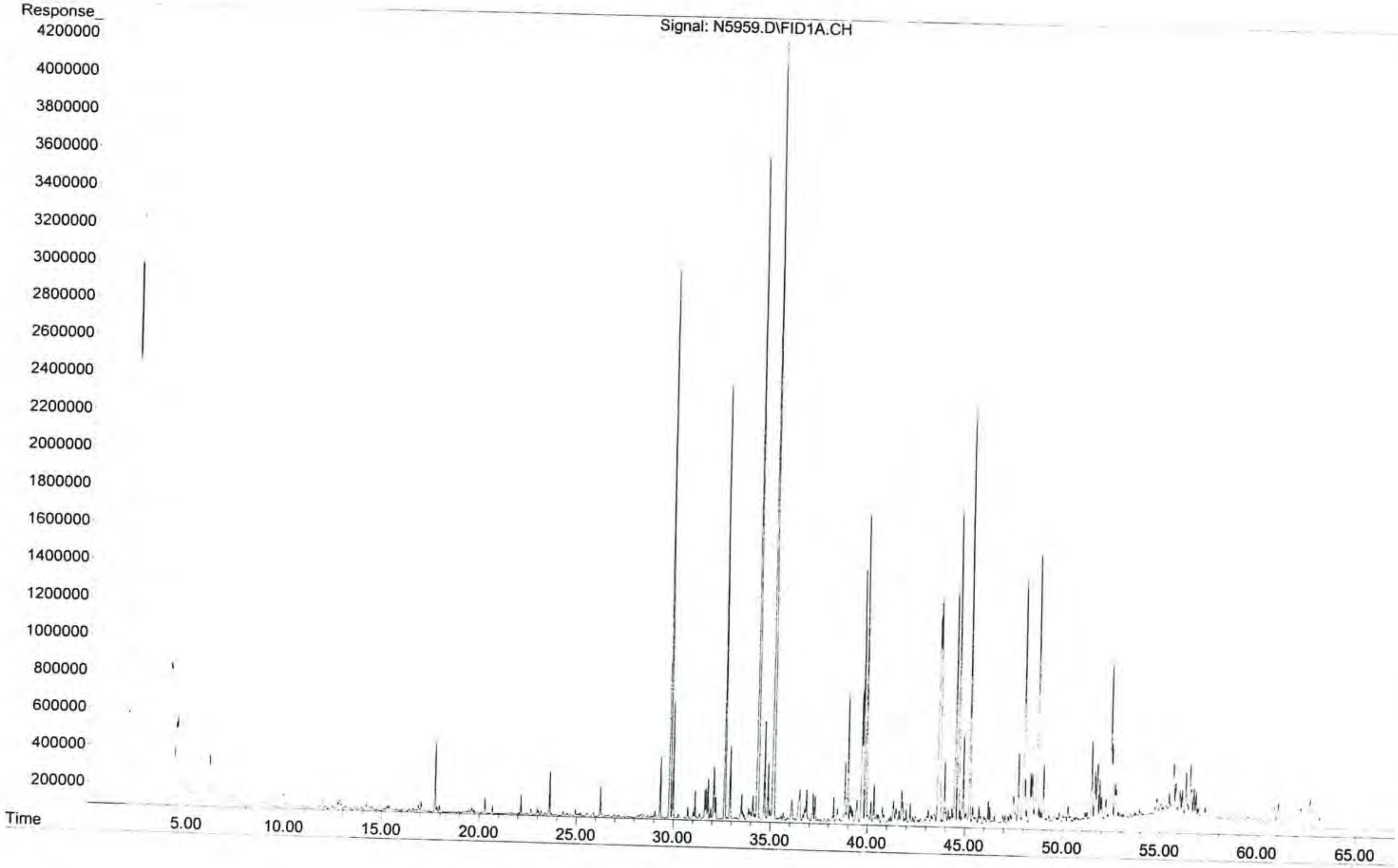
```
File        : F:\N\DATA\SN0260\N5953.D
Operator    : MM
Acquired    : 10-30-2007 09:19:59 PM using AcqMethod TPH.M
Instrument  :    Inst. N
Sample Name: BL087NSC-P(0)
Misc Info   : North Slope Crude 5-202 07-0266
Vial Number: 33
```



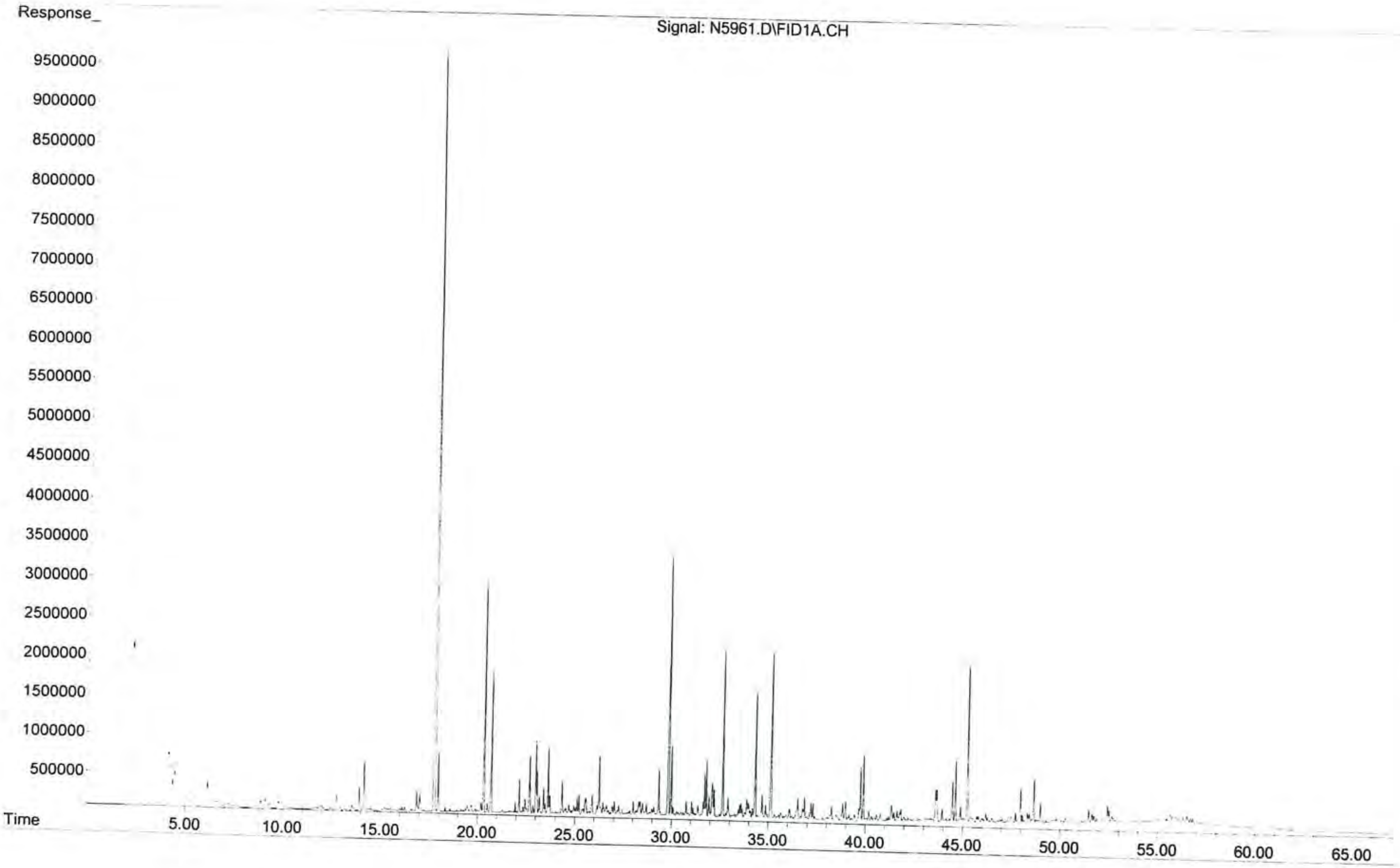
```
File        : F:\N\DATA\SN0260\N5955.D
Operator    : MM
Acquired    : 30 Oct 2007  10:40 pm using AcqMethod TPH.M
Instrument  :   Inst. N
Sample Name: Q0542-P1-FID(11)
Misc Info   : SB-8 S5 9-10.5 5-202 07-0266
Vial Number: 34
```



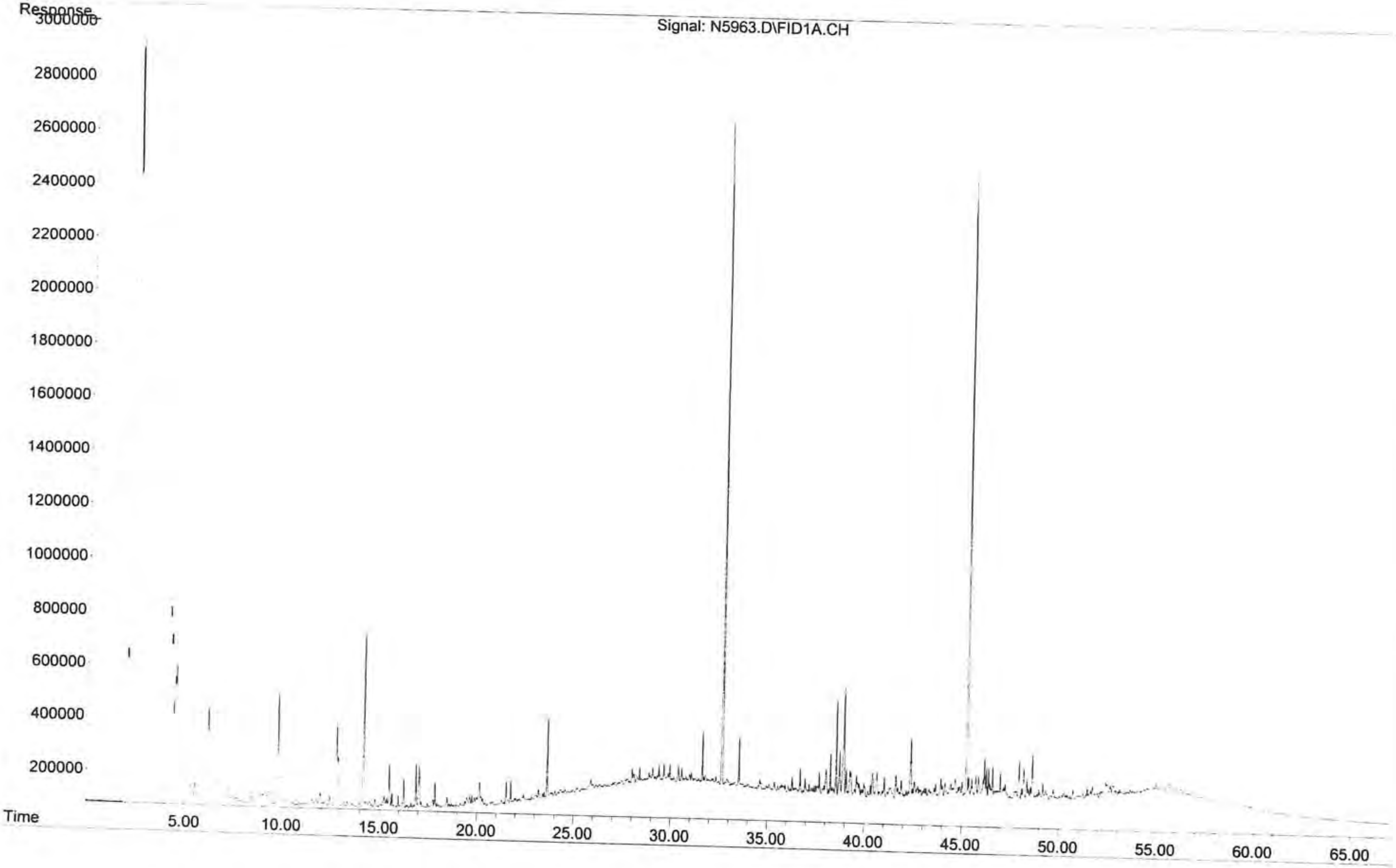
File : F:\N\DATA\SN0260\N5959.D
Operator : MM
Acquired : 10-31-2007 01:20:57 AM using AcqMethod TPH.M
Instrument : Inst. N
Sample Name: Q0543-P1-FID(15)
Misc Info : SB-13 2.5-4.0 5-202 07-0266
Vial Number: 36



```
File        : F:\N\DATA\SN0260\N5961.D
Operator    : MM
Acquired    : 10-31-2007 02:40:32 AM using AcqMethod TPH.M
Instrument  :    Inst. N
Sample Name: Q0544-P1-FID(11)
Misc Info   : SB-12A S3 5-6.5 5-202 07-0266
Vial Number: 37
```



```
File       : F:\N\DATA\SN0260\N5963.D
Operator   : MM
Acquired   : 10-31-2007 04:00:52 AM using AcqMethod TPH.M
Instrument :   Inst. N
Sample Name: Q0546-P1-FID(11)
Misc Info  : GP-9 7-8 5-202 07-0266
Vial Number: 38
```



PAH Data and Histograms
Biomarker Data and EICPs

PAH and Biomarker – SEDIMENT QA/QC SUMMARY
Batch 07-0259

PROJECT:	Floyd/Snyder – Gas Works Park
PARAMETER:	Polycyclic Aromatic Hydrocarbons (PAH) and Biomarkers
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Sediment
SAMPLE CUSTODY:	Six soil samples and 1 NAPL were received at Battelle Duxbury Operations (BDO) Laboratory on 10/9/07. Upon Receipt of the samples, the temperature of the cooler was taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was slightly below the acceptable range (4°C ± 2°) at 0.6°C. Also, it was noted that sample Q0540 (MW-9) had some oil residue on the outside of the container as well as the inner side of the bubble wrap. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples. The client was notified on 10/16/07. The laboratory was instructed to proceed with the analysis. Samples were stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS Recovery	MS/MSD Precision	Control Oil % Diff
SHC and TPH	General NS&T	<5xMDL	40-120% Recovery	40-120% Recovery	40-120% Recovery MS target spike must be >5x background	≤30% RPD	PD,30% for 90% of the analytes

METHOD:

Soil samples were extracted following general NS&T methods. Approximately 5-8 g of sample was spiked with SHC, PAH, and biomarker surrogates and serial extracted three times with dichloromethane using orbital shaker table techniques. The combined extracts were dried over anhydrous sodium sulfate and concentrated by Kuderna-Danish and nitrogen evaporation techniques. The sample extracts were split in half: one-half of the extract was removed for archiving; the other half was processed through an alumina gravity column to isolate the hydrocarbon fractions of interest. The weights of the resulting extracts were determined gravimetrically. The extracts were concentrated to 1 mL, split, and spiked with internal standard (IS). The pre-injection volume and/or extract split were adjusted to 5mg/mL. One extract was submitted for PAH and the second extract was submitted for SHC and TPH analysis.

PAH and petroleum biomarkers were measured by gas chromatography –mass spectrometry (GC/MS) in the selected ion mode (SIM). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of the analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of the PAH and petroleum biomarkers were calculated by the internal standard method. Target PAH were quantified using the average RF generated from the initial calibration. The alkyl homologue PAH series were assigned the RF of the parent PAH, Steranes were assigned the RF of cholestane, and triterpanes were assigned the RF of Moretane.

Note: the reporting limit for the alkyl benzene compounds is orders of magnitude higher than the reporting limits for the rest of the PAH compounds.

HOLDING TIMES:

Samples were prepared for analysis in three analytical batches and were extracted within 30 days of sample collection analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0259	10/15/2007	10/24/2007

PAH and Biomarker – SEDIMENT QA/QC SUMMARY

Batch 07-0259

PROCEDURAL BLANK (PB): A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0259 – No exceedences noted.

Comments – None.

LABORATORY CONTROL SAMPLE (LCS): A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0259 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY: Five surrogate compounds were added prior to extraction, including naphthalene-d8, acenaphthene-d10, phenanthrene-d10, benzo(a)pyrene-d12, and 5b(H)-chloane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0259 – Several surrogates are over-recovered in the samples. Benzo(a)pyrene-d12 is out in the PB and the NSC, though the NSC still passes for all the analytes and this does not affect the authentic samples.

Comments – The exceedences in the authentic samples is most likely attributed to the high levels of target analytes found in the samples and should have not affect on the values reported for the target analytes.

CONTROL OIL: A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0259 – No exceedences noted.

Comments – None.

CALIBRATIONS: The GC/MS is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (% RSD) between RF for the individual target analytes must be $\leq$25%, and the mean RSD of all target analytes must be $\leq$15%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be $\leq$25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be $\leq$25%.

07-0259 – No exceedences noted.

Comments – None.

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-2 S5 8-9.5	GP-12 S2 23-24
Battelle ID	Q0541-P	Q0545-P
Sample Type	SA	SA
Collection Date	09/17/07	09/20/07
Extraction Date	10/15/07	10/15/07
Analysis Date	10/24/07	10/24/07
Analytical Instrument	MS	MS
% Moisture	18.05	26.35
% Lipid	NA	NA
Matrix	SOIL	SOIL
Sample Size	4.59	3.93
Size Unit-Basis	G_DRY	G_DRY
Units	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	10085.26	5127.04
C4-Alkylbenzenes	15434.72	3892.29
C5-Alkylbenzenes	10512.82	742.61 J
C6-Alkylbenzenes	12276.98	339 J
Benzo(b)thiophene	9878.53	20344.59
C1-benzo(b)thiophenes	11507.34	7546.34
C2-benzo(b)thiophenes	14450.56	4669.98
C3-benzo(b)thiophenes	14482.43	1168.82
C4-benzo(b)thiophenes	8555.49	159.28
Naphthalene	280712.07 D	401296.71 D
C1-Naphthalenes	161435.32 D	106483 D
C2-Naphthalenes	200528.1 D	32509.83 D
C3-Naphthalenes	150550.6 D	6892.79 D
C4-Naphthalenes	78992.16 D	1297.11 D
C1-Biphenyls + Dibenzofuran	28932.64	16556.81
Biphenyl	8957.51	12549.72
C2-Biphenyls + C1-Dibenzofurans	45019.06	6521.65
Acenaphthylene	5745.65	15068.74
Acenaphthene	122429.23 D	6762.95
Dibenzofuran	7893.62	12352.38
Fluorene	64333.84 D	20199.05
C1-Fluorenes	37349.9 D	3928.84
C2-Fluorenes	32374.2 D	1332.36
C3-Fluorenes	20462.87 D	565.53
C4-Fluorenes	9721.05 D	233.13
Anthracene	54254.5 D	15041.8 D
Phenanthrene	187892.05 D	60533.18 D
C1-Phenanthrenes/Anthracenes	109645.54 D	12567.33 D
C2-Phenanthrenes/Anthracenes	55169.03 D	5974.74 D
C3-Phenanthrenes/Anthracenes	20750.58 D	1092.05 D
C4-Phenanthrenes/Anthracenes	5696.83 D	442.09
Retene	2259.18	891.41
Dibenzothiophene	15598.08	3943.26
C1-Dibenzothiophenes	18802.31	1433.37
C2-Dibenzothiophenes	16145.18	660.06
C3-Dibenzothiophenes	8872.71	234.5
C4-Dibenzothiophenes	3335.64	67.4
Fluoranthene	59196.4 D	22336.82
Pyrene	97480.76 D	20773.98
C1-Fluoranthenes/Pyrenes	65145.99 D	12195.01
C2-Fluoranthenes/Pyrenes	14924.46 D	3270.47
C3-Fluoranthenes/Pyrenes	4915.67 D	988.68
C4-Fluoranthenes/Pyrenes	2180.92 D	465.25
C0-Benzo(b)naphthothiophenes	3776.25	913.61
C1-Benzo(b)naphthothiophenes	4725.17	694.13
C2-Benzo(b)naphthothiophenes	2125.13	221.74
C3-Benzo(b)naphthothiophenes	1212.17	154.67
C4-Benzo(b)naphthothiophenes	536.8	36.21
Benzo(a)anthracene	24074.78	9590.03
Chrysene	22810.15	9771.77

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-2 S5 8-9.5	GP-12 S2 23-24
Battelle ID	Q0541-P	Q0545-P
Sample Type	SA	SA
Collection Date	09/17/07	09/20/07
Extraction Date	10/15/07	10/15/07
Analysis Date	10/24/07	10/24/07
Analytical Instrument	MS	MS
% Moisture	18.05	26.35
% Lipid	NA	NA
Matrix	SOIL	SOIL
Sample Size	4.59	3.93
Size Unit-Basis	G_DRY	G_DRY
Units	NG/G_DRY	NG/G_DRY
C1-Chrysenes	16589.65	4494.91
C2-Chrysenes	5241.89	1459.72
C3-Chrysenes	2403.14	619.55
C4-Chrysenes	1114.53	241.79
Benzo(b)fluoranthene	12560.8	7467.49
Benzo(k)fluoranthene	17864.18	8774.71
Benzo(e)pyrene	15474.59	6186
Benzo(a)pyrene	28503.51	11388.72
Perylene	4224.91	3288.78
Indeno(1,2,3-cd)pyrene	12042.45 D	5028.52 D
Dibenz(a,h)anthracene	2886.08 D	1140.83 D
Benzo(g,h,i)perylene	13776.39	7060.88
Total PAH	2089157.85	859307.45

Surrogate Recoveries (%)

Naphthalene-d8	123 N	103
Acenaphthene-d10	189 N	110
Phenanthrene-d10	94	93
Benzo(a)pyrene-d12	107 D	72 D
5b(H)-Cholane	209 N	1182 N

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Battelle

The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98 North Slope Crude				
Battelle ID	BL042NSC-P				
Sample Type	NSC				
Collection Date	10/17/07				
Extraction Date	10/17/07				
Analysis Date	10/24/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
C3-Alkylbenzenes	1616.97				
C4-Alkylbenzenes	1276.68				
C5-Alkylbenzenes	721.47				
C6-Alkylbenzenes	454.78				
Benzo(b)thiophene	12.64				
C1-benzo(b)thiophenes	42.96				
C2-benzo(b)thiophenes	76.93		95.74	19.6	
C3-benzo(b)thiophenes	99.29		132.67	25.2	
C4-benzo(b)thiophenes	96.03		96.72	0.7	
Naphthalene	705.29		740.29	4.7	
C1-Naphthalenes	1418.33		1516.04	6.4	
C2-Naphthalenes	1865.4		2000.10	6.7	
C3-Naphthalenes	1459.07		1526.96	4.4	
C4-Naphthalenes	792.31		898.03	11.8	
C1-Biphenyls + Dibenzofuran	338.3				
Biphenyl	211		220.82	4.4	
C2-Biphenyls + C1-Dibenzofurans	502.68				
Acenaphthylene		U			
Acenaphthene	13.59		14.50	6.3	
Dibenzofuran	67.6		77.75	13.1	
Fluorene	98.21		92.51	6.2	
C1-Fluorenes	209.14		227.01	7.9	
C2-Fluorenes	298.65		367.09	18.6	
C3-Fluorenes	274.46		326.32	15.9	
C4-Fluorenes	179.5				
Anthracene		U			
Phenanthrene	237.55		249.49	4.8	
C1-Phenanthrenes/Anthracenes	507.25		549.17	7.6	
C2-Phenanthrenes/Anthracenes	596.02		642.72	7.3	
C3-Phenanthrenes/Anthracenes	423.45		446.11	5.1	
C4-Phenanthrenes/Anthracenes	150.11		180.02	16.6	
Retene	43.19				
Dibenzothiophene	197.91		210.35	5.9	
C1-Dibenzothiophenes	376.95		409.03	7.8	
C2-Dibenzothiophenes	520.69		551.46	5.6	
C3-Dibenzothiophenes	420.01		471.36	10.9	
C4-Dibenzothiophenes	232.92		243.11	4.2	
Fluoranthene	3.51				
Pyrene	11.92		12.99	8.2	
C1-Fluoranthenes/Pyrenes	69.22		70.92	2.4	
C2-Fluoranthenes/Pyrenes	128.43		117.89	8.9	
C3-Fluoranthenes/Pyrenes	146.1		137.25	6.4	
C4-Fluoranthenes/Pyrenes	111.01				
C0-Benzo(b)naphthothiophenes	40.92				
C1-Benzo(b)naphthothiophenes	160.58				
C2-Benzo(b)naphthothiophenes	194.47				
C3-Benzo(b)naphthothiophenes	143.86				
C4-Benzo(b)naphthothiophenes	96.41				
Benzo(a)anthracene	4.52				

Not Surrogate Corrected

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11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude				
Battelle ID	BL042NSC-P				
Sample Type	NSC				
Collection Date	10/17/07				
Extraction Date	10/17/07				
Analysis Date	10/24/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
Chrysene	48.26		47.18	2.3	
C1-Chrysenes	83.68		78.82	6.2	
C2-Chrysenes	108.82		102.67	6.0	
C3-Chrysenes	98.2		85.36	15.0	
C4-Chrysenes	60.53		61.99	2.4	
Benzo(b)fluoranthene	6.48		6.08	6.6	
Benzo(k)fluoranthene	0.68	J			
Benzo(e)pyrene	14.65		12.88	13.7	
Benzo(a)pyrene		U			
Perylene		U			
Indeno(1,2,3-cd)pyrene		U			
Dibenz(a,h)anthracene	1.26				
Benzo(g,h,i)perylene	3.46		3.44	0.6	
Total PAH	11865.63				

Surrogate Recoveries (%)

Naphthalene-d8	113	
Acenaphthene-d10	98	
Phenanthrene-d10	96	
Benzo(a)pyrene-d12	139	N
5b(H)-Cholane		

Not Surrogate Corrected

Analyzed by Bardon, Daniel
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Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL033PB-P
Sample Type	PB
Collection Date	10/15/07
Extraction Date	10/15/07
Analysis Date	10/24/07
Analytical Instrument	MS
% Moisture	22.07
% Lipid	NA
Matrix	SEDIMENT
Sample Size	11.03
Size Unit-Basis	G_DRY
Units	NG/G_DRY
C3-Alkylbenzenes	U
C4-Alkylbenzenes	U
C5-Alkylbenzenes	U
C6-Alkylbenzenes	U
Benzo(b)thiophene	U
C1-benzo(b)thiophenes	U
C2-benzo(b)thiophenes	U
C3-benzo(b)thiophenes	U
C4-benzo(b)thiophenes	U
Naphthalene	0.82 J
C1-Naphthalenes	0.12 J
C2-Naphthalenes	U
C3-Naphthalenes	U
C4-Naphthalenes	U
C1-Biphenyls + Dibenzofuran	U
Biphenyl	U
C2-Biphenyls + C1-Dibenzofurans	U
Acenaphthylene	U
Acenaphthene	U
Dibenzofuran	U
Fluorene	U
C1-Fluorenes	U
C2-Fluorenes	U
C3-Fluorenes	U
C4-Fluorenes	U
Anthracene	U
Phenanthrene	U
C1-Phenanthrenes/Anthracenes	U
C2-Phenanthrenes/Anthracenes	U
C3-Phenanthrenes/Anthracenes	U
C4-Phenanthrenes/Anthracenes	U
Retene	U
Dibenzothiophene	U
C1-Dibenzothiophenes	U
C2-Dibenzothiophenes	U
C3-Dibenzothiophenes	U
C4-Dibenzothiophenes	U
Fluoranthene	U
Pyrene	U
C1-Fluoranthenes/Pyrenes	U
C2-Fluoranthenes/Pyrenes	U
C3-Fluoranthenes/Pyrenes	U
C4-Fluoranthenes/Pyrenes	U
C0-Benzo(b)naphthothiophenes	U
C1-Benzo(b)naphthothiophenes	U
C2-Benzo(b)naphthothiophenes	U
C3-Benzo(b)naphthothiophenes	U
C4-Benzo(b)naphthothiophenes	U
Benzo(a)anthracene	U
Chrysene	U

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL033PB-P
Sample Type	PB
Collection Date	10/15/07
Extraction Date	10/15/07
Analysis Date	10/24/07
Analytical Instrument	MS
% Moisture	22.07
% Lipid	NA
Matrix	SEDIMENT
Sample Size	11.03
Size Unit-Basis	G_DRY
Units	NG/G_DRY
C1-Chrysenes	U
C2-Chrysenes	U
C3-Chrysenes	U
C4-Chrysenes	U
Benzo(b)fluoranthene	U
Benzo(k)fluoranthene	U
Benzo(e)pyrene	U
Benzo(a)pyrene	U
Perylene	U
Indeno(1,2,3-cd)pyrene	U
Dibenz(a,h)anthracene	U
Benzo(g,h,i)perylene	U
Total PAH	0.94 J

Surrogate Recoveries (%)

Naphthalene-d8	108
Acenaphthene-d10	96
Phenanthrene-d10	93
Benzo(a)pyrene-d12	121 N
5b(H)-Cholane	100

Not Surrogate Corrected

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Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70
Battelle ID	BL034LCS-P
Sample Type	LCS
Collection Date	10/15/07
Extraction Date	10/15/07
Analysis Date	10/24/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	SEDIMENT
Sample Size	NA
Size Unit-Basis	NA

Units	NG		Target	% Recovery	Qualifier
C3-Alkylbenzenes		U			
C4-Alkylbenzenes		U			
C5-Alkylbenzenes		U			
C6-Alkylbenzenes		U			
Benzo(b)thiophene	2229.17		2508.50	89	
C1-benzo(b)thiophenes		U			
C2-benzo(b)thiophenes		U			
C3-benzo(b)thiophenes		U			
C4-benzo(b)thiophenes		U			
Naphthalene	2498.65		2500.50	100	
C1-Naphthalenes		U			
C2-Naphthalenes		U			
C3-Naphthalenes		U			
C4-Naphthalenes		U			
C1-Biphenyls + Dibenzofuran		U			
Biphenyl	2082.17		2504.25	83	
C2-Biphenyls + C1-Dibenzofurans		U			
Acenaphthylene	2301.46		2502.25	92	
Acenaphthene	2451.23		2501.63	98	
Dibenzofuran	2068.13		2504.75	83	
Fluorene	2285.22		2501.38	91	
C1-Fluorenes		U			
C2-Fluorenes		U			
C3-Fluorenes		U			
C4-Fluorenes		U			
Anthracene	2095.12		2500.38	84	
Phenanthrene	2091		2501.25	84	
C1-Phenanthrenes/Anthracenes		U			
C2-Phenanthrenes/Anthracenes		U			
C3-Phenanthrenes/Anthracenes		U			
C4-Phenanthrenes/Anthracenes		U			
Retene		U			
Dibenzothiophene	1838.31		2502.50	73	
C1-Dibenzothiophenes		U			
C2-Dibenzothiophenes		U			
C3-Dibenzothiophenes		U			
C4-Dibenzothiophenes		U			
Fluoranthene	2132.27		2501.25	85	
Pyrene	2165.99		2500.88	87	
C1-Fluoranthenes/Pyrenes		U			
C2-Fluoranthenes/Pyrenes		U			
C3-Fluoranthenes/Pyrenes		U			
C4-Fluoranthenes/Pyrenes		U			
C0-Benzo(b)naphthothiophenes		U			
C1-Benzo(b)naphthothiophenes		U			
C2-Benzo(b)naphthothiophenes		U			
C3-Benzo(b)naphthothiophenes		U			
C4-Benzo(b)naphthothiophenes		U			
Benzo(a)anthracene	2291.31		2500.63	92	

Not Surrogate Corrected

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LCS: S07-0259MS-Master_157-Final.xls

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70				
Battelle ID	BL034LCS-P				
Sample Type	LCS				
Collection Date	10/15/07				
Extraction Date	10/15/07				
Analysis Date	10/24/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	SEDIMENT				
Sample Size	NA				
Size Unit-Basis	NA				
Units	NG		Target	% Recovery	Qualifier
Chrysene	2168.08		2501.00	87	
C1-Chrysenes		U			
C2-Chrysenes		U			
C3-Chrysenes		U			
C4-Chrysenes		U			
Benzo(b)fluoranthene	2605.55		2502.13	104	
Benzo(k)fluoranthene	2769.68		2501.38	111	
Benzo(e)pyrene	2446.43		2503.50	98	
Benzo(a)pyrene	2764.71		2502.00	111	
Perylene	2683.02		2505.13	107	
Indeno(1,2,3-cd)pyrene	2979.41		2501.25	119	
Dibenz(a,h)anthracene	2790.14		2501.38	112	
Benzo(g,h,i)perylene	2908.59		2500.75	116	
Total PAH	50416.47				

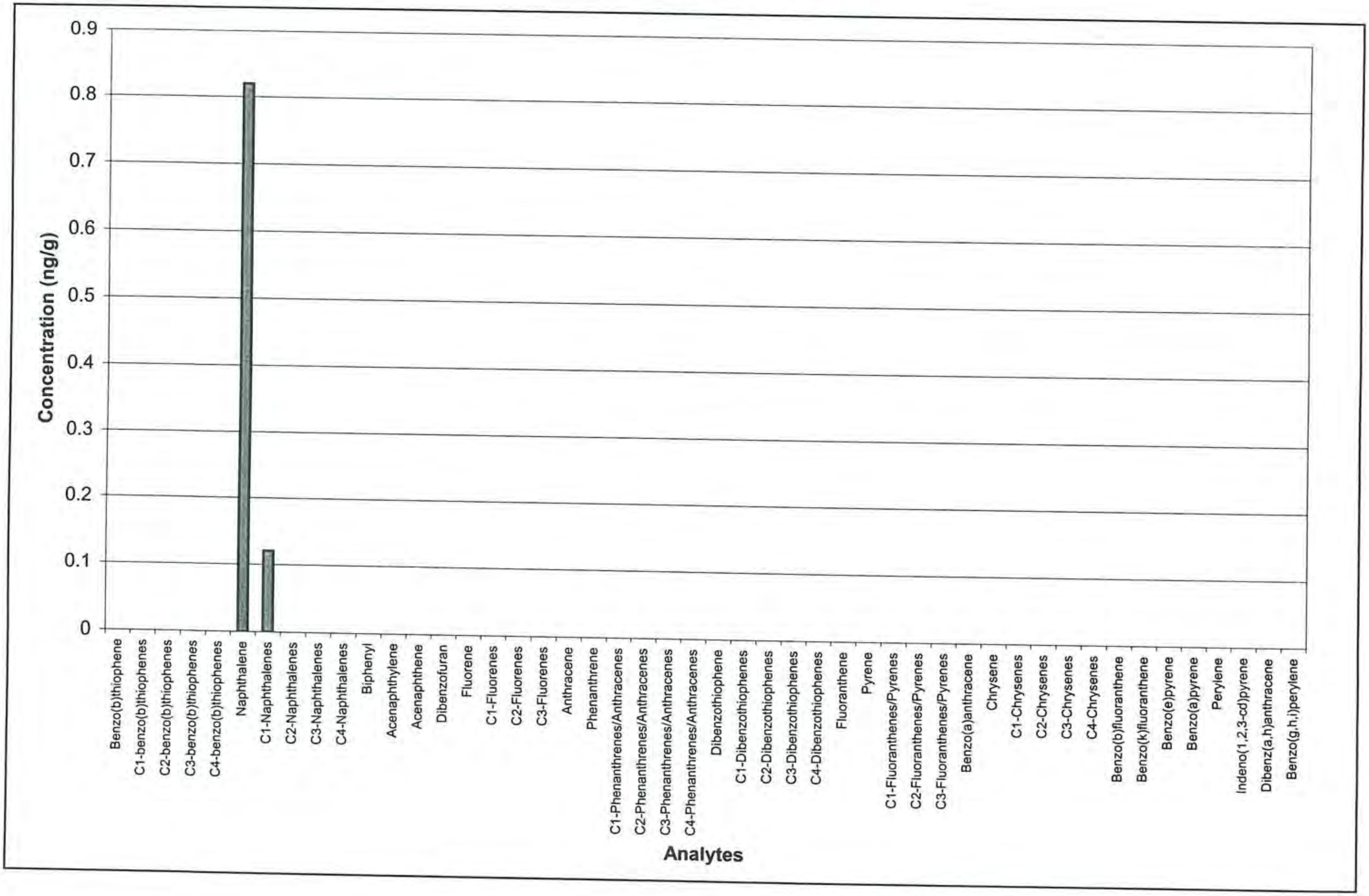
Surrogate Recoveries (%)

Naphthalene-d8	92
Acenaphthene-d10	81
Phenanthrene-d10	79
Benzo(a)pyrene-d12	111
5b(H)-Cholane	82

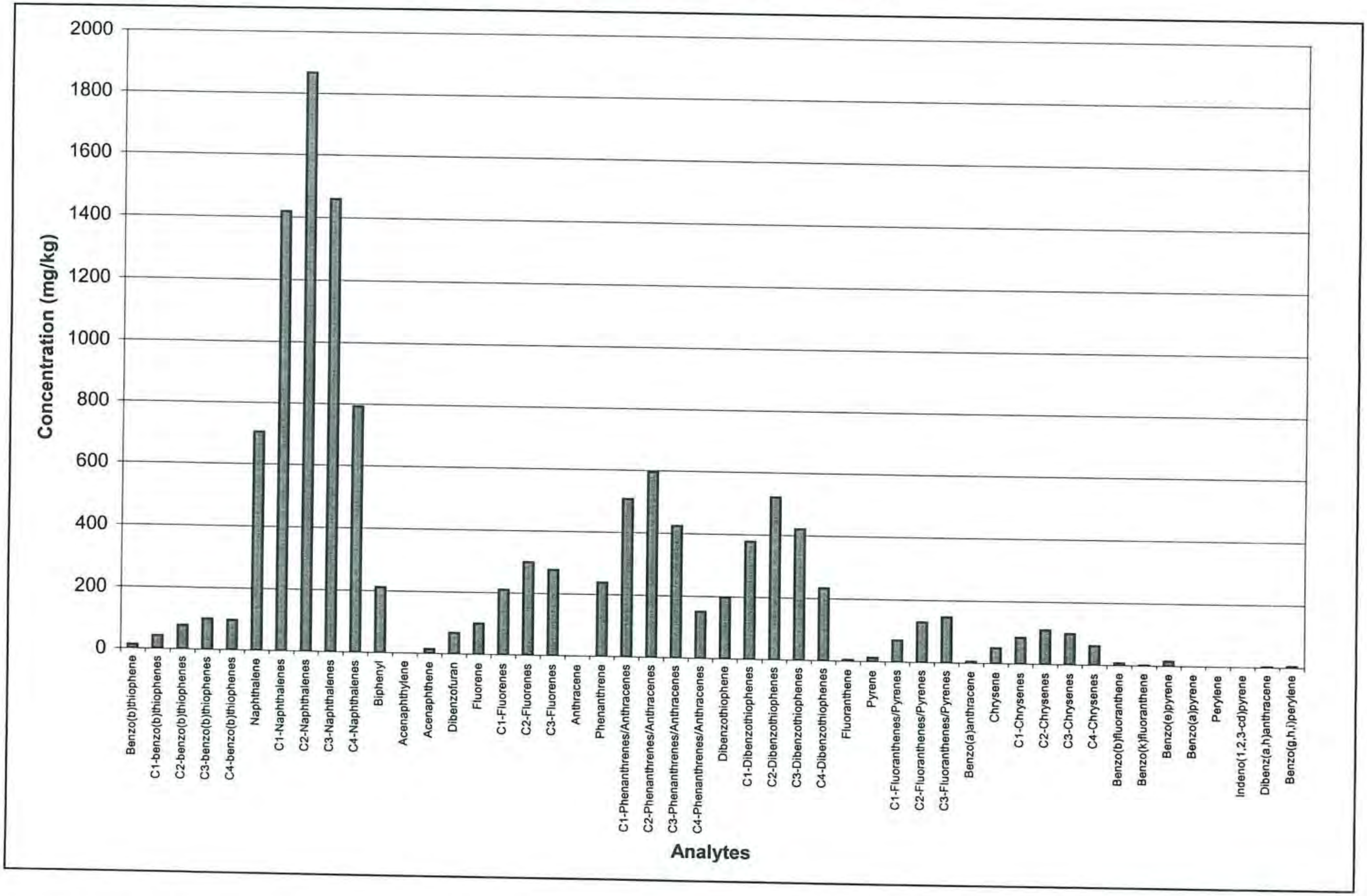
Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

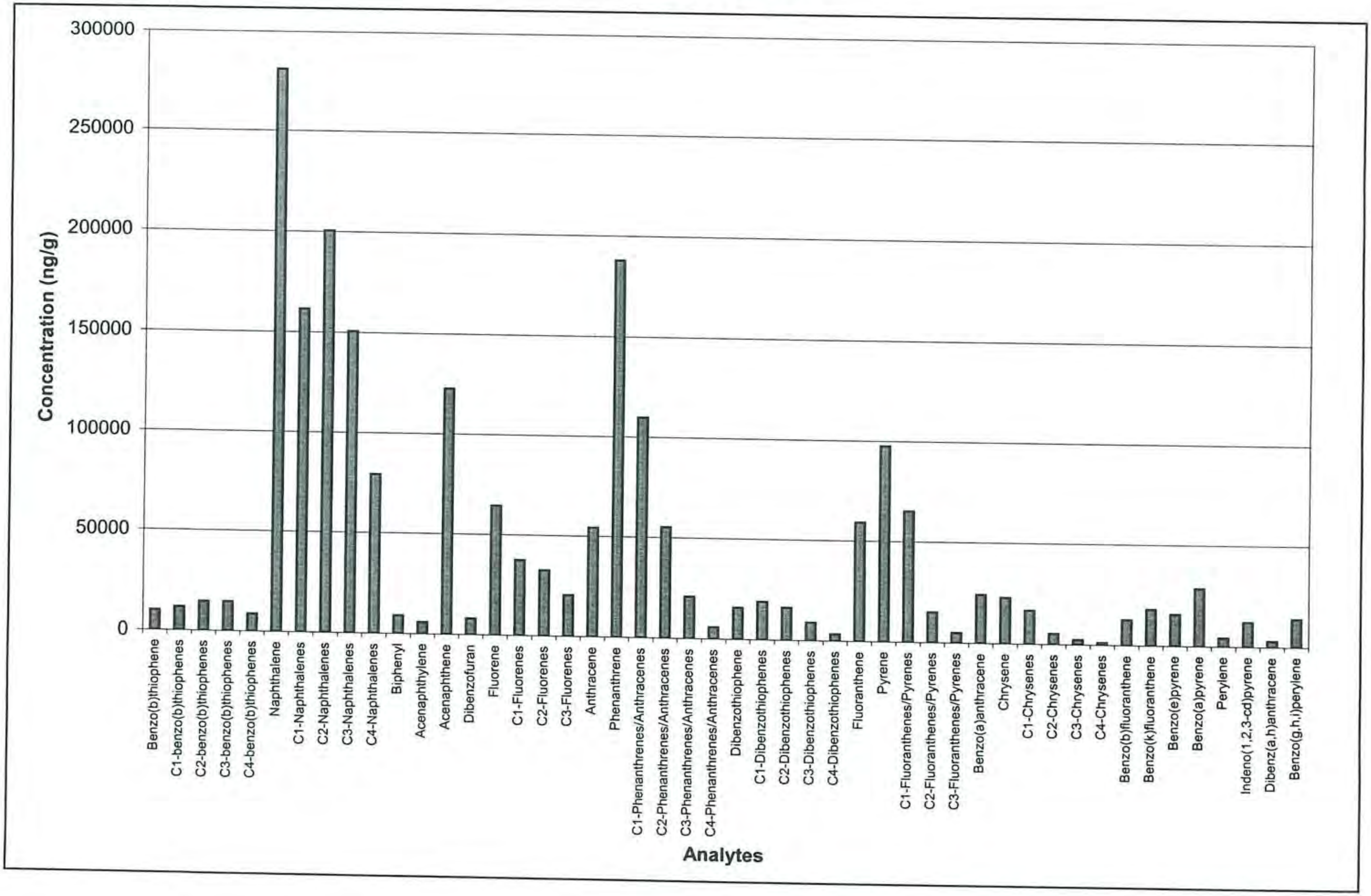
Procedural Blank (BL033PB-P)



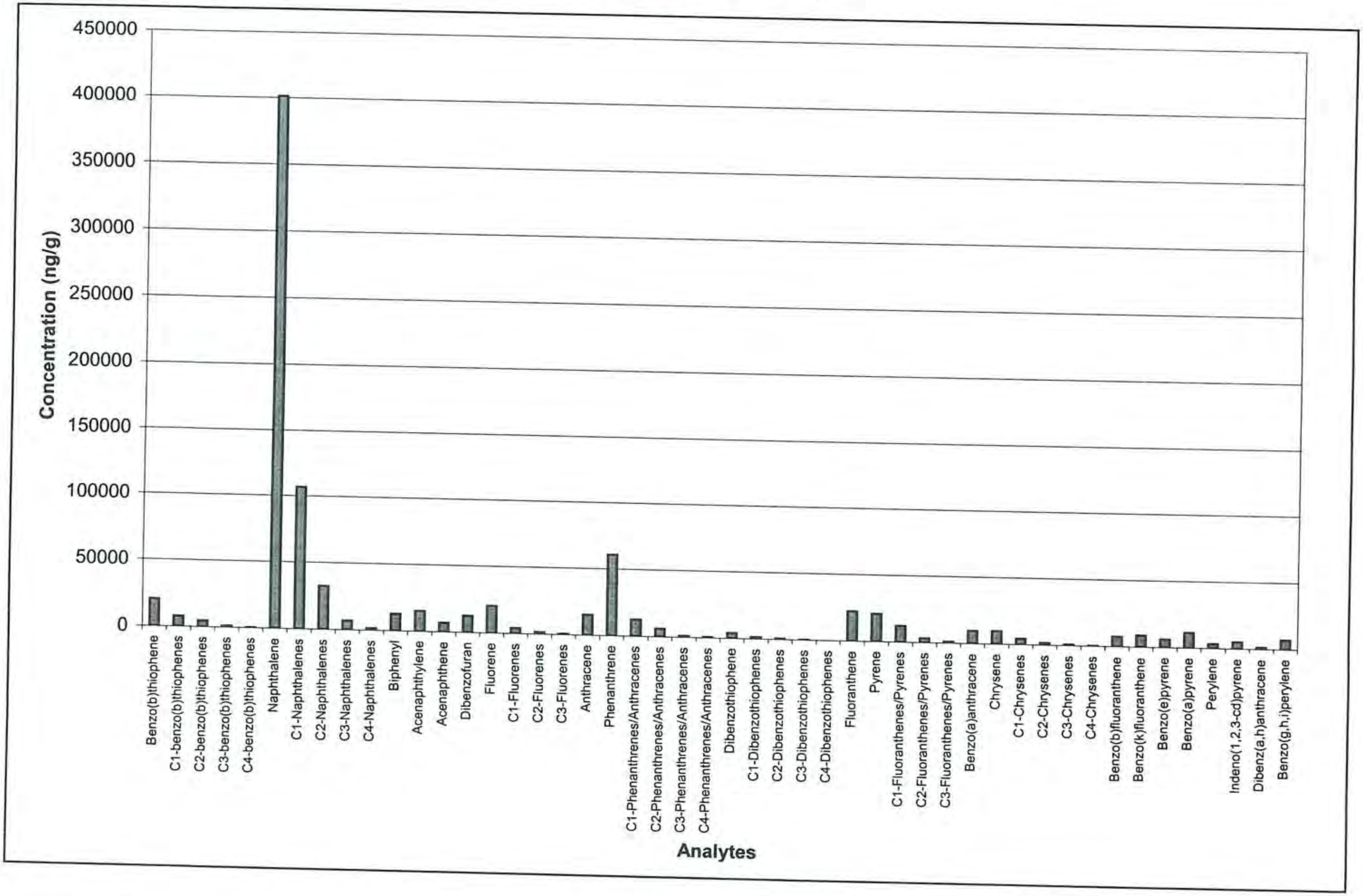
GO98: North Slope Crude (BL042NSC-P)



SB-2 S5 8-9.5 (Q0541-P)



GP-12 S2 23-24 (Q0545-P)



Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-2 S5 8-9.5	GP-12 S2 23-24
Battelle ID	Q0541-P	Q0545-P
Sample Type	SA	SA
Collection Date	09/17/07	09/20/07
Extraction Date	10/15/07	10/15/07
Analysis Date	10/24/07	10/24/07
Analytical Instrument	MS	MS
% Moisture	18.05	26.35
% Lipid	NA	NA
Matrix	SOIL	SOIL
Sample Size	4.59	3.93
Size Unit-Basis	G_DRY	G_DRY
Units	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	808.38	U
C29 Tricyclic Terpane -22S	186.44	U
C29 Tricyclic Terpane -22R	161.44	U
18a(H)-22,29,30-Trisnorneohopane -TS	106.17	U
17a(H)-22,29,30-Trisnorhopane -TM	206.65	9.32 J
30-Norhopane	585.14	17.21 J
18a(H) & 18b(H)-Oleananes	249.57	U
Hopane	1145.01	25.49
30-Homohopane -22S	348.58	7.89 J
30-Homohopane -22R	256.76	9.62 J
13b(H),17a(H)-20S-Diacholestane	933.64	U
13b(H),17a(H)-20R-Diacholestane	506.1	U
14a(H),17a(H)-20R-methylcholestane	2052.28	1.56 J
14a(H),17a(H)-20S-Ethylcholestane	792.41	1.33 J
14a(H),17a(H)-20R-Ethylcholestane	1253.6	U
C21-TAS	233.87	96.2
C26-TAS(20S)	316.84	U
C26,C27-TAS	1112.01	3.93 J
C27-TAS(20R)	582.47	1.57 J
C28-TAS(20S)	356.92	1.69 J
C28-TAS(20R)	285.06	1.48 J
C21-MAS	181.17	2.44 J
C22-MAS	79.43	U
C27-MAS	77.57	5.44 J
C27-20R-MAS	450.42	67.48
C27-20S-MAS	331.86	18.33
C28-20S-MAS	473.27	5.27 J
C27-C2920S/R-MAS	595.97	237.34
C29-20S-MAS	1813.24	U
C29-20R-MAS	389.19	626.34
TAS_245	U	U
MAS_239	U	U

Surrogate Recoveries (%)

Naphthalene-d8	123 N	103
Acenaphthene-d10	189 N	110
Phenanthrene-d10	94	93
Benzo(a)pyrene-d12	107 D	72 D
5b(H)-Cholane	209 N	1182 N

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70			
Battelle ID	BL034LCS-P			
Sample Type	LCS			
Collection Date	10/15/07			
Extraction Date	10/15/07			
Analysis Date	10/24/07			
Analytical Instrument	MS			
% Moisture	NA			
% Lipid	NA			
Matrix	SEDIMENT			
Sample Size	NA			
Size Unit-Basis	NA			
Units	NG		Target % Recovery	Qualifier
C23 Tricyclic Terpane		U		
C29 Tricyclic Terpane -22S		U		
C29 Tricyclic Terpane -22R		U		
18a(H)-22,29,30-Trisnorneohopane -TS		U		
17a(H)-22,29,30-Trisnorhopane -TM		U		
30-Norhopane		U		
18a(H) & 18b(H)-Oleananes		U		
Hopane		U		
30-Homohopane -22S		U		
30-Homohopane -22R		U		
13b(H),17a(H)-20S-Diacholestane		U		
13b(H),17a(H)-20R-Diacholestane		U		
14a(H),17a(H)-20R-methylcholestane		U		
14a(H),17a(H)-20S-Ethylcholestane		U		
14a(H),17a(H)-20R-Ethylcholestane		U		
C21-TAS		U		
C26-TAS(20S)		U		
C26,C27-TAS		U		
C27-TAS(20R)		U		
C28-TAS(20S)		U		
C28-TAS(20R)		U		
C21-MAS		U		
C22-MAS		U		
C27-MAS		U		
C27-20R-MAS		U		
C27-20S-MAS		U		
C28-20S-MAS		U		
C27-C2920S/R-MAS		U		
C29-20S-MAS		U		
C29-20R-MAS		U		
TAS_245		U		
MAS_239		U		

Surrogate Recoveries (%)

Naphthalene-d8	92
Acenaphthene-d10	81
Phenanthrene-d10	79
Benzo(a)pyrene-d12	111
5b(H)-Cholane	82

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL033PB-P
Sample Type	PB
Collection Date	10/15/07
Extraction Date	10/15/07
Analysis Date	10/24/07
Analytical Instrument	MS
% Moisture	22.07
% Lipid	NA
Matrix	SEDIMENT
Sample Size	11.03
Size Unit-Basis	G_DRY
Units	NG/G_DRY

C23 Tricyclic Terpane	U
C29 Tricyclic Terpane -22S	U
C29 Tricyclic Terpane -22R	U
18a(H)-22,29,30-Trisnorneohopane -TS	U
17a(H)-22,29,30-Trisnorhopane -TM	U
30-Norhopane	U
18a(H) & 18b(H)-Oleananes	U
Hopane	U
30-Homohopane -22S	U
30-Homohopane -22R	U
13b(H),17a(H)-20S-Diacholestane	U
13b(H),17a(H)-20R-Diacholestane	U
14a(H),17a(H)-20R-methylcholestane	U
14a(H),17a(H)-20S-Ethylcholestane	U
14a(H),17a(H)-20R-Ethylcholestane	U
C21-TAS	U
C26-TAS(20S)	U
C26,C27-TAS	U
C27-TAS(20R)	0.23 J
C28-TAS(20S)	0.16 J
C28-TAS(20R)	U
C21-MAS	U
C22-MAS	U
C27-MAS	U
C27-20R-MAS	U
C27-20S-MAS	U
C28-20S-MAS	U
C27-C2920S/R-MAS	U
C29-20S-MAS	U
C29-20R-MAS	U
TAS_245	U
MAS_239	U

Surrogate Recoveries (%)

Naphthalene-d8	108
Acenaphthene-d10	96
Phenanthrene-d10	93
Benzo(a)pyrene-d12	121 N
5b(H)-Cholane	100

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

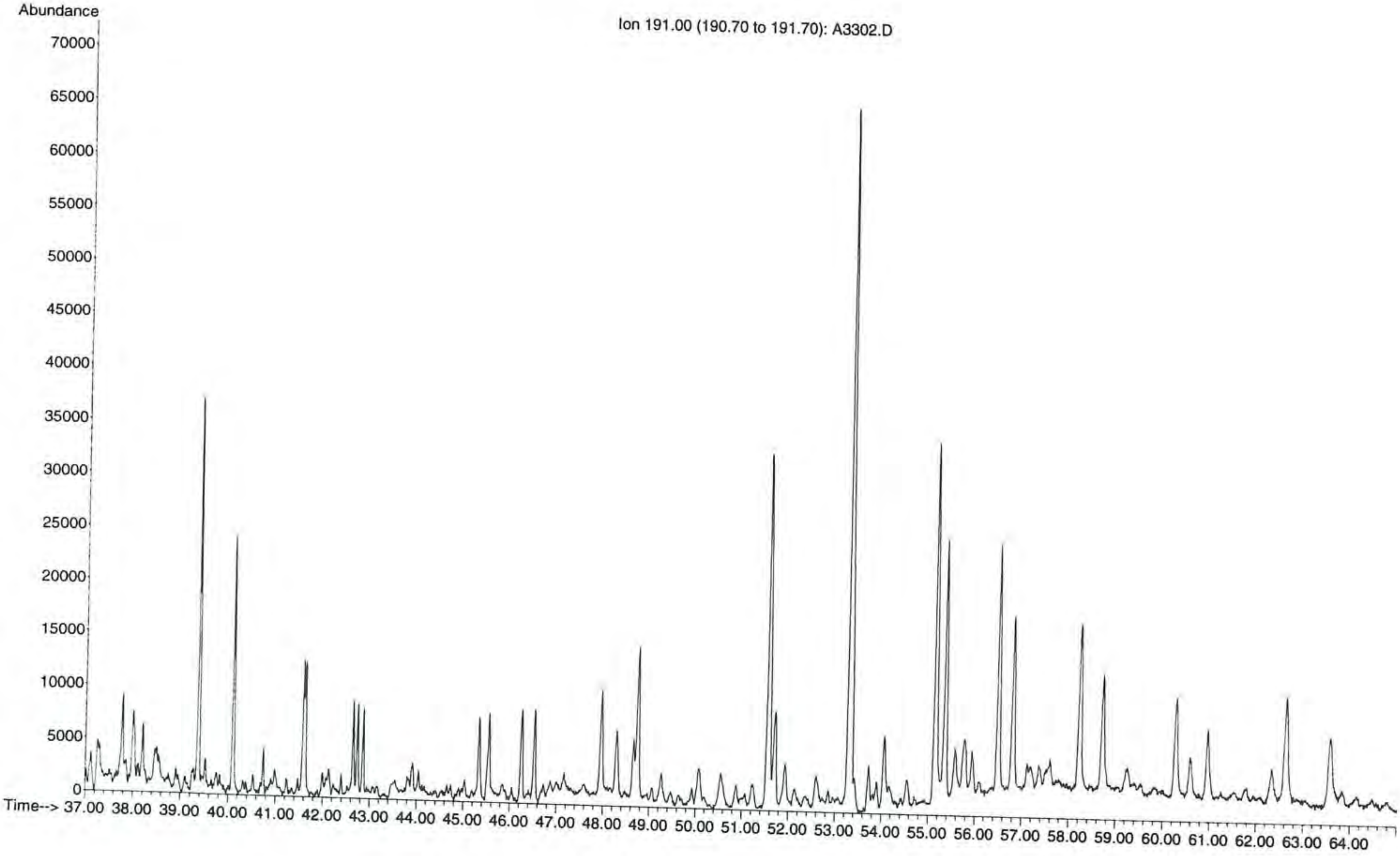
Client ID	GO98: North Slope Crude				
Battelle ID	BL043NSC-P				
Sample Type	NSC				
Collection Date	10/17/2007				
Extraction Date	10/17/2007				
Analysis Date	10/24/2007				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
C23 Tricyclic Terpane	38.41		47.76	19.6	
C29 Tricyclic Terpane -22S	12.22		14.70	16.9	
C29 Tricyclic Terpane -22R	11.89		14.64	18.8	
18a(H)-22,29,30-Trisnorneohopane -TS	14.61		15.96	8.5	
17a(H)-22,29,30-Trisnorhopane -TM	23.47		24.82	5.4	
30-Norhopane	63.43		69.58	8.8	
18a(H) & 18b(H)-Oleananes		U			
Hopane	111.6		120.14	7.1	
30-Homohopane -22S	60.02		59.93	0.2	
30-Homohopane -22R	42.46		39.69	7.0	
13b(H),17a(H)-20S-Diacholestane	38.87		44.18	12.0	
13b(H),17a(H)-20R-Diacholestane	23.96		25.52	6.1	
14a(H),17a(H)-20R-methylcholestane	31.74		33.94	6.5	
14a(H),17a(H)-20S-Ethylcholestane	37.87		35.93	5.4	
14a(H),17a(H)-20R-Ethylcholestane	38		39.17	3.0	
C21-TAS		U			
C26-TAS(20S)		U			
C26,C27-TAS		U			
C27-TAS(20R)		U			
C28-TAS(20S)		U			
C28-TAS(20R)		U			
C21-MAS		U			
C22-MAS		U			
C27-MAS		U			
C27-20R-MAS		U			
C27-20S-MAS		U			
C28-20S-MAS		U			
C27-C2920S/R-MAS		U			
C29-20S-MAS		U			
C29-20R-MAS		U			
TAS_245		U			
MAS_239		U			

Surrogate Recoveries (%)

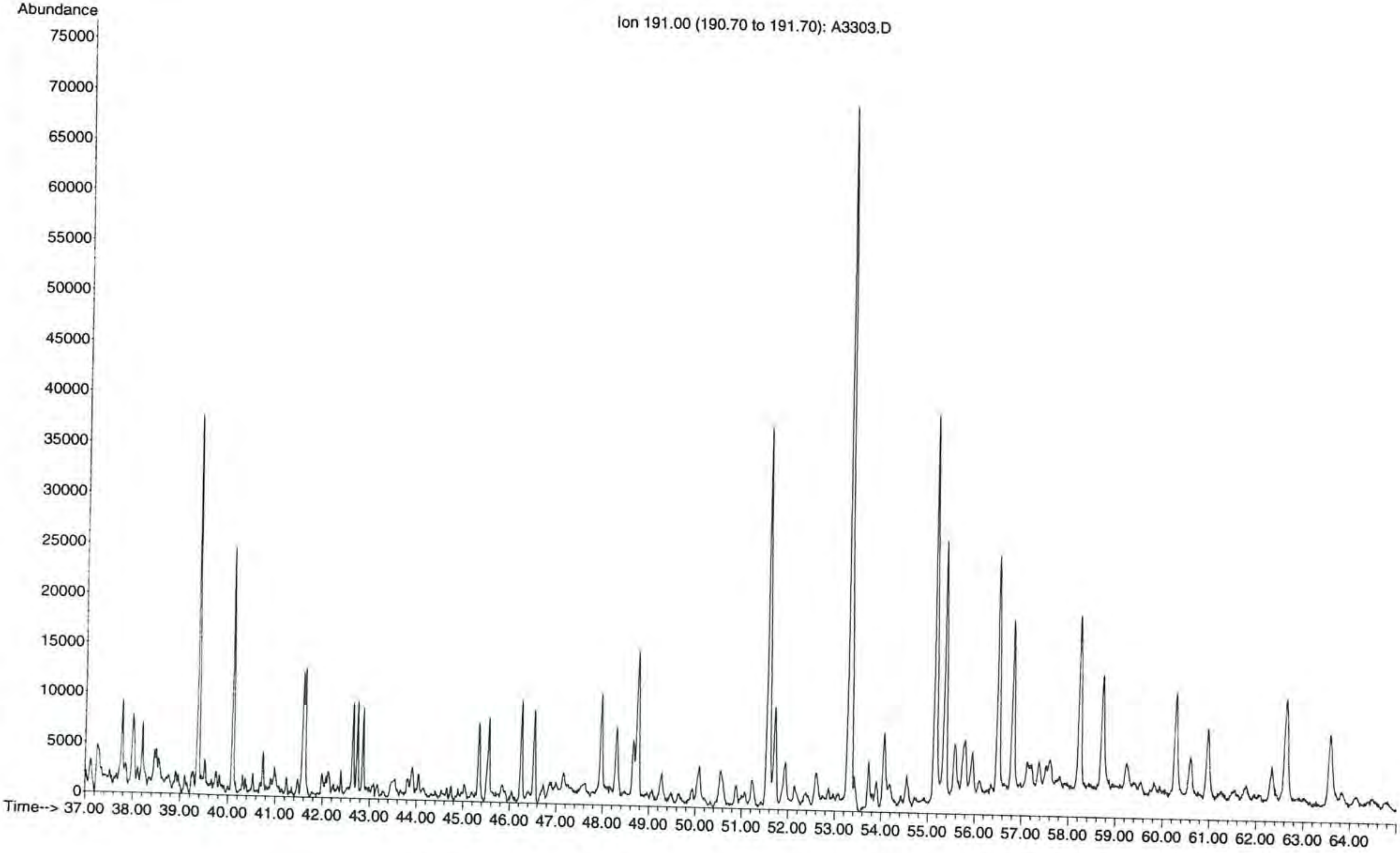
Naphthalene-d8	
Acenaphthene-d10	
Phenanthrene-d10	
Benzo(a)pyrene-d12	
5b(H)-Cholane	101

Analyzed by Bardon, Daniel
11/15/2007

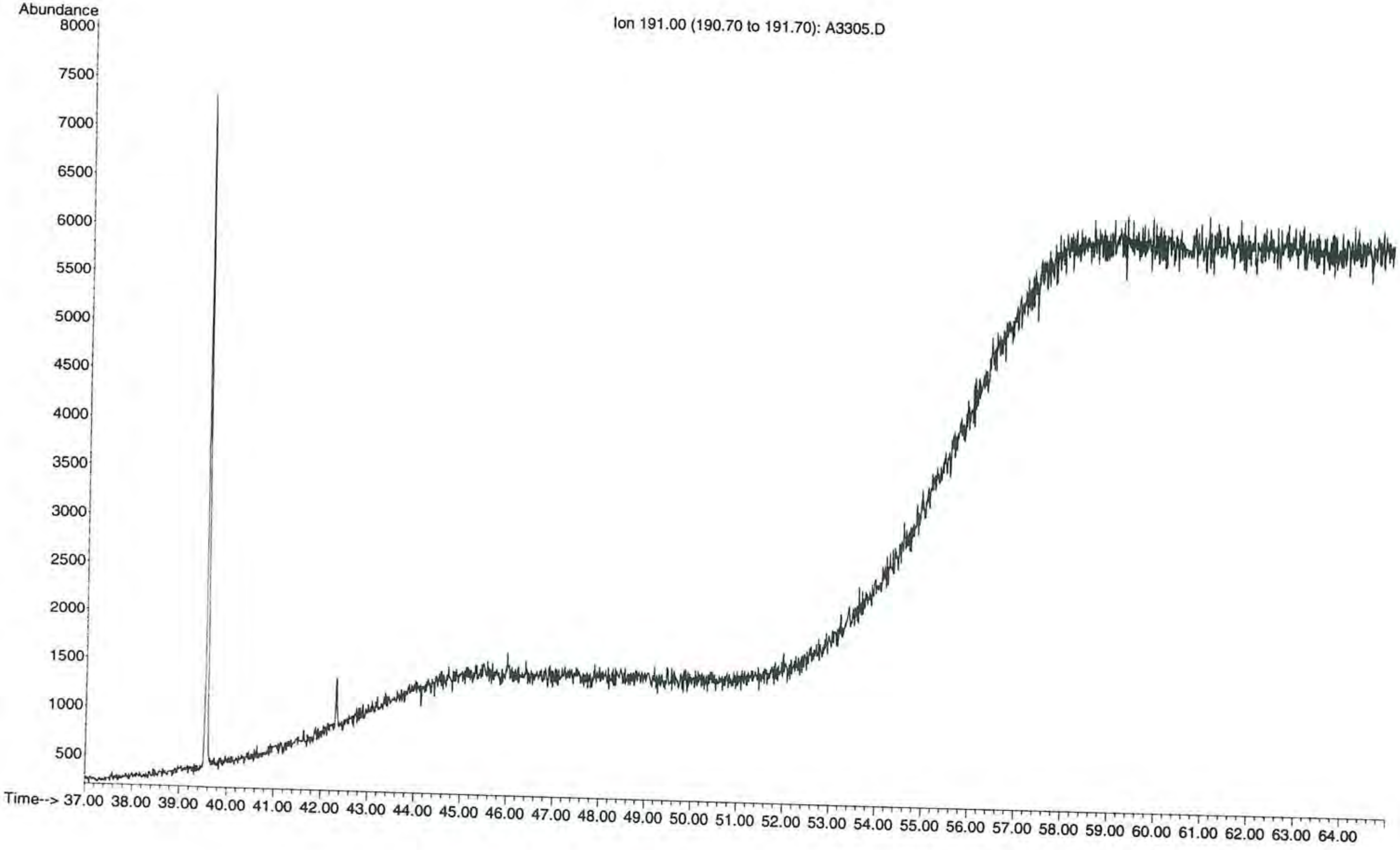
```
File       : G:\A\DATA\SA0612\A3302.D
Operator   : DPB
Acquired   : 24 Oct 2007   3:46 am using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: BL042NSC-P(0)
Misc Info  : North Slope Crude  07-0259
Vial Number: 9
```



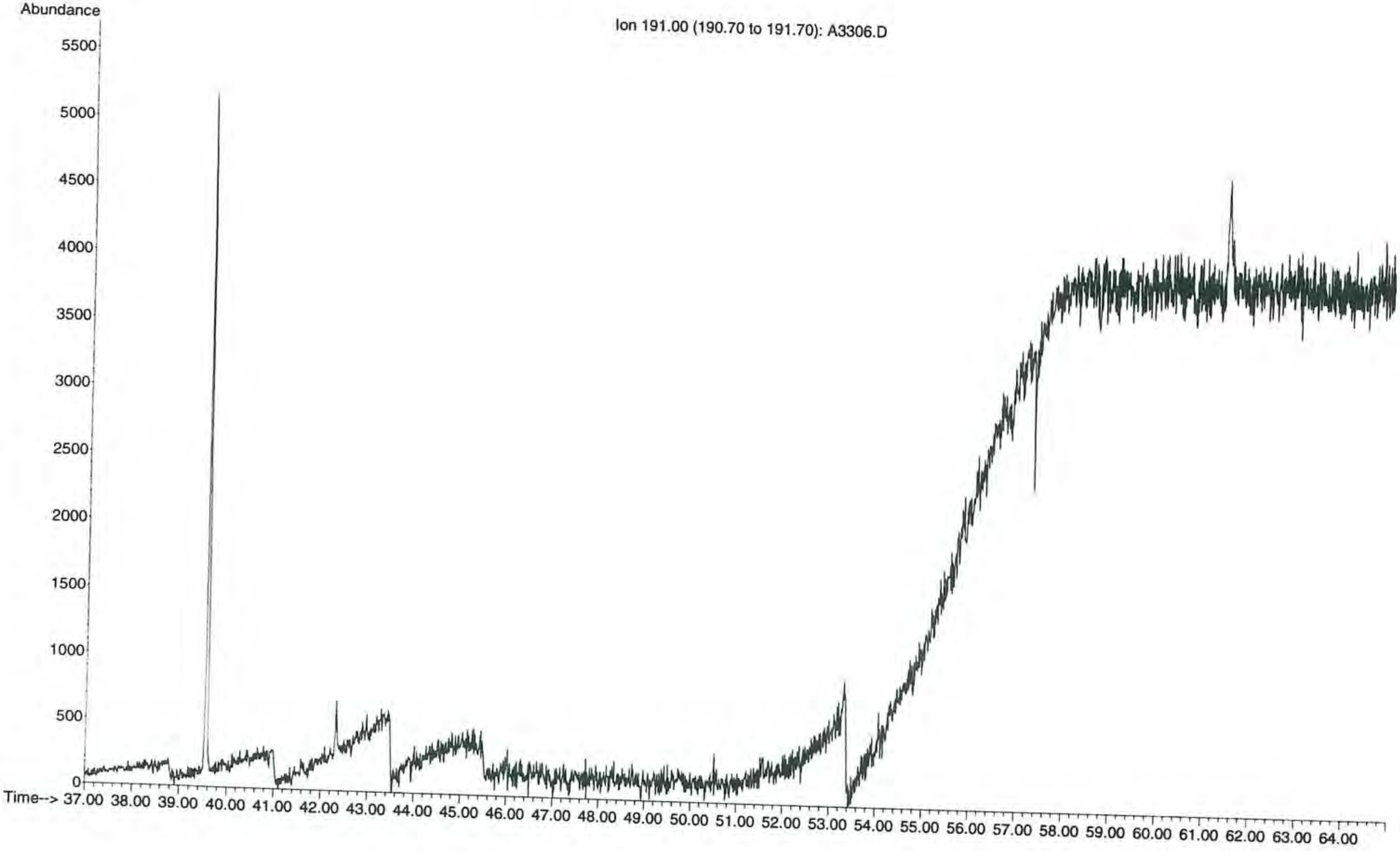
```
File        : G:\A\DATA\SA0612\A3303.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:15 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 10
```



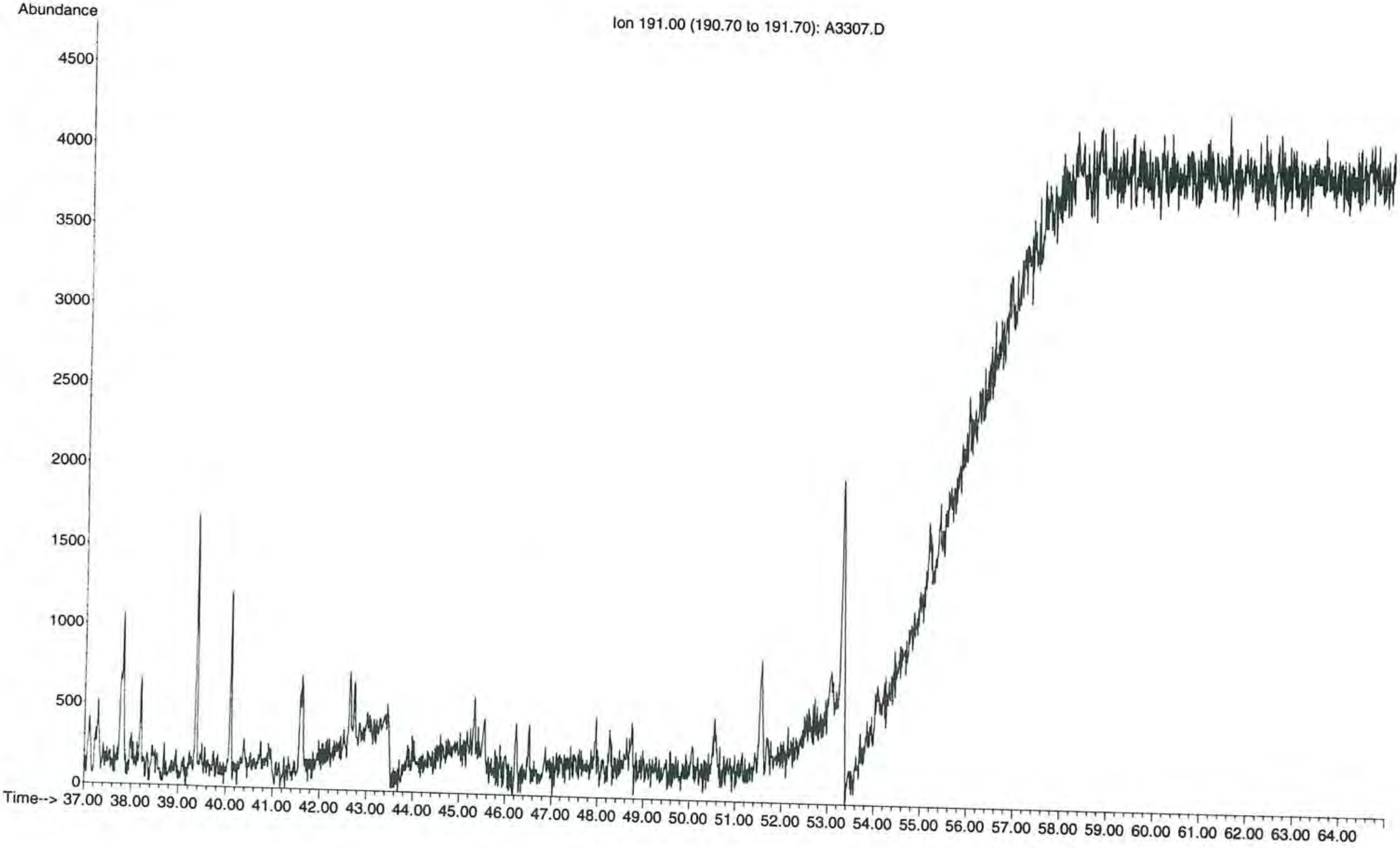
```
File        : G:\A\DATA\SA0612\A3305.D
Operator    : DPB
Acquired    : 24 Oct 2007   8:13 am using AcqMethod BIOPLUSN
Instrument  :    Inst. A
Sample Name: BL033PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0259
Vial Number: 12
```



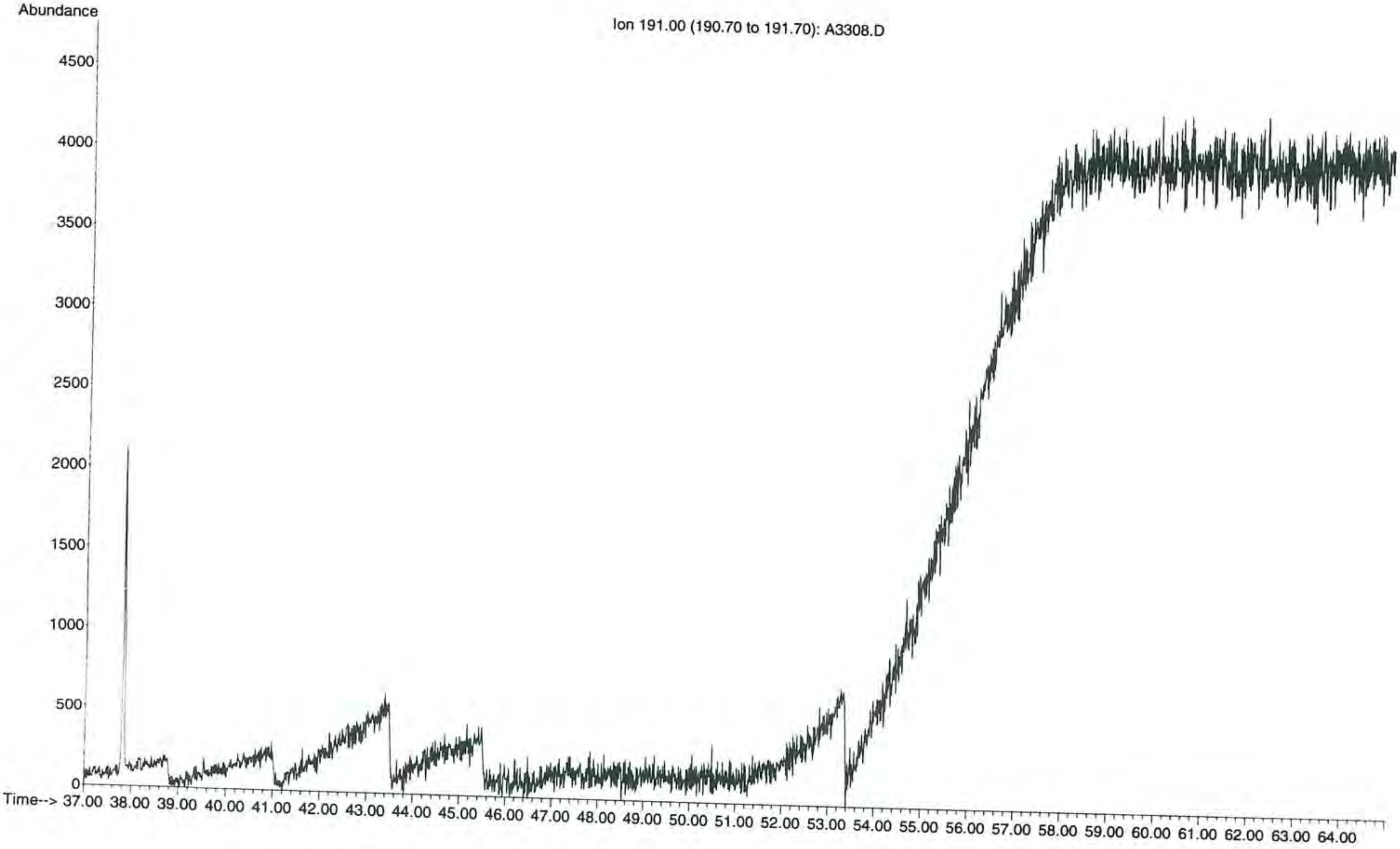
```
File        : G:\A\DATA\SA0612\A3306.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:42 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL034LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0259
Vial Number: 13
```



