APPENDIX F

Chromatograms

APPENDIX F

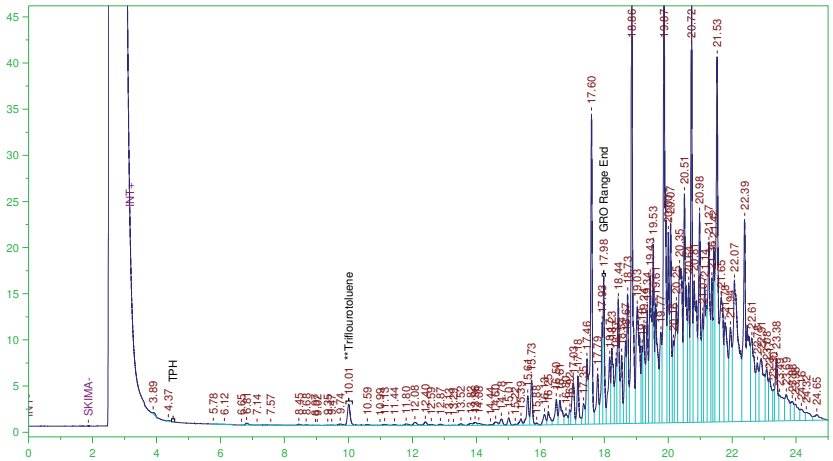
CHROMATOGRAMS

CONTENTS

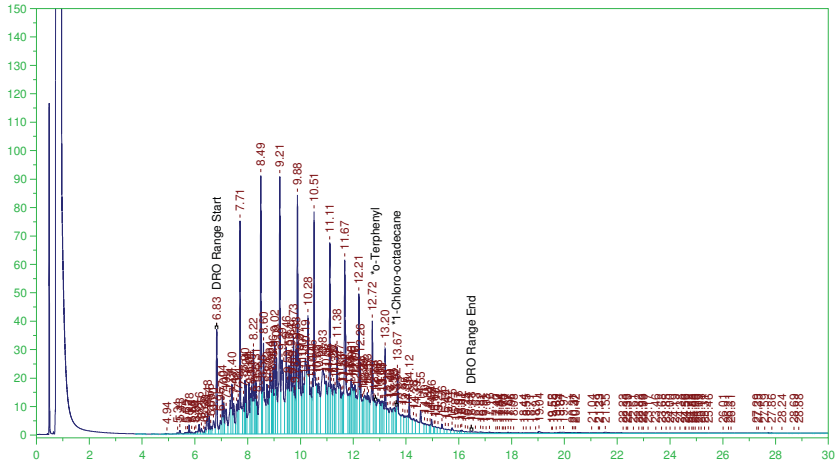
Figure F-1	GRO and DRO Chromatograms: Drill Mud (RS 4-10 Mud and JEN 1A Mud)
Figure F-2	GRO and DRO Chromatograms: Condensate and Drill Mud (CGF-3 and MS 12-16 Mud)
Figure F-3	GRO and DRO Chromatograms: Produced Water (SP 13-33 PDW and MS 14-16 PDW)
Figure F-4	GRO and DRO Chromatograms: Produced Water (RS 15-12 PW and WB 7-15 PW)
Figure F-5	GRO and DRO Chromatograms: Produced Water (RN 16-30 PW and AN 1-9 PDW)
Figure F-6	GRO and DRO Chromatograms: Flowback Fluid (MS D2-21 FBF and MS 3C-33D FBF)
Figure F-7	GRO and DRO Chromatograms: Flowback Fluid (MS 3-27 FBF and RS 9-2 FBF)
Figure F-8	GRO and DRO Chromatograms: Pump Installation Materials (BO 1-32-1 and WB 16-5 Pump)
Figure F-9	GRO and DRO Chromatograms: Pump Installation Materials (WB 7-5-2 and PD Baseline)
Figure F-10	GRO and DRO Chromatograms: LNAPL and Groundwater Sample from Well AN 1-16 (AN 1-16 PHC and AN 1-16)
Figure F-11	GRO and Mass Spectrometry Chromatograms: Wells HWY 7 and RS 11-14
Figure F-12	GRO and Mass Spectrometry Chromatograms: Wells AN 11-10D and AN 1-16
Figure F-13	GRO and Mass Spectrometry Chromatograms: Study Wells T-4-RW-a and T-4-RW-b
Figure F-14	DRO Chromatograms: Before and After Silica Gel Treatment (SGT): Study Wells T-5-RW and T-9-RW
Figure F-15	DRO Chromatograms: Before and After Silica Gel Treatment (SGT): Study Wells X-3-SW and T-8-A
Figure F-16	GRO and DRO Chromatograms for Groundwater, Condensate and Produced Water Samples collected from the Warbonnet 7-15D Pad
Figure F-17	Carbon Scan of LNAPL Sample Compared to Carbon Scans of Standard Reference Materials and Sampled Potential Source Materials
Figure F-18	GRO and DRO Chromatograms: Wells RS 11-25 and RS 15-12 and Drill Mud
Figure F-19	GRO, DRO and Mass Spectrometry Chromatograms: Well RB 16-30

Figure F-20 GRO and DRO Chromatograms: Wells SP 5-20, SP 11-33, and SP 11-34
Figure F-21 GRO and DRO Chromatograms: Wells BO 12A-33 and BO 1-32
Figure F-22 GRO and DRO Chromatograms: Wells WB 7-4 and HWY 11
Figure F-23 DRO Chromatograms: Before and After Silica Gel Treatment (SGT): Study Wells X-1-SW, X-2-SW and X-5-A
Figure F-24 DRO Chromatograms: Before and After Silica Gel Treatment (SGT): Study Wells T-1-SW, T-6-RW and T-7-RW
Figure F-25 GRO and DRO Chromatograms: Wells MS-14-16 and MS 15-16 and Pipe Dope
Figure F-26 GRO and DRO and Mass Spectrometry Chromatograms: Wells MS 12-28 and RS 1-4
Figure F-27 GRO and DRO Chromatograms: Wells RB 13-29 and AN 15-23
Figure F-28 DRO Chromatograms: Before and After Silica Gel Treatment (SGT): Study Wells T-1-RW and T-2-RW
Figure F-29 DRO Chromatograms: Before and After Silica Gel Treatment (SGT): Study Wells T-4-SW, T-4-RW-a and T-4-RW-b
Figure F-30 Standard Reference Chromatograms: Diesel Fuel and Mineral Oil
Figure F-31 GRO, DRO and Mass Spectrometry Chromatograms: Wells WB 7-5 and WB 8-6

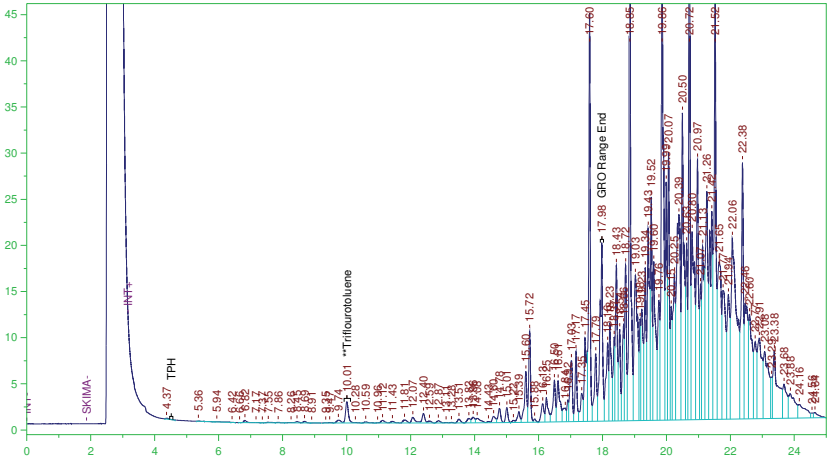
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-1.ai



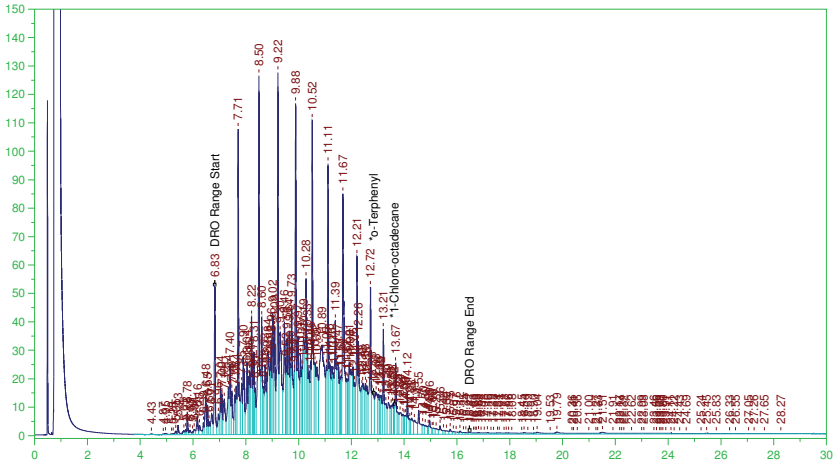
GRO - Drill Mud (RS 4-10 Mud)



DRO - Drill Mud (RS 4-10 Mud)



GRO - Drill Mud (JEN 1A Mud)

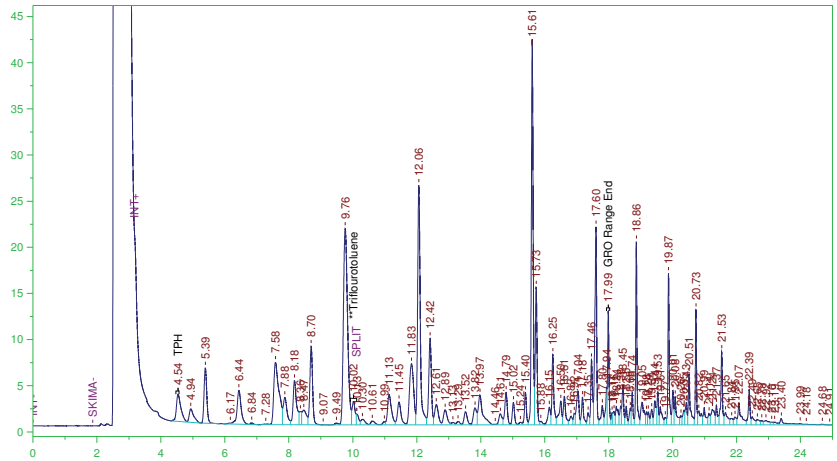


DRO - Drill Mud (JEN 1A Mud)

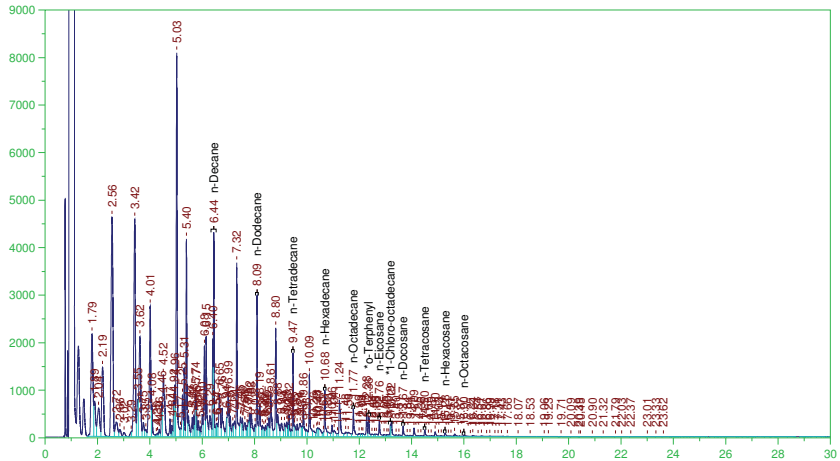
GRO and DRO Chromatograms
Drill Mud
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-1

amec

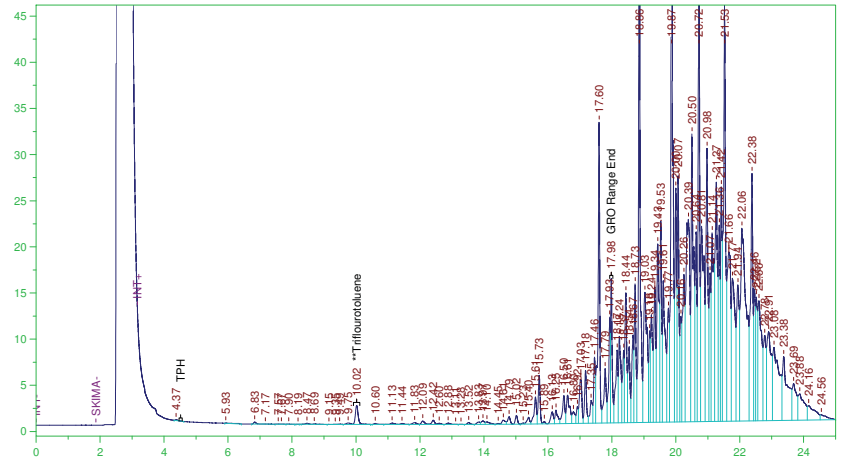
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-2.ai



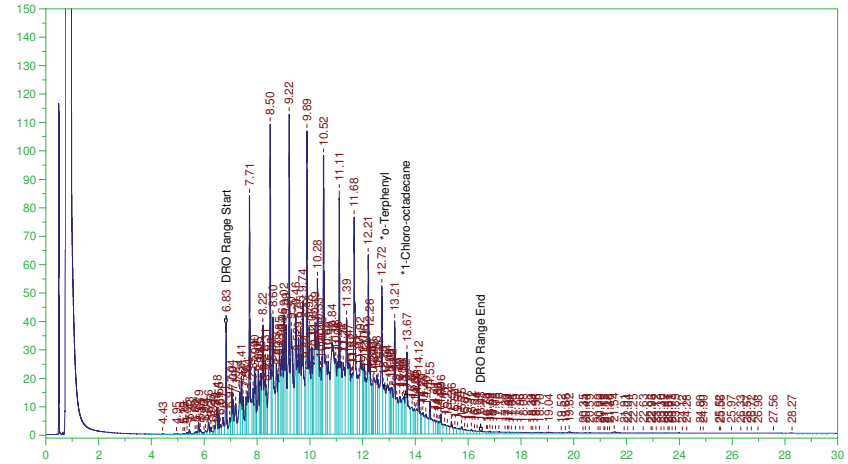
GRO - Condensate (CGF-3)



DRO - Condensate (CGF-3)



GRO - Drill Mud (MS 12-16 Mud)

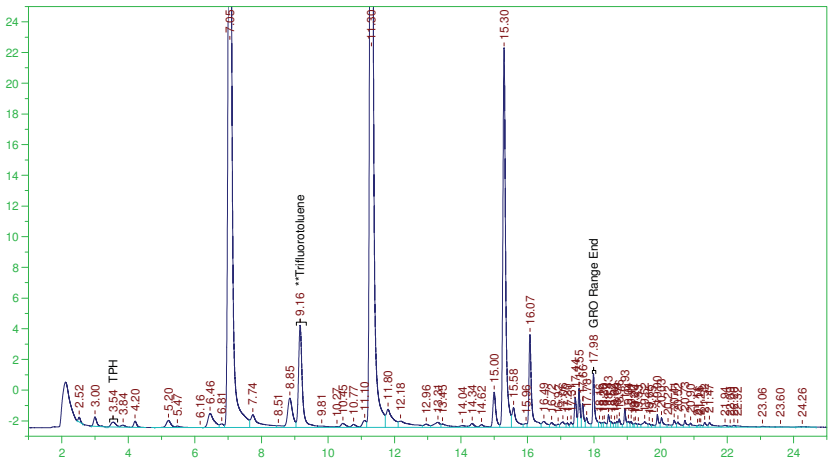


DRO - Drill Mud (MS 12-16 Mud)

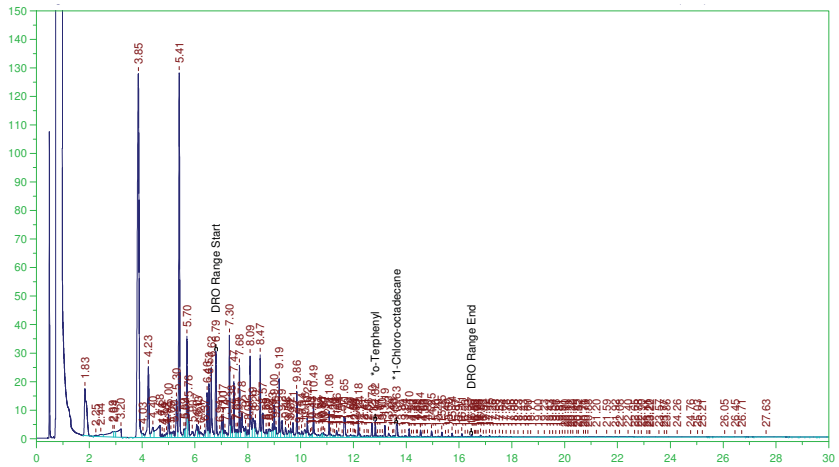
GRO and DRO Chromatograms
Condensate and Drill Mud
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-2

amec

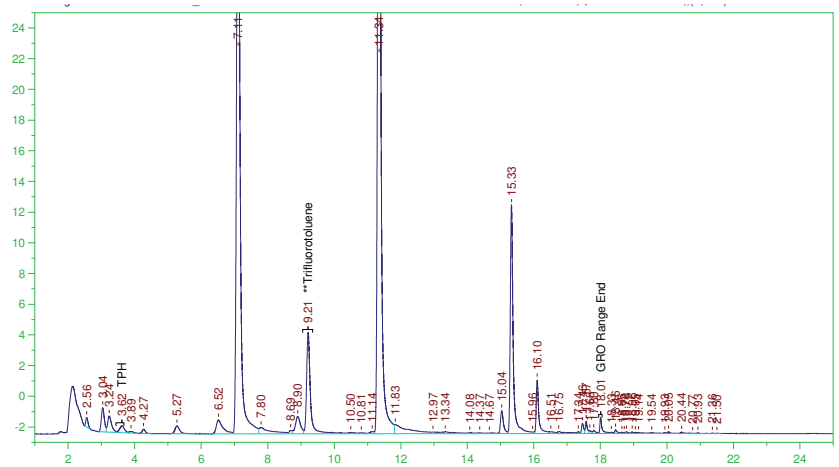
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-3.ai



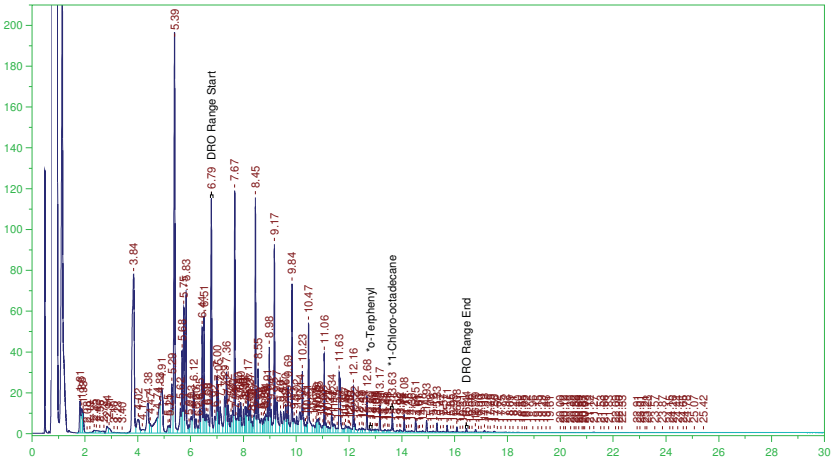
GRO - Produced Water (SP 13-33 PDW)



DRO - Produced Water (SP 13-33 PDW)



GRO - Produced Water (MS 14-16 PDW)

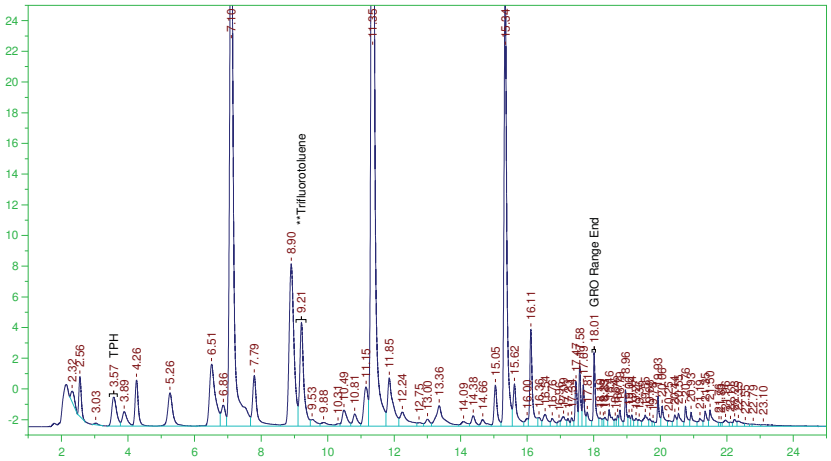


DRO - Produced Water (MS 14-16 PDW)

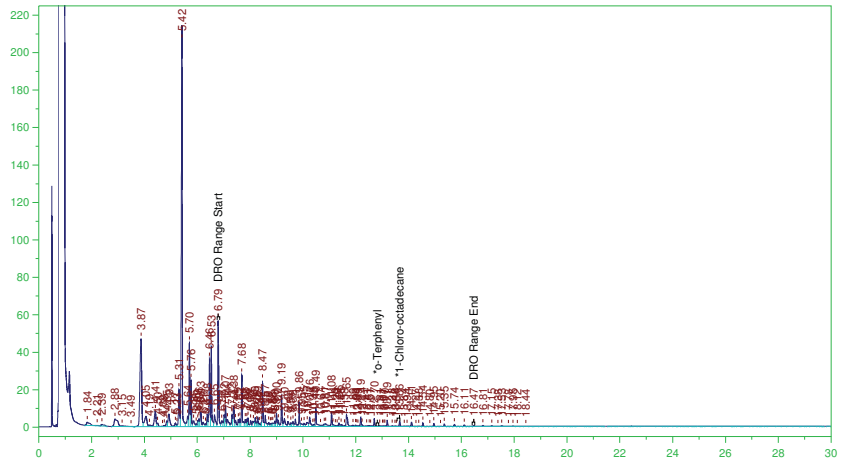
GRO and DRO Chromatograms
Produced Water
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-3

amec

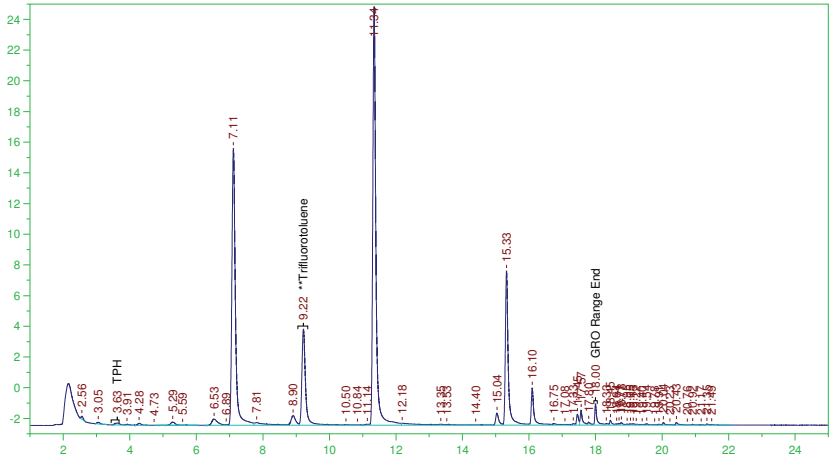
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-4.ai



