OCS Study MMS 2006-033

FINAL TASK 1 REPORT

VOLUME II: APPENDICES

Alternative Oil Spill Occurrence Estimators and their Variability for the Chukchi Sea – Fault Tree Method

MMS Contract Number 1435-01-05-CT-39348

October, 2006

By

Bercha International Inc.
Calgary, Alberta, Canada

U.S. Department of the Interior
Minerals Management Service
Alaska Outer Continental Shelf Region

OCS Study MMS 2006-033

FINAL TASK 1 REPORT

VOLUME II: APPENDICES

Alternative Oil Spill Occurrence Estimators and their Variability for the Chukchi Sea – Fault Tree Method

October, 2006

Principal Investigator: Dr. Frank G. Bercha, P.Eng.

Bercha International Inc.
2926 Parkdale Boulevard N.W.
Calgary, Alberta, T2N 3S9, Canada
Email: berchaf@berchagroup.com

This study was funded by the U.S. Department of the Interior, Minerals Management Service (MMS), Alaska Outer Continental Shelf Region, Anchorage, under Contract No. 1435-01-05-CT-39348, as part of the MMS Alaska Environmental Studies Program.

APPENDICES

TABLE OF CONTENTS

4 Spill Occurrence

4.1 Arctic Spill Occurrence - Chukchi Sea

4.2 Arctic Spill Occurrence – Chukchi Sea Non Arctic

T.4.2.1 Non Arctic Spill Occurrence - Chukchi Sea - Pipeline
T.4.2.2 Non Arctic Spill Occurrence - Pipeline - Summary
T.4.2.3 Non Arctic Spill Occurrence - Platforms
T.4.2.4 Non Arctic Spill Occurrence - Platforms - Summary
T.4.2.5 Non Arctic Spill Occurrence - Production Wells
T.4.2.6 Non Arctic Spill Occurrence - Production Wells - Summary
T.4.2.7 Non Arctic Spill Occurrence - Exploration Wells
T.4.2.8 Non Arctic Spill Occurrence - Exploration Wells - Summary
T.4.2.9 Non Arctic Spill Occurrence - Development Wells
T.4.2.10 Non Arctic Spill Occurrence - Development Wells - Summary
T.4.2.11 Non Arctic Spill Occurrence - Wells - Summary
T.4.2.12 Non Arctic Spill Occurrence - Summary
T.4.2.13 Non Arctic Spill Occurrence non Non Arctic - Annual Summary
T.4.2.14 Non Arctic - Year 2024 - Monte Carlo Results
T.4.2.15 Non Arctic - LOF Average - Pipeline - Monte Carlo Results
T.4.2.16 Non Arctic - LOF Average - Platforms - Monte Carlo Results
T.4.2.17 Non Arctic - LOF Average - Wells - Monte Carlo Results
T.4.2.18 Non Arctic - LOF Average - Platforms+Wells - Monte Carlo Results
T.4.2.19 Non Arctic - LOF Average - Monte Carlo Results
T.4.2.20 Non Arctic Composition of Spill Indicators - Year 2024
T.4.2.21 Non Arctic Composition of Spill Indicators - LOF Average

F.4.2.1 Non Arctic - Spill Frequency
F.4.2.2 Non Arctic - Spill Frequency per 10^9 bbl Produced
F.4.2.3 Non Arctic - Spill Index
F.4.2.4 Non Arctic - Spill Frequency - P/L
F.4.2.5 Non Arctic - Spill Frequency per 10^9 bbl Produced - P/L
F.4.2.6 Non Arctic - Spill Index - P/L
F.4.2.7 Non Arctic - Spill Frequency - Platforms
F.4.2.8 Non Arctic - Spill Frequency per 10^9 bbl Produced - Platforms
F.4.2.9 Non Arctic - Spill Index - Platforms
F.4.2.10 Non Arctic - Spill Frequency - Wells
F.4.2.11 Non Arctic - Spill Frequency per 10^9 bbl Produced - Wells
F.4.2.12 Non Arctic - Spill Index - Wells
F.4.2.13 Non Arctic - Spill Indicators - CDF - Year 2024
F.4.2.14 Non Arctic - Spill Frequency - CDF
F.4.2.15 Non Arctic - Spill Frequency per bbl produced - CDF
F.4.2.16 Non Arctic - Spill Index - CDF
F.4.2.17 Non Arctic - Spill Indicators - Year 2024
F.4.2.18 Non Arctic - Spill Indicators - LOF Average