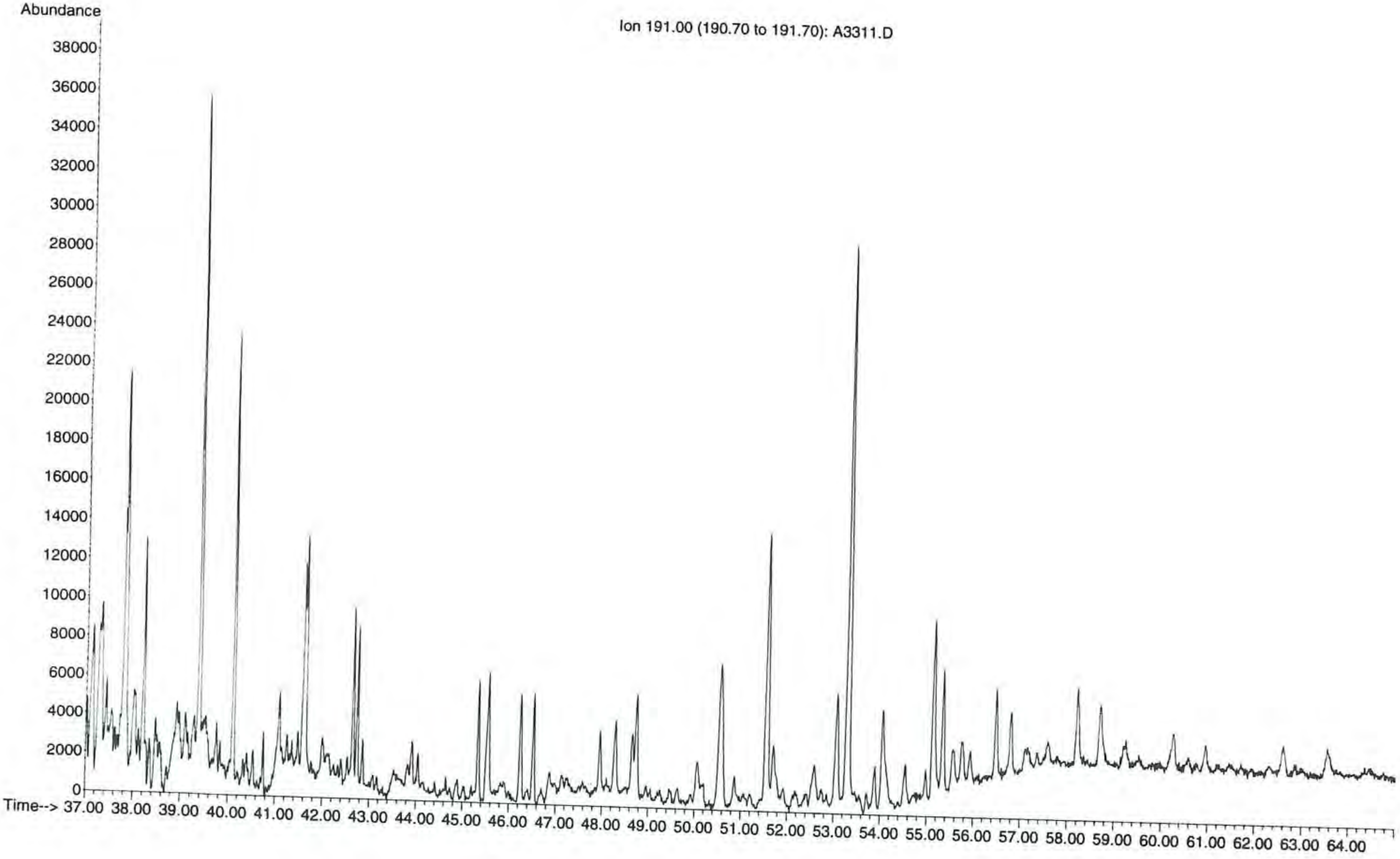
File   : G:\A\DATA\SA0612\A3307.D
Operator   : DPB
Acquired   : 24 Oct 2007 11:12 am using AcqMethod BIOPLUSN.M
Instrument :   Inst. A
Sample Name: Q0541-P-MS-D(13)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 14



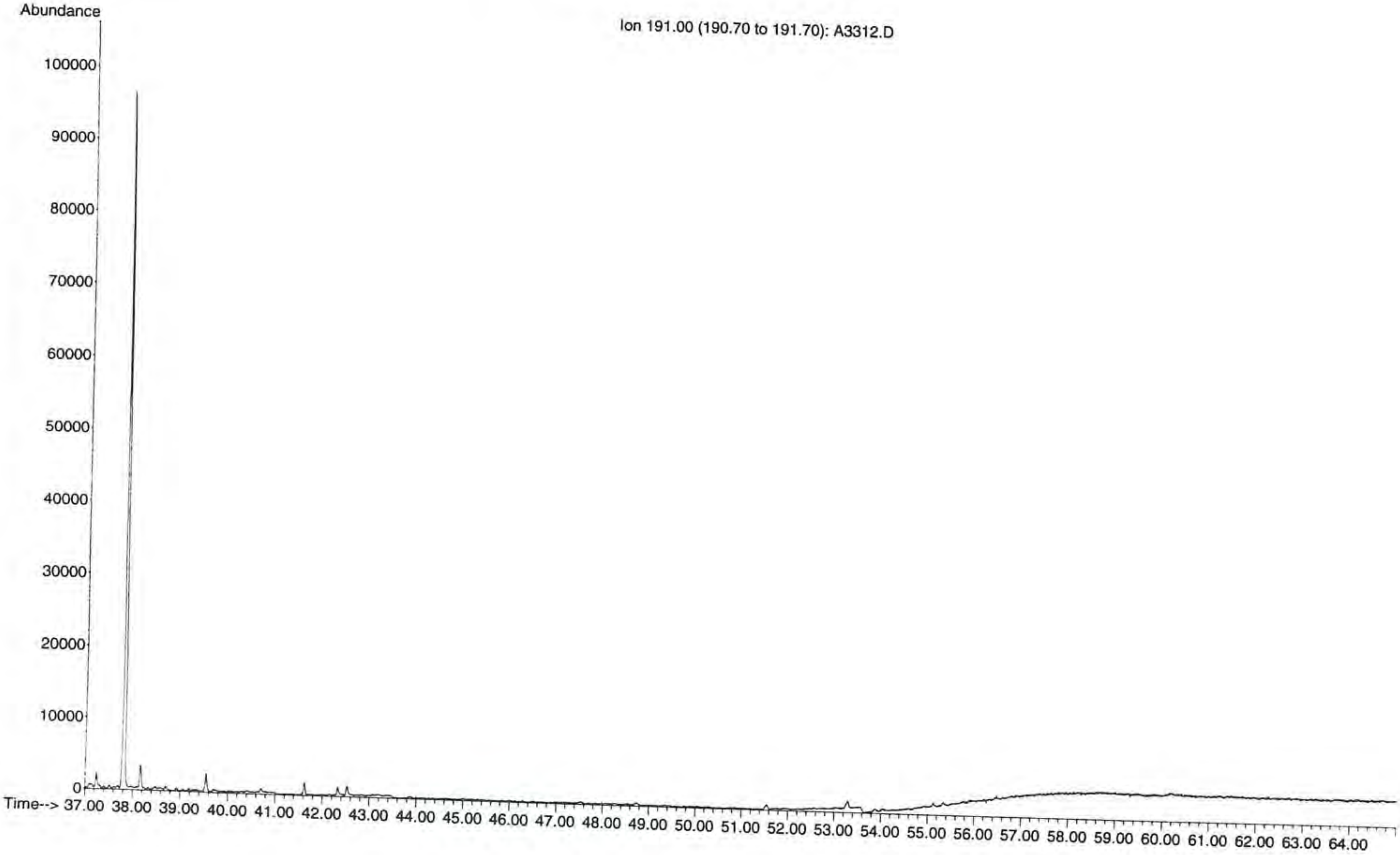
```
File        : G:\A\DATA\SA0612\A3308.D
Operator    : DPB
Acquired    : 24 Oct 2007  12:41 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS-D(13)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 15
```



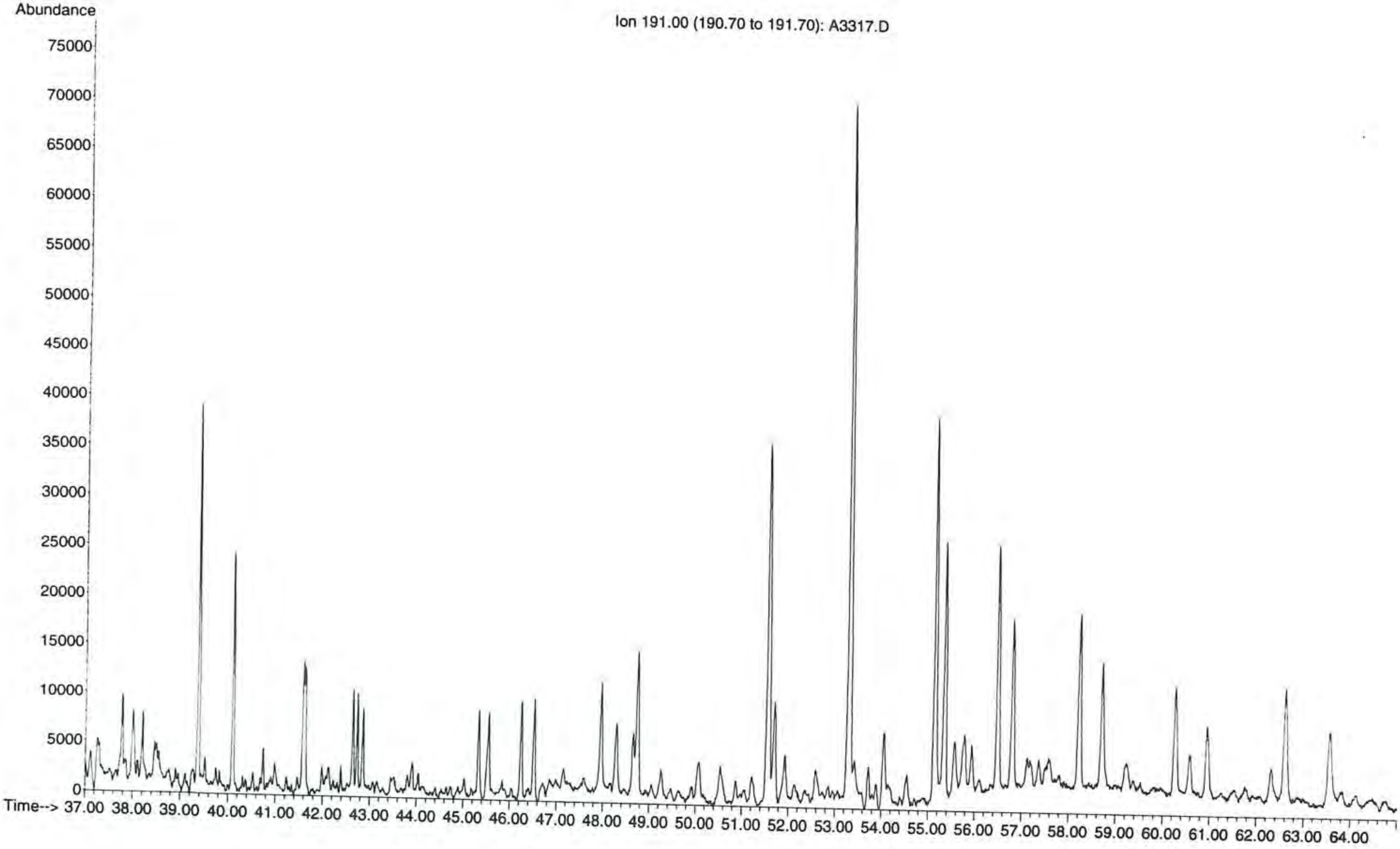
```
File        : G:\A\DATA\SA0612\A3311.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:18 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0541-P-MS(12)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 18
```



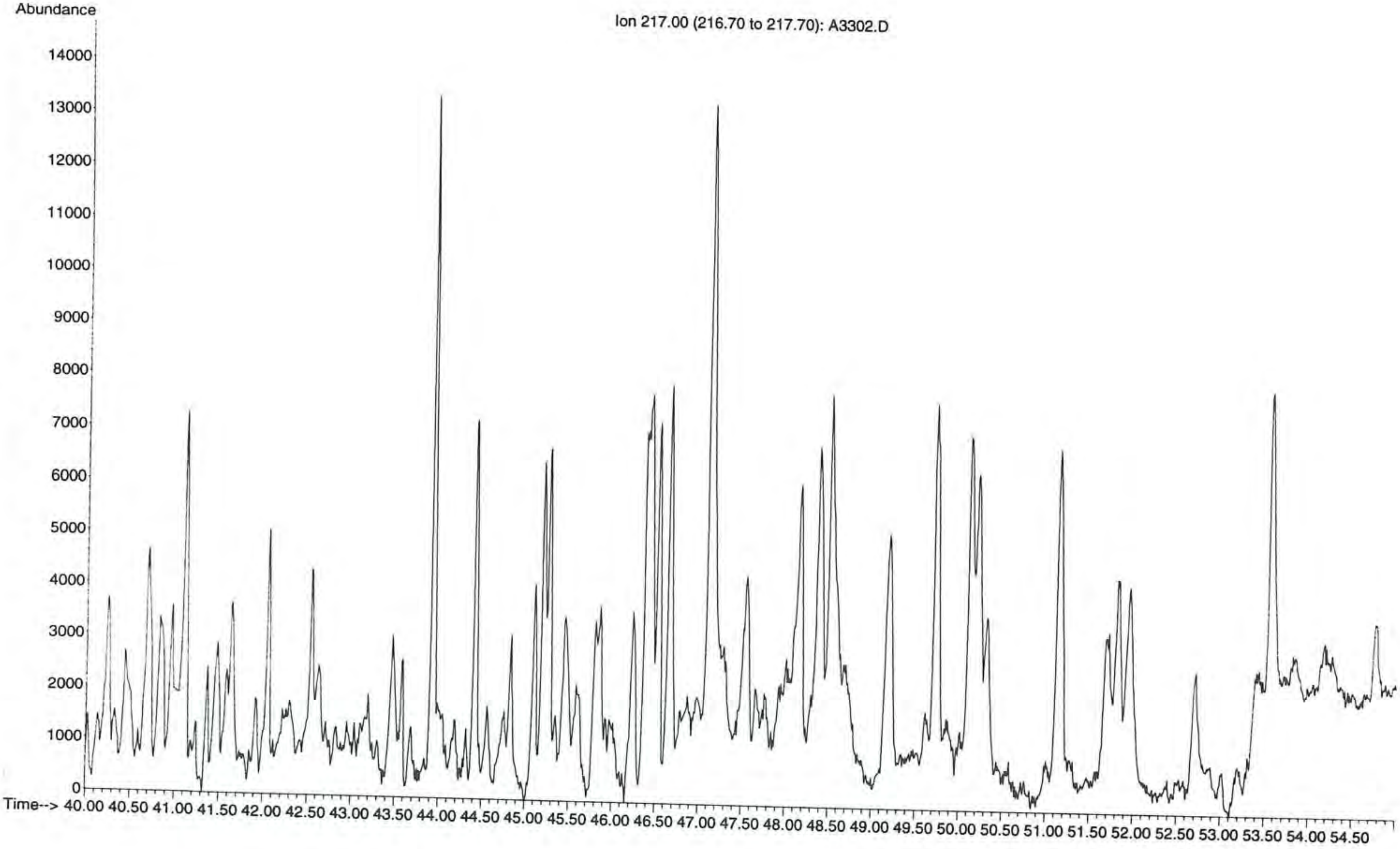
```
File        : G:\A\DATA\SA0612\A3312.D
Operator    : DPB
Acquired    : 24 Oct 2007   6:47 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS(12)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 19
```



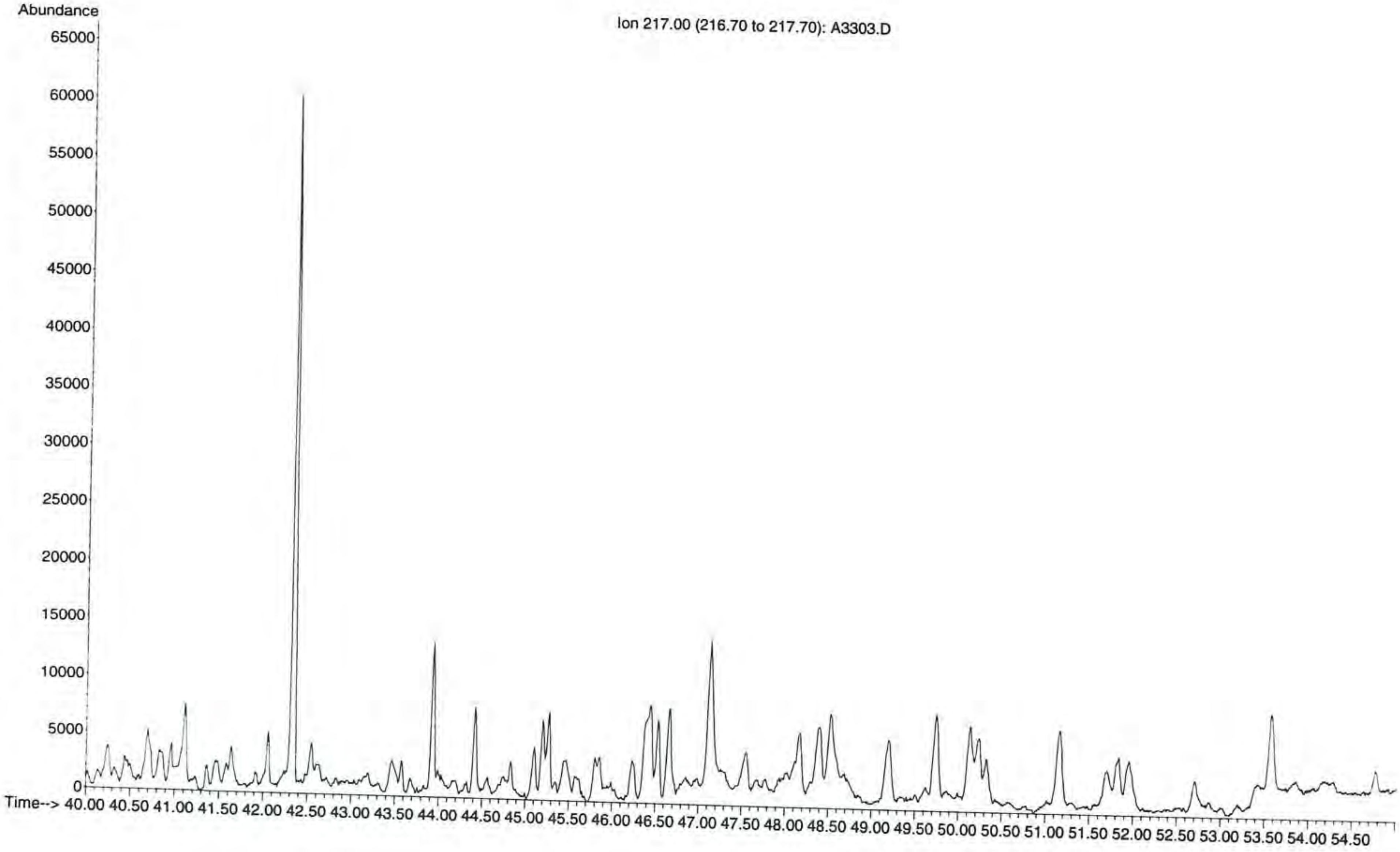
File : G:\A\DATA\SA0612\A3317.D
Operator : DPB
Acquired : 25 Oct 2007 2:12 am using AcqMethod BIOPLUSN.M
Instrument : Inst. A
Sample Name: BL043NSC-P(0)
Misc Info : North Slope Crude 07-0259
Vial Number: 24


Ion 191.00 (190.70 to 191.70): A3317.D

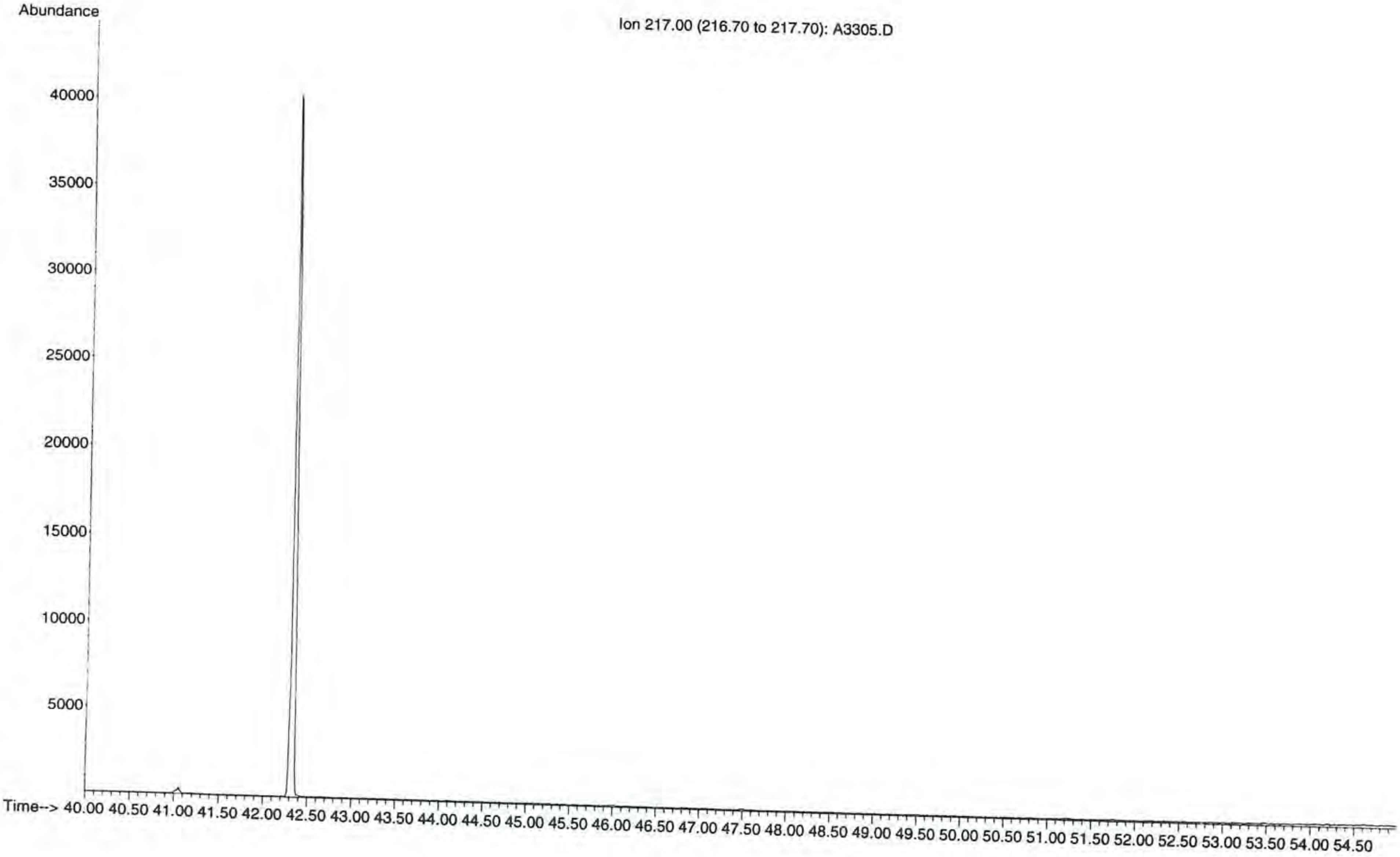
```
File        : G:\A\DATA\SA0612\A3302.D
Operator    : DPB
Acquired    : 24 Oct 2007   3:46 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL042NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 9
```



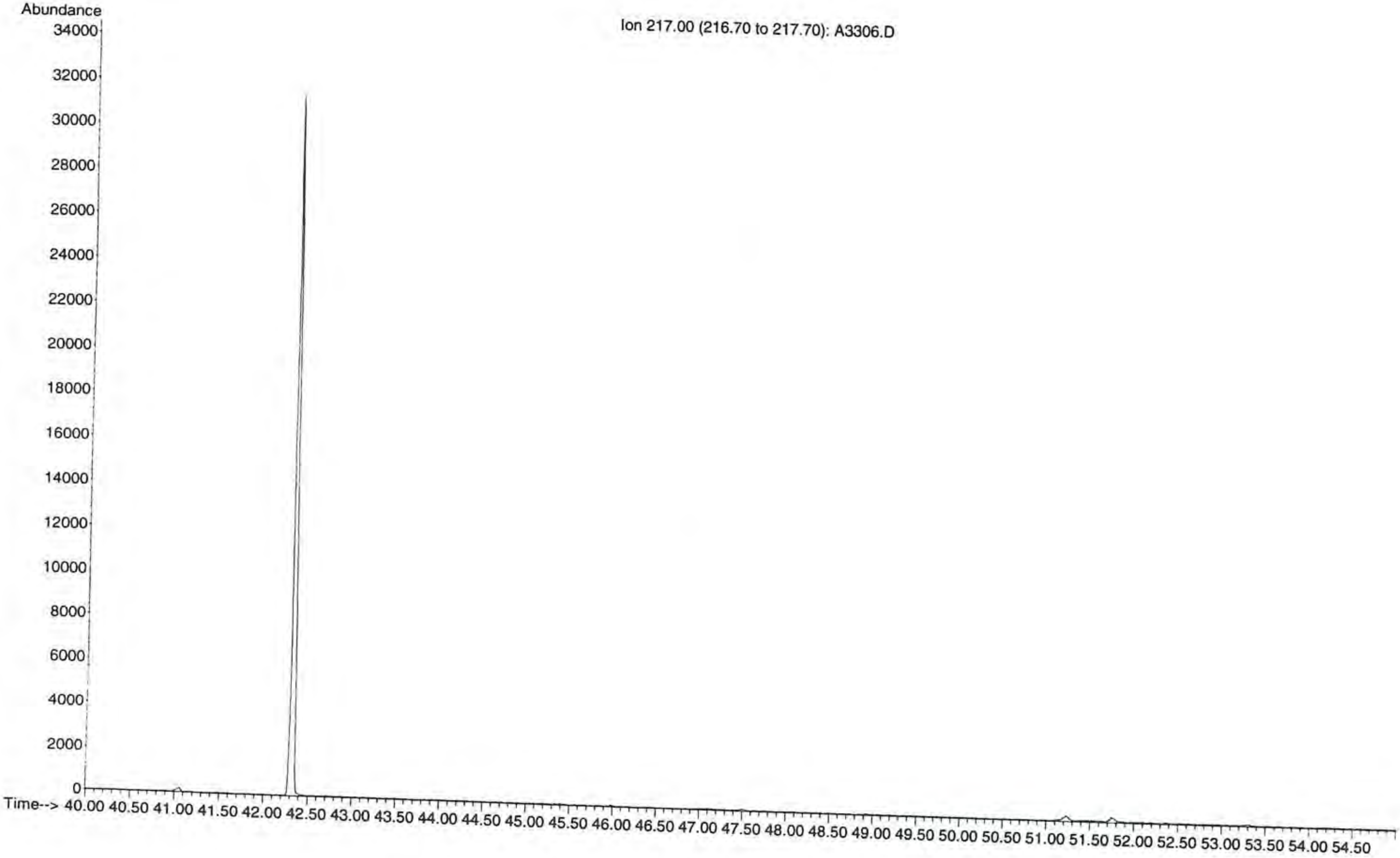
```
File        : G:\A\DATA\SA0612\A3303.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:15 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 10
```



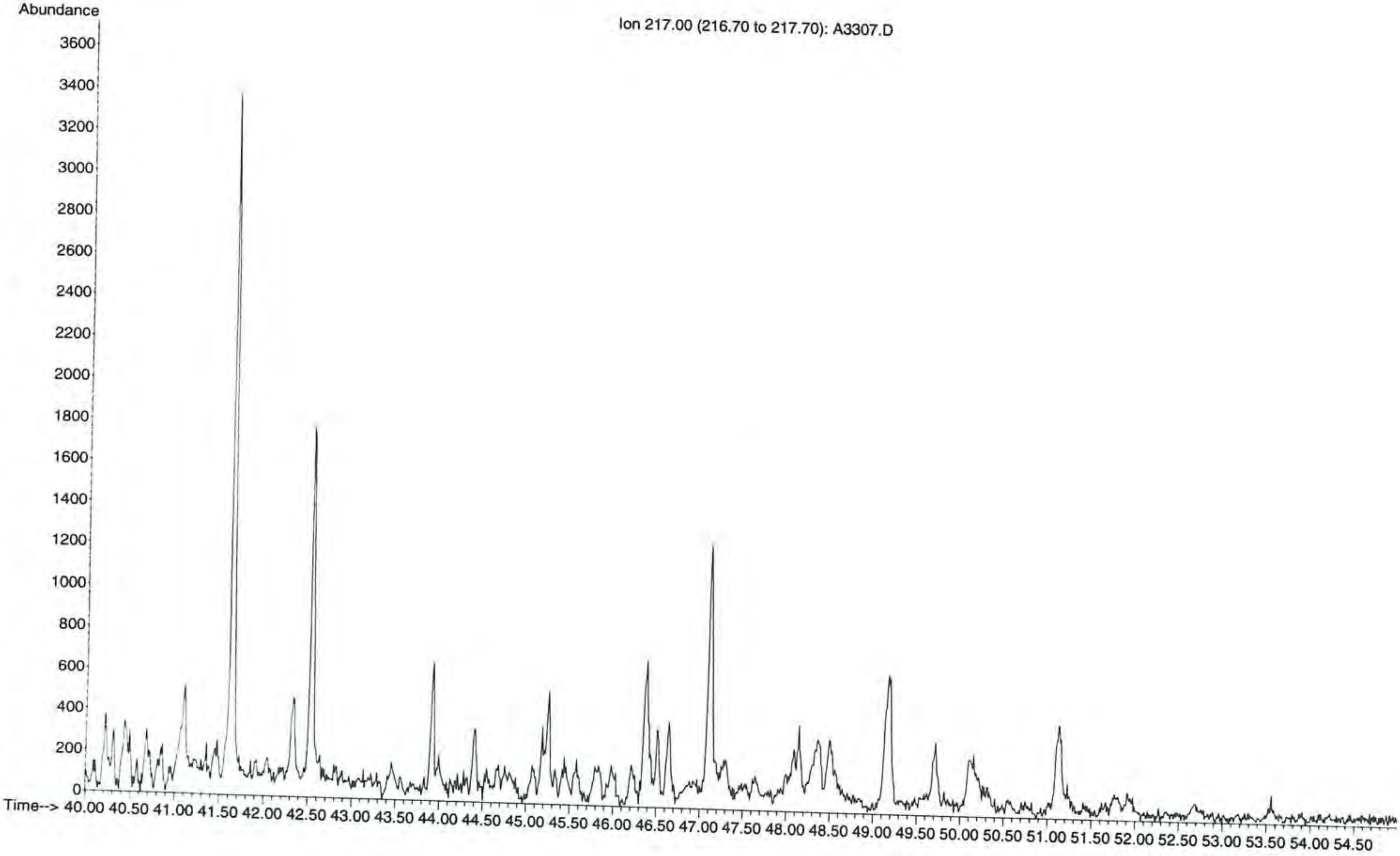
```
File        : G:\A\DATA\SA0612\A3305.D
Operator    : DPB
Acquired    : 24 Oct 2007   8:13 am using AcqMethod BIOPLUSN
Instrument  :   Inst. A
Sample Name: BL033PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0259
Vial Number: 12
```



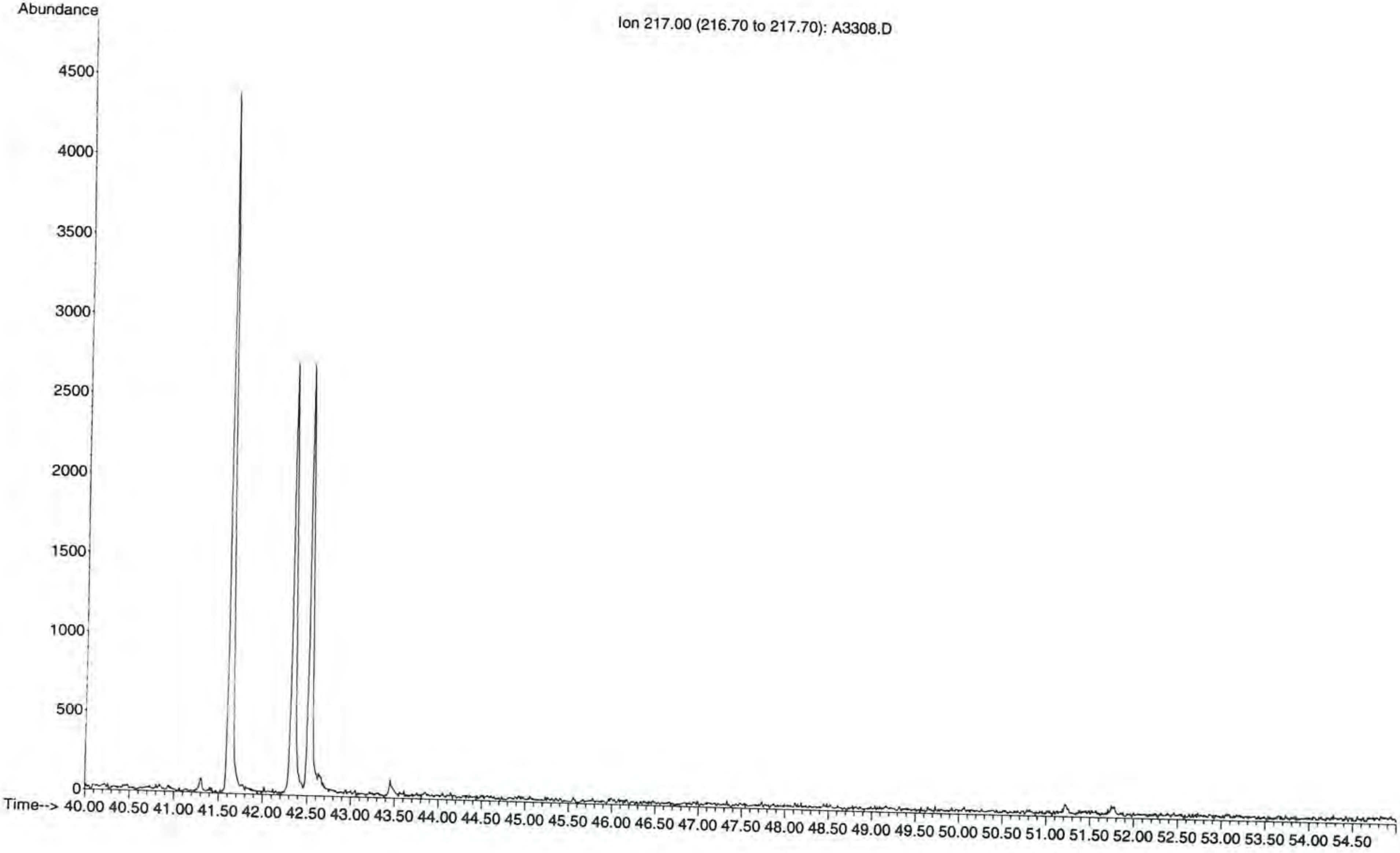
```
File        : G:\A\DATA\SA0612\A3306.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:42 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL034LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0259
Vial Number: 13
```



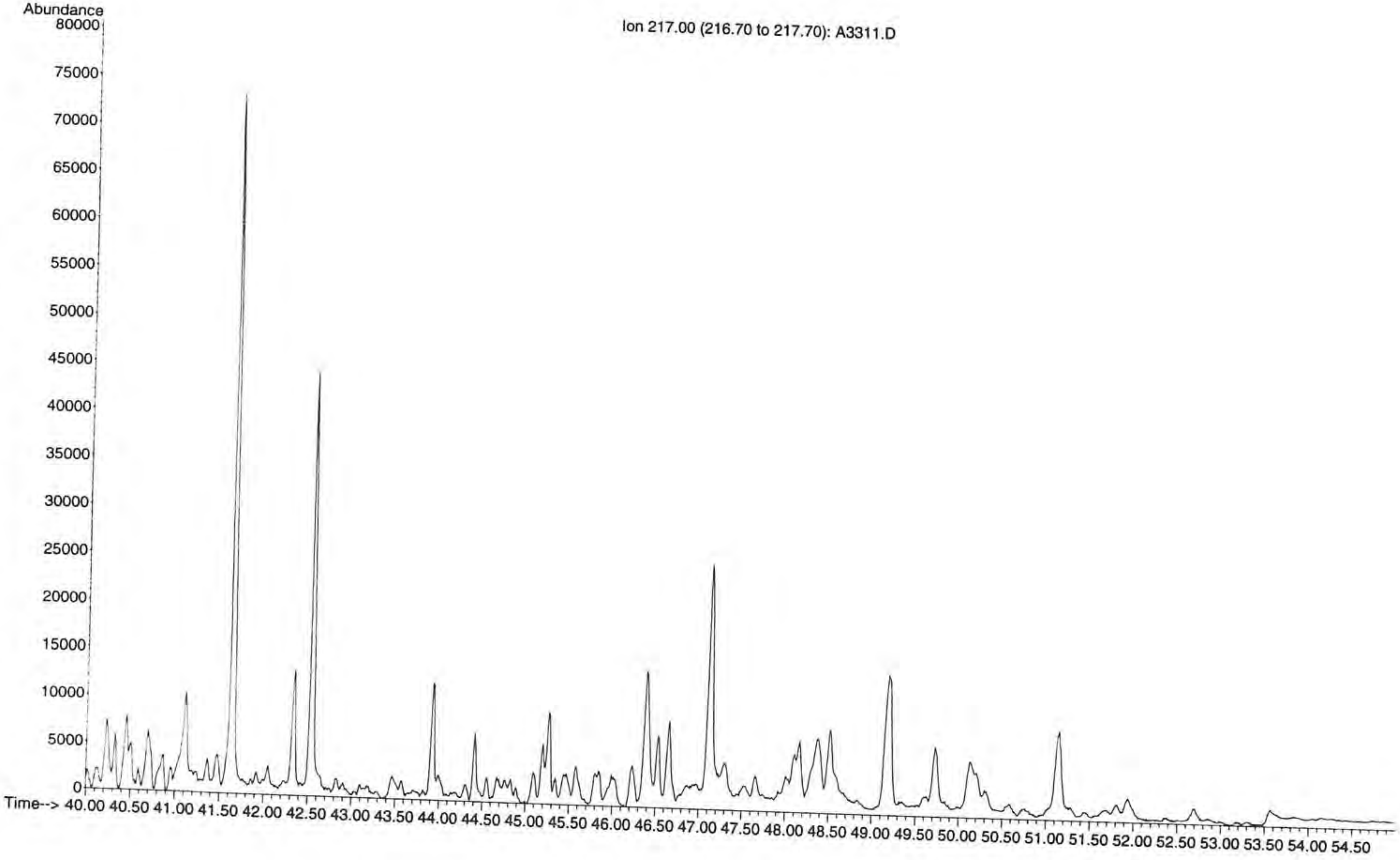
```
File        : G:\A\DATA\SA0612\A3307.D
Operator    : DPB
Acquired    : 24 Oct 2007  11:12 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0541-P-MS-D(13)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 14
```


Ion 217.00 (216.70 to 217.70): A3307.D

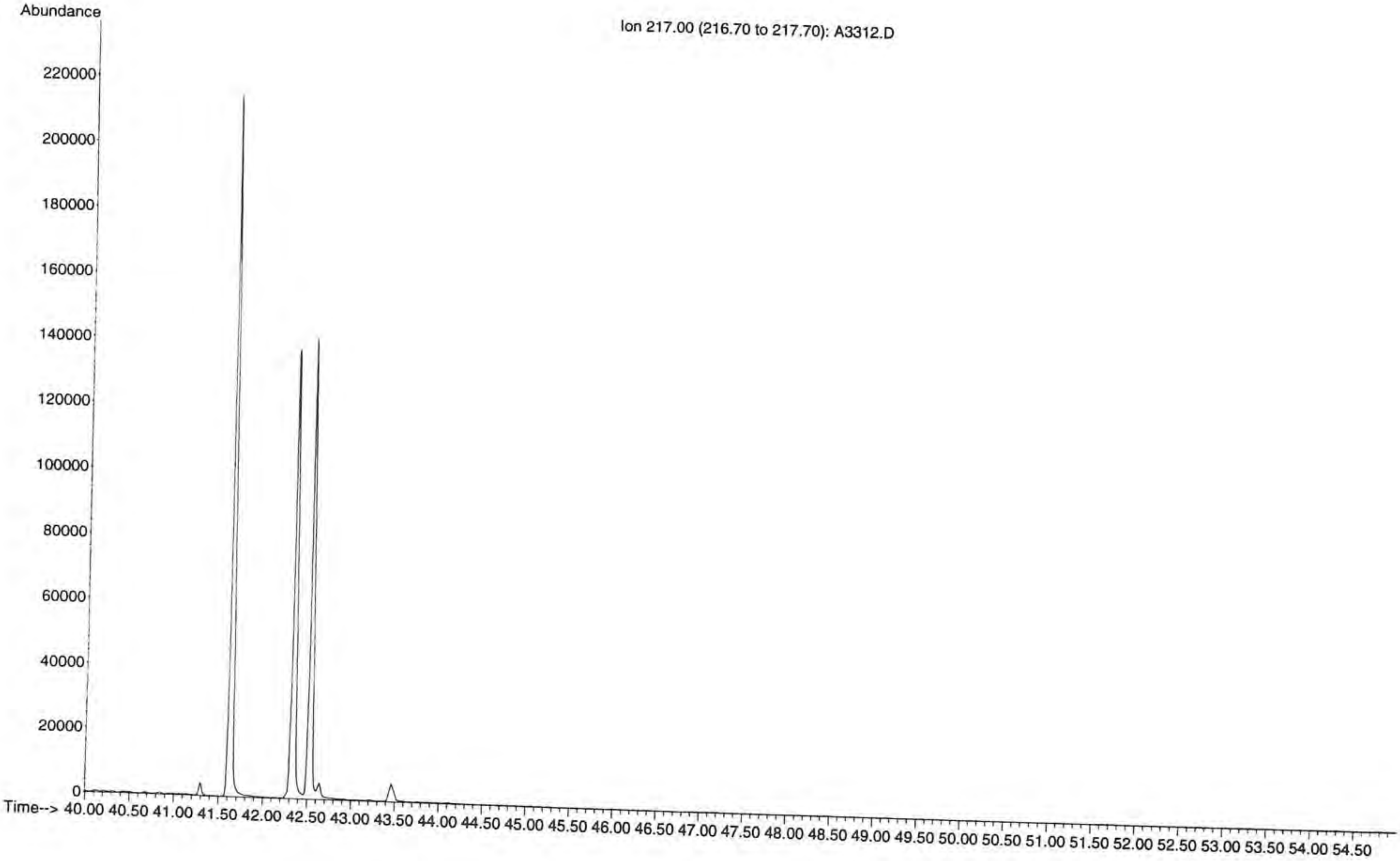
```
File        : G:\A\DATA\SA0612\A3308.D
Operator    : DPB
Acquired    : 24 Oct 2007  12:41 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS-D(13)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 15
```



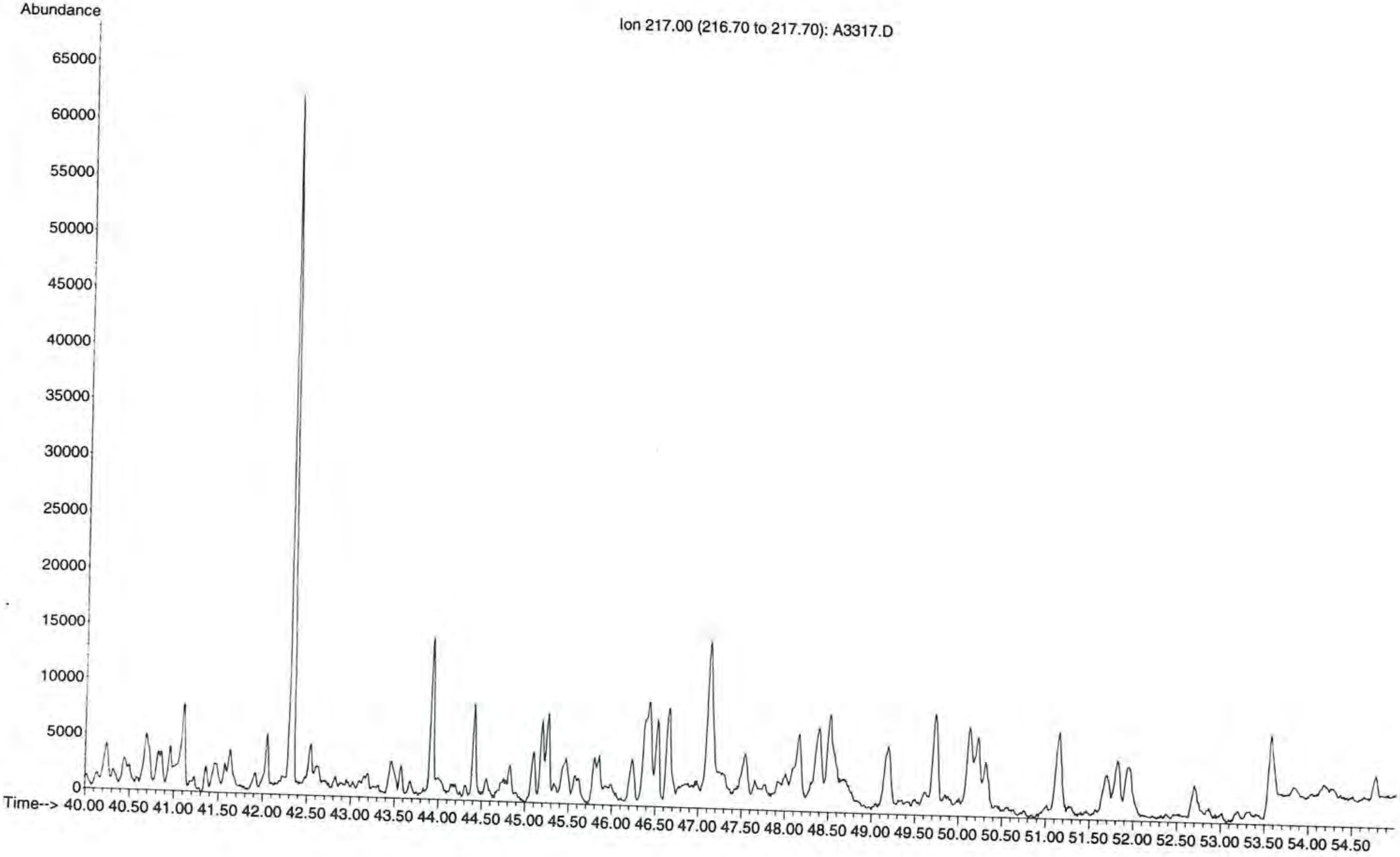
```
File        : G:\A\DATA\SA0612\A3311.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:18 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0541-P-MS(12)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 18
```



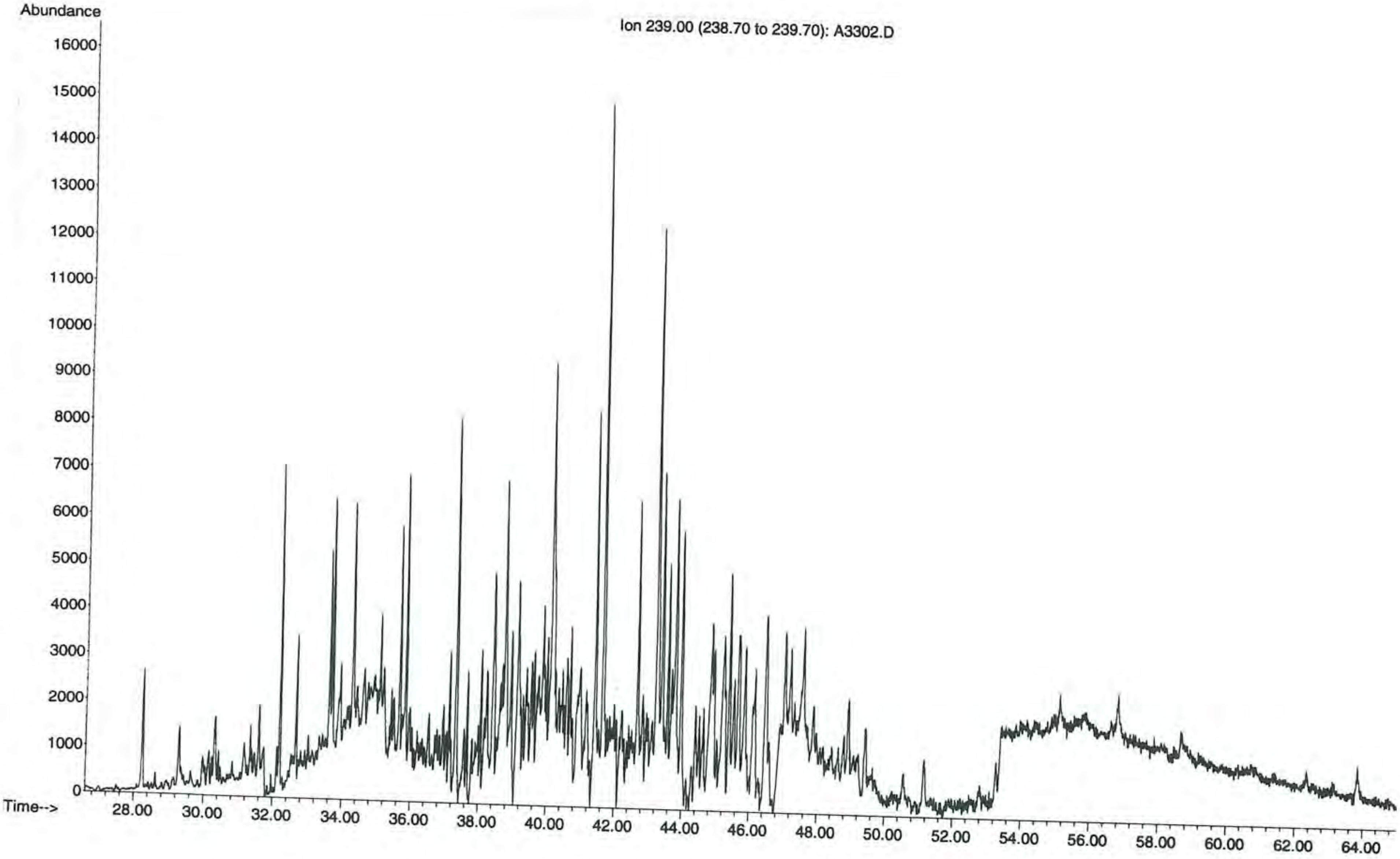
```
File        : G:\A\DATA\SA0612\A3312.D
Operator    : DPB
Acquired    : 24 Oct 2007   6:47 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS(12)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 19
```



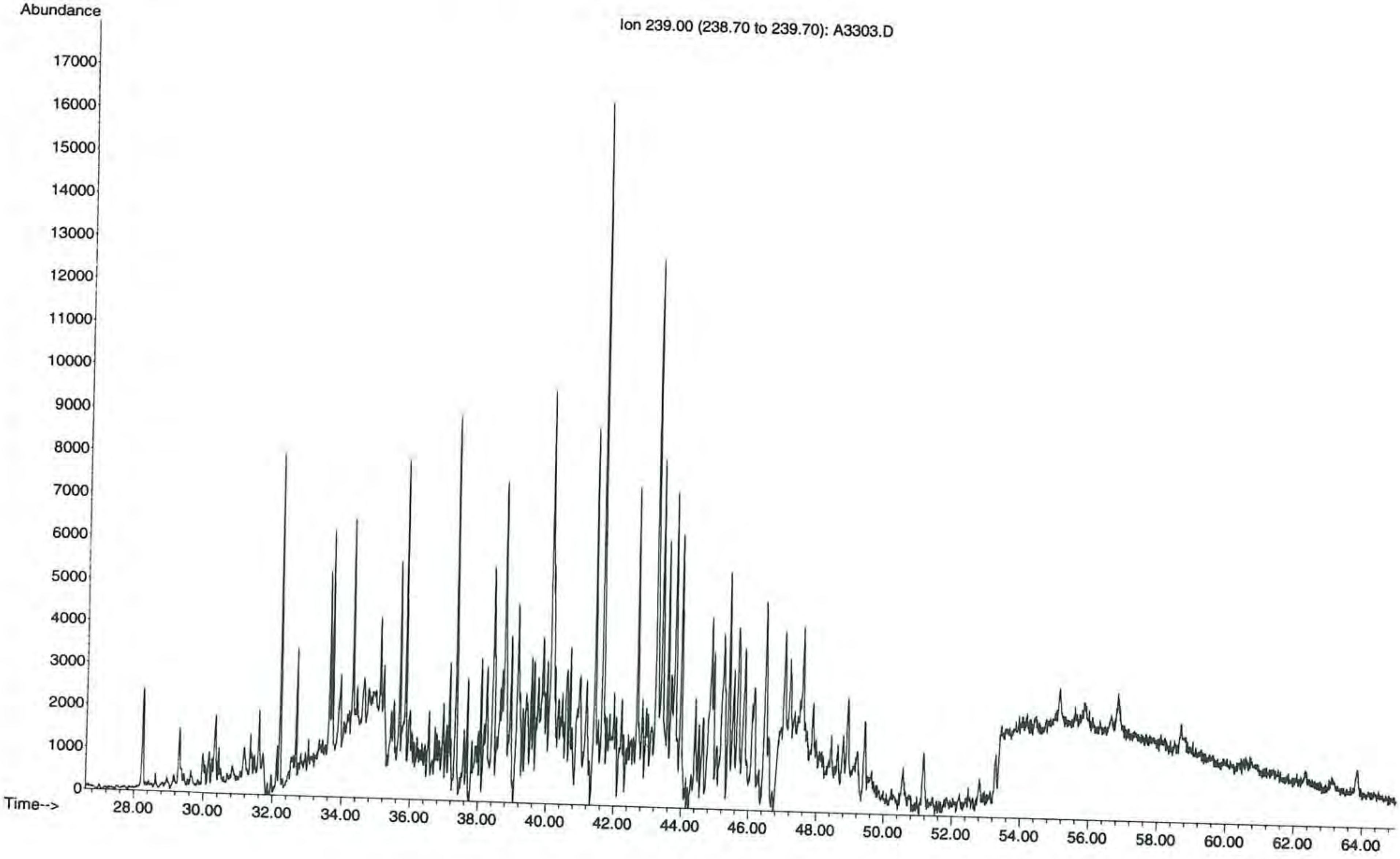
```
File        : G:\A\DATA\SA0612\A3317.D
Operator    : DPB
Acquired    : 25 Oct 2007   2:12 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 24
```



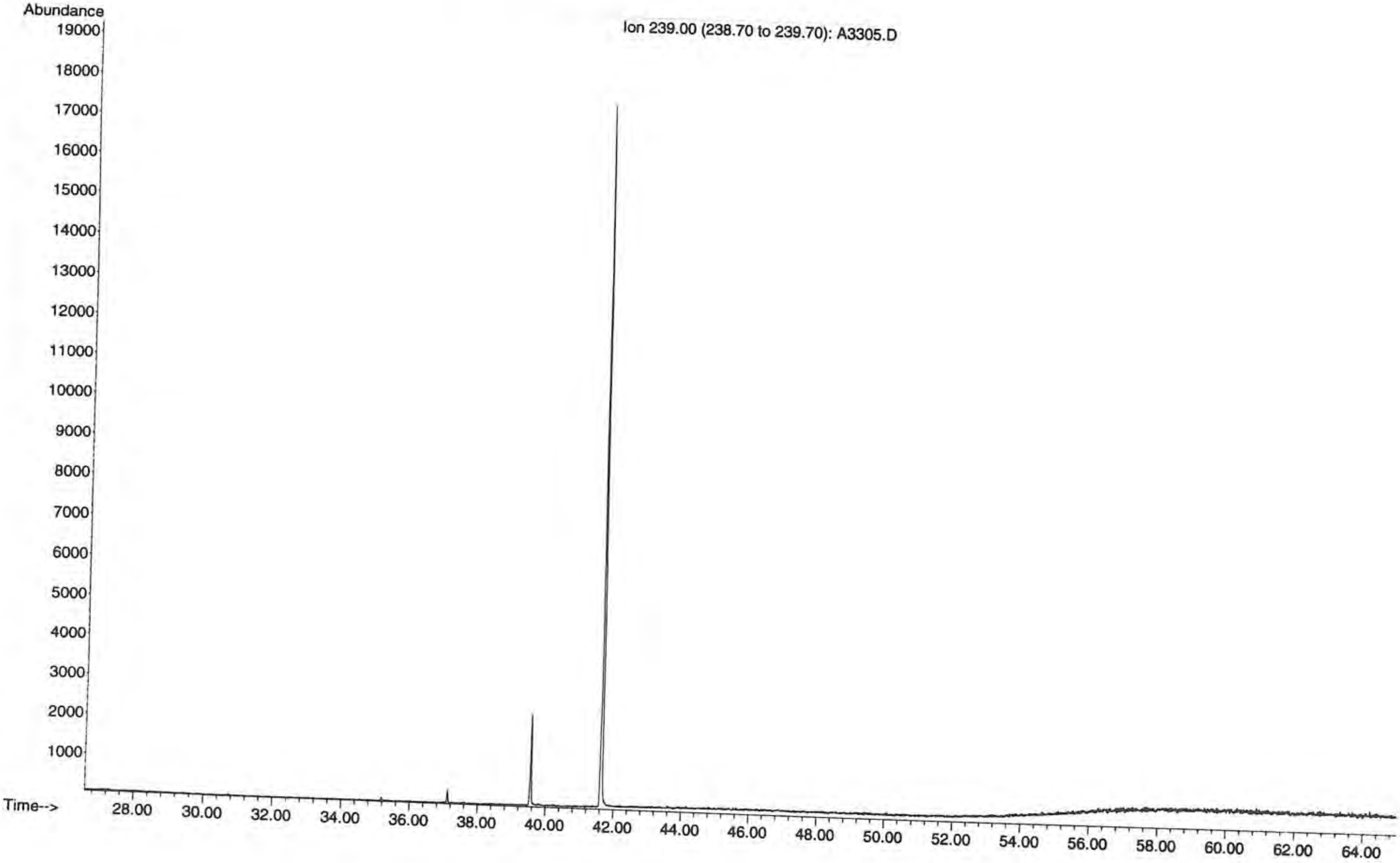
```
File        : G:\A\DATA\SA0612\A3302.D
Operator    : DPB
Acquired    : 24 Oct 2007   3:46 am using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: BL042NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 9
```



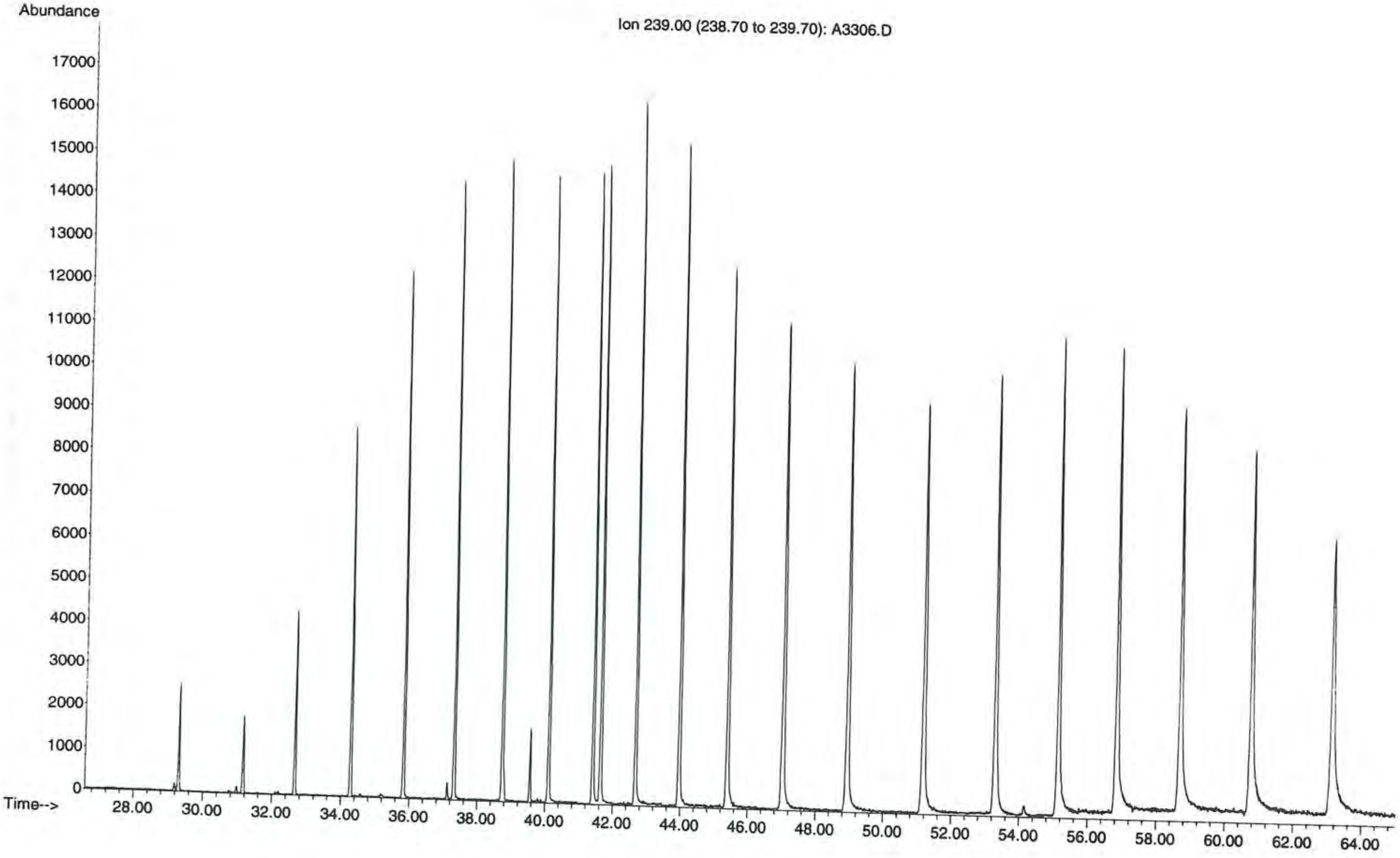
```
File        : G:\A\DATA\SA0612\A3303.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:15 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 10
```



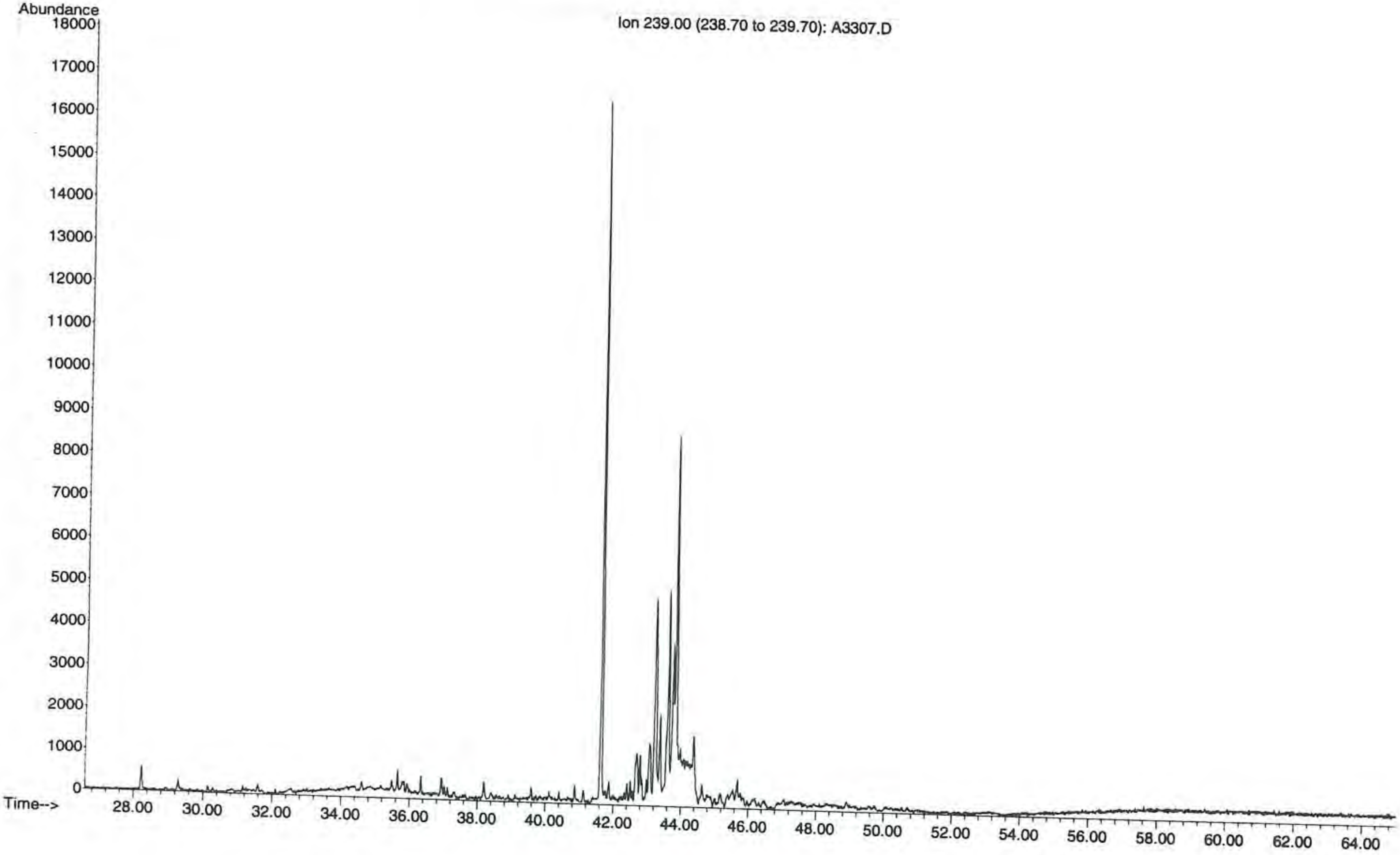
```
File         : G:\A\DATA\SA0612\A3305.D
Operator     : DPB
Acquired     : 24 Oct 2007   8:13 am using AcqMethod BIOPLUSN
Instrument :    Inst. A
Sample Name: BL033PB-P-MS(5)
Misc Info    : Procedural Blank 5-157 07-0259
Vial Number: 12
```



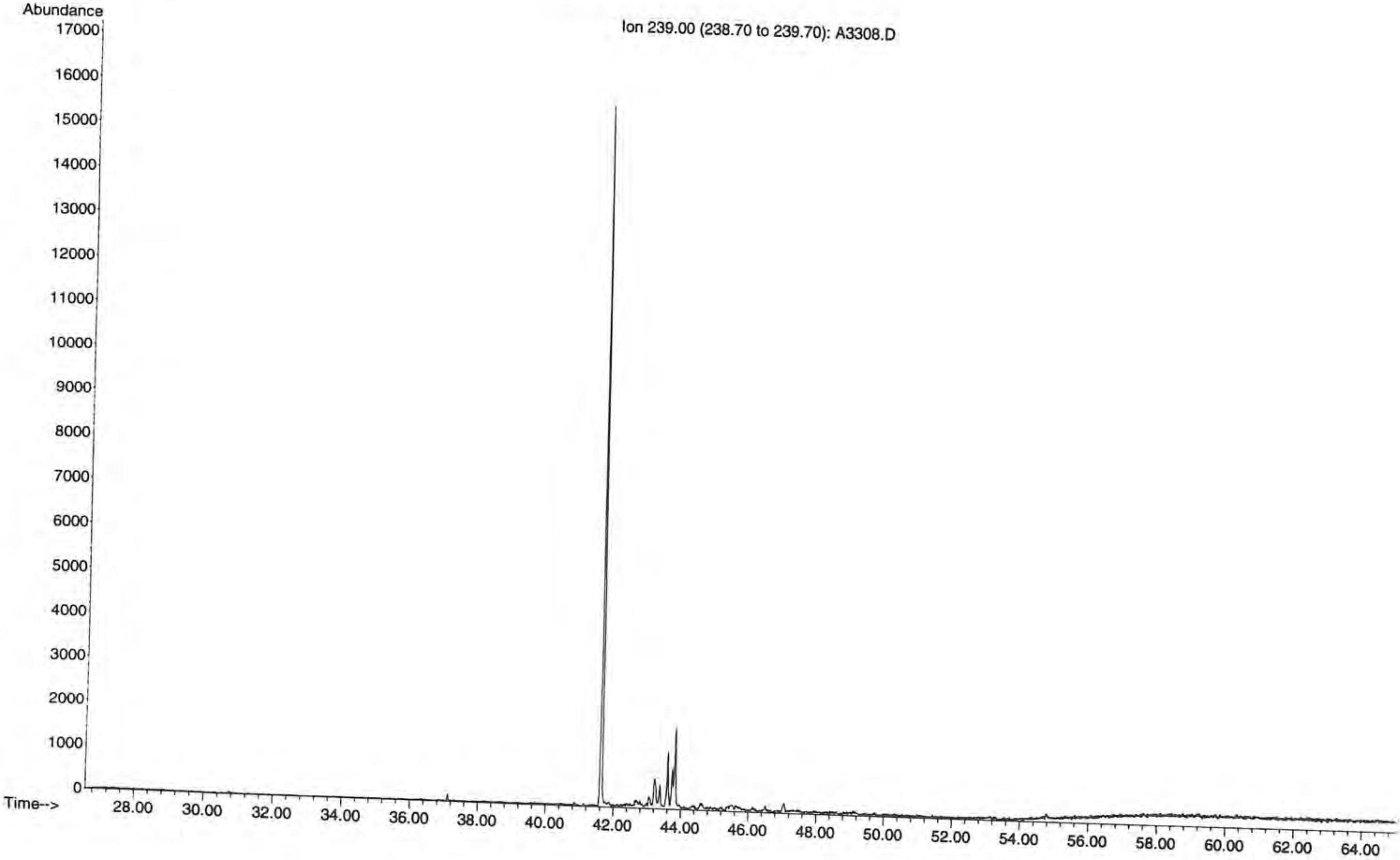
```
File        : G:\A\DATA\SA0612\A3306.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:42 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL034LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0259
Vial Number: 13
```



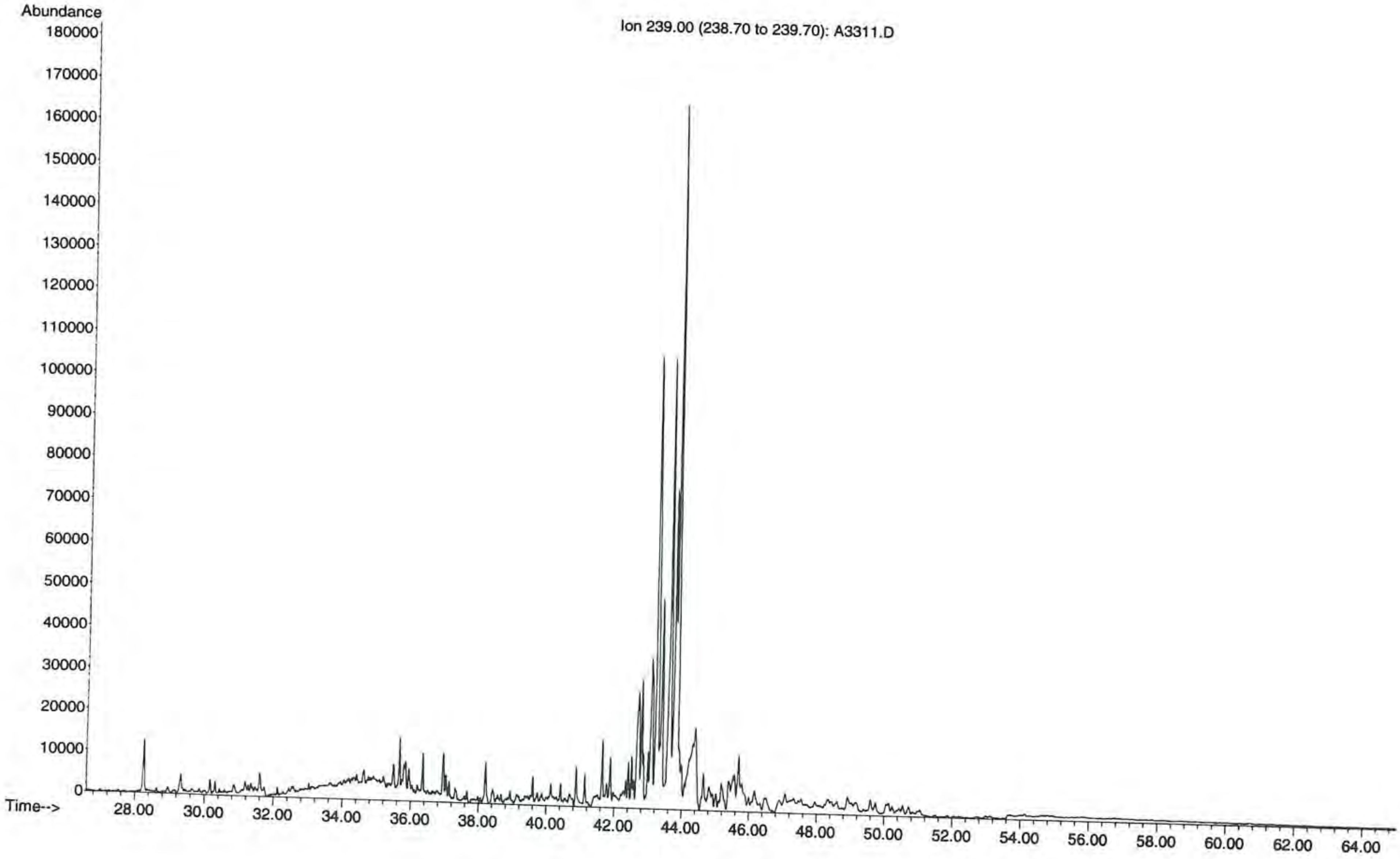
```
File        : G:\A\DATA\SA0612\A3307.D
Operator    : DPB
Acquired    : 24 Oct 2007  11:12 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0541-P-MS-D(13)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 14
```



```
File        : G:\A\DATA\SA0612\A3308.D
Operator    : DPB
Acquired    : 24 Oct 2007  12:41 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS-D(13)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 15
```



```
File        : G:\A\DATA\SA0612\A3311.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:18 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0541-P-MS(12)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 18
```



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File        : G:\A\DATA\SA0612\A3312.D
Operator    : DPB
Acquired    : 24 Oct 2007   6:47 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0545-P-MS(12)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 19
```
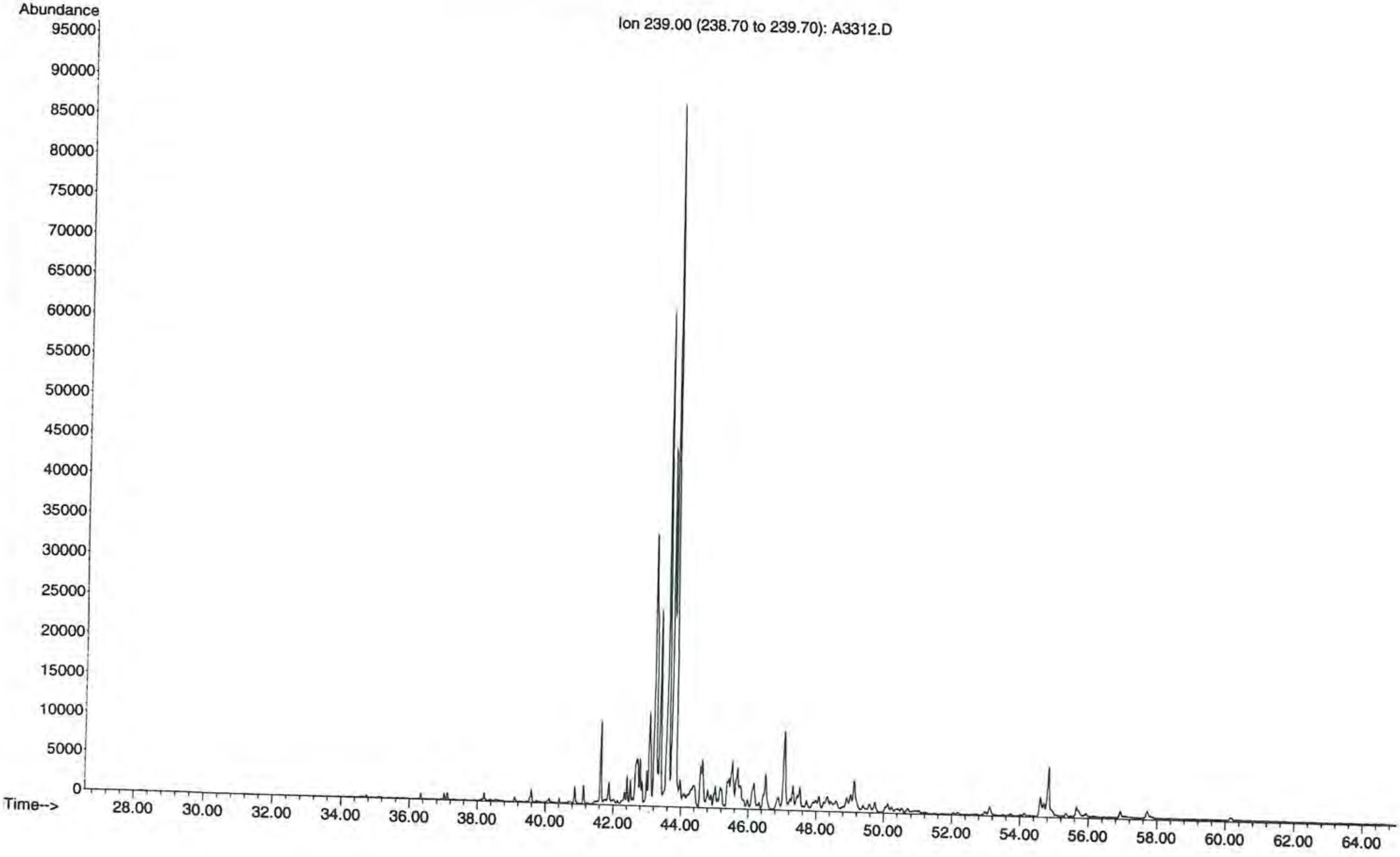
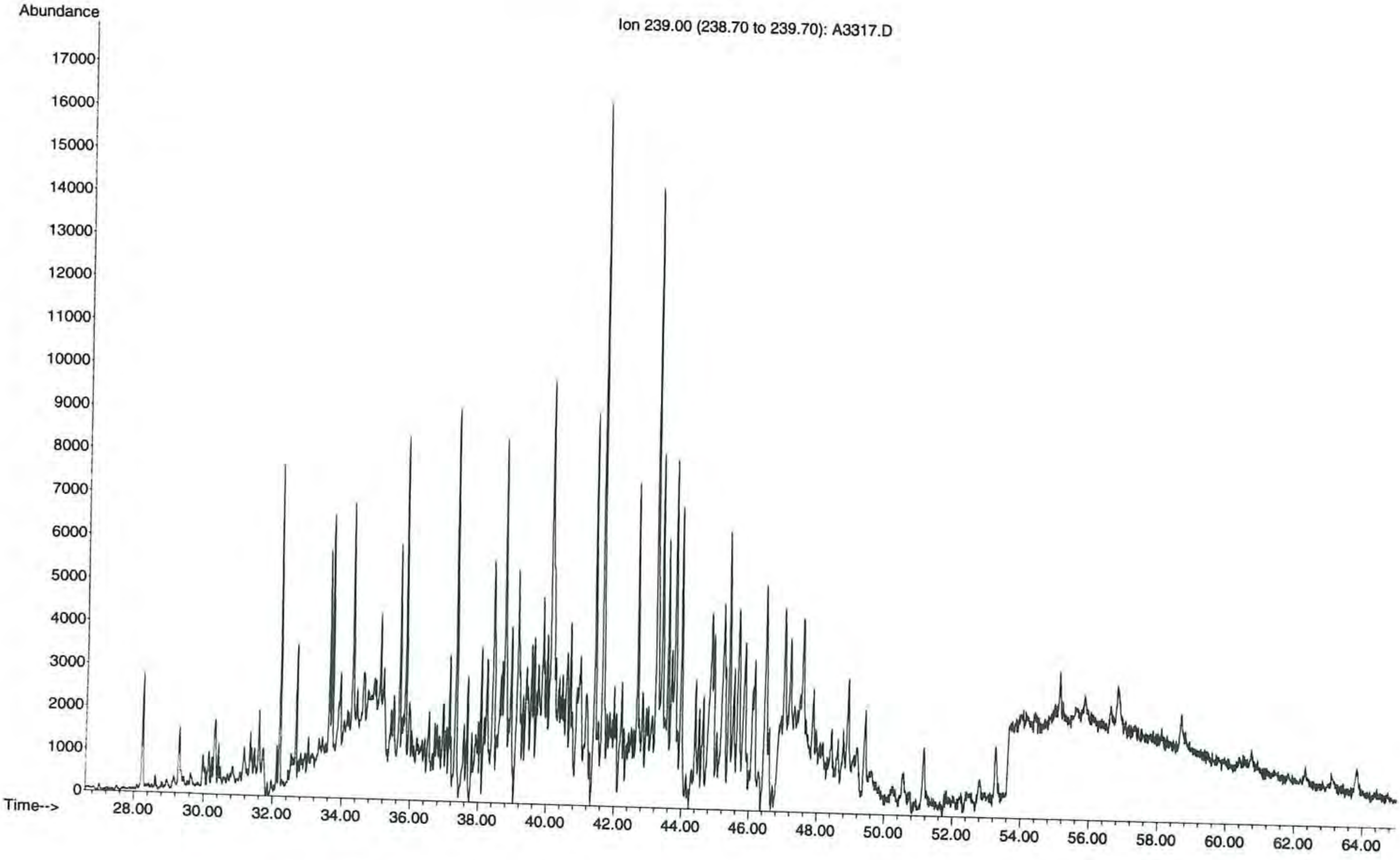



```
File        : G:\A\DATA\SA0612\A3317.D
Operator    : DPB
Acquired    : 25 Oct 2007   2:12 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 24
```