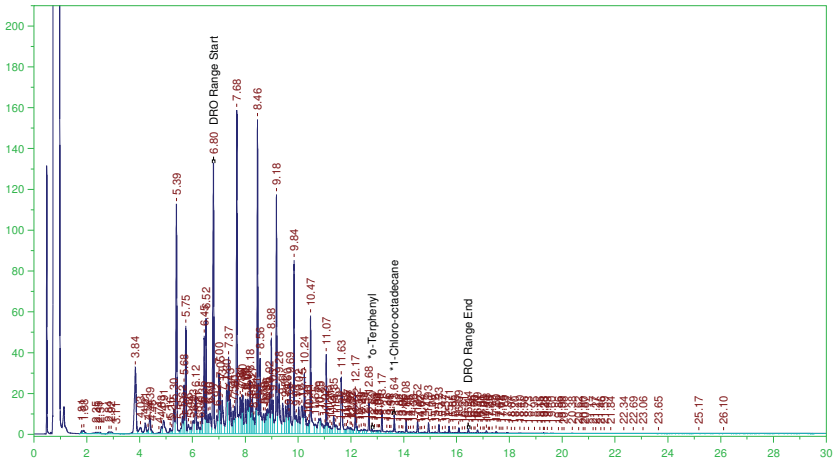
GRO - Produced Water (RS 15-12 PW)



DRO - Produced Water (RS 15-12 PW)



GRO - Produced Water (WB 7-15 PW)

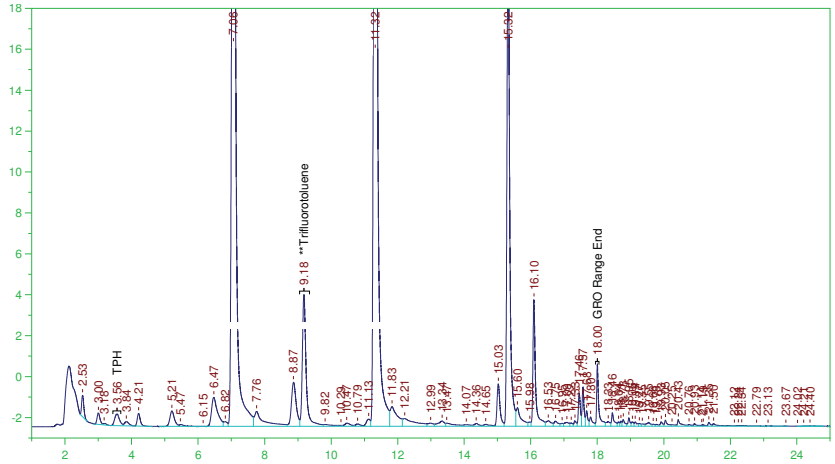


DRO - Produced Water (WB 7-15 PW)

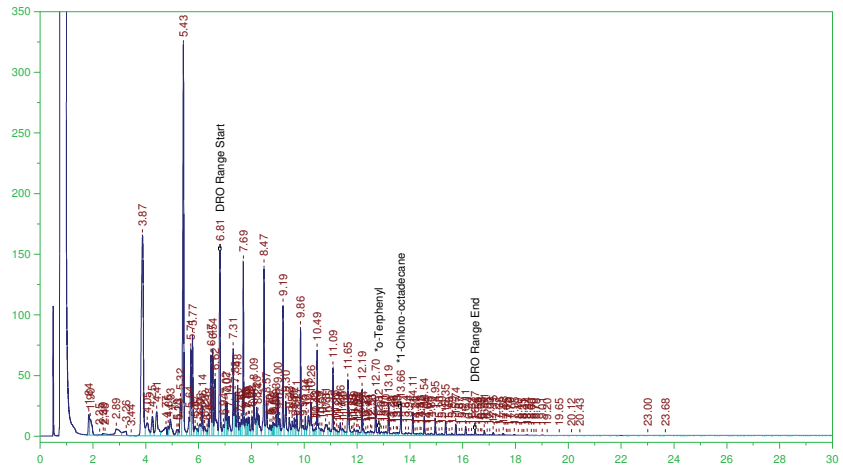
GRO and DRO Chromatograms
Produced Water
Low-Level Petromeum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-4

amec

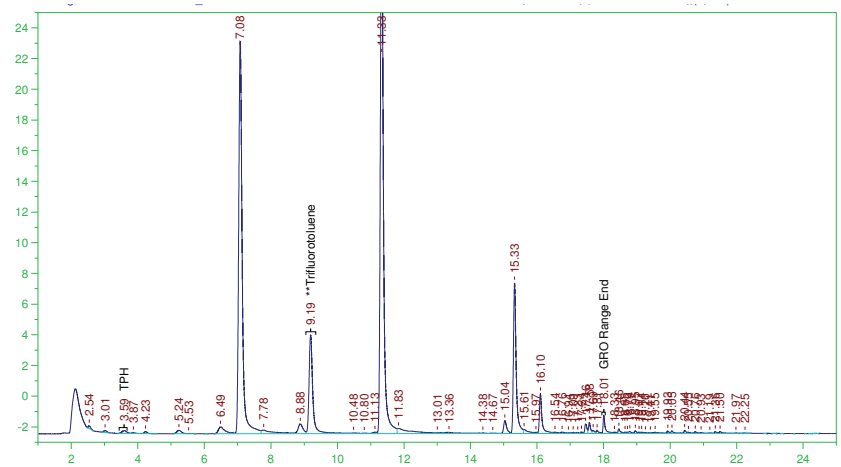
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-5.ai



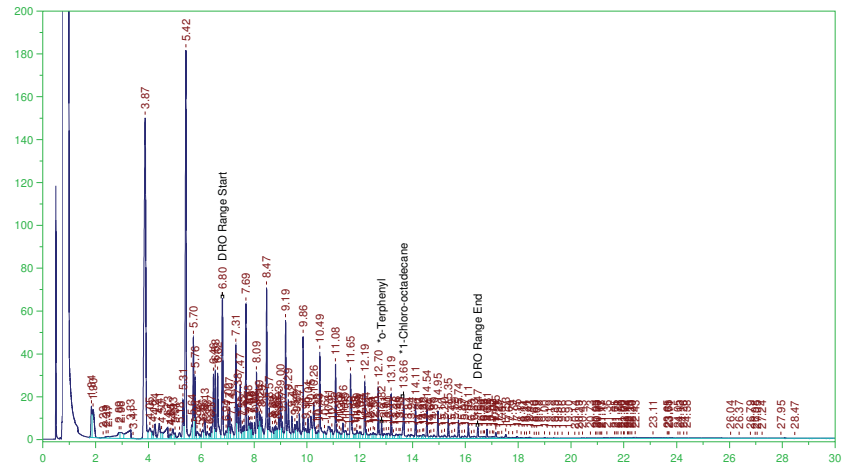
GRO - Produced Water (RN 16-30 PW)



DRO - Produced Water (RN 16-30 PW)



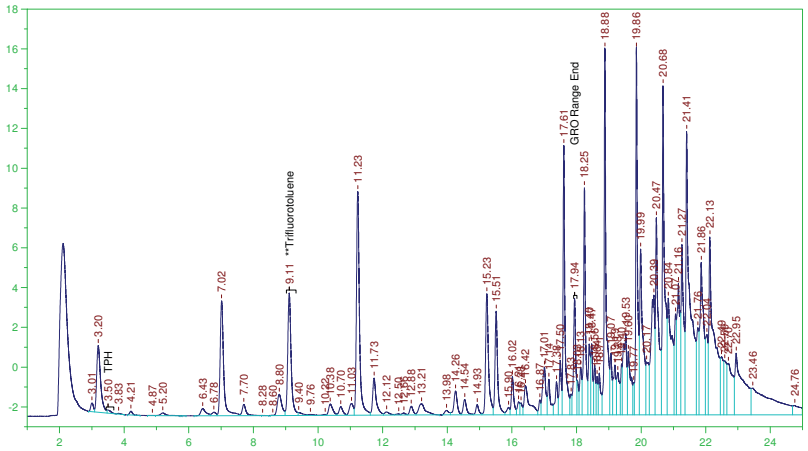
GRO - Produced Water (AN 1-9 PDW)



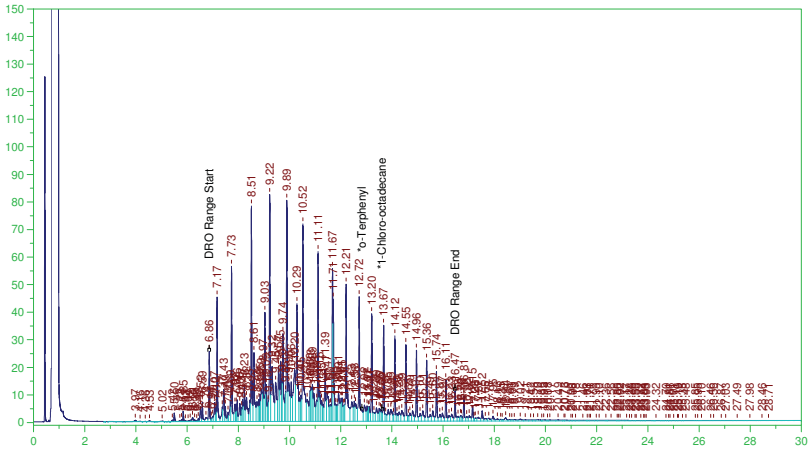
DRO - Produced Water (AN 1-9 PDW)

GRO and DRO Chromatograms
Produced Water
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-5

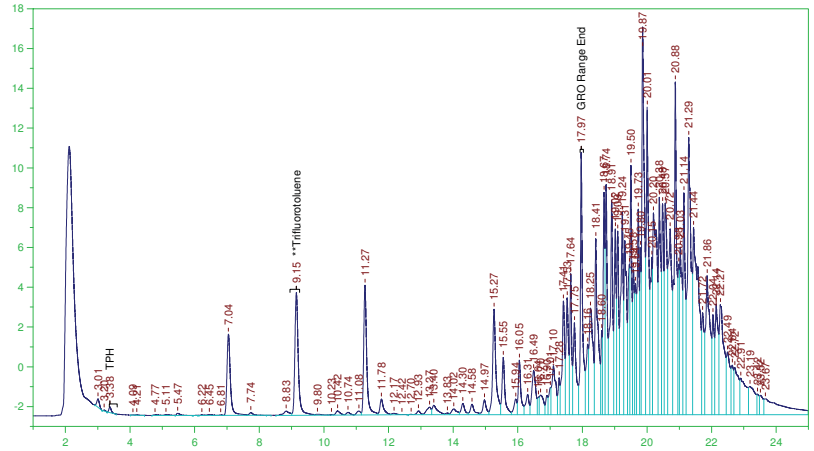
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-6.ai



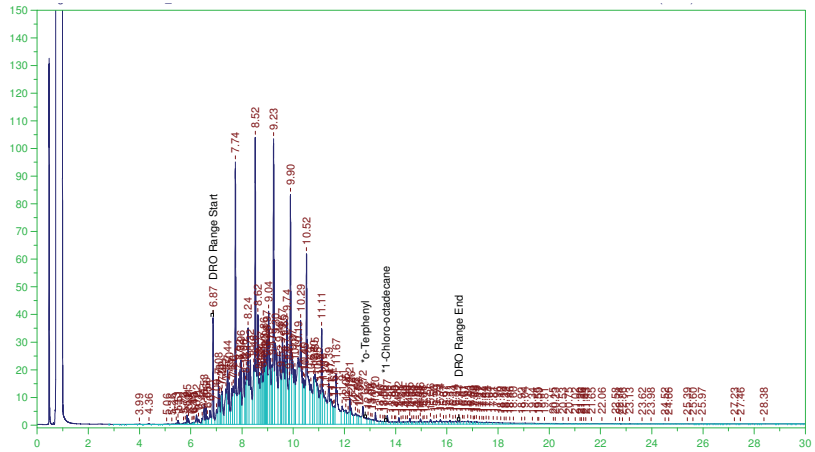
GRO - Flowback Fluid (MS D2-21)



DRO - Flowback Fluid (MS D2-21)



GRO - Flowback Fluid (MS 3C-33D FBF)

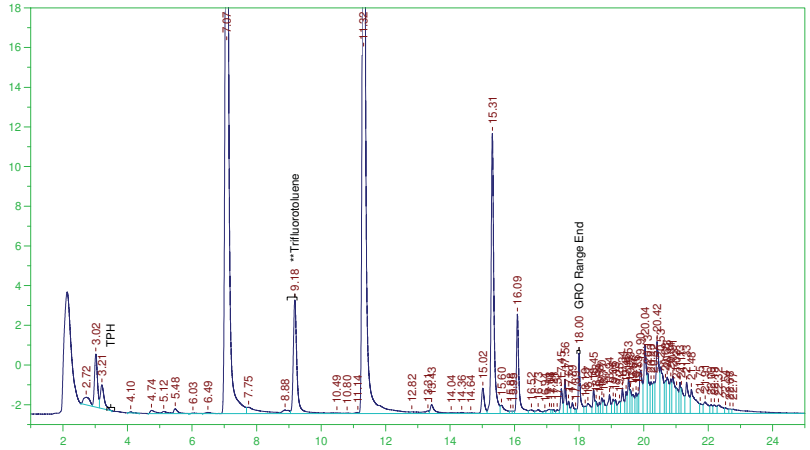


DRO - Flowback Fluid (MS 3C-33D FBF)

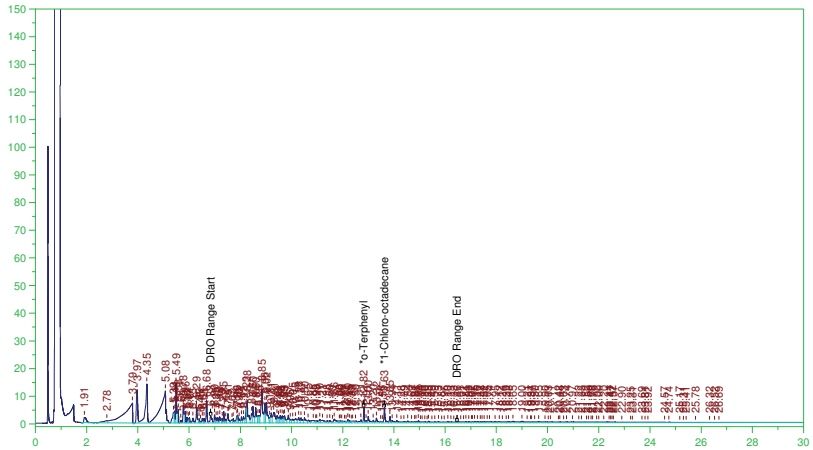
GRO and DRO Chromatograms
Flowback Fluid
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-6

amec

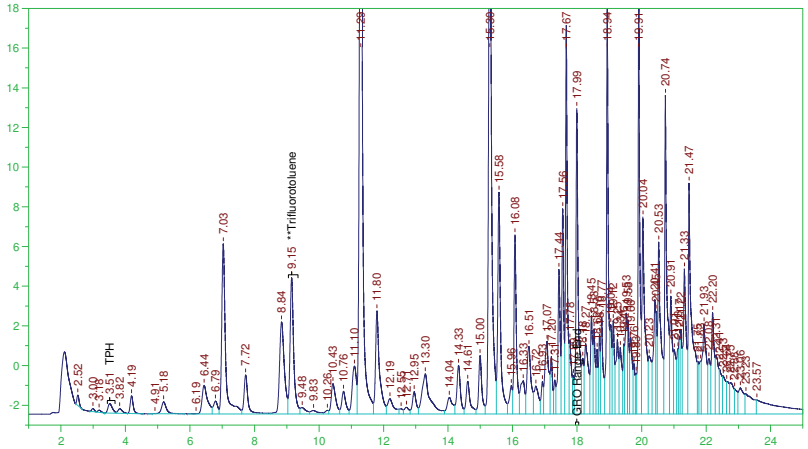
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-7.ai



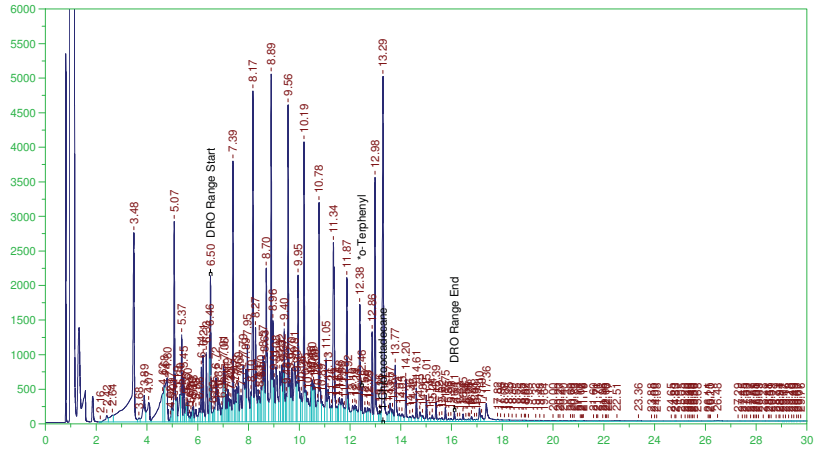
GRO - Flowback Fluid (MS 3-27 FBF)



DRO - Flowback Fluid (MS 3-27 FBF)



GRO - Flowback Fluid (RS 9-2 FBF)

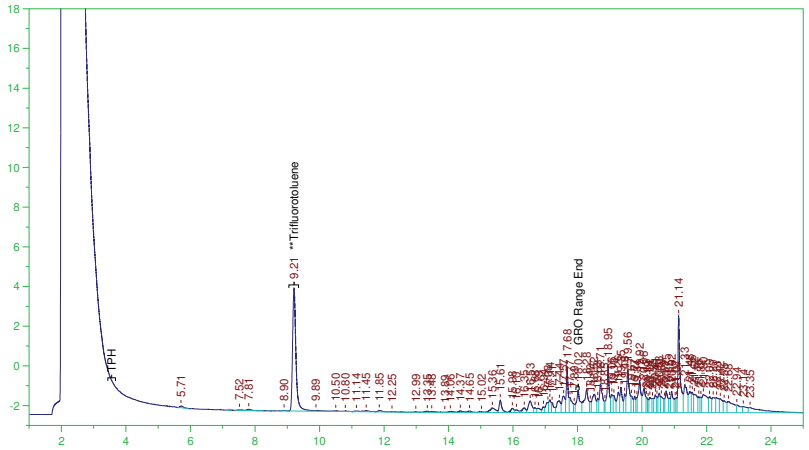


DRO - Flowback Fluid (RS 9-2 FBF)

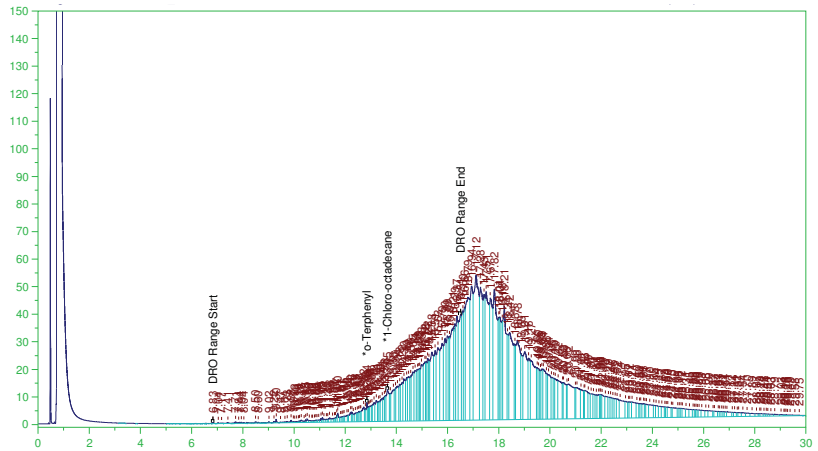
GRO and DRO Chromatograms
Flowback Fluid
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-7

amec

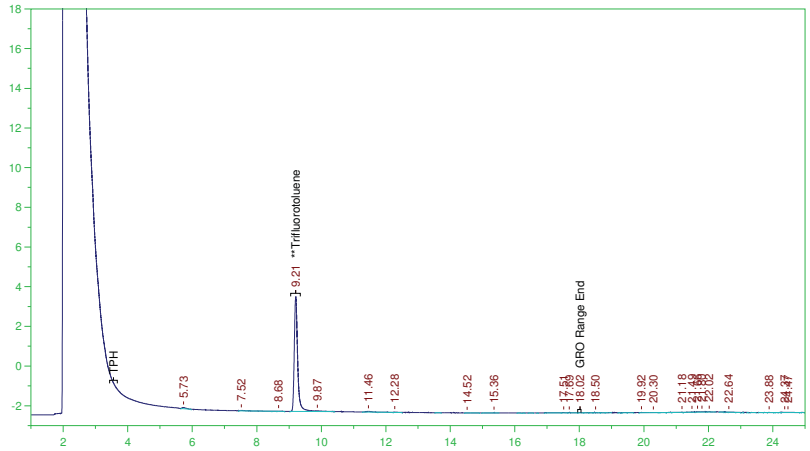
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-8.ai



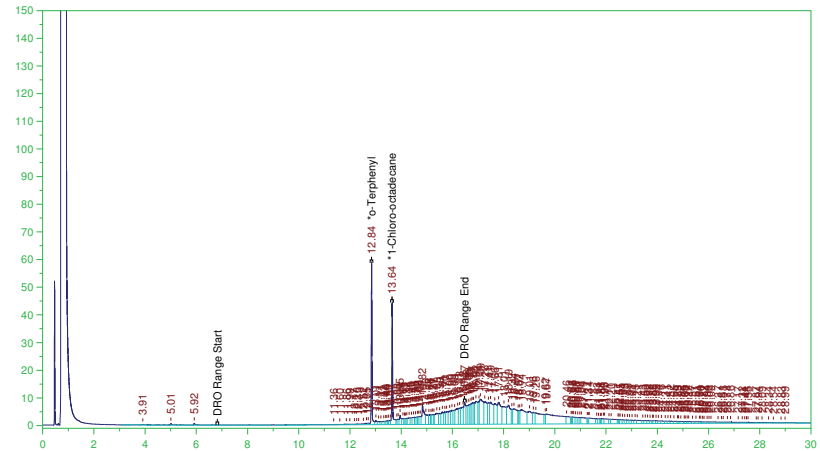
GRO - Pipe Dope (BO 1-32-1)