5 Conclusions

T.5.1 Summary of Life of Field Average Spill Indicators by Spill Source and Size

F.5.1 LOF Spill indicators - by Spill Size
F.5.2 LOF Spill indicators - by Source
F.5.3 Chukchi Sea Spill Frequency
F.5.4 Chukchi Sea Spill Frequency per 10^9 bbl Produced
F.5.5 Chukchi Sea Spill Index

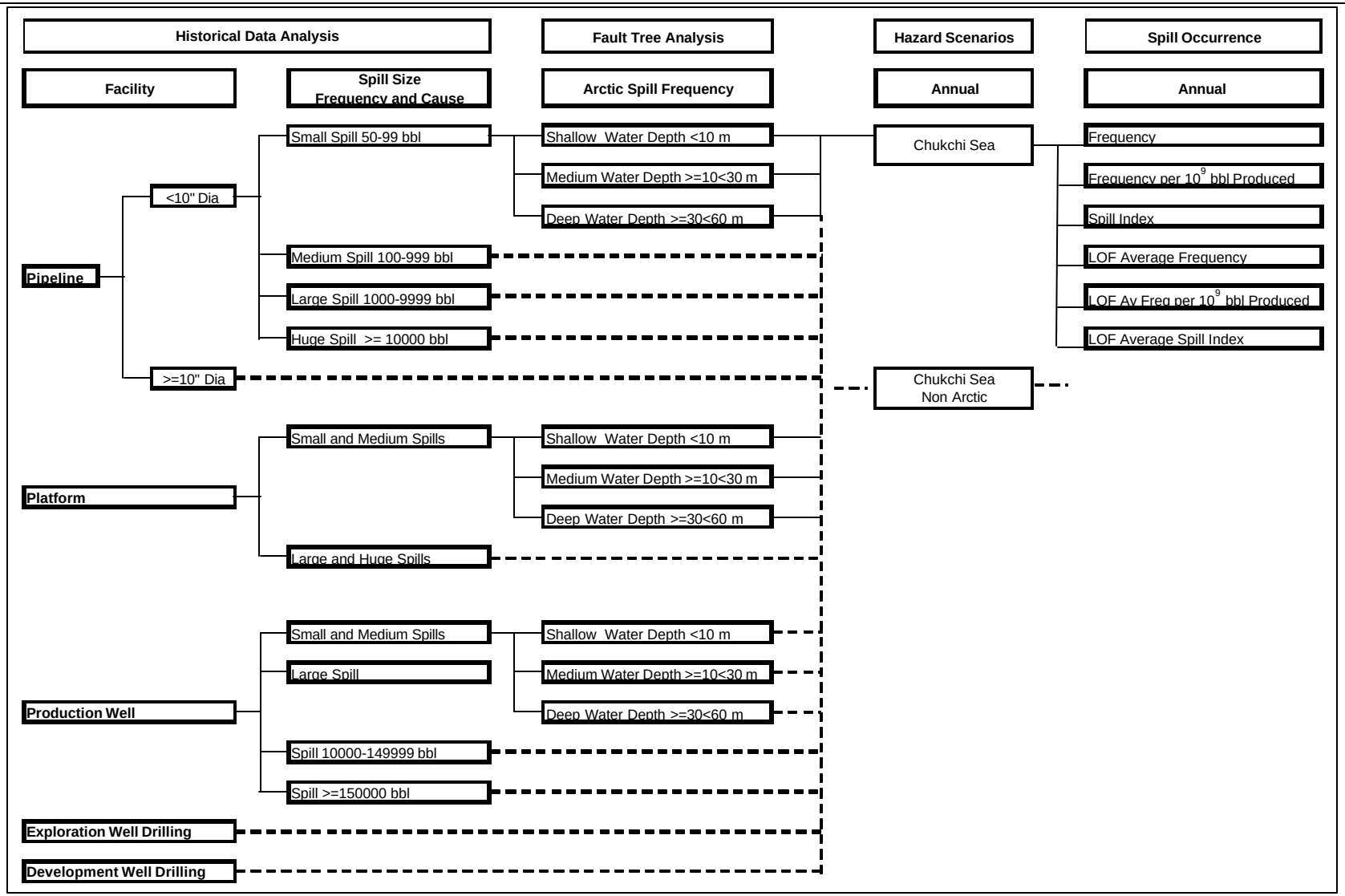


Figure F.0
Flow Chart

APPENDIX 1

Historical Data Analysis

Table 1.1
Analysis of GOM OCS Pipeline Spill Data for Causal Distribution and Spill Size

CAUSE CLASSIFICATION	NUMBER OF SPILLS	SPILL SIZE BBL										NUMBER OF SPILLS					
		1	2	3	4	5	6	7	8	9	10	S	M	L	H	SM	LH
CORROSION	**4**											**1**	**2**	**1**		**3**	**1**
External	1	80										1				**1**	
Internal	3	100	5000	414									2	1		**2**	**1**
THIRD PARTY IMPACT	**16**											**2**	**5**	**6**	**3**	**7**	**9**
Anchor Impact	10	19833	65	50	300	900	323	15576	2000	800	1211	2	4	2	2	**6**	**4**
Jackup Rig or Spud Barge	1	3200												1			**1**
Trawl/Fishing Net	5	4000	100	14423	4569	4533							1	3	1	**1**	**4**
OPERATION IMPACT	**4**											**3**		**1**		**3**	**1**
Rig Anchoring	1	50										1				**1**	
Work Boat Anchoring	3	50	5100	50								2		1		**2**	**1**
MECHANICAL	**2**												**2**			**2**	
Connection Failure	1	135											1			**1**	
Material Failure	1	210											1			**1**	
NATURAL HAZARD	**4**											**1**	**1**	**2**		**2**	**2**
Mud Slide	3	250	80	8212								1	1	1		**2**	**1**
Storm/ Hurricane	1	3500												1			**1**
ARCTIC																	
Ice Gouging																	
Strudel Scour																	
Upheaval Buckling																	
Thaw Settlement																	
Other																	
UNKNOWN	**2**	119	190										**2**			**2**	
TOTALS	**32**											**7**	**12**	**10**	**3**	**19**	**13**