```
File       : G:\A\DATA\SA0612\A3302.D
Operator   : DPB
Acquired   : 24 Oct 2007   3:46 am using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: BL042NSC-P(0)
Misc Info  : North Slope Crude  07-0259
Vial Number: 9
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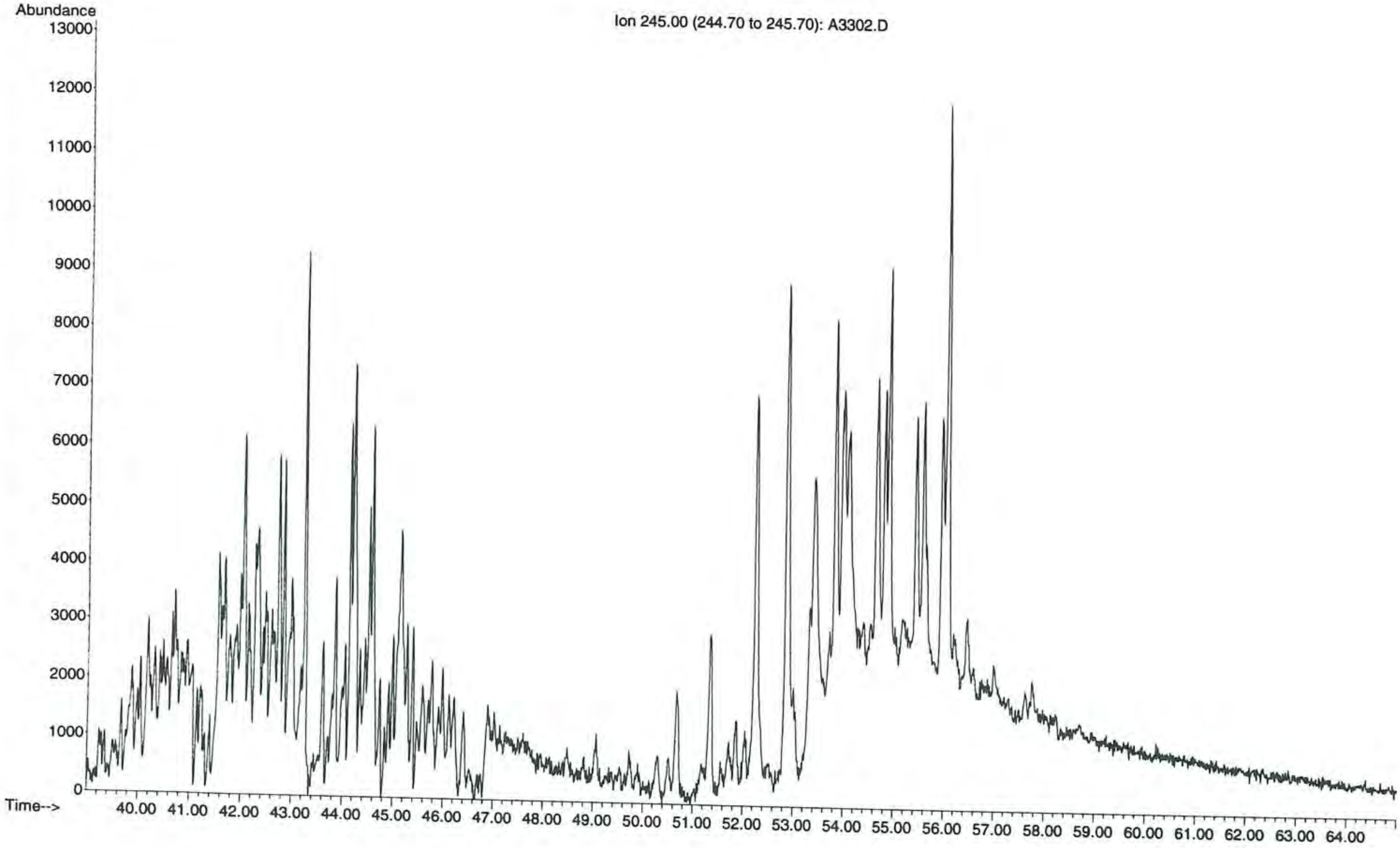

```
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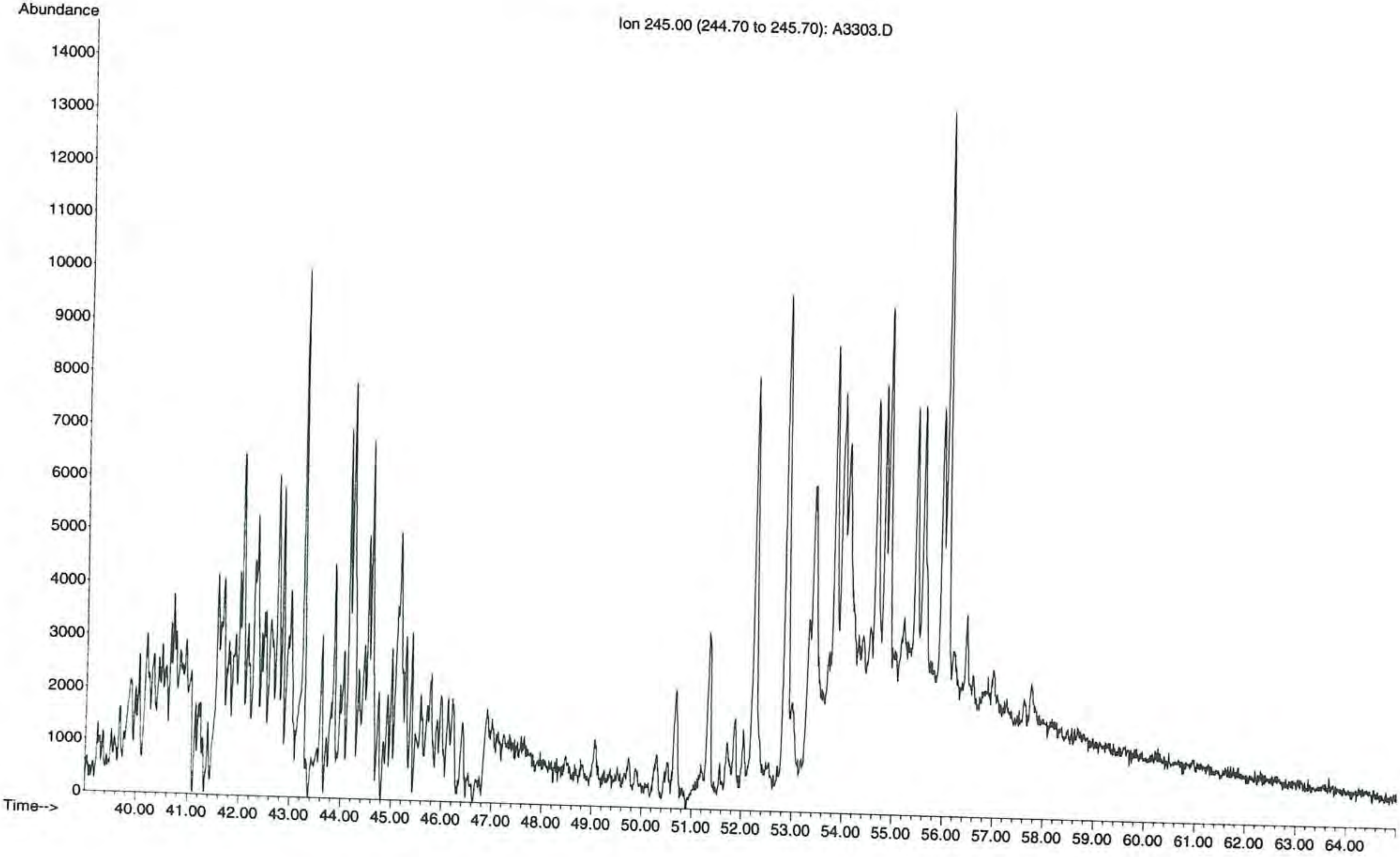
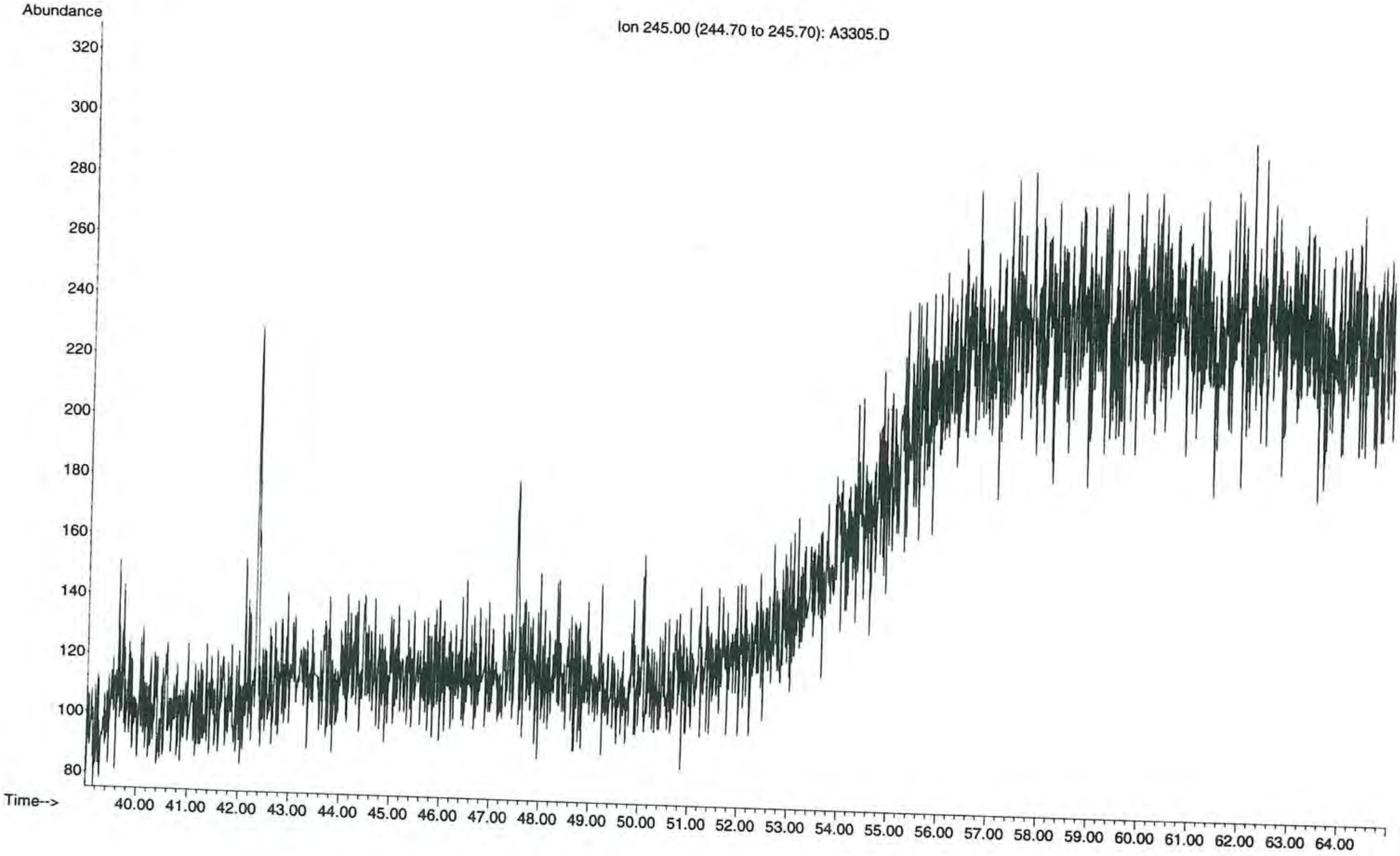
Operator    : DPB
Acquired    : 24 Oct 2007   5:15 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 10
```



```
File        : G:\A\DATA\SA0612\A3305.D
Operator    : DPB
Acquired    : 24 Oct 2007   8:13 am using AcqMethod BIOPLUSN
Instrument  :    Inst. A
Sample Name: BL033PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0259
Vial Number: 12
```



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File        : G:\A\DATA\SA0612\A3306.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:42 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL034LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0259
Vial Number: 13
```
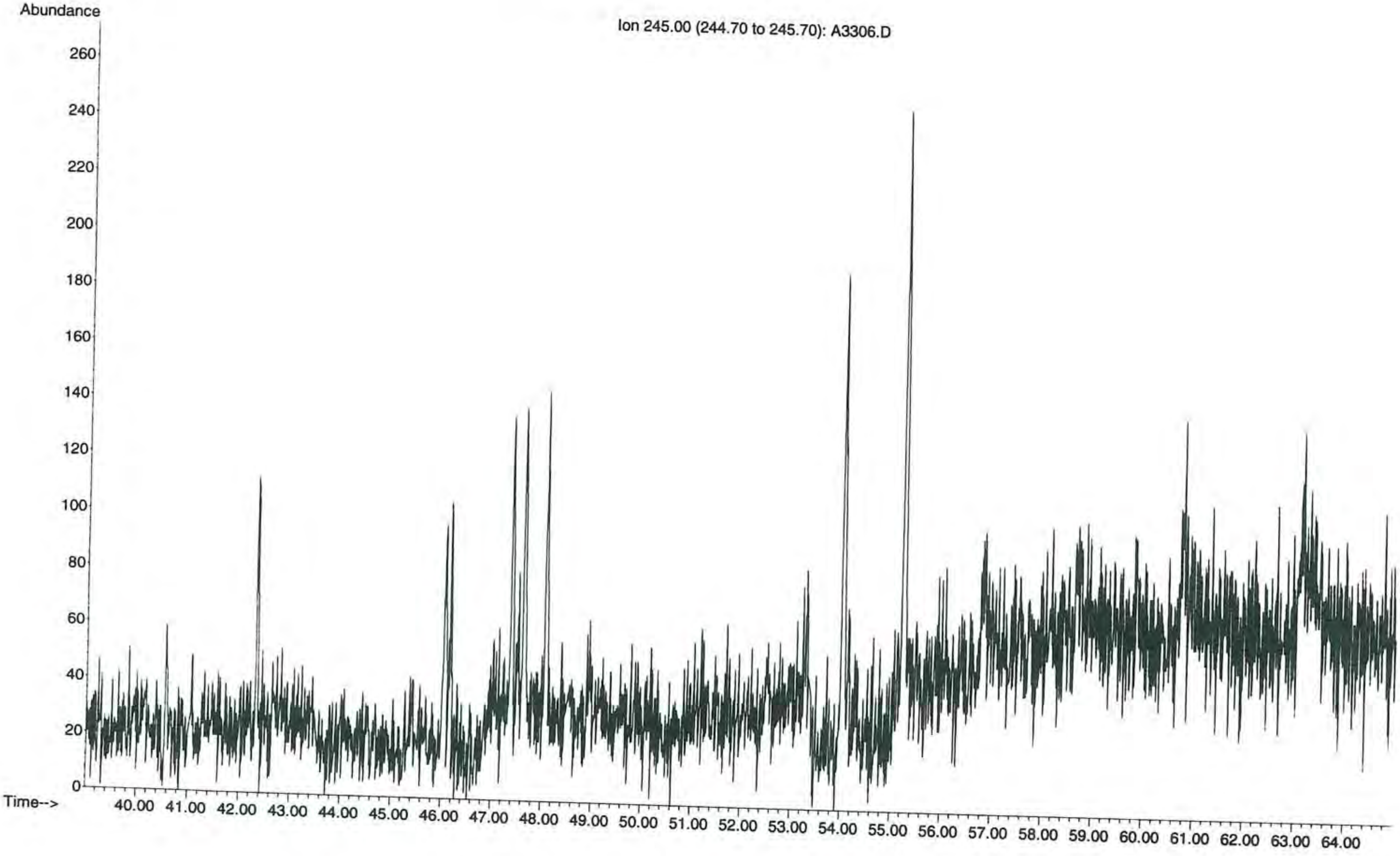
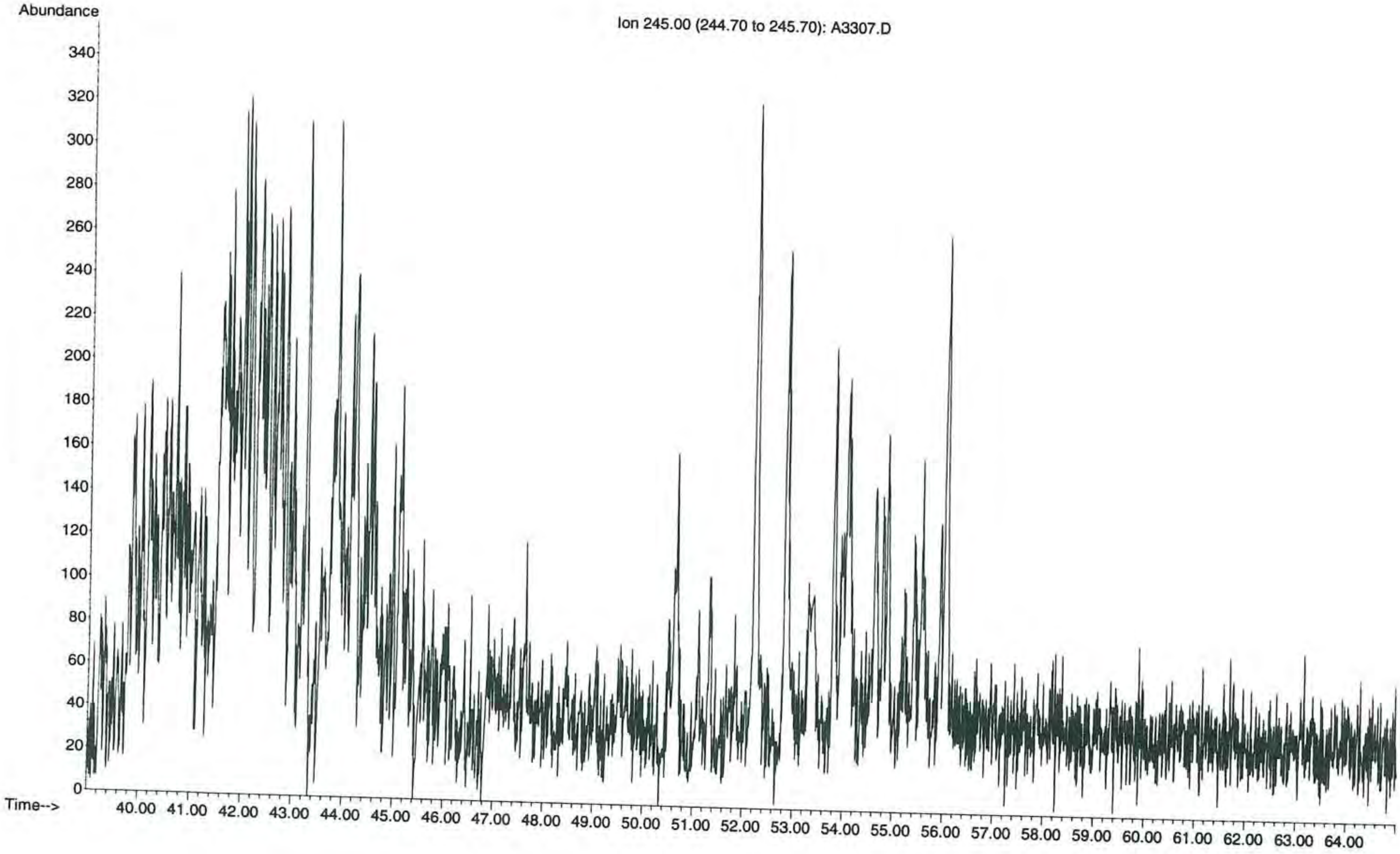
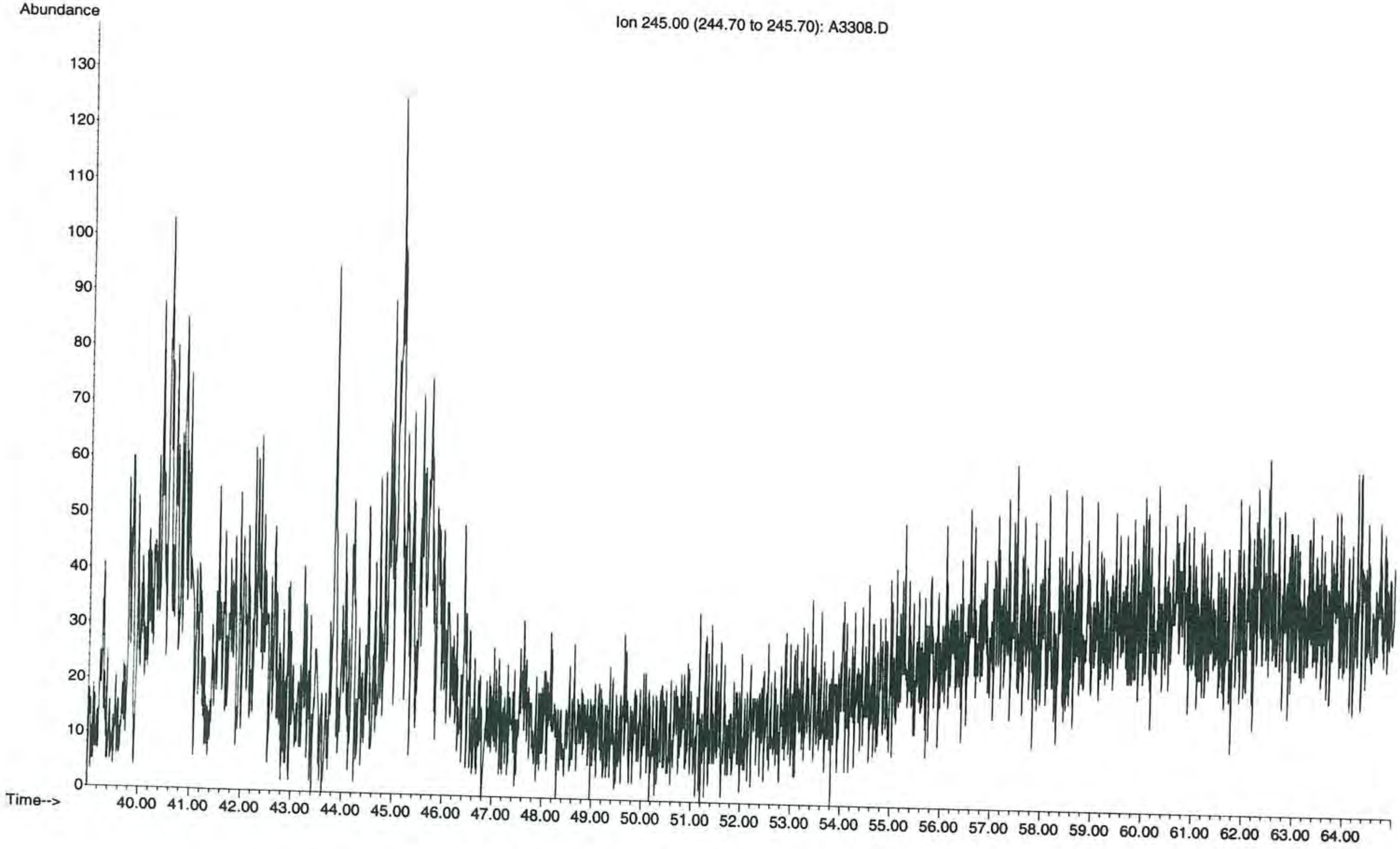



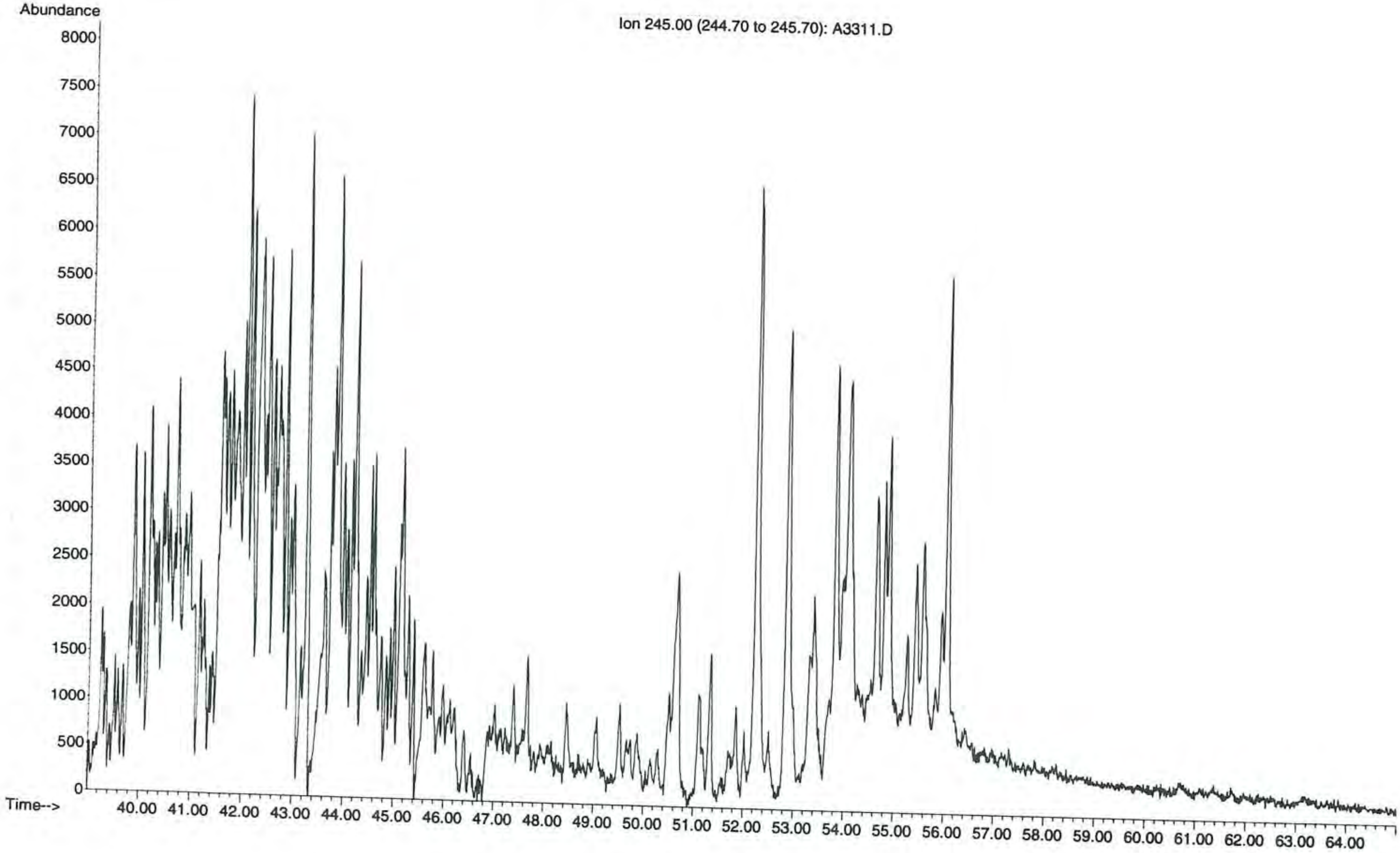
```
File          : G:\A\DATA\SA0612\A3307.D
Operator      : DPB
Acquired      : 24 Oct 2007  11:12 am using AcqMethod BIOPLUSN.M
Instrument    :    Inst. A
Sample Name: Q0541-P-MS-D(13)
Misc Info     : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 14
```



```
File        : G:\A\DATA\SA0612\A3308.D
Operator    : DPB
Acquired    : 24 Oct 2007  12:41 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS-D(13)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 15
```



```
File        : G:\A\DATA\SA0612\A3311.D
Operator    : DPB
Acquired    : 24 Oct 2007   5:18 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0541-P-MS(12)
Misc Info   : SB-2 S5 8-9.5 5-157 07-0259
Vial Number: 18
```



```
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Operator    : DPB
Acquired    : 24 Oct 2007   6:47 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0545-P-MS(12)
Misc Info   : GP-12 S2 23-24 5-157 07-0259
Vial Number: 19
```
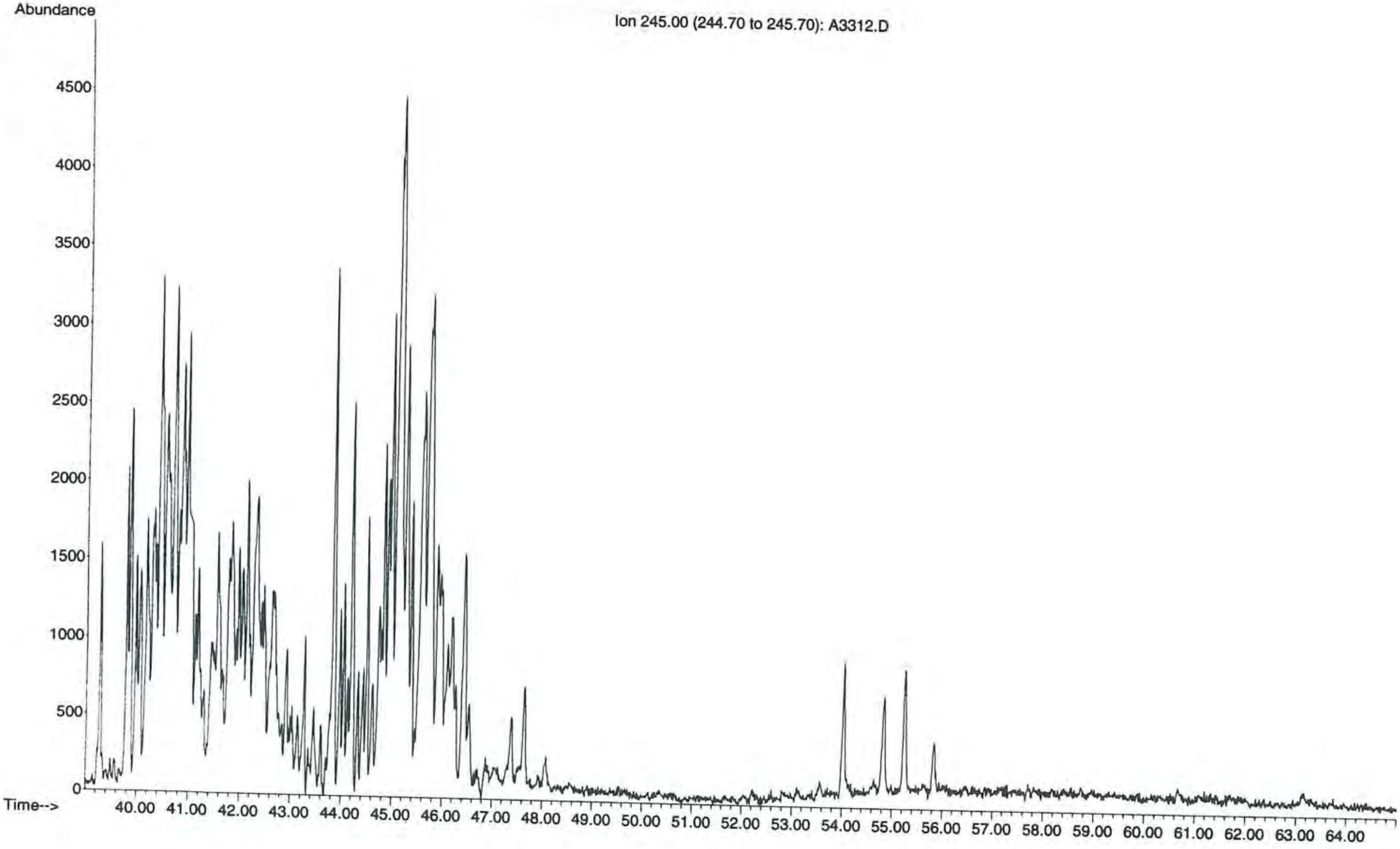
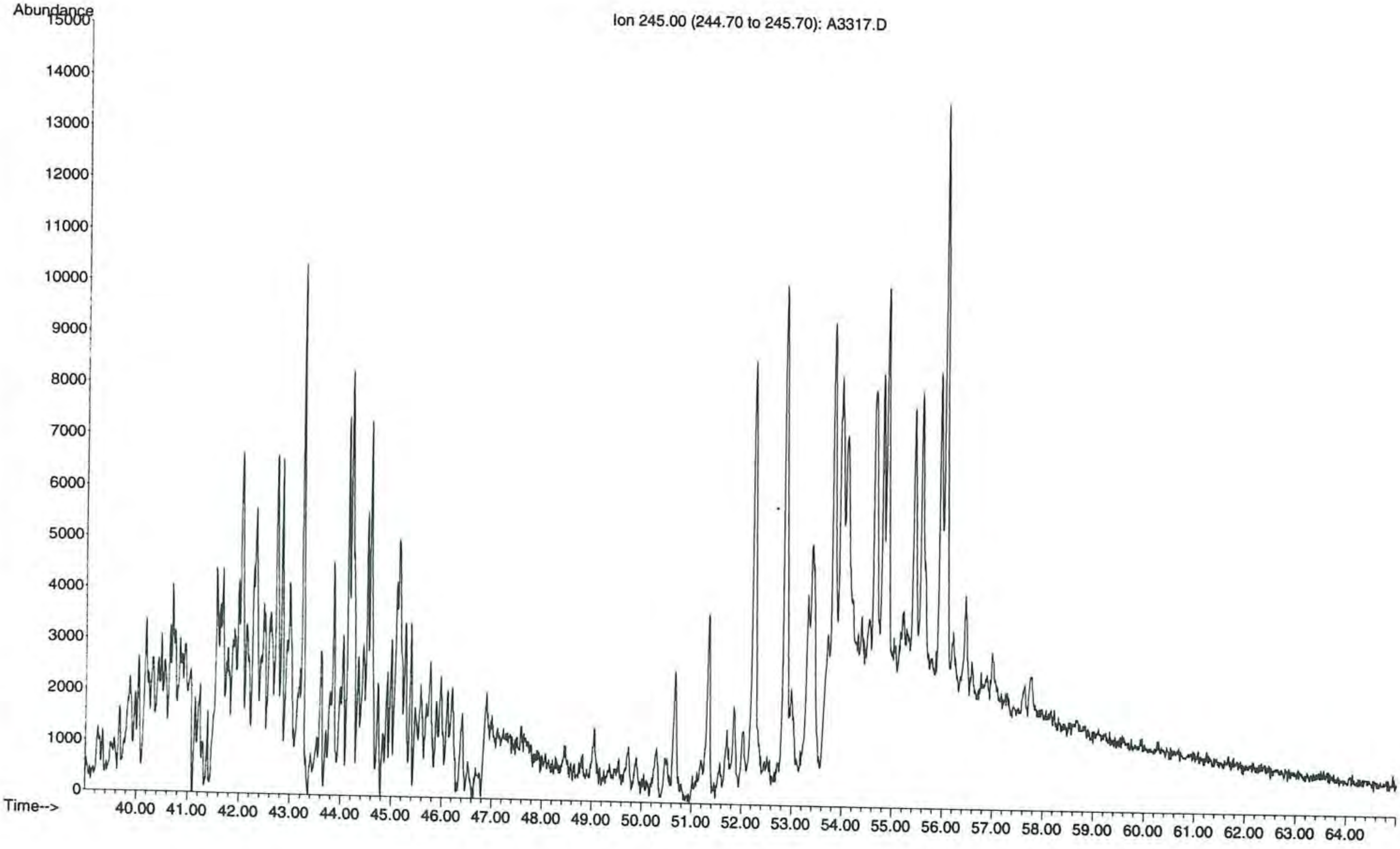