DRO - Pipe Dope (BO 1-32-1)



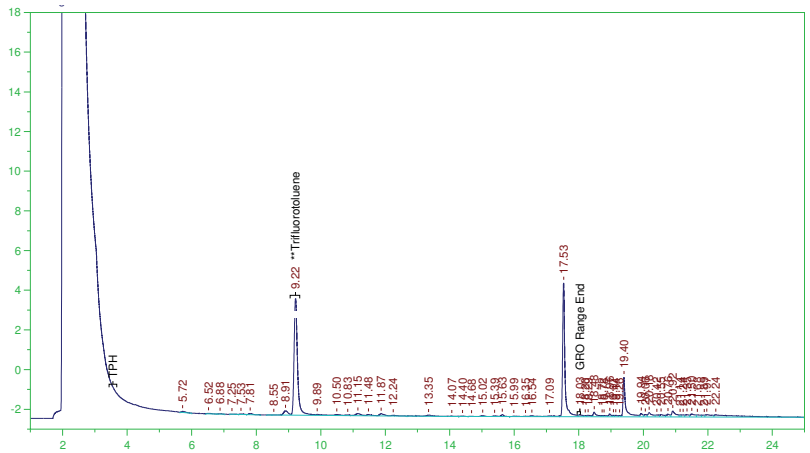
GRO - Pipe Dope (WB 16-5 Pump)



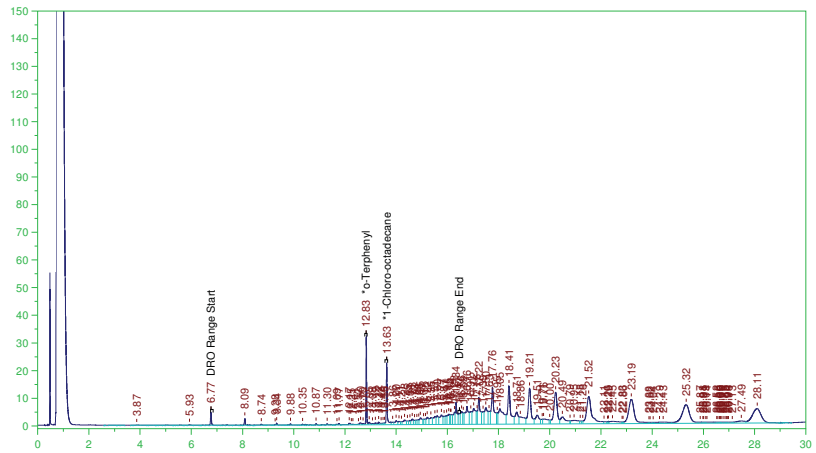
DRO - Pipe Dope (WB 16-5 Pump)

GRO and DRO Chromatograms
Pump Installation Materials
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-8

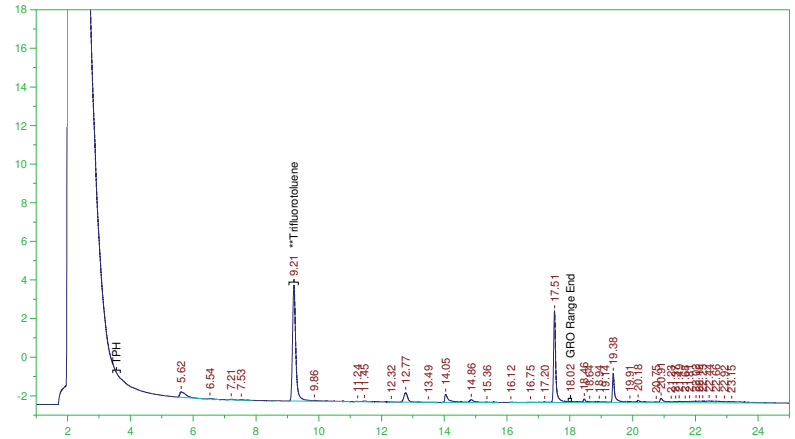
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-9.ai



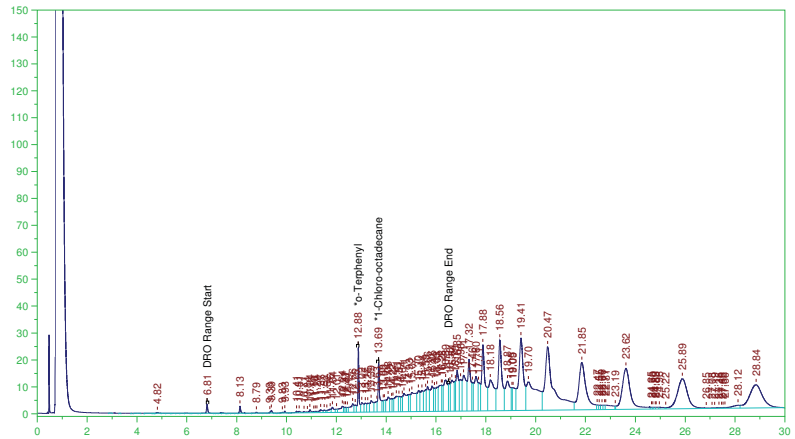
GRO - Pipe Dope (WB 7-5-2)



DRO - Pipe Dope (WB 7-5-2)



GRO - Pipe Dope (PD Baseline)

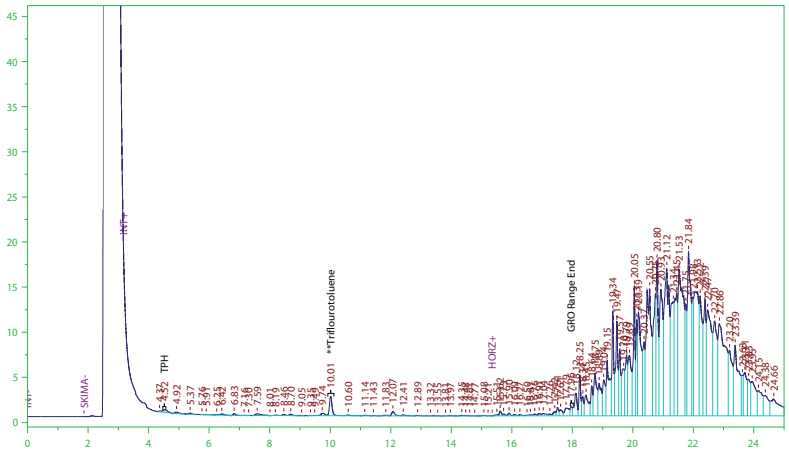


DRO - Pipe Dope (PD Baseline)

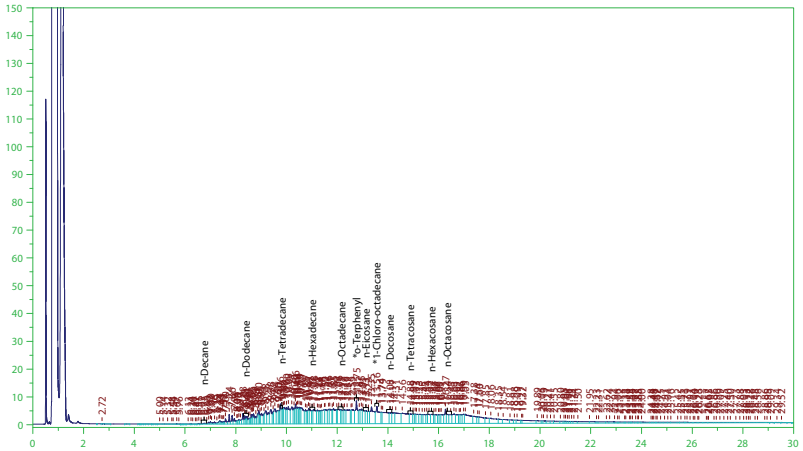
GRO and DRO Chromatograms
Pump Installation Materials
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-9

amec

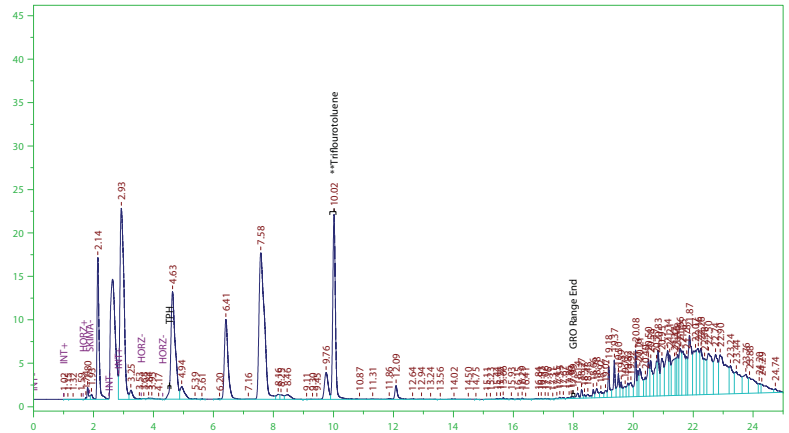
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-10.ai



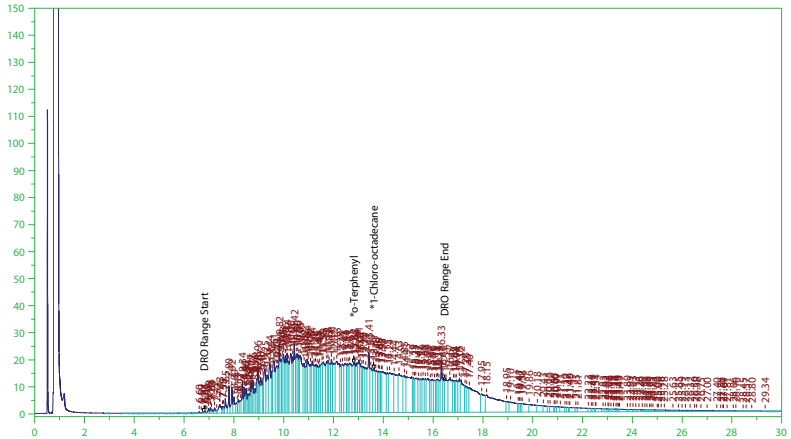
GRO - AN 1-16 PHC



DRO - AN 1-16 PHC



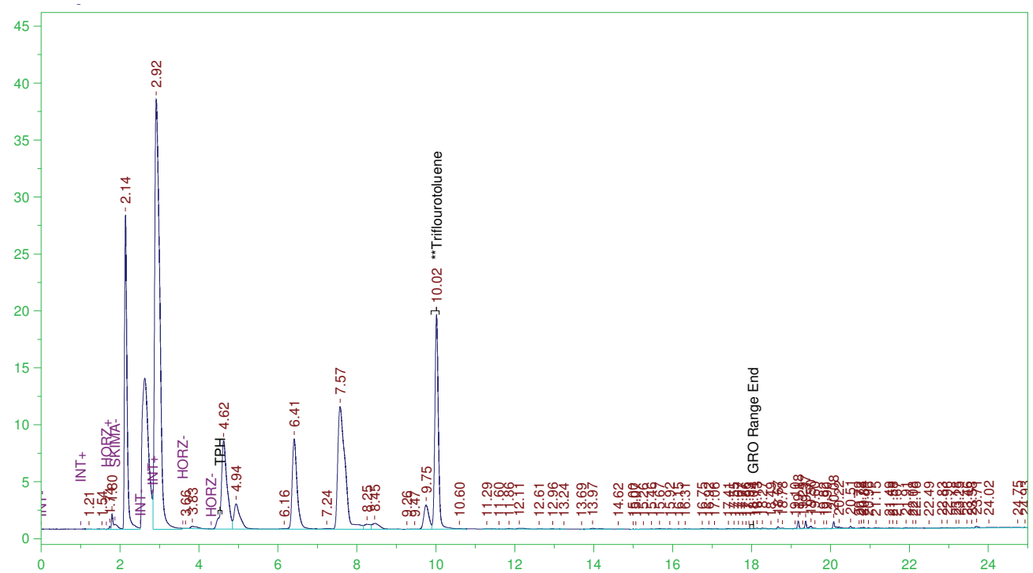
GRO - AN 1-16



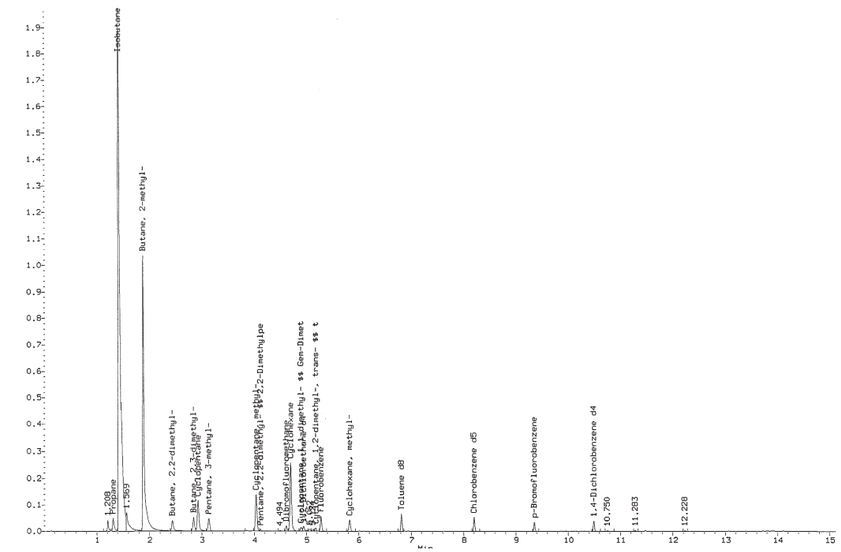
DRO - AN 1-16

GRO and DRO Chromatograms
LNAPL and Groundwater Sample from Well AN 1-16
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-10

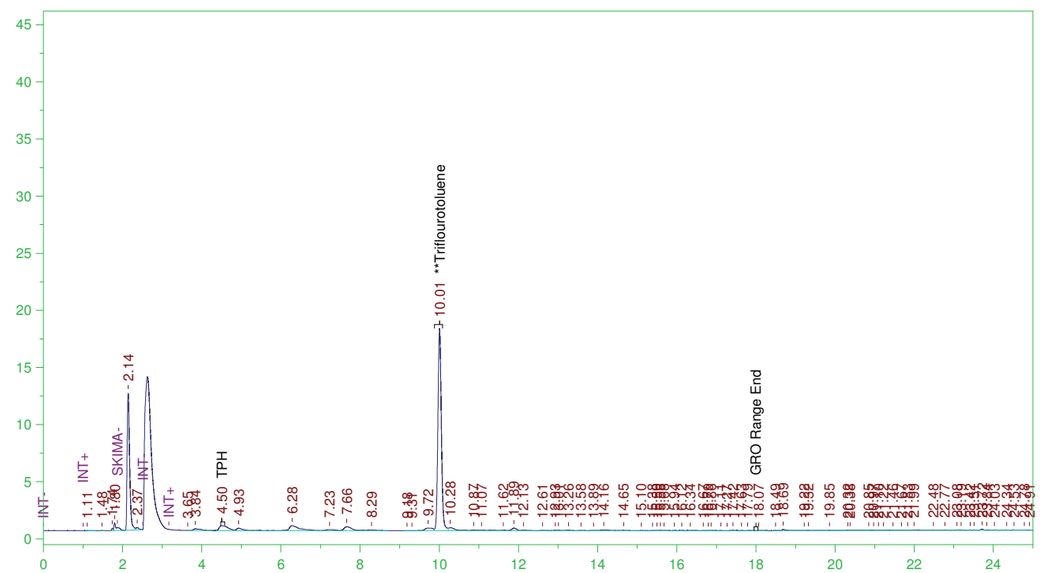
amec



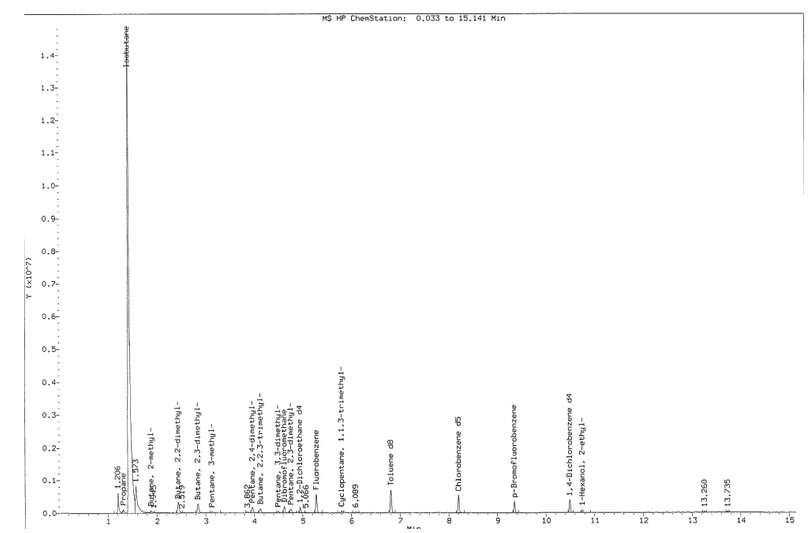
GRO - HWY 7



MS VOC - HWY 7



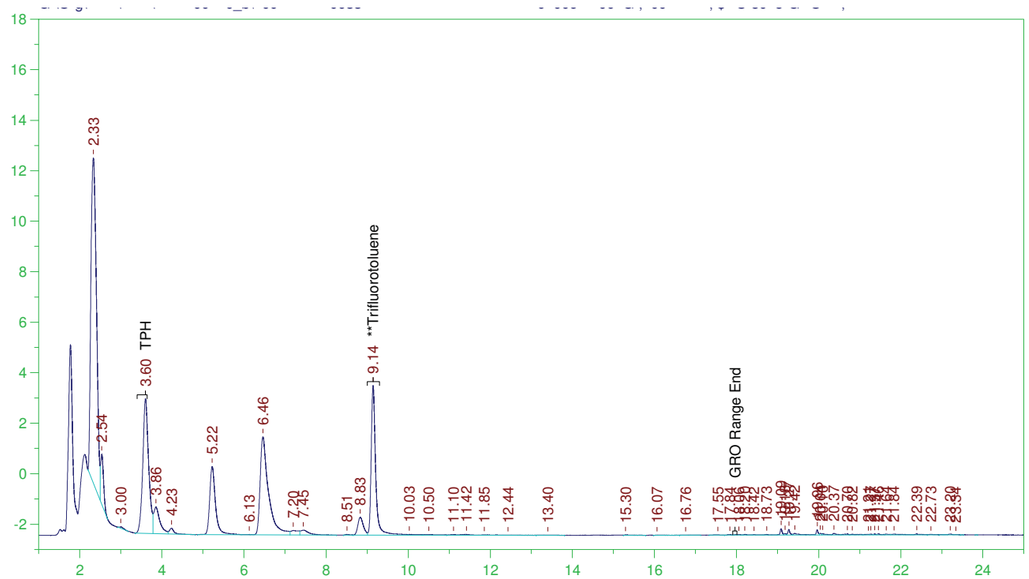
GRO - RS 11-14



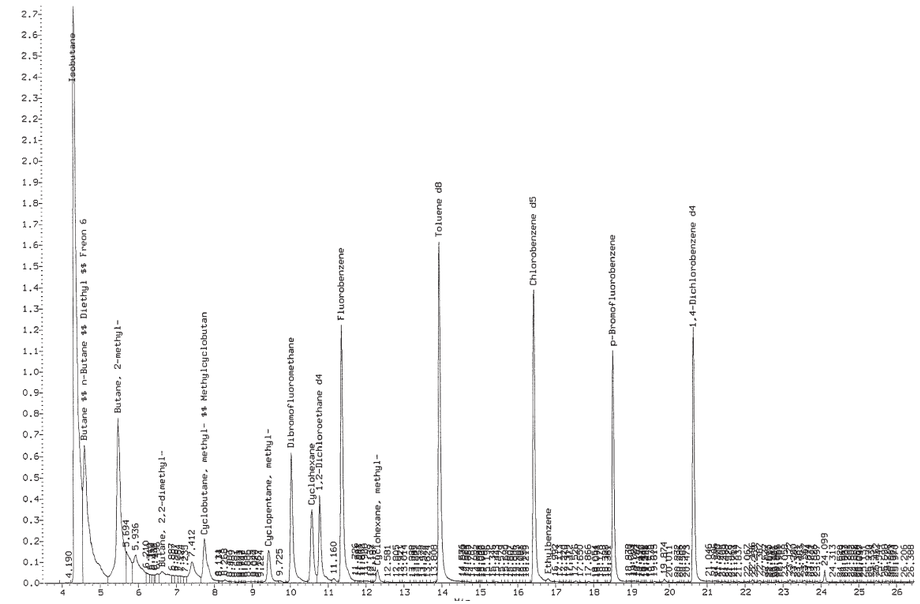
MS VOC - RS 11-14

H:\13655 Pinedale\1365500\10.070.5 LPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-11.ai

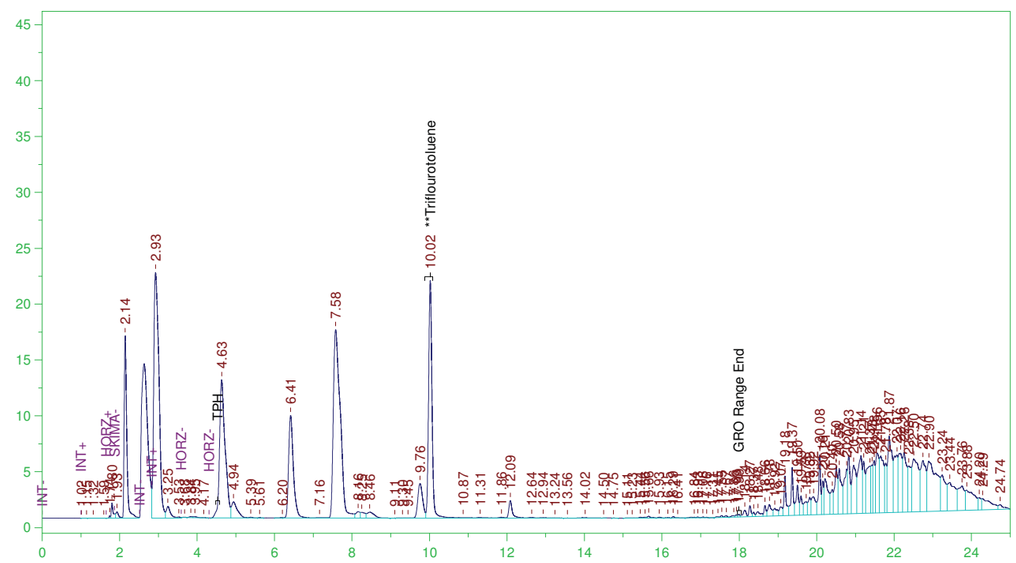
GRO and Mass Spectrometry Chromatograms
Wells HWY 7 and RS 11-14
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-11