Table 1.2
Distribution and Frequency of Historical Spills - Pipeline

CAUSE CLASSIFICATION	Small and Medium Spills 50-999 bbl				Large and Huge Spills >=1000 bbl			
	HIST. DISTRIBUTION %	NUMBER OF SPILLS	EXPOSURE [km-years]	FREQUENCY spill per 10^5km-year	HIST. DISTRIBUTION %	NUMBER OF SPILLS	EXPOSURE [km-years]	FREQUENCY spill per 10^5km-year
CORROSION	**15.79**	**3**		**1.6027**	**7.69**	**1**		**0.5342**
External	5.26	1		0.5342				
Internal	10.53	2		1.0685	7.69	1		0.5342
THIRD PARTY IMPACT	**36.84**	**7**		**3.7397**	**69.23**	**9**		**4.8081**
Anchor Impact	31.58	6		3.2054	30.77	4		2.1369
Jackup Rig or Spud Barge					7.69	1		0.5342
Trawl/Fishing Net	5.26	1		0.0534	30.77	4		2.1369
OPERATION IMPACT	**15.79**	**3**		**1.6027**	**7.69**	**1**		**0.5342**
Rig Anchoring	5.26	1		0.5342				
Work Boat Anchoring	10.53	2		1.0685	7.69	1		0.5342
MECHANICAL	**10.53**	**2**		**1.0685**				
Connection Failure	5.26	1	**187183**	0.5342			**187183**	
Material Failure	5.26	1		0.5342				
NATURAL HAZARD	**10.53**	**2**		**1.0685**	**15.38**	**2**		**1.0685**
Mud Slide	10.53	2		1.0685	7.69	1		0.5342
Storm/ Hurricane					7.69	1		0.5342
ARCTIC								
Ice Gouging								
Strudel Scour								
Upheaval Buckling								
Thaw Settlement								
Other								
UNKNOWN	**10.53**	**2**		**1.0685**				
TOTALS	**100.00**	**19**		**10.1505**	**100.00**	**13**		**6.9451**

Table 1.3
GOM OCS Pipeline Spills Statistics Summary (1972-1999)

GOM OCS Pipeline Spills, Categorized 1972-99		Spill Statistics	Exposure	Frequency
		Number of Spills	km-years	spills per 10^5 km-years
By Pipe Diameter				
	< 10"	16	105,336	15.1894
	>= 10"	16	81,847	19.5488
By Spill Size				
	Small 50-99 bbl	6	187,183	3.2054
	Medium 100 - 999 bbl	13	187,183	6.9451
	Large 1000 - 9999 bbl	10	187,183	5.3424
	Huge >=10000 bbl	3	187,183	1.6027
By Diameter, By Spill Size				
< 10"	Small 50-99 bbl	4	105,336	3.7974
	Medium 100 - 999 bbl	7	105,336	6.6454
	Large 1000 - 9999 bbl	4	105,336	3.7974
	Huge >=10000 bbl	1	105,336	0.9493
>= 10"	Small <100 bbl	2	81,847	2.4436
	Medium 100 - 999 bbl	6	81,847	7.3308
	Large 1000 - 9999 bbl	6	81,847	7.3308
	Huge >=10000 bbl	2	81,847	2.4436

*14 of the 32 records have both MIN_WATER_DEPTH and MAX_WATER_DEPTH set to "0".

Table 1.4
Pipeline Spill Frequency Triangular Distribution Properties

GOM OCS Pipeline Spills, Categorized 1972-99		Low Factor	High Factor	Frequency spill per 10^5 km-years				
				Historical	Low	Mode	High	Expected
By Diameter, By Spill Size								
<10"	**Small**	0	2.57	3.7974	0	1.6329	9.7592	5.1720
	Medium	0	2.57	6.6454	0	2.8575	17.0786	9.0510
	Large	0	2.57	3.7974	0	1.6329	9.7592	5.1720
	Huge	0	2.57	0.9493	0	0.4082	2.4398	1.2930
>=10"	**Small**	0	2.57	2.4436	0	1.0507	6.2800	3.3282
	Medium	0	2.57	7.3308	0	3.1522	18.8401	9.9846
	Large	0	2.57	7.3308	0	3.1522	18.8401	9.9846
	Huge	0	2.57	2.4436	0	1.0507	6.2800	3.3282

Table 1.5
Analysis of GOM OCS Platform Spill Data for Causal Distribution and Spill Size (1972-1999)

CAUSE CLASSIFICATION	NUMBER OF SPILLS	SPILL SIZE BBL													NUMBER OF SPILLS					
		1	2	3	4	5	6	7	8	9	10	11	12	13	S	M	L	H	SM	LH
PROCESS FACILITY RLS.	**13**	130	50	120	104	60	1456	125	50	50	55	400	280	75	**6**	**6**	**1**		**12**	**1**
STORAGE TANK RLS.	**3**	9935	7000	435												**1**	**2**		**1**	**2**
STRUCTURAL FAILURE	**1**	58													**1**				**1**	
HURRICANE/STORM	**2**	75	66												**2**				**2**	
COLLISION	**2**	600	108													**2**			**2**	
ARCTIC																				
Ice Force																				
Facility Low Temperature																				
Other																				
TOTALS	**21**														**9**	**9**	**3**		**18**	**3**