```
File        : G:\A\DATA\SA0612\A3317.D
Operator    : DPB
Acquired    : 25 Oct 2007   2:12 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL043NSC-P(0)
Misc Info   : North Slope Crude  07-0259
Vial Number: 24
```



PAH and Biomarker – SEDIMENT QA/QC SUMMARY
Batch 07-0264

PROJECT:	Floyd/Snyder – Gas Works Park
PARAMETER:	Polycyclic Aromatic Hydrocarbons (PAH) and Biomarkers
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Non-aqueous phase liquid (NAPL)
SAMPLE CUSTODY:	Six soil samples and 1 NAPL were received at Battelle Duxbury Operations (BDO) Laboratory on 10/9/07. Upon Receipt of the samples, the temperature of the cooler was taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was slightly below the acceptable range (4°C ± 2°) at 0.6°C. Also, it was noted that sample Q0540 (MW-9) had some oil residue on the outside of the container as well as the inner side of the bubble wrap. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples. The client was notified on 10/16/07. The laboratory was instructed to proceed with the analysis. Samples were stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin.

	Reference Method	Method Blank	Surrogate Recovery	LCS Recovery	MS Recovery	MS/MSD Precision	Control Oil % Diff
SHC and TPH	General NS&T	<5xMDL	40-120% Recovery	40-120% Recovery	40-120% Recovery MS target spike must be >5x background	≤30% RPD	PD,30% for 90% of the analytes

METHOD:

The NAPL sample was extracted following general NS&T methods. Approximately 50 mg of oil was weighed and diluted with 10mL of hexane. A portion of the extract was removed and spiked with SIS and IS. One extract was submitted for PAH and petroleum biomarker analysis and the second extract was submitted for SHC and TPH analysis. NAPL sample data is reported on an oil weight basis.

PAH and petroleum biomarkers were measured by gas chromatography –mass spectrometry (GC/MS) in the selected ion mode (SIM). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of the analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of the PAH and petroleum biomarkers were calculated by the internal standard method. Target PAH were quantified using the average RF generated from the initial calibration. The alkyl homologue PAH series were assigned the RF of the parent PAH, Steranes were assigned the RF of cholestane, and triterpanes were assigned the RF of Moretane.

Note: the reporting limit for the alkyl benzene compounds is orders of magnitude higher than the reporting limits for the rest of the PAH compounds.

HOLDING TIMES:

Samples were prepared for analysis in three analytical batches and were extracted within 15 days of sample collection analyzed within 40 days of extraction.

Batch	Extraction Date	Analysis Date
07-0264	10/18/2007	10/23/2007

PAH and Biomarker – SEDIMENT QA/QC SUMMARY

Batch 07-0264

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0264 – No exceedences noted.

Comments – None.

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0264 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY:

Five surrogate compounds were added prior to extraction, including naphthalene-d8, acenaphthene-d10, phenanthrene-d10, benzo(a)pyrene-d12, and 5b(H)-chloane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0264 – Benzo(a)pyrene-d12 is out in NSC, though the NSC still passes for all the analytes and this does not affect the authentic samples.

Comments – None.

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0264 – No exceedences noted.

Comments – None.

CALIBRATIONS:

The GC/MS is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (% RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be ≤15%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be ≤25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be ≤25%.

07-0264 – No exceedences noted.

Comments – None.

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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	MW-9
Battelle ID	Q0540-P
Sample Type	SA
Collection Date	10/03/07
Extraction Date	10/18/07
Analysis Date	10/23/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	NAPL
Sample Size	53.70
Size Unit-Basis	MG_OIL
Units	MG/KG_OIL
C3-Alkylbenzenes	957.06
C4-Alkylbenzenes	1229.52
C5-Alkylbenzenes	522.11
C6-Alkylbenzenes	546.55
Benzo(b)thiophene	230.3
C1-benzo(b)thiophenes	588.57
C2-benzo(b)thiophenes	770.41
C3-benzo(b)thiophenes	681.89
C4-benzo(b)thiophenes	348.21
Naphthalene	12501.92 D
C1-Naphthalenes	14043.83 D
C2-Naphthalenes	11458.07 D
C3-Naphthalenes	6178.7 D
C4-Naphthalenes	2509.58 D
C1-Biphenyls + Dibenzofuran	1045.39
Biphenyl	705.62
C2-Biphenyls + C1-Dibenzofurans	1651.94
Acenaphthylene	562.91
Acenaphthene	1875.64
Dibenzofuran	251.7
Fluorene	1457.43
C1-Fluorenes	1344.02
C2-Fluorenes	1034.47
C3-Fluorenes	539.52
C4-Fluorenes	485.27
Anthracene	998.56 D
Phenanthrene	4785.59 D
C1-Phenanthrenes/Anthracenes	3773.15 D
C2-Phenanthrenes/Anthracenes	1970.53 D
C3-Phenanthrenes/Anthracenes	664.8 D
C4-Phenanthrenes/Anthracenes	208.41 D
Retene	85.3
Dibenzothiophene	359.75
C1-Dibenzothiophenes	547.93
C2-Dibenzothiophenes	508.9
C3-Dibenzothiophenes	278.07
C4-Dibenzothiophenes	97.27
Fluoranthene	979.03
Pyrene	1443.38
C1-Fluoranthenes/Pyrenes	1749.41
C2-Fluoranthenes/Pyrenes	692.53
C3-Fluoranthenes/Pyrenes	264.09
C4-Fluoranthenes/Pyrenes	92.23
C0-Benzo(b)naphthothiophenes	58.98
C1-Benzo(b)naphthothiophenes	112.29
C2-Benzo(b)naphthothiophenes	61.47
C3-Benzo(b)naphthothiophenes	31.01
C4-Benzo(b)naphthothiophenes	20.71
Benzo(a)anthracene	539.72
Chrysene	538.43

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	MW-9
Battelle ID	Q0540-P
Sample Type	SA
Collection Date	10/03/07
Extraction Date	10/18/07
Analysis Date	10/23/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	NAPL
Sample Size	53.70
Size Unit-Basis	MG_OIL
Units	MG/KG_OIL
C1-Chrysenes	518.15
C2-Chrysenes	226.85
C3-Chrysenes	100.32
C4-Chrysenes	45.7
Benzo(b)fluoranthene	225.58
Benzo(k)fluoranthene	335.92
Benzo(e)pyrene	257.94
Benzo(a)pyrene	512.94
Perylene	85.5
Indeno(1,2,3-cd)pyrene	229.39
Dibenz(a,h)anthracene	56.45
Benzo(g,h,i)perylene	203.45
Total PAH	77661.15

Surrogate Recoveries (%)

Naphthalene-d8	96
Acenaphthene-d10	90
Phenanthrene-d10	86
Benzo(a)pyrene-d12	120
5b(H)-Cholane	115

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Battelle
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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL057PB-P
Sample Type	PB
Collection Date	10/18/07
Extraction Date	10/18/07
Analysis Date	10/23/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	50.00
Size Unit-Basis	MG_OIL
Units	MG/KG_OIL
C3-Alkylbenzenes	U
C4-Alkylbenzenes	U
C5-Alkylbenzenes	U
C6-Alkylbenzenes	U
Benzo(b)thiophene	U
C1-benzo(b)thiophenes	U
C2-benzo(b)thiophenes	U
C3-benzo(b)thiophenes	U
C4-benzo(b)thiophenes	U
Naphthalene	0.09 J
C1-Naphthalenes	U
C2-Naphthalenes	U
C3-Naphthalenes	U
C4-Naphthalenes	U
C1-Biphenyls + Dibenzofuran	U
Biphenyl	U
C2-Biphenyls + C1-Dibenzofurans	U
Acenaphthylene	U
Acenaphthene	U
Dibenzofuran	U
Fluorene	U
C1-Fluorenes	U
C2-Fluorenes	U
C3-Fluorenes	U
C4-Fluorenes	U
Anthracene	U
Phenanthrene	U
C1-Phenanthrenes/Anthracenes	U
C2-Phenanthrenes/Anthracenes	U
C3-Phenanthrenes/Anthracenes	U
C4-Phenanthrenes/Anthracenes	U
Retene	U
Dibenzothiophene	U
C1-Dibenzothiophenes	U
C2-Dibenzothiophenes	U
C3-Dibenzothiophenes	U
C4-Dibenzothiophenes	U
Fluoranthene	U
Pyrene	U
C1-Fluoranthenes/Pyrenes	U
C2-Fluoranthenes/Pyrenes	U
C3-Fluoranthenes/Pyrenes	U
C4-Fluoranthenes/Pyrenes	U
C0-Benzo(b)naphthothiophenes	U
C1-Benzo(b)naphthothiophenes	U
C2-Benzo(b)naphthothiophenes	U
C3-Benzo(b)naphthothiophenes	U
C4-Benzo(b)naphthothiophenes	U
Benzo(a)anthracene	U
Chrysene	U

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL057PB-P
Sample Type	PB
Collection Date	10/18/07
Extraction Date	10/18/07
Analysis Date	10/23/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	50.00
Size Unit-Basis	MG_OIL
Units	MG/KG_OIL
C1-Chrysenes	U
C2-Chrysenes	U
C3-Chrysenes	U
C4-Chrysenes	U
Benzo(b)fluoranthene	U
Benzo(k)fluoranthene	U
Benzo(e)pyrene	U
Benzo(a)pyrene	U
Perylene	U
Indeno(1,2,3-cd)pyrene	U
Dibenz(a,h)anthracene	U
Benzo(g,h,i)perylene	U
Total PAH	0.09 J

Surrogate Recoveries (%)

Naphthalene-d8	106
Acenaphthene-d10	97
Phenanthrene-d10	96
Benzo(a)pyrene-d12	109
5b(H)-Cholane	95

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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Laboratory Control Sample				
Battelle ID	BL058LCS-P				
Sample Type	LCS				
Collection Date	10/18/07				
Extraction Date	10/18/07				
Analysis Date	10/23/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	NA				
Size Unit-Basis	NA				
Units	NG		Target	% Recovery	Qualifier
C3-Alkylbenzenes		U			
C4-Alkylbenzenes		U			
C5-Alkylbenzenes		U			
C6-Alkylbenzenes		U			
Benzo(b)thiophene	1697.65		2006.80	85	
C1-benzo(b)thiophenes		U			
C2-benzo(b)thiophenes		U			
C3-benzo(b)thiophenes		U			
C4-benzo(b)thiophenes		U			
Naphthalene	1948.35		2000.40	97	
C1-Naphthalenes		U			
C2-Naphthalenes		U			
C3-Naphthalenes		U			
C4-Naphthalenes		U			
C1-Biphenyls + Dibenzofuran		U			
Biphenyl	1681.44		2003.40	84	
C2-Biphenyls + C1-Dibenzofurans		U			
Acenaphthylene	1859.47		2001.80	93	
Acenaphthene	1962.93		2001.30	98	
Dibenzofuran	1739.28		2003.80	87	
Fluorene	1864.93		2001.10	93	
C1-Fluorenes		U			
C2-Fluorenes		U			
C3-Fluorenes		U			
C4-Fluorenes		U			
Anthracene	1779.37		2000.30	89	
Phenanthrene	1781.84		2001.00	89	
C1-Phenanthrenes/Anthracenes		U			
C2-Phenanthrenes/Anthracenes		U			
C3-Phenanthrenes/Anthracenes		U			
C4-Phenanthrenes/Anthracenes		U			
Retene		U			
Dibenzothiophene	1570.79		2002.00	78	
C1-Dibenzothiophenes		U			
C2-Dibenzothiophenes		U			
C3-Dibenzothiophenes		U			
C4-Dibenzothiophenes		U			
Fluoranthene	1732.39		2001.00	87	
Pyrene	1782.5		2000.70	89	
C1-Fluoranthenes/Pyrenes		U			
C2-Fluoranthenes/Pyrenes		U			
C3-Fluoranthenes/Pyrenes		U			
C4-Fluoranthenes/Pyrenes		U			
C0-Benzo(b)naphthothiophenes		U			
C1-Benzo(b)naphthothiophenes		U			
C2-Benzo(b)naphthothiophenes		U			
C3-Benzo(b)naphthothiophenes		U			
C4-Benzo(b)naphthothiophenes		U			
Benzo(a)anthracene	1698.46		2000.50	85	

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Laboratory Control Sample				
Battelle ID	BL058LCS-P				
Sample Type	LCS				
Collection Date	10/18/07				
Extraction Date	10/18/07				
Analysis Date	10/23/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	NA				
Size Unit-Basis	NA				
Units	NG		Target	% Recovery	Qualifier
Chrysene	1712.45		2000.80	86	
C1-Chrysenes		U			
C2-Chrysenes		U			
C3-Chrysenes		U			
C4-Chrysenes		U			
Benzo(b)fluoranthene	1859.09		2001.70	93	
Benzo(k)fluoranthene	2011.19		2001.10	101	
Benzo(e)pyrene	1721.05		2002.80	86	
Benzo(a)pyrene	1965.52		2001.60	98	
Perylene	1873.42		2004.10	93	
Indeno(1,2,3-cd)pyrene	1851.82		2001.00	93	
Dibenz(a,h)anthracene	1779.91		2001.10	89	
Benzo(g,h,i)perylene	1811.31		2000.60	91	
Total PAH	37987.51				

Surrogate Recoveries (%)

Naphthalene-d8	104
Acenaphthene-d10	96
Phenanthrene-d10	95
Benzo(a)pyrene-d12	110
5b(H)-Cholane	88

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude			
Battelle ID	BL060NSC-P			
Sample Type	NSC			
Collection Date	10/18/07			
Extraction Date	10/18/07			
Analysis Date	10/23/07			
Analytical Instrument	MS			
% Moisture	NA			
% Lipid	NA			
Matrix	OIL			
Sample Size	5.04			
Size Unit-Basis	MG_OIL			
Units	MG/KG_OIL	Target	% Difference	Qualifier
C3-Alkylbenzenes	1560.8			
C4-Alkylbenzenes	1216.22			
C5-Alkylbenzenes	685.39			
C6-Alkylbenzenes	430.56			
Benzo(b)thiophene	12.17			
C1-benzo(b)thiophenes	39.72			
C2-benzo(b)thiophenes	72.43	95.74	24.3	
C3-benzo(b)thiophenes	127.49	132.67	3.9	
C4-benzo(b)thiophenes	85.27	96.72	11.8	
Naphthalene	689.11	740.29	6.9	
C1-Naphthalenes	1395.18	1516.04	8.0	
C2-Naphthalenes	1805.37	2000.10	9.7	
C3-Naphthalenes	1399.36	1526.96	8.4	
C4-Naphthalenes	755.68	898.03	15.9	
C1-Biphenyls + Dibenzofuran	318.25			
Biphenyl	204.89	220.82	7.2	
C2-Biphenyls + C1-Dibenzofurans	473.11			
Acenaphthylene	U			
Acenaphthene	12.4	14.50	14.5	
Dibenzofuran	64.18	77.75	17.5	
Fluorene	95.2	92.51	2.9	
C1-Fluorenes	200.32	227.01	11.8	
C2-Fluorenes	287.55	367.09	21.7	
C3-Fluorenes	250.22	326.32	23.3	
C4-Fluorenes	157.75			
Anthracene	U			
Phenanthrene	228.28	249.49	8.5	
C1-Phenanthrenes/Anthracenes	497.37	549.17	9.4	
C2-Phenanthrenes/Anthracenes	574.96	642.72	10.5	
C3-Phenanthrenes/Anthracenes	390.44	446.11	12.5	
C4-Phenanthrenes/Anthracenes	142.25	180.02	21.0	
Retene	43.86			
Dibenzothiophene	194.31	210.35	7.6	
C1-Dibenzothiophenes	362.86	409.03	11.3	
C2-Dibenzothiophenes	498.7	551.46	9.6	
C3-Dibenzothiophenes	408.82	471.36	13.3	
C4-Dibenzothiophenes	221.26	243.11	9.0	
Fluoranthene	3.55			
Pyrene	15.21	12.99	17.1	
C1-Fluoranthenes/Pyrenes	61.96	70.92	12.6	
C2-Fluoranthenes/Pyrenes	119.12	117.89	1.0	
C3-Fluoranthenes/Pyrenes	141.73	137.25	3.3	
C4-Fluoranthenes/Pyrenes	98.19			
C0-Benzo(b)naphthothiophenes	39.22			
C1-Benzo(b)naphthothiophenes	153.8			
C2-Benzo(b)naphthothiophenes	189.65			
C3-Benzo(b)naphthothiophenes	128.56			
C4-Benzo(b)naphthothiophenes	78.36			
Benzo(a)anthracene	4.17			

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude				
Battelle ID	BL060NSC-P				
Sample Type	NSC				
Collection Date	10/18/07				
Extraction Date	10/18/07				
Analysis Date	10/23/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
Chrysene	47.25		47.18	0.1	
C1-Chrysenes	78.63		78.82	0.2	
C2-Chrysenes	102.3		102.67	0.4	
C3-Chrysenes	88.83		85.36	4.1	
C4-Chrysenes	55.14		61.99	11.1	
Benzo(b)fluoranthene	5.89		6.08	3.1	
Benzo(k)fluoranthene		U			
Benzo(e)pyrene	13.72		12.88	6.5	
Benzo(a)pyrene	1.09	J			
Perylene		U			
Indeno(1,2,3-cd)pyrene		U			
Dibenz(a,h)anthracene	1.09	J			
Benzo(g,h,i)perylene	3.61		3.44	4.9	
Total PAH	11422				

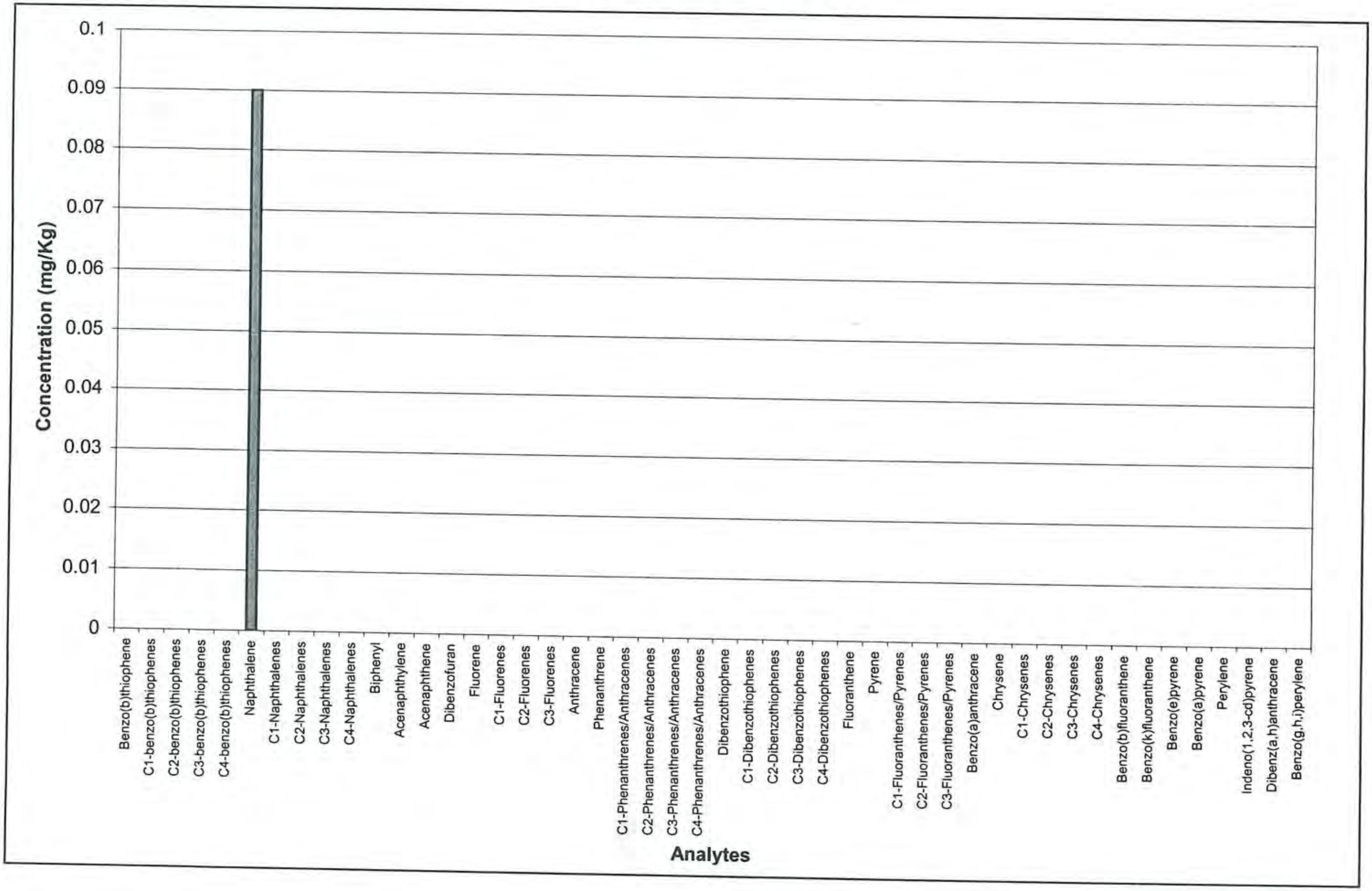
Surrogate Recoveries (%)

Naphthalene-d8	104	
Acenaphthene-d10	92	
Phenanthrene-d10	90	
Benzo(a)pyrene-d12	126	N
5b(H)-Cholane	96	

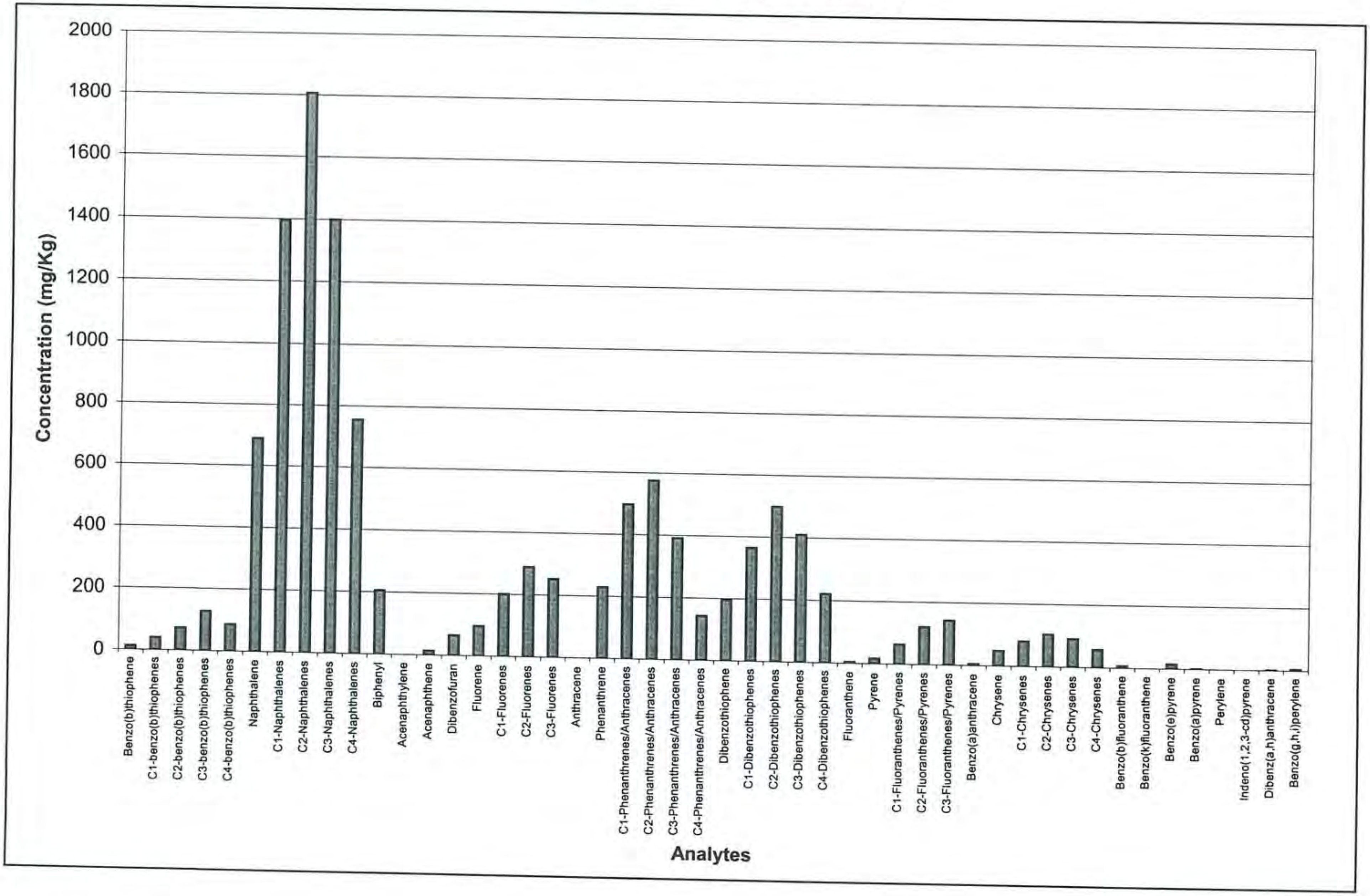
Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

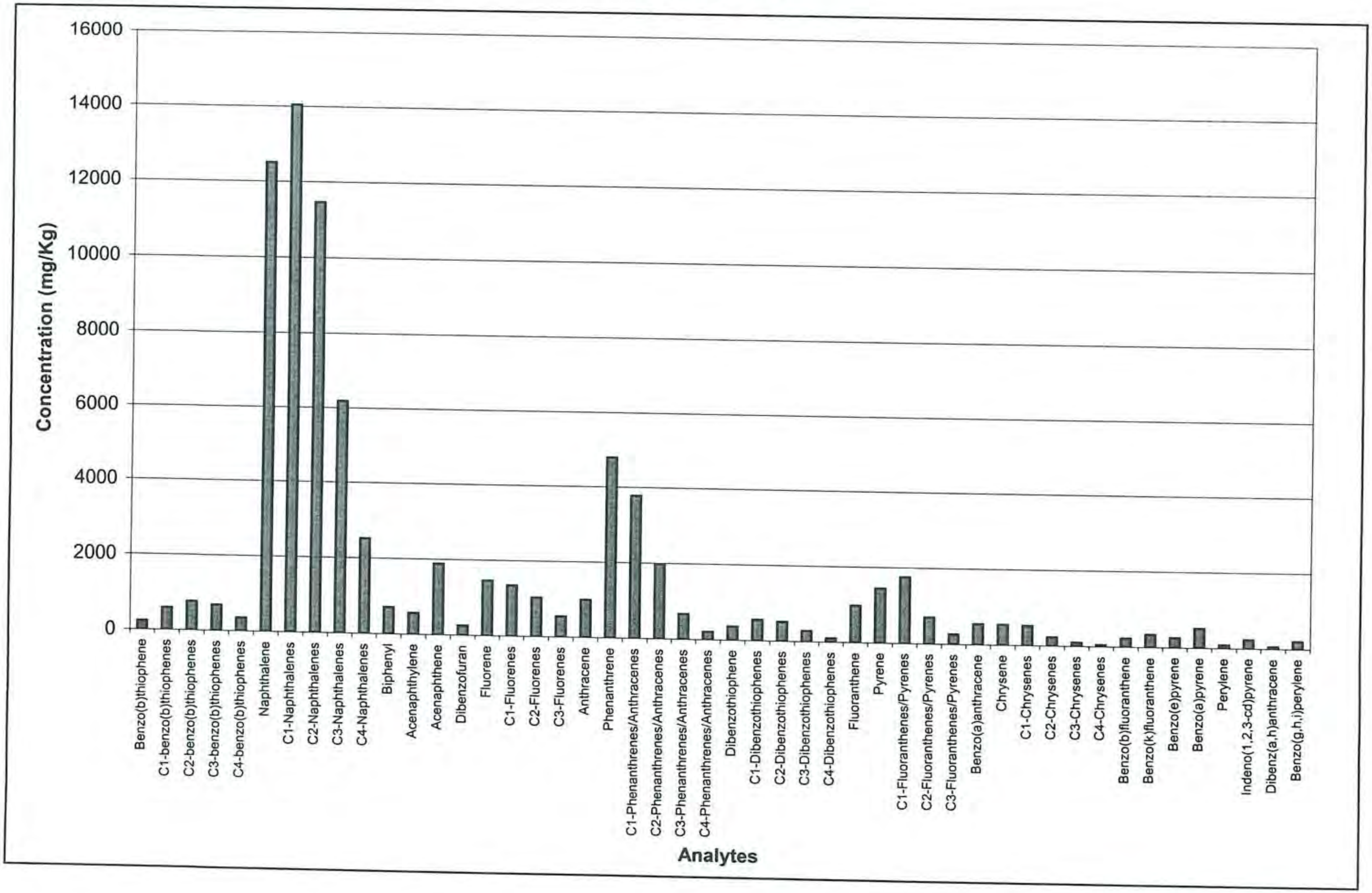
Procedural Blank (BL057PB-P)



GO98: North Slope Crude (BL060NSC-P)



MW-9 (Q0540-P)


Concentration (mg/Kg)
16000
14000
12000
10000
8000
6000
4000
2000
0
Benzo(b)thiophene
C1-benzo(b)thiophenes
C2-benzo(b)thiophenes
C3-benzo(b)thiophenes
C4-benzo(b)thiophenes
Naphthalene
C1-Naphthalenes
C2-Naphthalenes
C3-Naphthalenes
C4-Naphthalenes
Biphenyl
Acenaphthylene
Acenaphthene
Dibenzofuran
Fluorene
C1-Fluorenes
C2-Fluorenes
C3-Fluorenes
Anthracene
Phenanthrene
C1-Phenanthrenes/Anthracenes
C2-Phenanthrenes/Anthracenes
C3-Phenanthrenes/Anthracenes
C4-Phenanthrenes/Anthracenes
Dibenzothiophene
C1-Dibenzothiophenes
C2-Dibenzothiophenes
C3-Dibenzothiophenes
C4-Dibenzothiophenes
Fluoranthene
Pyrene
C1-Fluoranthenes/Pyrenes
C2-Fluoranthenes/Pyrenes
C3-Fluoranthenes/Pyrenes
Benzo(a)anthracene
Chrysene
C1-Chrysenes
C2-Chrysenes
C3-Chrysenes
C4-Chrysenes
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(e)pyrene
Benzo(a)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenz(a,h)anthracene
Benzo(g,h,i)perylene
Analytes

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	MW-9
Battelle ID	Q0540-P
Sample Type	SA
Collection Date	10/03/07
Extraction Date	10/18/07
Analysis Date	10/23/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	NAPL
Sample Size	53.70
Size Unit-Basis	MG_OIL
Units	MG/KG_OIL
C23 Tricyclic Terpane	44.57
C29 Tricyclic Terpane -22S	13.91
C29 Tricyclic Terpane -22R	12.55
18a(H)-22,29,30-Trisnorneohopane -TS	8.56
17a(H)-22,29,30-Trisnorhopane -TM	12.67
30-Norhopane	35.59
18a(H) & 18b(H)-Oleananes	13.97
Hopane	65.08
30-Homohopane -22S	23.21
30-Homohopane -22R	13.35
13b(H),17a(H)-20S-Diacholestane	78.45
13b(H),17a(H)-20R-Diacholestane	45.43
14a(H),17a(H)-20R-methylcholestane	102.96
14a(H),17a(H)-20S-Ethylcholestane	40.52
14a(H),17a(H)-20R-Ethylcholestane	59.44
C21-TAS	10.91
C26-TAS(20S)	18.2
C26,C27-TAS	58.72
C27-TAS(20R)	30.58
C28-TAS(20S)	18.79
C28-TAS(20R)	14.16
C21-MAS	7.93
C22-MAS	3.89
C27-MAS	3.14
C27-20R-MAS	18.71
C27-20S-MAS	14.78
C28-20S-MAS	32.2
C27-C2920S/R-MAS	36.37
C29-20S-MAS	33.57
C29-20R-MAS	24.77
TAS_245	U
MAS_239	U

Surrogate Recoveries (%)

Naphthalene-d8	96
Acenaphthene-d10	90
Phenanthrene-d10	86
Benzo(a)pyrene-d12	120
5b(H)-Cholane	115

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL057PB-P
Sample Type	PB
Collection Date	10/18/07
Extraction Date	10/18/07
Analysis Date	10/23/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	OIL
Sample Size	50.00
Size Unit-Basis	MG_OIL
Units	MG/KG_OIL
C23 Tricyclic Terpane	U
C29 Tricyclic Terpane -22S	U
C29 Tricyclic Terpane -22R	U
18a(H)-22,29,30-Trisnorneohopane -TS	U
17a(H)-22,29,30-Trisnorhopane -TM	U
30-Norhopane	U
18a(H) & 18b(H)-Oleananes	U
Hopane	U
30-Homohopane -22S	U
30-Homohopane -22R	U
13b(H),17a(H)-20S-Diacholestane	U
13b(H),17a(H)-20R-Diacholestane	U
14a(H),17a(H)-20R-methylcholestane	U
14a(H),17a(H)-20S-Ethylcholestane	U
14a(H),17a(H)-20R-Ethylcholestane	U
C21-TAS	U
C26-TAS(20S)	U
C26,C27-TAS	U
C27-TAS(20R)	U
C28-TAS(20S)	U
C28-TAS(20R)	U
C21-MAS	U
C22-MAS	U
C27-MAS	U
C27-20R-MAS	U
C27-20S-MAS	U
C28-20S-MAS	U
C27-C2920S/R-MAS	U
C29-20S-MAS	U
C29-20R-MAS	U
TAS_245	U
MAS_239	U

Surrogate Recoveries (%)

Naphthalene-d8	106
Acenaphthene-d10	97
Phenanthrene-d10	96
Benzo(a)pyrene-d12	109
5b(H)-Cholane	95

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Laboratory Control Sample		
Battelle ID	BL058LCS-P		
Sample Type	LCS		
Collection Date	10/18/07		
Extraction Date	10/18/07		
Analysis Date	10/23/07		
Analytical Instrument	MS		
% Moisture	NA		
% Lipid	NA		
Matrix	OIL		
Sample Size	NA		
Size Unit-Basis	NA		
Units	NG	Target % Recovery	Qualifier
C23 Tricyclic Terpane	U		
C29 Tricyclic Terpane -22S	U		
C29 Tricyclic Terpane -22R	U		
18a(H)-22,29,30-Trisnorneohopane -TS	U		
17a(H)-22,29,30-Trisnorhopane -TM	U		
30-Norhopane	U		
18a(H) & 18b(H)-Oleananes	U		
Hopane	U		
30-Homohopane -22S	U		
30-Homohopane -22R	U		
13b(H),17a(H)-20S-Diacholestane	U		
13b(H),17a(H)-20R-Diacholestane	U		
14a(H),17a(H)-20R-methylcholestane	U		
14a(H),17a(H)-20S-Ethylcholestane	U		
14a(H),17a(H)-20R-Ethylcholestane	U		
C21-TAS	U		
C26-TAS(20S)	U		
C26,C27-TAS	U		
C27-TAS(20R)	U		
C28-TAS(20S)	U		
C28-TAS(20R)	U		
C21-MAS	U		
C22-MAS	U		
C27-MAS	U		
C27-20R-MAS	U		
C27-20S-MAS	U		
C28-20S-MAS	U		
C27-C2920S/R-MAS	U		
C29-20S-MAS	U		
C29-20R-MAS	U		
TAS_245	U		
MAS_239	U		

Surrogate Recoveries (%)

Naphthalene-d8	104
Acenaphthene-d10	96
Phenanthrene-d10	95
Benzo(a)pyrene-d12	110
5b(H)-Cholane	88

Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude				
Battelle ID	BL060NSC-P				
Sample Type	NSC				
Collection Date	10/18/07				
Extraction Date	10/18/07				
Analysis Date	10/23/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
C23 Tricyclic Terpane	39.58		47.76	17.1	
C29 Tricyclic Terpane -22S	11.85		14.70	19.4	
C29 Tricyclic Terpane -22R	11.1		14.64	24.2	
18a(H)-22,29,30-Trisnorneohopane -TS	15.34		15.96	3.9	
17a(H)-22,29,30-Trisnorhopane -TM	22.14		24.82	10.8	
30-Norhopane	61.9		69.58	11.0	
18a(H) & 18b(H)-Oleananes	0.88	J			
Hopane	106.92		120.14	11.0	
30-Homohopane -22S	55.79		59.93	6.9	
30-Homohopane -22R	39.79		39.69	0.3	
13b(H),17a(H)-20S-Diacholestane	38.7		44.18	12.4	
13b(H),17a(H)-20R-Diacholestane	21.96		25.52	13.9	
14a(H),17a(H)-20R-methylcholestane	28.93		33.94	14.8	
14a(H),17a(H)-20S-Ethylcholestane	33.42		35.93	7.0	
14a(H),17a(H)-20R-Ethylcholestane	36.01		39.17	8.1	
C21-TAS	17.14				
C26-TAS(20S)	12.87				
C26,C27-TAS	52.98				
C27-TAS(20R)	31.83				
C28-TAS(20S)	28.99				
C28-TAS(20R)	26.51				
C21-MAS	5.01				
C22-MAS	3.29				
C27-MAS	4.68				
C27-20R-MAS	7.65				
C27-20S-MAS	1.36				
C28-20S-MAS	14.61				
C27-C2920S/R-MAS	13.91				
C29-20S-MAS	3.56				
C29-20R-MAS	9.39				
TAS_245		U			
MAS_239		U			

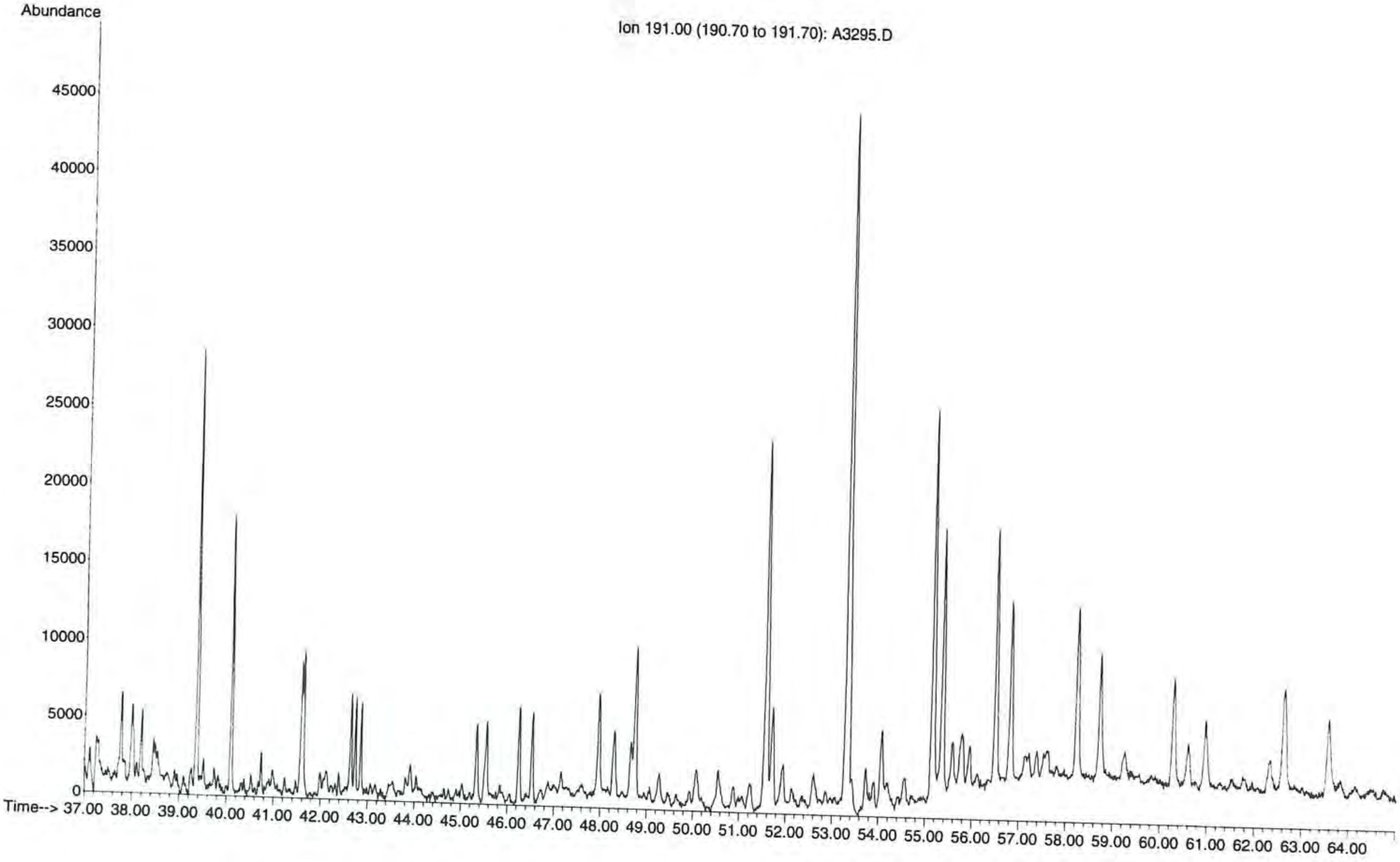
Surrogate Recoveries (%)

Naphthalene-d8	104	
Acenaphthene-d10	92	
Phenanthrene-d10	90	
Benzo(a)pyrene-d12	126	N
5b(H)-Cholane	96	

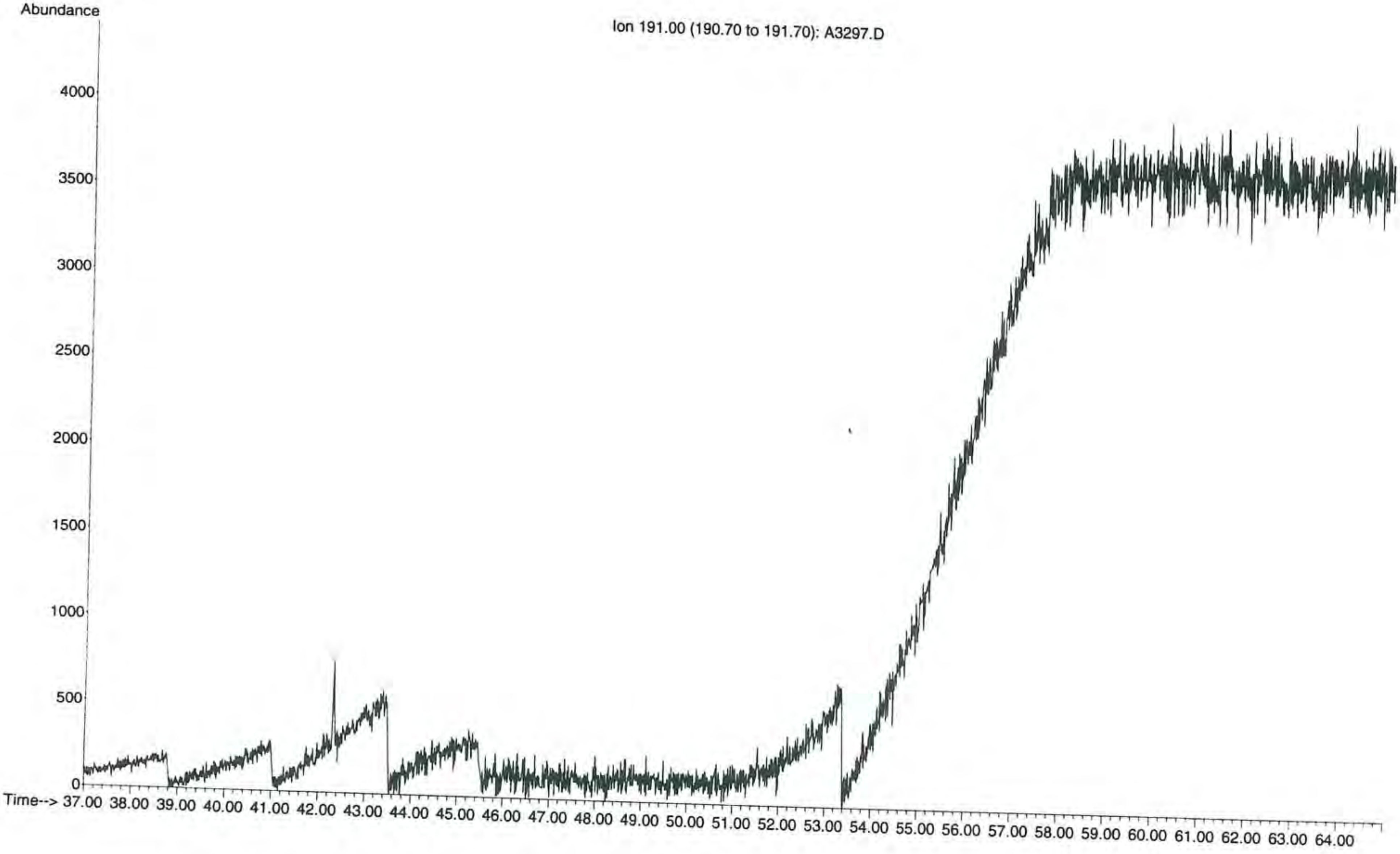
Not Surrogate Corrected

Analyzed by Bardon, Daniel
11/15/2007

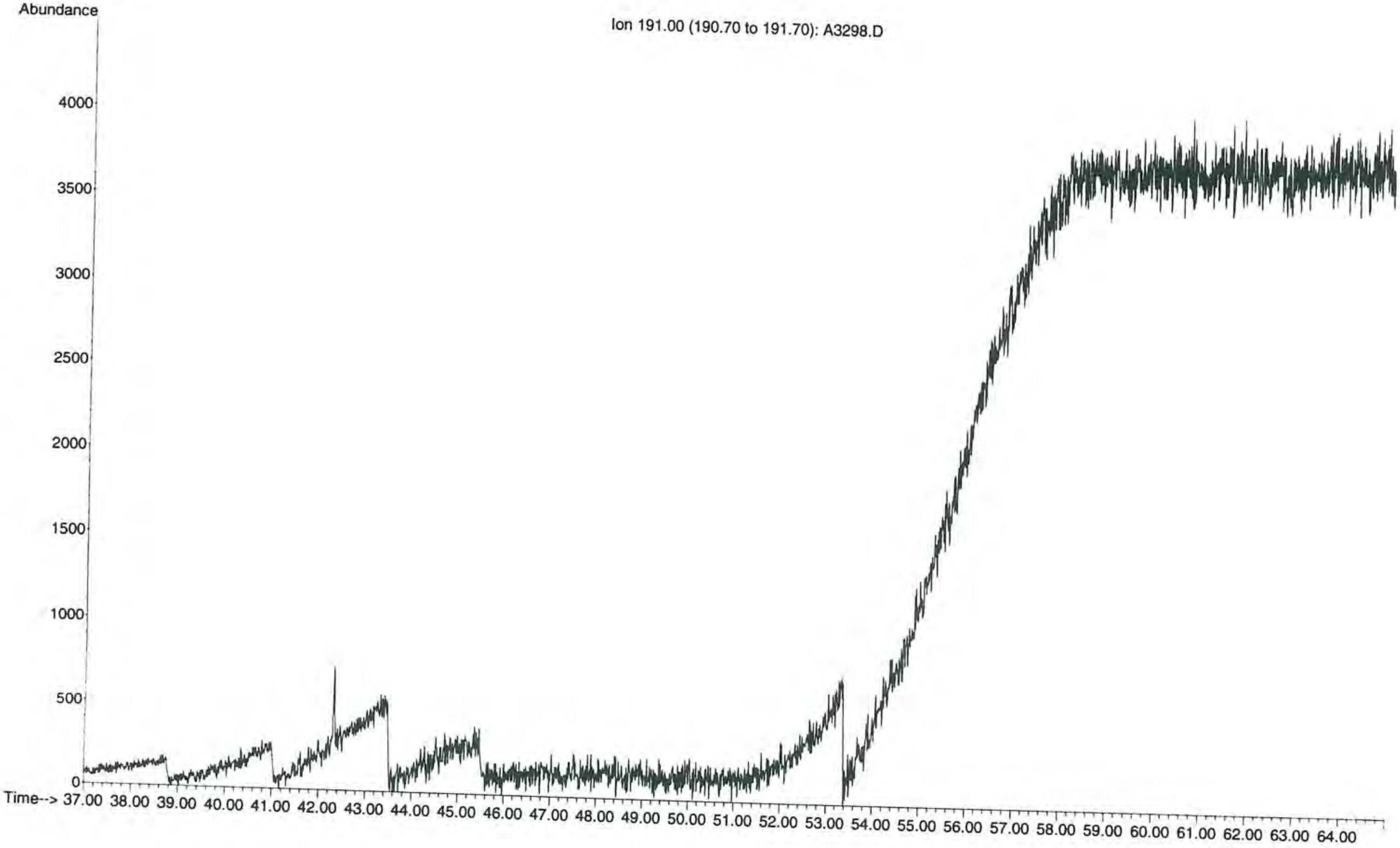
```
File        : G:\A\DATA\SA0612\A3295.D
Operator    : DPB
Acquired    : 23 Oct 2007   5:20 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 2
```



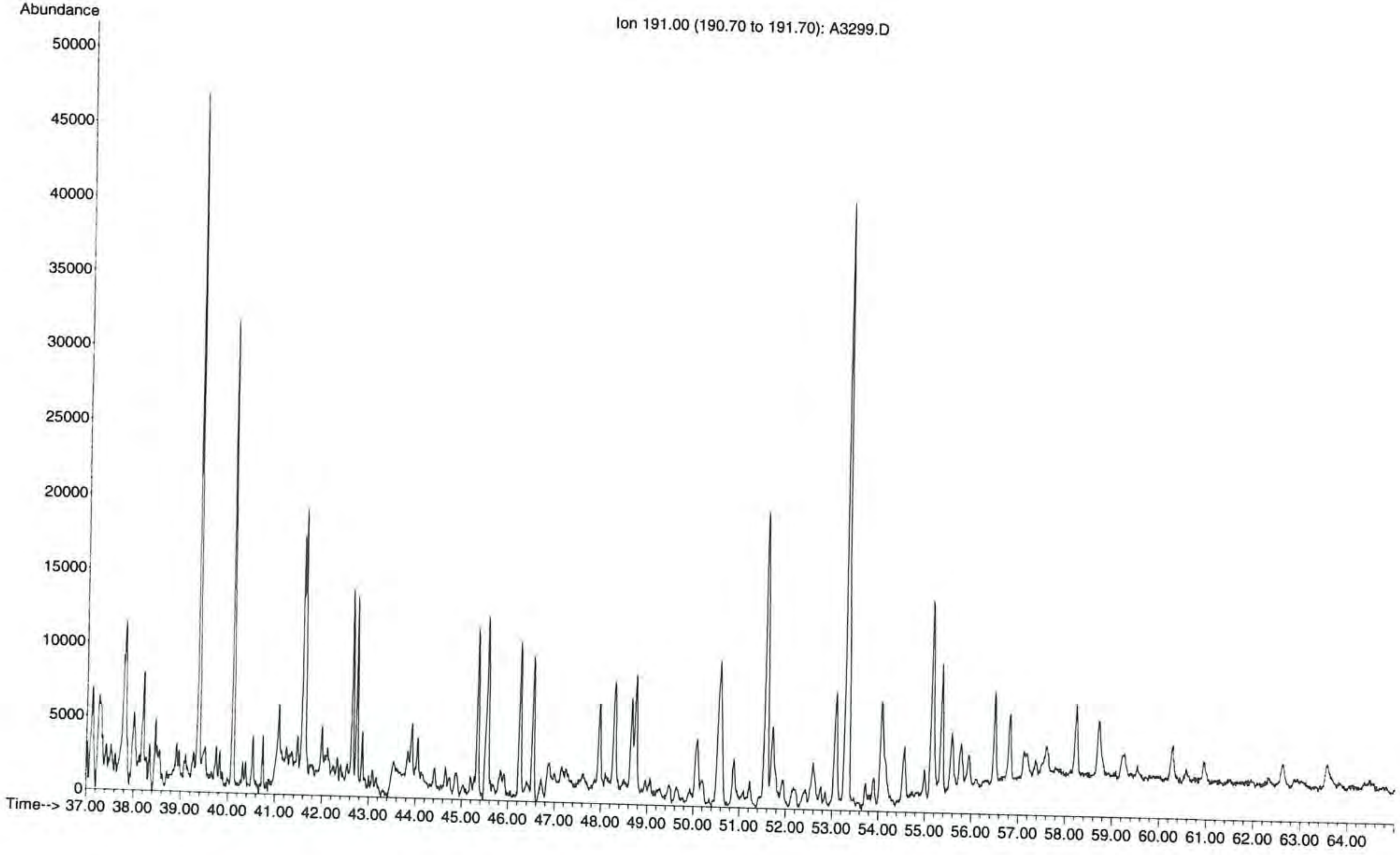
```
File        : G:\A\DATA\SA0612\A3297.D
Operator    : DPB
Acquired    : 23 Oct 2007   8:19 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL057PB-P-MS(3)
Misc Info   : Procedural Blank 5-157 07-0264
Vial Number: 4
```



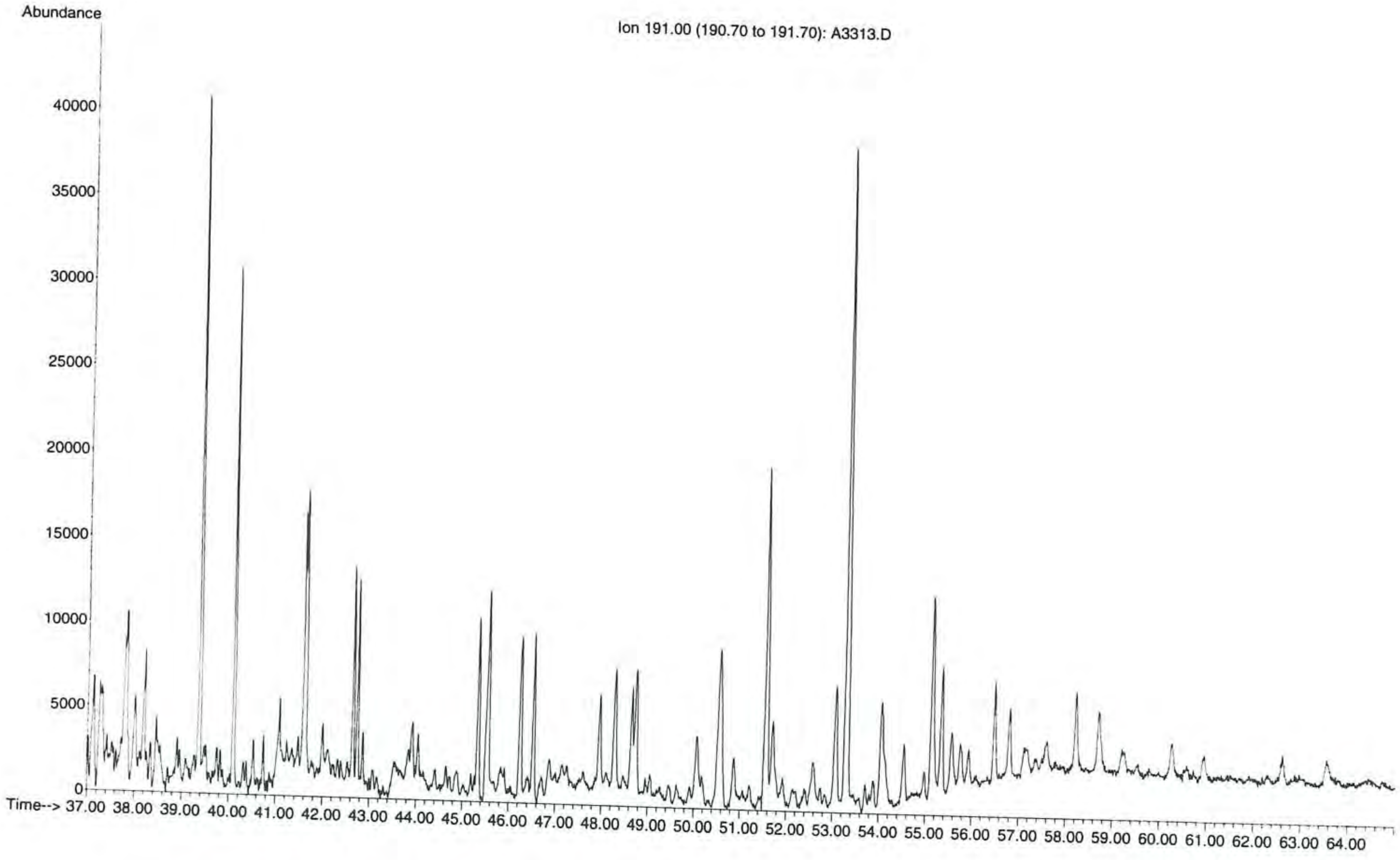
File : G:\A\DATA\SA0612\A3298.D
Operator : DPB
Acquired : 23 Oct 2007 9:49 pm using AcqMethod BIOPLUSN.M
Instrument : Inst. A
Sample Name: BL058LCS-P-MS(3)
Misc Info : Laboratory Control Sample 5-157 07-0264
Vial Number: 5



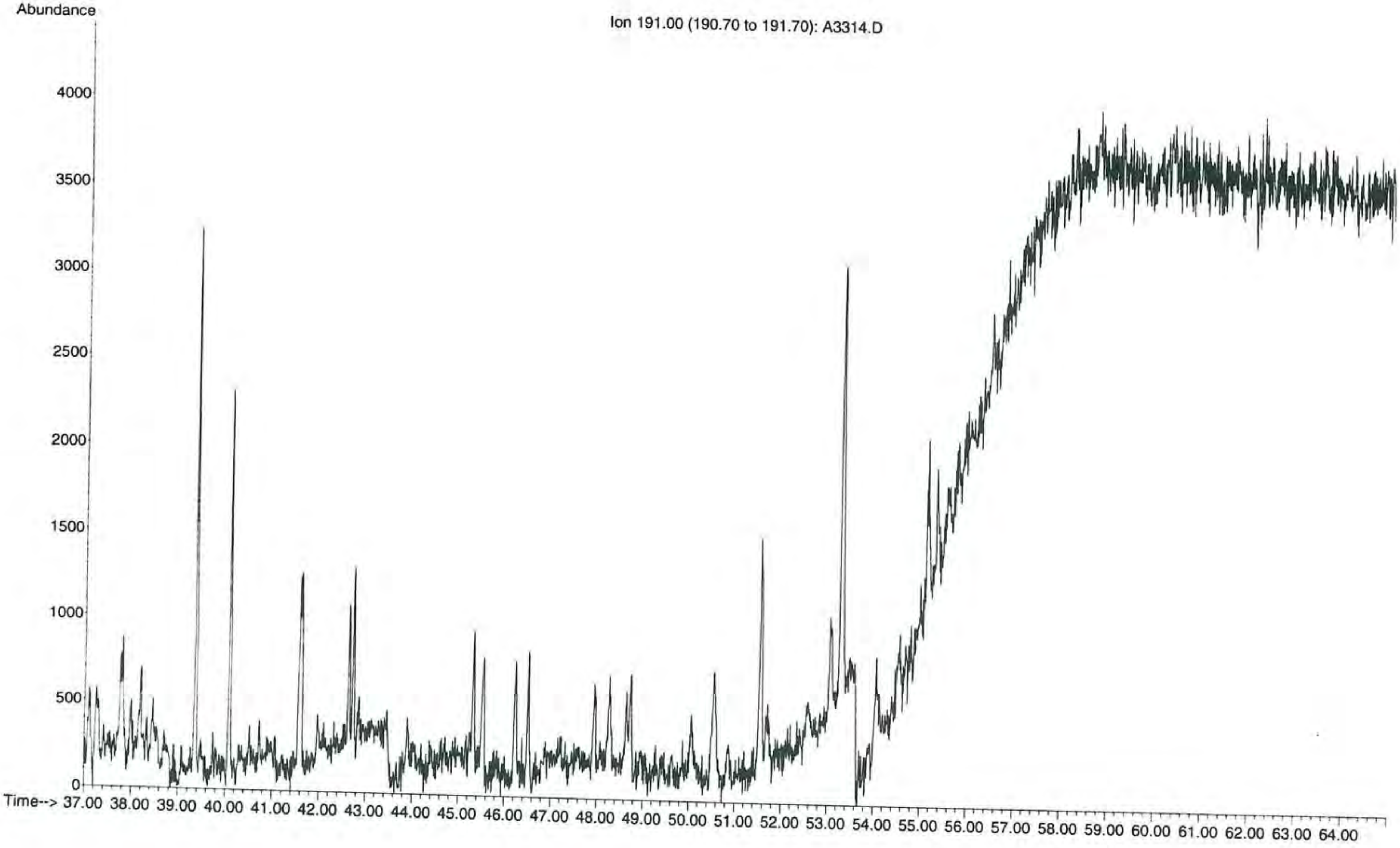
```
File        : G:\A\DATA\SA0612\A3299.D
Operator    : DPB
Acquired    : 23 Oct 2007  11:18 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0540-P-MS(3)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 6
```



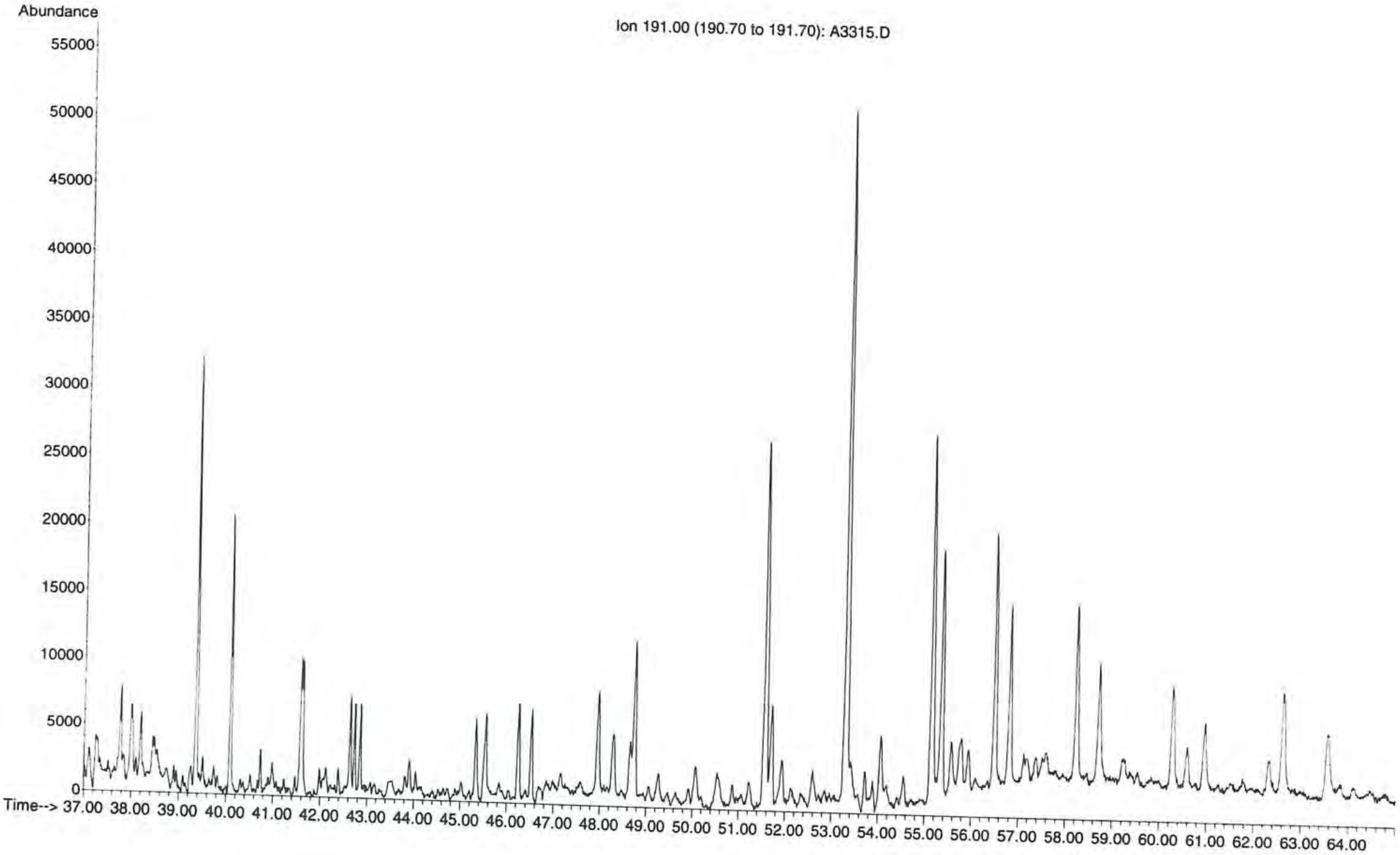
```
File        : G:\A\DATA\SA0612\A3313.D
Operator    : DPB
Acquired    : 24 Oct 2007   8:16 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0540-P-MS(6)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 20
```



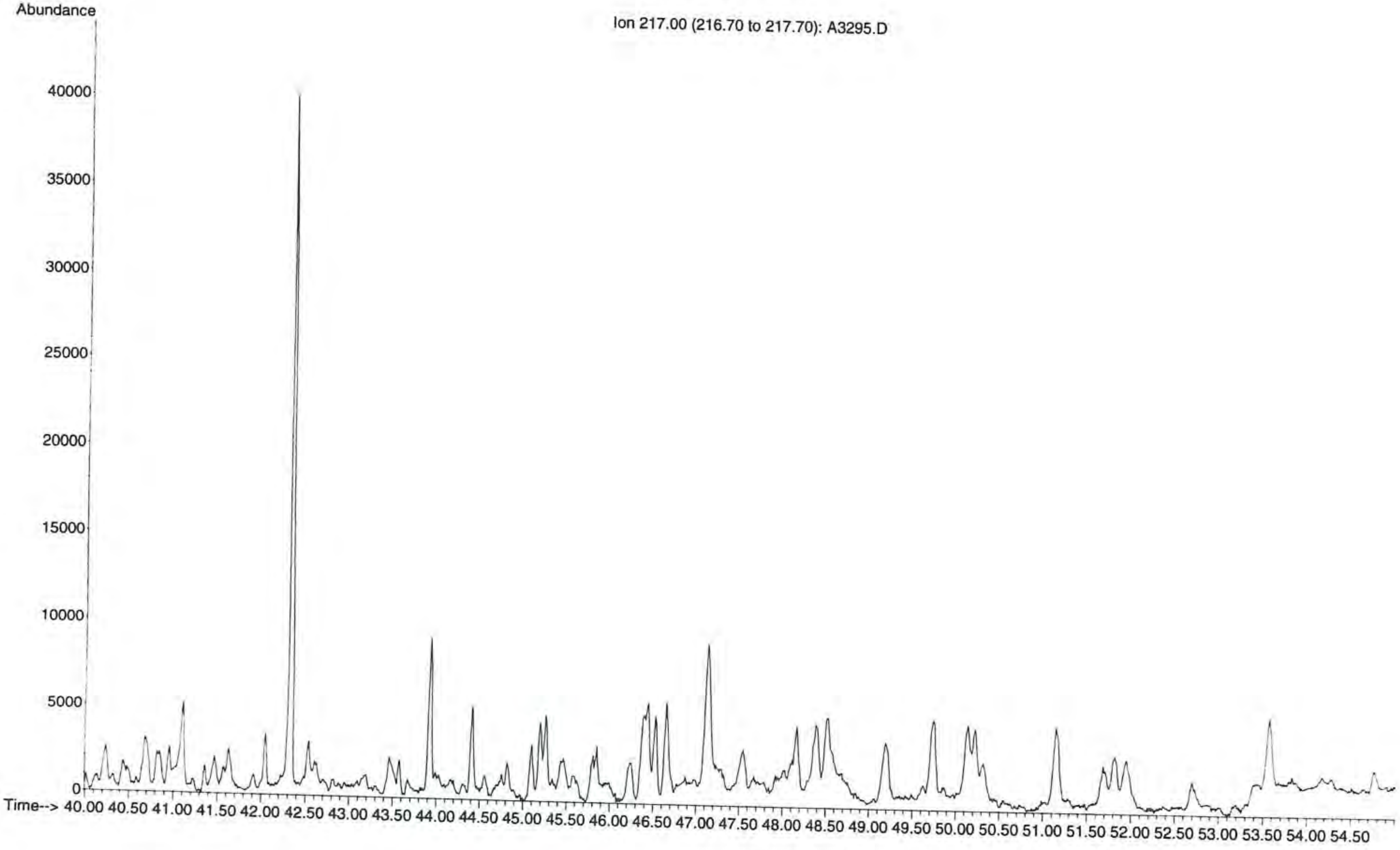
```
File        : G:\A\DATA\SA0612\A3314.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:45 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0540-P-MS-D(7)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 21
```



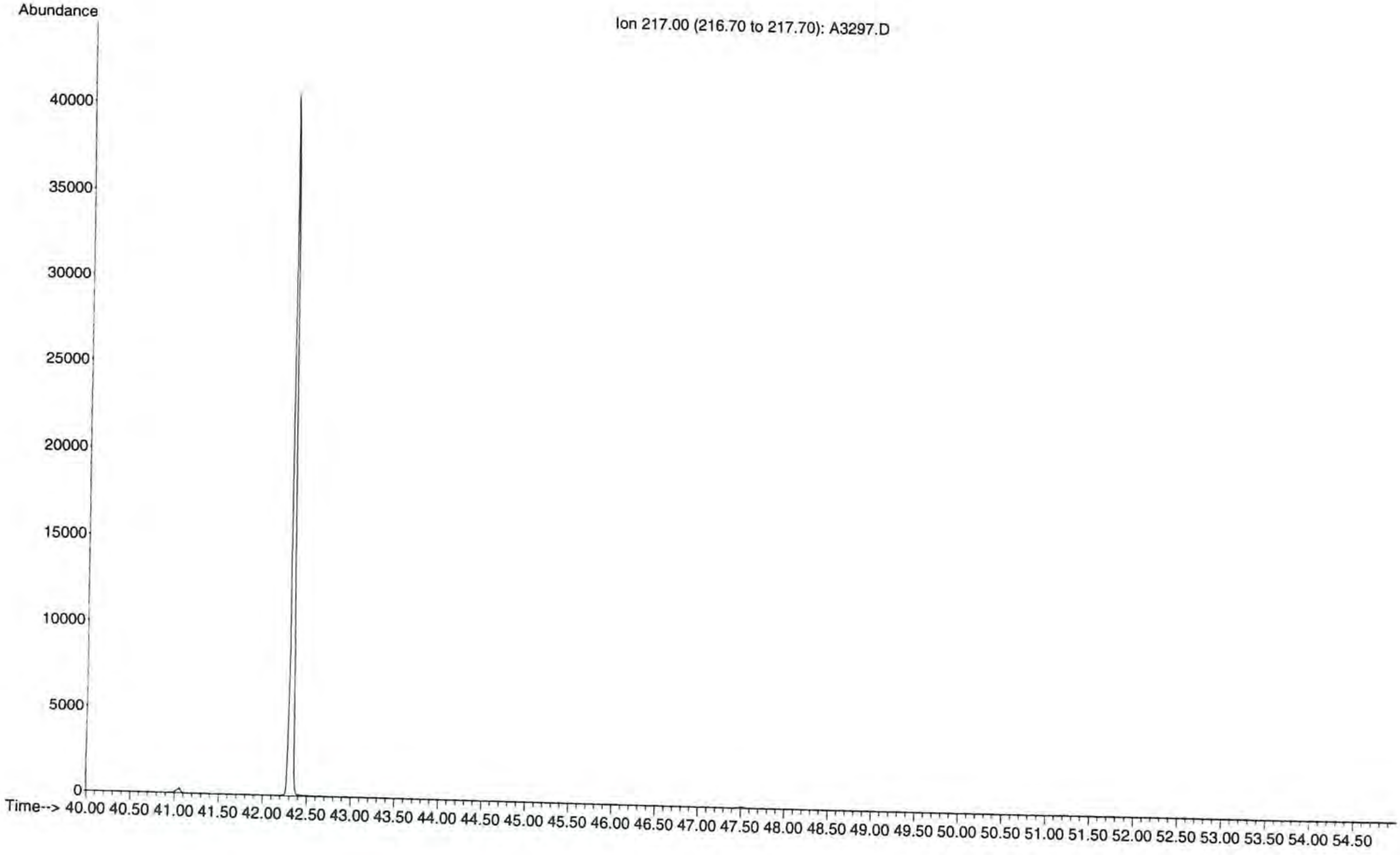
```
File          : G:\A\DATA\SA0612\A3315.D
Operator      : DPB
Acquired      : 24 Oct 2007  11:14 pm using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: BL060NSC-P(0)
Misc Info     : North Slope Crude 5-157 07-0264
Vial Number: 22
```



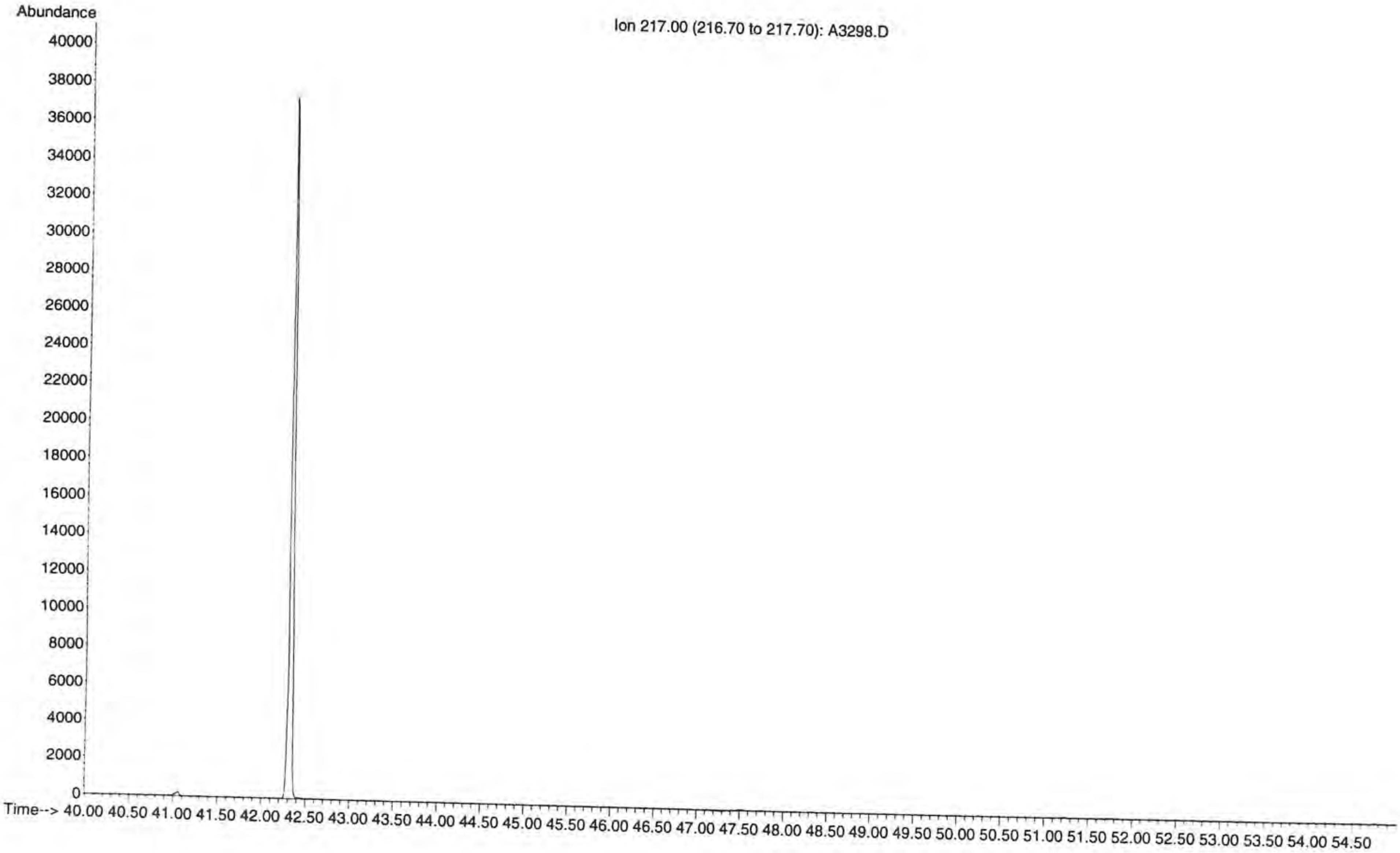
```
File        : G:\A\DATA\SA0612\A3295.D
Operator    : DPB
Acquired    : 23 Oct 2007   5:20 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 2
```



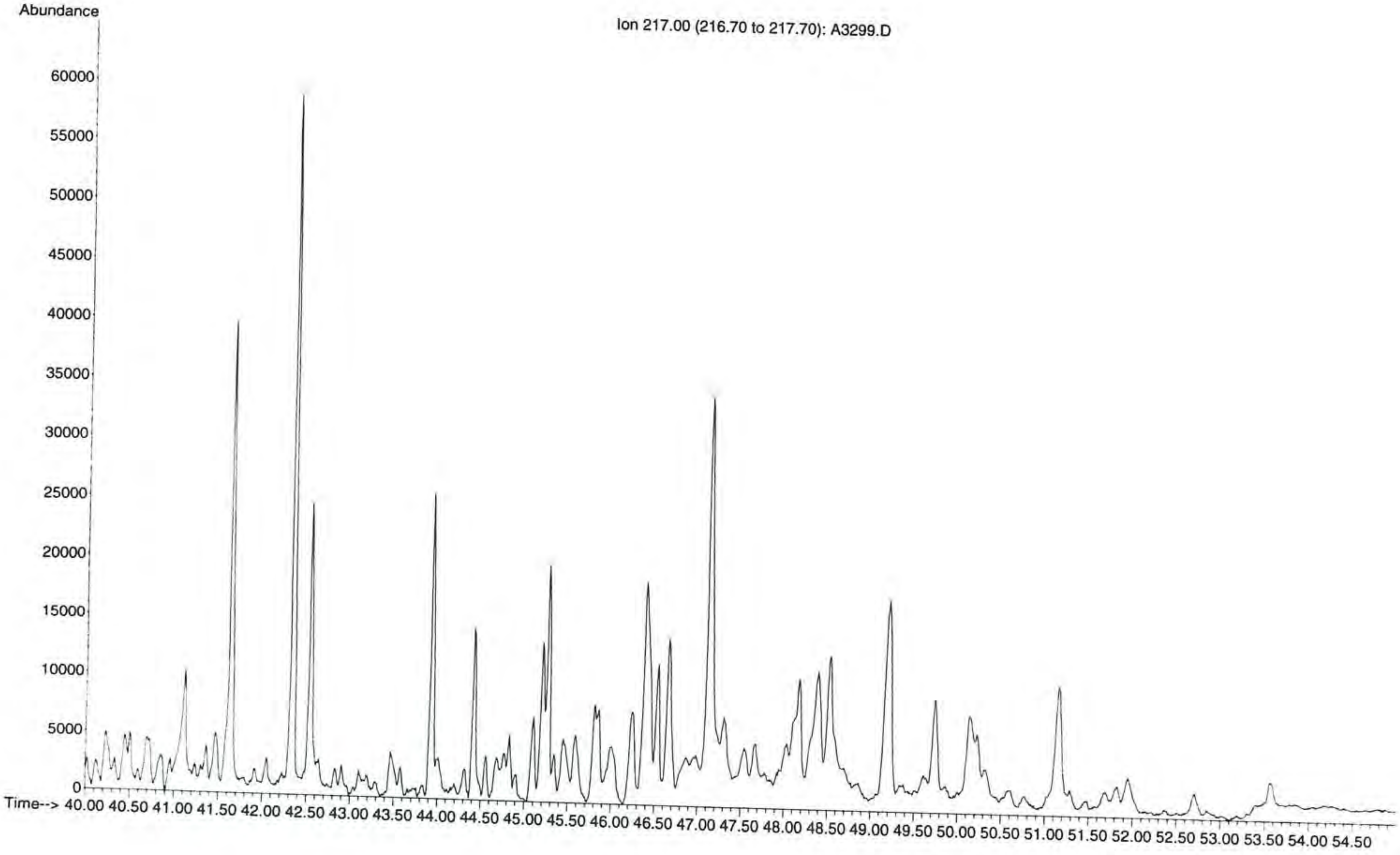
```
File        : G:\A\DATA\SA0612\A3297.D
Operator    : DPB
Acquired    : 23 Oct 2007   8:19 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL057PB-P-MS(3)
Misc Info   : Procedural Blank 5-157 07-0264
Vial Number: 4
```



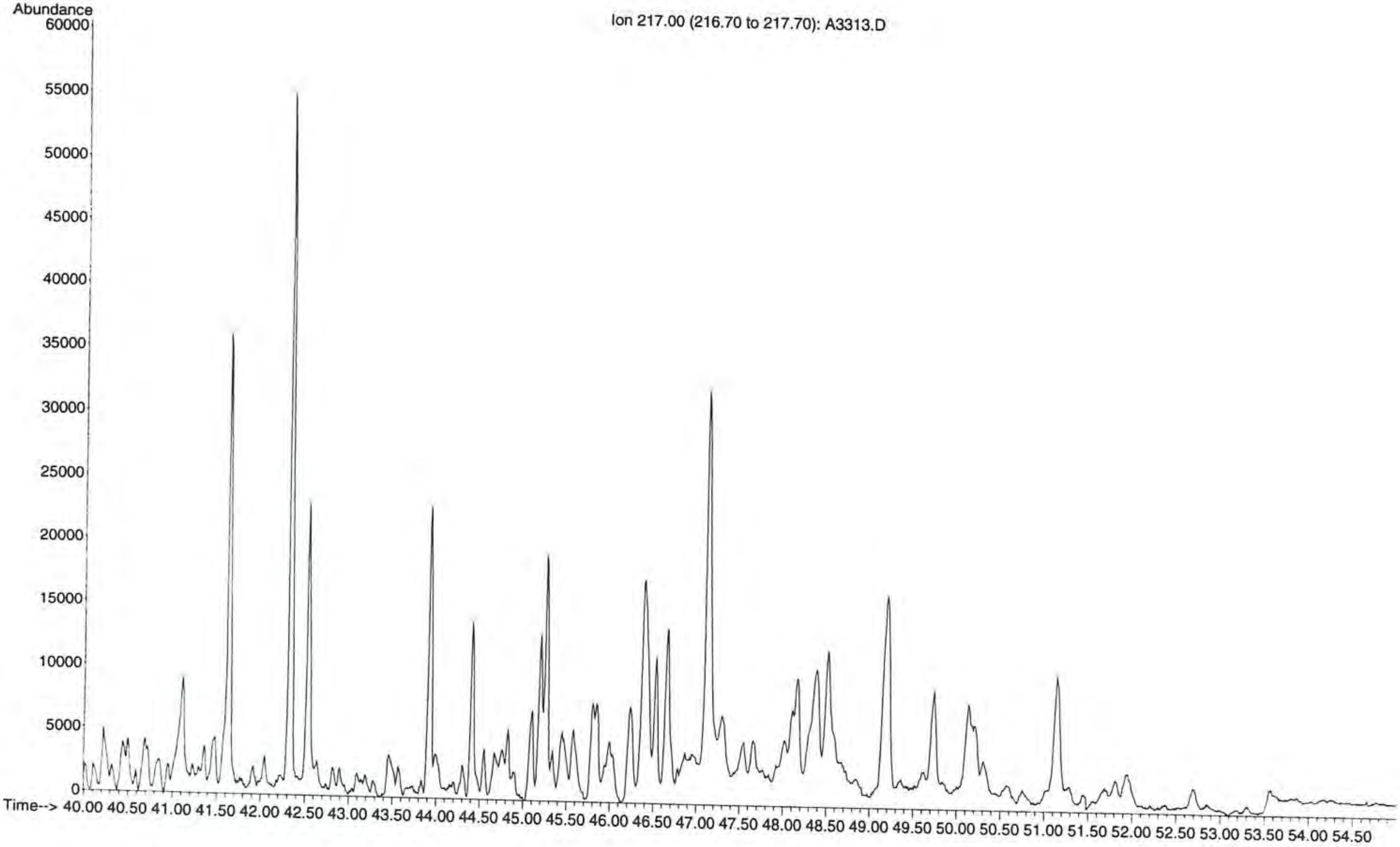
```
File        : G:\A\DATA\SA0612\A3298.D
Operator    : DPB
Acquired    : 23 Oct 2007   9:49 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL058LCS-P-MS(3)
Misc Info   : Laboratory Control Sample 5-157 07-0264
Vial Number: 5
```



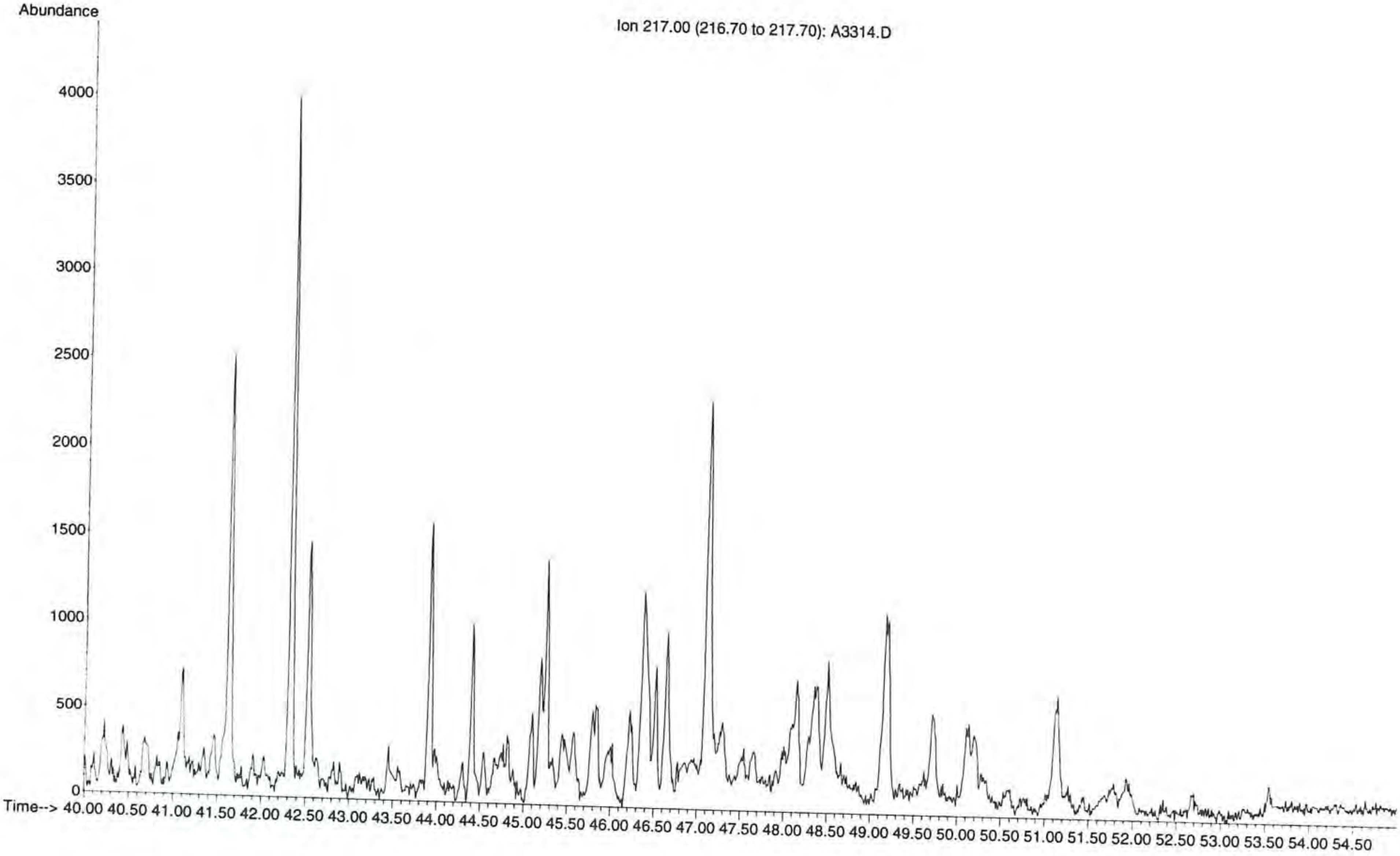
```
File        : G:\A\DATA\SA0612\A3299.D
Operator    : DPB
Acquired    : 23 Oct 2007  11:18 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0540-P-MS(3)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 6
```



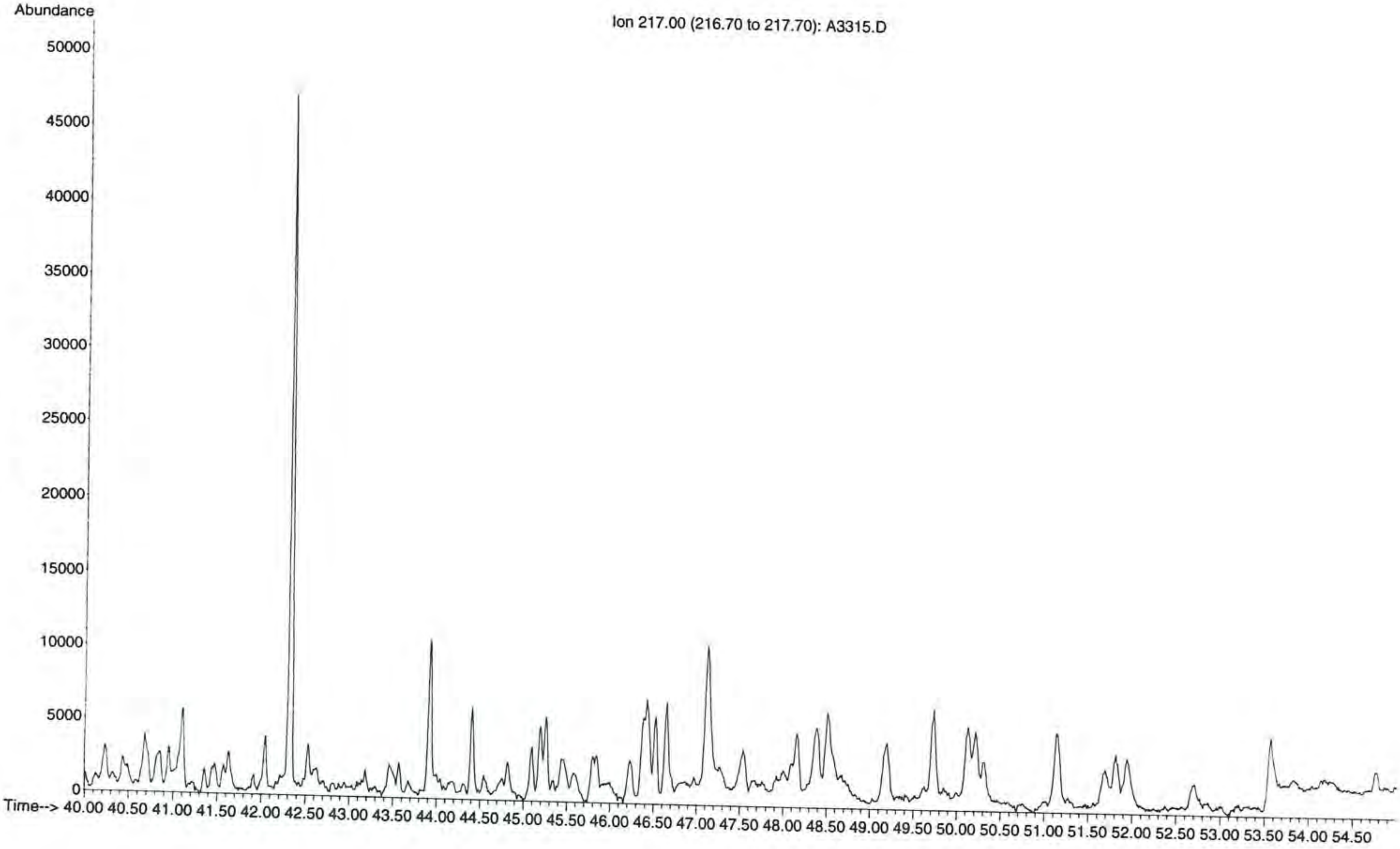
```
File       : G:\A\DATA\SA0612\A3313.D
Operator   : DPB
Acquired   : 24 Oct 2007   8:16 pm using AcqMethod BIOPLUSN.M
Instrument :   Inst. A
Sample Name: Q0540-P-MS(6)
Misc Info  : MW-9 5-157 07-0264
Vial Number: 20
```



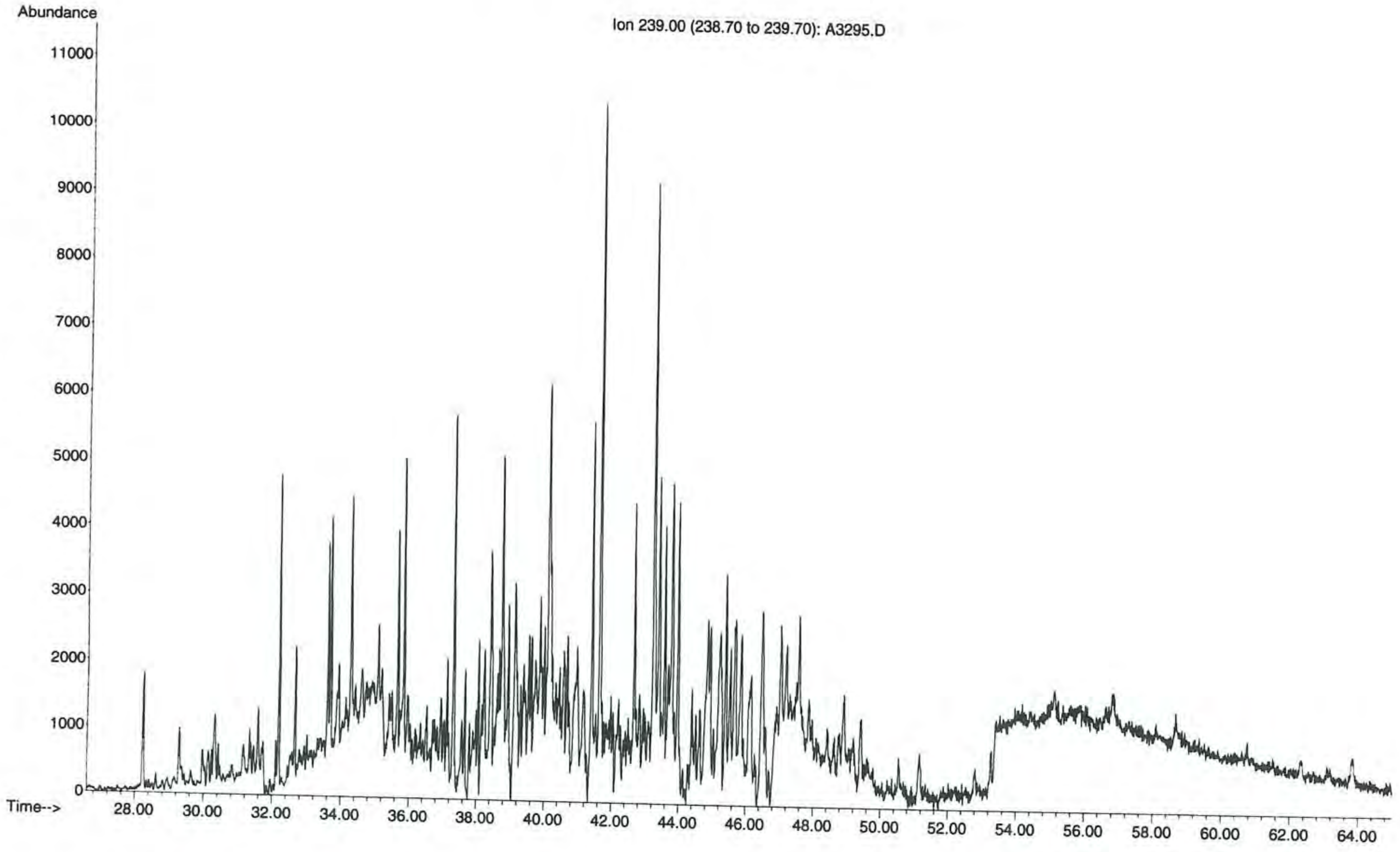
```
File        : G:\A\DATA\SA0612\A3314.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:45 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0540-P-MS-D(7)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 21
```



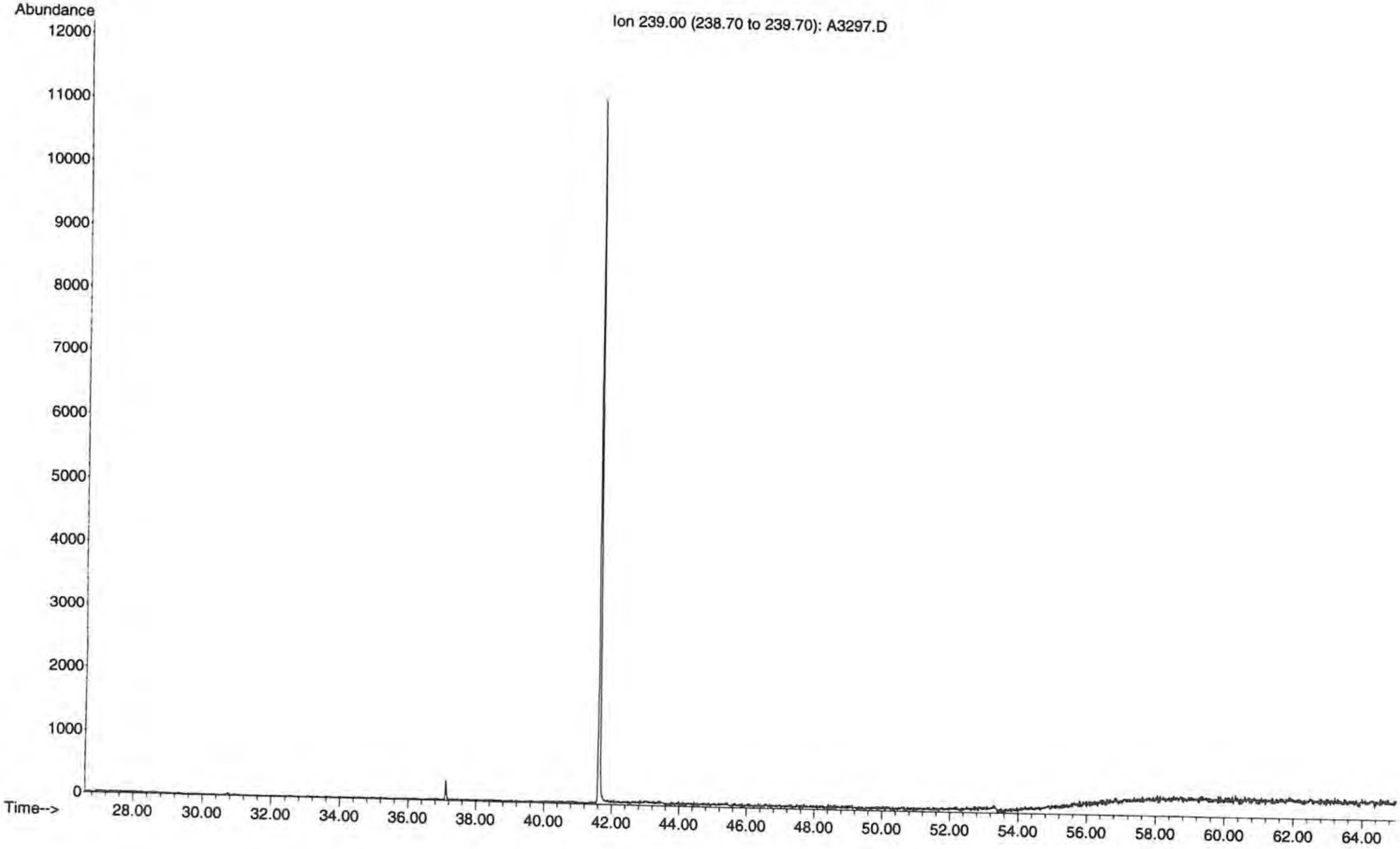
```
File        : G:\A\DATA\SA0612\A3315.D
Operator    : DPB
Acquired    : 24 Oct 2007  11:14 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 22
```



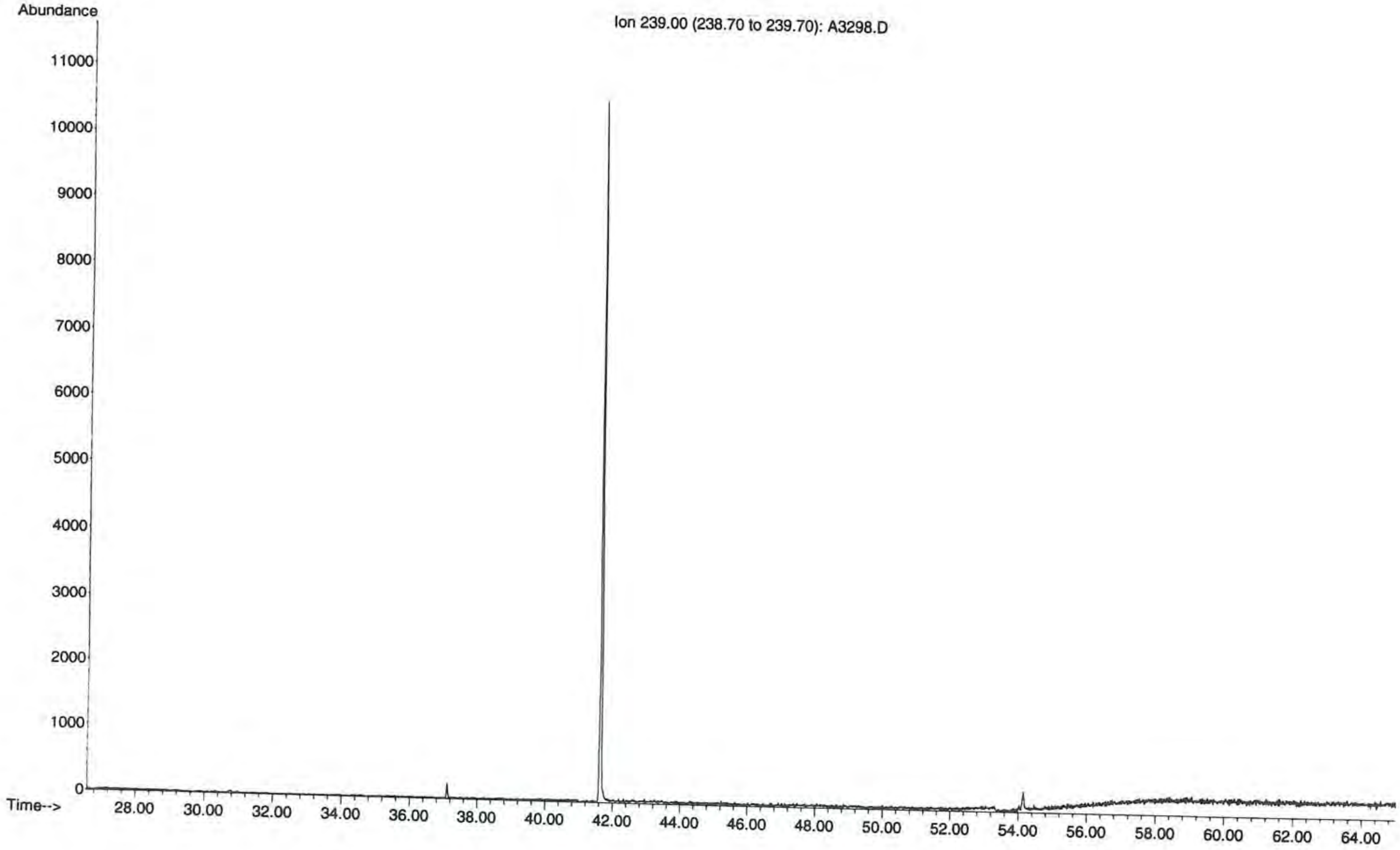
```
File        : G:\A\DATA\SA0612\A3295.D
Operator    : DPB
Acquired    : 23 Oct 2007   5:20 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 2
```



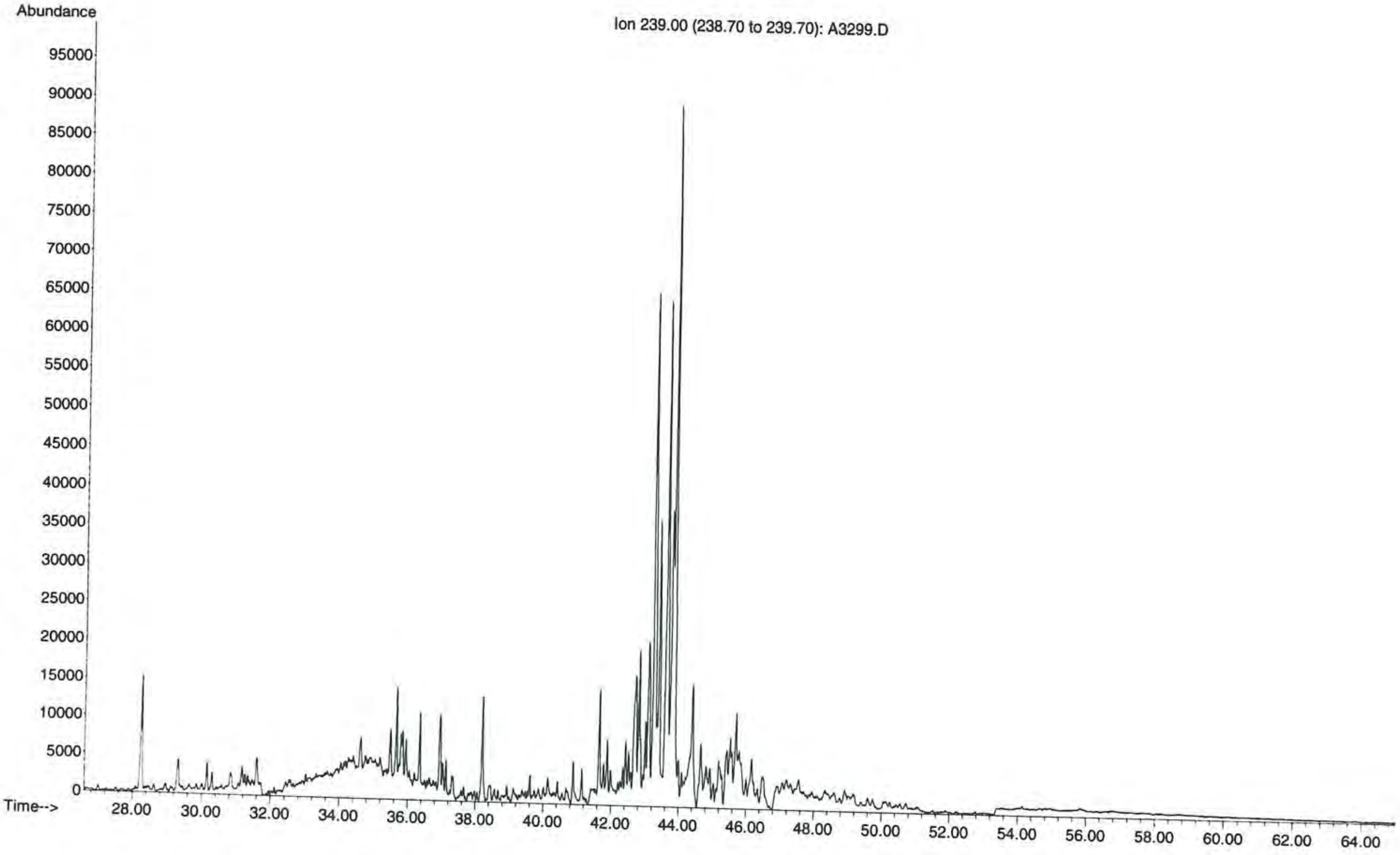
```
File        : G:\A\DATA\SA0612\A3297.D
Operator    : DPB
Acquired    : 23 Oct 2007   8:19 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL057PB-P-MS(3)
Misc Info   : Procedural Blank 5-157 07-0264
Vial Number: 4
```



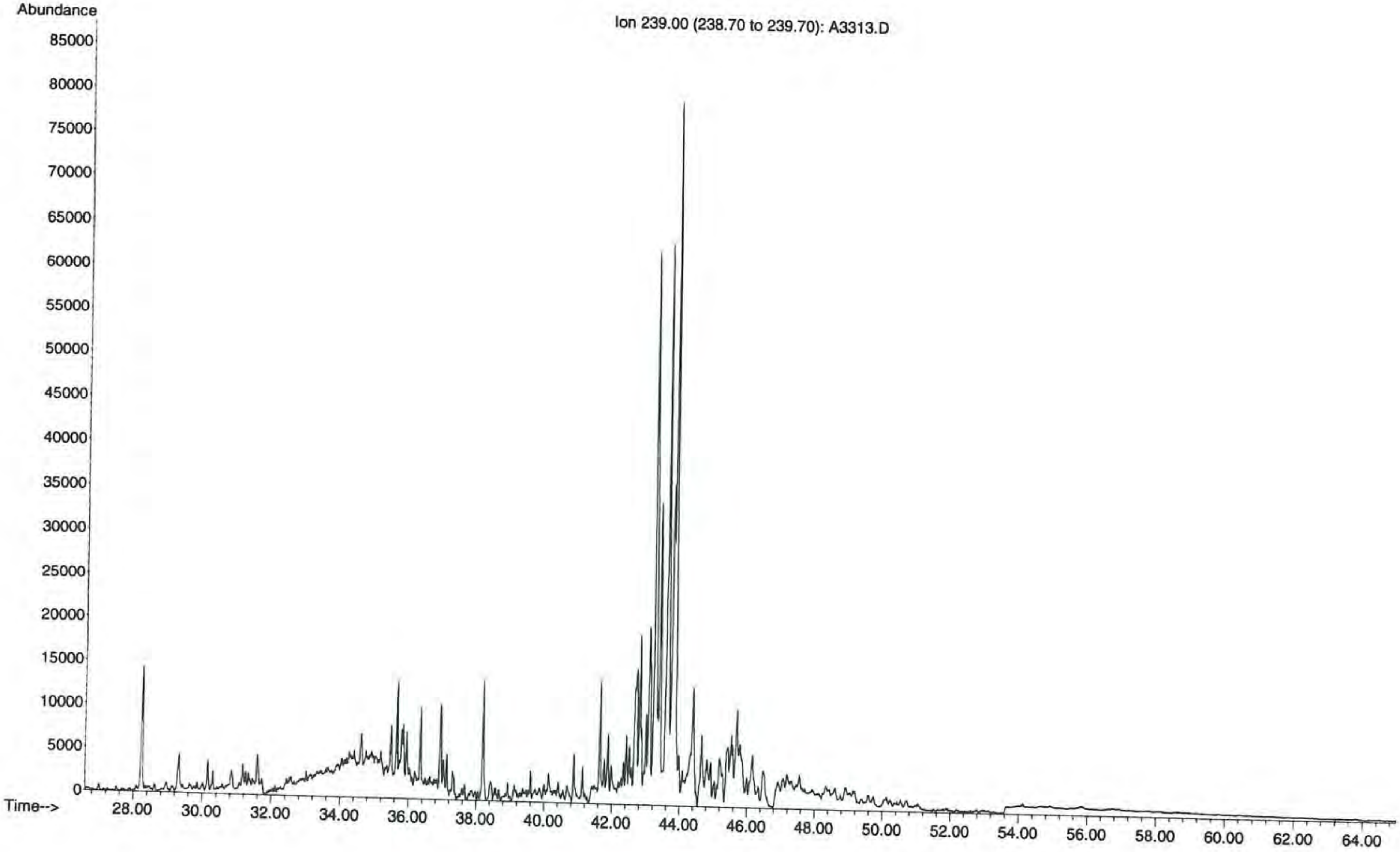
```
File        : G:\A\DATA\SA0612\A3298.D
Operator    : DPB
Acquired    : 23 Oct 2007   9:49 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL058LCS-P-MS(3)
Misc Info   : Laboratory Control Sample 5-157 07-0264
Vial Number: 5
```



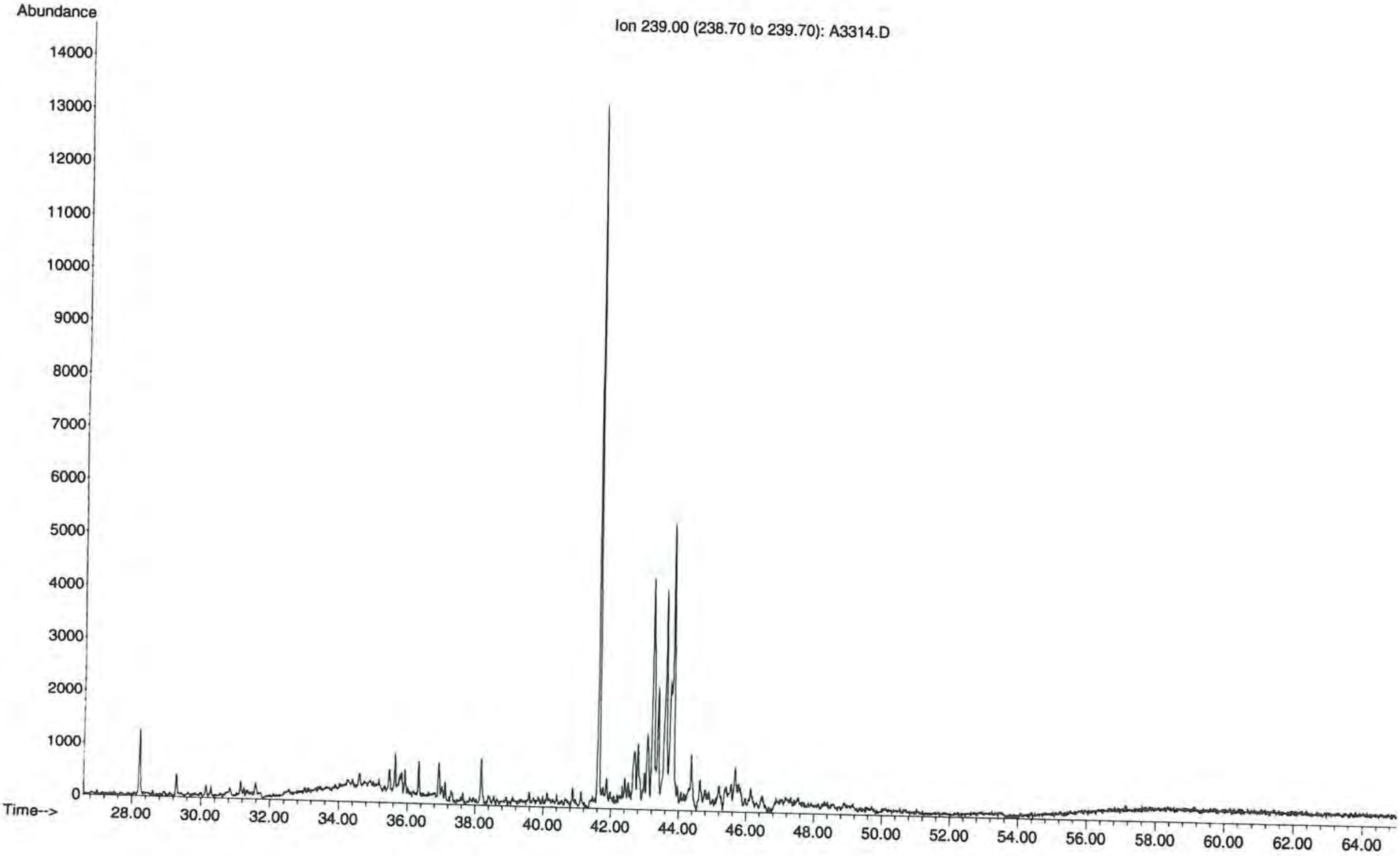
```
File        : G:\A\DATA\SA0612\A3299.D
Operator    : DPB
Acquired    : 23 Oct 2007  11:18 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0540-P-MS(3)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 6
```



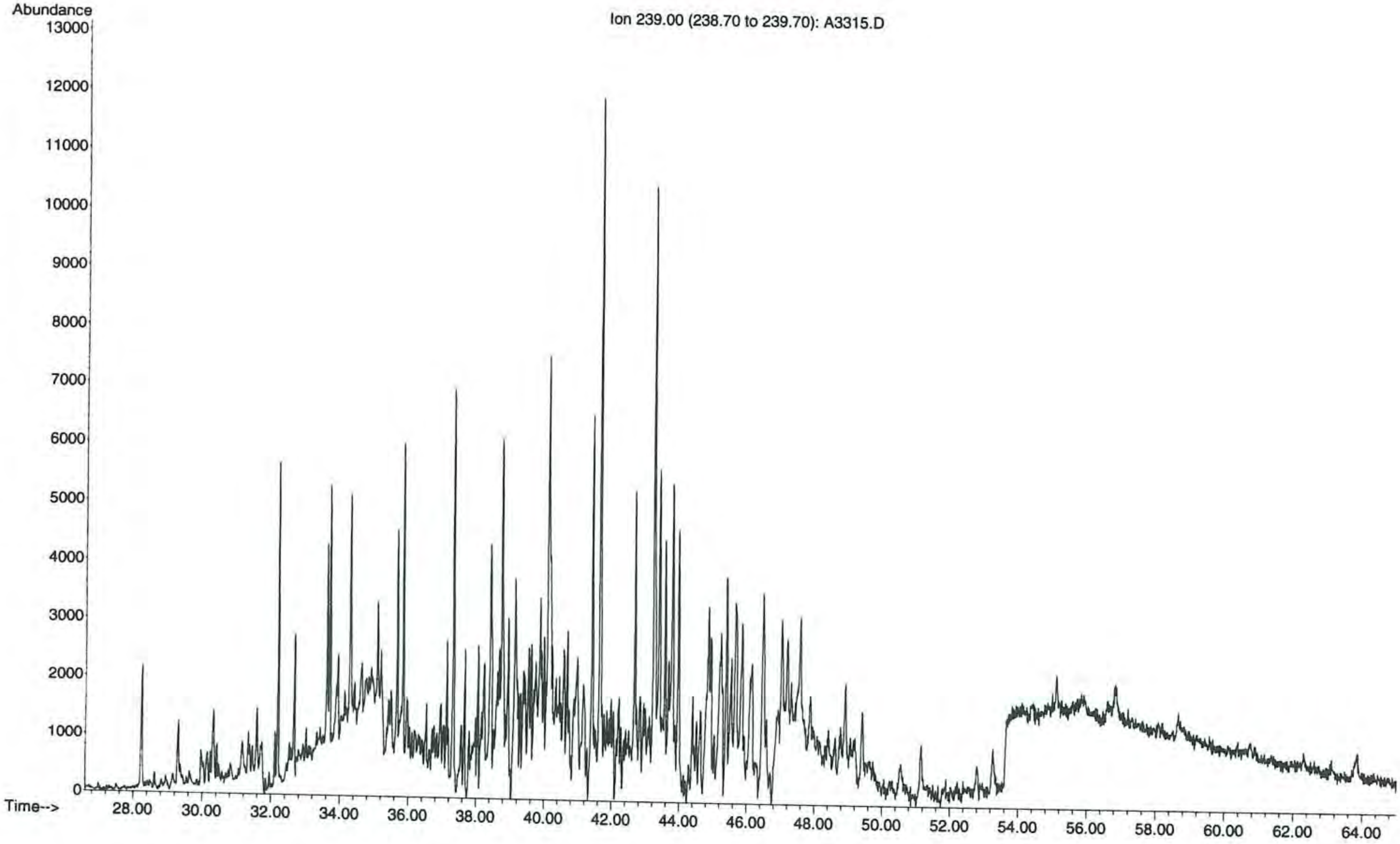
```
File        : G:\A\DATA\SA0612\A3313.D
Operator    : DPB
Acquired    : 24 Oct 2007   8:16 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0540-P-MS(6)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 20
```



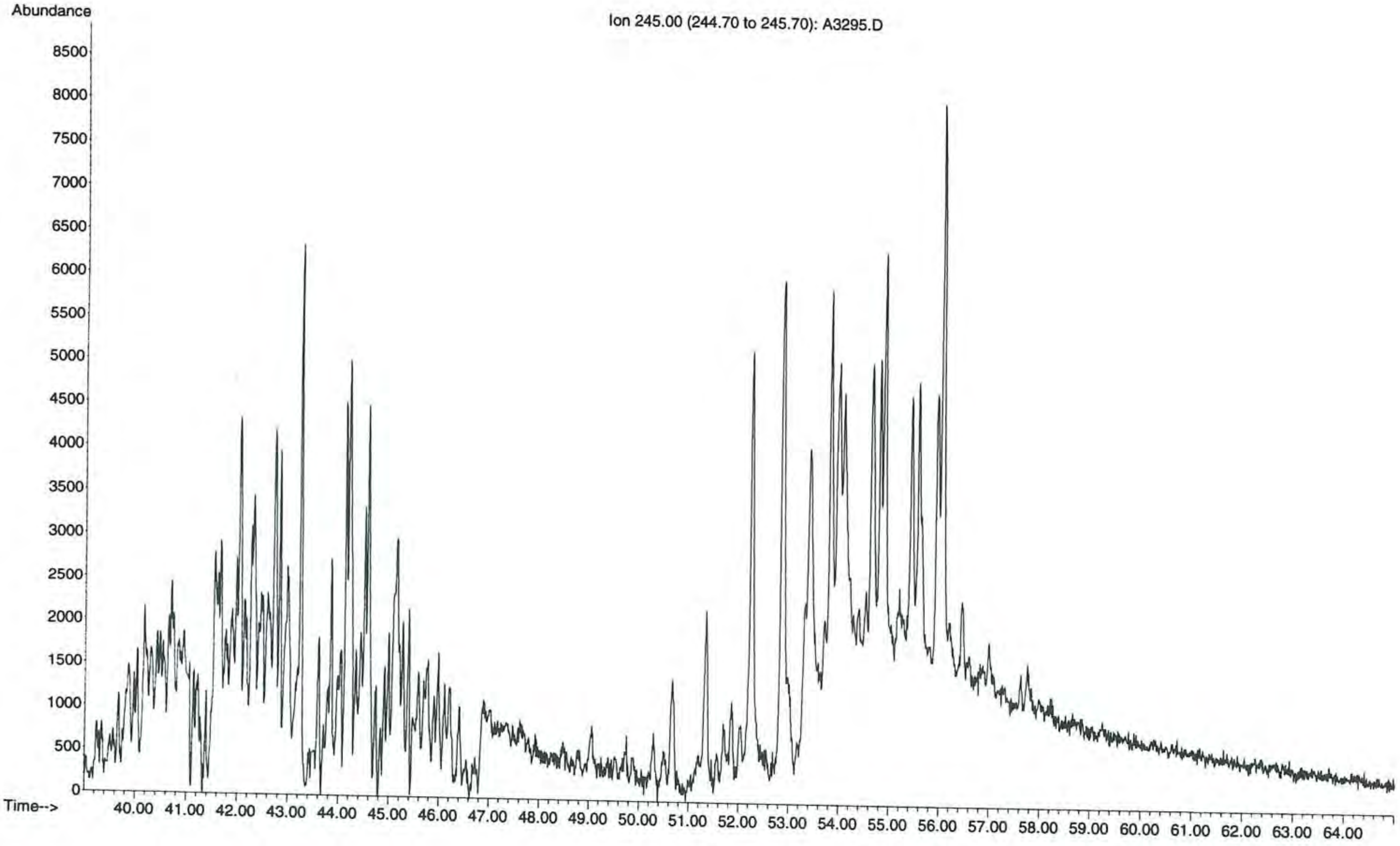
```
File        : G:\A\DATA\SA0612\A3314.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:45 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0540-P-MS-D(7)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 21
```



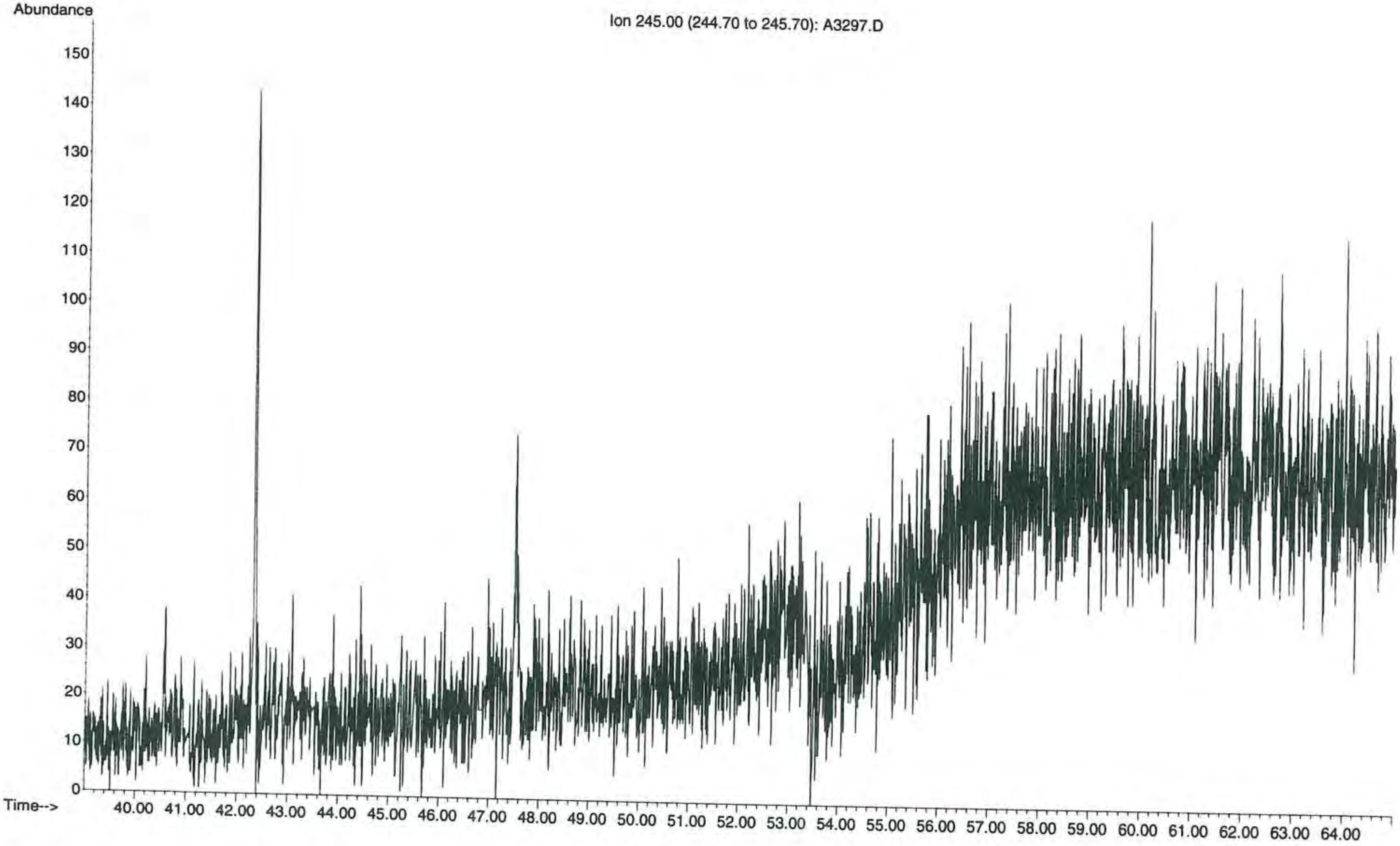
```
File        : G:\A\DATA\SA0612\A3315.D
Operator    : DPB
Acquired    : 24 Oct 2007  11:14 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 22
```



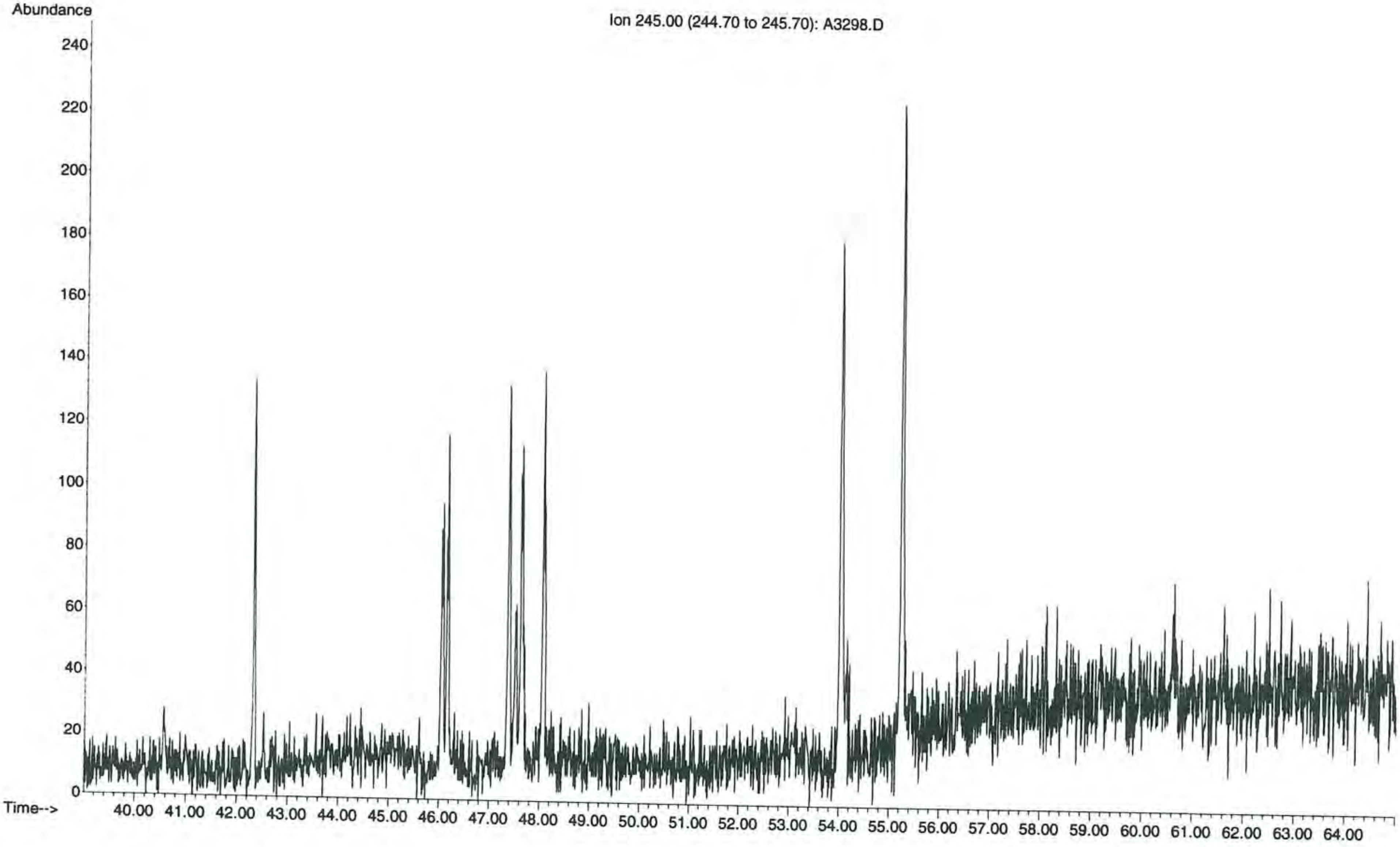
```
File        : G:\A\DATA\SA0612\A3295.D
Operator    : DPB
Acquired    : 23 Oct 2007   5:20 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 2
```



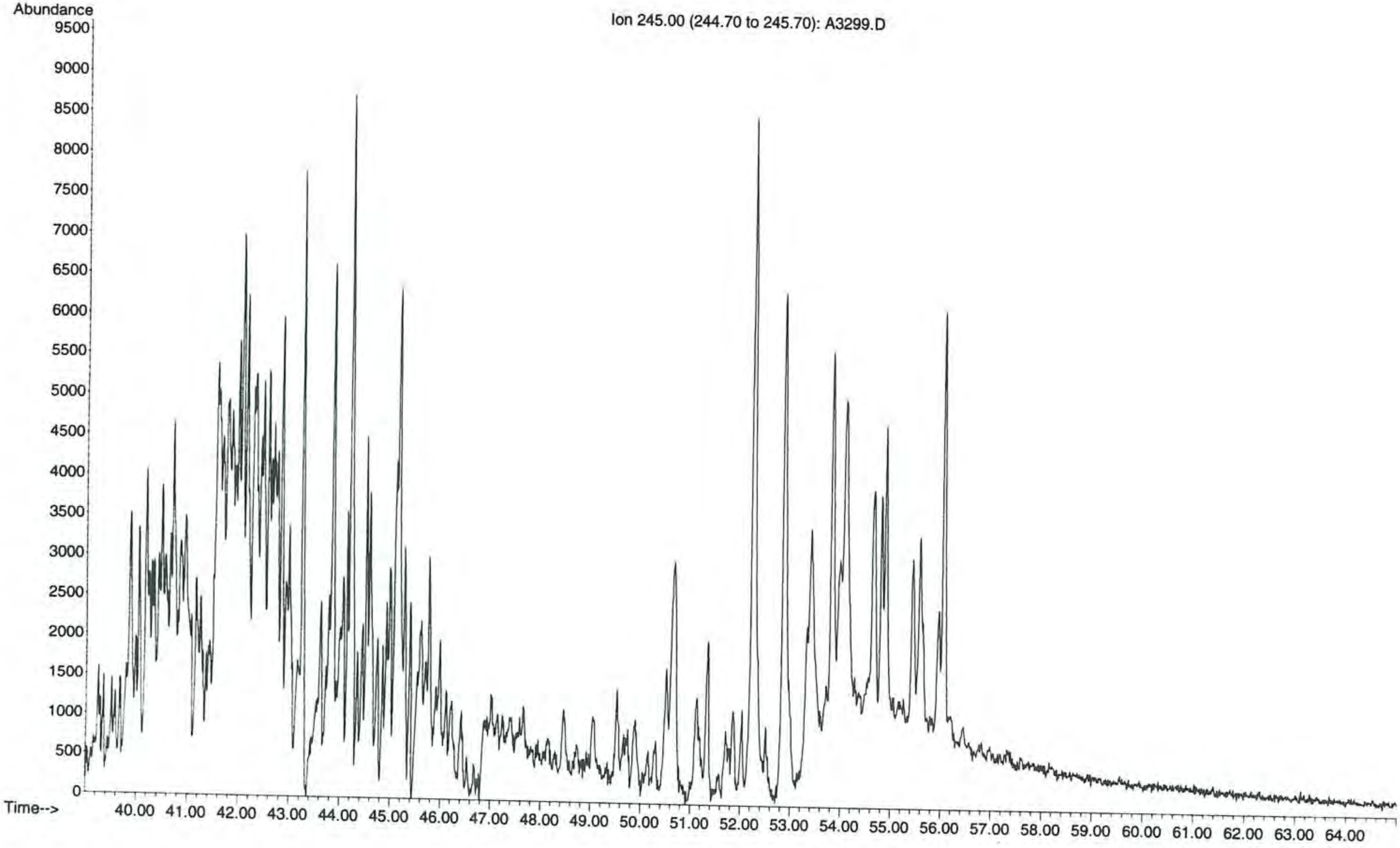
File   : G:\A\DATA\SA0612\A3297.D
Operator   : DPB
Acquired   : 23 Oct 2007   8:19 pm using AcqMethod BIOPLUSN.M
Instrument :   Inst. A
Sample Name: BL057PB-P-MS(3)
Misc Info   : Procedural Blank 5-157 07-0264
Vial Number: 4