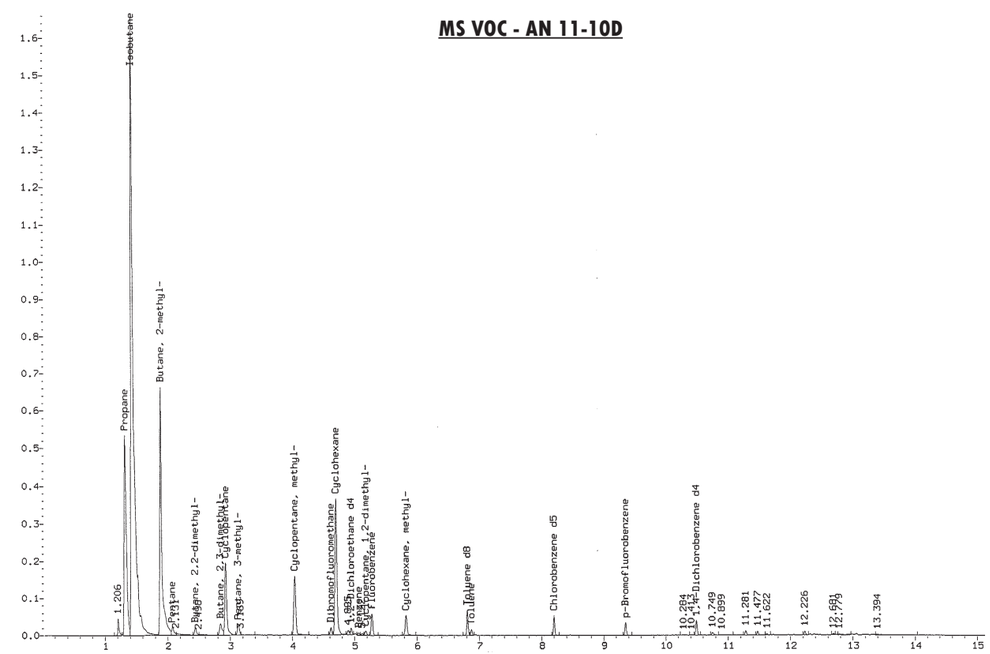
GRO - AN 11-10D



MS VOC - AN 11-10D



GRO - AN 1-16

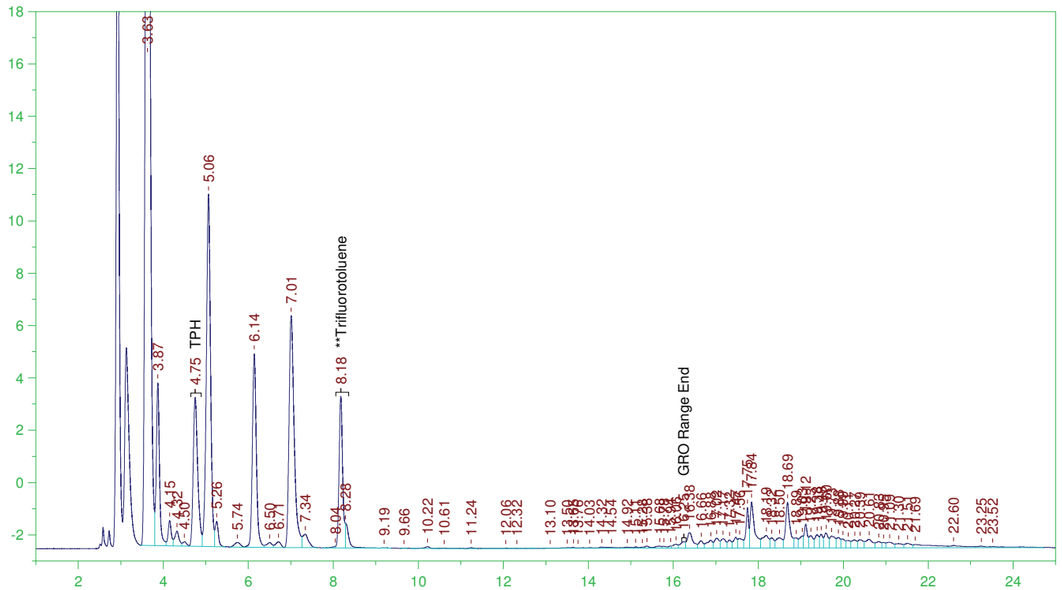


MS VOC - AN 1-16

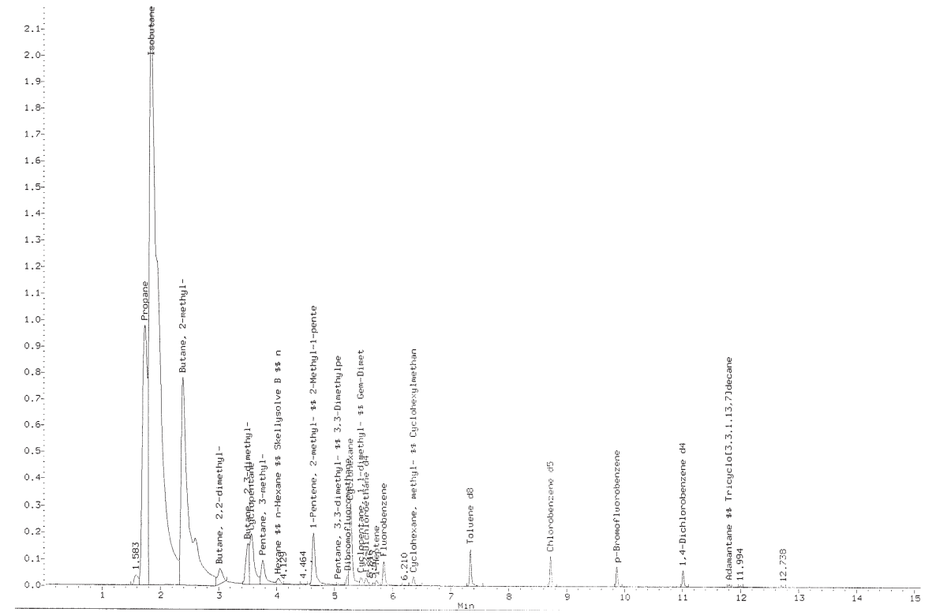
H:\13655 Pinedale\13655001\0.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-12.ai

amec

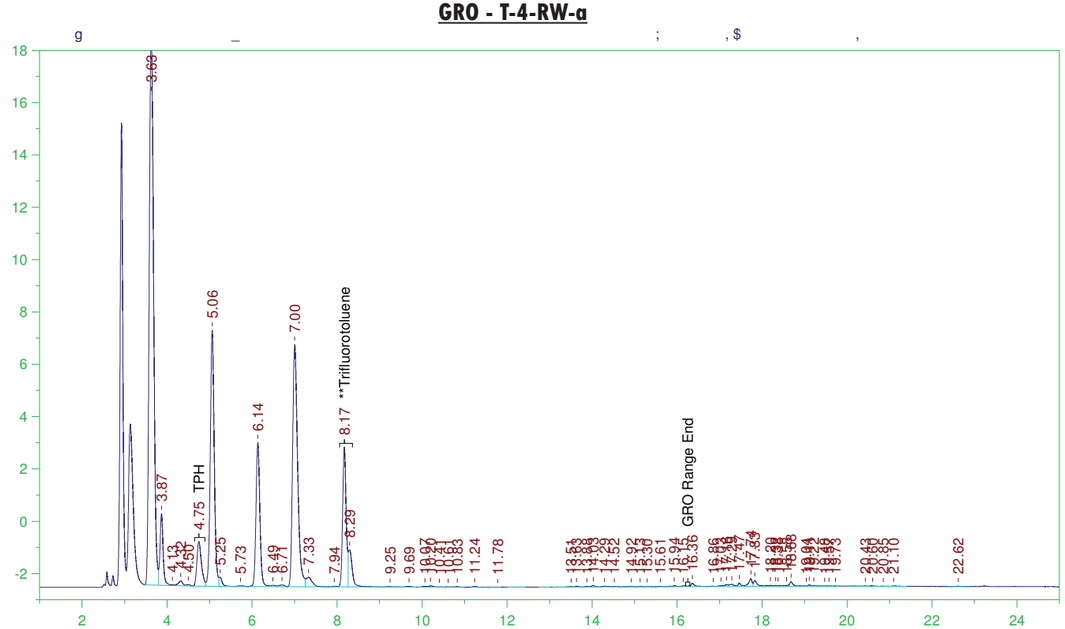
GRO and Mass Spectrometry Chromatograms
Wells AN 11-10D and AN 1-16
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-12



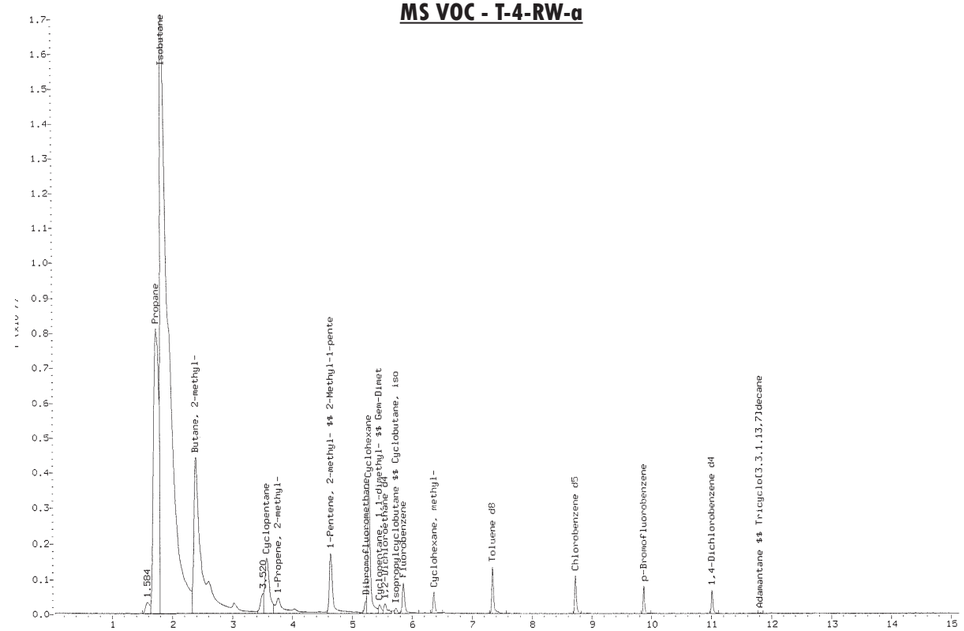
GRO - T-4-RW-a



MS VOC - T-4-RW-a



GRO - T-4-RW-b



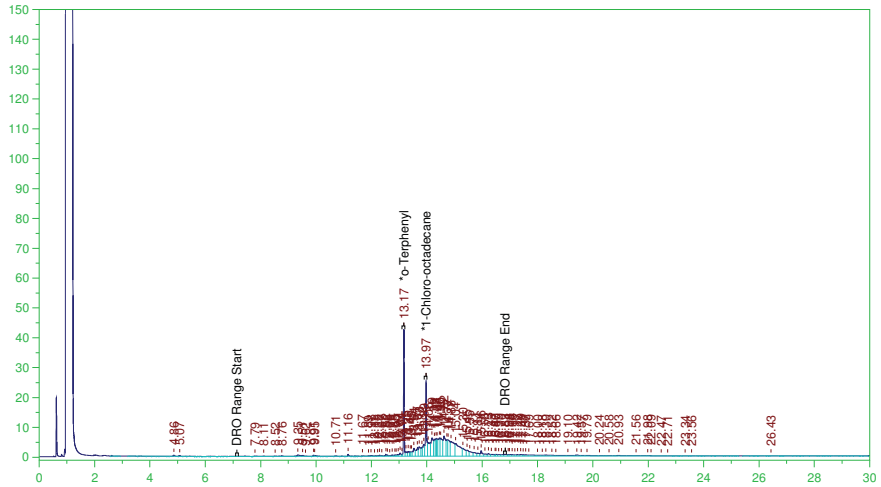
MS VOC - T-4-RW-b

H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-13.ai

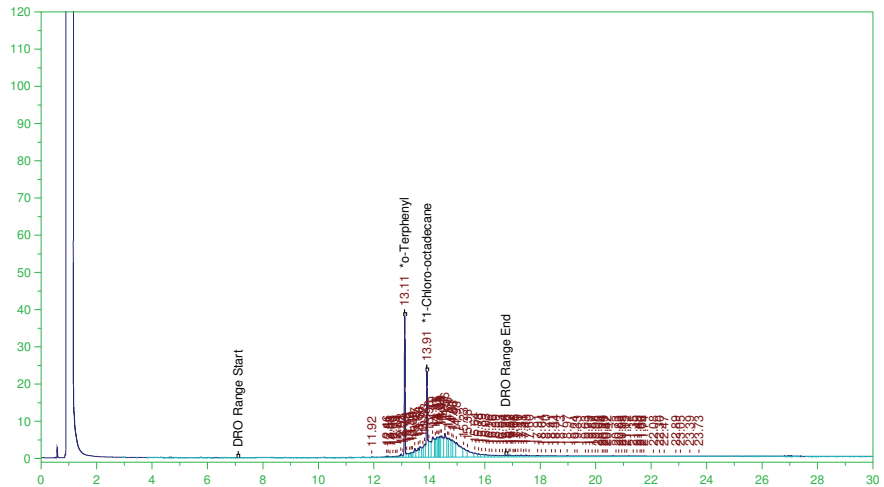
amec

GRO and Mass Spectrometry Chromatograms
Study Wells T-4-RW-a and T-4-RW-b
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-13

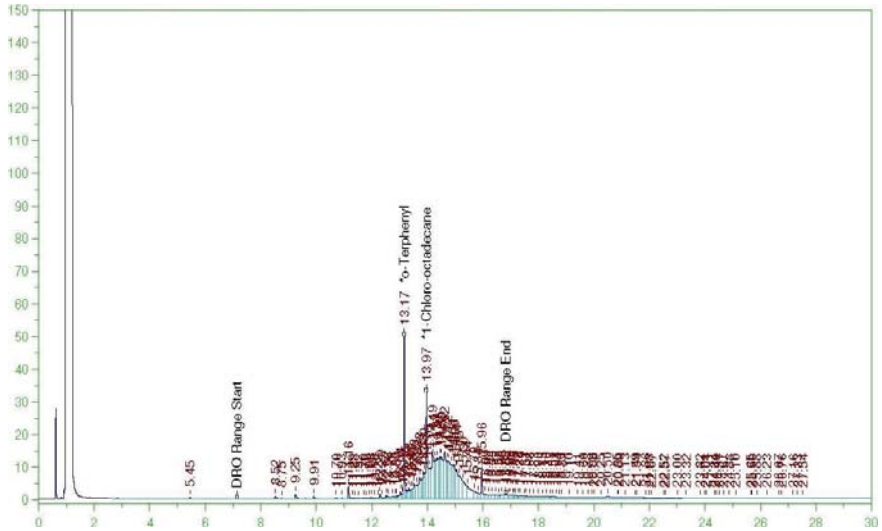
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-14.ai



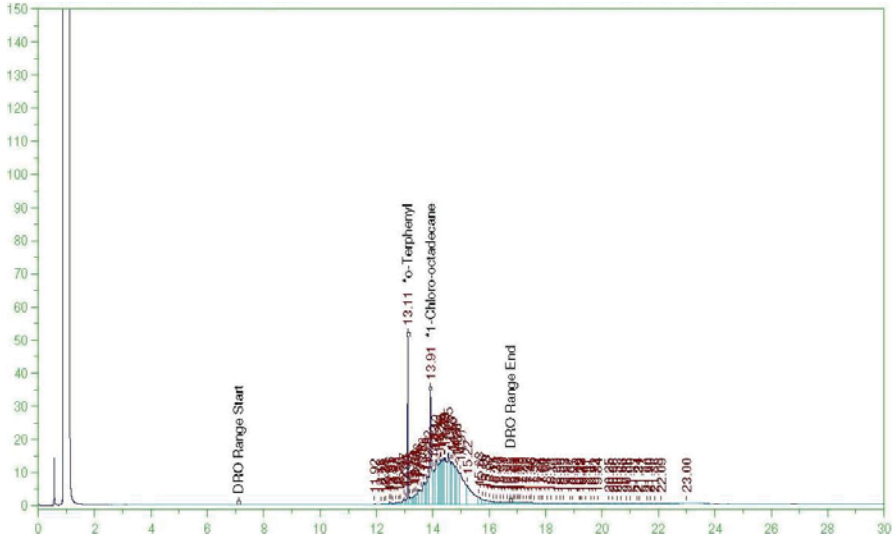
DRO T-5-RW



DRO After SGT T-5-RW



DRO T-9-RW

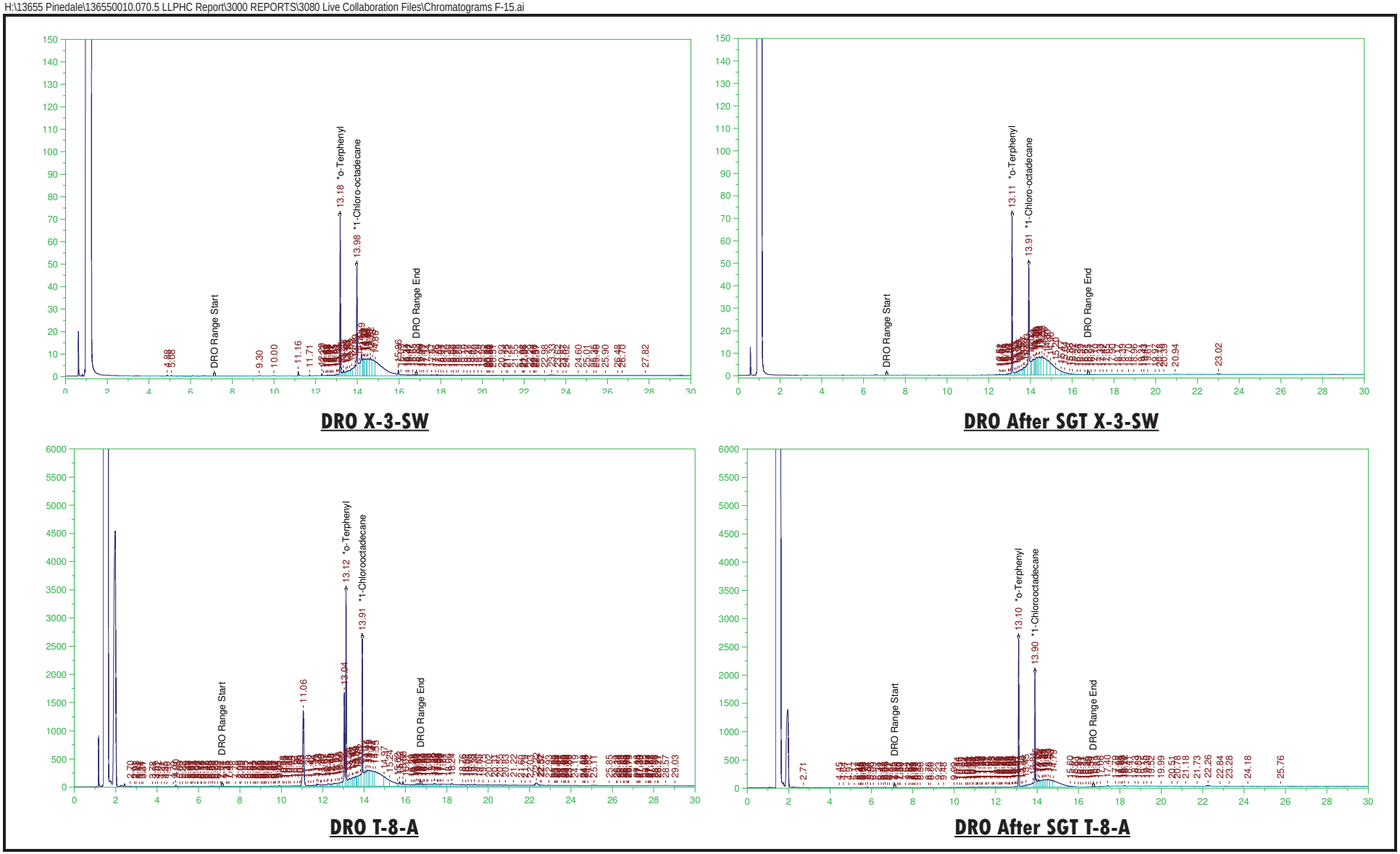


DRO After SGT T-9-RW

DRO Chromatograms
Before and After Silica Gel Treatment (SGT)
Study Wells T-5-RW and T-9-RW
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-14

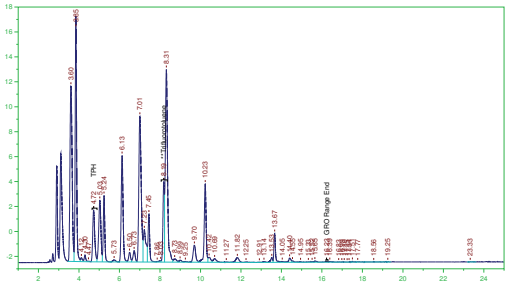
amec

H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-15.ai

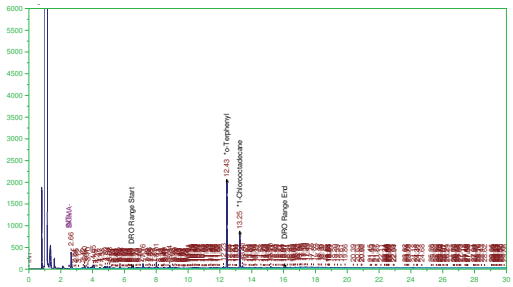


DRO Chromatograms
Before and After Silica Gel Treatment (SGT)
Study Wells X-3-SW and T-8-A
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-15