Table 1.6
Causal and Spill Size Distribution of GOM OCS Platform Spills (1972-1999)

CAUSE CLASSIFICATION	Small and Medium Spills 55-999 bbl				Large and Huge Spills >=1000 bbl			
	HIST. DISTRIBUTION %	NUMBER OF SPILLS	EXPOSURE [well-years]	FREQUENCY spill per 10^4well-year	HIST. DISTRIBUTION %	NUMBER OF SPILLS	EXPOSURE [well-years]	FREQUENCY spill per 10^4well-year
PROCESS FACILITY RLS.	66.67	**12**	**119714**	**1.0024**	33.33	**1**	**119714**	**0.0835**
STORAGE TANK RLS.	5.56	**1**		**0.0835**	66.67	**2**		**0.1671**
STRUCTURAL FAILURE	5.56	**1**		**0.0835**				
HURRICANE/STORM	11.11	**2**		**0.1671**				
COLLISION	11.11	**2**		**0.1671**				
ARCTIC								
Ice Force								
Facility Low Temperature								
Other								
TOTALS	**100.00**	**18**		**1.5036**	**100.00**	**3**		**0.2506**

Table 1.7
Platform Spill Frequency Triangular Distribution Properties

Frequency Unit	Low Factor	High Factor	Historical	Low	Mode	High	Expected
			Small and Medium Spills 50-999 bbl				
spill per 10^4well-year	0	2.88	1.5036	0.0000	0.1804	4.3303	2.1571
			Large and Huge Spills >=1000 bbl				
spill per 10^4well-year	0	2.88	0.2506	0.0000	0.0301	0.7217	0.3595

Table 1.8
Well Blowout Historical Spill Size Distribution

EVENT	FREQUENCY UNIT	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Small, Medium, and Large Spills 50-9999 bbl	Spills 10000-149999 bbl	Spills >=150000 bbl	All spills
		HISTORICAL FREQUENCY					
PRODUCTION WELL	spills per 10^4 well-year	0.15	1.03	1.18	0.44	0.29	1.91
EXPLORATION WELL DRILLING	spills per 10^4 wells	1.97	13.75	15.72	5.91	3.42	25.05
DEVELOPMENT WELL DRILLING	spills per 10^4 wells	0.65	4.57	5.22	1.96	1.96	9.15

Table 1.9
Well Blowout Frequency Triangular Distribution Properties

EVENT	FREQUENCY UNIT	Low Factor	High Factor	Frequencies				
				Historical	Low	Mode	High	Expected
				Small and Medium Spills 50-999 bbl				
PRODUCTION WELL	spill per 10^4 well-year	0.448	1.545	0.147	0.066	0.148	0.227	0.147
EXPLORATION WELL DRILLING	spill per 10^4 wells	0.439	2.036	1.966	0.863	1.032	4.002	2.262
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	0.437	1.760	0.654	0.286	0.526	1.151	0.692
				Large Spills 1000-9999 bbl				
PRODUCTION WELL	spill per 10^4 well-year	0.448	1.545	1.028	0.460	1.037	1.588	1.026
EXPLORATION WELL DRILLING	spill per 10^4 wells	0.439	2.036	13.754	6.039	7.220	28.001	15.824
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	0.437	1.760	4.570	1.998	3.671	8.041	4.833
				Small, Medium and Large Spills 50-9999 bbl				
PRODUCTION WELL	spill per 10^4 well-year	0.448	1.545	1.175	0.526	1.185	1.815	1.173
EXPLORATION WELL DRILLING	spill per 10^4 wells	0.439	2.036	15.719	6.903	8.252	32.003	18.086
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	0.437	1.760	5.224	2.284	4.197	9.192	5.525
				Spill 10000-149999 bbl				
PRODUCTION WELL	spill per 10^4 well-year	0.448	1.545	0.441	0.197	0.444	0.681	0.440
EXPLORATION WELL DRILLING	spill per 10^4 wells	0.439	2.036	5.909	2.595	3.102	12.031	6.799
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	0.437	1.760	1.963	0.858	1.577	3.454	2.076
				Spill >=150000 bbl				
PRODUCTION WELL	spill per 10^4 well-year	0.448	1.545	0.294	0.132	0.296	0.454	0.293
EXPLORATION WELL DRILLING	spill per 10^4 wells	0.439	2.036	3.421	1.502	1.796	6.965	3.936
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	0.437	1.760	1.963	0.858	1.577	3.454	2.076