```
File        : G:\A\DATA\SA0612\A3298.D
Operator    : DPB
Acquired    : 23 Oct 2007   9:49 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL058LCS-P-MS(3)
Misc Info   : Laboratory Control Sample 5-157 07-0264
Vial Number: 5
```



File   : G:\A\DATA\SA0612\A3299.D
Operator   : DPB
Acquired   : 23 Oct 2007 11:18 pm using AcqMethod BIOPLUSN.M
Instrument :   Inst. A
Sample Name: Q0540-P-MS(3)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 6



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File        : G:\A\DATA\SA0612\A3313.D
Operator    : DPB
Acquired    : 24 Oct 2007   8:16 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0540-P-MS(6)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 20
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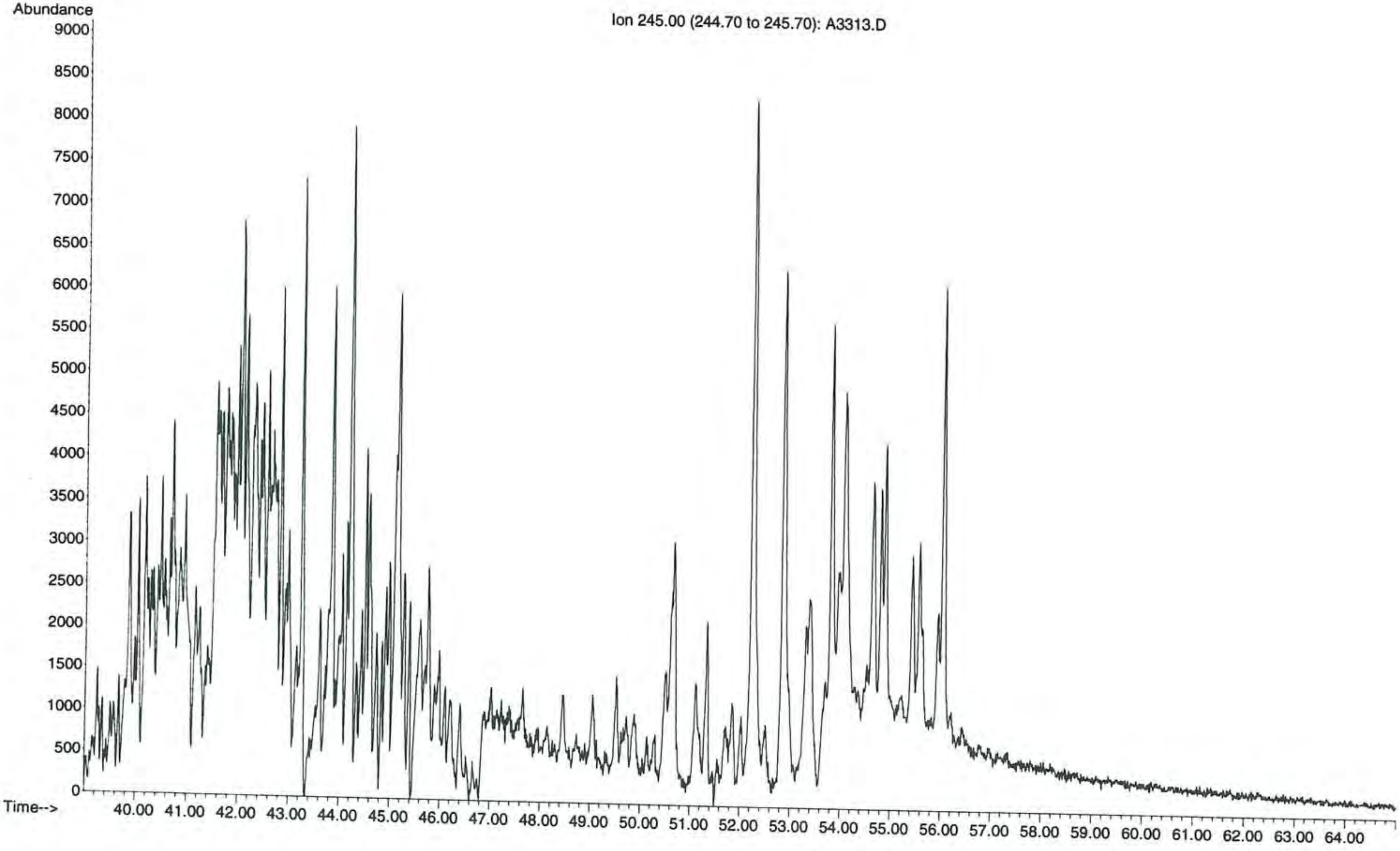

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File        : G:\A\DATA\SA0612\A3314.D
Operator    : DPB
Acquired    : 24 Oct 2007   9:45 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0540-P-MS-D(7)
Misc Info   : MW-9 5-157 07-0264
Vial Number: 21
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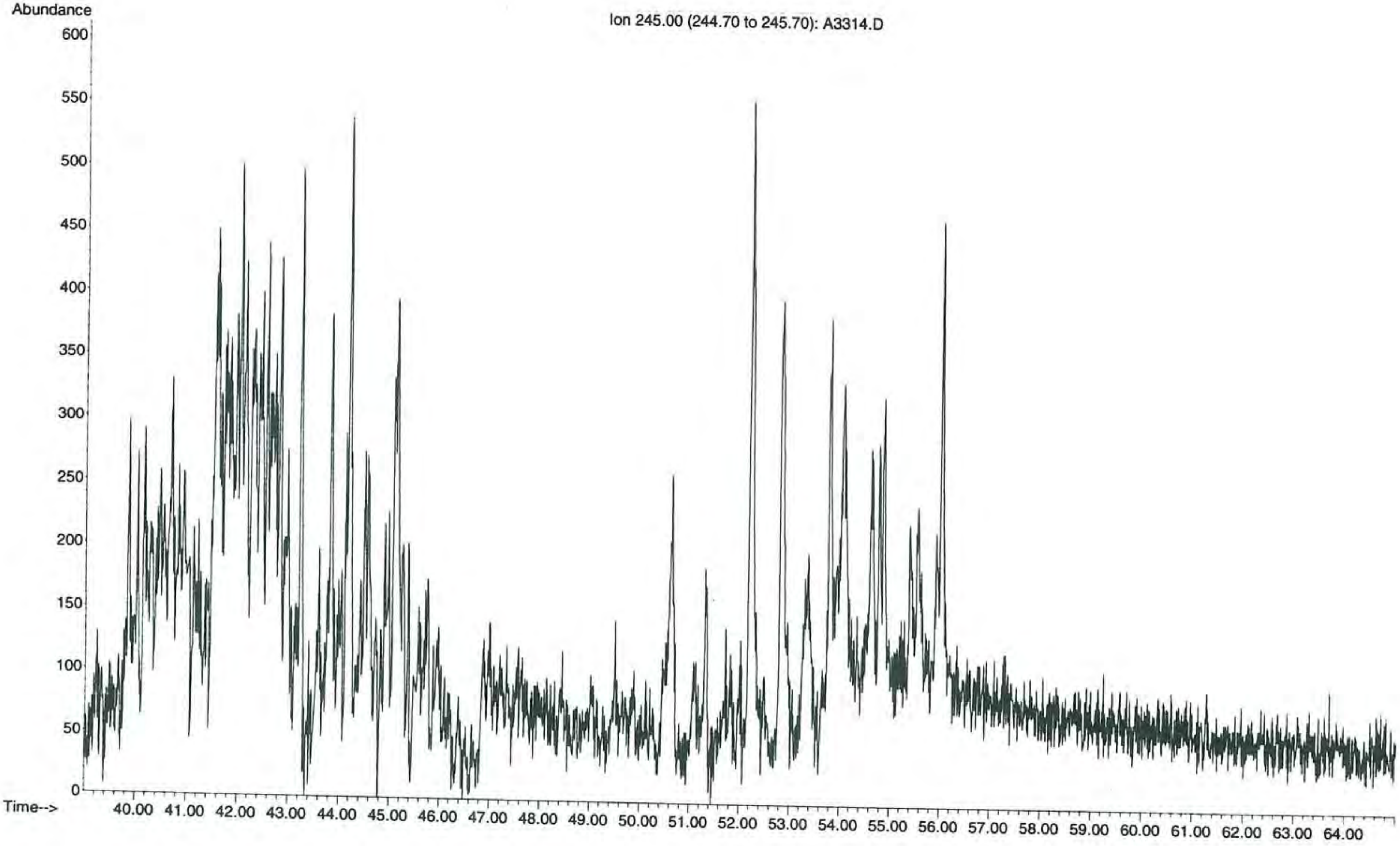

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File        : G:\A\DATA\SA0612\A3315.D
Operator    : DPB
Acquired    : 24 Oct 2007  11:14 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL060NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0264
Vial Number: 22
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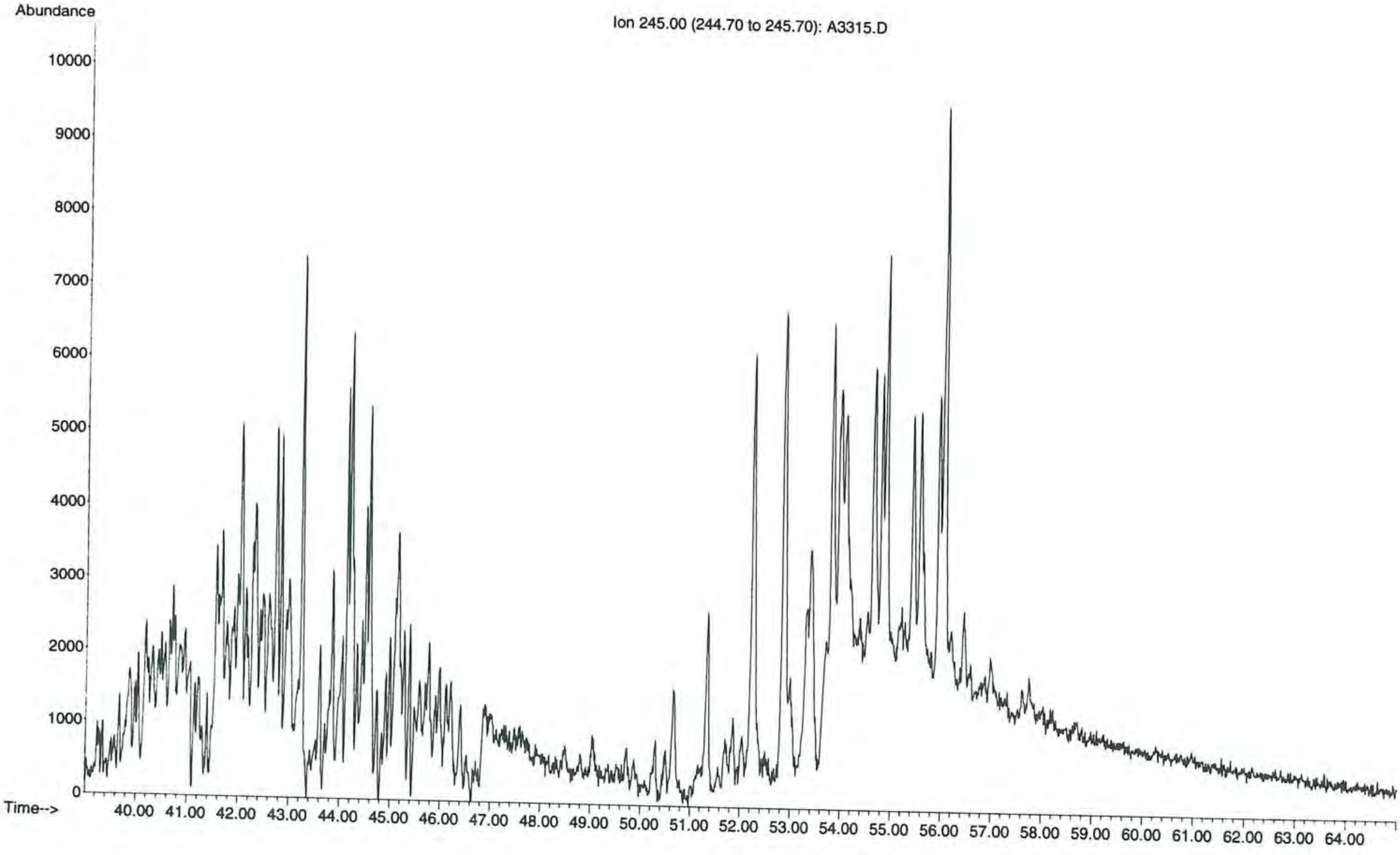

PAH and Biomarker – SEDIMENT QA/QC SUMMARY

Batch 07-0266

PROJECT:	Floyd/Snyder – Gas Works Park
PARAMETER:	Polycyclic Aromatic Hydrocarbons (PAH) and Biomarkers
LABORATORY:	Battelle, Duxbury, MA
MATRIX:	Sediment
SAMPLE CUSTODY:	Six soil samples and 1 NAPL were received at Battelle Duxbury Operations (BDO) Laboratory on 10/9/07. Upon Receipt of the samples, the temperature of the cooler was taken and the samples were logged into the laboratory and given unique IDs. The temperature of the cooler upon receipt was slightly below the acceptable range (4°C ± 2°) at 0.6°C. Also, it was noted that sample Q0540 (MW-9) had some oil residue on the outside of the container as well as the inner side of the bubble wrap. The oil residue was only on the inside of the bubble wrap and did not touch any of the other samples. The client was notified on 10/16/07. The laboratory was instructed to proceed with the analysis. Samples were stored in an access-limited walk-in refrigerator at 4°C until sample preparation could begin.

	Reference Method	**Method Blank**	**Surrogate Recovery**	**LCS Recovery**	**MS Recovery**	**MS/MSD Precision**	**Control Oil % Diff**
SHC and TPH	General NS&T	<5xMDL	40-120% Recovery	40-120% Recovery	40-120% Recovery MS target spike must be >5x background	≤30% RPD	PD,30% for 90% of the analytes

ETHOD: Soil samples were extracted following general NS&T methods. Approximately 5-8 g of sample was spiked with SHC, PAH, and biomarker surrogates and serial extracted three times with dichloromethane using orbital shaker table techniques. The combined extracts were dried over anhydrous sodium sulfate and concentrated by Kuderna-Danish and nitrogen evaporation techniques. The sample extracts were split in half: one-half of the extract was removed for archiving; the other half was processed through an alumina gravity column to isolate the hydrocarbon fractions of interest. The weights of the resulting extracts were determined gravimetrically. The extracts were concentrated to 1 mL, split, and spiked with internal standard (IS). The pre-injection volume and/or extract split were adjusted to 5mg/mL. One extract was submitted for PAH and the second extract was submitted for SHC and TPH analysis.

PAH and petroleum biomarkers were measured by gas chromatography –mass spectrometry (GC/MS) in the selected ion mode (SIM). An initial calibration consisting of target analytes was completed prior to analysis to demonstrate the linear range of the analysis. Calibration verification was performed at the beginning and end of each 12 hour period in which samples were analyzed. Concentrations of the PAH and petroleum biomarkers were calculated by the internal standard method. Target PAH were quantified using the average RF generated from the initial calibration. The alkyl homologue PAH series were assigned the RF of the parent PAH, Steranes were assigned the RF of cholestane, and triterpanes were assigned the RF of Moretane.

Note: the reporting limit for the alkyl benzene compounds is orders of magnitude higher than the reporting limits for the rest of the PAH compounds.

PAH and Biomarker – SEDIMENT QA/QC SUMMARY

Batch 07-0266

PROCEDURAL BLANK (PB):

A procedural blank (PB) was prepared with each analytical batch. Blanks were analyzed to ensure the sample extraction and analysis methods were free of contamination.

07-0266 – No exceedences noted.

Comments – None.

LABORATORY CONTROL SAMPLE (LCS):

A laboratory control sample (LCS) was prepared with each analytical batch. The percent recoveries of target analytes were calculated to measure data quality in terms of accuracy.

07-0266 – No exceedences noted.

Comments – None.

SURROGATE RECOVERY:

Five surrogate compounds were added prior to extraction, including naphthalene-d8, acenaphthene-d10, phenanthrene-d10, benzo(a)pyrene-d12, and 5b(H)-chloane. The recovery of the surrogate compound was calculated to measure data quality in terms of accuracy (extraction efficiency).

07-0266 – All four samples extracted in this batch failed SIS recovery criteria with high recoveries.

Comments – These samples have been extracted twice with similar results. The issue appears to be matrix related rather than extraction related as the PB and LCS (samples without matrix) did not exhibit similar trends.

CONTROL OIL:

A control oil (North Slope Crude) was prepared with the analytical batch. The percent difference (PD) between the measured value and the target value was calculated to measure data quality in terms of accuracy.

07-0266 – No exceedences noted.

Comments – None.

CALIBRATIONS:

The GC/MS is calibrated with a minimum 5 level curve for all compounds. The percent relative standard deviation (% RSD) between RF for the individual target analytes must be ≤25%, and the mean RSD of all target analytes must be ≤15%. Each batch of samples analyzed is bracketed by a continuing calibration verification (CCV) sample, run at a frequency of minimally every 12 hours. The PD between the true value and the CCV should be ≤25% for individual analytes. Additionally an initial calibration check (ICC) sample is run immediately after each initial calibration. The PD between the ICC and the initial calibration should be ≤25%.

07-0266 – No exceedences noted.

Comments – None.

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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-8 S5 9-10.5	SB-13 2.5-4.0	SB-12A S3 5-6.5	GP-9 7-8
Battelle ID	Q0542-P1	Q0543-P1	Q0544-P1	Q0546-P1
Sample Type	SA	SA	SA	SA
Collection Date	09/18/07	09/20/07	09/20/07	09/18/07
Extraction Date	10/23/07	10/23/07	10/23/07	10/23/07
Analysis Date	11/14/07	11/14/07	11/14/07	11/13/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	8.06	16.77	13.98	49.24
% Lipid	NA	NA	NA	NA
Matrix	SOIL	SOIL	SOIL	SOIL
Sample Size	4.78	4.45	4.63	2.84
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C3-Alkylbenzenes	3892.89	186.94 J	47632.7	5372.73 J
C4-Alkylbenzenes	18749.55	249.65 J	33828.46	5577.88 J
C5-Alkylbenzenes	5557.54	156.88 J	10399.43 J	2089.59 J
C6-Alkylbenzenes	4402.57	98.64 J	8583.42 J	1729.16 J
Benzo(b)thiophene	3378.11	5076.38	393493.15 D	3568.95
C1-benzo(b)thiophenes	3329.38	1139.53	178498.3 D	3388.9
C2-benzo(b)thiophenes	2895.91	1482.64	145715.34 D	U
C3-benzo(b)thiophenes	2534.91	1140.93	63061.83 D	U
C4-benzo(b)thiophenes	1632.18	412.32	16930.09 D	U
Naphthalene	197097.18 D	46290.73	4524558.48 D	10239.32
C1-Naphthalenes	98316.58 D	9577.93	1193806.3 D	2301.13
C2-Naphthalenes	43038.8 D	8881.07	641883.07 D	6972.28
C3-Naphthalenes	20997.44 D	7590.06	260962.9 D	5843.44
C4-Naphthalenes	9953.1 D	3506.08	75069.96 D	U
C1-Biphenyls + Dibenzofuran	4673.01	7971.01	95177.23	1984.95
Biphenyl	9344.63	14005.81	141278.54	856.33
C2-Biphenyls + C1-Dibenzofurans	5754.07	4533.09	91796.6	7146.12
Acenaphthylene	170.56	23360.5	196999.75	79299.94
Acenaphthene	5931.38	2216.54	128297.35	622.88
Dibenzofuran	1232.99	5571.55	43413.34	454.05
Fluorene	2703.28	22655.84	242645.7	667.43
C1-Fluorenes	3297.95	5254.37	127932.59	U
C2-Fluorenes	3895.26	4151.98	86930.23	U
C3-Fluorenes	2966.17	U	41379.34	U
C4-Fluorenes	2393.37	U	13759.75	U
Anthracene	268.41	88166.17 D	327451.33 D	10159.52
Phenanthrene	3271.85	515173.52 D	1652158.57 D	2405.95
C1-Phenanthrenes/Anthracenes	5110.85	76738.48 D	713534.16 D	6776.77
C2-Phenanthrenes/Anthracenes	5084.27	31628.12 D	351181.43 D	7611.12
C3-Phenanthrenes/Anthracenes	2895.42	11745.34 D	103700.95 D	7070.4
C4-Phenanthrenes/Anthracenes	1396.86	2593.54 D	23157.55 D	U
Retene	2268.57	1860.34	U	3378.98
Dibenzothiophene	561.92	58124.16	248996.12	979.76
C1-Dibenzothiophenes	1416.11	15918.52	204065.03	2546.1
C2-Dibenzothiophenes	1656.13	10229.11	159270.15	5089.4
C3-Dibenzothiophenes	1020.41	4900.03	69948.85	4871.82
C4-Dibenzothiophenes	432.74	1443.07	19585.16	2457.45
Fluoranthene	425.84	740795.46 D	769240.56 D	4503.06
Pyrene	632.53	954314.48 D	1147697.77 D	14763.15
C1-Fluoranthenes/Pyrenes	715.32	120979.11 D	517881 D	13411.77
C2-Fluoranthenes/Pyrenes	578	28376.19 D	182979.44 D	19334.13
C3-Fluoranthenes/Pyrenes	463.84	9383.55 D	71821.42 D	U
C4-Fluoranthenes/Pyrenes	262.87	U	23035.94	U
C0-Benzo(b)naphthothiophenes	45.36	62969.55	105627.53	U
C1-Benzo(b)naphthothiophenes	140.59	19773.48	126444.47	U
C2-Benzo(b)naphthothiophenes	142.96	6070.07	74933.29	U
C3-Benzo(b)naphthothiophenes	87.78	7872.43	33192.02	U
C4-Benzo(b)naphthothiophenes	U	725.56	8221.03	U
Benzo(a)anthracene	124.37	223728.55 D	290498.83 D	3336.09
Chrysene	165.04	267190.22 D	315473.14 D	3206.35

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-8 S5 9-10.5	SB-13 2.5-4.0	SB-12A S3 5-6.5	GP-9 7-8
Battelle ID	Q0542-P1	Q0543-P1	Q0544-P1	Q0546-P1
Sample Type	SA	SA	SA	SA
Collection Date	09/18/07	09/20/07	09/20/07	09/18/07
Extraction Date	10/23/07	10/23/07	10/23/07	10/23/07
Analysis Date	11/14/07	11/14/07	11/14/07	11/13/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	8.06	16.77	13.98	49.24
% Lipid	NA	NA	NA	NA
Matrix	SOIL	SOIL	SOIL	SOIL
Sample Size	4.78	4.45	4.63	2.84
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C1-Chrysenes	177.77	45327.58	197122.34 D	3503.96
C2-Chrysenes	174.33	13412.49 D	102039.96 D	U
C3-Chrysenes	136.57	5542.83	42176.85	U
C4-Chrysenes	87.49	4208.54	12791.94	U
Benzo(b)fluoranthene	70.16	215988 D	160335.11	7404.91
Benzo(k)fluoranthene	76.29	222855.07 D	170225.35	7060.37
Benzo(e)pyrene	72.83	235414.11 D	195020.96	8672.4
Benzo(a)pyrene	104.89	290768.98 D	339611.03 D	9161.57
Perylene	31.08	70186.94	76194.88	8317.43
Indeno(1,2,3-cd)pyrene	72.35	298934.42 D	206298.24	81298.7
Dibenz(a,h)anthracene	11.27	40419.21	42577.76	2717.59
Benzo(g,h,i)perylene	79.03	303454.24 D	208321.14	87159.31
Total PAH	426259.29	5061002.49	16626514.57	431075.88

Surrogate Recoveries (%)

Naphthalene-d8	136 NME	40	134 NME	142 NME
Acenaphthene-d10	142 NME	47	260 NME	141 NME
Phenanthrene-d10	145 NME	46	152 NME	165 NME
Benzo(a)pyrene-d12	135 NME	49	171 NME	132 NME
5b(H)-Cholane	155 NME	712 NME	6100 NME	255 NME

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL065PB-P
Sample Type	PB
Collection Date	10/23/07
Extraction Date	10/23/07
Analysis Date	11/13/07
Analytical Instrument	MS
% Moisture	22.01
% Lipid	NA
Matrix	SEDIMENT
Sample Size	4.20
Size Unit-Basis	G_DRY
Units	NG/G_DRY
C3-Alkylbenzenes	U
C4-Alkylbenzenes	U
C5-Alkylbenzenes	U
C6-Alkylbenzenes	U
Benzo(b)thiophene	U
C1-benzo(b)thiophenes	U
C2-benzo(b)thiophenes	U
C3-benzo(b)thiophenes	U
C4-benzo(b)thiophenes	U
Naphthalene	19.41 N
C1-Naphthalenes	3.75 J
C2-Naphthalenes	U
C3-Naphthalenes	U
C4-Naphthalenes	U
C1-Biphenyls + Dibenzofuran	U
Biphenyl	U
C2-Biphenyls + C1-Dibenzofurans	U
Acenaphthylene	0.74 J
Acenaphthene	U
Dibenzofuran	U
Fluorene	U
C1-Fluorenes	U
C2-Fluorenes	U
C3-Fluorenes	U
C4-Fluorenes	U
Anthracene	U
Phenanthrene	1.25 J
C1-Phenanthrenes/Anthracenes	U
C2-Phenanthrenes/Anthracenes	U
C3-Phenanthrenes/Anthracenes	U
C4-Phenanthrenes/Anthracenes	U
Retene	U
Dibenzothiophene	U
C1-Dibenzothiophenes	U
C2-Dibenzothiophenes	U
C3-Dibenzothiophenes	U
C4-Dibenzothiophenes	U
Fluoranthene	1.01 J
Pyrene	1.72 J
C1-Fluoranthenes/Pyrenes	U
C2-Fluoranthenes/Pyrenes	U
C3-Fluoranthenes/Pyrenes	U
C4-Fluoranthenes/Pyrenes	U
C0-Benzo(b)naphthothiophenes	U
C1-Benzo(b)naphthothiophenes	U
C2-Benzo(b)naphthothiophenes	U
C3-Benzo(b)naphthothiophenes	U
C4-Benzo(b)naphthothiophenes	U
Benzo(a)anthracene	0.49 J
Chrysene	0.75 J

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL065PB-P
Sample Type	PB
Collection Date	10/23/07
Extraction Date	10/23/07
Analysis Date	11/13/07
Analytical Instrument	MS
% Moisture	22.01
% Lipid	NA
Matrix	SEDIMENT
Sample Size	4.20
Size Unit-Basis	G_DRY
Units	NG/G_DRY
C1-Chrysenes	U
C2-Chrysenes	U
C3-Chrysenes	U
C4-Chrysenes	U
Benzo(b)fluoranthene	U
Benzo(k)fluoranthene	U
Benzo(e)pyrene	U
Benzo(a)pyrene	U
Perylene	U
Indeno(1,2,3-cd)pyrene	U
Dibenz(a,h)anthracene	U
Benzo(g,h,i)perylene	1.3 J
Total PAH	30.42 J

Surrogate Recoveries (%)

Naphthalene-d8	93
Acenaphthene-d10	87
Phenanthrene-d10	94
Benzo(a)pyrene-d12	96
5b(H)-Cholane	101

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Battelle
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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70
Battelle ID	BL066LCS-P
Sample Type	LCS
Collection Date	10/23/07
Extraction Date	10/23/07
Analysis Date	11/13/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	SEDIMENT
Sample Size	NA
Size Unit-Basis	NA

Units	NG		Target	% Recovery	Qualifier
C3-Alkylbenzenes		U			
C4-Alkylbenzenes		U			
C5-Alkylbenzenes		U			
C6-Alkylbenzenes		U			
Benzo(b)thiophene	1598.34		2508.50	64	
C1-benzo(b)thiophenes		U			
C2-benzo(b)thiophenes		U			
C3-benzo(b)thiophenes		U			
C4-benzo(b)thiophenes		U			
Naphthalene	1696.05		2500.50	68	
C1-Naphthalenes		U			
C2-Naphthalenes		U			
C3-Naphthalenes		U			
C4-Naphthalenes		U			
C1-Biphenyls + Dibenzofuran		U			
Biphenyl	1514.31		2504.25	60	
C2-Biphenyls + C1-Dibenzofurans		U			
Acenaphthylene	1796.09		2502.25	72	
Acenaphthene	1813.64		2501.63	72	
Dibenzofuran	1617.51		2504.75	65	
Fluorene	1761.72		2501.38	70	
C1-Fluorenes		U			
C2-Fluorenes		U			
C3-Fluorenes		U			
C4-Fluorenes		U			
Anthracene	1801.19		2500.38	72	
Phenanthrene	1873.41		2501.25	75	
C1-Phenanthrenes/Anthracenes		U			
C2-Phenanthrenes/Anthracenes		U			
C3-Phenanthrenes/Anthracenes		U			
C4-Phenanthrenes/Anthracenes		U			
Retene		U			
Dibenzothiophene	1649.82		2502.50	66	
C1-Dibenzothiophenes		U			
C2-Dibenzothiophenes		U			
C3-Dibenzothiophenes		U			
C4-Dibenzothiophenes		U			
Fluoranthene	1942.61		2501.25	78	
Pyrene	1936.25		2500.88	77	
C1-Fluoranthenes/Pyrenes		U			
C2-Fluoranthenes/Pyrenes		U			
C3-Fluoranthenes/Pyrenes		U			
C4-Fluoranthenes/Pyrenes		U			
C0-Benzo(b)naphthothiophenes		U			
C1-Benzo(b)naphthothiophenes		U			
C2-Benzo(b)naphthothiophenes		U			
C3-Benzo(b)naphthothiophenes		U			
C4-Benzo(b)naphthothiophenes		U			
Benzo(a)anthracene	1773.04		2500.63	71	

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

LCS: S07-0266MS-Master_157-Final.xls

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70
Battelle ID	BL066LCS-P
Sample Type	LCS
Collection Date	10/23/07
Extraction Date	10/23/07
Analysis Date	11/13/07
Analytical Instrument	MS
% Moisture	NA
% Lipid	NA
Matrix	SEDIMENT
Sample Size	NA
Size Unit-Basis	NA

Units	NG		Target	% Recovery	Qualifier
Chrysene	1630.11		2501.00	65	
C1-Chrysenes		U			
C2-Chrysenes		U			
C3-Chrysenes		U			
C4-Chrysenes		U			
Benzo(b)fluoranthene	1727.03		2502.13	69	
Benzo(k)fluoranthene	1847.36		2501.38	74	
Benzo(e)pyrene	1626.79		2503.50	65	
Benzo(a)pyrene	1744.04		2502.00	70	
Perylene	1671.75		2505.13	67	
Indeno(1,2,3-cd)pyrene	1776.5		2501.25	71	
Dibenz(a,h)anthracene	1750.62		2501.38	70	
Benzo(g,h,i)perylene	1808.55		2500.75	72	
Total PAH	36758.39				

Surrogate Recoveries (%)

Naphthalene-d8	62
Acenaphthene-d10	61
Phenanthrene-d10	66
Benzo(a)pyrene-d12	64
5b(H)-Cholane	62

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Battelle
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Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude				
Battelle ID	BL088NSC-P				
Sample Type	NSC				
Collection Date	10/30/07				
Extraction Date	10/30/07				
Analysis Date	11/13/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
C3-Alkylbenzenes	1535.55				
C4-Alkylbenzenes	1217.77				
C5-Alkylbenzenes	694.08				
C6-Alkylbenzenes	443.15				
Benzo(b)thiophene		U			
C1-benzo(b)thiophenes	44.7				
C2-benzo(b)thiophenes	91.01		95.74	4.9	
C3-benzo(b)thiophenes	144.34		132.67	8.8	
C4-benzo(b)thiophenes	98.69		96.72	2.0	
Naphthalene	672.77		740.29	9.1	
C1-Naphthalenes	1417.68		1516.04	6.5	
C2-Naphthalenes	1886.29		2000.10	5.7	
C3-Naphthalenes	1497.57		1526.96	1.9	
C4-Naphthalenes	762.58		898.03	15.1	
C1-Biphenyls + Dibenzofuran	365.13				
Biphenyl	217.33		220.82	1.6	
C2-Biphenyls + C1-Dibenzofurans	502.49				
Acenaphthylene	8.11				
Acenaphthene	13.93		14.50	3.9	
Dibenzofuran	68.86		77.75	11.4	
Fluorene	101.65		92.51	9.9	
C1-Fluorenes	236.93		227.01	4.4	
C2-Fluorenes	324		367.09	11.7	
C3-Fluorenes	235.59		326.32	27.8	
C4-Fluorenes	248.33				
Anthracene		U			
Phenanthrene	272.7		249.49	9.3	
C1-Phenanthrenes/Anthracenes	638.52		549.17	16.3	
C2-Phenanthrenes/Anthracenes	757.4		642.72	17.8	
C3-Phenanthrenes/Anthracenes	537.54		446.11	20.5	
C4-Phenanthrenes/Anthracenes	211.77		180.02	17.6	
Retene		U			
Dibenzothiophene	228.5		210.35	8.6	
C1-Dibenzothiophenes	466.01		409.03	13.9	
C2-Dibenzothiophenes	651.87		551.46	18.2	
C3-Dibenzothiophenes	526.38		471.36	11.7	
C4-Dibenzothiophenes	315.87		243.11	29.9	
Fluoranthene	4				
Pyrene	16.52		12.99	27.2	
C1-Fluoranthenes/Pyrenes	89.15		70.92	25.7	
C2-Fluoranthenes/Pyrenes	150.71		117.89	27.8	
C3-Fluoranthenes/Pyrenes	176.84		137.25	28.8	
C4-Fluoranthenes/Pyrenes	133.73				
C0-Benzo(b)naphthothiophenes	56.15				
C1-Benzo(b)naphthothiophenes	215.16				
C2-Benzo(b)naphthothiophenes	277.03				
C3-Benzo(b)naphthothiophenes	179.86				
C4-Benzo(b)naphthothiophenes	125.39				
Benzo(a)anthracene	5.71				

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude				
Battelle ID	BL088NSC-P				
Sample Type	NSC				
Collection Date	10/30/07				
Extraction Date	10/30/07				
Analysis Date	11/13/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
Chrysene	50.54		47.18	7.1	
C1-Chrysenes	86.81		78.82	10.1	
C2-Chrysenes	112.8		102.67	9.9	
C3-Chrysenes	101.95		85.36	19.4	
C4-Chrysenes	62.39		61.99	0.6	
Benzo(b)fluoranthene	5.88		6.08	3.3	
Benzo(k)fluoranthene		U			
Benzo(e)pyrene	12.4		12.88	3.7	
Benzo(a)pyrene		U			
Perylene		U			
Indeno(1,2,3-cd)pyrene		U			
Dibenz(a,h)anthracene	0.8	J			
Benzo(g,h,i)perylene	3.15		3.44	8.4	
Total PAH	12929.5				

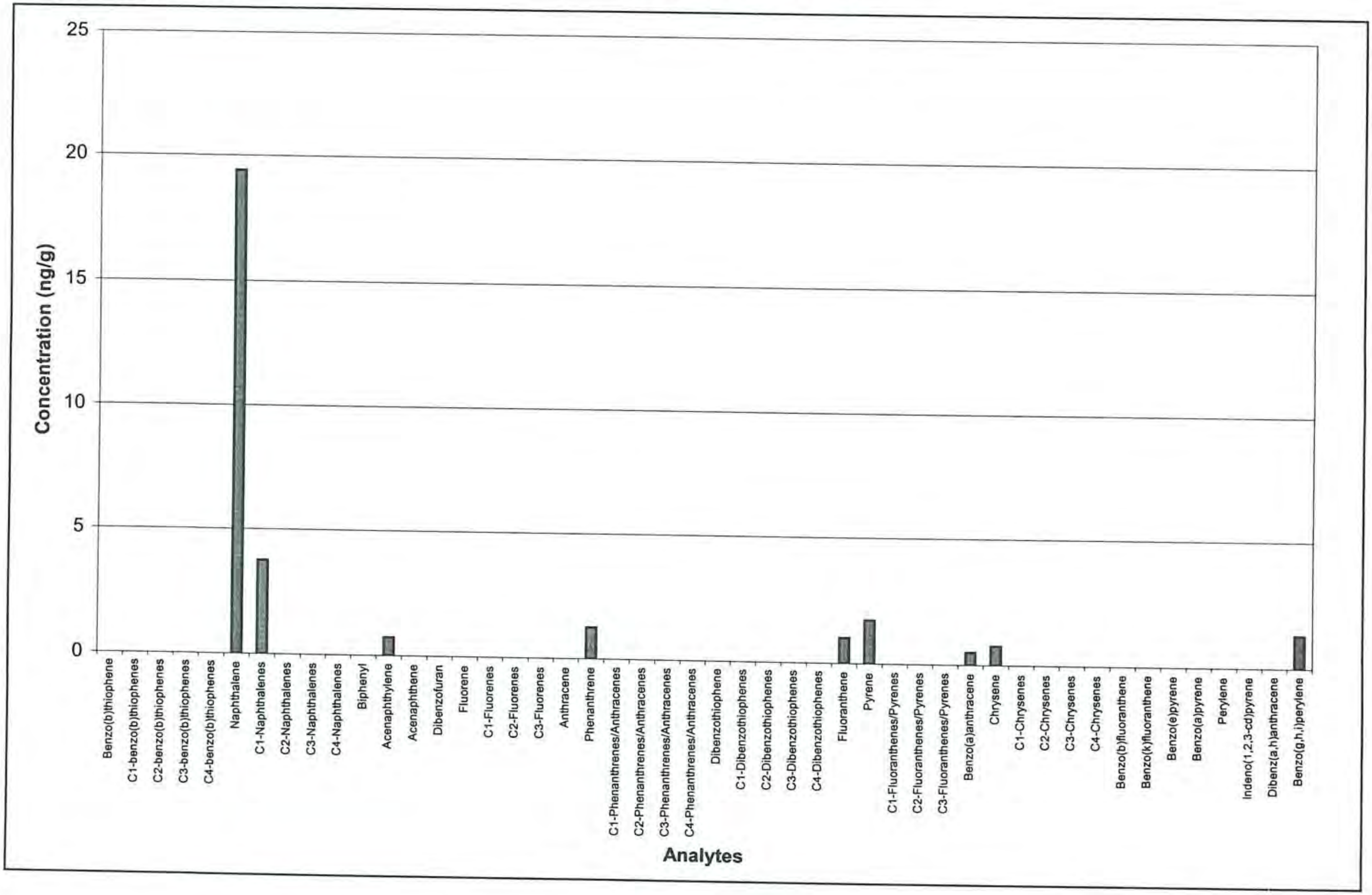
Surrogate Recoveries (%)

Naphthalene-d8	96
Acenaphthene-d10	94
Phenanthrene-d10	97
Benzo(a)pyrene-d12	105
5b(H)-Cholane	106

Not Surrogate Corrected

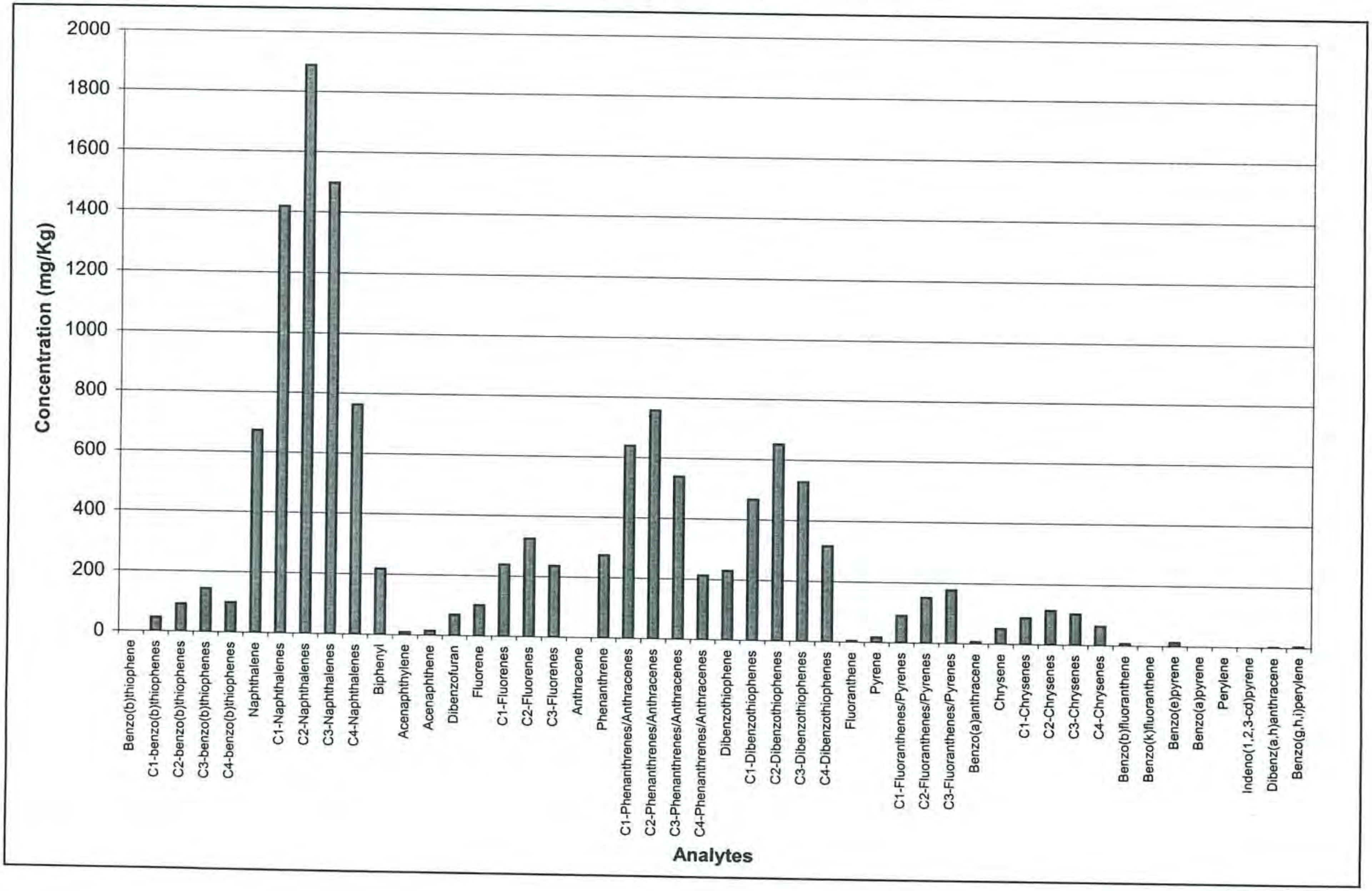
Analyzed by Restucci Jr, Richard
11/15/2007

Procedural Blank (BL065PB-P)



Battelle
The Business of Innovation

GO98: North Slope Crude (BL088NSC-P)



Battelle
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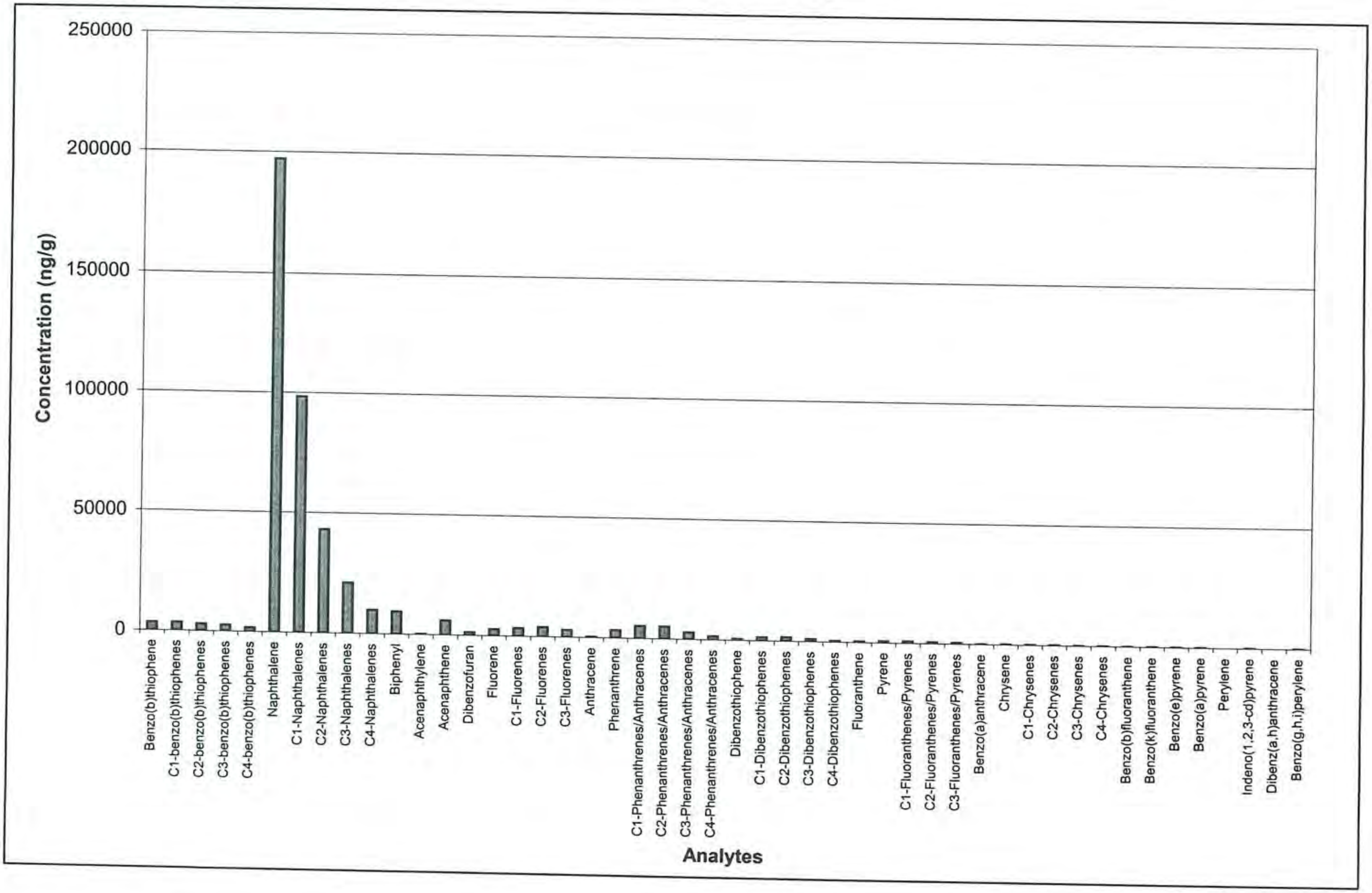
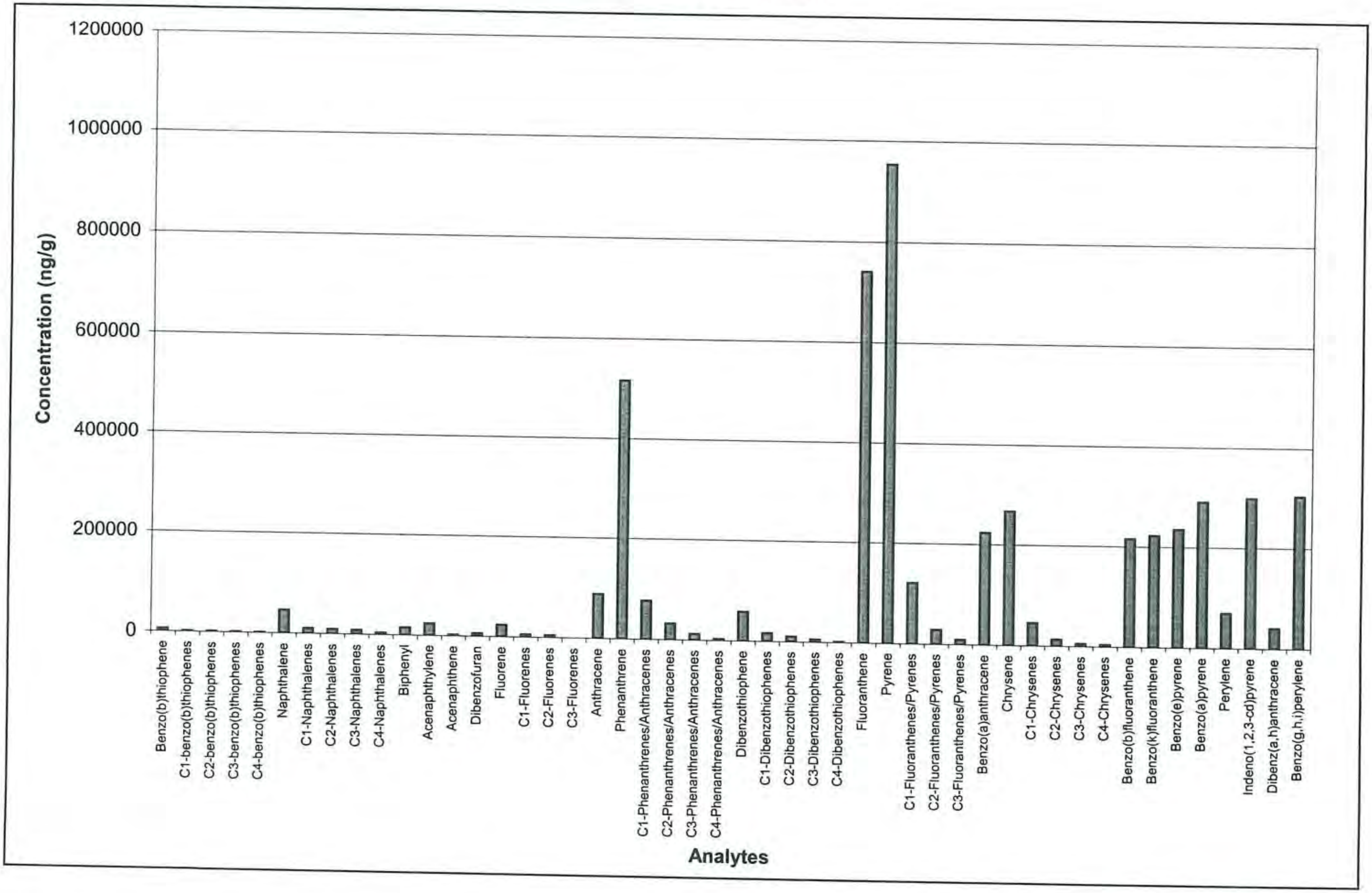
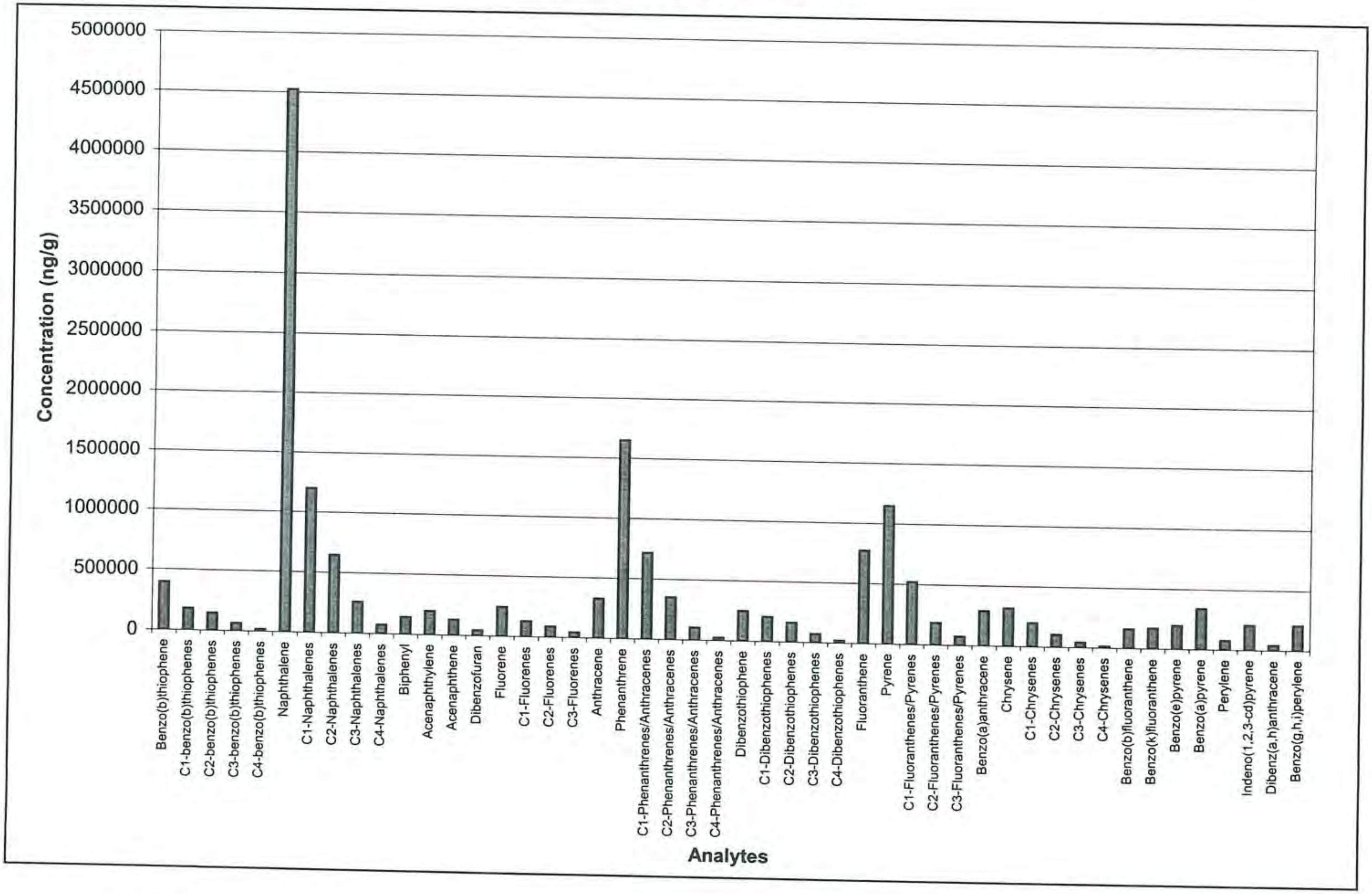
SB-8 S5 9-10.5 (Q0542-P1)



SB-13 2.5-4.0 (Q0543-P1)



SB-12A S3 5-6.5 (Q0544-P1)



Battelle
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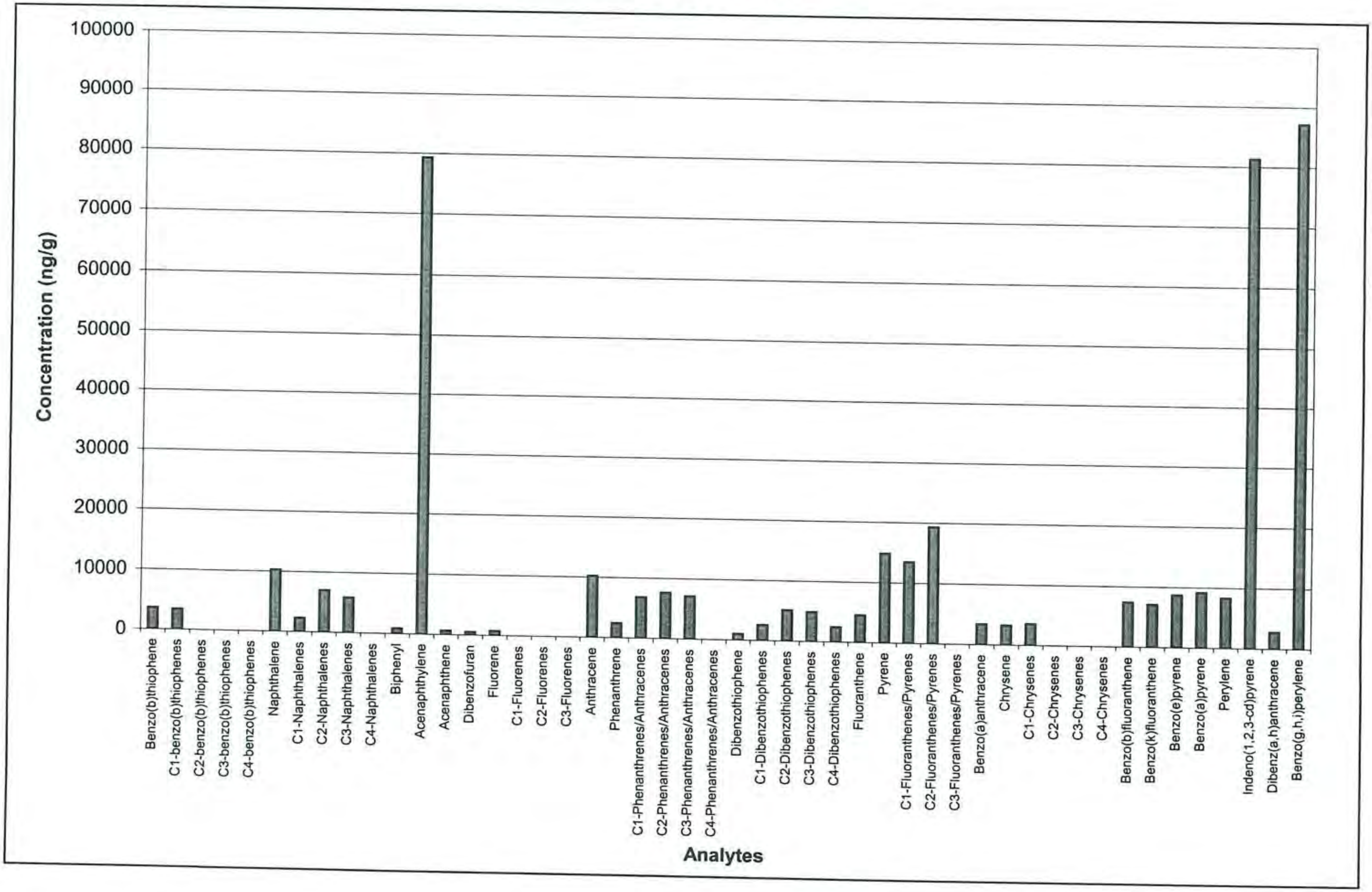
GP-9 7-8 (Q0546-P1)



Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	SB-8 S5 9-10.5	SB-13 2.5-4.0	SB-12A S3 5-6.5	GP-9 7-8
Battelle ID	Q0542-P1	Q0543-P1	Q0544-P1	Q0546-P1
Sample Type	SA	SA	SA	SA
Collection Date	09/18/07	09/20/07	09/20/07	09/18/07
Extraction Date	10/23/07	10/23/07	10/23/07	10/23/07
Analysis Date	11/14/07	11/14/07	11/14/07	11/13/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	8.06	16.77	13.98	49.24
% Lipid	NA	NA	NA	NA
Matrix	SOIL	SOIL	SOIL	SOIL
Sample Size	4.78	4.45	4.63	2.84
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	162.73	U	809.73	U
C29 Tricyclic Terpane -22S	27.09	U	314.6	596.59
C29 Tricyclic Terpane -22R	25	U	326.97	722.25
18a(H)-22,29,30-Trisnorneohopane -TS	17.34 J	U	229.08	U
17a(H)-22,29,30-Trisnorhopane -TM	32.61	34.85 J	483.22	U
30-Norhopane	94.28	73.47 J	1399.33	1551.53
18a(H) & 18b(H)-Oleananes	35.41	70.63 J	333.67	596.7
Hopane	164.54	151.58	1994.84	1270.93
30-Homohopane -22S	66.91	61.44 J	1003.25	896.47
30-Homohopane -22R	37.11	U	630.21	716.91
13b(H),17a(H)-20S-Diacholestane	153.15	187.6	880.4	1117.57
13b(H),17a(H)-20R-Diacholestane	85.75	76.89 J	496.59	3573.01
14a(H),17a(H)-20R-methylcholestane	209.35	71.97 J	1752.21	2459.83
14a(H),17a(H)-20S-Ethylcholestane	133.71	U	U	U
14a(H),17a(H)-20R-Ethylcholestane	134.38	70.72 J	1260.44	1428.5
C21-TAS	37.97	398.7	308.64	590.98
C26-TAS(20S)	43.29	U	968.53	343.78
C26,C27-TAS	129.61	28.11 J	3548.47	3304.51
C27-TAS(20R)	64.93	8.84 J	2175.84	794.95
C28-TAS(20S)	36.12	8.61 J	906.06	1410.9
C28-TAS(20R)	32.67	9.93 J	845.84	368.27
C21-MAS	50.35	5.24 J	82.76 J	854.6
C22-MAS	20.34	U	54.36 J	820.26
C27-MAS	15.71	86.56	936.12	U
C27-20R-MAS	41.57	1949.58	3176.64	U
C27-20S-MAS	35.96	440.19	1190.74	276.54
C28-20S-MAS	73.31	91.98	2517.57	2212.9
C27-C2920S/R-MAS	61.6	9478.41	10891.68	1345.44
C29-20S-MAS	27.19	11591.31	U	3971.75
C29-20R-MAS	61.79	1060.24	1105.64	1000.84
TAS_245	U	U	U	U
MAS_239	U	U	U	U

Surrogate Recoveries (%)

Naphthalene-d8	136 NME	40	134 NME	142 NME
Acenaphthene-d10	142 NME	47	260 NME	141 NME
Phenanthrene-d10	145 NME	46	152 NME	165 NME
Benzo(a)pyrene-d12	135 NME	49	171 NME	132 NME
5b(H)-Cholane	155 NME	712 NME	6100 NME	255 NME

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	Procedural Blank
Battelle ID	BL065PB-P
Sample Type	PB
Collection Date	10/23/07
Extraction Date	10/23/07
Analysis Date	11/13/07
Analytical Instrument	MS
% Moisture	22.01
% Lipid	NA
Matrix	SEDIMENT
Sample Size	4.20
Size Unit-Basis	G_DRY
Units	NG/G_DRY
C23 Tricyclic Terpane	U
C29 Tricyclic Terpane -22S	U
C29 Tricyclic Terpane -22R	U
18a(H)-22,29,30-Trisnorneohopane -TS	U
17a(H)-22,29,30-Trisnorhopane -TM	U
30-Norhopane	U
18a(H) & 18b(H)-Oleananes	U
Hopane	U
30-Homohopane -22S	U
30-Homohopane -22R	U
13b(H),17a(H)-20S-Diacholestane	U
13b(H),17a(H)-20R-Diacholestane	U
14a(H),17a(H)-20R-methylcholestane	U
14a(H),17a(H)-20S-Ethylcholestane	U
14a(H),17a(H)-20R-Ethylcholestane	U
C21-TAS	U
C26-TAS(20S)	U
C26,C27-TAS	U
C27-TAS(20R)	U
C28-TAS(20S)	U
C28-TAS(20R)	U
C21-MAS	U
C22-MAS	U
C27-MAS	U
C27-20R-MAS	U
C27-20S-MAS	U
C28-20S-MAS	U
C27-C2920S/R-MAS	U
C29-20S-MAS	U
C29-20R-MAS	U
TAS_245	U
MAS_239	U

Surrogate Recoveries (%)

Naphthalene-d8	93
Acenaphthene-d10	87
Phenanthrene-d10	94
Benzo(a)pyrene-d12	96
5b(H)-Cholane	101

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	060208-03: Sand, White Quartz, -50+70		
Battelle ID	BL066LCS-P		
Sample Type	LCS		
Collection Date	10/23/07		
Extraction Date	10/23/07		
Analysis Date	11/13/07		
Analytical Instrument	MS		
% Moisture	NA		
% Lipid	NA		
Matrix	SEDIMENT		
Sample Size	NA		
Size Unit-Basis	NA		
Units	NG	Target % Recovery	Qualifier
C23 Tricyclic Terpane	U		
C29 Tricyclic Terpane -22S	U		
C29 Tricyclic Terpane -22R	U		
18a(H)-22,29,30-Trisnorneohopane -TS	U		
17a(H)-22,29,30-Trisnorhopane -TM	U		
30-Norhopane	U		
18a(H) & 18b(H)-Oleananes	U		
Hopane	U		
30-Homohopane -22S	U		
30-Homohopane -22R	U		
13b(H),17a(H)-20S-Diacholestane	U		
13b(H),17a(H)-20R-Diacholestane	U		
14a(H),17a(H)-20R-methylcholestane	U		
14a(H),17a(H)-20S-Ethylcholestane	U		
14a(H),17a(H)-20R-Ethylcholestane	U		
C21-TAS	U		
C26-TAS(20S)	U		
C26,C27-TAS	U		
C27-TAS(20R)	U		
C28-TAS(20S)	U		
C28-TAS(20R)	U		
C21-MAS	U		
C22-MAS	U		
C27-MAS	U		
C27-20R-MAS	U		
C27-20S-MAS	U		
C28-20S-MAS	U		
C27-C2920S/R-MAS	U		
C29-20S-MAS	U		
C29-20R-MAS	U		
TAS_245	U		
MAS_239	U		

Surrogate Recoveries (%)

Naphthalene-d8	62
Acenaphthene-d10	61
Phenanthrene-d10	66
Benzo(a)pyrene-d12	64
5b(H)-Cholane	62

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

Battelle
The Business of Innovation

Project Client: Floyd|Snider
Project Name: Gas Works Park
Project Number: N007097-0001

Client ID	GO98: North Slope Crude				
Battelle ID	BL088NSC-P				
Sample Type	NSC				
Collection Date	10/30/07				
Extraction Date	10/30/07				
Analysis Date	11/13/07				
Analytical Instrument	MS				
% Moisture	NA				
% Lipid	NA				
Matrix	OIL				
Sample Size	5.04				
Size Unit-Basis	MG_OIL				
Units	MG/KG_OIL		Target	% Difference	Qualifier
C23 Tricyclic Terpane	41.31		47.76	13.5	
C29 Tricyclic Terpane -22S	13.23		14.70	10.0	
C29 Tricyclic Terpane -22R	13.32		14.64	9.0	
18a(H)-22,29,30-Trisnorneohopane -TS	15.52		15.96	2.8	
17a(H)-22,29,30-Trisnorhopane -TM	22.68		24.82	8.6	
30-Norhopane	61.75		69.58	11.3	
18a(H) & 18b(H)-Oleananes		U			
Hopane	106.73		120.14	11.2	
30-Homohopane -22S	50.15		59.93	16.3	
30-Homohopane -22R	39.69		39.69	0.0	
13b(H),17a(H)-20S-Diacholestane	41.02		44.18	7.2	
13b(H),17a(H)-20R-Diacholestane	24.2		25.52	5.2	
14a(H),17a(H)-20R-methylcholestane	33		33.94	2.8	
14a(H),17a(H)-20S-Ethylcholestane	35.99		35.93	0.2	
14a(H),17a(H)-20R-Ethylcholestane	40.34		39.17	3.0	
C21-TAS	18.95				
C26-TAS(20S)	14.31				
C26,C27-TAS	53.61				
C27-TAS(20R)	32.3				
C28-TAS(20S)	29.5				
C28-TAS(20R)	31.76				
C21-MAS	6.02				
C22-MAS	2.94				
C27-MAS	6.92				
C27-20R-MAS	7.84				
C27-20S-MAS	1.92				
C28-20S-MAS	14.73				
C27-C2920S/R-MAS	9.46				
C29-20S-MAS	3.04				
C29-20R-MAS	11.36				
TAS_245		U			
MAS_239		U			

Surrogate Recoveries (%)

Naphthalene-d8	96
Acenaphthene-d10	94
Phenanthrene-d10	97
Benzo(a)pyrene-d12	105
5b(H)-Cholane	106

Not Surrogate Corrected

Analyzed by Restucci Jr, Richard
11/15/2007

```
File        : G:\A\DATA\SA0618\A3450.D
Operator    : DPB
Acquired    : 13 Nov 2007   4:42 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL088NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0266
Vial Number: 2
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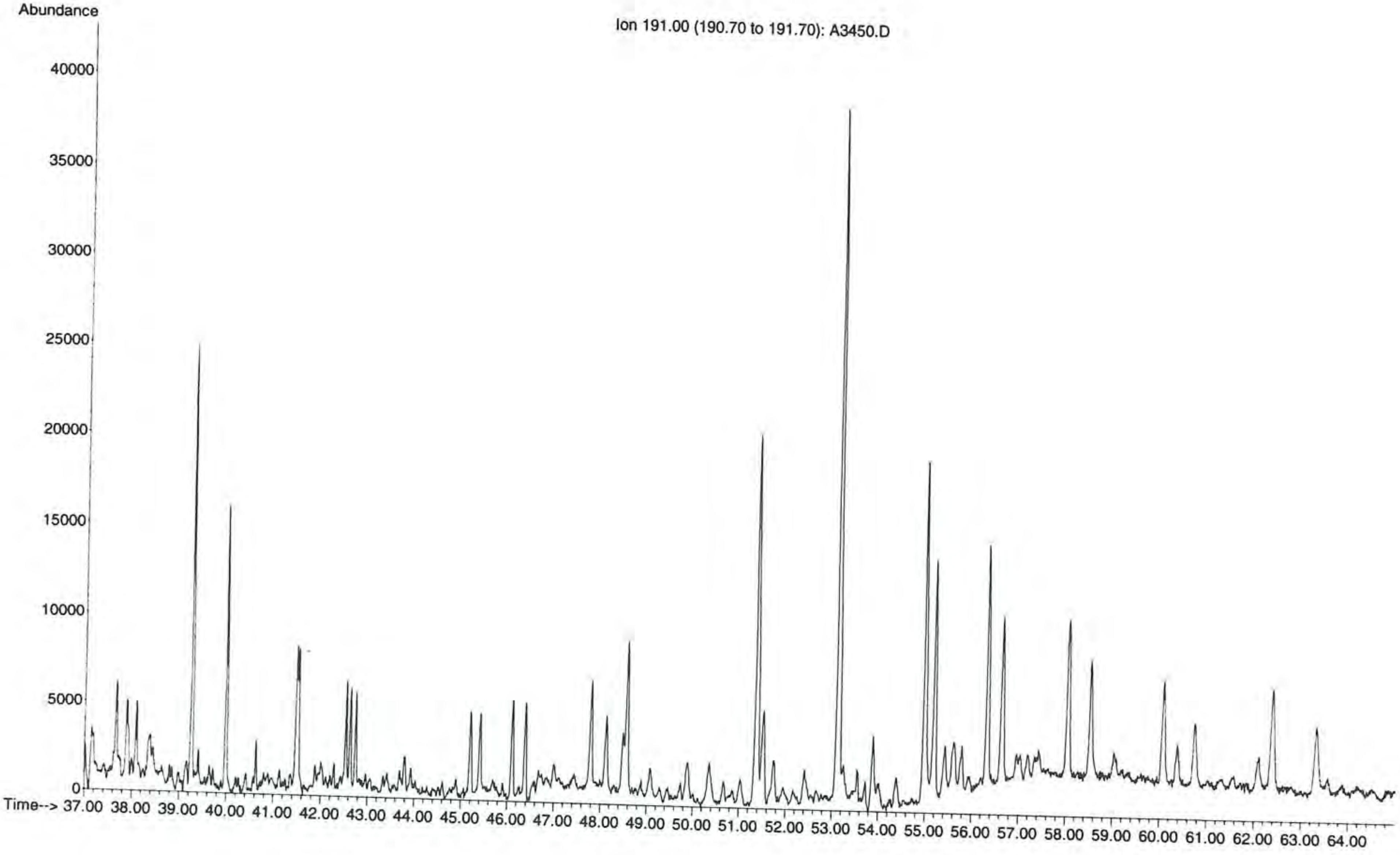