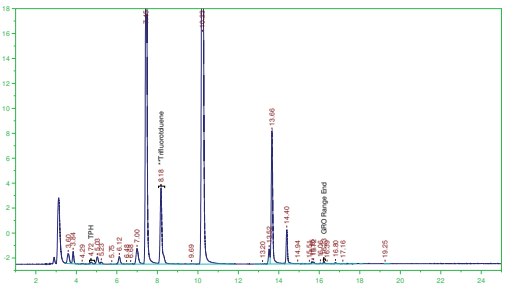
amec



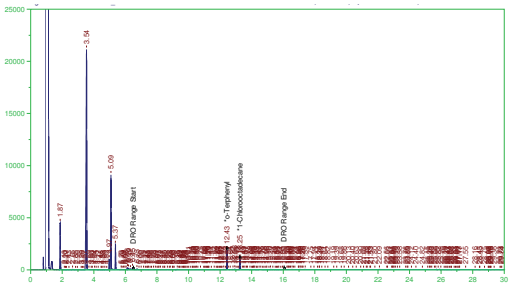
GRO - T-3-SW



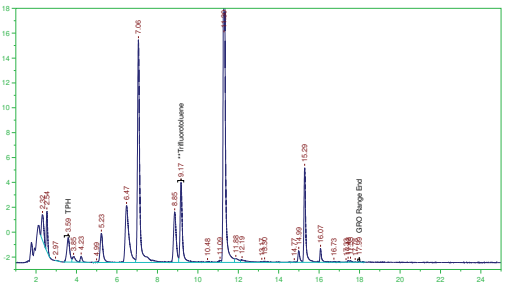
DRO - T-3-SW



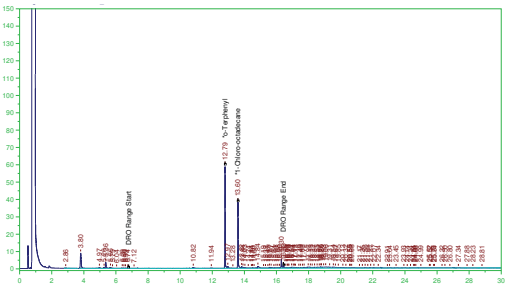
GRO - T-3-RW



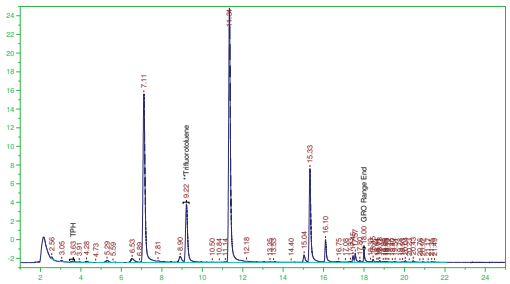
DRO - T-3-RW



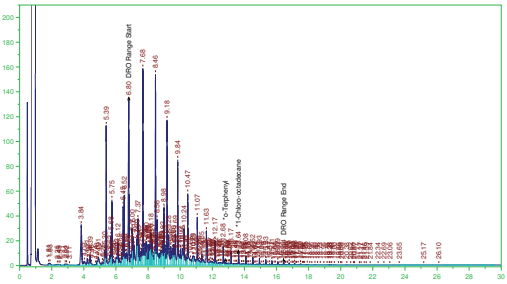
GRO - WB 7-15



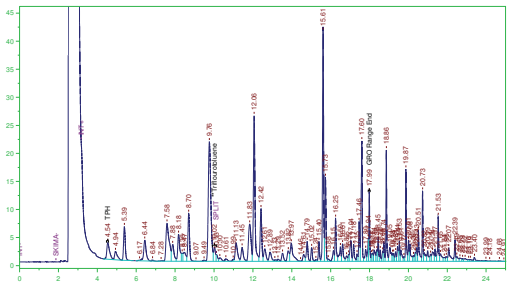
DRO - WB 7-15



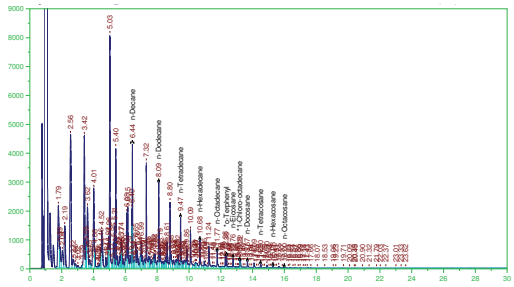
GRO - WB 7-15 PW



DRO - WB 7-15 PW



GRO - CONDENSATE

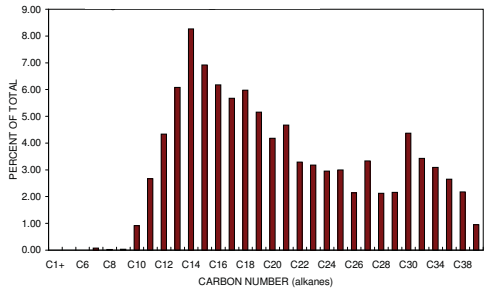


DRO - CONDENSATE

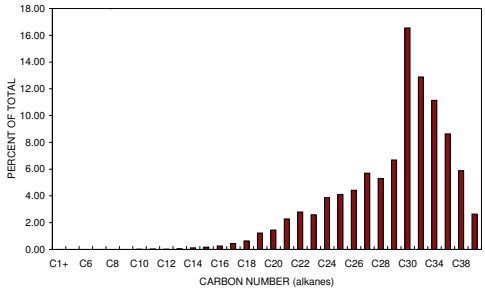
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-16.ai

GRO and DRO Chromatograms for Groundwater
Condensate and Produced Water Samples
Collected from the Warbonnet 7-15D Pad
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-16

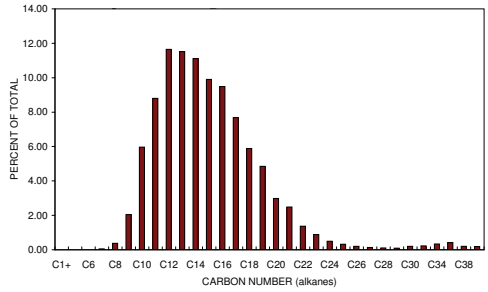
Samples from Low-Level Petroleum Hydrocarbon Study



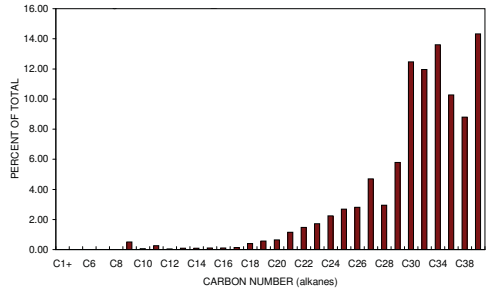
AN 1-16 PHC - LNAPL



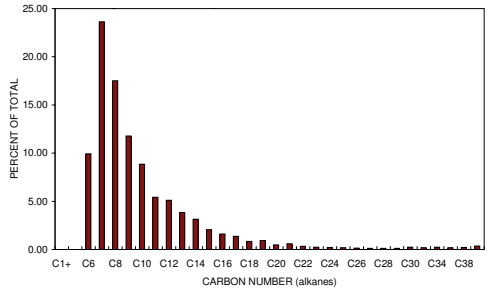
BO 1-32-1 - PIPE DOPE



JEN 1A MUD - DRILL MUD

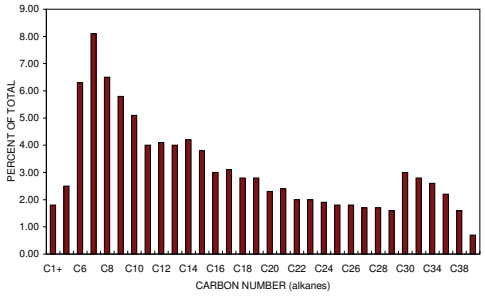


WB 7-5-2 - PIPE DOPE

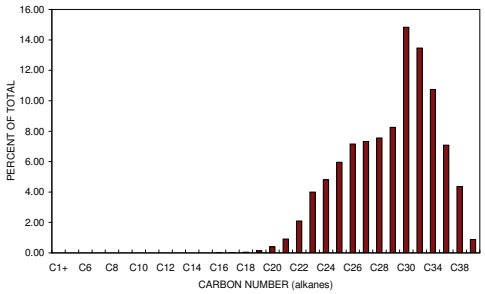


CGF-3-C - CONDENSATE

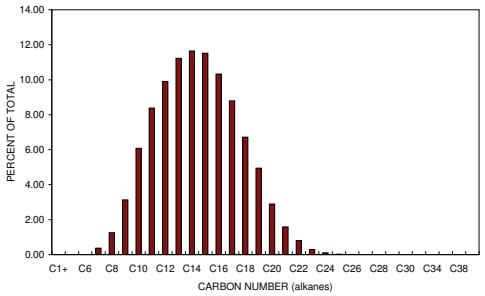
Standard Reference Carbon Scans from Laboratory



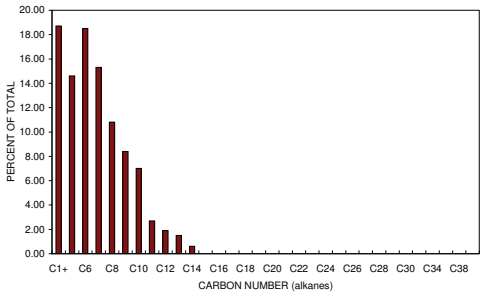
CRUDE OIL - MISSION CANYON FORMATION



MOTOR OIL-30W



DIESEL FUEL, #2

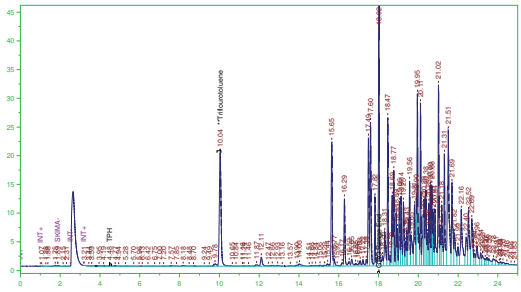


GASOLINE - REGULAR

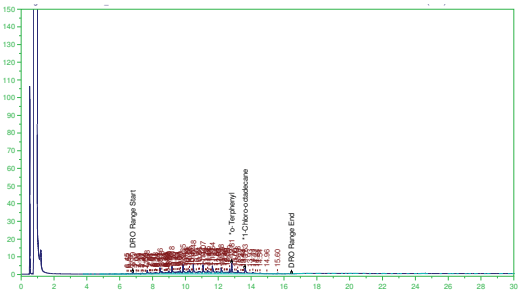
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-17.ai

Carbon Scan of LNAPL Sample Compared
to Carbon Scans of Standard Reference Materials
and Sampled Potential Source Materials
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-17

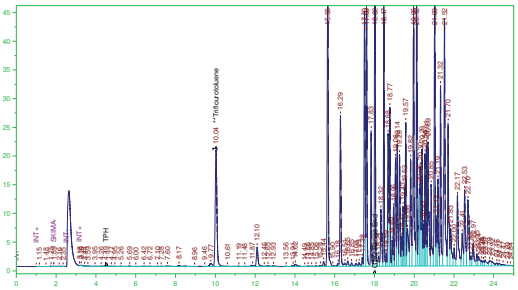
amec



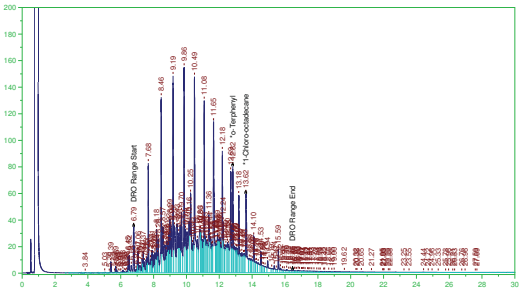
GRO - RS 11-25



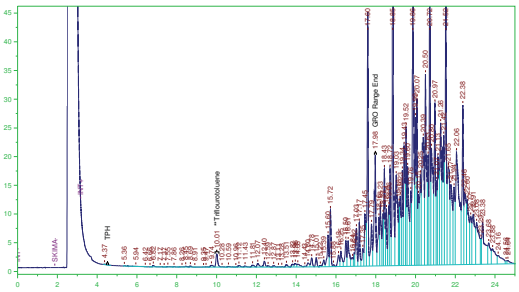
DRO - RS 11-25



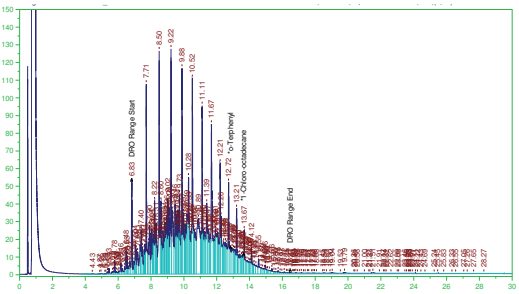
GRO - RS 11-25 PHC



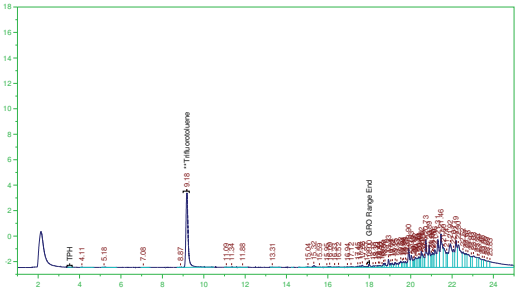
DRO - RS 11-25 PHC



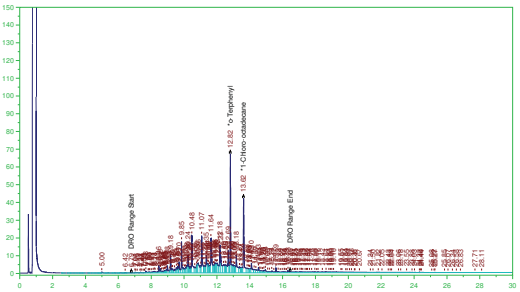
GRO - JEN 1A MUD



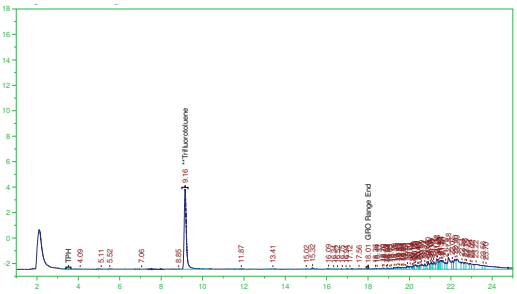
DRO - JEN 1A MUD



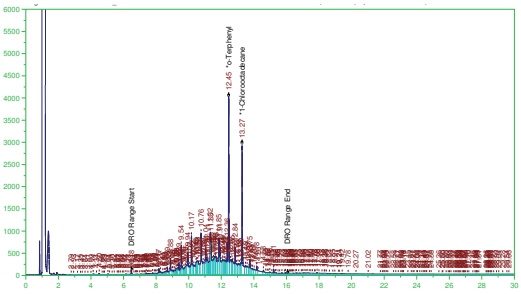
GRO - RS 15-12



DRO - RS 15-12



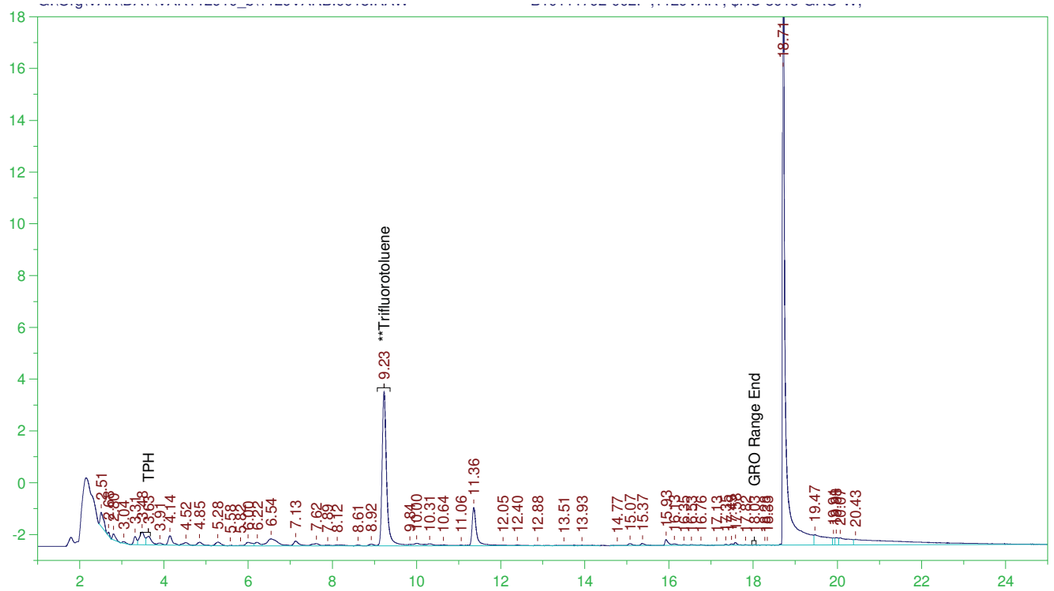
GRO - RS 15-12 PHC



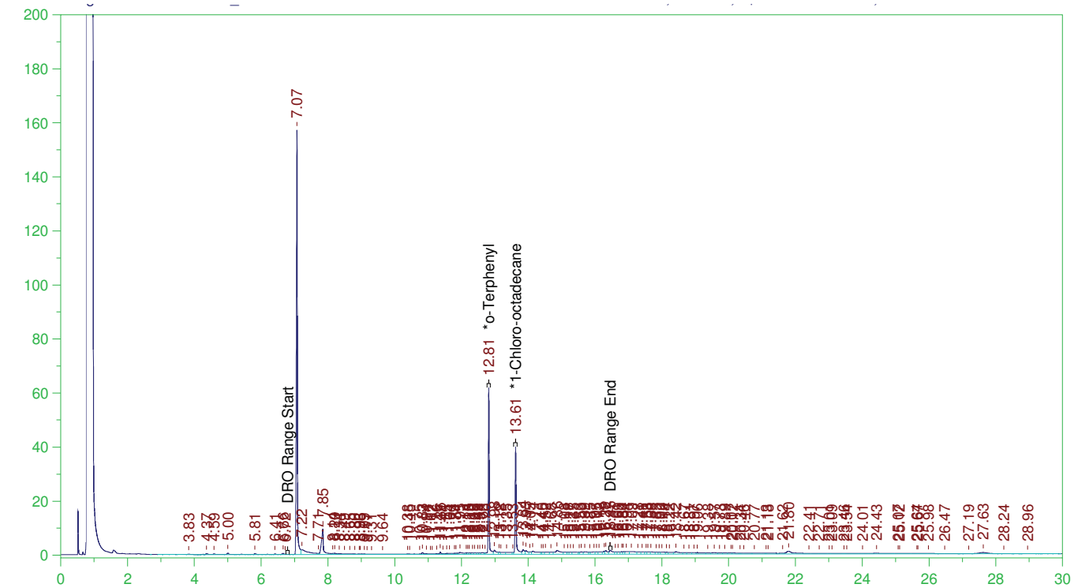
DRO - RS 15-12 PHC

H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-18.ai

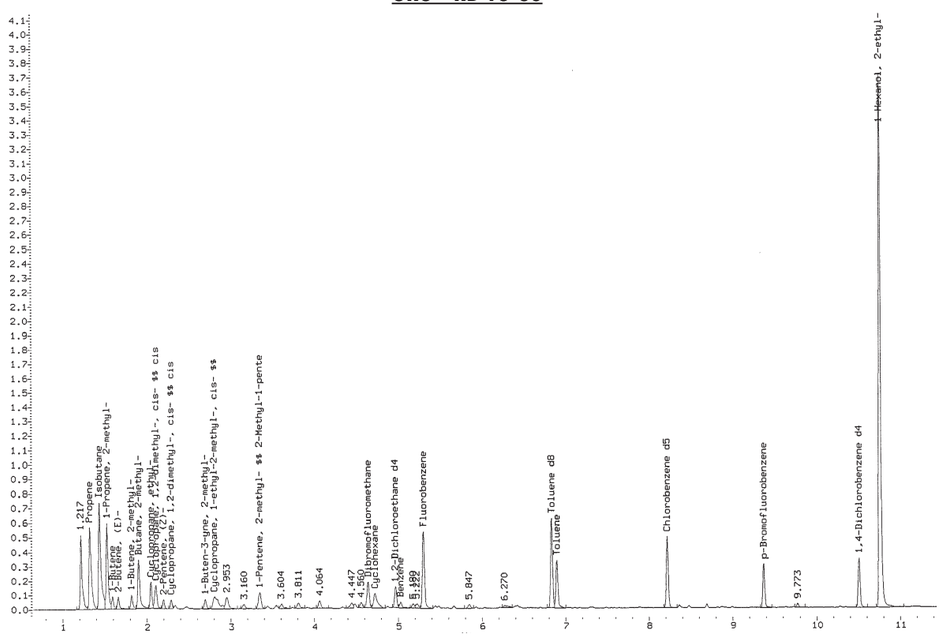
GRO and DRO Chromatograms
Wells RS 11-25 and RS 15-12
and Drill Mud
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-18



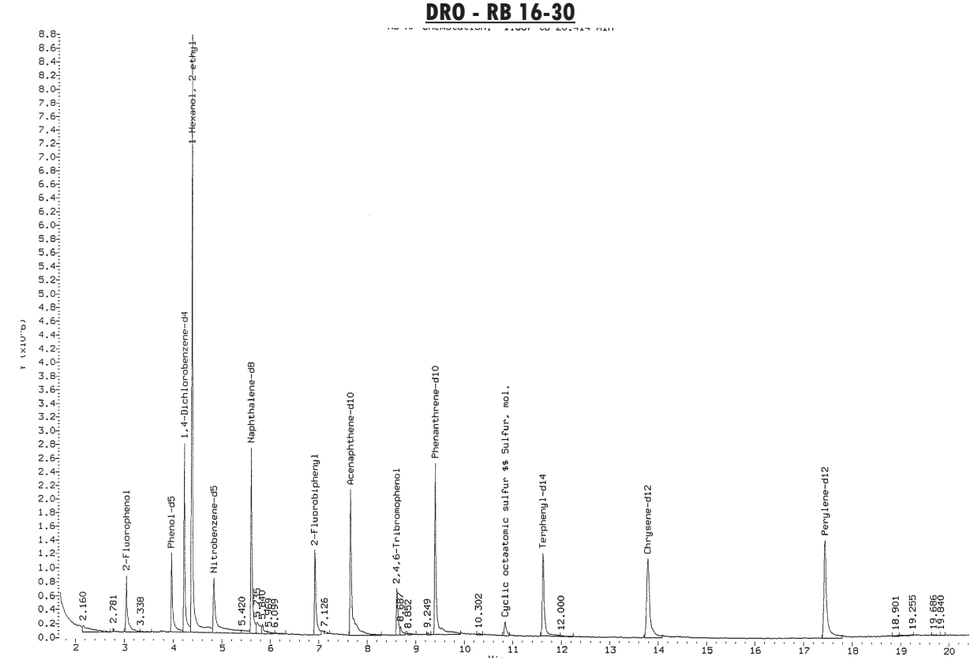
GRO - RB 16-30



DRO - RB 16-30



MS VOC RB 16-30

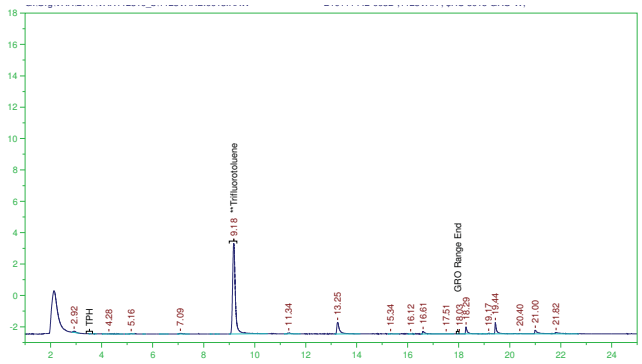


MS SVOC RB 16-30

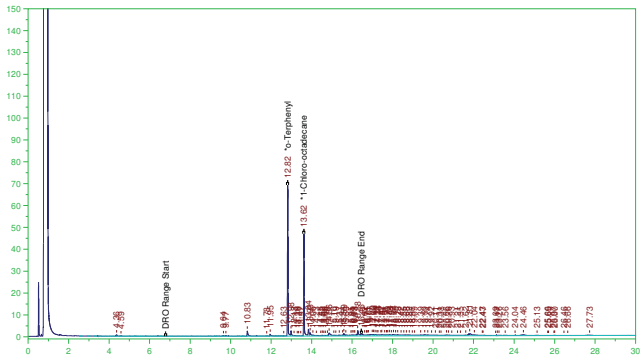
H:\13655 Pinedale\13655001\0.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-19.ai

amec

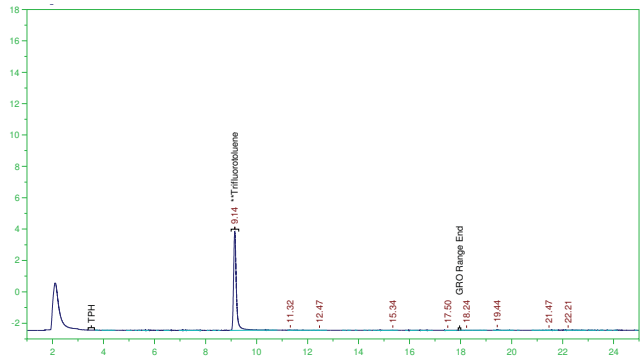
GRO, DRO and Mass Spectrometry Chromatograms
Well RB 16-30
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-19