APPENDIX 2

Fault Tree Analysis

Table 2.1
Pipeline Arctic Effect Derivation Summary

CAUSE CLASSIFICATION	Spill Size	Shallow	Medium	Deep	Reason
		Historical Expected Frequency Change %			
CORROSION					
External	All	(30)	(30)	(30)	Low temperature and bio effects. Extra smart pigging.
Internal	All	(30)	(30)	(30)	Extra smart pigging.
THIRD PARTY IMPACT					
Anchor Impact	All	(50)	(50)	(50)	Low traffic.
Jackup Rig or Spud Barge	All	(50)	(50)	(50)	Low facility density.
Trawl/Fishing Net	All	(50)	(60)	(70)	Low fishing activity. Less bottom fishing in deep water.
OPERATION IMPACT					
Rig Anchoring	All	(20)	(20)	(20)	Low marine traffic during ice season (8 months).
Work Boat Anchoring	All	(20)	(20)	(20)	Low work boat traffic during ice season (8 months).
MECHANICAL					
Connection Failure	All				
Material Failure	All				
NATURAL HAZARD					
Mud Slide	All	(60)	(50)	(40)	Gradient low. Mud slide potential (gradient) increases with water depth.
Storm/ Hurricane	All	(50)	(50)	(50)	Fewer severe storms.
		Freq. Increment per 10^5 km-year			
		Expected	Expected	Expected	
		Mode	Mode	Mode	
ARCTIC					
Ice Gouging	S	0.3495	0.2796		Ice gouge failure rate calculated using exponential failure distribution for 2.5-m cover, 0.2-m average gouge depth, 2 gouges per km-yr flux. Spill size Distribution explained in text Section 2.5.2. Medium depth has 0.8 as many gouges as shallow.
		0.0680	0.0544		
	M	0.6178	0.4943		
		0.1210	0.0968		
	L	1.3438	1.0750		
		0.2610	0.2088		
	H	0.3762	0.3010		
		0.0730	0.0584		
Strudel Scour	S	0.0021			Only in shallow water. Average frequency of 2 scours/mile^2 and 100 ft of bridge length with 10% conditional P/L failure probability. The same spill size distribution as above.
		0.0012			
	M	0.0038			
		0.0020			
	L	0.0082			
		0.0045			
	H	0.0023			
		0.0012			
Upheaval Buckling	S	0.0004	0.0004	0.0004	All water depth. The failure frequency is 20% of that of Strudel Scour.
		0.0002	0.0002	0.0002	
	M	0.0008	0.0008	0.0008	
		0.0004	0.0004	0.0004	
	L	0.0016	0.0016	0.0016	
		0.0009	0.0009	0.0009	
	H	0.0005	0.0005	0.0005	
		0.0002	0.0002	0.0002	
Thaw Settlement	S				No thaw settlement expected in Chukchi OCS.
	M				
	L				
	H				
Other	S	0.0880	0.0700	0.0001	To be assessed as 25% of above.
		0.0173	0.0137	0.0001	
	M	0.1556	0.1238	0.0002	
		0.0309	0.0243	0.0001	
	L	0.3384	0.2692	0.0004	
		0.0666	0.0524	0.0002	
	H	0.0947	0.0754	0.0001	
		0.0186	0.0147	0.0001	