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File        : G:\A\DATA\SA0618\A3452.D
Operator    : DPB
Acquired    : 13 Nov 2007   7:25 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL065PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0266
Vial Number: 4
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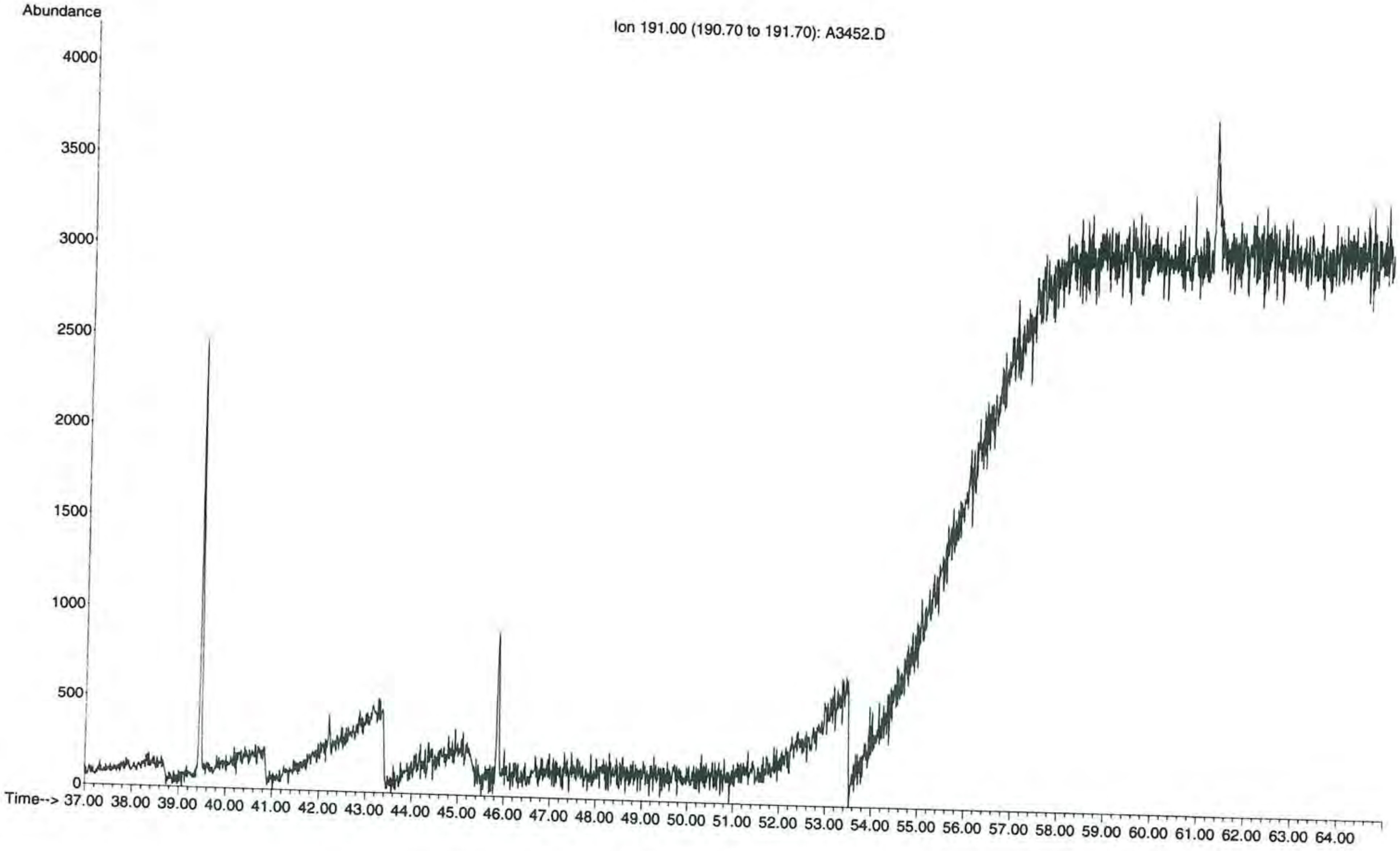

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Operator     : DPB
Acquired     : 13 Nov 2007   8:46 pm using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: BL066LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0266
Vial Number: 5
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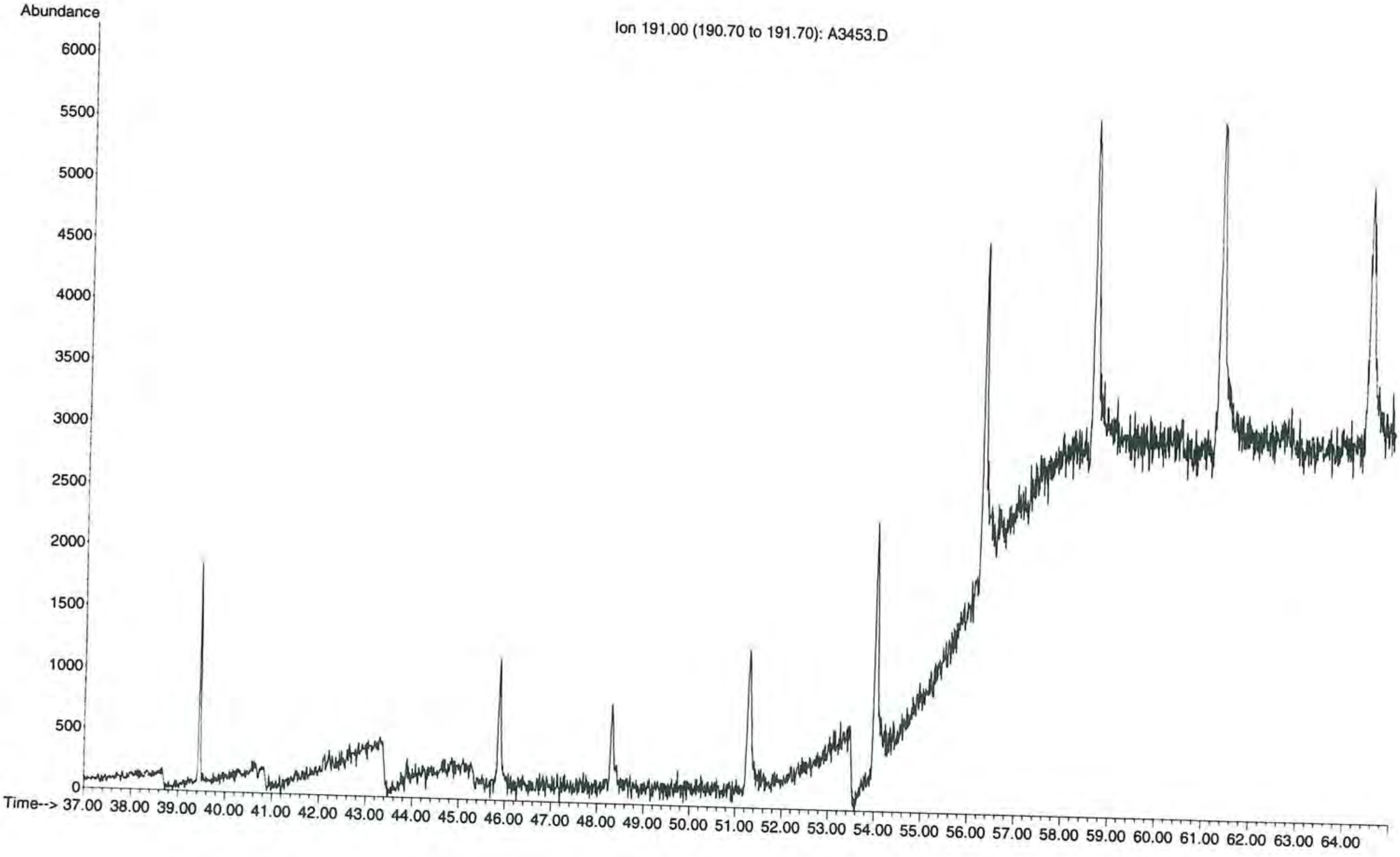

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File        : G:\A\DATA\SA0618\A3454.D
Operator    : DPB
Acquired    : 13 Nov 2007  10:08 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0546-P1-MS(9)
Misc Info   : GP-9 7-8 5-157 07-0266
Vial Number: 6
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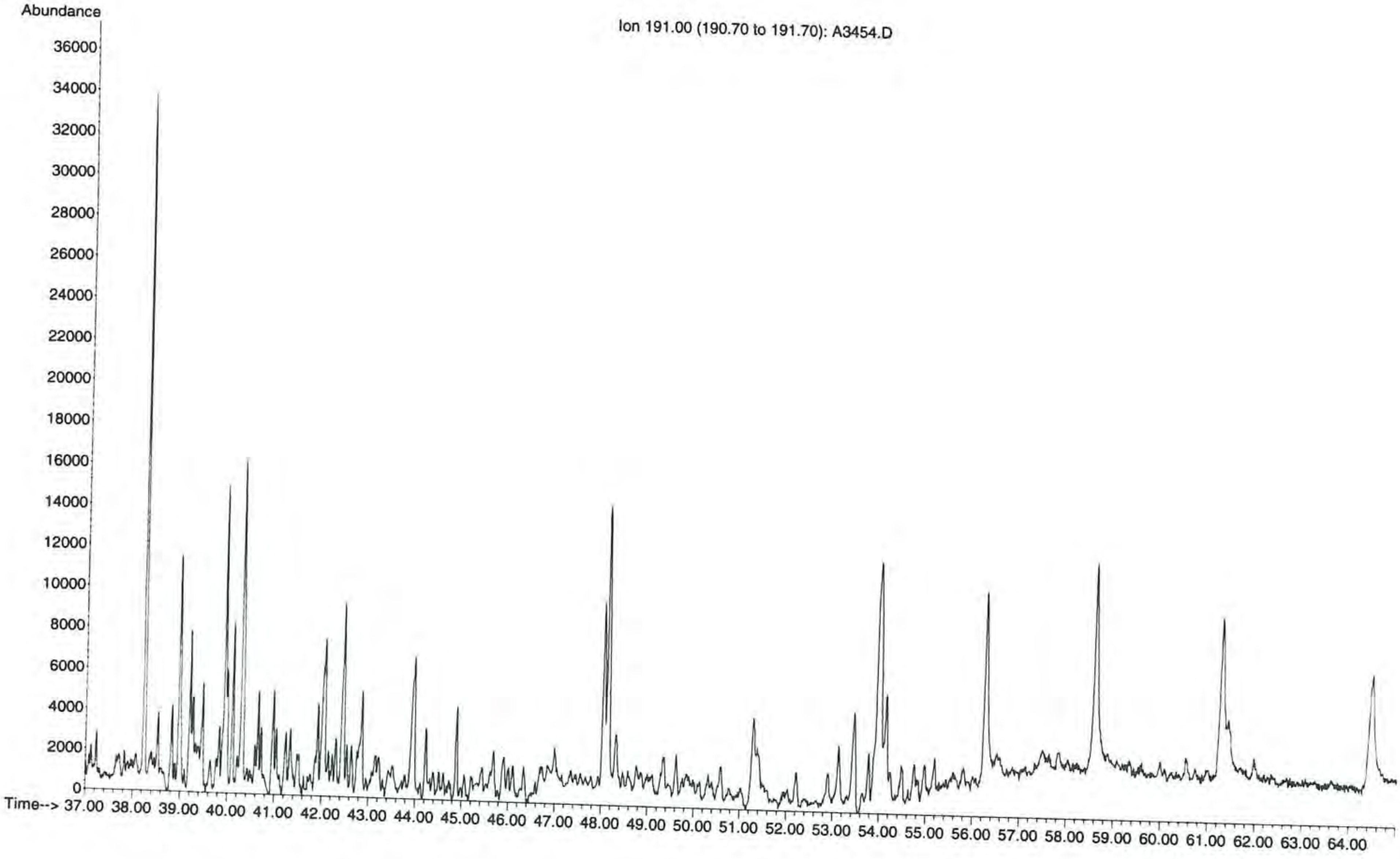

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File        : G:\A\DATA\SA0618\A3457.D
Operator    : DPB
Acquired    : 14 Nov 2007   2:13 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0542-P1-MS(12)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 9
```

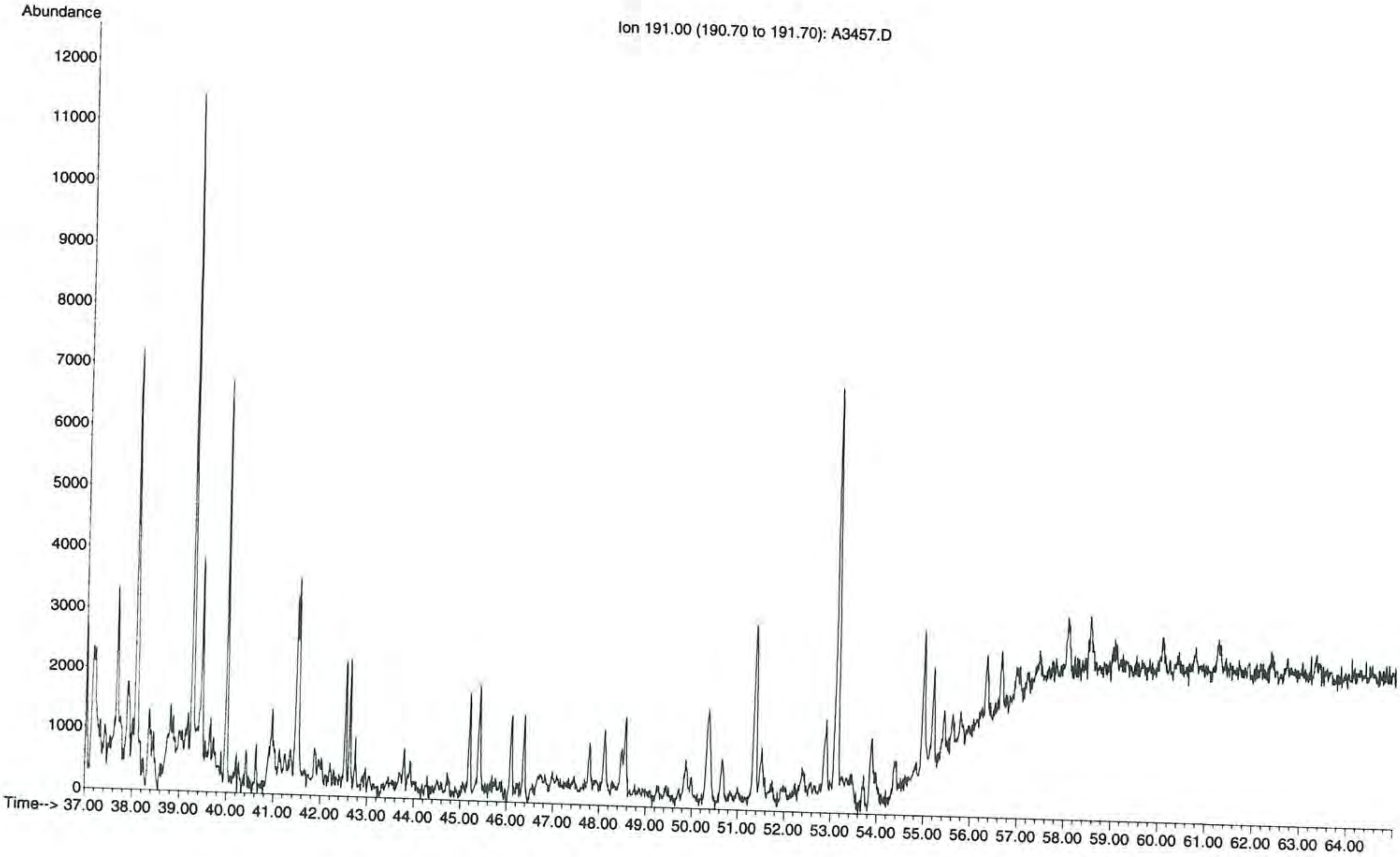

```
File        : G:\A\DATA\SA0618\A3458.D
Operator    : DPB
Acquired    : 14 Nov 2007   3:34 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0542-P1-MS-D(13)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 10
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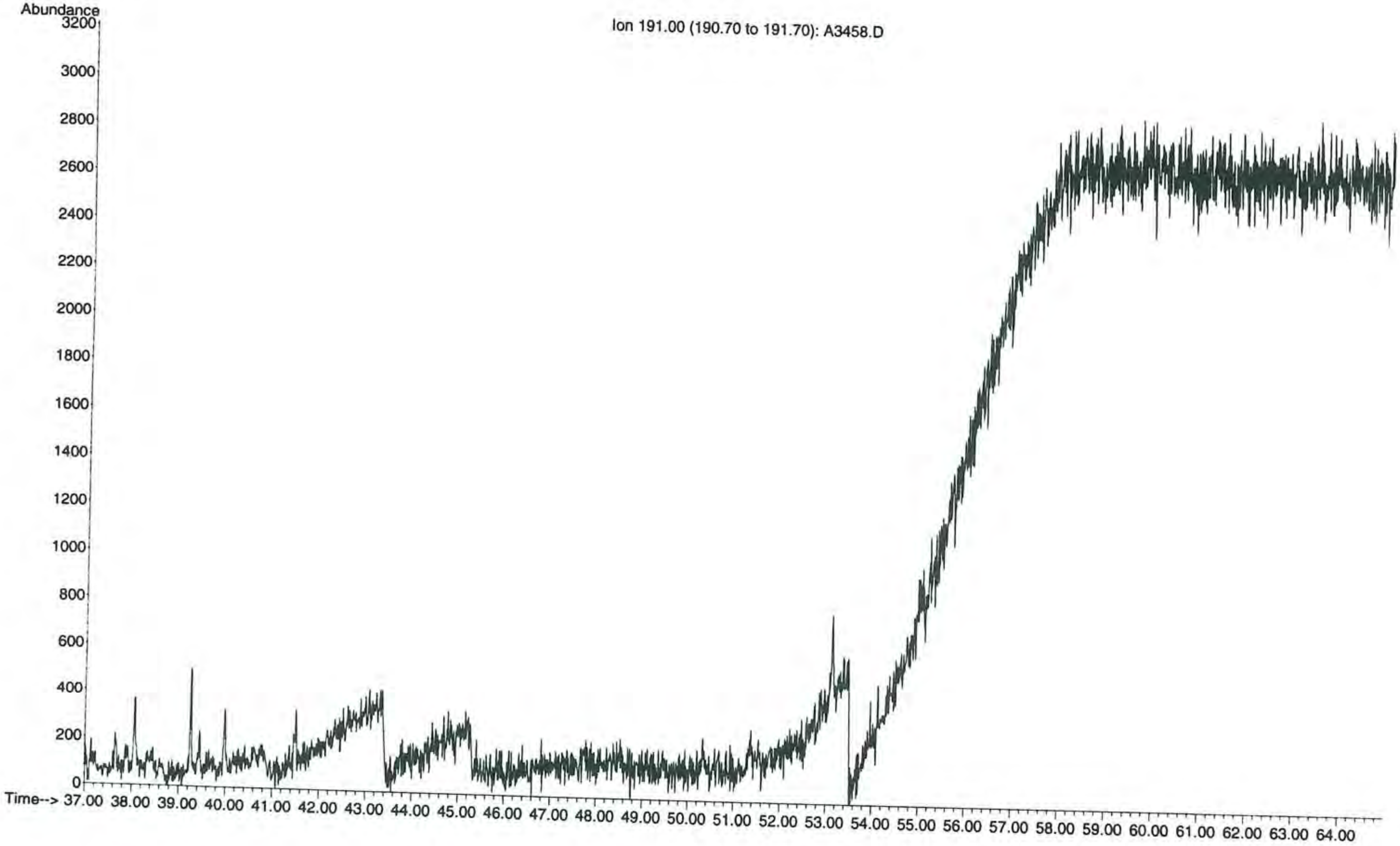

```
File       : G:\A\DATA\SA0618\A3459.D
Operator   : DPB
Acquired   : 14 Nov 2007   4:55 am using AcqMethod BIOPLUSN.M
Instrument :   Inst. A
Sample Name: Q0543-P1-MS(16)
Misc Info  : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 11
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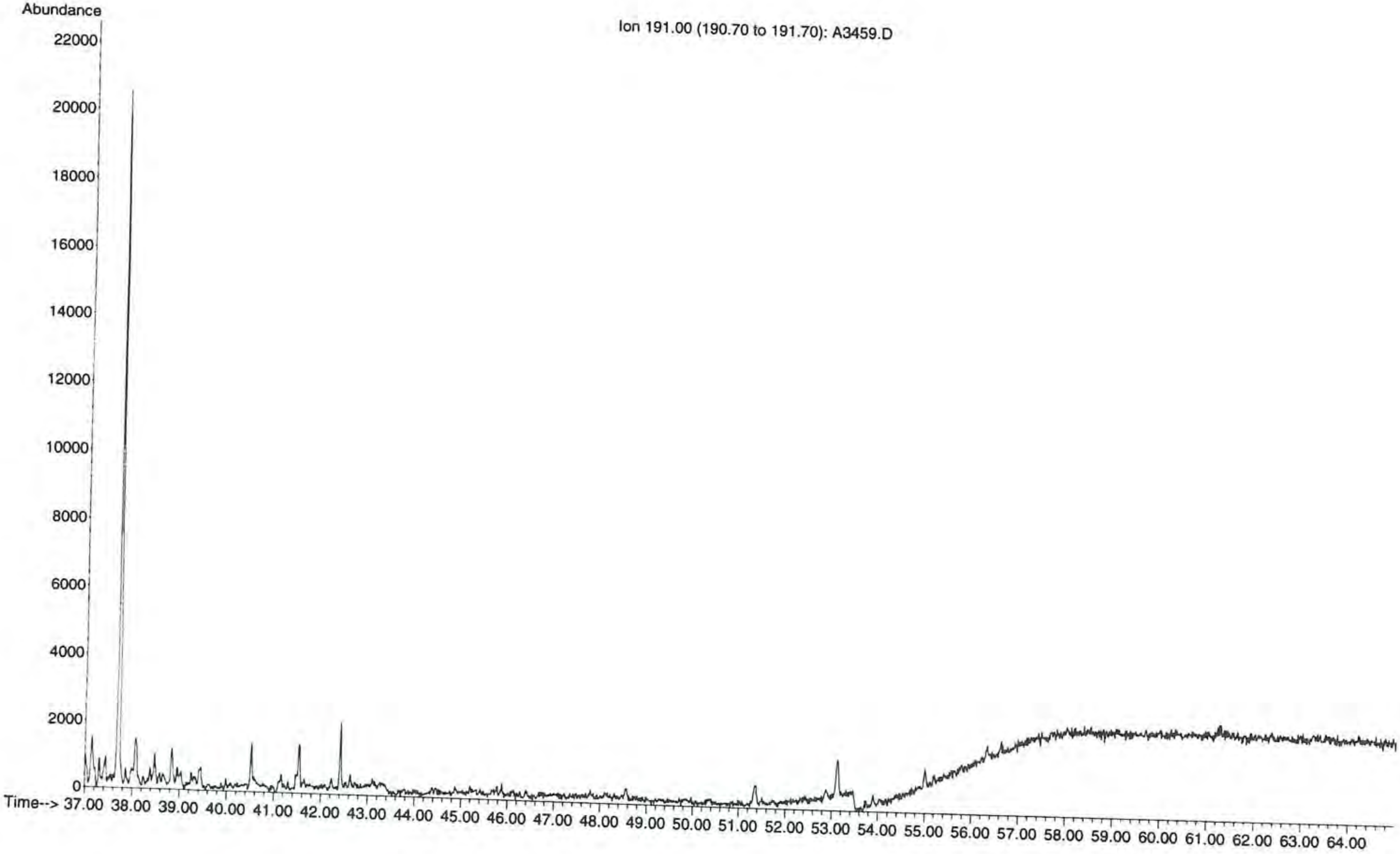

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Operator    : DPB
Acquired    : 14 Nov 2007   6:16 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0543-P1-MS-D(17)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 12
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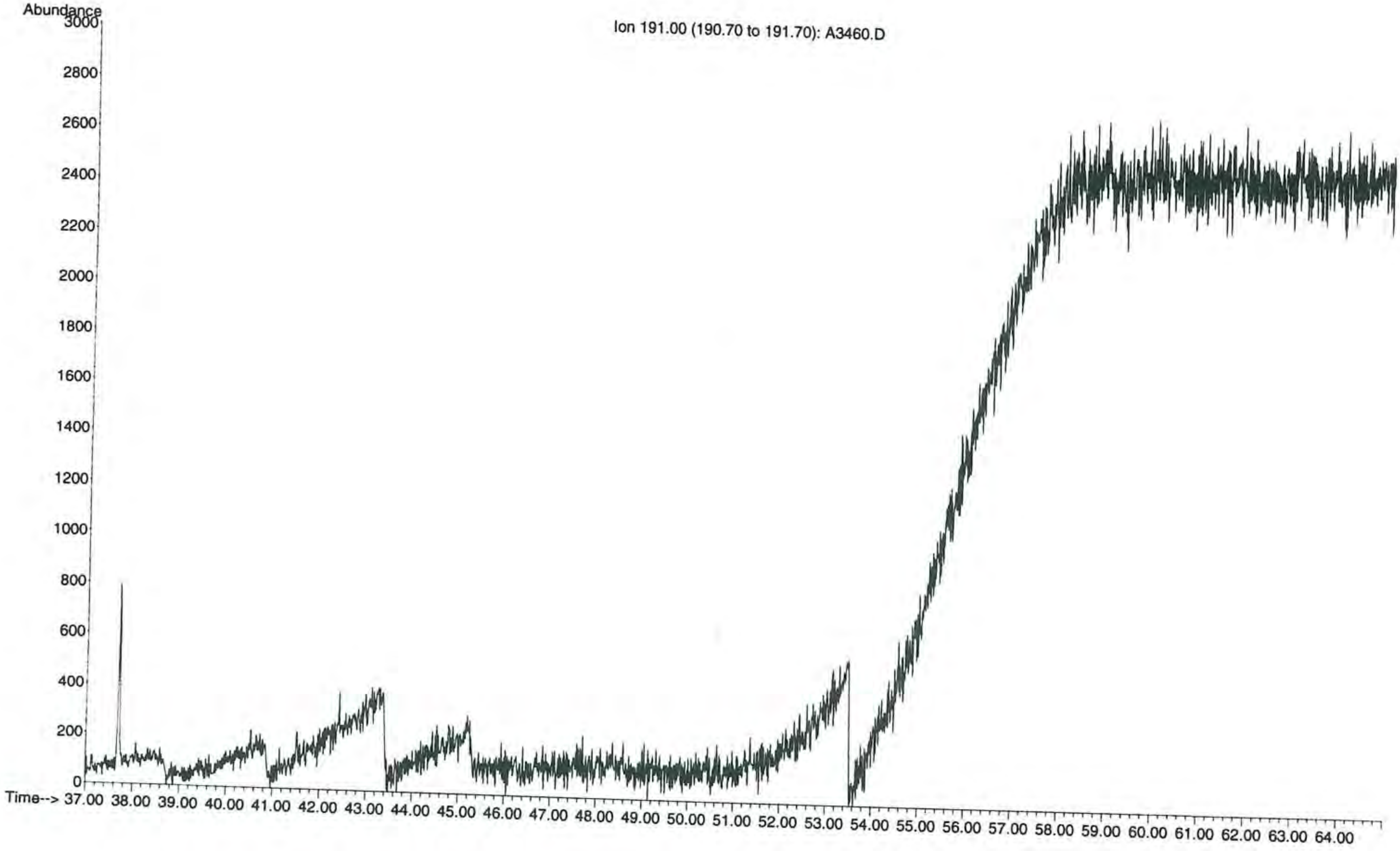

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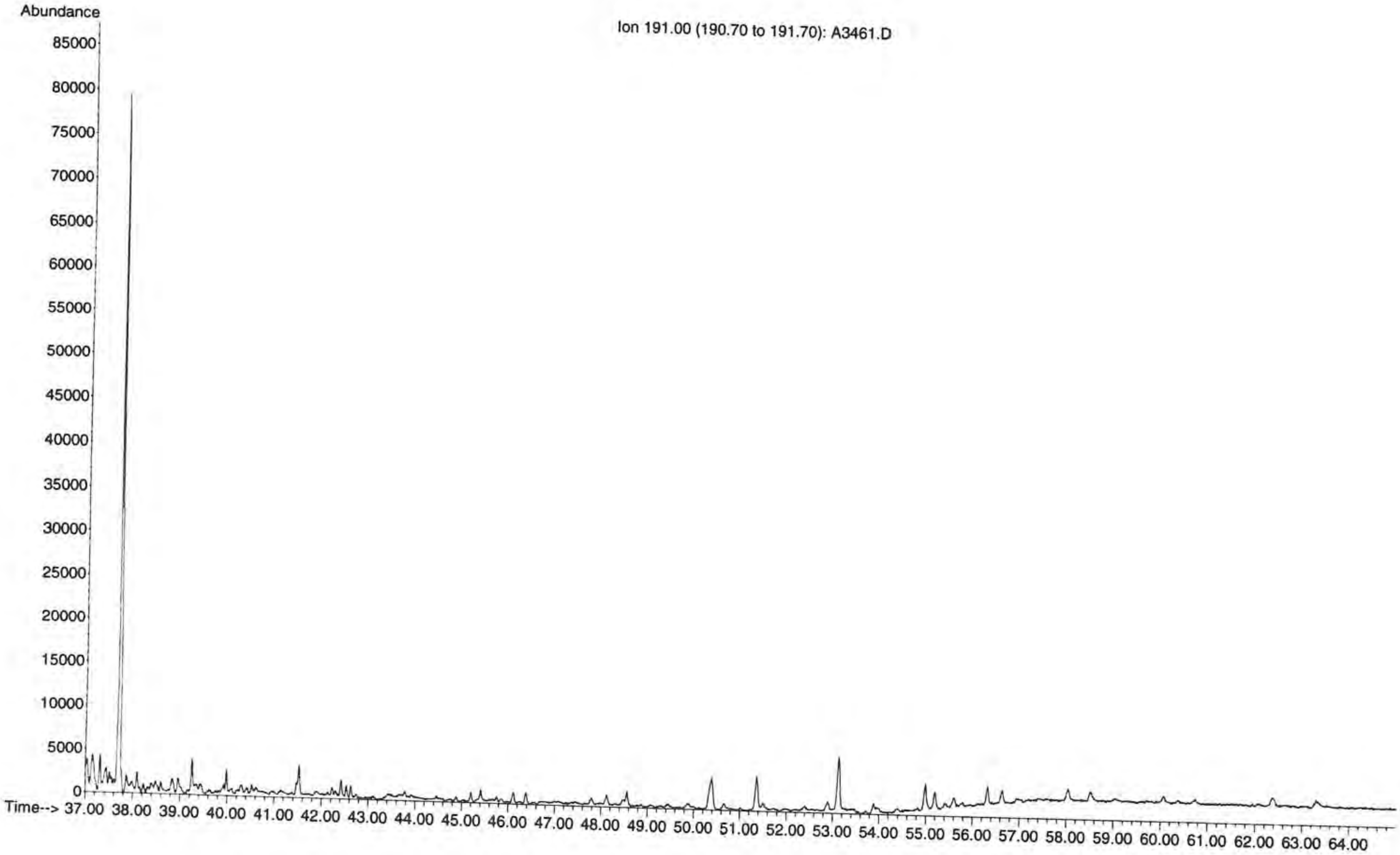
File        : G:\A\DATA\SA0618\A3461.D
Operator    : DPB
Acquired    : 14 Nov 2007   7:37 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0544-P1-MS(12)
Misc Info   : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 13
```



Ion 191.00 (190.70 to 191.70): A3461.D

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File         : G:\A\DATA\SA0618\A3462.D
Operator     : DPB
Acquired     : 14 Nov 2007   9:43 am using AcqMethod BIOPLUSN.M
Instrument   :   Inst. A
Sample Name: Q0544-P1-MS-D(13)
Misc Info    : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 14
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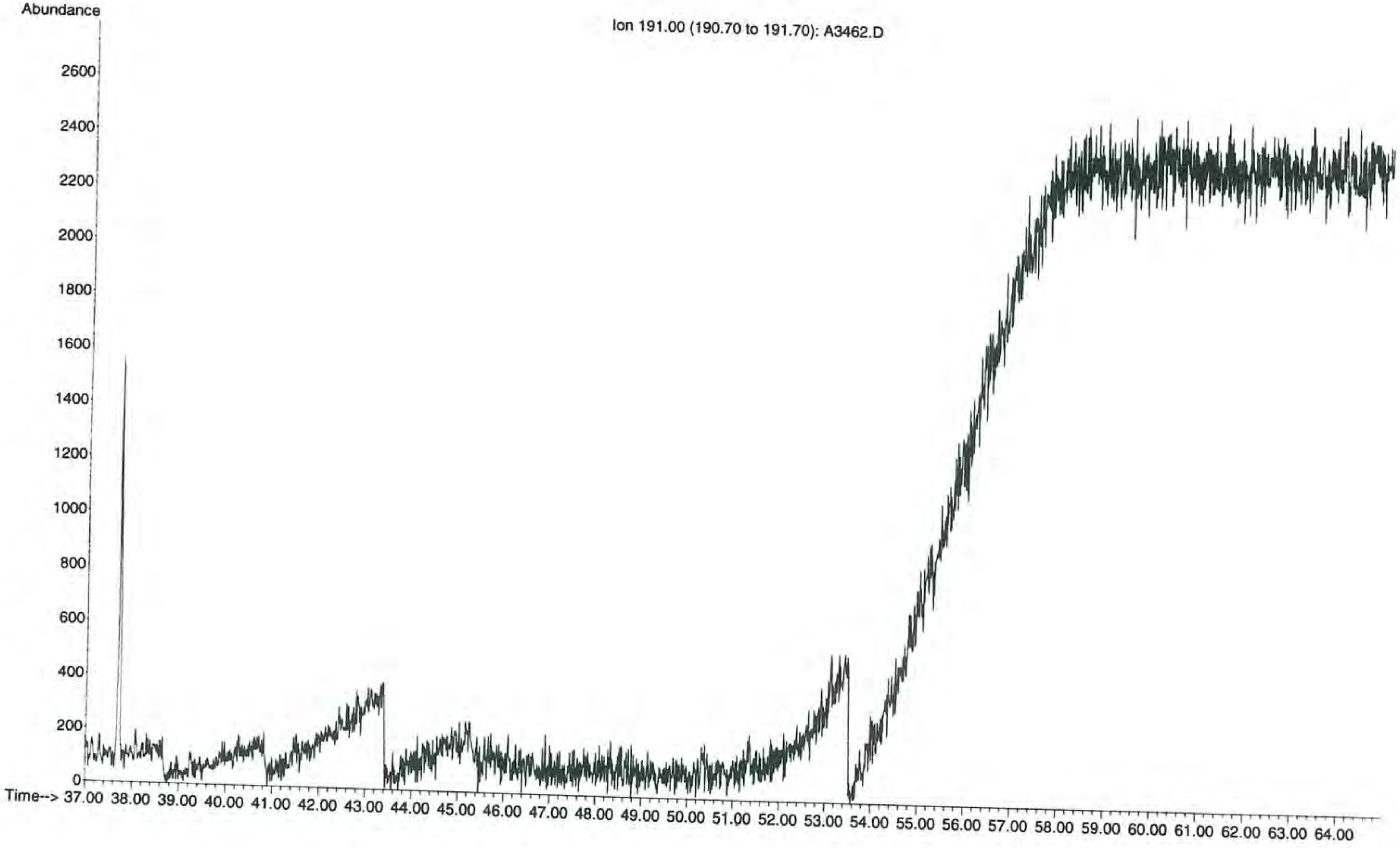

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Operator    : DPB
Acquired    : 13 Nov 2007   4:42 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL088NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0266
Vial Number: 2
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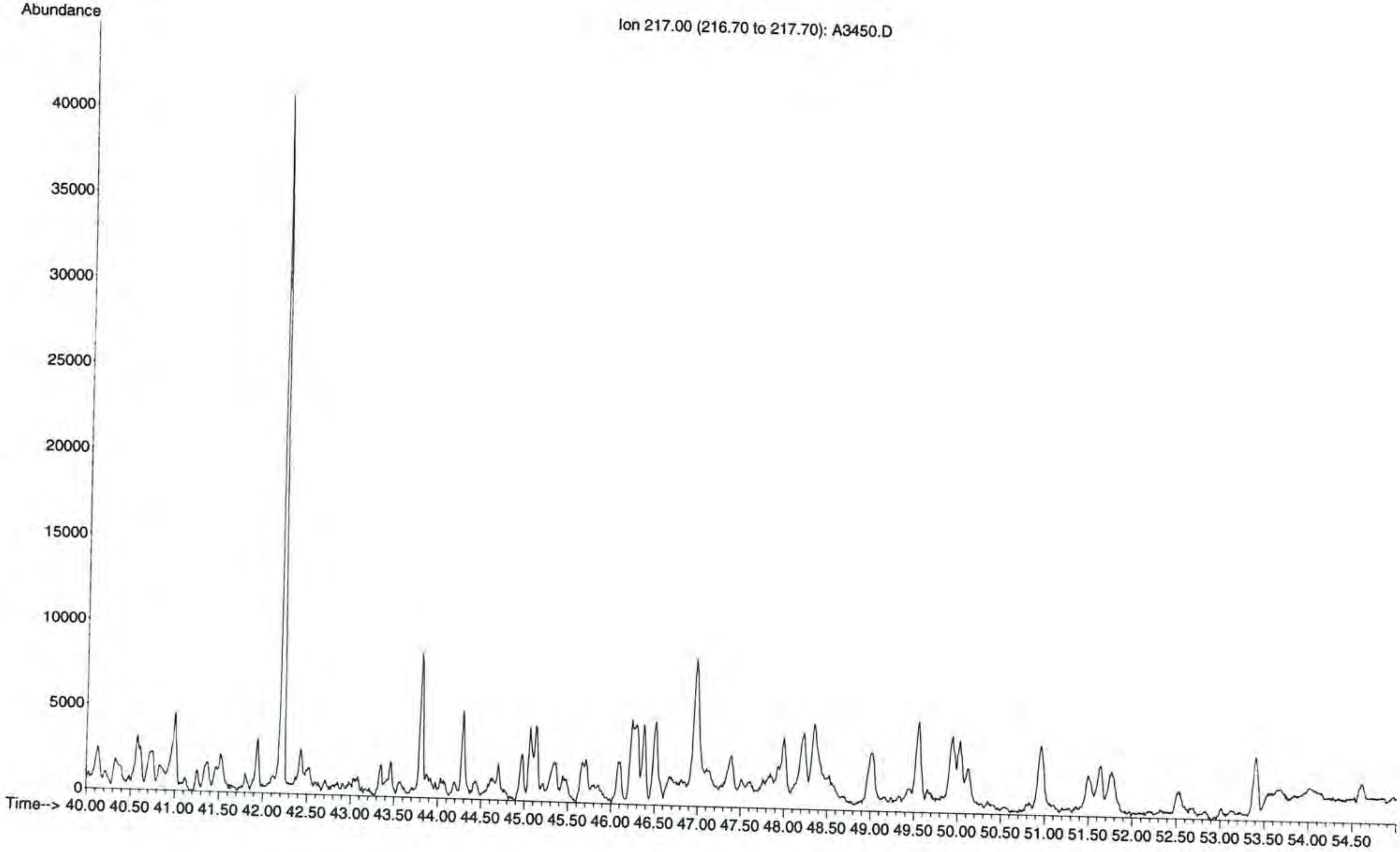

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Operator    : DPB
Acquired    : 13 Nov 2007   7:25 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL065PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0266
Vial Number: 4
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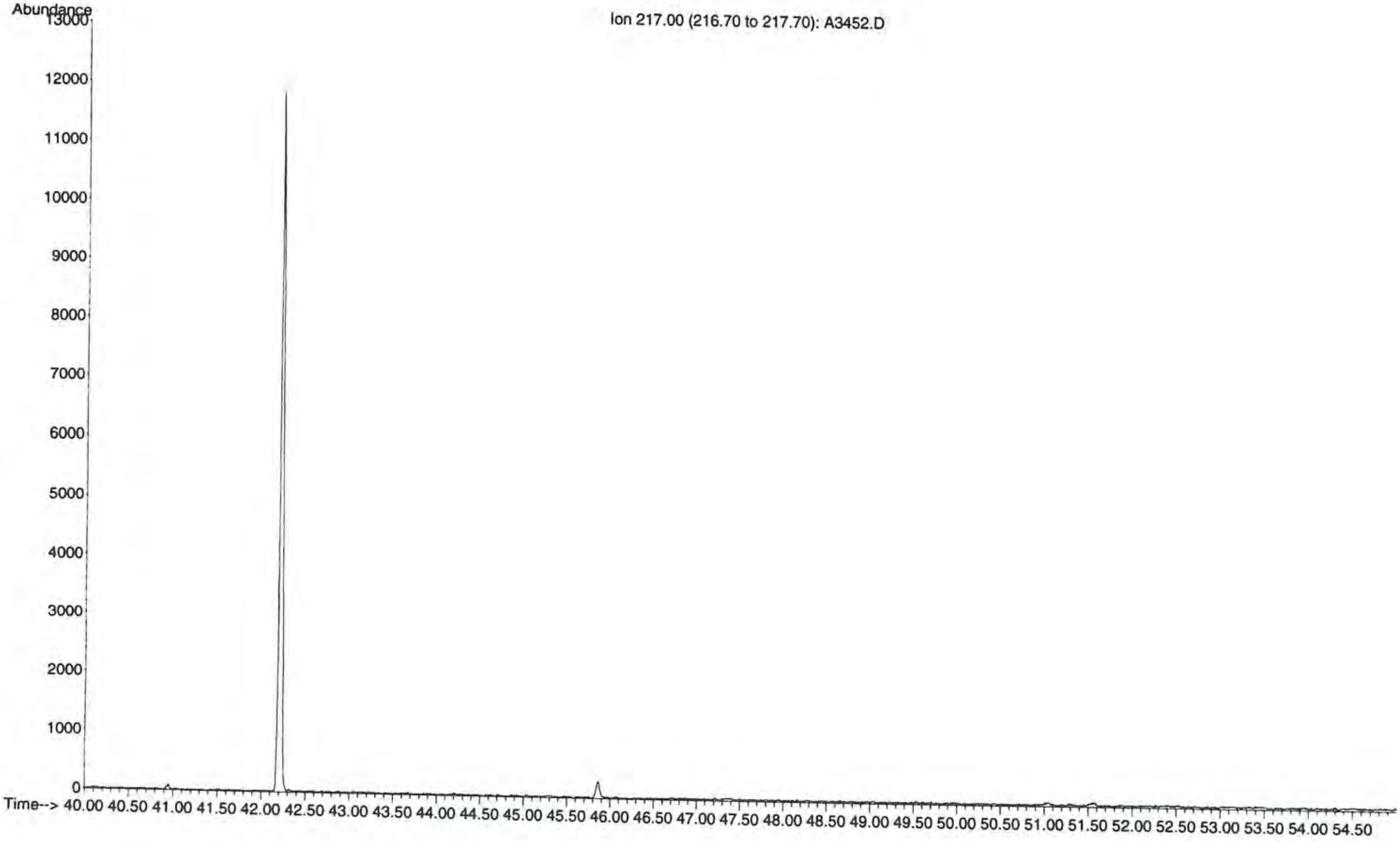

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Operator    : DPB
Acquired    : 13 Nov 2007   8:46 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL066LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0266
Vial Number: 5
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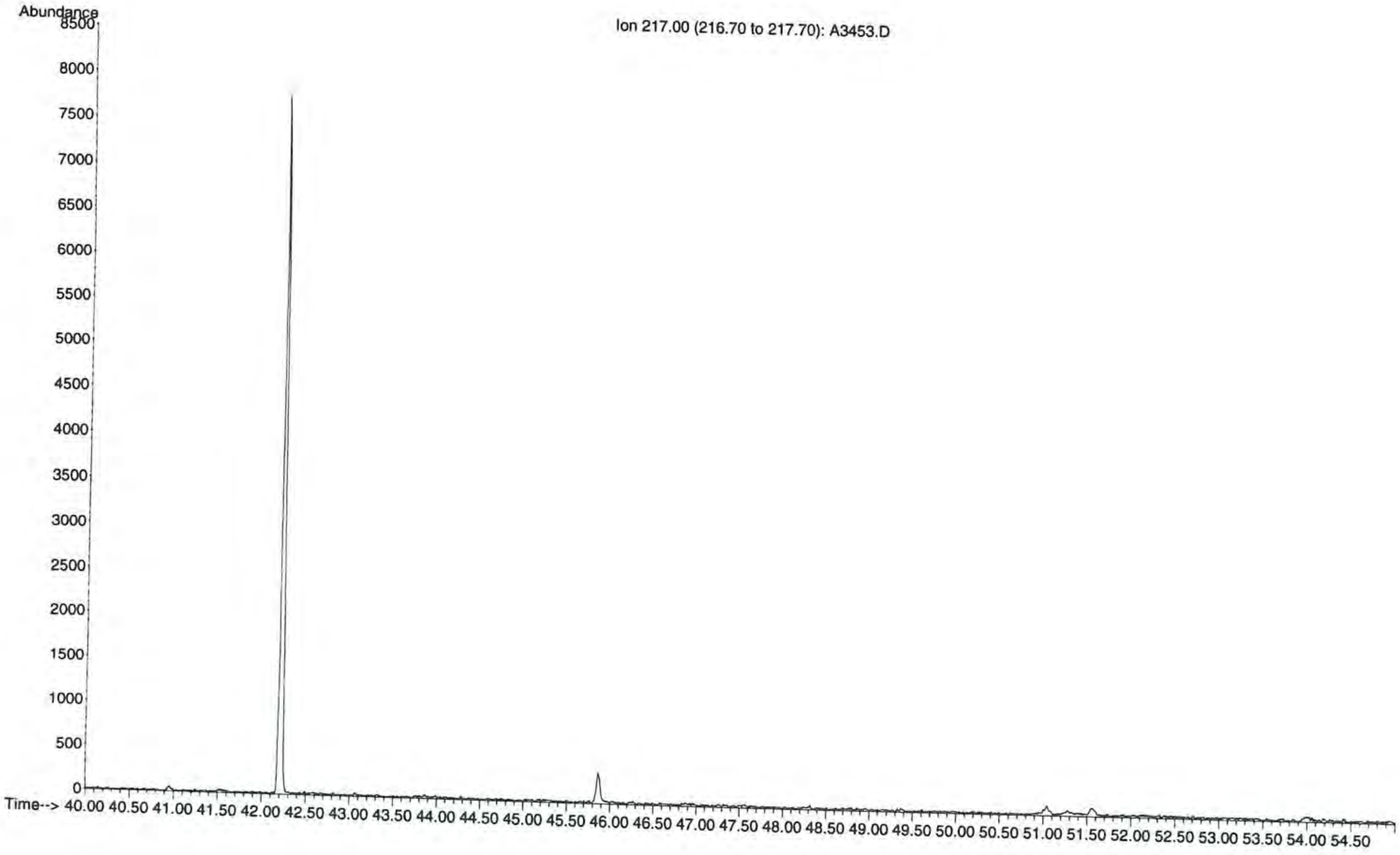
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```
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Operator    : DPB
Acquired    : 13 Nov 2007  10:08 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0546-P1-MS(9)
Misc Info   : GP-9 7-8 5-157 07-0266
Vial Number: 6
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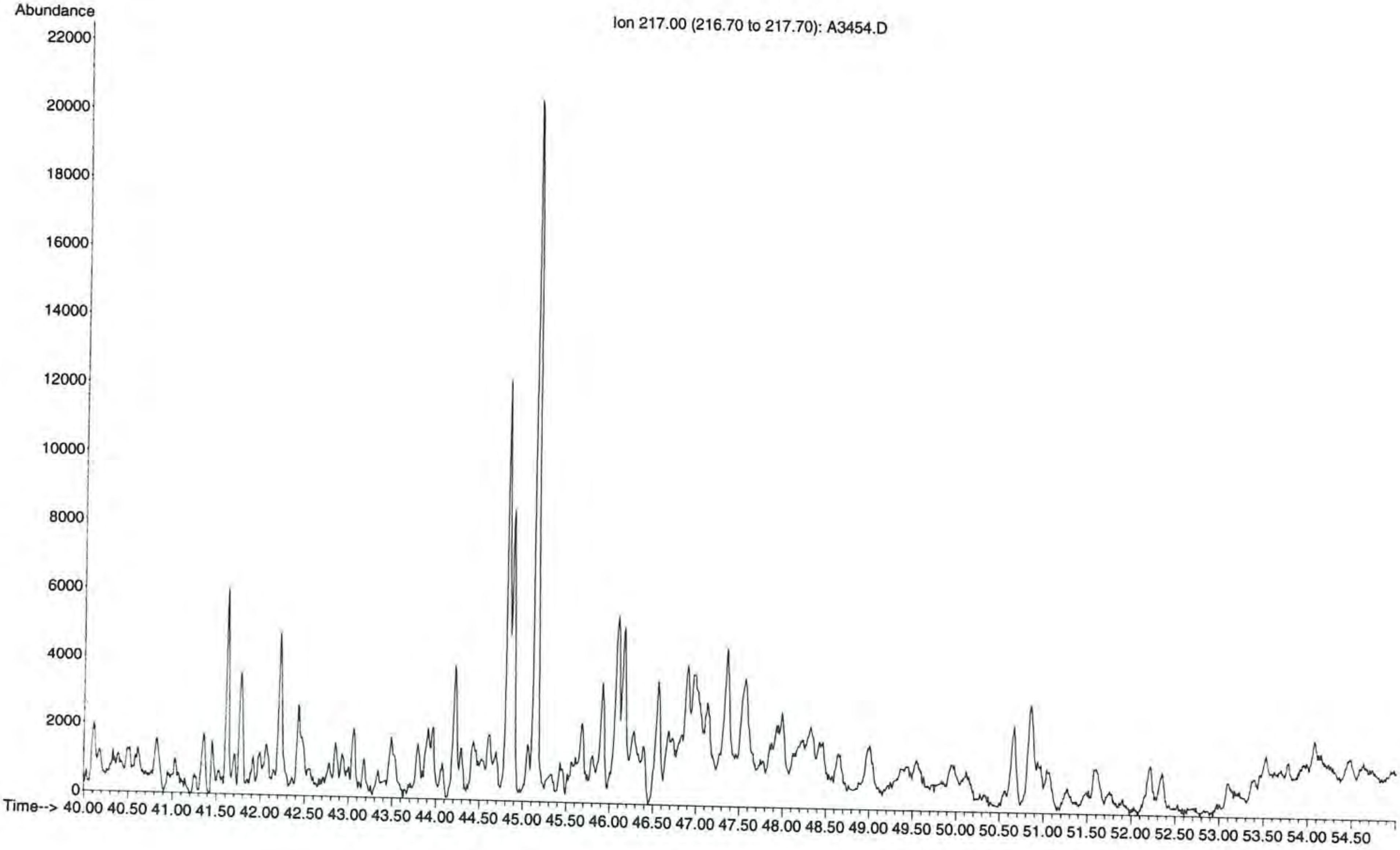

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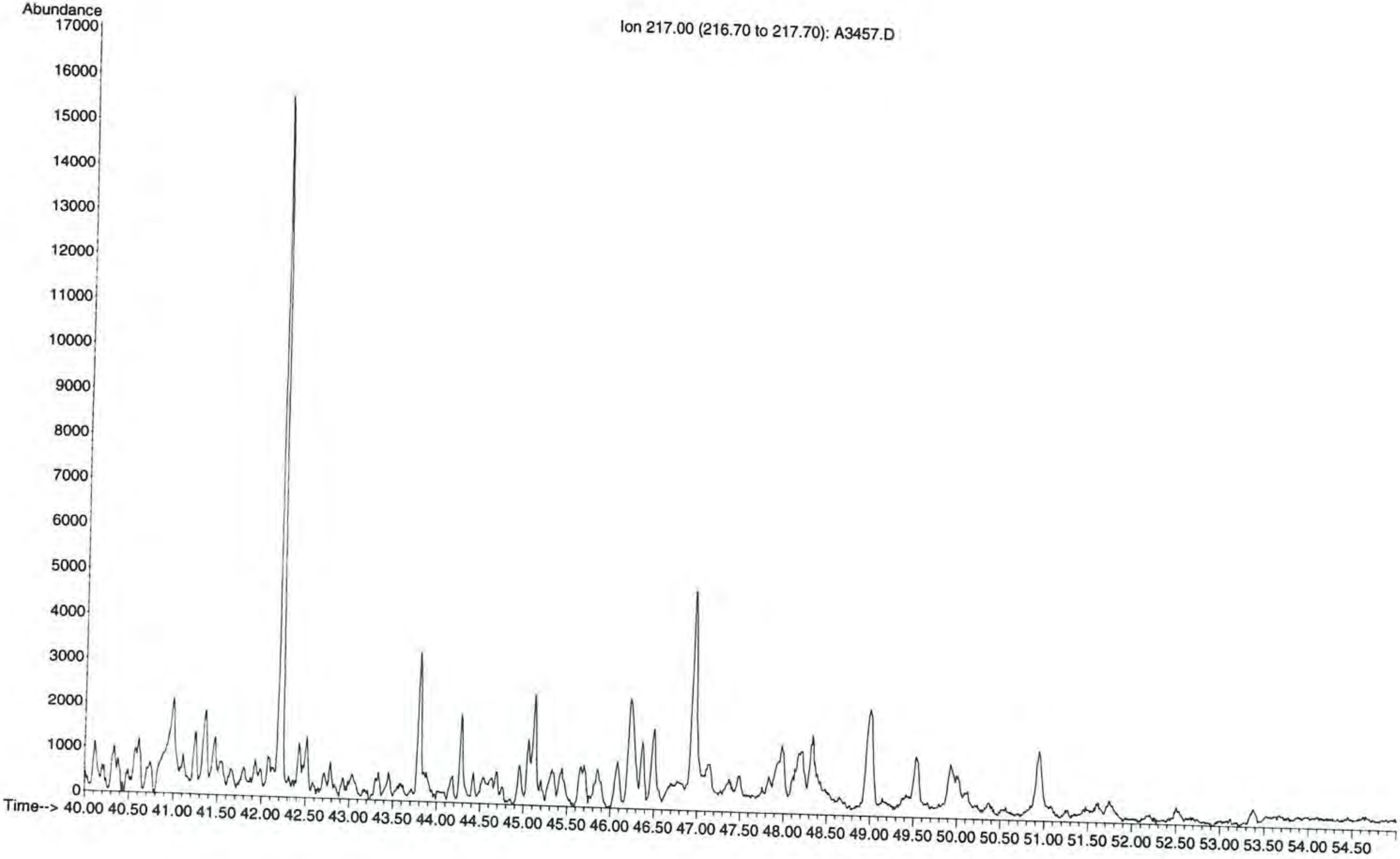
Operator    : DPB
Acquired    : 14 Nov 2007   2:13 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0542-P1-MS(12)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 9
```



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File        : G:\A\DATA\SA0618\A3458.D
Operator    : DPB
Acquired    : 14 Nov 2007   3:34 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0542-P1-MS-D(13)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 10
```

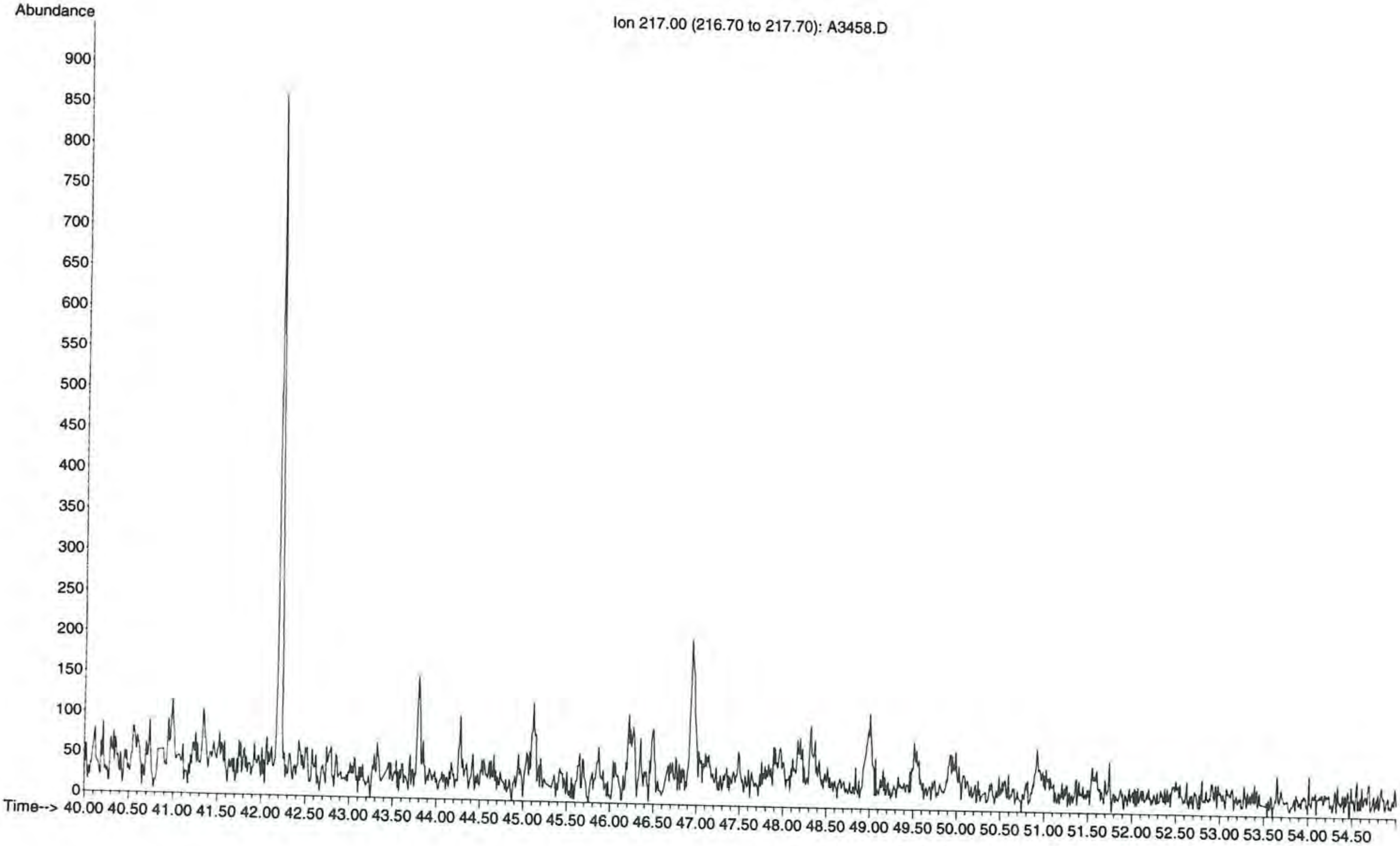

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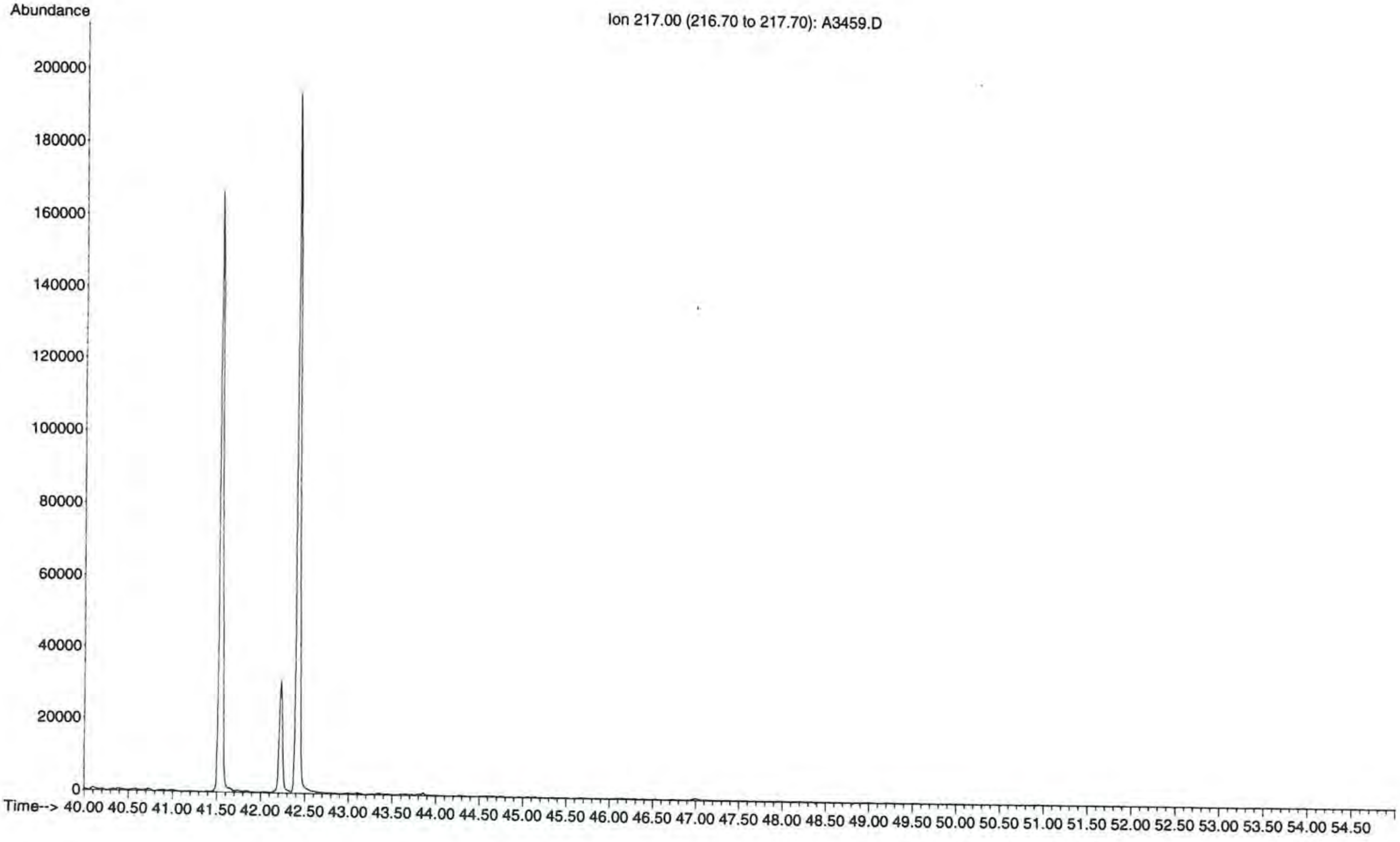
Operator    : DPB
Acquired    : 14 Nov 2007   4:55 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0543-P1-MS(16)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 11
```



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File        : G:\A\DATA\SA0618\A3460.D
Operator    : DPB
Acquired    : 14 Nov 2007   6:16 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0543-P1-MS-D(17)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 12
```
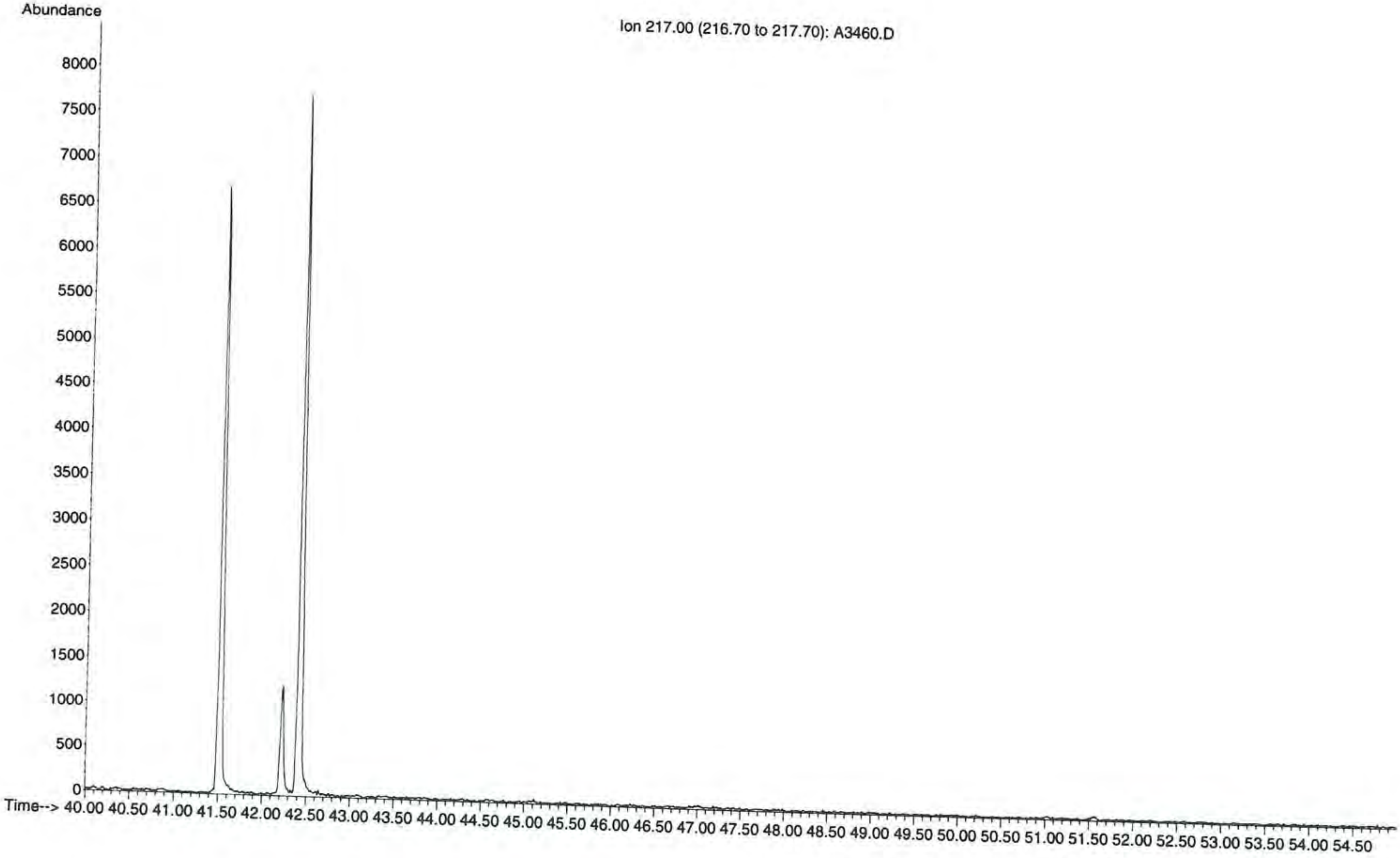
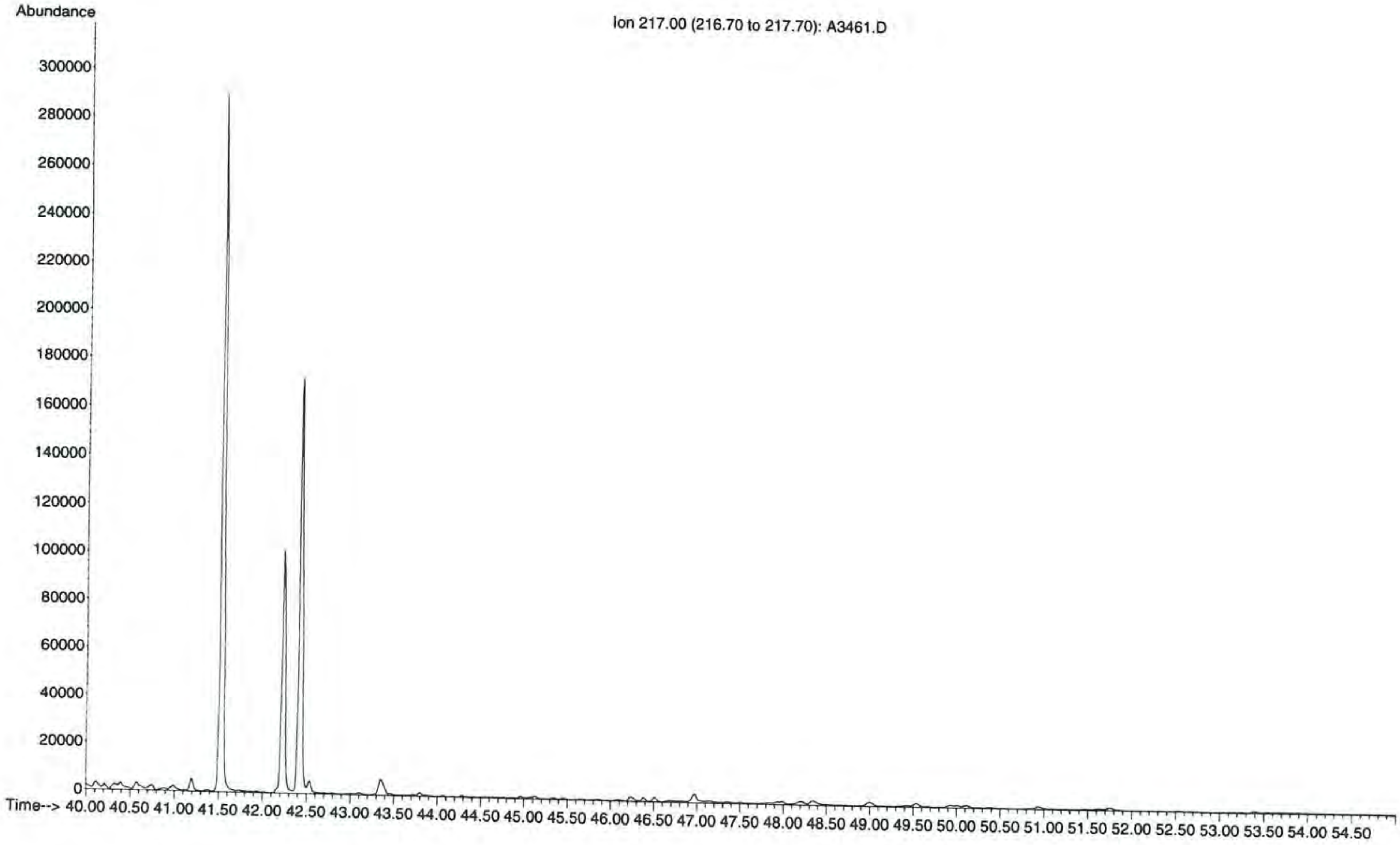
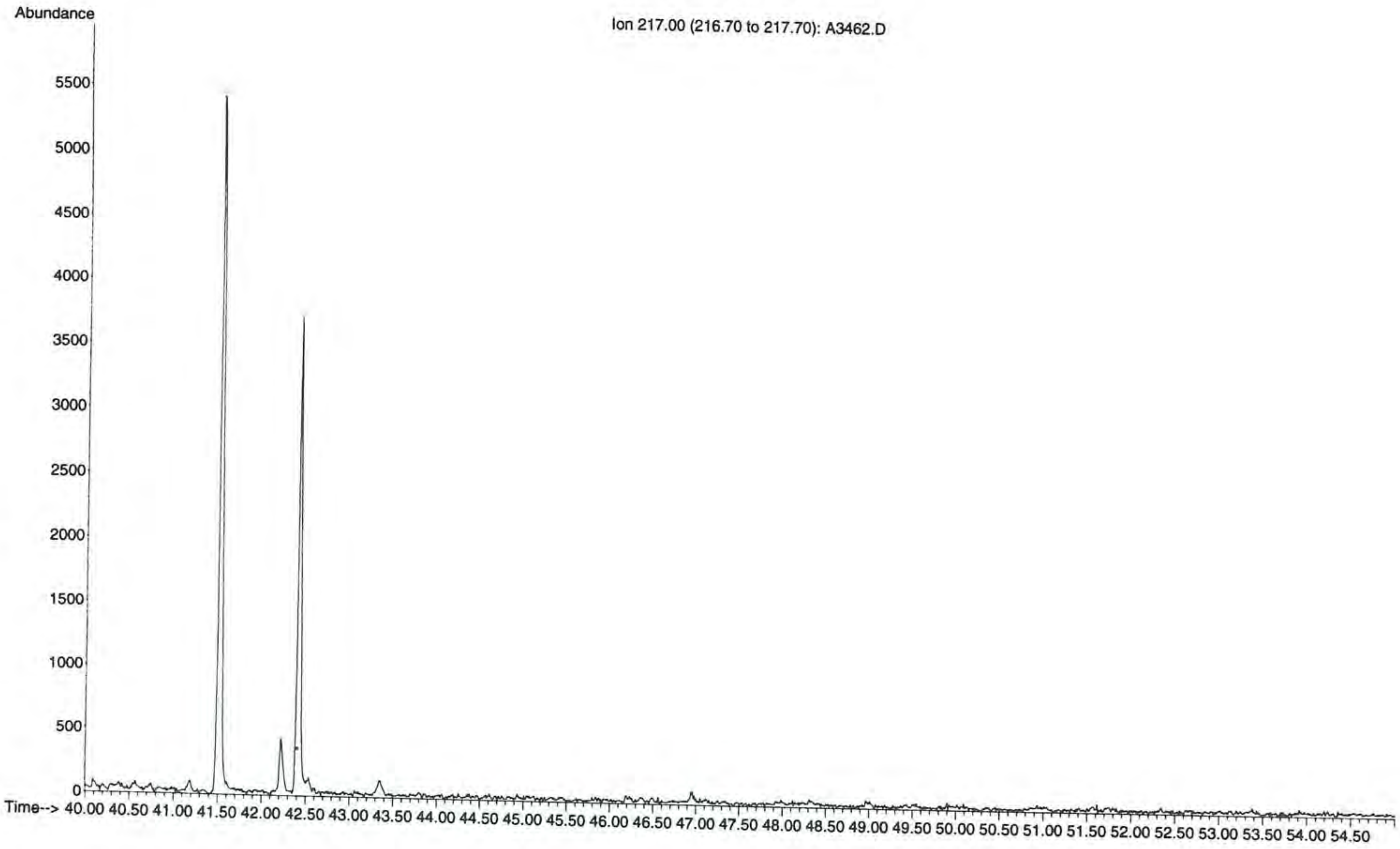


Ion 217.00 (216.70 to 217.70): A3460.D

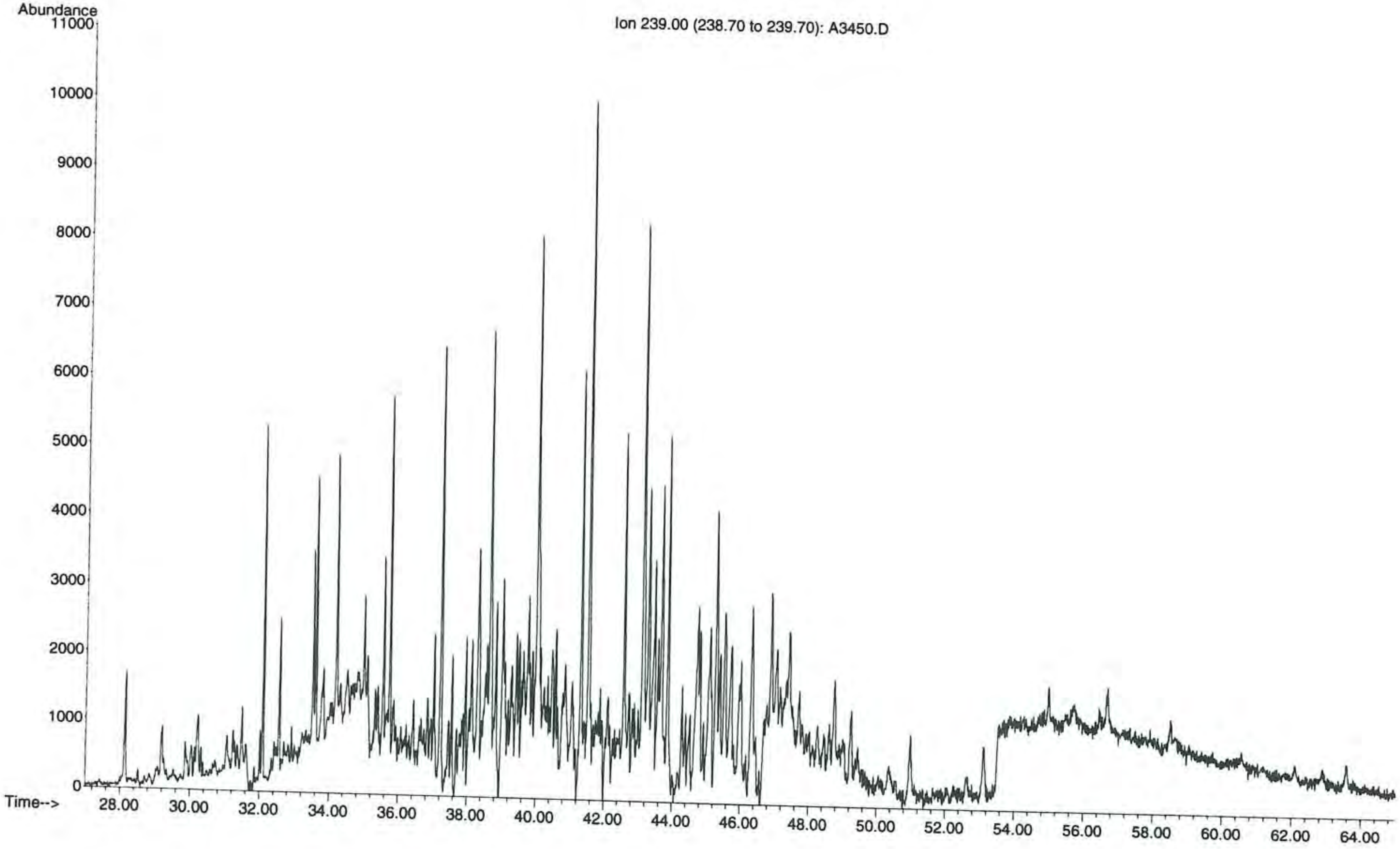
```
File        : G:\A\DATA\SA0618\A3461.D
Operator    : DPB
Acquired    : 14 Nov 2007   7:37 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0544-P1-MS(12)
Misc Info   : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 13
```



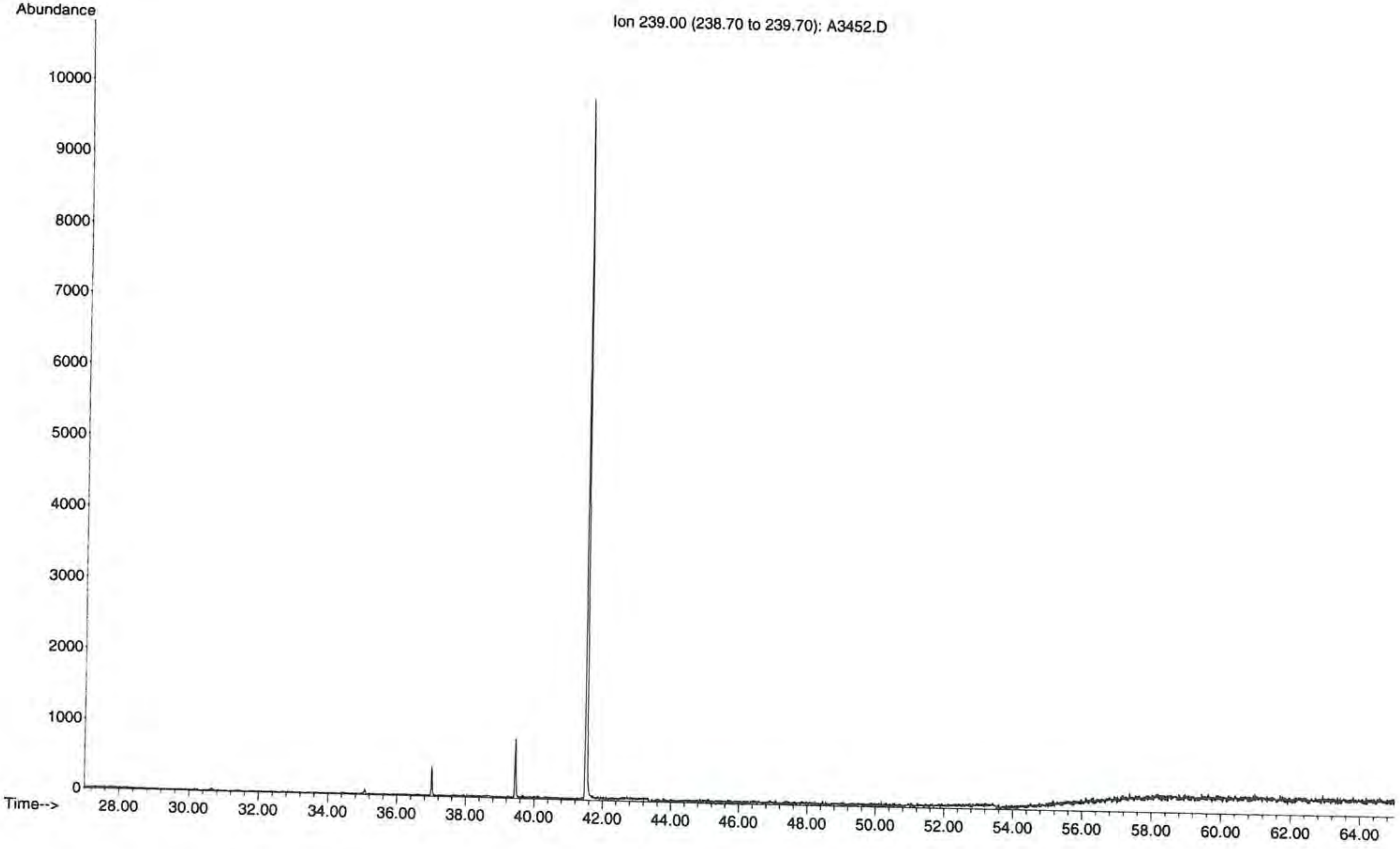
```
File         : G:\A\DATA\SA0618\A3462.D
Operator     : DPB
Acquired     : 14 Nov 2007   9:43 am using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: Q0544-P1-MS-D(13)
Misc Info    : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 14
```