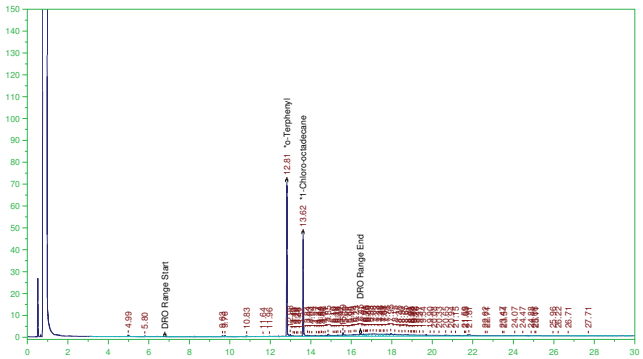
GRO - SP 5-20



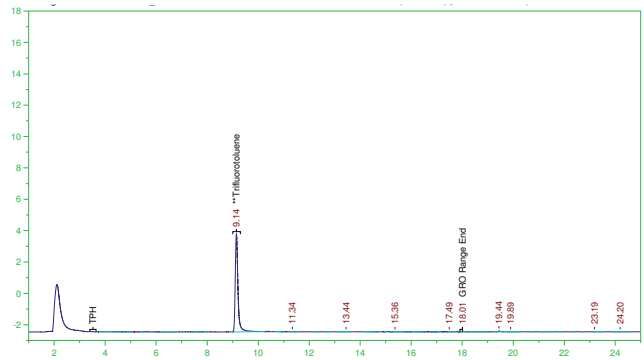
DRO - SP 5-20



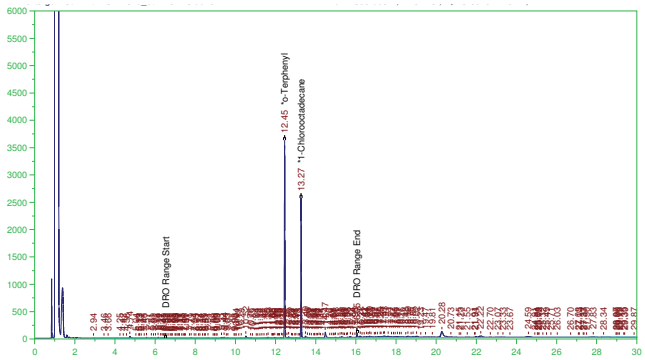
GRO - SP 11-33



DRO - SP 11-33



GRO - SP 11-34



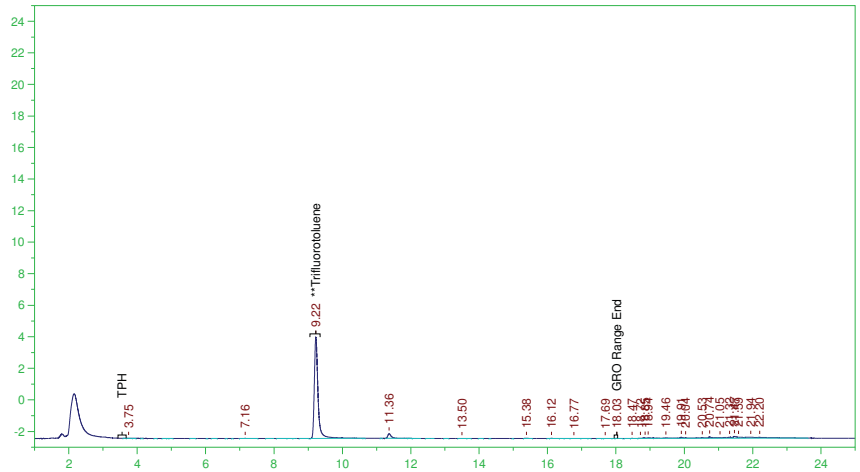
DRO - SP 11-34

H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-20.ai

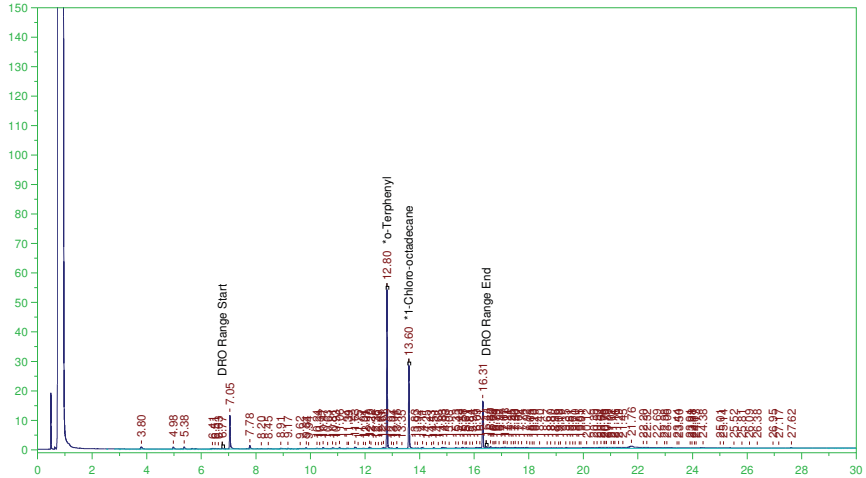
amec

GRO and DRO Chromatograms
Wells SP 5-20, SP 11-33, and SP 11-34
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-20

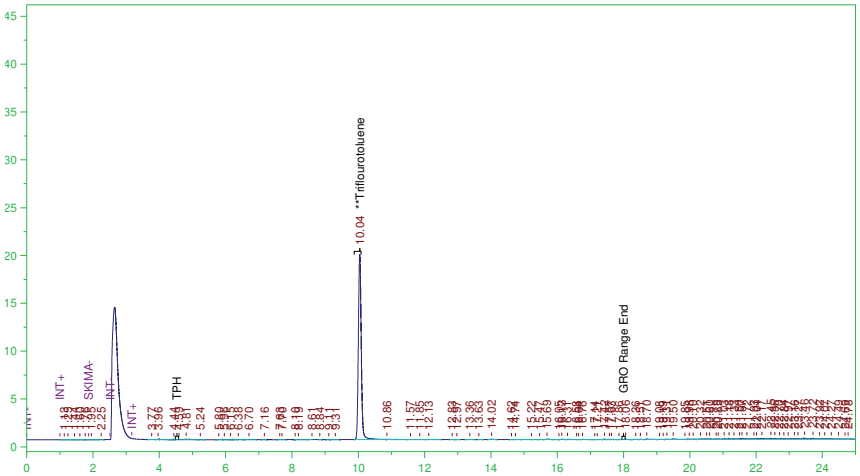
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-21.ai



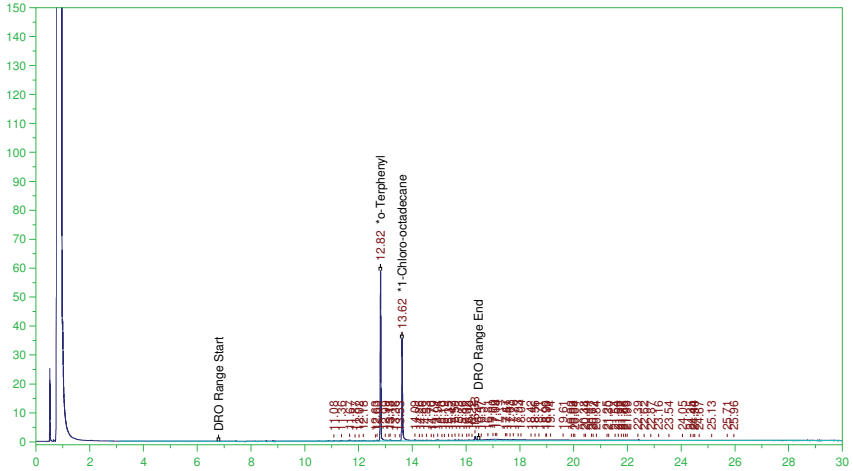
GRO - BO 12A-33



DRO - BO 12A-33



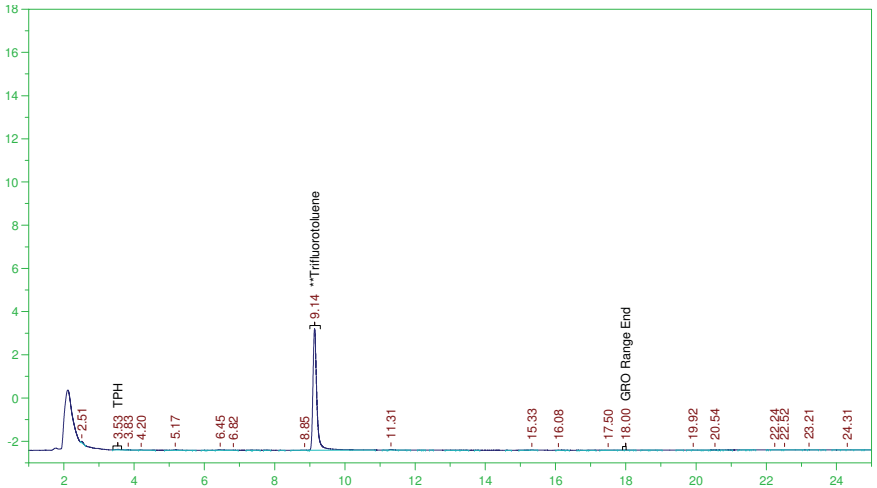
GRO - BO 1-32



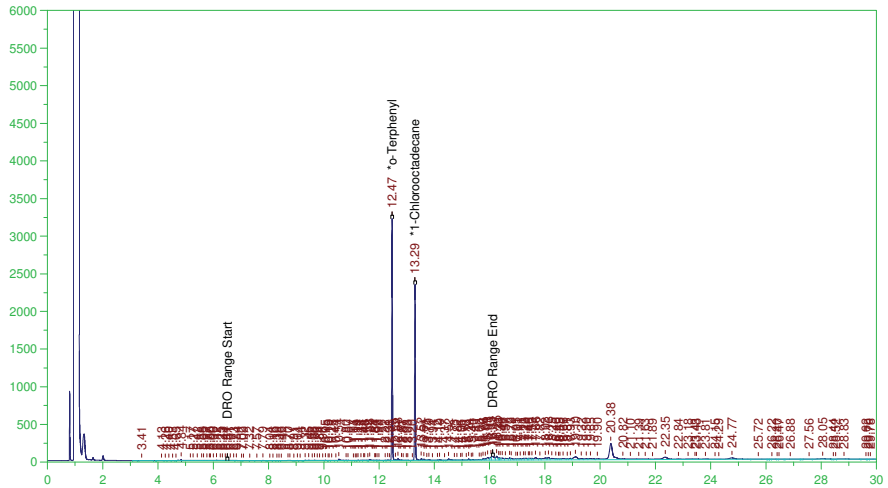
DRO - BO 1-32

GRO and DRO Chromatograms
Wells BO 12A-33 and BO 1-32
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-21

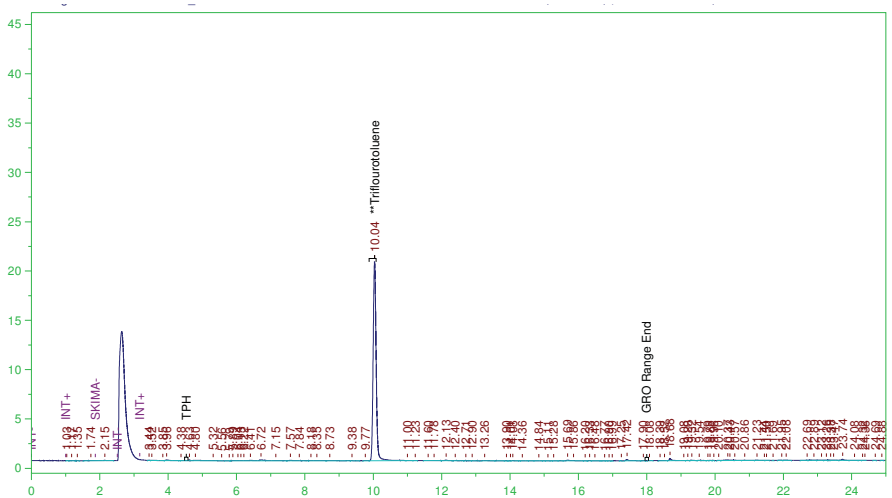
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-22.ai



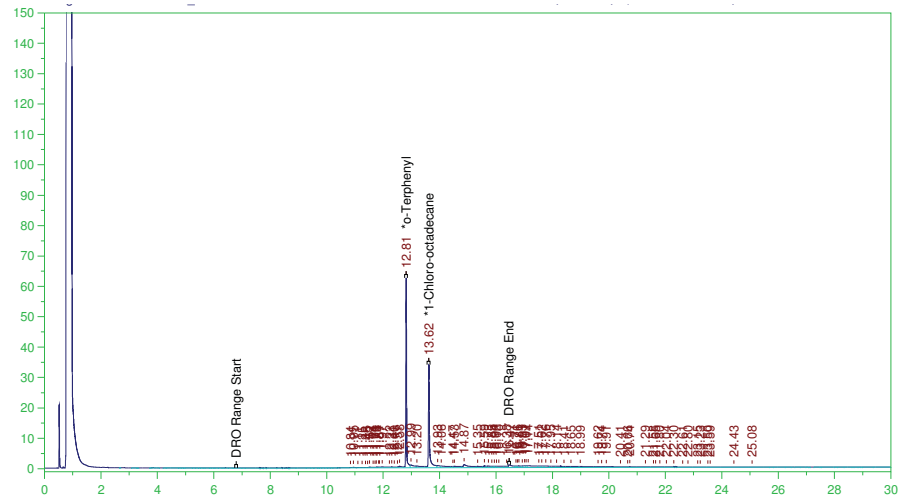
GRO - WB 7-4



DRO - WB 7-4

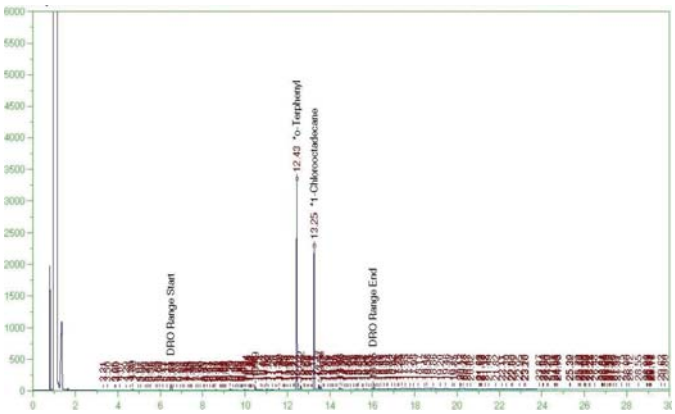


GRO - HWY 11

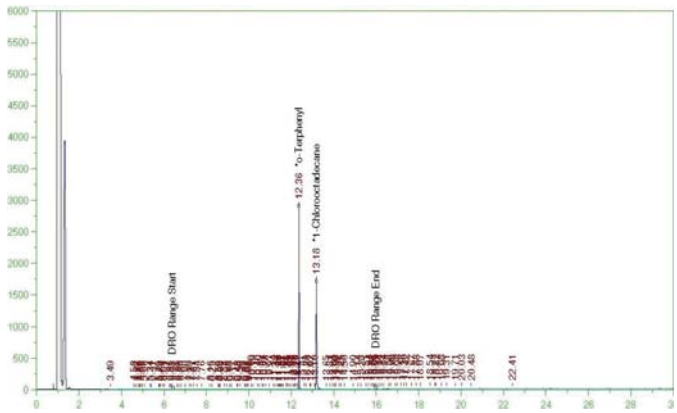


DRO - HWY 11

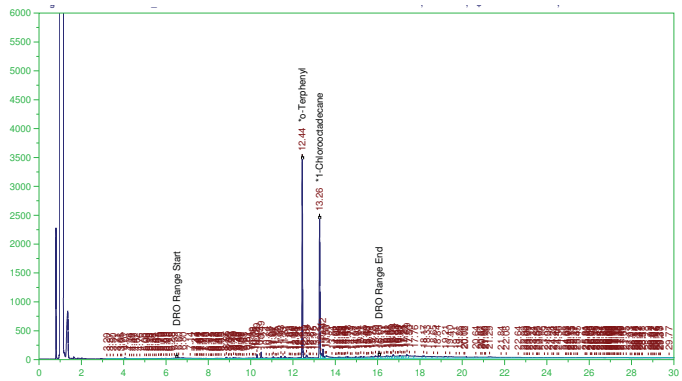
GRO and DRO Chromatograms
Wells WB 7-4 and HWY 11
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-22



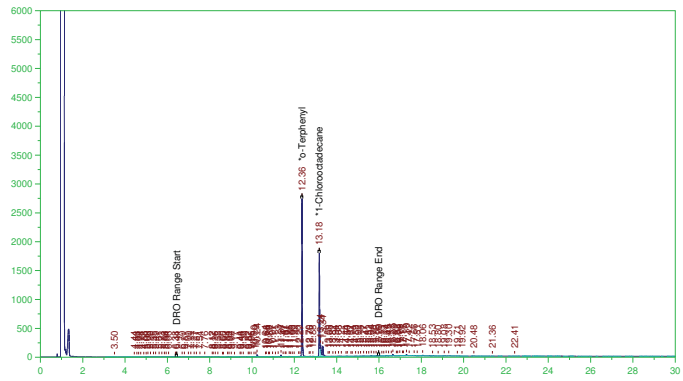
DRO - X-1-SW



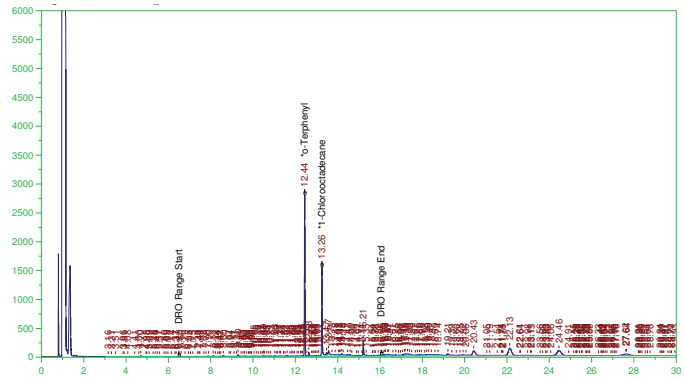
DRO After SGT - X-1-SW



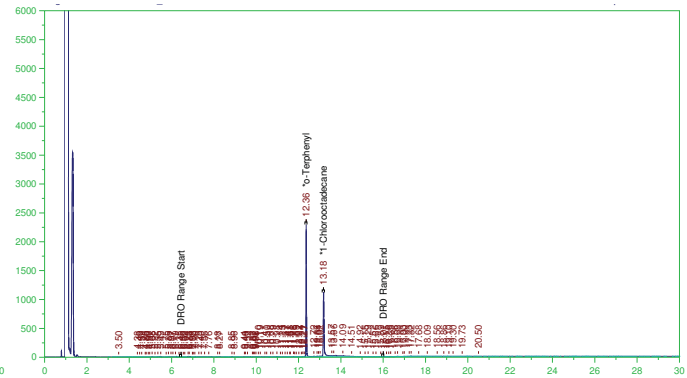
DRO - X-2-SW



DRO After SGT - X-2-SW



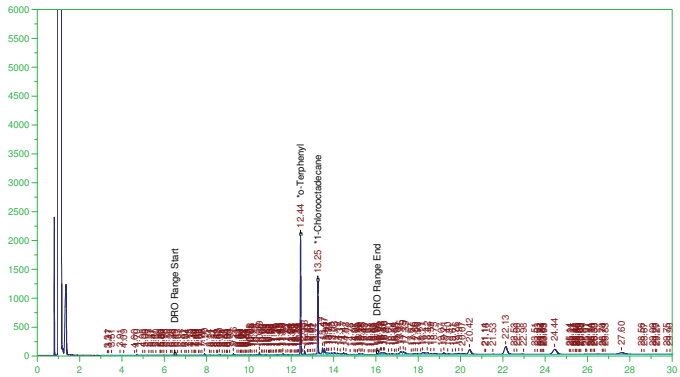
DRO - X-5-A



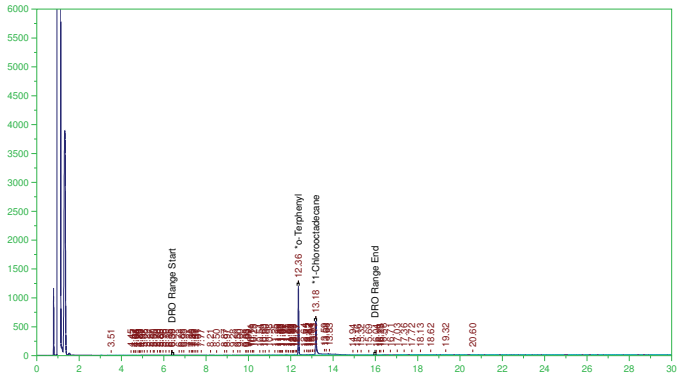
DRO After SGT - X-5-A

H:\13655 Pinedale\13655001\0.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-23.ai