Table 2.2
Pipeline Arctic Effect Distribution Derivation Summary

CAUSE CLASSIFICATION	Spill Size	Shallow			Medium			Deep		
		Frequency Change %								
		Min	Mode	Max	Min	Mode	Max	Min	Mode	Max
CORROSION										
External	**All**	(90)	(30)	(10)	(90)	(30)	(10)	(90)	(30)	(10)
Internal	**All**	(90)	(30)	(10)	(90)	(30)	(10)	(90)	(30)	(10)
THIRD PARTY IMPACT										
Anchor Impact	**All**	(90)	(50)	(10)	(90)	(50)	(10)	(90)	(50)	(10)
Jackup Rig or Spud Barge	**All**	(90)	(50)	(10)	(90)	(50)	(10)	(90)	(50)	(10)
Trawl/Fishing Net	**All**	(90)	(50)	(10)	(90)	(60)	(10)	(90)	(70)	(10)
OPERATION IMPACT										
Rig Anchoring	**All**	(50)	(20)	(10)	(50)	(20)	(10)	(50)	(20)	(10)
Work Boat Anchoring	**All**	(50)	(20)	(10)	(50)	(20)	(10)	(50)	(20)	(10)
MECHANICAL										
Connection Failure	**All**									
Material Failure	**All**									
NATURAL HAZARD										
Mud Slide	**All**	(90)	(60)	(10)	(90)	(50)	(10)	(90)	(40)	(10)
Storm/ Hurricane	**All**	(90)	(50)	(10)	(90)	(50)	(10)	(90)	(50)	(10)
		Frequency Increment per 10^5 km-year								
ARCTIC										
Ice Gouging	**S**	0.0060	0.0680	0.8290	0.0048	0.0544	0.6632			
	M	0.0090	0.1210	1.4670	0.0072	0.0968	1.1736			
	L	0.0210	0.2610	3.1900	0.0168	0.2088	2.5520			
	H	0.0060	0.0730	0.8930	0.0048	0.0584	0.7144			
Strudel Scour	**S**	0.0004	0.0012	0.0044						
	M	0.0006	0.0020	0.0078						
	L	0.0014	0.0045	0.0170						
	H	0.0004	0.0012	0.0048						
Upheaval Buckling	**S**	0.00007	0.00023	0.00088	0.00007	0.00023	0.00088	0.00007	0.00023	0.00088
	M	0.00013	0.00041	0.00156	0.00013	0.00041	0.00156	0.00013	0.00041	0.00156
	L	0.00028	0.00089	0.00340	0.00028	0.00089	0.00340	0.00028	0.00089	0.00340
	H	0.00008	0.00025	0.00095	0.00008	0.00025	0.00095	0.00008	0.00025	0.00095
Thaw Settlement	**S**									
	M									
	L									
	H									
Other	**S**	0.00161	0.01735	0.20858	0.00122	0.01366	0.16602	0.00002	0.00006	0.00022
	M	0.00244	0.03086	0.36910	0.00183	0.02430	0.29379	0.00003	0.00010	0.00039
	L	0.00567	0.06659	0.80260	0.00427	0.05242	0.63885	0.00007	0.00022	0.00085
	H	0.00162	0.01862	0.22468	0.00122	0.01466	0.17884	0.00002	0.00006	0.00024