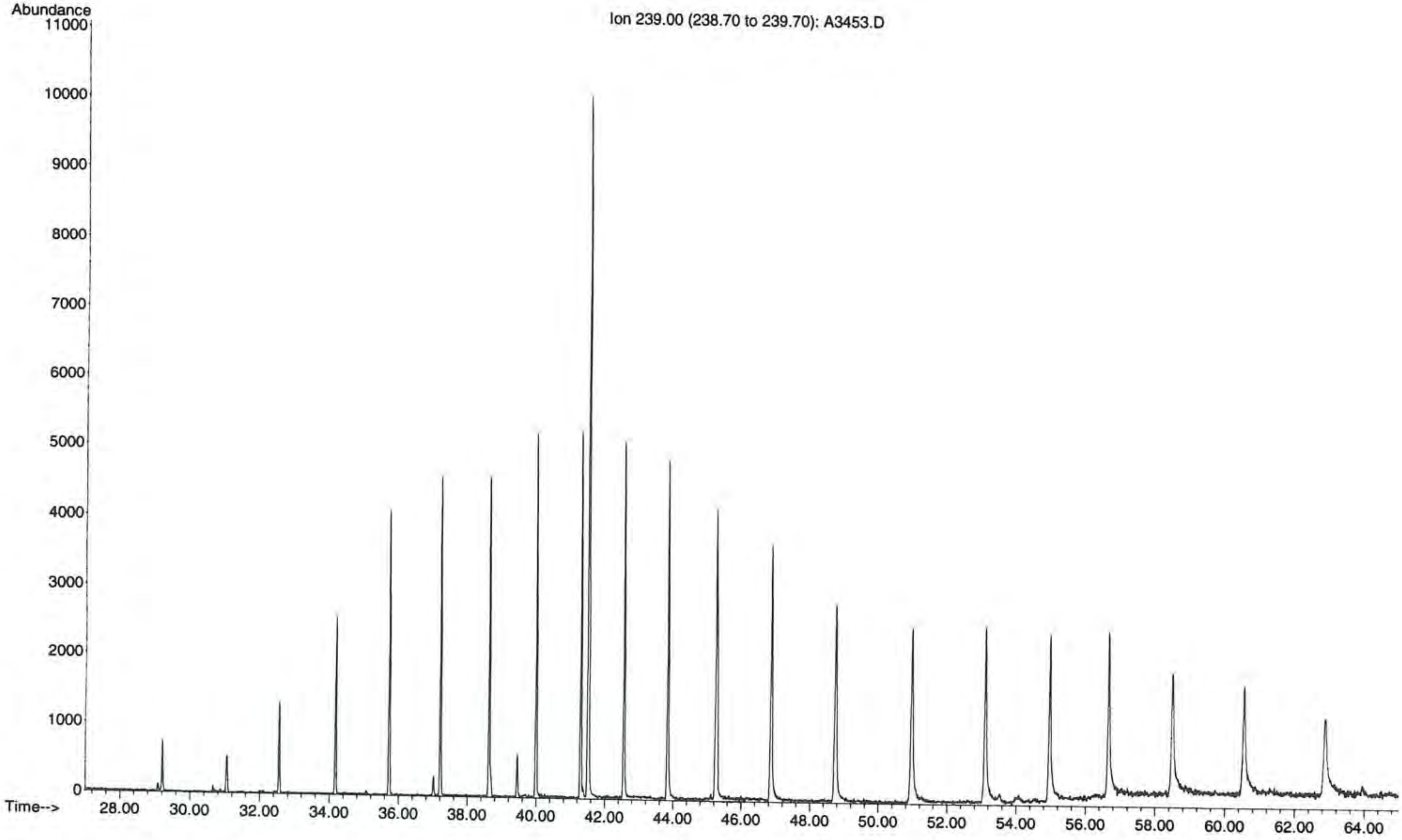
```
File        : G:\A\DATA\SA0618\A3450.D
Operator    : DPB
Acquired    : 13 Nov 2007   4:42 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL088NSC-P(0)
Misc Info   : North Slope Crude 5-157 07-0266
Vial Number: 2
```



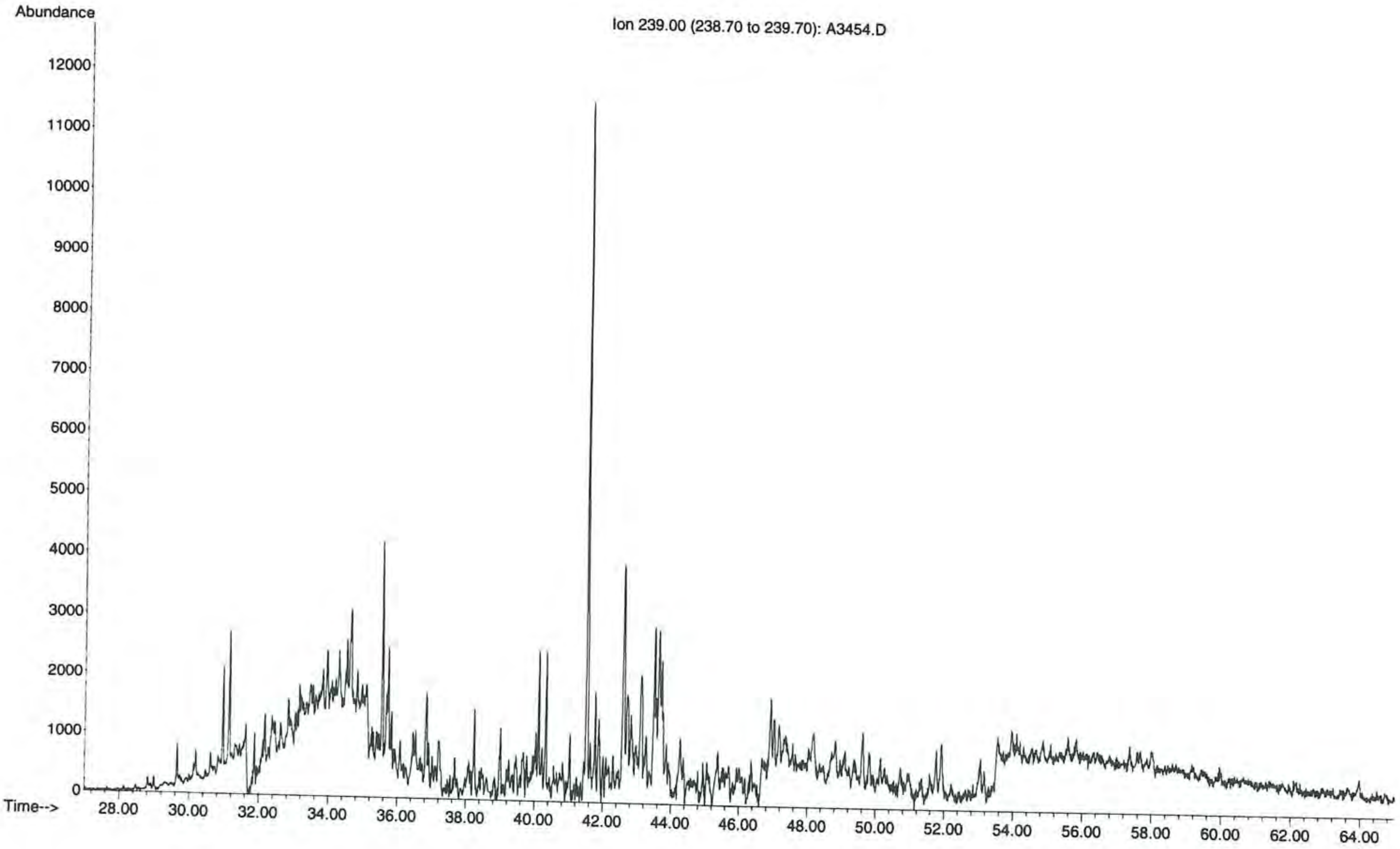
```
File        : G:\A\DATA\SA0618\A3452.D
Operator    : DPB
Acquired    : 13 Nov 2007   7:25 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL065PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0266
Vial Number: 4
```



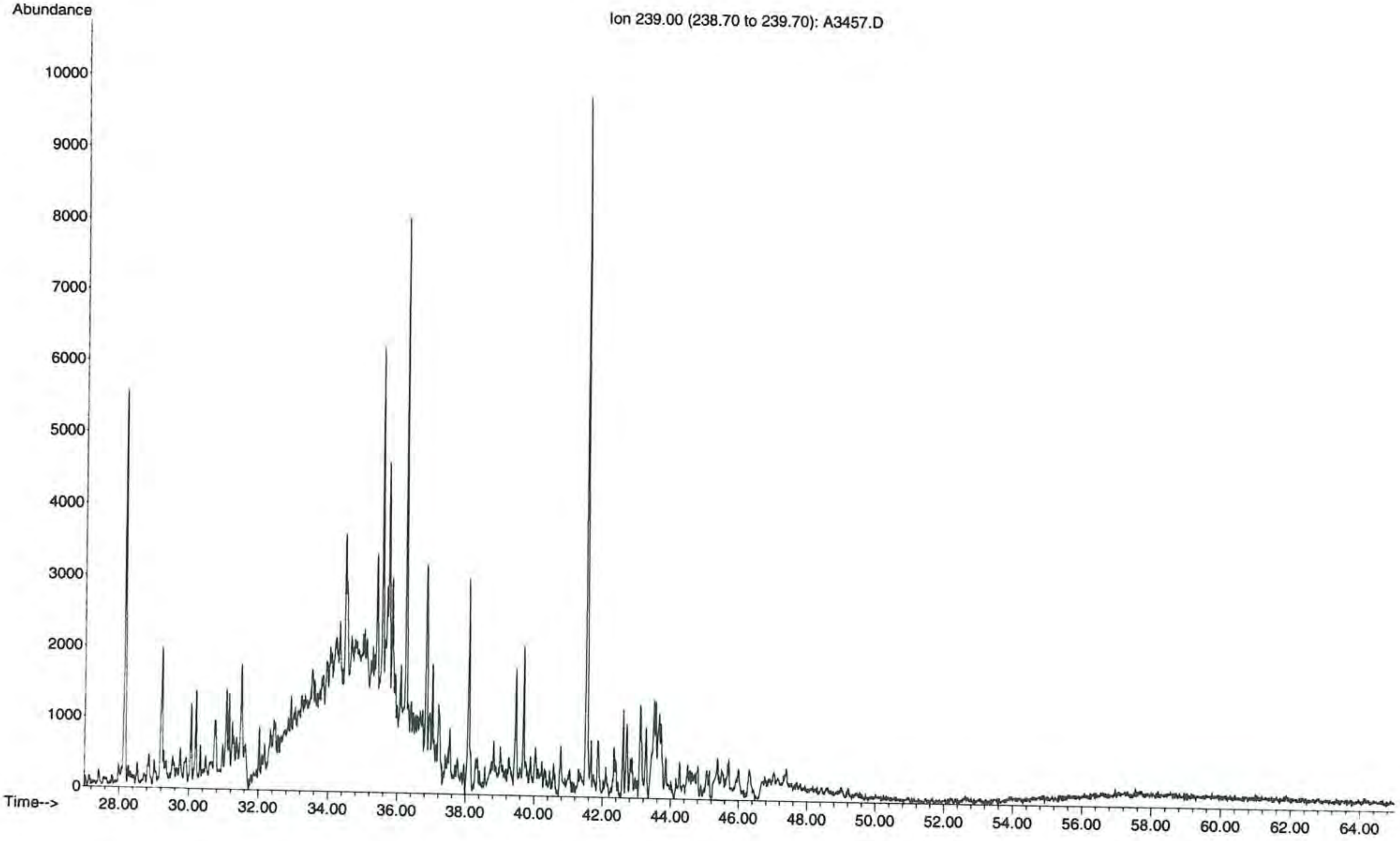
```
File        : G:\A\DATA\SA0618\A3453.D
Operator    : DPB
Acquired    : 13 Nov 2007   8:46 pm using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: BL066LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0266
Vial Number: 5
```



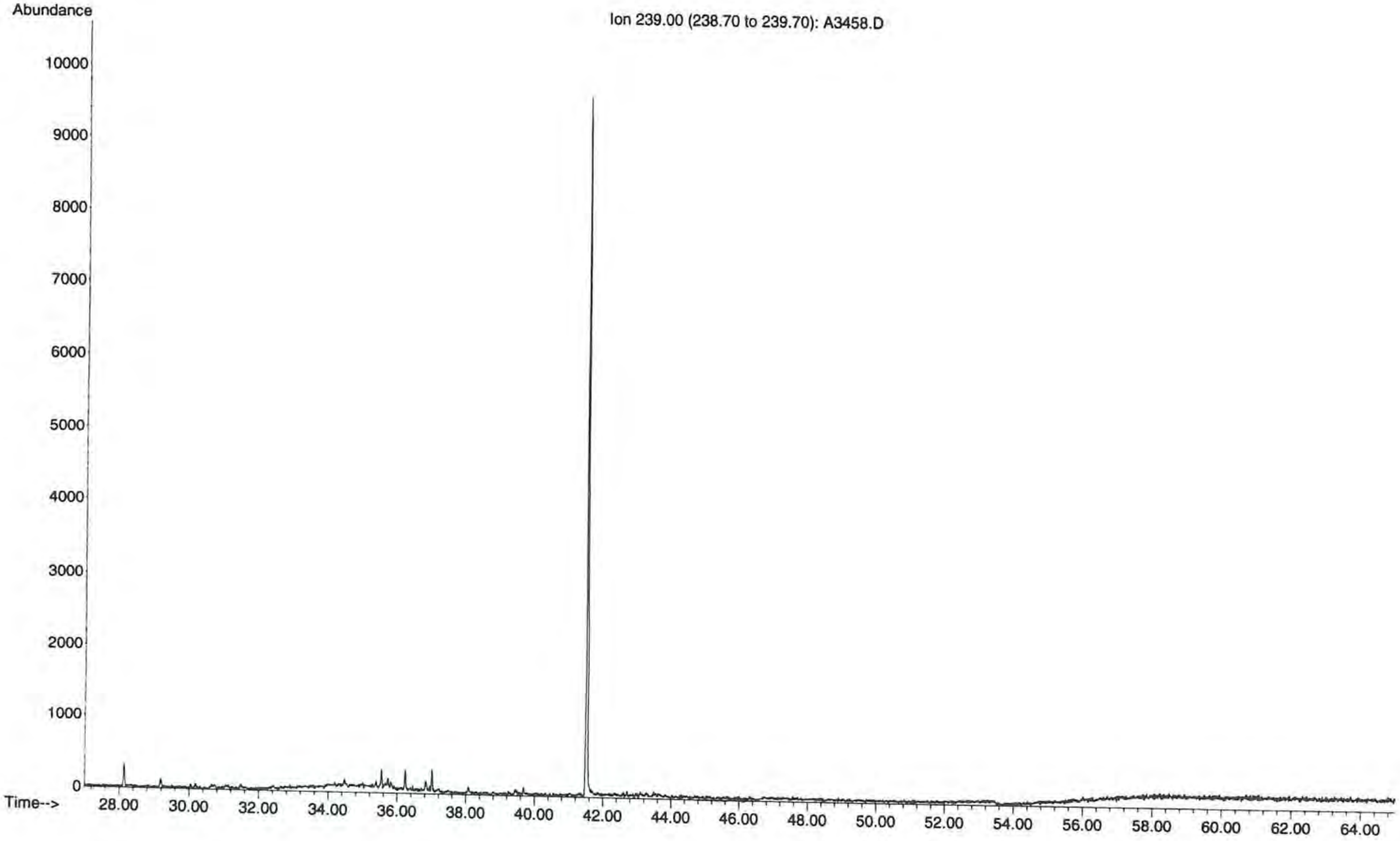
```
File        : G:\A\DATA\SA0618\A3454.D
Operator    : DPB
Acquired    : 13 Nov 2007  10:08 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0546-P1-MS(9)
Misc Info   : GP-9 7-8 5-157 07-0266
Vial Number: 6
```



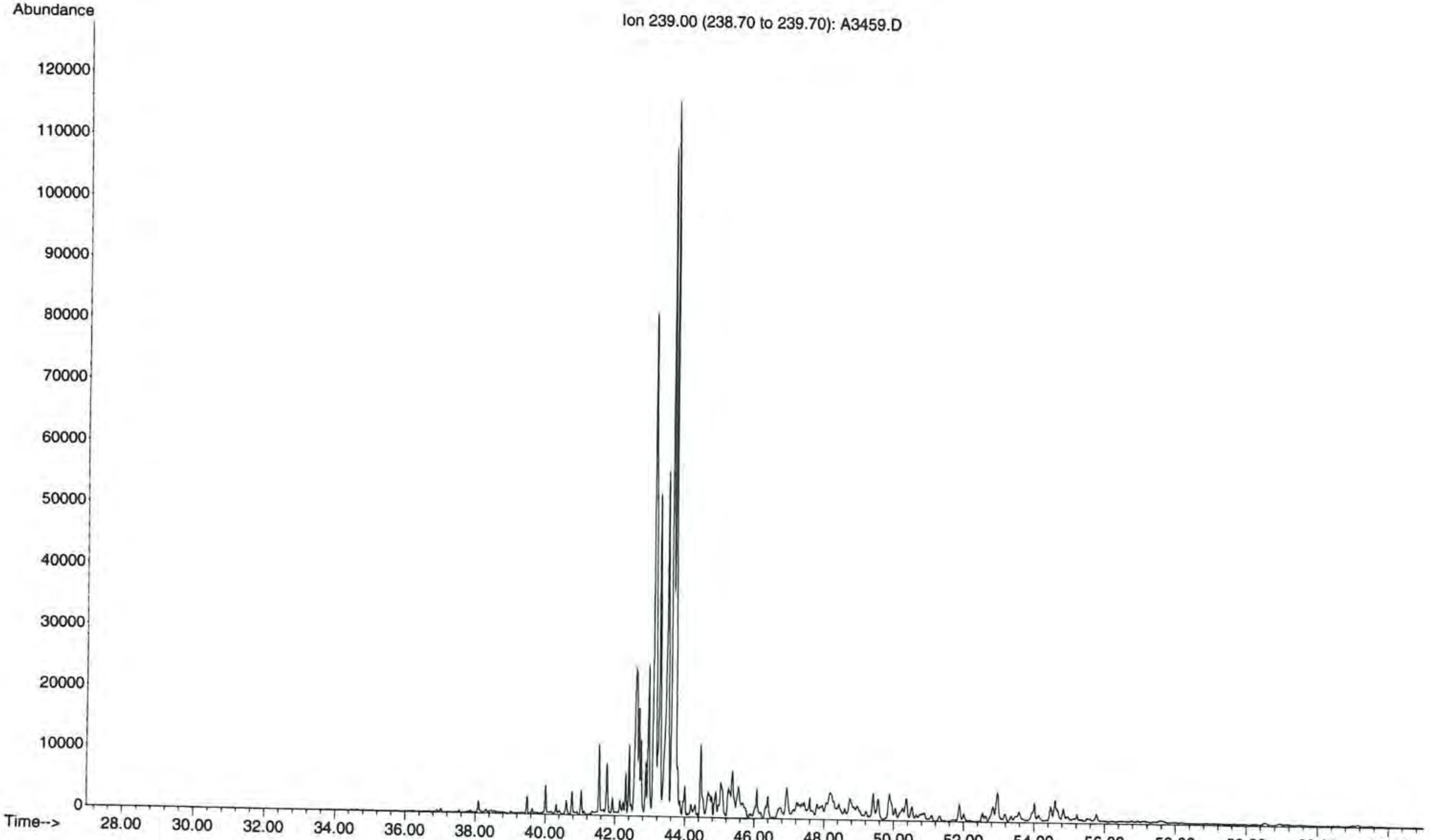
```
File        : G:\A\DATA\SA0618\A3457.D
Operator    : DPB
Acquired    : 14 Nov 2007   2:13 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0542-P1-MS(12)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 9
```



```
File        : G:\A\DATA\SA0618\A3458.D
Operator    : DPB
Acquired    : 14 Nov 2007   3:34 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0542-P1-MS-D(13)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 10
```



```
File        : G:\A\DATA\SA0618\A3459.D
Operator    : DPB
Acquired    : 14 Nov 2007   4:55 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0543-P1-MS(16)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 11
```



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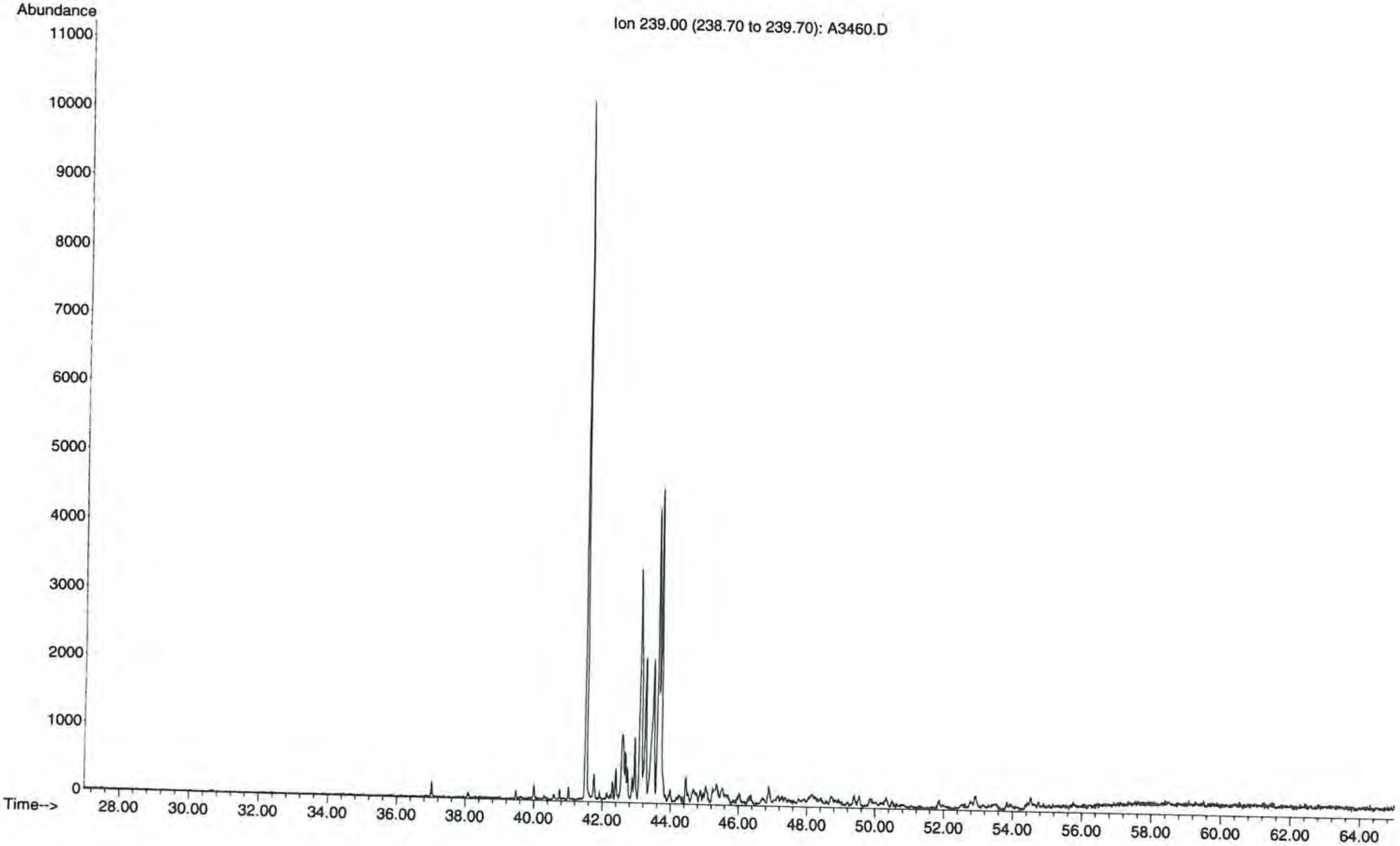
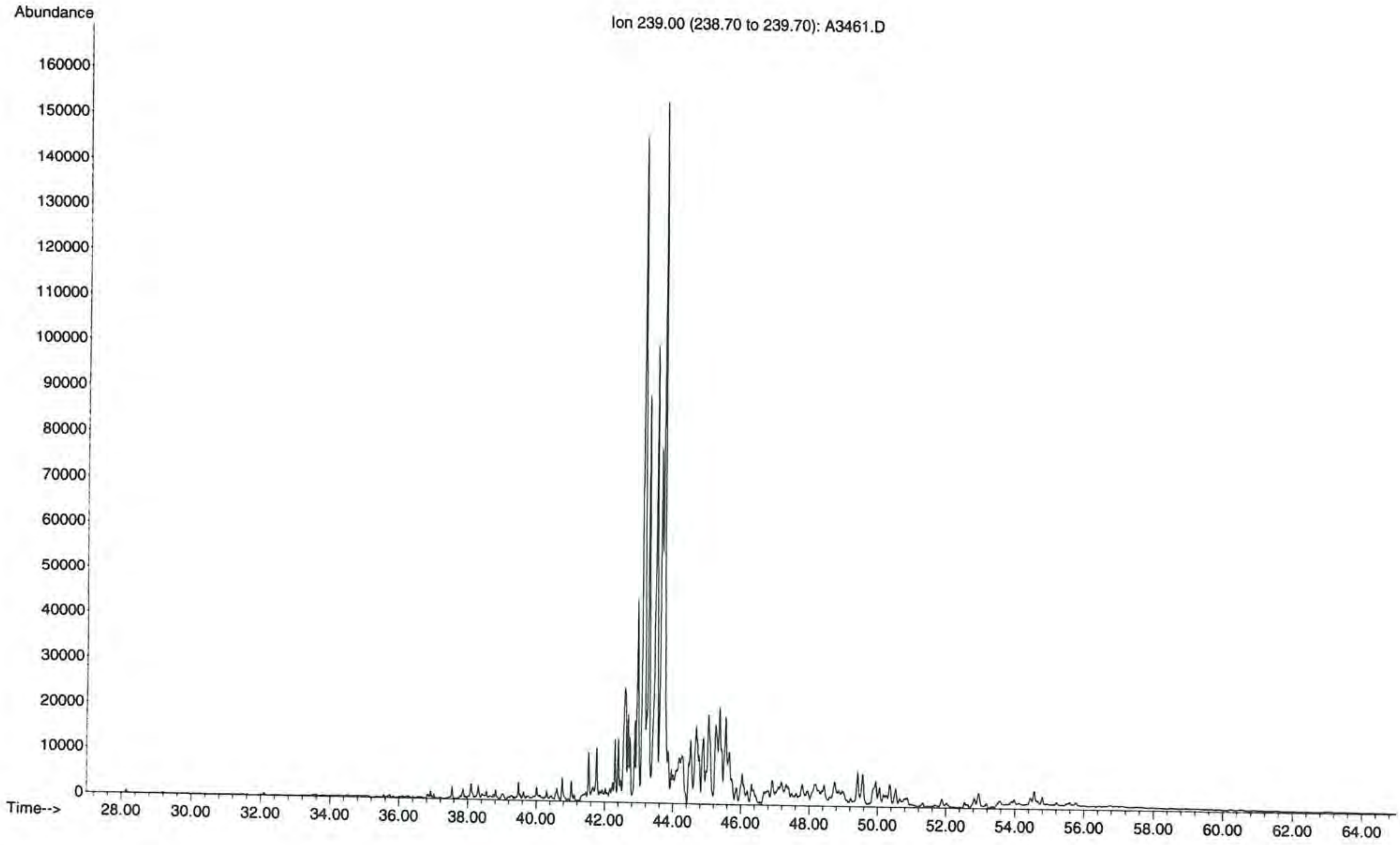
File        : G:\A\DATA\SA0618\A3460.D
Operator    : DPB
Acquired    : 14 Nov 2007   6:16 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0543-P1-MS-D(17)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 12
```



```
File        : G:\A\DATA\SA0618\A3461.D
Operator    : DPB
Acquired    : 14 Nov 2007   7:37 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0544-P1-MS(12)
Misc Info   : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 13
```



```
File        : G:\A\DATA\SA0618\A3462.D
Operator    : DPB
Acquired    : 14 Nov 2007   9:43 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0544-P1-MS-D(13)
Misc Info   : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 14
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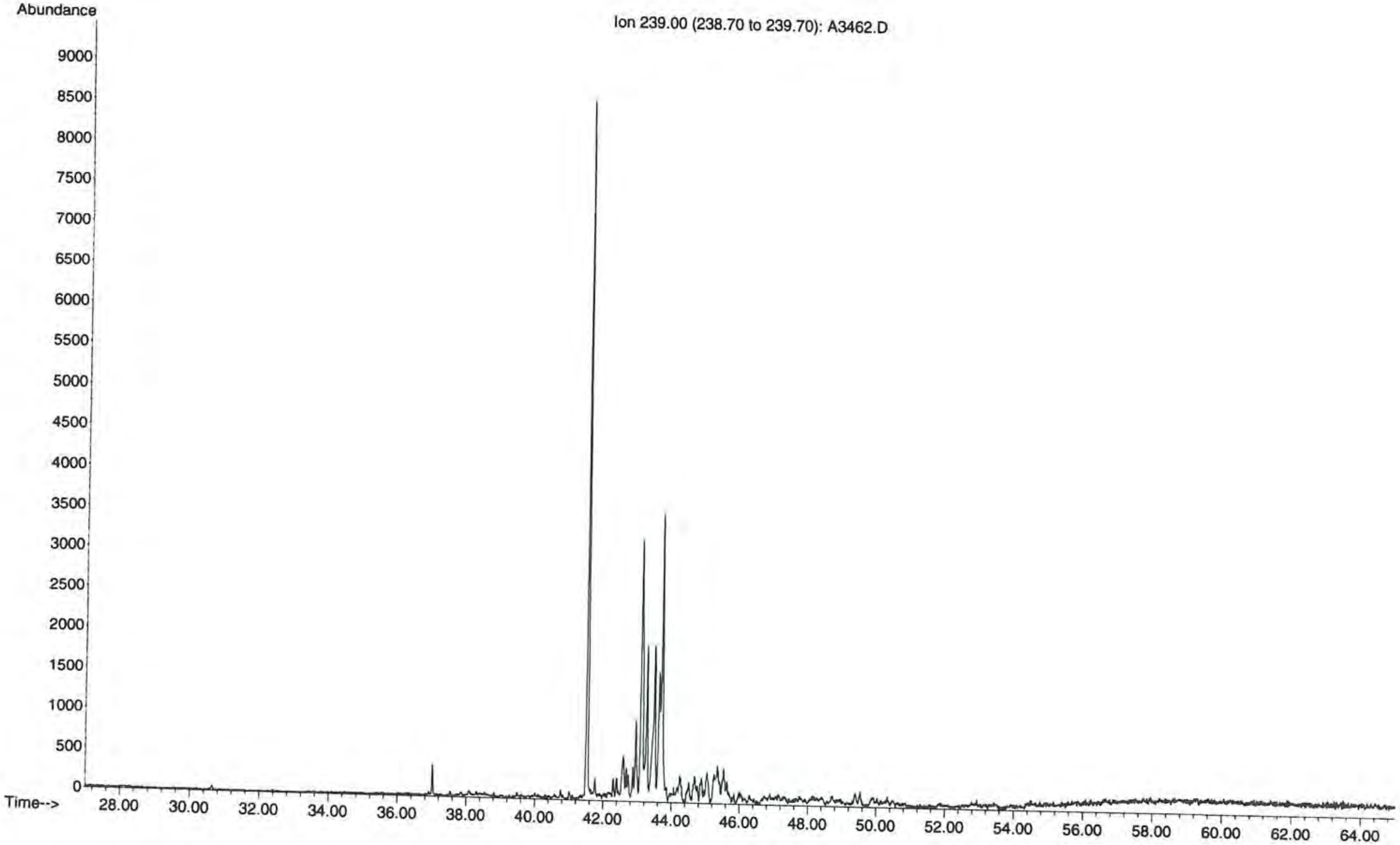
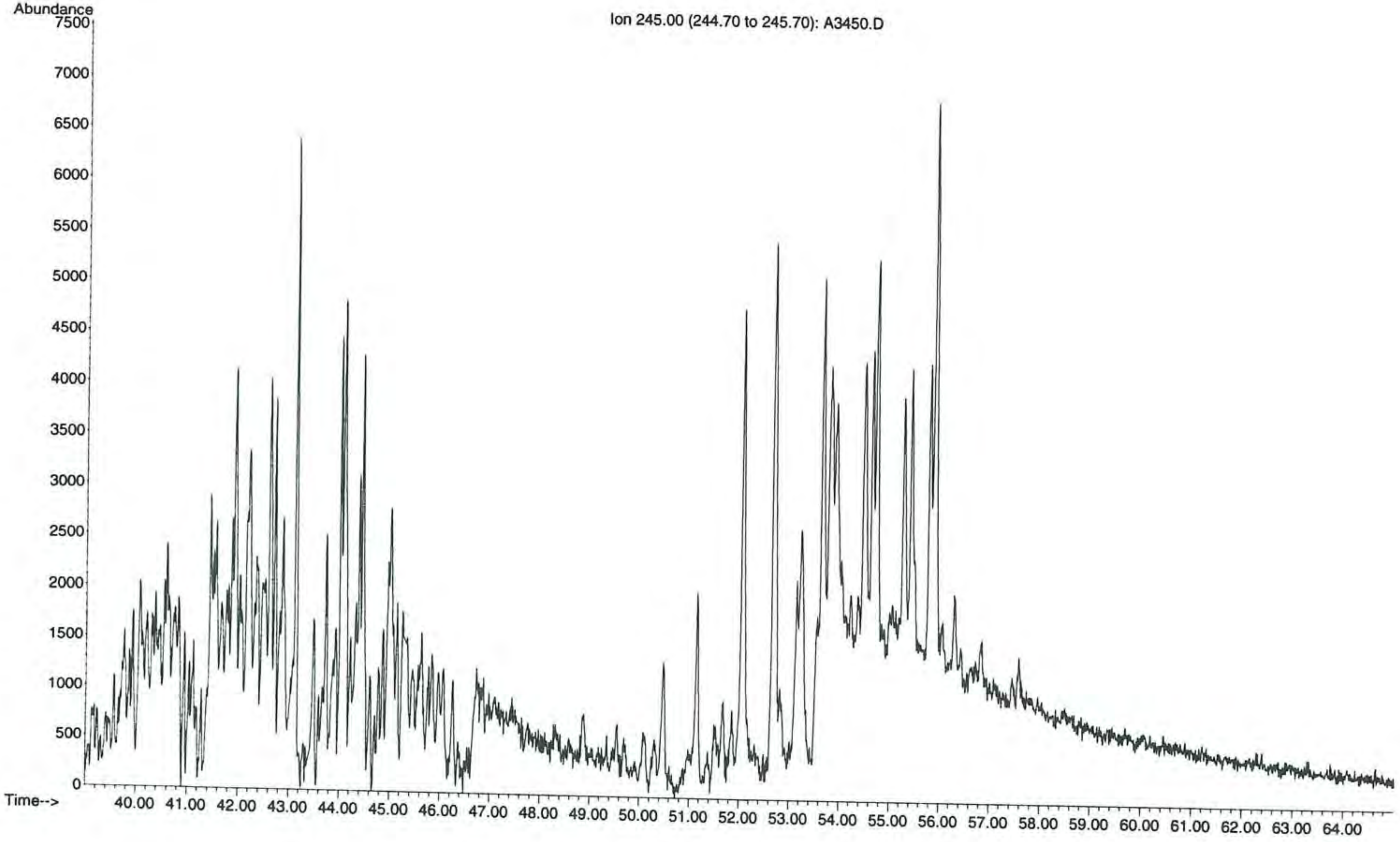
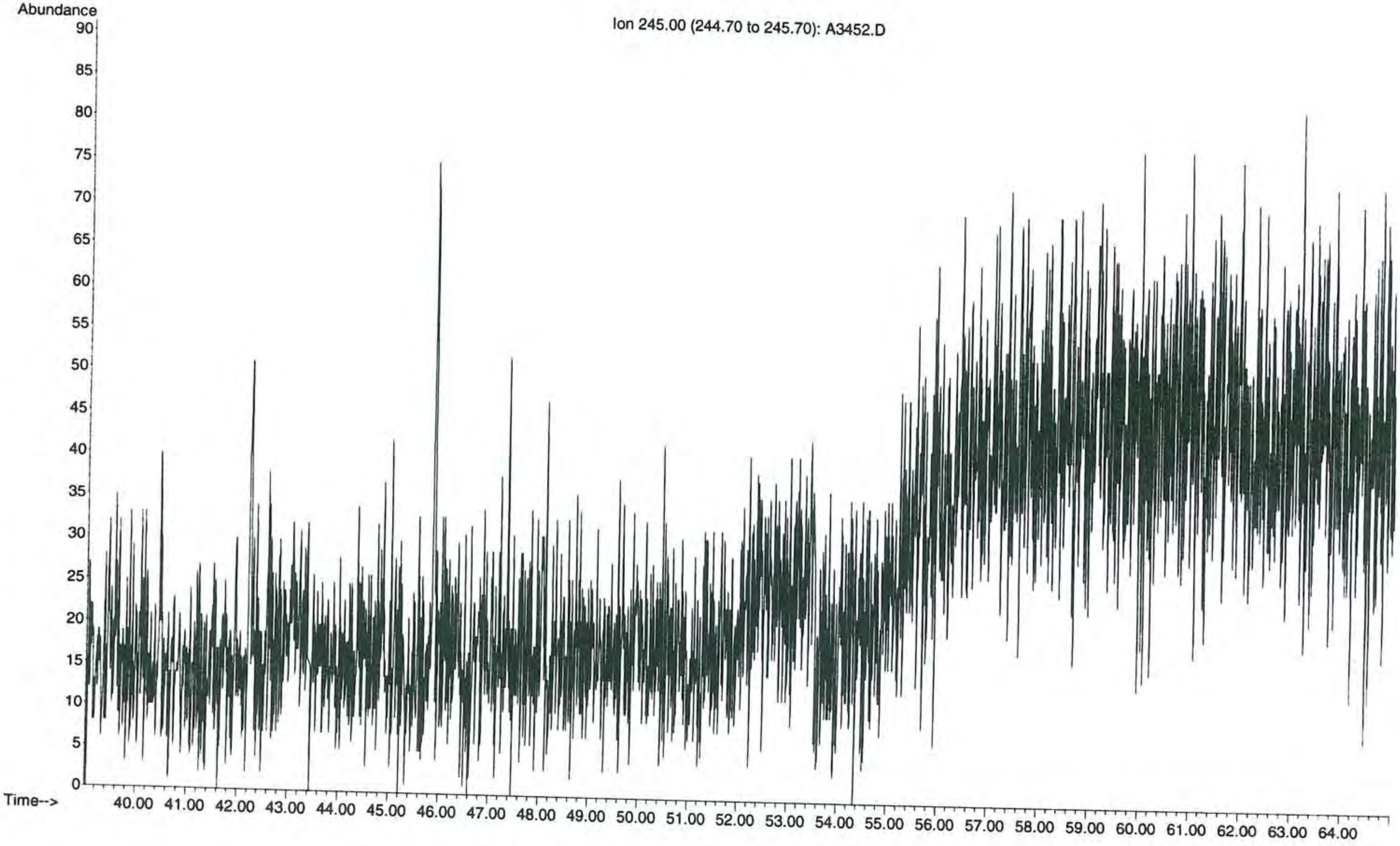


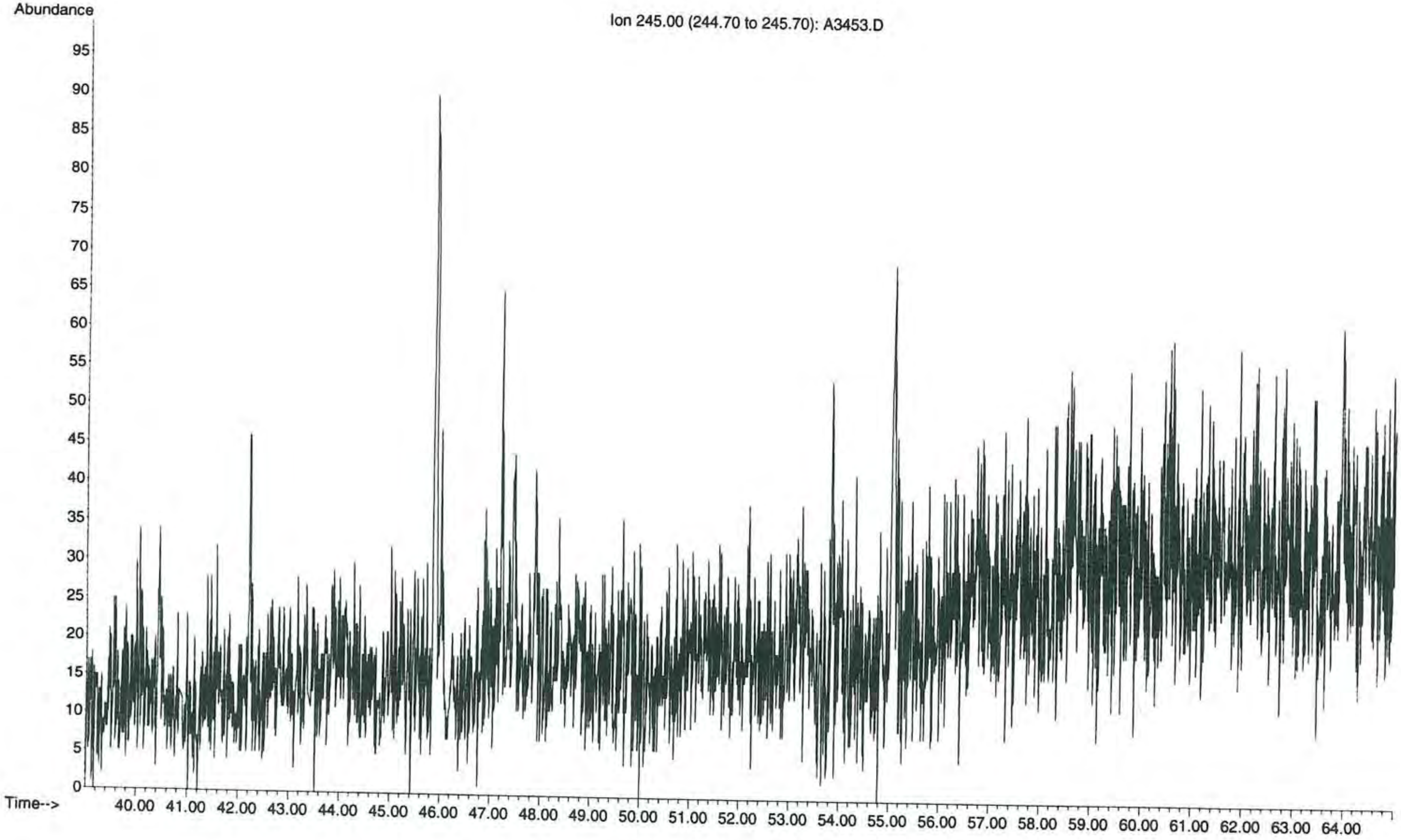
```
File         : G:\A\DATA\SA0618\A3450.D
Operator     : DPB
Acquired     : 13 Nov 2007    4:42 pm using AcqMethod BIOPLUSN.M
Instrument :    Inst. A
Sample Name: BL088NSC-P(0)
Misc Info    : North Slope Crude 5-157 07-0266
Vial Number: 2
```



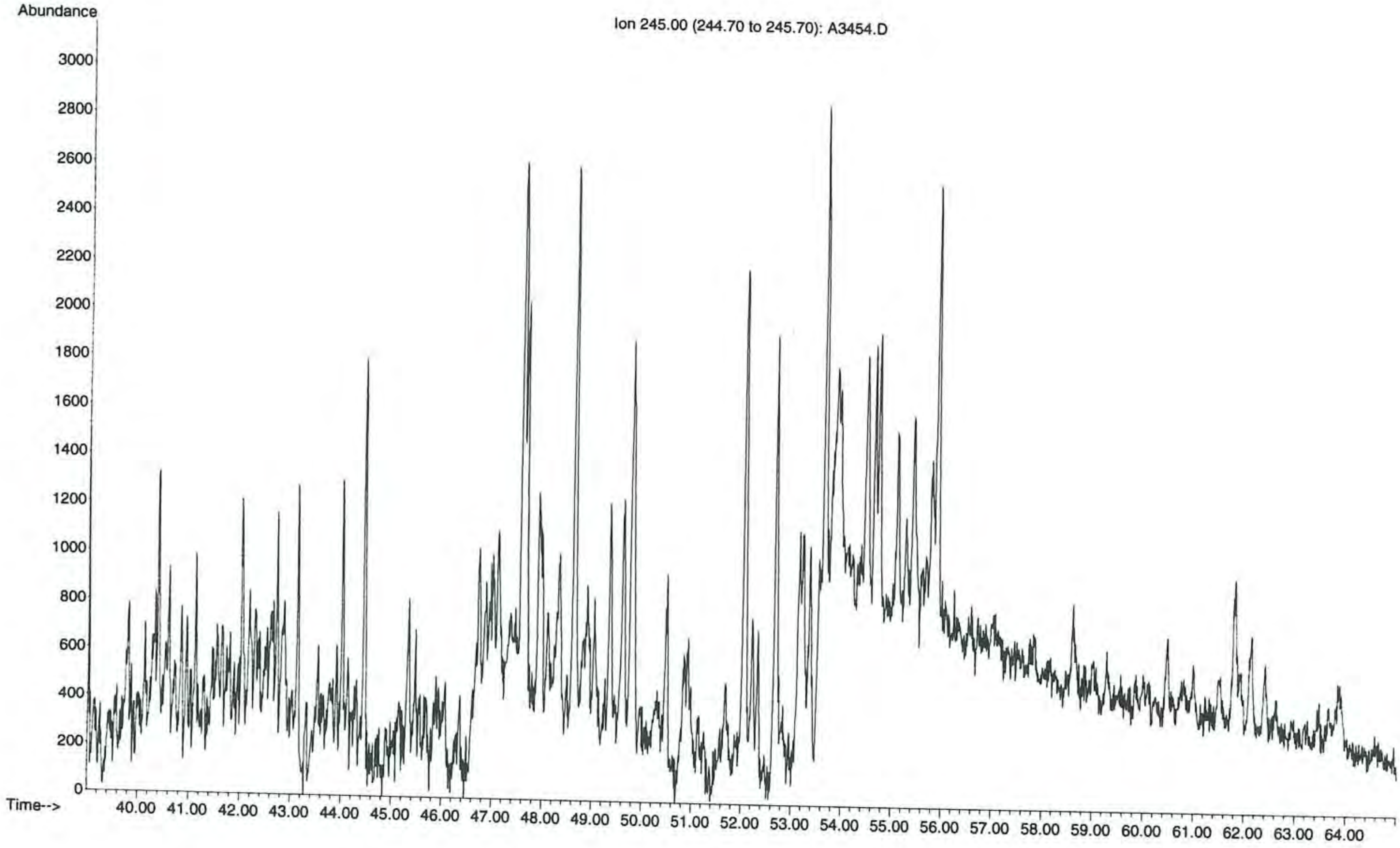
```
File        : G:\A\DATA\SA0618\A3452.D
Operator    : DPB
Acquired    : 13 Nov 2007   7:25 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL065PB-P-MS(5)
Misc Info   : Procedural Blank 5-157 07-0266
Vial Number: 4
```



```
File        : G:\A\DATA\SA0618\A3453.D
Operator    : DPB
Acquired    : 13 Nov 2007   8:46 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: BL066LCS-P-MS(5)
Misc Info   : Laboratory Control Sample 5-157 07-0266
Vial Number: 5
```



```
File        : G:\A\DATA\SA0618\A3454.D
Operator    : DPB
Acquired    : 13 Nov 2007  10:08 pm using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0546-P1-MS(9)
Misc Info   : GP-9 7-8 5-157 07-0266
Vial Number: 6
```



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File        : G:\A\DATA\SA0618\A3457.D
Operator    : DPB
Acquired    : 14 Nov 2007   2:13 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0542-P1-MS(12)
Misc Info   : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 9
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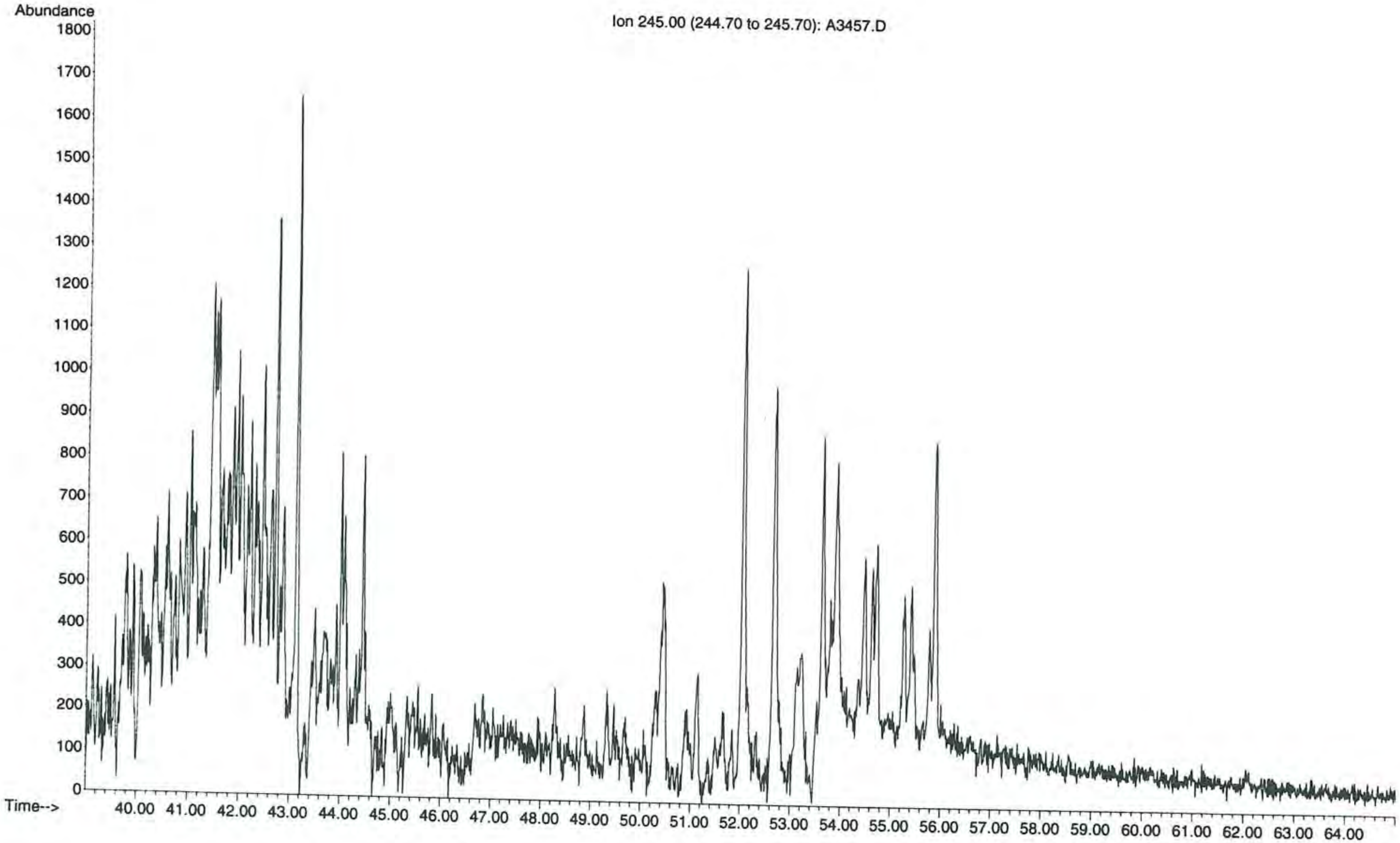

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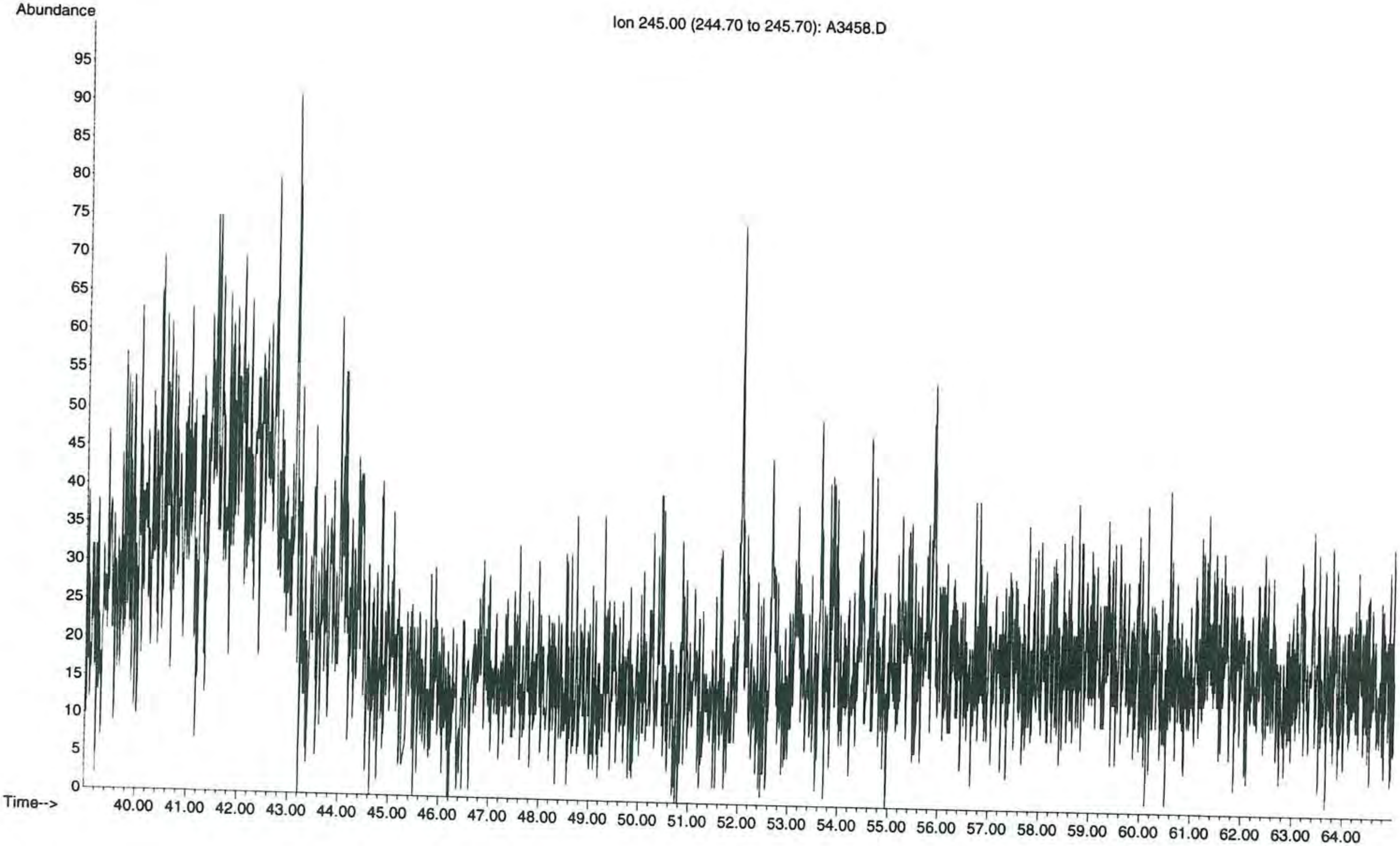
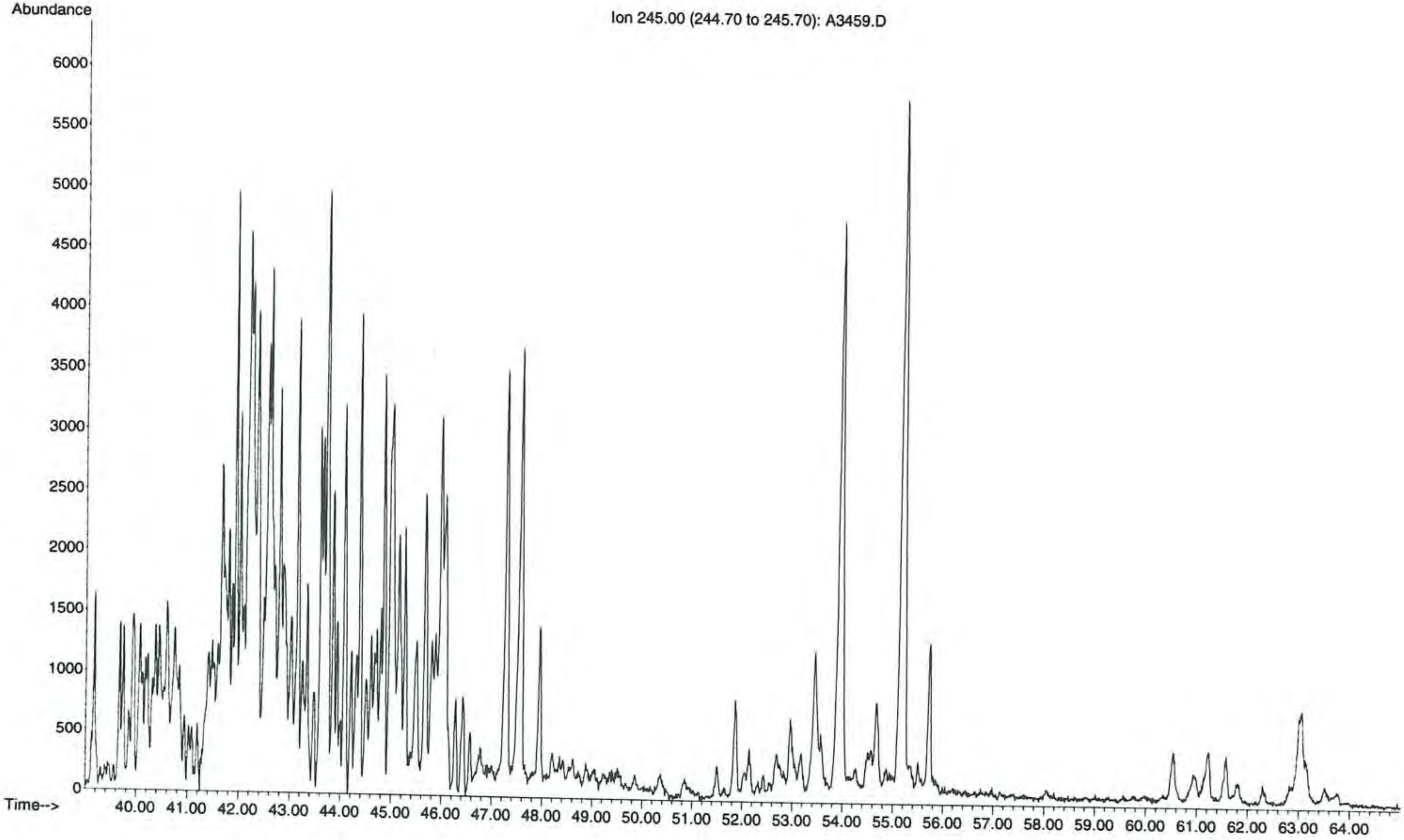
File         : G:\A\DATA\SA0618\A3458.D
Operator     : DPB
Acquired     : 14 Nov 2007   3:34 am using AcqMethod BIOPLUSN.M
Instrument   :   Inst. A
Sample Name: Q0542-P1-MS-D(13)
Misc Info    : SB-8 S5 9-10.5 5-157 07-0266
Vial Number: 10
```



File   : G:\A\DATA\SA0618\A3459.D
Operator   : DPB
Acquired   : 14 Nov 2007   4:55 am using AcqMethod BIOPLUSN.M
Instrument :   Inst. A
Sample Name: Q0543-P1-MS(16)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 11



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File        : G:\A\DATA\SA0618\A3460.D
Operator    : DPB
Acquired    : 14 Nov 2007   6:16 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0543-P1-MS-D(17)
Misc Info   : SB-13 2.5-4.0 5-157 07-0266
Vial Number: 12
```

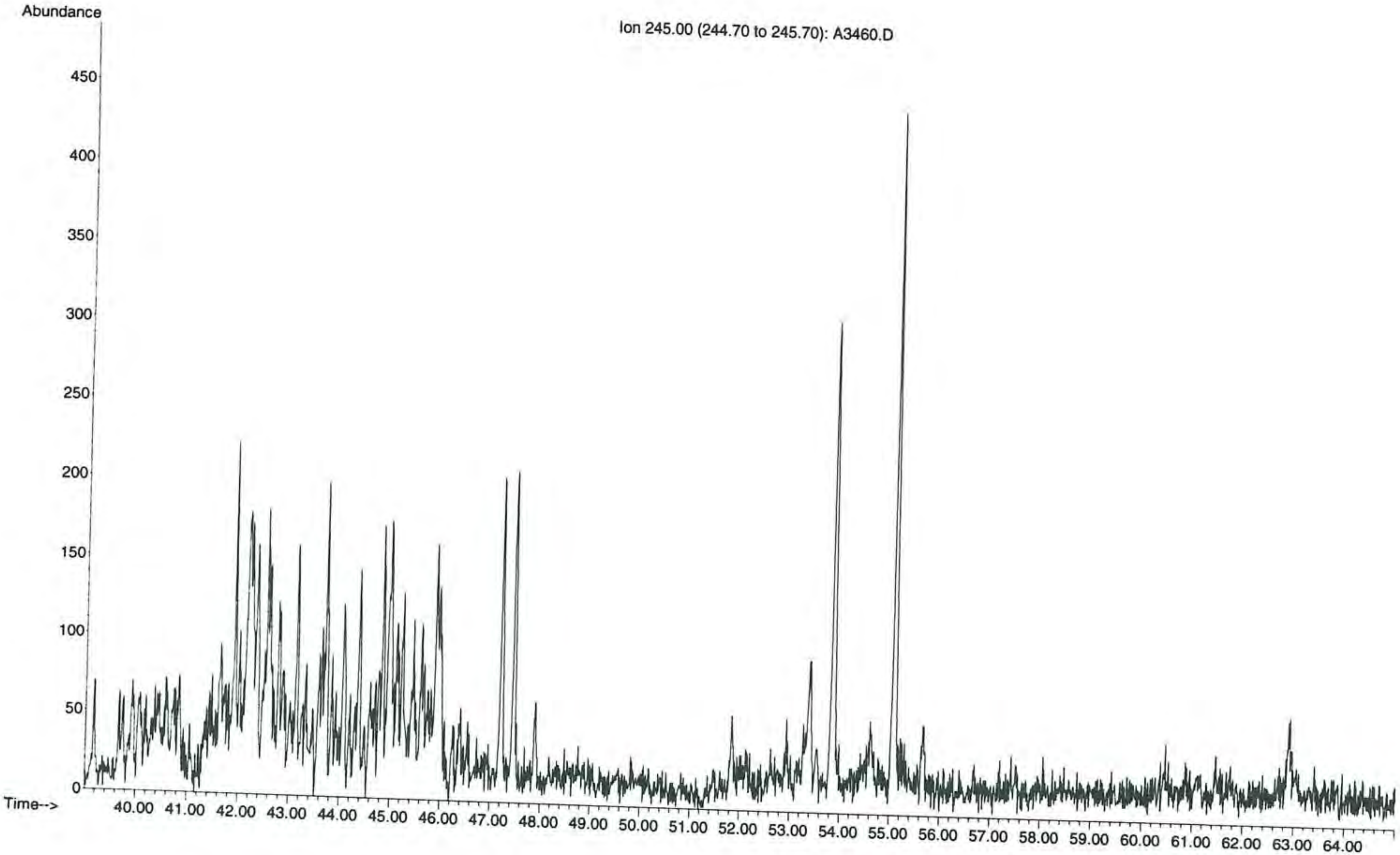

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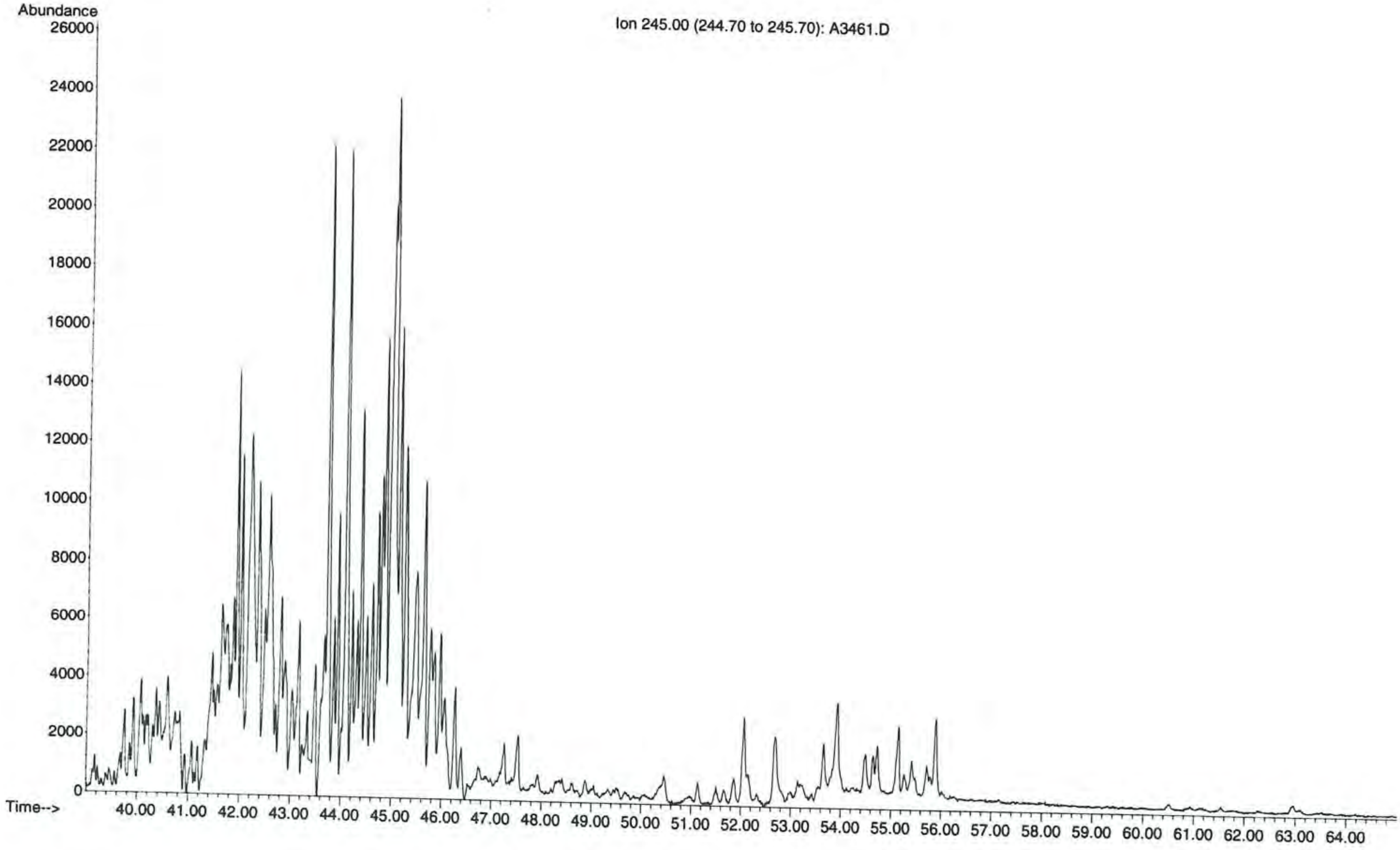
File        : G:\A\DATA\SA0618\A3461.D
Operator    : DPB
Acquired    : 14 Nov 2007   7:37 am using AcqMethod BIOPLUSN.M
Instrument  :    Inst. A
Sample Name: Q0544-P1-MS(12)
Misc Info   : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 13
```



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File        : G:\A\DATA\SA0618\A3462.D
Operator    : DPB
Acquired    : 14 Nov 2007   9:43 am using AcqMethod BIOPLUSN.M
Instrument  :   Inst. A
Sample Name: Q0544-P1-MS-D(13)
Misc Info   : SB-12A S3 5-6.5 5-157 07-0266
Vial Number: 14
```

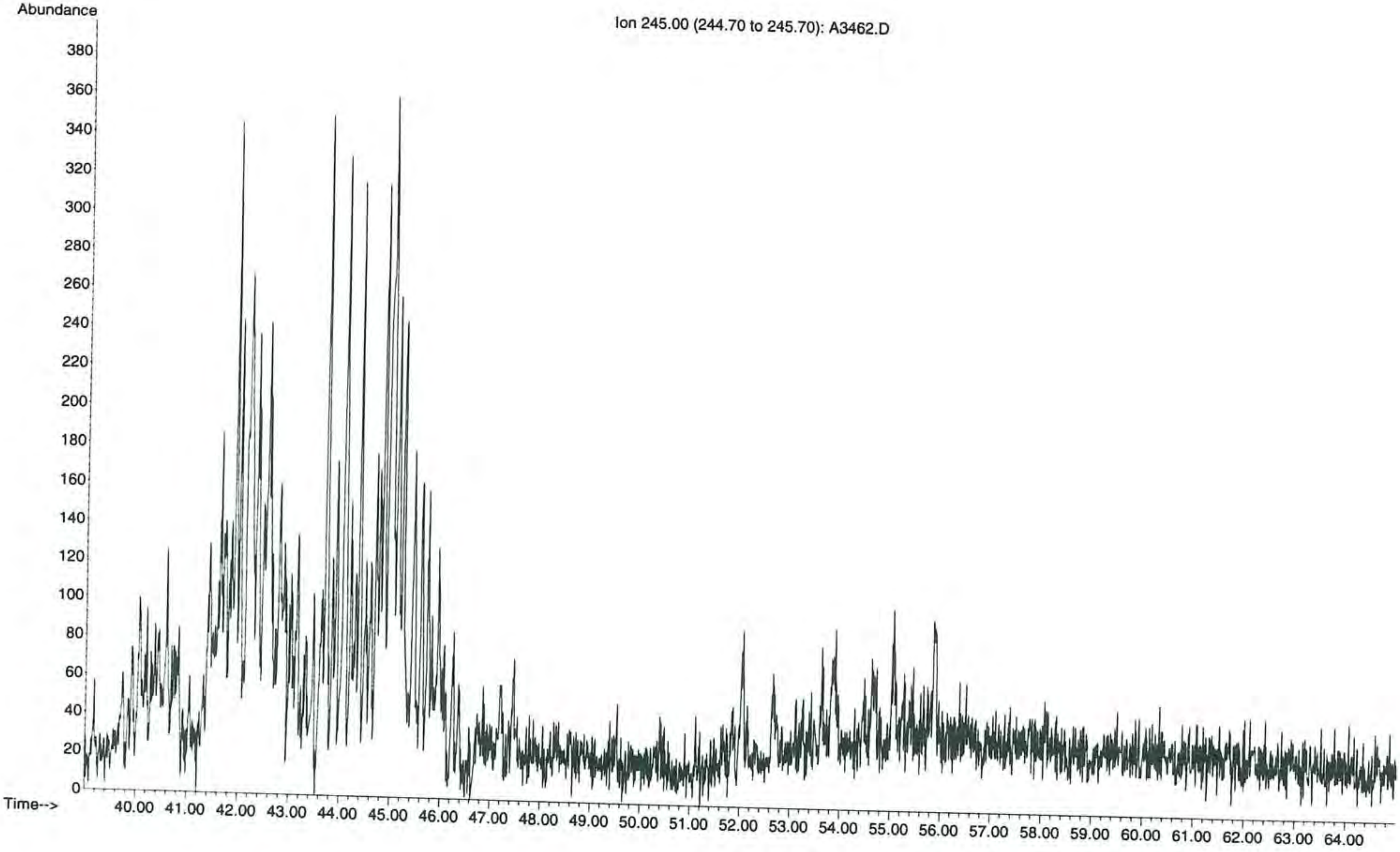

Glossary of Data Qualifiers

Flag:	Application:
B	Analyte concentration found in the sample at a concentration <5x the level found in the procedural blank.
D	Dilution Run. Initial run outside linear range of instrument.
E	Estimate, result is greater than the highest concentration level in the calibration.
H	Surrogate diluted out. Used when surrogate recovery is affected by excessive dilution of the sample extract.
J	Analyte detected below the sample-specific Reporting Limit (RL).
m	Confirmation column manually over-ridden by analyst
ME	Significant Matrix Interference - Estimated value.
MI	Significant Matrix Interference - value could not be determined or estimated.
n	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO), but meets the contingency criteria.
N	Quality Control (QC) value is outside the accuracy or precision Data Quality Objective (DQO)
NA	Not applicable
p	Dual column value exceeds RPD criteria
T	Holding Time (HT) exceeded.
U	Analyte not detected at 3:1 signal:noise ratio.

ATTACHMENT 2D-7

Stanford Aqueous Equilibrium Report

Final Report – February 3, 2006

PAH Partitioning in Black Carbon-impacted Sediments from Lake Union

Lei Hong and Richard G. Luthy
Department of Civil and Environmental Engineering
Stanford University, Stanford, CA 94305-4020

SUMMARY

This report summarizes laboratory investigations of the physicochemical nature of polycyclic aromatic hydrocarbon (PAH) contamination in sediment samples from Lake Union, Seattle, WA. This work infers the extent to which black carbon (BC) materials are present in samples, and the role that these black, particulate organic particles may have in affecting the PAH availability from sediments. Three partitioning models are evaluated to explain the aqueous equilibrium sorption between PAHs and sediment samples: a conventional partitioning model based on natural organic matter sorption, an oil or tar phase partitioning model based on Raoult's Law assuming an ideal aromatic phase, and a model assuming sorption on soot-like matter.

Twenty sediment samples were examined in this study, which exhibited a wide variety of physicochemical characteristics. It was noted that one sample, CR10-NAPL, appeared completely different from the other nineteen sediment samples and was comprised mainly of a soft-tar like non-aqueous phase liquid (NAPL) substance. The total organic carbon contents of these samples ranged from less than 1% to over 70% by weight, and PAH analyses showed highly variable degrees of PAH contamination in these sediment samples. The total concentrations of the 16 EPA priority PAHs ranged from 18 mg/kg for NLU 54 to 4,400 mg/kg for NLU 51, and for the NAPL sample the value was 90,500 mg/kg. In addition to PAH analyses in bulk sediment samples, PAH analyses on density-separated fractions provided insights about the association of PAHs with sediment particles. The significant findings were that PAH concentrations in the low-density fractions were greatly elevated by at least five-fold as compared to those in the high-density fractions; and for most samples the majority of the PAH mass (78 ~ 100% of total PAH mass) was associated with the low-density particulate fractions. These observations were not surprising given the hydrophobicity of PAH compounds and the high organic matter and

black carbon content in the low-density fractions.

Measurements of aqueous equilibrium concentrations of PAHs from these sediment samples provide a quantitative evaluation of PAH leaching potential and availability from the sediment to the aqueous phase. Site-specific, sediment-water distribution coefficients (K_d) of PAHs are calculated. By comparing experimentally-determined K_d values with predictions based on different partitioning models, we propose three PAH partitioning scenarios occur in these sediment samples: ***i)*** modified fraction organic carbon partitioning: the majority (fifteen out of twenty in total) of sediment samples generally agree with the conventional organic carbon equilibrium partitioning model, $K_d = f_{oc}\ K_{oc}$. However, due to the existence of black carbonaceous particles, the observed K_d values are approximately 0.5 ~ 1.0 logarithmic units higher than conventional predictions for sorption onto natural organic matter with the divergence from the conventional model greater for the more hydrophobic PAH compounds; ***ii)*** oil / tar partitioning: three sediment samples NLU 51, NLU 56, NLU 65, and the NAPL sample (CR10-NAPL) exhibit PAH partitioning behavior described by an oil/tar-water partitioning model, which includes the case of oily-coated soot. This model assumes that the PAHs are present in an oil phase and that the partitioning behavior follows the dissolution process from the oil phase; and ***iii)*** soot carbon partitioning: NLU 73-Stanford is the only sample that clearly exhibits partitioning behavior of PAHs being controlled by oil soot (or lampblack, carbon black). In this case the PAH sediment-water distribution coefficients K_d are generally 1.5 ~ 2 orders of magnitude higher than those derived on the basis of conventional natural organic matter partitioning, and correspondingly the aqueous equilibrium concentrations are disproportionally lower than predicted by such partitioning models.

This report also includes two documents as appendixes. Appendix I is the detailed data for PAH analyses on density separated fractions for each sediment sample. Appendix II comprises results on aqueous equilibrium concentration measurements and calculated site-specific PAH sediment-water distribution coefficients for sediment samples.

INTRODUCTION

This project examined the characteristics of polycyclic aromatic hydrocarbon (PAH) contamination in sediment samples from Lake Union, Seattle, WA, and the role that black carbonaceous particles may contribute to the presence of PAHs and PAH partitioning behaviors to the aqueous phase. Specifically, this project (1) inferred the extent to which the sediment samples from Lake Union contain black carbon materials, and (2) investigated their roles in affecting the availability of PAHs in samples obtained from the site.

This project evaluated the sorptive binding of PAHs to the lake sediment in order to better determine how sorption affects the fate of these contaminants in the aquatic environment. It is well accepted that hydrophobic organic compounds such as PAHs sorb to the organic carbon fraction of sediment. Thus, sorption models based on the fraction organic carbon content (f_{oc}) are useful to predict the sorption behavior of hydrophobic organic compounds to natural sediments assuming the organic matter to be homogeneous and equally sorptive (1, 2). Traditionally such models employ an organic-carbon-normalized distribution coefficient (K_{oc}) that is dependent on the sorbing chemical's hydrophobicity or solubility, as may be quantified by the sorbate's octonal-water partition coefficient K_{ow} (3). Although the organic carbon fraction f_{oc} is generally taken as a measure to characterize the sorption capacity of natural sediments, investigators have noted for several years that the sorption of hydrophobic organic compounds to sediments is not always consistent with model predictions. Our earlier work (4, 5) demonstrated that organic carbon in sediments may comprise different compositional forms having very different sorption capacities. Thus, the nature of the organic carbon in the sediment could have a significant impact on the sorption behavior of contaminants associated with the sediment. This is especially the case if the sediment contains black carbon particulate matter known to have high sorption capacities and strong affinities for PAHs. The strong binding between black carbon materials and PAHs could result in less availability of PAHs to the aqueous phase and thus considerably reduce the potential environmental risk to the aquatic environment.

Furthermore, in our recent work we demonstrate that the presence of oil/tar in soil or sediment also could be an important factor in determining the organic contaminant partitioning behavior of PAHs (5) or PCBs (14). We showed for lampblack that, when the oil/tar content in soil or sediment is high enough to exhaust the sorption capacity of lampblack carbonaceous matter, the oil/tar phase governs PAH partitioning and that PAHs associated with a liquid or semi-soft oil/tar phase will be more available. This could result in higher aqueous equilibrium concentrations and pose greater environmental concern than PAHs sorbed only on lampblack.