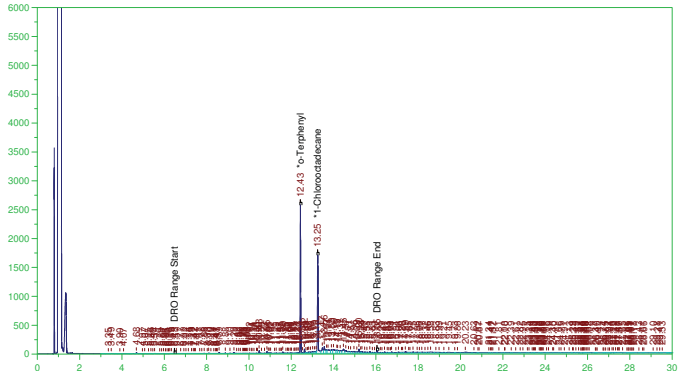
DRO Chromatograms
Before and After Silica Gel Treatment (SGT)
Study Wells X-1-SW, X-2-SW and X-5-A
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-23



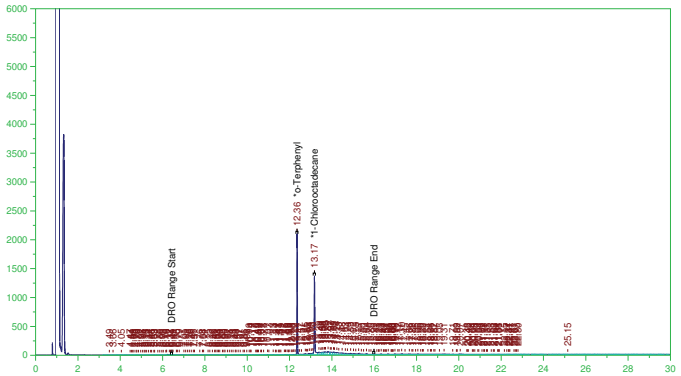
DRO - T-1-SW



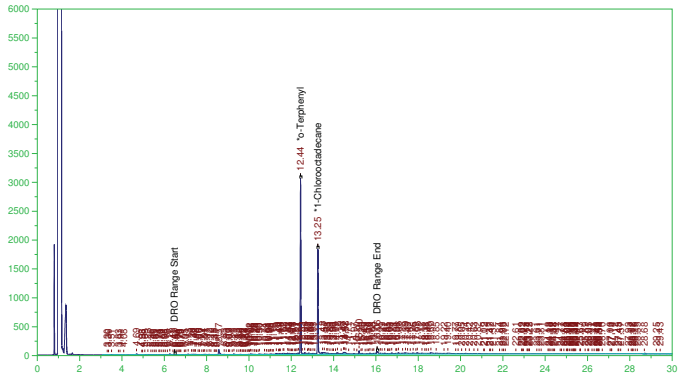
DRO After SGT - T-1-SW



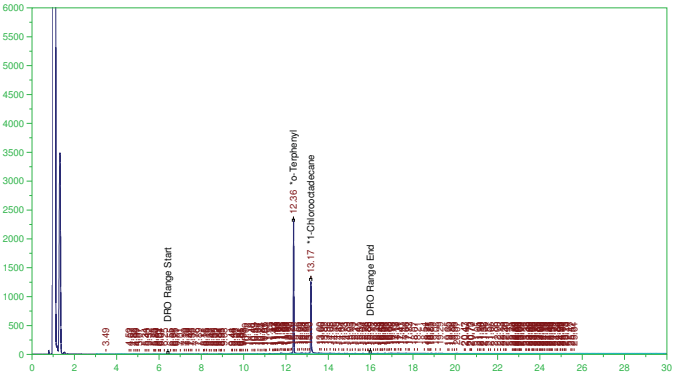
DRO - T-6-SW



DRO After SGT - T-6-SW



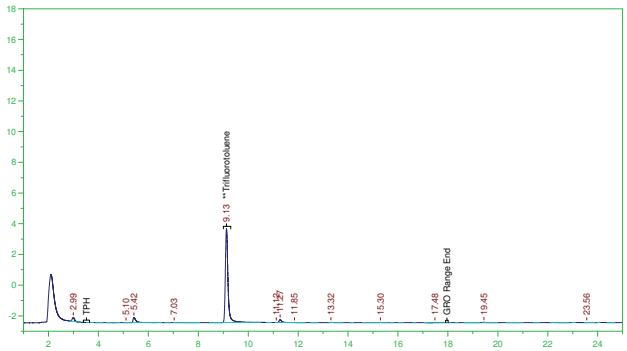
DRO - T-7-RW



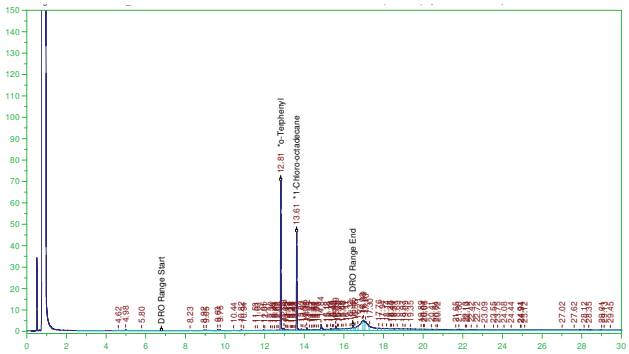
DRO After SGT - T-7-RW

H:\13655 Pinedale\L13655001 0.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-24.ai

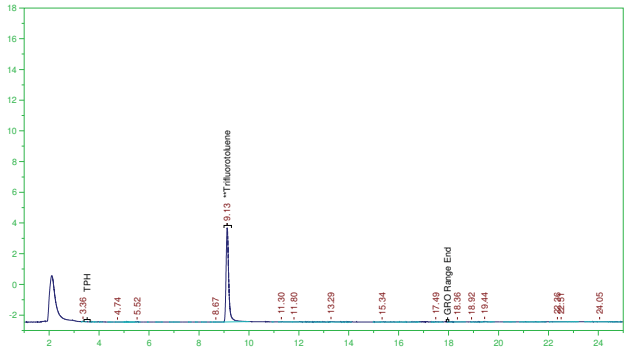
DRO Chromatograms
Before and After Silica Gel Treatment (SGT)
Study Wells T-1-SW, T-6-SW and T-7-RW
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-24



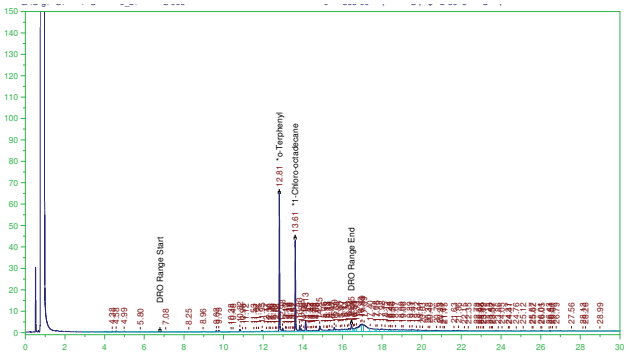
GRO - MS 14-16



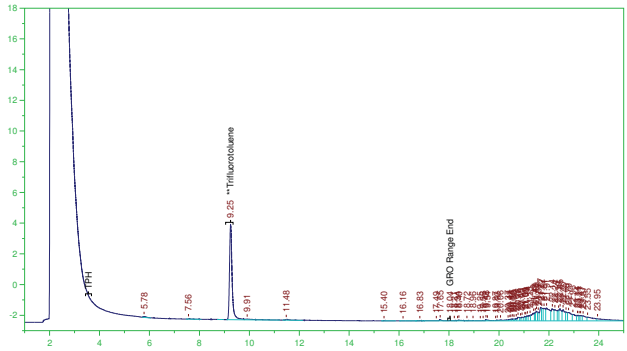
DRO - MS 14-16



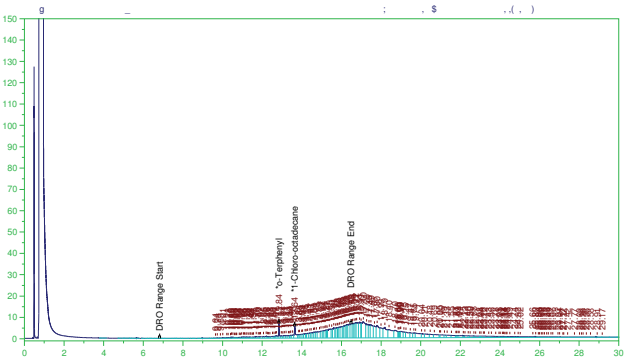
GRO - MS 15-16



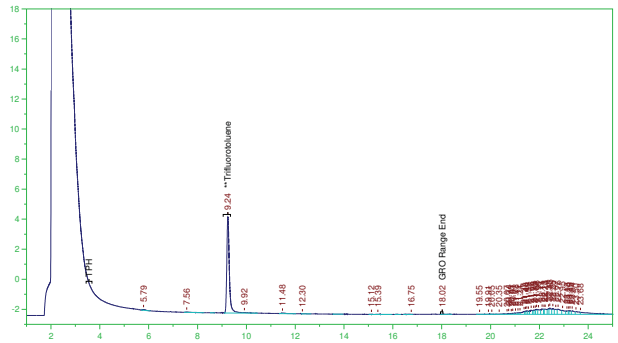
DRO - MS 15-16



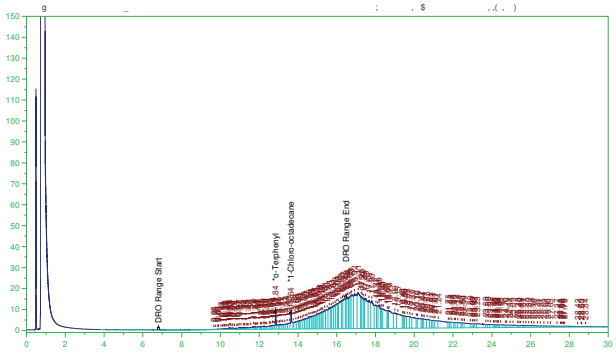
GRO - MS 14-16-1 PIPE DOPE



DRO - MESA 14-16-1 PIPE DOPE



GRO - MS 15-16-1 PIPE DOPE

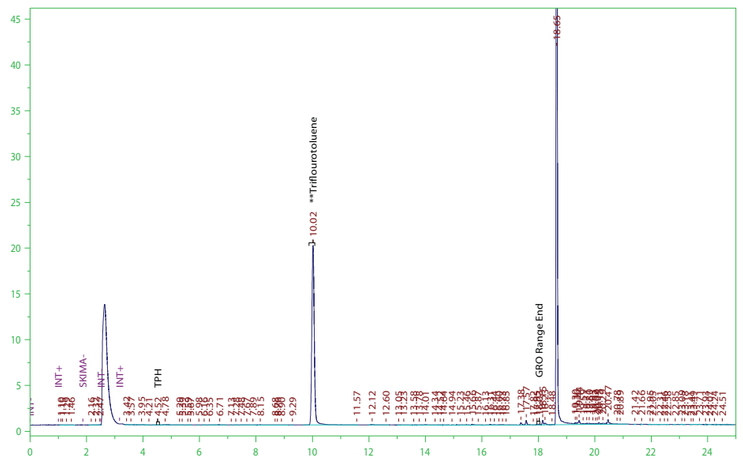


DRO - MS 15-16-1 PIPE DOPE

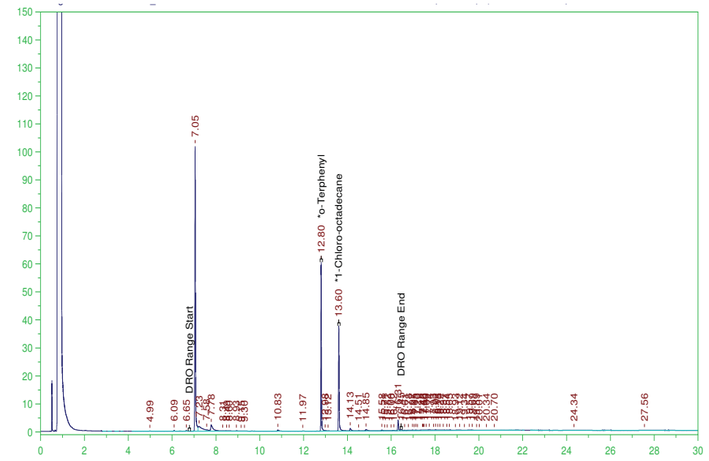
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-25.ai

GRO and DRO Chromatograms
Wells MS-14-16 and MS 15-16 and Pipe Dope
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-25

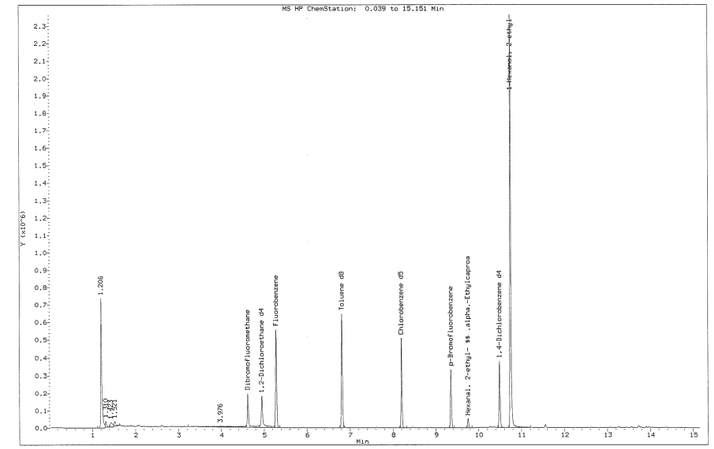
amec



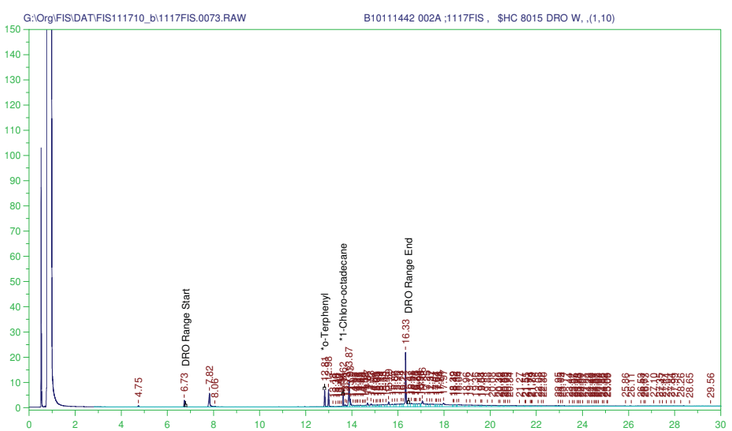
GRO - MS 12-28



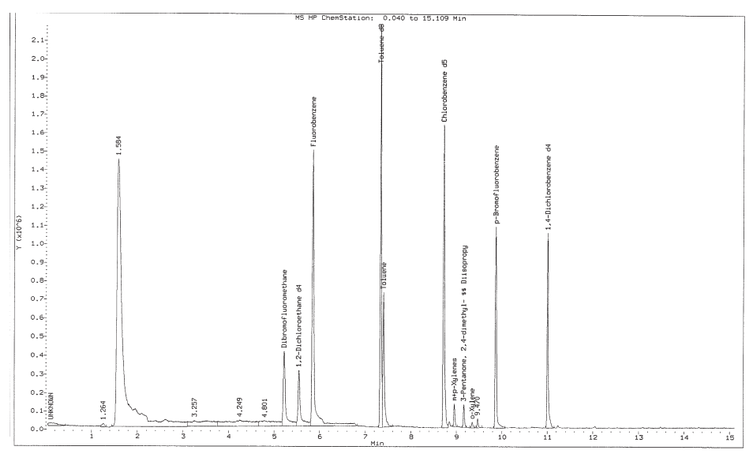
DRO - MS 12-28



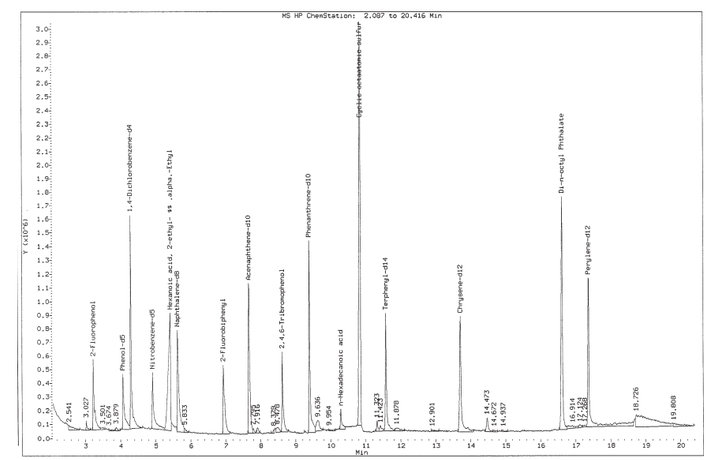
VOC - MS MS 12-28



DRO - RS 1-4



VOC - MS RS 1-4



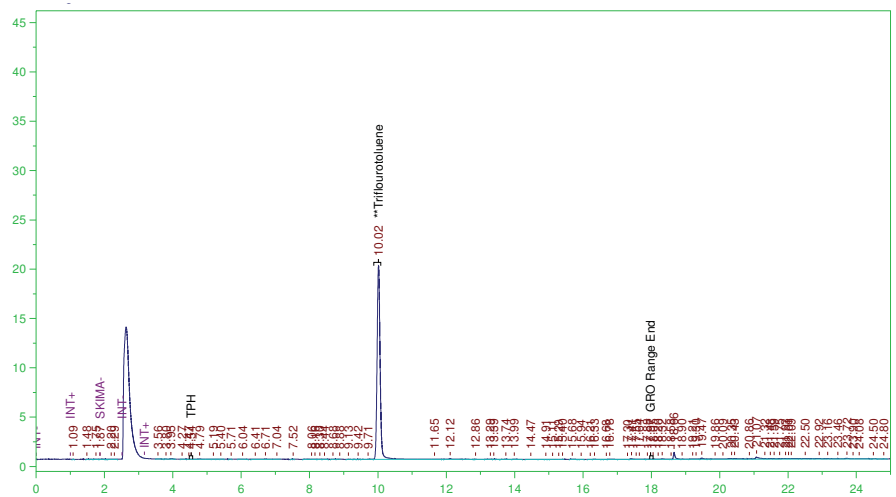
SVOC - MS RS 1-4

H:\13655 Pinedale\136550010\70.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-26.ai

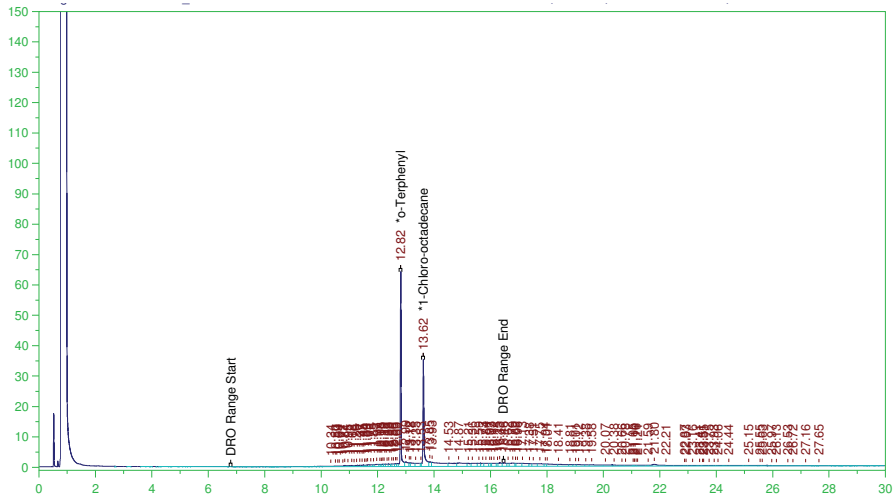
amec

GRO, DRO and Mass Spectrometry Chromatograms
Wells MS 12-28 and RS 1-4
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-26

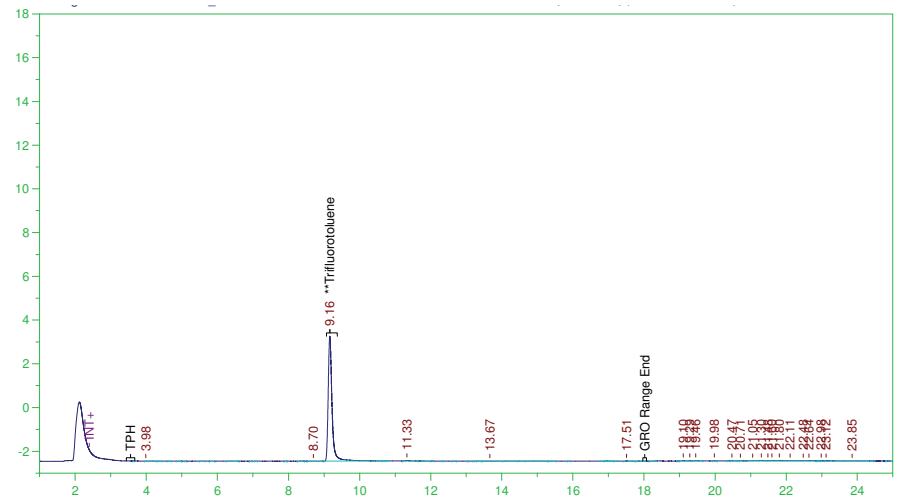
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-27.ai



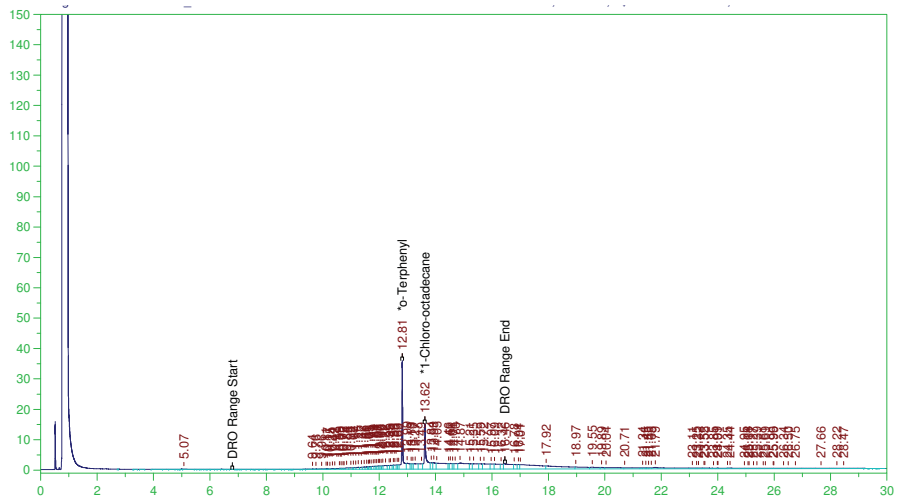
GRO - RB 13-29



DRO - RB 13-29



GRO - AN 15-23

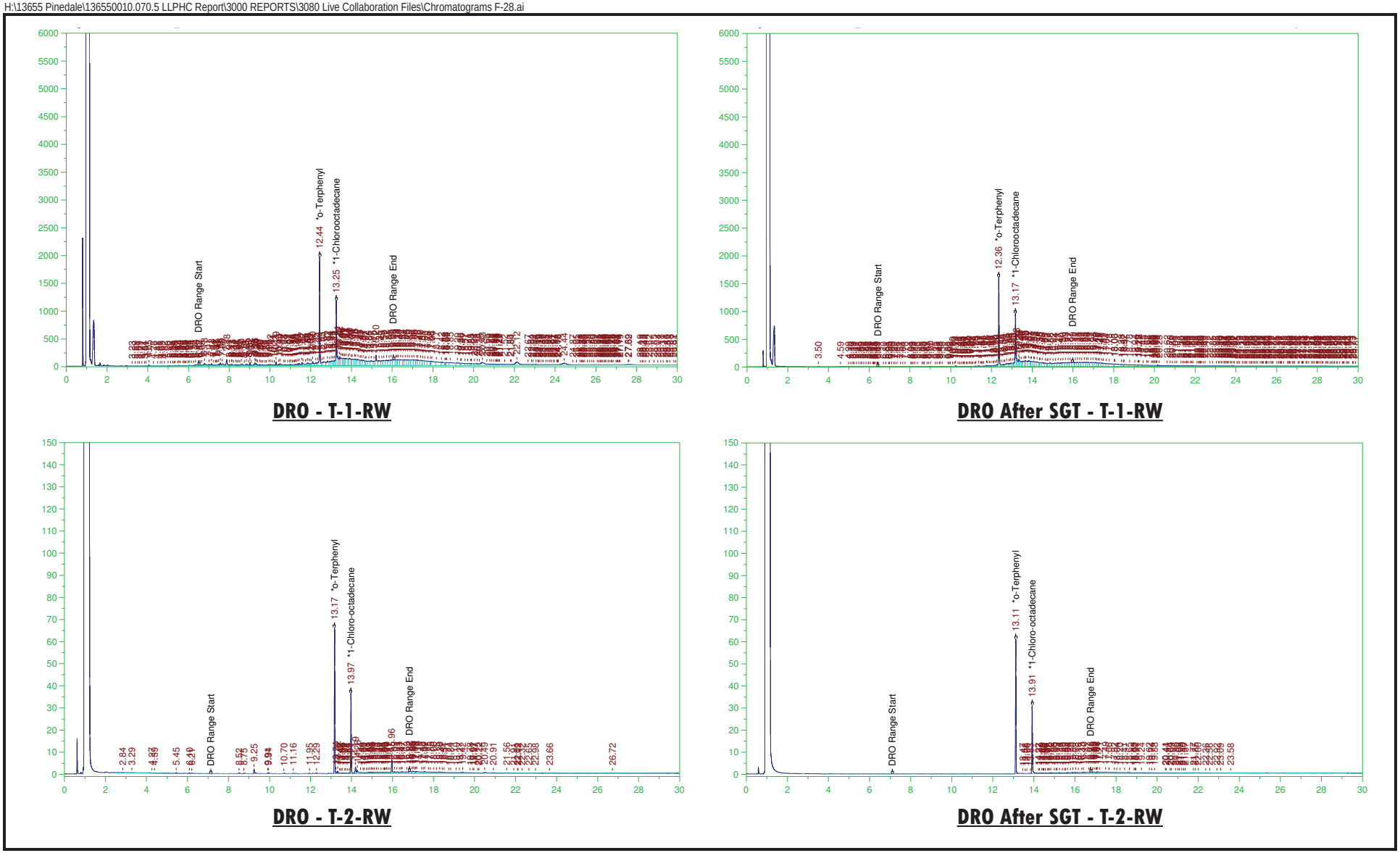


DRO - AN 15-23

GRO and DRO Chromatograms
Wells RB 13-29 and AN 15-23
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-27

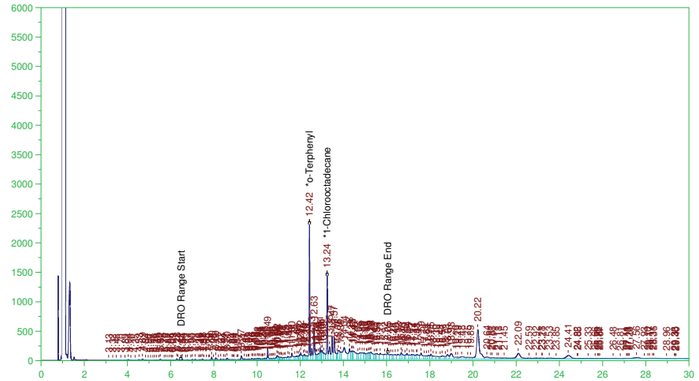
amec

H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-28.ai

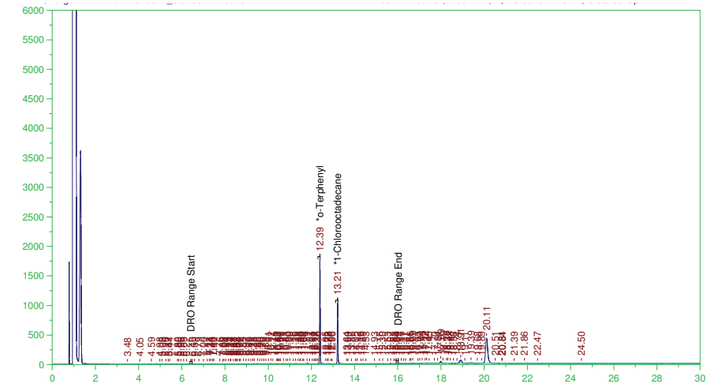


DRO Chromatograms
Before and After Silica Gel Treatment (SGT)
Study Wells T-1-RW and T-2-RW
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-28

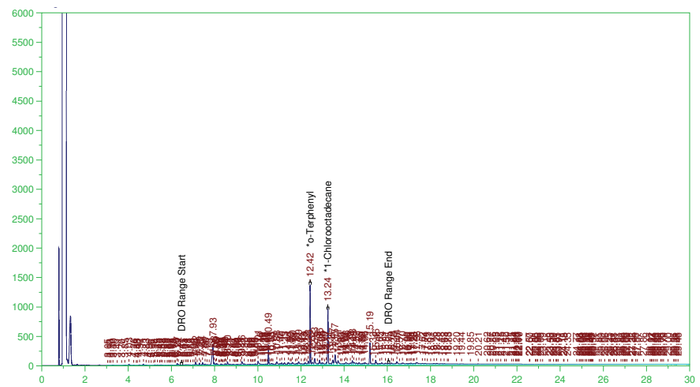
amec



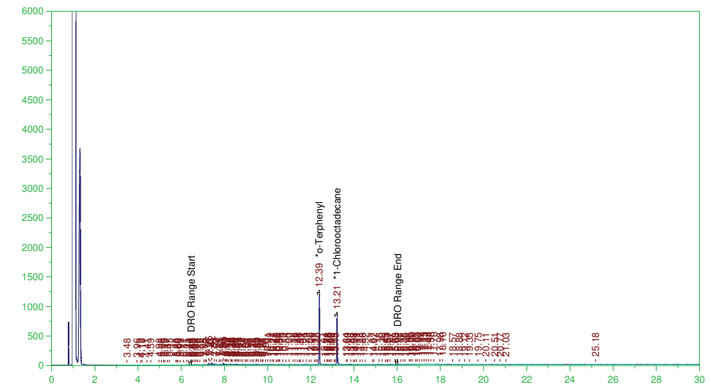
DRO - T-4-SW



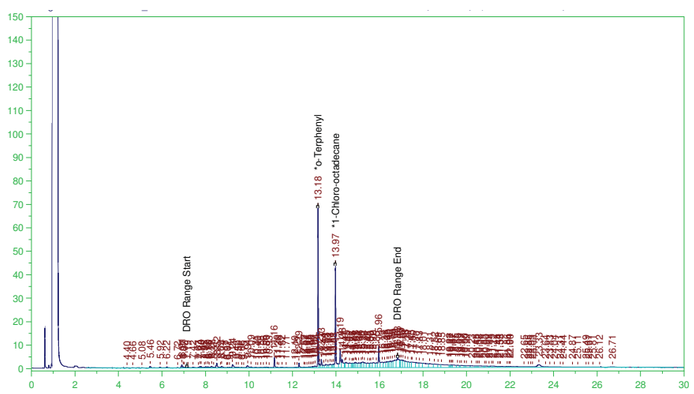
DRO After SGT - T-4-SW



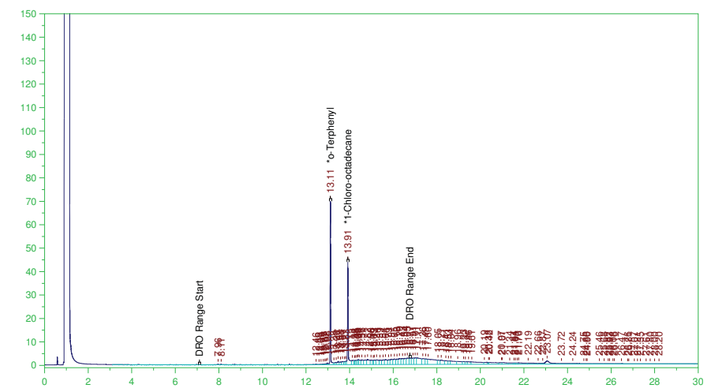
DRO - T-4-RW-a



DRO After SGT - T-4-RW-a



DRO - T-4-RW-b

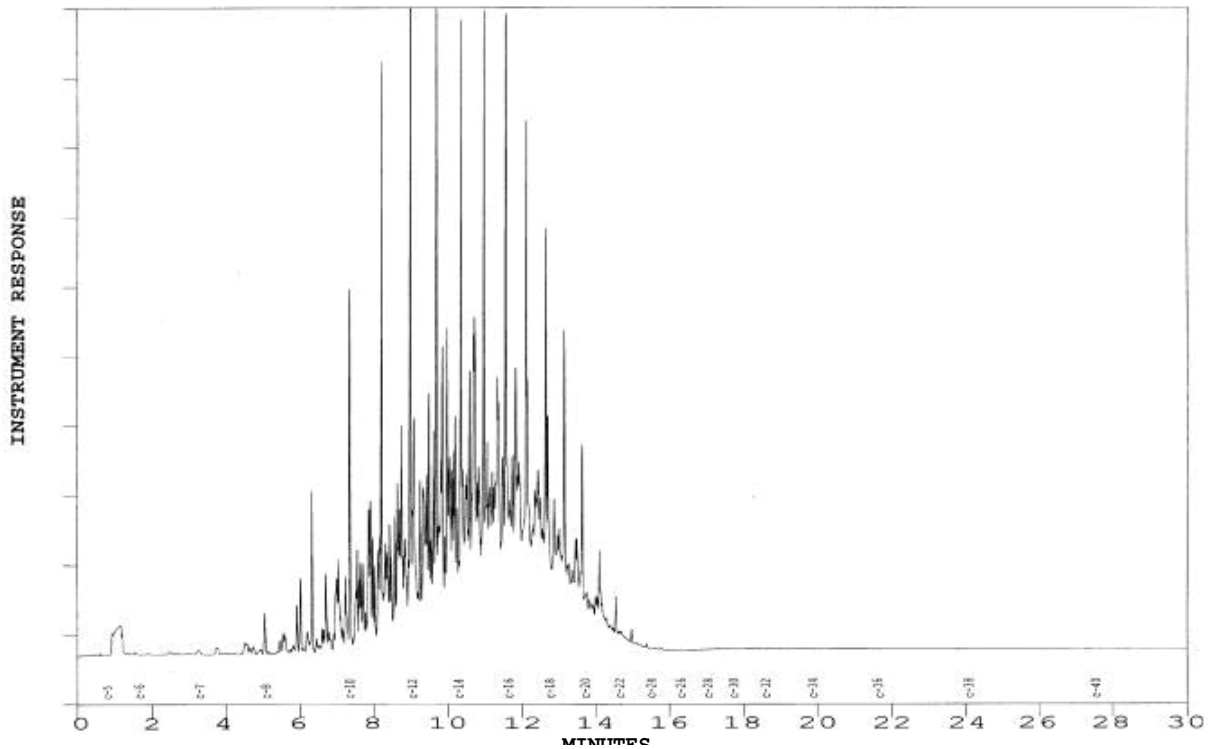


DRO After SGT - T-4-RW-b

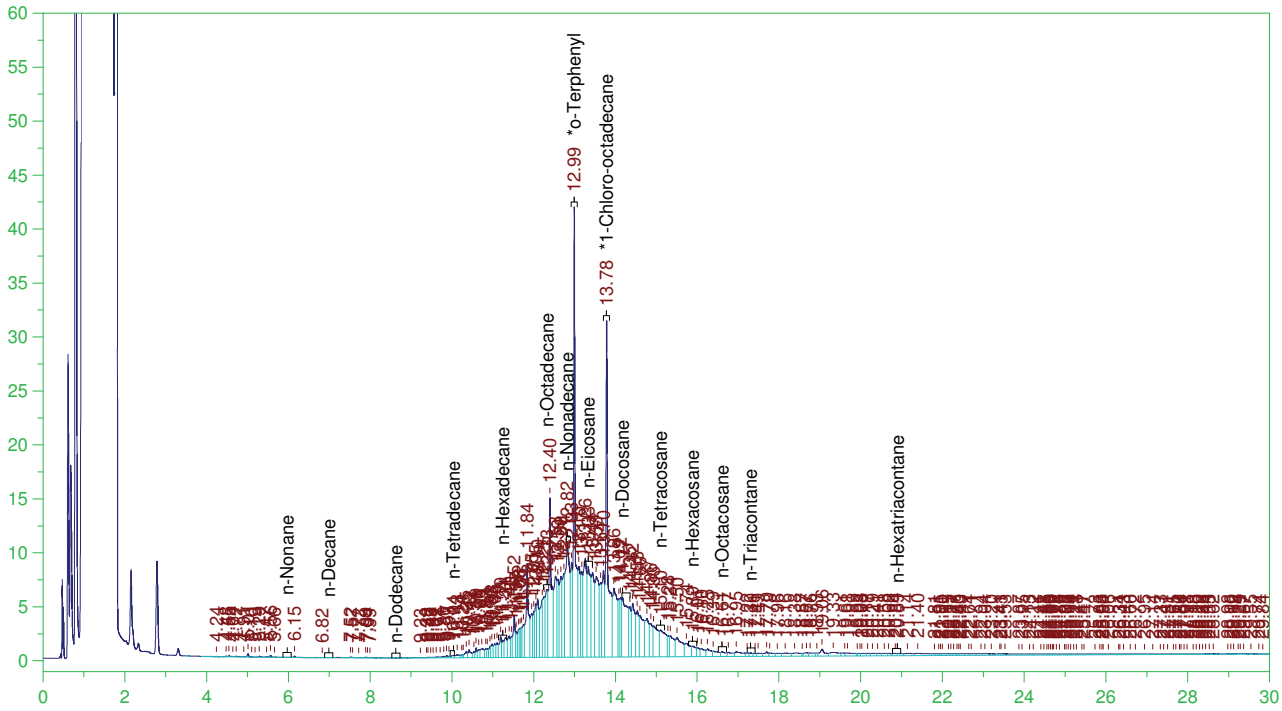
H:\13655 Pinedale\136550010.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-29.ai

amec

DRO Chromatograms
Before and After Silica Gel Treatment (SGT)
Study Wells T-4-SW, T-4-RW-a and T-4-RW-b
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-29



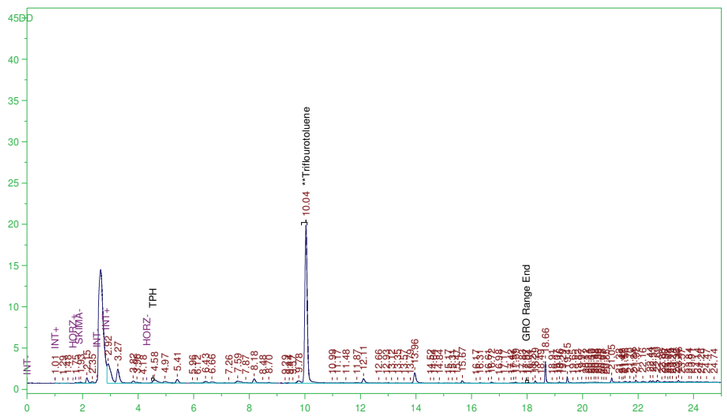
Diesel Fuel



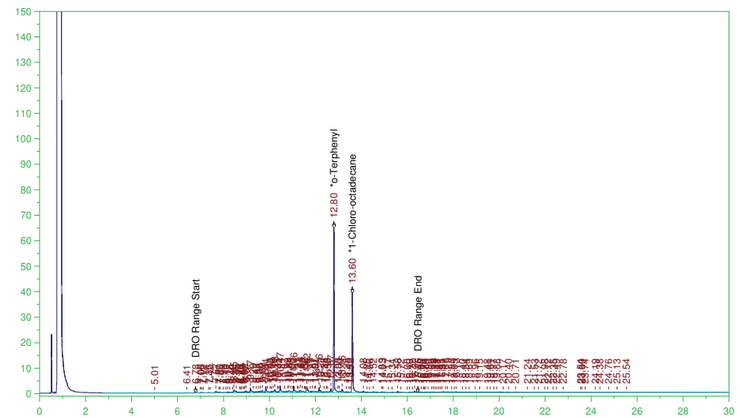
Mineral Oil

H:\13655 Pinedale\13655001\0.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-30.ai

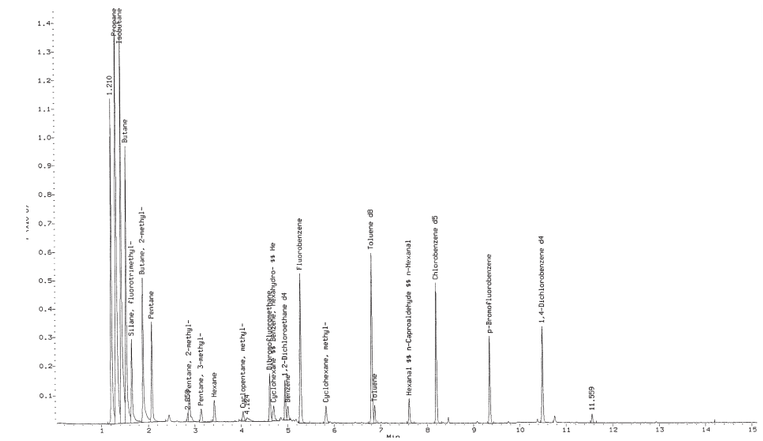
Standard Reference Chromatograms
Diesel Fuel and Mineral Oil
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-30



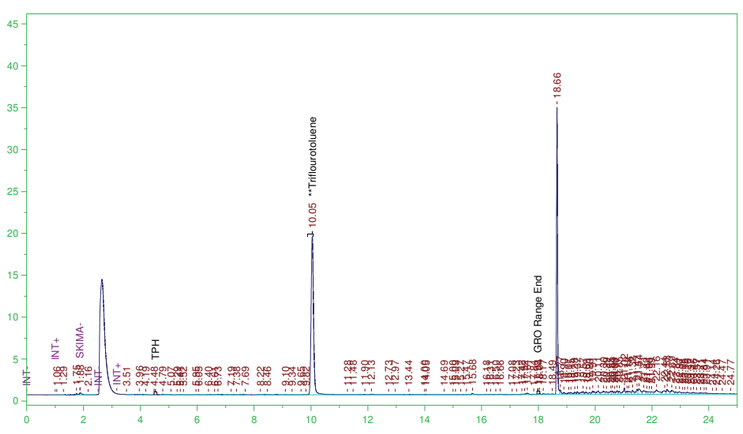
GRO - WB 7-5



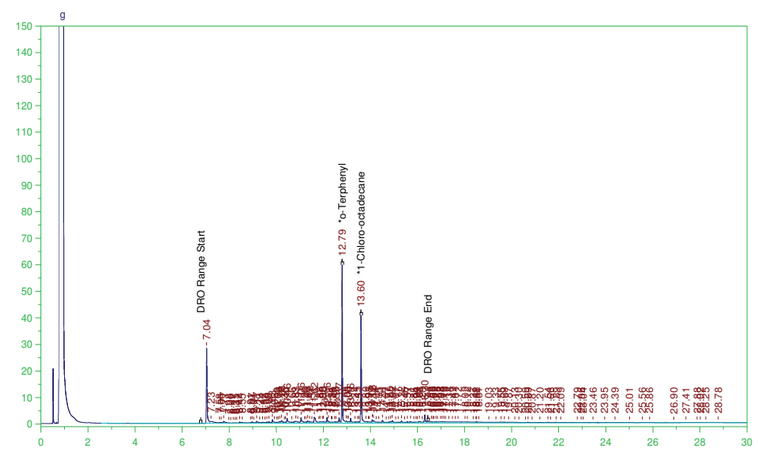
DRO - WB 7-5



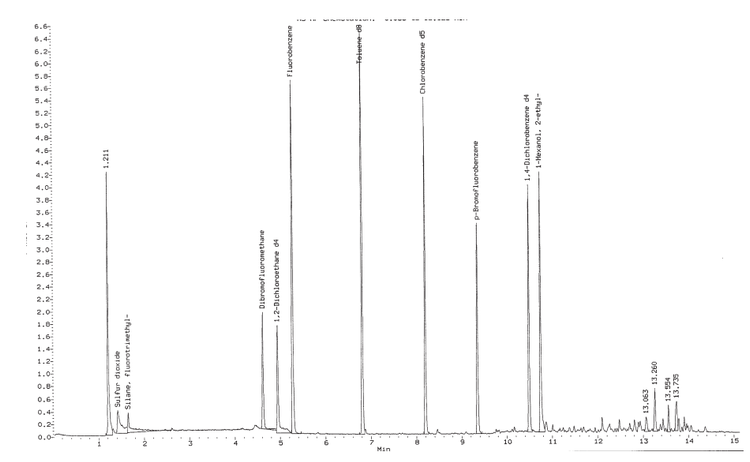
DRO - WB 7-5



GRO - WB 8-6



DRO - WB 8-6



VOC MS - WB 8-6

H:\13655 Pinedale\13655001\0.070.5 LLPHC Report\3000 REPORTS\3080 Live Collaboration Files\Chromatograms F-31.ai

amec

GRO, DRO and Mass Spectrometry
Wells WB 7-5 and WB 8-6
Low-Level Petroleum Hydrocarbon Evaluation
Sublette County, Wyoming
FIGURE F-31