OBJECTIVES AND SCOPE OF THE STUDY

The primary objective of this research is to identify the extent of black carbon materials in Lake Union, WA, sediment samples and to characterize the association of PAHs with black carbon-impacted sediment. The second major objective of this project is to measure aqueous equilibrium concentrations with sediment samples and to calculate site-specific PAH partition coefficients between sediment samples and water. The measured PAH partition coefficients are compared with conventionally-estimated partition coefficients based on the organic carbon content in the sediment. This comparison will shed light on estimating the impact of black carbonaceous materials in the sediment and the effects of such materials on the availability of PAHs from the site.

This report summarizes results of (1) characterization of PAH concentration levels and distribution patterns, as well as (2) the determination of PAH aqueous equilibrium concentrations for sediment samples from Lake Union. We received 16 sediment samples on January 20, 2005, and four remaining sediment samples arrived on February 3, 2005. Since receipt, the following tasks have been conducted on these twenty sediment samples:

1. **Characterization of sediment samples and PAH analyses**
    - A density separation technique aided by a saturated cesium chloride solution was used to identify the percentage by weight light carbonaceous particulate fraction in each sediment sample.
    - The total organic carbon content in each sediment sample was measured using a combustion technique followed by nondispersive infrared detection.
    - The percentage by weight oil/grease in the whole samples was determined by following procedures similar to SW-846 EPA method 9071A (Hexane Extractable Materials) for oil and grease in soils and sediments using ultrasonic extraction.
    - Analyses for 16 EPA priority PAHs were performed on the whole samples and the separated fractions by following EPA method 3550B (ultrasonic extraction), EPA

method 3630C (silica gel cleanup), and EPA method 8100 for PAH analyses with a gas chromatograph (GC) and a flamed ionization detector (FID).

2. **Aqueous equilibrium tests with sediment samples and calculation of site-specific partition coefficients of PAHs**
    - Aqueous equilibrium tests with sediment samples were performed using a newly-developed polyoxymethylene (POM) – solid phase extraction (SPE) method as described in Jonker et al., 2001 (6). This technique has been fully characterized with the polyoxymethylene material in our laboratory (7) and is confirmed to be comparable with other aqueous equilibrium concentration measurement techniques such as air-bridge or alum flocculation procedures.
    - The PAH aqueous equilibrium concentrations for selected samples were measured by employing a direct contact protocol, which involves supernatant treatment by alum flocculation and centrifugation. This was performed on six sediment samples to confirm results obtained by the POM – solid phase extraction method.
    - An air-bridge technique was used to measure PAH aqueous equilibrium concentrations for the non-aqueous phase liquid sample (CR10-NAPL-1523). This technique was chosen due to the need for absolute certainty of eliminating the potential oil contamination in the aqueous phase measurements.
    - Site-specific partition coefficients (K_d) of PAHs were calculated for each sediment sample, and these results were compared with values obtained based on a conventional, organic-carbon partitioning model. Organic-carbon normalized partition coefficients (K_{oc}) were also determined.

SITE DESCRIPTION AND SAMPLE INFORMATION

The study area of this project comprises a band of sediments in the region surrounding the Gas Works Park site in north-central Lake Union. The Gas Works Park site is located on the northern shore of Lake Union in Seattle, WA. Historically significant activities occurring at this site over time included: a manufactured gas plant, a tar refinery, and park construction. The gas works plant was built on the site in 1906 and the plant gasified coal to produce “town gas.” In 1937, oil-gas generators were added and the plant was converted to an oil gasification process.

The gas making operations ceased in 1956 due to the availability of cheaper natural gas. A tar refinery was operated on the northwestern part of the site from 1907 through the 1950s. The tar company processed tars from the gas works plant, as well as feedstock from other sources, to produce various grades of tar and pitch. After the gas works converted to oil gas in 1937, manufactured gas plant tar was no longer a major feedstock to the tar refinery. The property was purchased by the City of Seattle in 1962 and converted to a public park, named Gas Work Park, and opened in 1976. Sediments in Lake Union are very likely contaminated from a number of sources owing to the long history of industrial and commercial activities near or along the lake.

EXPERIMENTAL METHODS

Twenty sediment samples from Lake Union were shipped to our laboratory in ice-packed coolers, and stored at 4 ºC until use. Prior to experiments, all sediment samples were wet sieved to remove particles larger than 2 mm in diameter. These large particles were primarily comprised of stones and brick fragments.

Chemicals and Materials. Pesticide grade solvents hexane, acetone, pentane, cyclohexane, and methylene chloride were purchased from Fisher Scientific (Pittsburgh, PA). Solvents were checked regularly for any PAH contaminations by GC-FID as described below. Anhydrous sodium sulfate (Fisher Scientific) was prepared with drying in an oven at 105 ºC for 24 hours prior to use. Silica gel (Fisher Scientific) used in the column cleanup procedure was activated at 130 ºC for 16 hours. White crystalline powder cesium chloride (CsCl) with a purity > 98% was obtained from Sigma Aldrich, Inc. PAH surrogate solution pyrene-d_{10} (500 ppm in acetone), internal standard 2-fluorobiphenyl, and standard solutions of 16 EPA PAHs for GC calibration were purchased from ULTRA Scientific, Inc. (North Kingstown, RI). Polyoxymethylene (POM) (trade name: poly-acetal, also known as acetal; molecular formula: $[\text{-OCH}_2]_n$; density: 1.38 g/cm^3) was obtained from Vink NV, Industriepark 7, B-2220 Heist-op-den-Berg, Belgium. The POM sheet has a thickness of 0.58 mm and natural white color. It was cut into strips with desirable dimensions of 13 mm by 5 mm prior to use and pre-cleaned by soaking in methanol and hexane sequentially for 30 minutes each, then rinsed with Milli-Q® water and allowed to air-dry. Before employed in experiments, several strips were randomly selected as blank samples to go through the whole procedure from extraction, column cleanup, and GC analysis to ensure that no contamination exists with these POM strips.

Density Separation. A saturated cesium chloride solution with a specific gravity of 1.8 was used to separate lighter-density carbonaceous particles from the mineral fraction of soil (i.e., sand and clay). Four to eight grams of wet sediment samples were mixed with 70 mL of saturated cesium chloride solution and centrifuged at 2000 rpm (1000g) for 10 minutes in 80-mL glass centrifuge tubes. The light particles that floated to the top were decanted and collected on a 0.7-μm glass fiber filter paper. This procedure was repeated 3-5 times until the light fraction was separated from the heavier mineral fraction. Separated fractions were washed with deionized water thoroughly to remove the residual cesium chloride. The mass of each fraction was recorded after air-drying and desiccating for 12 hours. Duplicate tests were performed with each sediment sample with relative standard deviations (RSDs) in all cases less than 2-10 %.

PAH Extraction, Cleanup, and Analysis by GC-FID. The PAH concentrations on bulk sediment samples and separated fractions were measured by following EPA standard method 3550B. Three grams of solid samples were placed in a beaker containing 50 mL hexane/acetone (1:1) mixture and extracted using a Fisher 550 Sonic Dismembrator (Pittsburgh, PA) for 6 minutes (pulsing for 15 s on and 15 s off). The sample was extracted three times and then the extracts were combined, concentrated and changed into solvent cyclohexane. Cleanup was performed on the final extract using an activated silica gel column as outlined in EPA standard method 3630C. An Agilent gas chromatograph 6890N system (Sunnyvale, CA) with a fused silica capillary column (HP-5, 30 m long x 0.25 mm I.D.) and a flamed ionization detector was used for analysis based on EPA standard method 8100 for PAHs. Duplicate extractions were performed for each sediment sample as well as the separated fractions. A blank solvent and a standard solution of 16 EPA PAHs spiked with the internal standard were run with every sequence of samples to assess GC performance and validate calibration.

Organic Carbon (TOC) Measurement. The organic carbon content in each sediment sample was determined by AGVISE Laboratories, Northwood, ND, using the conventional combustion technique followed by nondispersive infrared detection after treating the samples with hydrochloric acid to remove the inorganic carbon that may exist in the solid matrix.

Total Extractable Organics (Oil and Grease). A similar experimental protocol to SW-846 EPA standard method 9071A (Hexane Extractable Material) was employed to quantify the level of oil and grease present in all sediment samples. The only difference is use of an ultrasonic extraction instead of a soxhlet extraction procedure, and a hexane/acetone (1:1, v/v) mixture as a solvent instead of pure hexane. It has been determined that TEO values obtained with this protocol are very close to those from the standard method, with differences less than 5%.

Aqueous Equilibrium Tests. Several different techniques for conducting aqueous equilibrium tests were employed in this project. Except for the non-aqueous phase liquid sample (CR10-NAPL-1523), a polyoxymethylene – solid phase extraction (POM-SPE) method developed by Jonker (6) was adopted to determine the distribution coefficients of PAHs between sediment samples and water. In order to confirm results from POM-SPE experiments, six sediment samples were selected to follow a conventional, direct-contact experimental protocol with alum flocculation to measure the PAH aqueous equilibrium concentrations. This direct contact experimental protocol with flocculation has been performed in several studies in our laboratory (5, 8) and is reliably demonstrated to accurately measure aqueous phase concentrations of PAHs and PCBs from soil and sediment samples without the interference from colloids and incomplete phase separation. For sample CR10-NAPL-1523, however, neither of these two methods works easily because of the presence of an oil emulsion in the aqueous phase. Therefore an air-bridge system was used for this sample, which eliminates any potential oil contamination in the measurement of aqueous equilibrium concentrations.

Prior to experiments, an aqueous phase was prepared with Milli-Q® water by adding in 100 mg/L sodium azide to inhibit microbial degradation and 0.01 M calcium chloride to compensate the ionic strength in the system. In order to avoid photolysis of PAH compounds, all experiments were carried out in amber glass bottles or covered glassware.

1) Aqueous equilibrium tests with POM-SPE method. Polymethylene (POM) strips were deployed in the sediment-water system as a passive equilibrium sampler. POM strips take up dissolved organic compounds such as PAHs from the sediment-water slurry until phase equilibrium is reached in the system. At equilibrium, the measured PAH concentrations in POM strips, together with the knowledge of concentration-independent POM-water partition coefficients predetermined for PAH compounds, can be used to quantify the PAH compounds' freely dissolved concentrations.

Prior to aqueous equilibrium experiments with POM-SPE for sediment samples, sorption isotherm tests were conducted in our laboratory to characterize the sorption properties of POM and to determine the POM-water partition coefficients for PAH compounds of interest. Each sorption isotherm comprised seven data points with a span of approximately two orders of magnitude in aqueous concentrations. For more hydrophobic compounds (> benz[a]anthracene) with their extremely low aqueous solubility, the lowest data points of aqueous concentrations were below the limit of aqueous quantification in our study, therefore six pairs rather than seven pairs of aqueous concentrations (C_{w}) and concentrations sorbed into POM (C_{POM}) are involved in the determination of $K_{\mathrm{POM\text{-}w}}$ values for these compounds. It was found for all PAH that sorption to POM follows a linear isotherm within aqueous concentration ranges that were examined. The POM-water partition coefficients are defined as the ratio of the compound concentration in the POM (C_{POM}) divided by the aqueous phase concentration (C_w) at equilibrium:

$$K_{POM\text{-}w} = C_{POM}\ (\mu\mathrm{g/kg})/C_w\ (\mu\mathrm{g/L}) \qquad [\mathrm{L/kg}]$$

Due to the linearity of sorption isotherms, the values of $K_{POM\text{-}w}$ were determined by taking slopes of the linear regression curves fitted to the sorption isotherm data. Results of sorption isotherm tests confirmed that sorption of PAHs to the POM can be regarded as a partitioning process and is independent of the solute concentration and other organic analytes in the aqueous phase. These properties make this material an excellent passive sampler for quantifying the freely dissolved concentrations of PAH compounds from environmental matrixes. Kinetic studies of PAH uptake into POM strips from water were also performed. Results showed that the attainment of equilibration for PAH uptake by POM requires less than 40 days with more hydrophobic compounds taking less time, and with higher mass ratio of POM-to-water phase taking less time. The detailed results and discussions about the POM-SPE method and applications in environmental analytical measurement were summarized in a recent research paper (7).

The aqueous equilibrium tests with POM strips were set up as follows: 3 g of wet sediment sample, 0.5 g of POM strip, and 35 mL of prepared aqueous phase were placed in a 40 mL glass bottle with an aluminum-lined lid. Duplicate tests were carried out for each sediment sample. All the bottles were tumbled end-to-end at 4 rpm in the dark at room temperature for a period of 40 days. The mass of POM strip was chosen so that less than 5% of the individual PAH compounds were accumulated into the POM from the water. This ensures that the original equilibrium between sediment and water will not be disturbed by POM as an additional sorbing phase (7, 9).

After equilibration, the POM strips were taken out of the system with a pair of tweezers, rinsed with deionized water and dried with a Kimwipe, and then soxhlet extracted continuously with 150 mL hexane/acetone (1:1, v/v) for 16 hours. An internal standard (2 μg 2-fluorobiphenyl) and a surrogate PAH compound (1 μg pyrene-d_{10}) were added prior to extraction. The extracts were then concentrated using a rotoevap followed by a stream of gentle nitrogen purge to 1 mL, and cleaned up for GC-FID analysis as described above. The measured PAH concentrations in POM strips allowed us to calculate the aqueous equilibrium concentrations based on the knowledge of POM-water partition coefficients.

2) Aqueous equilibration tests with batch mixing and particle separation using alum flocculation. In this method, the wet sediment sample and the synthetic aqueous phase in the weight ratio of 1:20 were placed in 1-L glass bottles with a Teflon-lined cap and gently agitated on a roller at 2 rpm in the dark for two weeks to allow complete mixing and full contact between sediment and water. In order to ensure aqueous equilibrium and phase separation within the sediment-water system, these bottles were equilibrated further for two months before sampling. After the sediment fraction settled to the bottom of the glass bottle, 750 mL of the aqueous phase was transferred to a centrifuge tube. To remove particulates from solution without sacrificing the aqueous PAH composition integrity, the tube contents were centrifuged at 20 ^{o}C and 1000 *g* for 10 minutes to settle any coarse particles (5, 8). This step was followed by the addition of about 10 mL 0.1 M alum solution and adjustment of pH back to neutral with 1.0 N NaOH solution. The supernatant water was mixed carefully using a glass pipette for 1 minute to mix and flocculate the alum without disturbing the settled particles. A sweep floc was formed, which co-precipitates with fine particles. The flocculated system was subjected to a second centrifugation step at 500 g for 30 minutes. The clear supernatant created afterwards was carefully pipetted into a separatory funnel and extracted with fresh volumes of hexane three times. The pipette was similarly rinsed with hexane into the separatory funnel. The hexane extracts were combined, dried using anhydrous sodium sulfate, concentrated to 1 mL, cleaned by a silica gel cleanup method, and the final clean eluate concentrated to 0.2 mL for GC analysis.

Our previous work showed that particulates are effectively precipitated by alum flocs and that aqueous PAH concentrations are not affected by the technique (5). In the absence of particulate removal using alum flocculation, equilibrium tests may be biased because the apparent aqueous phase concentration may comprise both dissolved PAHs and PAHs sorbed on micro-particulates or colloids. This is an especially important concern when measuring PAH concentrations at sub-microgram per liter concentrations as in this study.

3) Aqueous equilibrium tests with an air-bridge system. This test protocol involves an equilibration technique in which an air bridge is employed to physically separate the sediment from the equilibrated water. The air-bridge method described by Bucheli and Gustafsson (10) was used. This method employs a beaker holding the sediment sample that is contained within a larger, closed vessel with an aqueous phase in the outer annular space. PAHs in sediment in the inner beaker are allowed to volatilize and transfer to the outer water phase through the air bridge, and over time an equilibrium state is attained between the sediment slurry inside the beaker and the water in the annular space outside the beaker. For PAHs, the equilibration takes one to two months. In this project, a 150-mL glass beaker containing about 10 grams of sediment sample (CR10-NAPL-1523), 120 mL synthetic aqueous phase and a stir bar was placed in a 4 L glass jar with Teflon-lined cap, and the annular space between the jar and the beaker was filled with 1 L synthetic aqueous phase. The glass jar was sealed with Teflon tape and equilibrated for two months on a magnetic stirrer to gently mix the solid slurry and facilitate solute transfer until sampled. The aqueous phase sampled from the outer annular space was extracted by hexane three times, and then the extracts were combined, concentrated and analyzed by GC for PAHs as described above. The main advantage of the air-bridge method is the absolute certainty of the elimination of particulate-phase contamination in the measurement of aqueous phase concentrations.

Quality Assurance and Quality Control (QA/QC). All solvents used in the experiments were checked periodically with GC-FID for any possible contamination. Prior to the extraction of sediment samples, a surrogate PAH compound (1 μg pyrene-d_{10}) and an internal standard (2 μg 2-fluorobiphenyl) were spiked in the sample matrix to monitor the performance of all procedures involved in PAH analyses in sediment samples. Duplicate tests were carried out with each sample. The reported values are average values with relative standard deviations ranging from 2% to 10%, which are well within the method control limits. A standard solution of 16 EPA PAHs with a known concentration of individual compounds was chosen as a laboratory control sample (LCS), and this was included in each analytical batch and its recovery was used to check the column cleanup efficiency and GC performance. A reagent blank consisting of the elution solvents was passed through the silica gel column and analyzed before each new lot of adsorbents and solvents were used in this method. This was done to ensure that any interferences from adsorbents (silica gel) are well below the method detection limits. The recovery rates of laboratory control samples (LCS) were 93 ± 7% (n=160) for all PAH compounds of interest, considerably higher than the requirement of ≥ 85% specified in the EPA standard method. The recovery check of the surrogate PAH compound and the internal standard in the column cleanup procedure was also performed, with recovery rates of 95 ± 8% (n=18) and 96 ± 4% (n=18) respectively.

A blank reagent and a standard solution spiked with known amount of the internal standard and the surrogate compound were run with each sample batch for GC-FID analysis. The instrumental performance was checked everyday and maintained by following the standard operating procedure (SOP) established in our laboratory, such as regularly changing the inlet liner and the septa for the injection port. GC calibration was performed every three months with standard solutions of 16 EPA PAHs at five different concentration levels. Calibration curves for each PAH compound of interest, which delineate the relationship between instrument responses to concentrations of target compounds in the standard solutions, were constructed and used to calculate the analyte concentrations in samples. GC calibration was verified for each analytical batch based on the instrument responses for the standard solution, making sure to meet the calibration verification criteria of within ± 20% difference from the initial calibration responses.

In aqueous equilibrium tests using the POM method, the extraction efficiency of POM strips with hexane-acetone (1:1, v/v) was found to be 98 ± 1.4% (n=160) for all 16 EPA PAH compounds. And in the tests using alum-flocculation and air-bridge techniques, PAHs in the aqueous phase were extracted in accordance with EPA standard method 550, and the average recovery rate was determined to be 99 ± 2%.

RESULTS AND DISCUSSIONS

Experimental results for this study are presented and discussed with respect to each of twenty sediment samples from the following three aspects: (a) physical and chemical characteristics, (b) PAH analyses for bulk and separated fractions of sediment samples, and (c) PAH aqueous equilibrium concentration measurements and calculation of site-specific sediment-water distribution coefficients.

Physical and Chemical Characteristics of Sediment Samples. Table 1 summarizes the physical and chemical properties of sediment samples examined in this study, including total organic carbon content, oil and grease content, mass percentage of light density materials, and weight ratio of total organic carbon to light density fraction in the sediment samples.

The total organic carbon (TOC) contents of the sediment samples are highly variable, with the lowest value of 0.7% by weight in sample NLU 402 and the highest value of 77.1% by weight in sample NLU 65. Among these sediment samples, the majority (i.e., thirteen out of twenty) have TOC levels of approximately 14% to 27%. Three samples including NLU 402, NLU 55, and NLU 56 have much lower TOC levels of less than 5% by weight. By contrast, the remaining four of twenty sediment samples have relatively high TOC levels ranging from 40.3% up to 77.1%, which include NLU 51, NLU 65, NLU 73-Stanford, and the NAPL sample, CR10-NAPL. The mass of light fraction particles (density < 1.8 g/cc) determined by density separation varied from sample to sample, ranging from less than 5% to 79% by weight.

The oil and grease contents of sediment sample varied from 0.2% to 2.5%, except the sample CR10-NAPL, which appears to be very oily, soft-tar like, having an oil and grease content of greater than 95% by weight. Oil and grease is a conventional pollutant defined under 40 CFR 401.16 by US EPA and generally refers to substances, including biological lipids and mineral hydrocarbons that have similar physical characteristics and common solubility in an organic extracting solvent. By comparing the oil and grease content with the PAH analysis results described below, we note that sediment samples with high TOC content have relatively higher oil and grease content and correspondingly higher levels of PAH contamination. The examples are the four samples with relatively high TOC values, NLU 51, NLU 65, NLU 73-Stanford, and CR10-NAPL.

Organic particles such as plantative materials and black carbons are generally less dense than the mineral (sand/clay/silt) fractions of sediments. Thus, low density fractions obtained by the density separation technique from sediment samples tend to comprise the majority of organic particles. Given the organic carbon content in a certain class of organic particles, the mass ratio of total organic carbon to the less-dense particulate fraction could provide a quick assay to predict the composition of organic carbon in the sediment sample. Our experience is that if the light density fraction comprises primarily black carbonaceous materials, then owing to their extremely high organic carbon content, usually close to or over 90% by weight, the TOC values and the light fraction measurements are in the same range for a ratio of TOC to light fraction in the proximity of unity. This means that the organic carbon in these sediments is mainly contributed by black carbon matter, and examples from this study are NLU 51, NLU 65 and NLU 73-Stanford. On the other hand, for cases as NLU 44, NLU 47 and NLU 62 etc., with TOC values around 15 ~ 17%, the light (density < 1.8 g/cc) fraction accounts for about 39 ~ 46% of total sample weight. This indicates that the weight percent of carbon in the less-dense particulate fraction for these samples is about 40%, which is expected if the majority of the organic particulate matter is plantative material. We also note that three samples NLU 68-S1, NLU 68-S2 and NLU 68-SS have a TOC-to-light fraction ratio of 0.6 or so, and based on the same reasoning, this suggests that the light fraction could be a mixture of both black carbonaceous materials and natural organic matter with either of these two components dominating.

PAH Analysis and Distribution Patterns. The experimental results of PAH analyses in bulk sediment samples, as well as that for density separated fractions, are summarized in Table 2 and Table 3. The detailed data for individual PAH concentrations and distributions among the light density fraction and the heavy density fraction for each sample are presented in Appendix I, except for the NAPL sediment sample for which the density separation is not applicable. As shown in Table 2, all twenty sediment samples exhibit various degrees of PAH contamination and the total 16 EPA PAH concentrations range from 18 mg/kg for NLU 54 to 4,390 mg/kg for NLU 51. The total 16 EPA-listed PAHs content of the NAPL sample is 90,480 mg/kg. Figures 1 and 2 depicted the distribution profiles of the 16 EPA PAHs in six highly or moderately contaminated sediment samples. Profiles for NLU 51, NLU 65, and NLU 73-Stanford are shown in Figure 1 for which total PAH concentrations range from 1,900 to 4,400 mg/kg, and profiles for NLU 56, NLU 64, and NLU 68-SS are shown in Figure 2 with total PAH levels in the range of 850 to 1,400 mg/kg. As shown in the figures, despite the various PAH concentration levels, a common feature for these samples is that fluoranthene and pyrene are the most abundant PAH compounds, except NLU 73-Stanford which has naphthalene and phenanthrene as dominant PAHs.

PAH concentrations on lighter and heavier fractions of each sediment sample were measured to examine the association and distribution patterns within the sample. The total concentrations of 16 EPA-listed PAHs on light-density and heavy-density fractions as well as the mass percent of PAHs associated with the less-dense fraction are reported in Table 3. From the data summarized in Table 3 and Appendix I, it is evident that PAH concentrations in the lighter density particle fractions are over four times greater than those in the heavier density particle fractions. In the case of NLU 65, the total concentration of PAHs in the light density particle fraction is 194-fold greater than the heavier fraction. Based on the knowledge of PAH concentrations in bulk samples, as well as separated fractions and measurements of mass percentage of light fraction for each sediment sample, it can be estimated that for most of these sediment samples the majority of the PAHs (78 ~ 100% of total mass) are associated with the low-density particle fraction. Only two samples, NLU 402 and NLU 68-US-S2, have lower values of 69% and 61% respectively for the mass of PAHs in the low-density fraction. The total PAH concentration in the light density particle fraction of sample NLU 402 is 2,905 mg/kg, which is 45 times as high as the concentration value (64 mg/kg) in the heavy density fraction. Since NLU 402 is the sample with the lowest TOC value (0.7% by weight) and the lowest light fraction (4.6% by weight), it is not surprising to observe that relatively less mass of PAHs are in the light density fraction.

Sediment-water Distribution Coefficients (K_d) for PAHs. Using the knowledge of the equilibrium partitioning of PAHs between POM strips and water established earlier (7), the aqueous equilibrium concentrations of PAHs from sediment samples were calculated based on measurements of PAH concentrations in POM strips according to $C_w = C_{POM} / K_{POM\text{-}water}$. From this, sediment-water distribution coefficients K_d were derived using the measured sediment PAH concentrations and the dissolved PAH concentrations inferred from the POM samplers. $K_{POM\text{-}water}$ values for 12 PAH compounds determined in our previous studies are listed in Table 4, along with literature values of octanol-water (K_{ow}) partition coefficients and organic carbon-normalized partition coefficients (K_{oc}). Values of K_{ow} were taken from the reference text *Environmental Organic Chemistry* by Schwarzenbach et al. (15), except that K_{ow} values of benzo[b]fluoranthene, benzo[k]fluoranthene and dibenz[a,h]anthracene are taken from Accardi-Dey et al. (16), and the K_{ow} value of benzo[g,h,i]perylene is taken from Mackay et al. (12). K_{oc} values are calculated from the equation:

$$\log K_{oc} = 0.989 \log K_{ow} - 0.346$$

$$K_d = f_{oc} K_{oc} \quad [\text{L/kg}]$$

which was originally developed by Karickhoff et al. (1). This equation is very close to the correlation given in the reference text *Environmental Organic Chemistry* (15): $\log K_{oc} = 0.98 \log K_{ow} - 0.32$ for PAH compounds with $\log K_{ow}$ values of 2.2 to 6.4. In the nineteen consecutive tables in Appendix II, the aqueous equilibrium concentrations determined by the POM-SPE method and the calculated site-specific sediment-water distribution coefficients for individual PAHs are presented for each sample.

In order to verify aqueous equilibrium concentration measurements and K_d values determined by the POM-SPE method, an alum-flocculation technique was applied to six selected sediment samples. Experimental results confirmed that PAH aqueous equilibrium concentrations measured by these two methods as well as K_d values calculated correspondingly agree with each other very well. Figure 3 shows the correlation between logarithmic K_d values obtained with

POM-SPE method and alum-flocculation method for samples NLU 73-stanford and NLU 51. Data shown in figure 3 demonstrate that the POM-SPE method can serve as a good alternative to the alum-flocculation method.

We compared our experimentally measured K_d values with the conventional organic-carbon equilibrium partitioning model, in which the K_d value was predicted on the basis of each sediment's organic carbon content (f_{oc}) and each PAH compound's K_{oc} value according to Karickhoff et al. (1) as cited above. This comparison shows that these sediment samples exhibit distinctive partitioning behaviors. Accordingly, three conceptual sorption models are proposed for adoption in the current study as follows:

1. **Modified fraction organic carbon partitioning:** in this model, all the organic matter present in the sample is assumed to be uniformly distributed and homogeneous in terms of sorption properties, and PAHs sorbed on sediment solids can be regarded as partitioning into the organic carbon domain. With this approach, the organic carbon content (f_{oc}) is considered to be the crucial parameter in the prediction of sediment-water distribution coefficients. In Karickhoff's model, the f_{oc} is considered to be comprised of natural plant and animal derived organic carbon. In the modified model, we envision the f_{oc} to be comprised partly of natural organic carbon and partly of black carbonaceous materials.

Fifteen sediment samples agreed reasonably well with this model, and they include: NLU 44, NLU 47, NLU 402, NLU 54, NLU 55, NLU 57, NLU 62, NLU 64, NLU 68-S1, NLU 68-S2, NLU 72, NLU 73-SS, NLU 45, NLU 58, and NLU 68-SS. These sediment samples have relatively low organic carbon contents (0.7 ~ 26.5% by weight) and low PAH concentration levels (total concentration 18 ~ 320 mg/kg) except NLU 64 and NLU 68-SS with relatively high 16 EPA PAH concentrations of 850 mg/kg and 1120 mg/kg, respectively.

Figure 4 shows a comparison between experimentally measured PAH sediment-water distribution coefficients and model predictions for two representative samples (a) NLU 44 and (b) NLU 64. As demonstrated in the diagrams, a common trend we find from the comparison between observed K_d values and model-predicted K_d values is that the observed site-specific K_d values are generally larger than those predicted by fraction organic carbon (OC) partitioning by approximately 0.5 ~ 1.0 logarithmic units, with the divergence from the model greater for the more hydrophobic PAH compounds. This implies that other than natural organic matter, some other types of organic carbon particles, such as black carbonaceous materials, affect the sorption process due to their higher sorption capacity and non-linear equilibrium sorption mechanisms for PAHs. The presence of black carbonaceous particles in these sediment samples is expected since the sediment samples examined in this study originated from the lake area surrounding the former manufactured gas and tar refining plant sites, and received runoff that likely contained soot from the surrounding urban areas.

2. Oil/tar partitioning: this model assumes that all PAHs are present in an oil phase and that the partitioning behavior follows dissolution from the oil phase. Our previous study (5) used an oil/tar-water partitioning model to describe PAH partitioning from lampblack-impacted soil samples governed by an oil/tar phase. In this approach the aqueous equilibrium concentration of a PAH compound is calculated using the equation:

$$C_{aq,i} = x_i \, S_i$$

where x_i is the mole fraction of PAH *i* in the oil/tar phase, and S_i is the subcooled liquid solubility of PAH *i*. The subcooled liquid solubility of PAH *i* is calculated by dividing the aqueous solubility of the solid PAH *i* by the ratio of the solid-liquid reference fugacities $(f^s/f^l)_i$ for the pure PAH *i*, as summarized by Peters et al. (13). The mole fraction of PAH *i* is computed by assuming that the oil/tar phase is measured as oil and grease (total extractable organics) with an average molecular weight of 270.

In the current study, this model was applied to three sediment samples (NLU 51, NLU 65 and NLU 56) and the NAPL sample to interpret PAH sorption mechanisms and partitioning properties. Figure 5 shows a comparison of the apparent PAH sediment-water distribution coefficients determined in this study with different model predictions for samples (a) NLU 51 and (b) NLU 65. It was noted that the fraction organic carbon model and oil/tar model are comparable in predicting the sediment-water distribution coefficients of PAHs for these two samples. This is because that the weight ratios of oil and grease content to TOC are 0.06 and 0.03 for NLU 51 and NLU 65 respectively, and the corresponding sorption capacity of oil and grease for PAHs is generally greater than that of natural organic matter by a factor of 5 to 25. Thus, these two factors approximately compensate each other and the predicted PAH distribution coefficients on the basis of these two models result in very similar values. Nonetheless, we believe that the oil/tar model is more appropriate for the following reasons. These two sediment samples have very high TOC values of 40.3% for NLU 51 and of 77.1% for NLU 65. The fact that the ratio of TOC value to light-density fraction is close to or greater than unity implied that black carbon materials may be the dominant type of organic carbon in these samples. NLU 51 and NLU 65 are two highly contaminated sediment samples with the highest total PAH concentration levels at 4,400 mg/kg and 4,200 mg/kg respectively, which may exhaust the black carbon sorption capacity. Based on these characteristics, it is conceivable that oil tar-water partitioning model would be more appropriate to interpret PAH sorption behavior in NLU 51 and NLU 65 than a fraction organic carbon-water partitioning model. It was observed that aqueous equilibrium concentrations measured with these two samples are significantly higher than that for the sediment sample controlled by soot carbon. For example, freely dissolved aqueous concentration of phenanthrene from NLU 51 is 103 μg/L and 22 μg/L for NLU 65, as opposed to 0.5 μg/L for NLU 73-Stanford which is controlled by oil soot partitioning as explained below.

As shown in figure 6, PAH partitioning behavior in sediment sample NLU 56 is described by the oil/tar-water partitioning model. NLU 56 has a very low TOC value of 2.7% but a relatively high PAH concentration at 1360 mg/kg. These factors result in the oil/tar-water partitioning model providing a much better fit to experimental results, especially for more hydrophobic PAH compounds.

Due to its unique nature as a soft-tar like material, the PAH aqueous equilibrium concentrations from sample CR10-NAPL can be predicted very well using the oil tar-water partition model. Figure 7 shows the good correlation between the measured distribution coefficients with the model predictions.

3. Soot-carbon controlling partition model: in this model, black carbon is the predominant form of organic particulate matter in the sediment, and PAHs are assumed to be associated with the soot carbon. Soot carbon normalized distribution coefficient K_{oc} values of PAHs were determined in our previous work with lampblack-impacted soils. As presented in

Table 4, these values are generally 1.5 ~ 2.5 orders of magnitude larger than those derived from natural organic matter due to the strong affinity of soot carbon for PAHs. Therefore a striking phenomenon often observed with this kind of sample is the diminished aqueous equilibrium concentrations and drastically elevated sediment-water distribution coefficients (K_d). NLU 73-Stanford is the only sample among this batch of sediments that clearly exhibits this unique partitioning behavior for PAHs.

Figure 8 shows that the aqueous equilibrium concentrations of PAHs from NLU 73-Stanford are in good agreement with the predictions of a soot partitioning model. NLU 73-Stanford has a total organic carbon content of 74.8% by weight, and this is very close to the light density fraction of 72.9% determined by density separation. The fact that the weight ratio of TOC versus light fraction is nearly unity suggests that black carbon is the major organic carbon source in this sample.

Based on the experimental results and modeling approaches demonstrated above, it is noted that even though sediment samples have similar compositions of organic matter with black carbonaceous particles being present, these samples may exhibit two different PAH partitioning behaviors depending on the predominance of either oil/tar or soot-carbon partitioning. We postulate that these phenomena can be explained on the basis of physiochemical characteristics of the black carbon solid matrix and sorptive nature of PAHs. The strong binding of PAHs to a black carbon solid matrix is attributed to the overlap of π-electrons in the aromatic soot structure and the planar aromatic rings of PAH molecules. Soot carbon has a non-linear equilibrium sorption isotherm, and the amount of PAHs that can be sorbed onto the soot carbon skeleton is limited. When the PAH concentrations reach the sorption capacity of soot carbon, they start to form a free oil phase, and the sorption mechanism for PAHs undergoes a transition from adsorption on a soot carbon matrix to absorption into a free aromatic oil phase, therefore the aqueous partitioning behaviors for PAHs in these kind of samples appear like dissolving from oil tar phase rather than from the strong carbon sorbent.

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Table 1 Characteristics of Lake Union sediment samples, including total organic carbon (TOC), oil and grease content, and weight percentage of light density fraction

Sample ID	TOC (%)	Carbonate (%)	Oil & grease (%)	Light fraction (%)	TOC vs. light fraction
NLU 44	14.8		0.98	38.7 ± 3.8	0.4
NLU 47	14.1		1.25	45.6 ± 1.3	0.3
NLU 51	40.3		2.44	44.9 ± 3.3	0.9
NLU 402	0.7		0.17	4.6 ± 0.7	0.2
NLU 54	15.2		0.92	45.0 ± 1.7	0.3
NLU 55	3.8		0.15	13.8 ± 0.5	0.3
NLU 56	2.7	0.2	0.60	9.2 ± 0.8	0.3
NLU 57	14.1	0.1	0.97	47.0 ± 2.2	0.3
NLU 62	16.8		1.27	46.0 ± 1.9	0.4
NLU 64	18.2	0.1	1.20	46.0 ± 0.7	0.4
NLU 65	77.1	0.1	2.15	46.4 ± 1.3	1.7
NLU 68-S1	15.8	0.1	1.38	25.7 ± 2.5	0.6
NLU 68-S2	14.6	0.2	1.06	23.0 ± 2.1	0.6
NLU 72	16.6		0.86	47.0 ± 3.0	0.4
NLU 73-SS	15.4		1.22	46.2 ± 1.8	0.3
NLU 73-Stanf	74.8		1.55	72.9 ± 1.6	1.0
NLU 45	13.5	0.1	0.98	56.1 ± 0.5	0.2
NLU 58	16.2	0.1	1.44	78.8 ± 3.7	0.2
NLU 68-SS	26.5		2.49	43.8 ± 0.7	0.6
CR10-NAPL	56.2		> 95%	n.a.	n.a.

Table 2 Summary of PAH concentrations in Lake Union sediment samples (mg/kg dry weight sediments)

Compounds	Sample ID										
	NLU 44	NLU 47	NLU 51	NLU 402	NLU 54	NLU 55	NLU 56	NLU 57	NLU 62	NLU 64	NLU 65
Naphthalene	0.2	0.7	19	2.3	n.d.	4.2	3.2	n.d.	3.1	3.0	14
Acenaphthylene	n.d.	0.4	16	4.6	n.d.	1.7	6.3	n.d.	1.4	4.2	27
Acenaphthene	n.d.	0.5	69	14	n.d.	1.8	37	0.2	3.3	12	64
Fluorene	n.d.	0.5	44	13	0.2	1.8	15	1.0	2.4	6.2	27
Phenanthrene	1.2	3.9	501	59	1.1	12	131	3.0	11	31	174
Anthracene	0.3	0.8	160	17	0.3	2.6	35	2.1	3.3	16	48
Fluoranthene	3.5	11.1	851	28	2.4	21	240	8.3	22	136	690
Pyrene	4.7	13.7	1009	32	2.8	25	300	7.0	28	169	908
Benz[a]anthracene	1.6	4.1	236	11	1.0	8.4	65	2.8	8.4	47	242
Chrysene	1.7	3.9	271	11	1.1	9.7	79	4.0	9.2	52	291
Benzo[b]fluoranthene	2.5	4.9	202	5.1	1.5	7.5	66	3.2	9.6	56	279
Benzo[k]fluoranthene	3.3	5.8	198	6.0	2.8	7.9	66	4.6	11	55	270
Benzo[a]pyrene	3.2	7.1	342	9.1	1.2	11	114	3.2	15	93	439
Indeno[1,2,3-cd]pyrene	2.5	5.4	205	4.1	1.6	7.6	90	3.1	13	76	333
Dibenz[a,h]anthracene	0.2	0.6	26	0.9	n.d.	1.2	11	0.4	1.7	8.9	47
Benzo[g,h,i]perylene	2.7	5.7	235	3.8	1.5	8.2	104	3.2	15	90	382
Total 16 EPA PAHs	28	69	4390	220	18	131	1360	46	157	854	4235

Table 2 (continued) Summary of PAH concentrations in Lake Union sediment samples (mg/kg dry weight sediments)

Compounds	Sample ID								
	NLU 68-S1	NLU 68-S2	NLU 72	NLU 73-SS	NLU 73-Stanford	NLU 45	NLU 58	NLU 68-SS	CR10-NAPL
Naphthalene	28	28	0.7	5.0	326	1.0	3.2	3.8	22890
Acenaphthylene	2.4	4.2	0.6	3.5	17	1.2	3.2	5.4	613
Acenaphthene	6.6	3.9	0.6	6.3	150	3.0	2.2	32	6700
Fluorene	4.2	7.1	0.3	3.9	71	1.4	2.2	21	2450
Phenanthrene	24	26	3.2	26	362	9.8	20	45	14380
Anthracene	6.6	6.0	0.8	7.6	86	2.6	4.6	43	2769
Fluoranthene	42	13	14	45	219	38	30	193	8580
Pyrene	55	19	17	57	276	46	37	244	11100
Benz[a]anthracene	19	6.7	5.6	18	60	14	13	65	2834
Chrysene	23	8.4	5.8	23	75	15	16	77	2830
Benzo[b]fluoranthene	19	3.5	7.7	19	48	16	13	59	2287
Benzo[k]fluoranthene	11	4.4	8.5	22	52	17	15	63	2560
Benzo[a]pyrene	27	5.4	12	31	74	26	19	101	4230
Indeno[1,2,3-cd]pyrene	22	3.2	11	24	50	21	16	76	2792
Dibenz[a,h]anthracene	3.5	0.9	1.2	3.4	12	2.6	2.5	11	430
Benzo[g,h,i]perylene	25	3.4	12	26	55	23	18	86	3030
Total 16 EPA PAHs	316	142	100	319	1932	237	214	1124	90480

Table 3 Summary of PAH analyses on Separated Fractions

Sample ID	Total 16 PAHs concentration in light density fraction (mg/kg dry weight)	Total 16 PAHs concentration in heavy density fraction (mg/kg dry weight)	Mass percentage of PAH in light density fraction (% by weight)
NLU 44-SS-0010	47	8	78
NLU 47-SS-0010	118	10	91
NLU 51-SS-0010	8738	542	93
NLU 402-GE15	2905	64	69
NLU 54-SS-0010	28	2	93
NLU 55-SS-0010	868	8	95
NLU 56-SS-0010	12779	181	88
NLU 57-SS-0010	63	13	81
NLU 62-SS-0010	296	29	90
NLU 64-SS-0010	1697	128	92
NLU 65-SS-0010	8937	46	99
NLU 68-US-S1	1119	67	85
NLU 68-US-S2	334	63	61
NLU 72-SS-0010	165	28	84
NLU 73-SS-0010	800	11	98
NLU 73-Stanford	2561	183	97
NLU 45-DC	457	49	92
NLU 58-SS-0010	340	12	99
NLU 68-SS-0010	2584	259	89
CR10-NAPL	n.a.	n.a.	n.a.

Note:

* Please refer to Appendix I for detailed data of PAH distribution on separated fractions for each sample.

Table 4

Partition Coefficients Used to Interpret Aqueous Equilibrium Experiments: Octanol-Water (K_{ow}), Organic Carbon-Water (K_{oc}), Lampblack (oil soot) Organic Carbon-Water ($K_{oc\text{-}lampblack}$), and Polyoxymethylene (POM)-Water ($K_{POM\text{-}w}$)

Compounds	**log K_{ow} [1] (-)**	**log K_{oc} [2] (L/kg)**	**log $K_{oc\text{-}lampblack}$ [3] (L/kg)**	**log $K_{POM\text{-}w}$ [4] (L/kg)**
Naphthalene	3.33	2.95		2.06
Acenaphthylene	4.20	3.81		n.a.
Acenaphthene	4.00	3.61		2.43
Fluorene	4.32	3.93		2.88
Phenanthrene	4.57	4.17	5.57	3.22
Anthracene	4.68	4.28	5.91	3.46
Fluoranthene	5.23	4.83	6.74	3.73
Pyrene	5.13	4.73	6.81	3.74
Benz[a]anthracene	5.91	5.50	7.34	4.36
Chrysene	5.81	5.40	7.44	4.32
Benzo[b]fluoranthene	5.90	5.49	8.05	4.75
Benzo[k]fluoranthene	6.00	5.59	8.08	4.63
Benzo[a]pyrene	6.13	5.72	8.35	4.73
Indeno[1,2,3-cd]pyrene				n.a.
Dibenz[a,h]anthracene	6.80	6.38		n.a.
Benzo[g,h,i]perylene	7.10	6.68		n.a.

Note:

1. Log K_{ow} values are taken from the reference *Environmental Organic Chemistry* by Schwarzenbach, Rene P.; Gschwend, P.M. and Imboden, Dieter M.; published by John Wiley & Sons, Inc., Hoboken, NJ, 2003, 2nd edition. Except that log K_{ow} values of benzo[b]fluoranthene, benzo[k]fluoranthene and dibenz[a,h]anthracene are taken from Accardi-Dey, A.; Gschwend, P.M., 2003 (16). Log K_{ow} value of benzo[g,h,i]perylene is taken from Mackay et al. (12).
2. Log K_{oc} values are calculated from the equation log K_{oc} = 0.989 log K_{ow} – 0.346 established by Karickhoff, S.W. (1)
3. Log $K_{oc\text{-}lampblack}$ values are determined in a previous study with lampblack-impacted soil samples (5).
4. Log $K_{POM\text{-}water}$ values are determined in our laboratory for 12 PAH compounds based on extensive sorption isotherm studies with POM strips; POM-water partition coefficients for acenaphthylene, indeno[1,2,3-cd]pyrene, dibenz[a,h]anthracene and benzo[g,h,i]perylene are not currently available (7).

Figure 1 PAH distribution profiles for sediment samples NLU 51, NLU 65 and NLU 73-Stanford (total 16 EPA PAH concentrations 1900 ~ 4400 mg/kg)

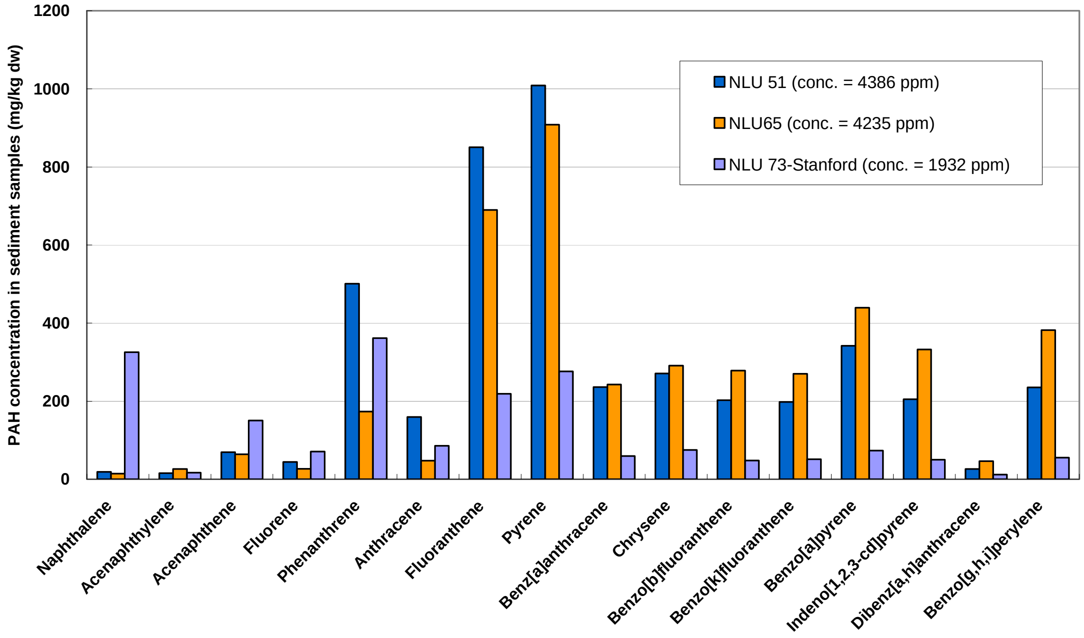
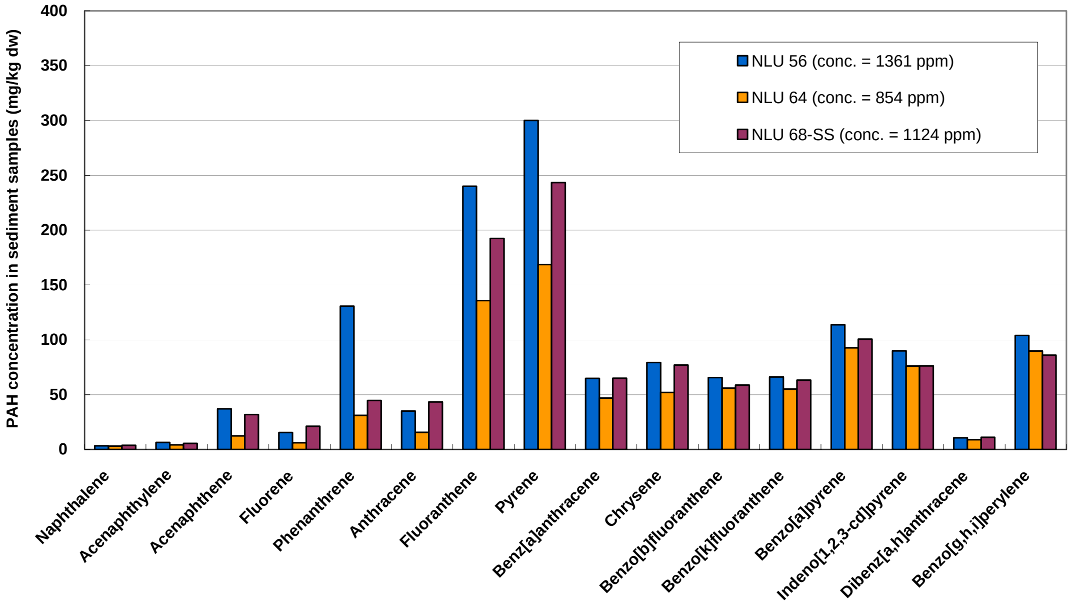


Figure 2 PAH distribution profiles for sediment samples NLU 56, NLU64 and NLU 68-SS (total 16 EPA PAH concentrations 850 ~ 1400 mg/kg)



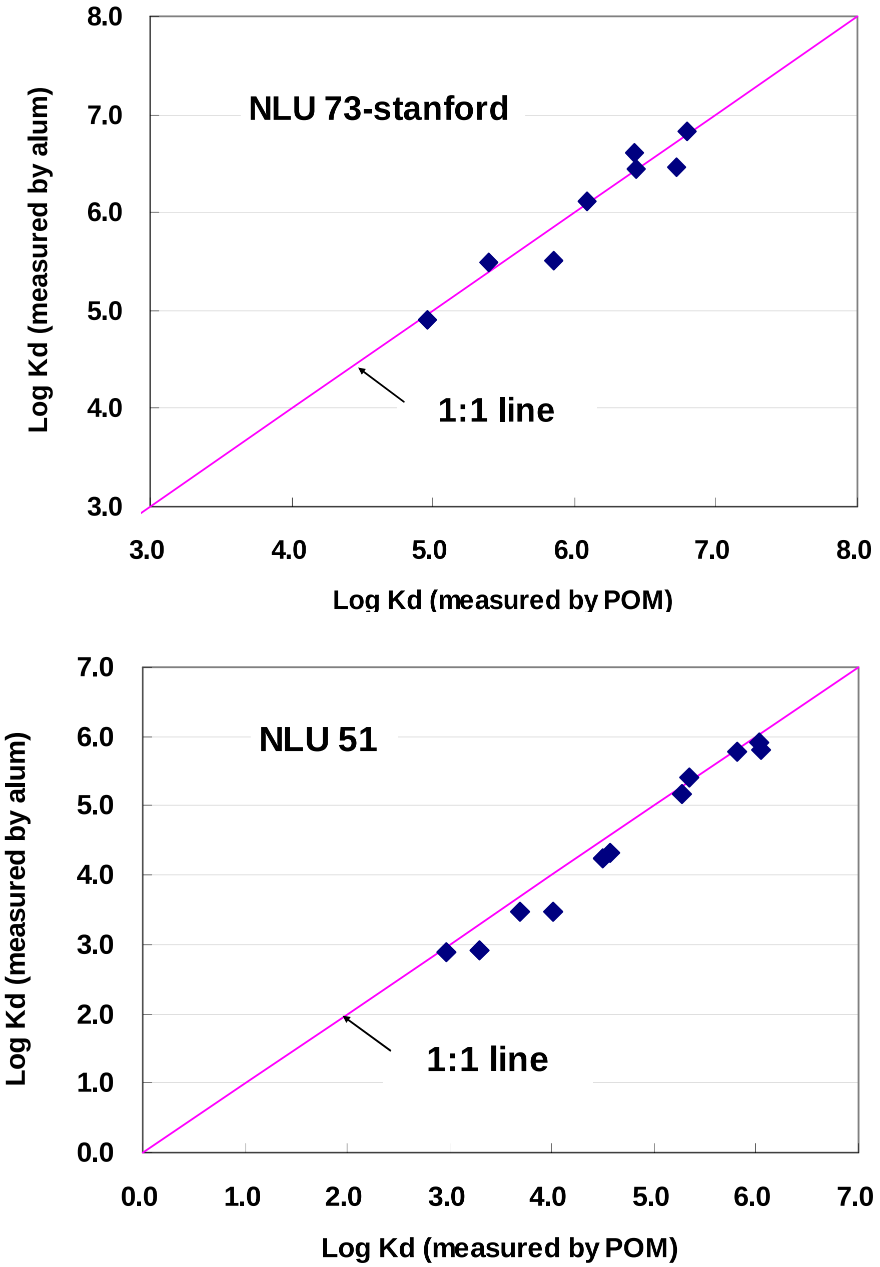


Figure 3 Comparison of sediment-water distribution coefficients (K_d) measured by two different methods, POM-SPE and alum-flocculation, for sample NLU 73-stanford and NLU 51. Experimental results show an excellent agreement in PAH aqueous equilibrium concentrations measured by these two methods, as well as the K_d values calculated correspondingly.

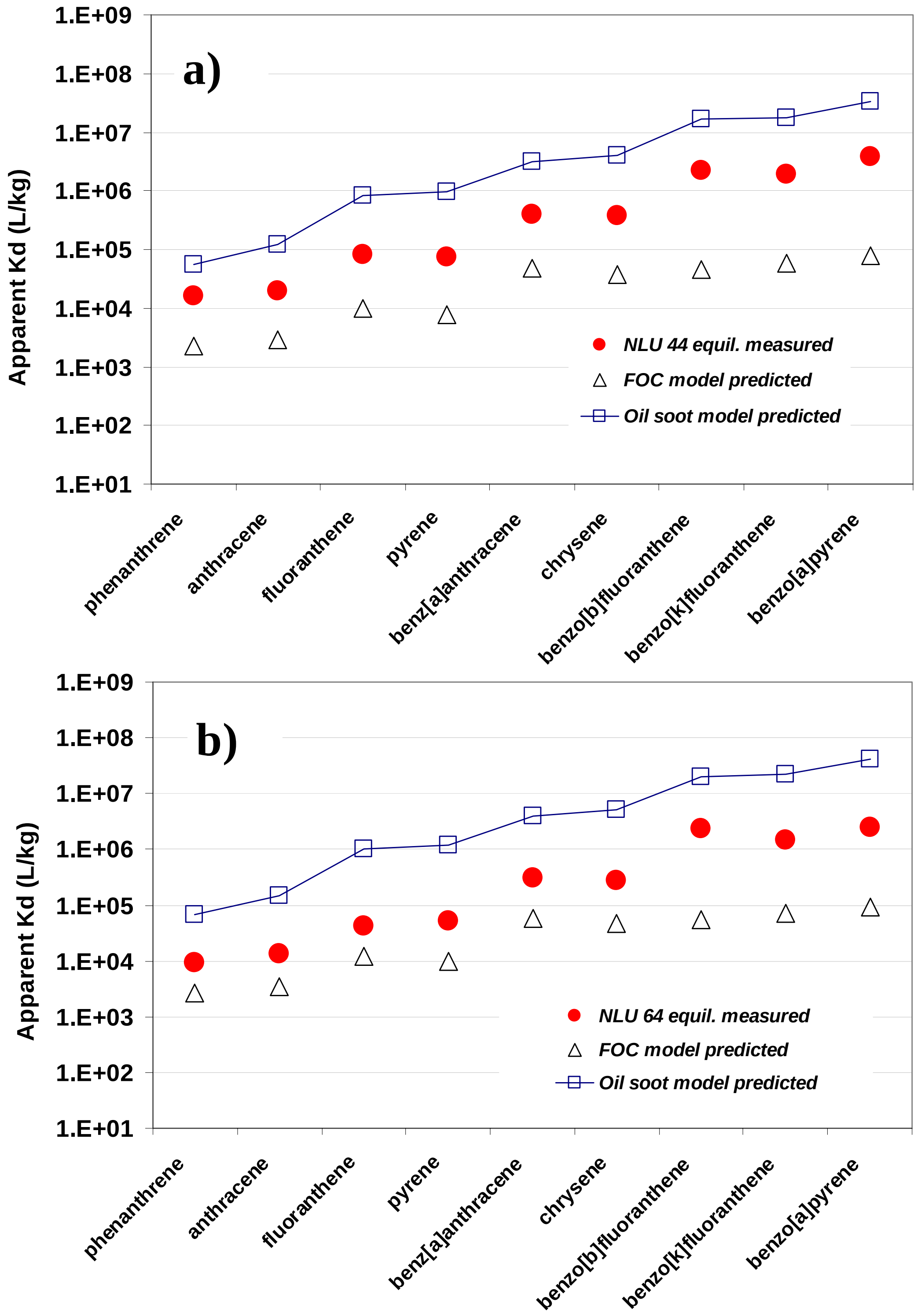
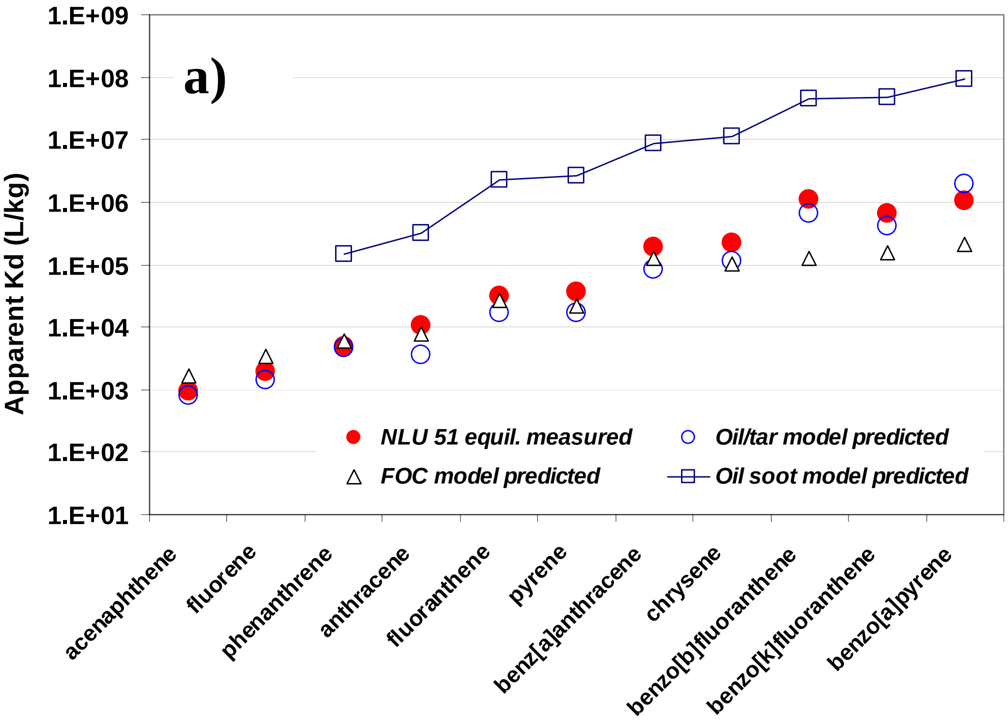


Figure 4 Comparisons between experimentally measured PAH sediment-water distribution coefficients with model predictions (fraction organic carbon partitioning model and oil-soot partitioning model) for two representative samples **(a)** NLU 44 and **(b)** NLU 64 in which natural organic matter is considered the dominant type of organic carbon. This representation is characteristic of fifteen sediment samples.



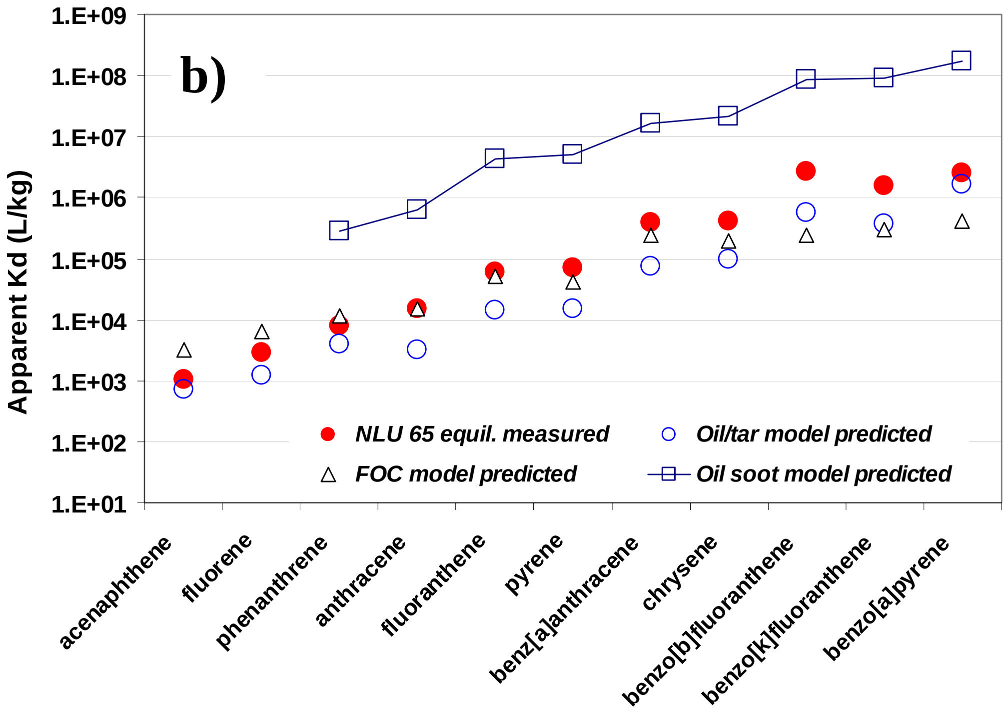


Figure 5 Comparisons between experimentally measured PAH sediment-water distribution coefficients with model predictions for samples **(a)** NLU 51 and **(b)** NLU 65 in which the majority of the PAH partitioning is described by equilibrium with an oil/tar phase.

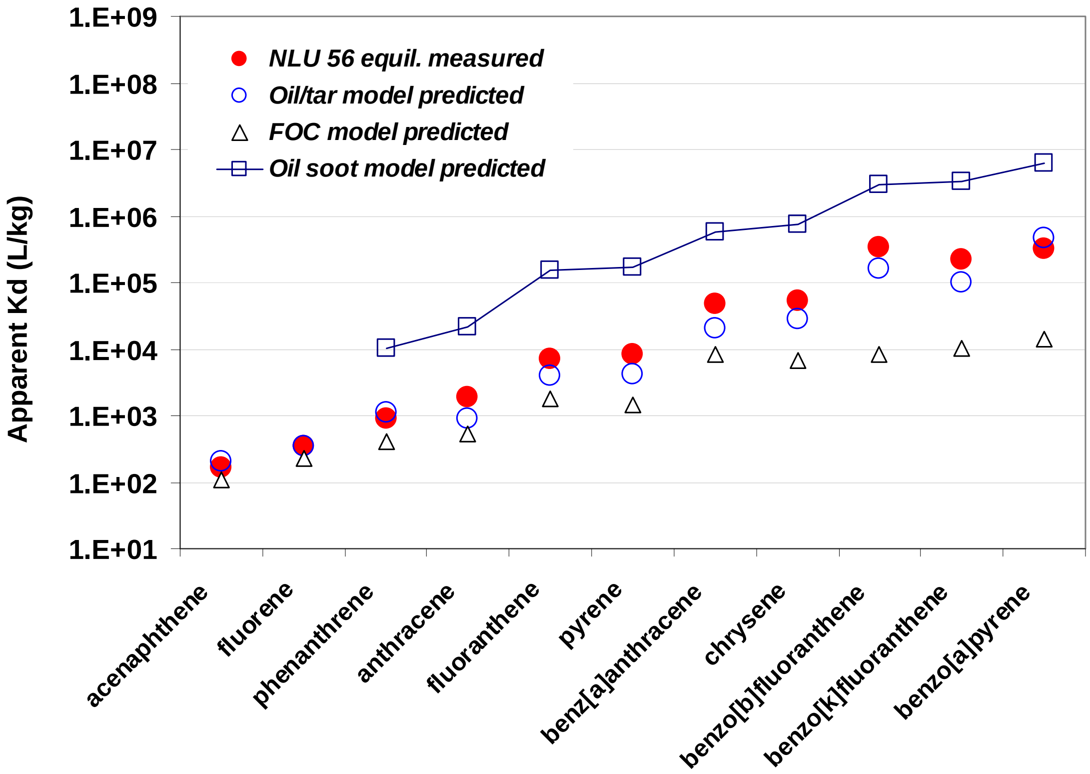


Figure 6 Comparisons between experimentally measured PAH sediment-water distribution coefficients with model predictions for sample NLU 56, showing that the oil tar-water partitioning model better describes the PAH partitioning behavior from this sample than the other models.

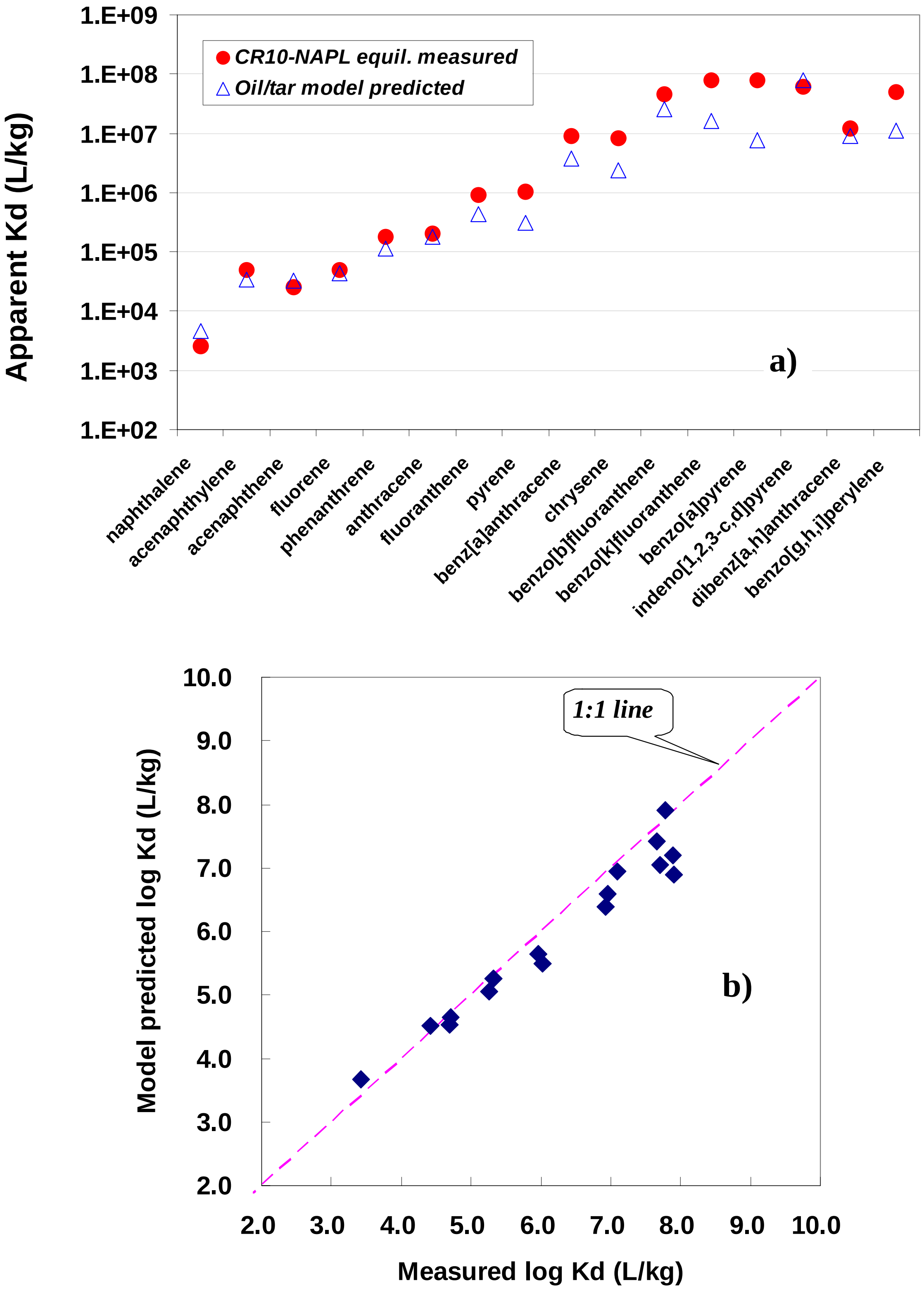


Figure 7 **(a)** Comparison between experimentally measured PAH sediment-water distribution coefficients with oil tar-water partition model predictions for sample CR10-NAPL. **(b)** Experimental results are in good agreement with the oil tar-water partitioning model.

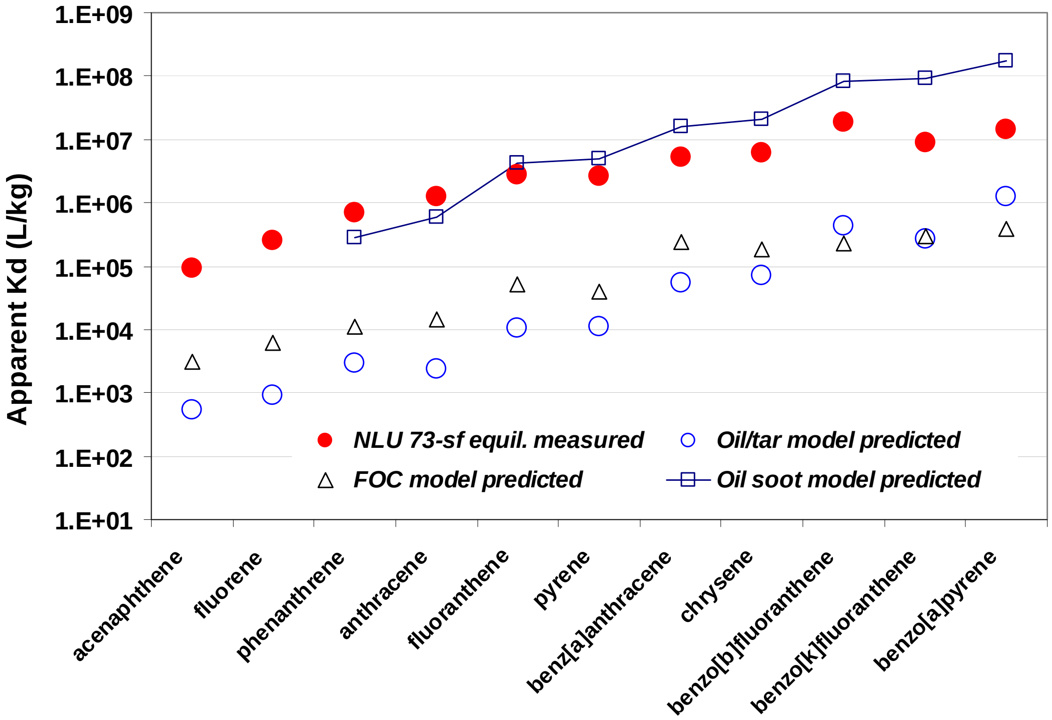


Figure 8 Comparisons between experimentally measured PAH sediment-water distribution coefficients with model predictions for sample NLU 73-Stanford, showing that the oil soot model best describes the PAH partitioning behavior from this sample.

SUB-ATTACHMENT 2D-7.1

Summary of PAH Analyses in Bulk Sediment Samples and Separated Fractions

NLU 44-SS-0010: Summary of PAH Analyses on Bulk Sediment Sample and Separated Fractions

Compounds	Sediment concentration in light density fraction (mg/kg dry weight)	Sediment concentration in heavy density fraction (mg/kg dry weight)	Calculated sediment concentration (mg/kg dry weight)	Measured bulk sediment concentration (mg/kg dry weight)	Mass percentage of PAH in light density fraction (% by weight)
Naphthalene	< 0.1	< 0.1	n.a.	0.2	n.a.
Acenaphthylene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Acenaphthene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Fluorene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Phenanthrene	2.2	0.6	1.2	1.2	69
Anthracene	< 0.1	< 0.1	n.a.	0.3	n.a.
Fluoranthene	6.9	1.0	3.3	3.5	82
Pyrene	9.2	1.5	4.4	4.7	80
Benz[a]anthracene	3.1	0.5	1.5	1.6	80
Chrysene	3.2	0.5	1.5	1.7	80
Benzo[b]fluoranthene	3.5	0.8	1.8	2.5	74
Benzo[k]fluoranthene	4.6	0.8	2.3	3.3	77
Benzo[a]pyrene	5.3	0.8	2.5	3.2	81
Indeno[1,2,3-cd]pyrene	4.0	0.9	2.1	2.5	73
Dibenz[a,h]anthracene	< 0.1	< 0.1	n.a.	0.2	n.a.
Benzo[g,h,i]perylene	4.8	0.9	2.4	2.7	77
Total (mg/kg)	**46.8**	**8.3**	**23.2**	**27.7**	**78**

Note:

- n.a. = not applicable, n.d. = not detected or below detection limit, the method detection limit (MDL) for PAH analysis on sediment samples has been determined as 0.1~0.5 mg/kg dry weight for individual PAH compounds.
- Reported concentration values are average values of duplicate tests with relative standard deviation (RSD) ranging from 1~17% for all PAH compounds of interest.
- Concentration values reported in each fraction are all based on the dry weight of corresponding fractions, for example, concentrations in the light fraction have a unit of mg PAH compounds / kg dry weight of light fraction of this sediment sample.

NLU 47-SS-0010: Summary of PAH Analyses on Bulk Sediment Sample and Separated Fractions

Compounds	Sediment concentration in light density fraction (mg/kg dry weight)	Sediment concentration in heavy density fraction (mg/kg dry weight)	Calculated sediment concentration (mg/kg dry weight)	Measured bulk sediment concentration (mg/kg dry weight)	Mass percentage of PAH in light density fraction (% by weight)
Naphthalene	< 0.5	< 0.5	n.a.	0.7	n.a.
Acenaphthylene	< 0.5	< 0.5	n.a.	0.4	n.a.
Acenaphthene	< 0.5	< 0.5	n.a.	0.5	n.a.
Fluorene	< 0.5	< 0.5	n.a.	0.4	n.a.
Phenanthrene	6.4	0.7	3.3	3.9	88
Anthracene	2.0	< 0.5	0.9	0.8	100
Fluoranthene	18.8	1.4	9.3	11.1	92
Pyrene	23.6	1.9	11.8	13.7	91
Benz[a]anthracene	7.4	0.6	3.7	4.1	91
Chrysene	6.7	0.6	3.4	3.9	91
Benzo[b]fluoranthene	7.9	1.1	4.2	4.9	86
Benzo[k]fluoranthene	9.7	0.8	4.9	5.8	91
Benzo[a]pyrene	14.5	0.9	7.1	7.1	93
Indeno[1,2,3-cd]pyrene	10.2	1.1	5.2	5.4	88
Dibenz[a,h]anthracene	< 0.5	< 0.5	< 0.5	0.6	n.a.
Benzo[g,h,i]perylene	11.0	0.9	5.5	5.7	91
Total (mg/kg)	**118.1**	**10.0**	**59.3**	**69.2**	**91**

Note:

- Reported concentration values are average values of duplicate tests with relative standard deviation (RSD) ranging from 0.3~12% for all PAH compounds of interest.
- Calculated PAH concentration in the whole sediment samples was calculated by multiplying measured PAH concentrations on light density fraction and heavy density fraction with their respective mass percentage and then summing those up. By comparing with bulk sediment sample PAH measurements, this confirms PAH mass balance in the separated fractions.

NLU 51-SS-0010: Summary of PAH Analyses on Bulk Sediment Sample and Separated Fractions

Compounds	Sediment concentration in light density fraction (mg/kg dry weight)	Sediment concentration in heavy density fraction (mg/kg dry weight)	Calculated sediment concentration (mg/kg dry weight)	Measured bulk sediment concentration (mg/kg dry weight)	Mass percentage of PAH in light density fraction (% by weight)
Naphthalene	40	0.6	18	19	98
Acenaphthylene	32	0.9	15	16	97
Acenaphthene	85	4	41	69	95
Fluorene	65	4	31	44	94
Phenanthrene	922	73	454	501	91
Anthracene	262	16	127	160	93
Fluoranthene	1678	124	822	851	92
Pyrene	2037	149	997	1009	92
Benz[a]anthracene	505	29	243	236	93
Chrysene	553	40	271	271	92
Benzo[b]fluoranthene	476	17	223	202	96
Benzo[k]fluoranthene	396	23	191	198	93
Benzo[a]pyrene	653	27	308	342	95
Indeno[1,2,3-cd]pyrene	447	16	209	205	96
Dibenz[a,h]anthracene	69	2	32	26	97
Benzo[g,h,i]perylene	516	17	241	235	96
Total (mg/kg)	**8738**	**542**	**4222**	**4386**	**93**

Note:

- Reported concentration values are average values of duplicate tests with relative standard deviation (RSD) ranging from 2~24% for all PAH compounds of interest.
- Calculated PAH concentration in the whole sediment samples was calculated by multiplying measured PAH concentrations on light density fraction and heavy density fraction with their respective mass percentage and then summing those up. By comparing with bulk sediment sample PAH measurements, this confirms PAH mass balance in the separated fractions.

NLU 402-GE15-16.5: Summary of PAH Analyses on Bulk Sediment Sample and Separated Fractions

Compounds	Sediment concentration in light density fraction (mg/kg dry weight)	Sediment concentration in heavy density fraction (mg/kg dry weight)	Calculated sediment concentration (mg/kg dry weight)	Measured bulk sediment concentration (mg/kg dry weight)	Mass percentage of PAH in light density fraction (% by weight)
Naphthalene	10	0.2	1	2	70
Acenaphthylene	61	1.5	4	5	66
Acenaphthene	114	4.5	10	14	55
Fluorene	112	4.0	9	13	58
Phenanthrene	662	18	48	59	64
Anthracene	211	4.7	14	17	68
Fluoranthene	381	7.5	25	28	71
Pyrene	441	8.4	28	32	72
Benz[a]anthracene	166	3.0	11	11	73
Chrysene	170	3.0	11	11	73
Benzo[b]fluoranthene	86	1.4	5	5	75
Benzo[k]fluoranthene	113	1.9	7	6	74
Benzo[a]pyrene	178	2.9	11	9	75
Indeno[1,2,3-cd]pyrene	89	1.4	5	4	75
Dibenz[a,h]anthracene	24	0.3	1	1	80
Benzo[g,h,i]perylene	87	1.3	5	4	76
Total (mg/kg)	**2905**	**64**	**195**	**220**	**69**

Note:

- Reported concentration values are average values of duplicate tests with relative standard deviation (RSD) ranging from 1~19% for all PAH compounds of interest.
- Calculated PAH concentration in the whole sediment samples was calculated by multiplying measured PAH concentrations on light density fraction and heavy density fraction with their respective mass percentage and then summing those up. By comparing with bulk sediment sample PAH measurements, this confirms PAH mass balance in the separated fractions.

NLU 54-SS-0010: Summary of PAH Analyses on Bulk Sediment Sample and Separated Fractions

Compounds	Sediment concentration in light density fraction (mg/kg dry weight)	Sediment concentration in heavy density fraction (mg/kg dry weight)	Calculated sediment concentration (mg/kg dry weight)	Measured bulk sediment concentration (mg/kg dry weight)	Mass percentage of PAH in light density fraction (% by weight)
Naphthalene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Acenaphthylene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Acenaphthene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Fluorene	< 0.1	< 0.1	n.a.	0.2	n.a.
Phenanthrene	2.2	< 0.1	1.0	1.1	100
Anthracene	< 0.1	< 0.1	n.a.	0.3	n.a.
Fluoranthene	4.5	0.8	2.5	2.4	83
Pyrene	5.3	0.9	2.9	2.8	83
Benz[a]anthracene	1.8	< 0.1	0.8	1.0	100
Chrysene	2.1	< 0.1	0.9	1.1	100
Benzo[b]fluoranthene	2.1	< 0.1	1.0	1.5	100
Benzo[k]fluoranthene	2.6	< 0.1	1.2	2.8	100
Benzo[a]pyrene	3.1	< 0.1	1.4	1.2	100
Indeno[1,2,3-cd]pyrene	2.4	< 0.1	1.1	1.6	100
Dibenz[a,h]anthracene	< 0.1	< 0.1	n.a.	n.d.	n.a.
Benzo[g,h,i]perylene	2.0	< 0.1	0.9	1.5	100
Total (mg/kg)	**28**	**2**	**14**	**17**	**93**

Note:

- Reported concentration values are average values of duplicate tests with relative standard deviation (RSD) ranging from 7~13% for all PAH compounds of interest.
- Calculated PAH concentration in the whole sediment samples was calculated by multiplying measured PAH concentrations on light density fraction and heavy density fraction with their respective mass percentage and then summing those up. By comparing with bulk sediment sample PAH measurements, this confirms PAH mass balance in the separated fractions.