Table 2.2A
Arctic Pipeline Spill Frequencies Expected Value Summary

Pipeline Spill Size	P/L Dia <10"				P/L Dia >=10"			
	Historical Frequency spills per 10^5km-year	Arctic Frequency			Historical Frequency spills per 10^5km-year	Arctic Frequency		
		Shallow	Medium	Deep		Shallow	Medium	Deep
SMALL SPILLS 50-99 bbl	5.172	3.773	3.688	3.345	3.328	2.585	2.498	2.152
MEDIUM SPILLS 100-999 bbl	9.051	6.610	6.461	5.853	9.985	7.212	7.063	6.457
LARGE SPILLS 1000-9999 bbl	5.172	4.374	4.003	2.635	9.985	6.869	6.475	5.085
HUGE SPILLS =>10000 bbl	1.293	1.144	1.041	0.659	3.328	2.199	2.087	1.695

Table 2.3
Arctic Pipeline Small Spill Frequencies

CAUSE CLASSIFICATION	HIST. DISTRIBUTION %	SMALL SPILLS 50-99 bbl																			
		P/L Dia <10"										P/L Dia >=10"									
			Shallow			Medium			Deep				Shallow			Medium			Deep		
		FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %
CORROSION	**15.79**	**0.817**	**(0.375)**	**0.442**	**11.71**	**(0.375)**	**0.442**	**11.98**	**(0.375)**	**0.442**	**13.21**	**0.526**	**(0.241)**	**0.284**	**11.00**	**(0.241)**	**0.284**	**11.38**	**(0.241)**	**0.284**	**13.21**
External	5.26	0.272	(0.125)	0.147	3.90	(0.125)	0.147	3.99	(0.125)	0.147	4.40	0.175	(0.080)	0.095	3.67	(0.080)	0.095	3.79	(0.080)	0.095	4.40
Internal	10.53	0.544	(0.250)	0.294	7.81	(0.250)	0.294	7.98	(0.250)	0.294	8.81	0.350	(0.161)	0.190	7.33	(0.161)	0.190	7.59	(0.161)	0.190	8.80
THIRD PARTY IMPACT	**36.84**	**1.905**	**(0.953)**	**0.953**	**25.25**	**(0.958)**	**0.947**	**25.68**	**(0.964)**	**0.942**	**28.15**	**1.226**	**(0.613)**	**0.613**	**23.72**	**(0.617)**	**0.609**	**24.40**	**(0.620)**	**0.606**	**28.15**
Anchor Impact	31.58	1.633	(0.817)	0.817	21.65	(0.817)	0.817	22.14	(0.817)	0.817	24.42	1.051	(0.526)	0.526	20.33	(0.526)	0.526	21.04	(0.526)	0.526	24.41
Jackup Rig or Spud Barge																					
Trawl/Fishing Net	5.26	0.272	(0.136)	0.136	3.61	(0.142)	0.130	3.54	(0.147)	0.125	3.74	0.175	(0.088)	0.088	3.39	(0.091)	0.084	3.36	(0.095)	0.080	3.74
OPERATION IMPACT	**15.79**	**0.817**	**(0.228)**	**0.588**	**15.60**	**(0.228)**	**0.588**	**15.95**	**(0.228)**	**0.588**	**17.59**	**0.526**	**(0.147)**	**0.379**	**14.65**	**(0.147)**	**0.379**	**15.16**	**(0.147)**	**0.379**	**17.59**
Rig Anchoring	5.26	0.272	(0.076)	0.196	5.20	(0.076)	0.196	5.32	(0.076)	0.196	5.86	0.175	(0.049)	0.126	4.88	(0.049)	0.126	5.05	(0.049)	0.126	5.86
Work Boat Anchoring	10.53	0.544	(0.152)	0.392	10.40	(0.152)	0.392	10.63	(0.152)	0.392	11.73	0.350	(0.098)	0.252	9.77	(0.098)	0.252	10.10	(0.098)	0.252	11.73
MECHANICAL	**10.53**	**0.544**		**0.544**	**14.43**		**0.544**	**14.76**		**0.544**	**16.28**	**0.350**		**0.350**	**13.55**		**0.350**	**14.02**		**0.350**	**16.28**
Connection Failure	5.26	0.272		0.272	7.22		0.272	7.38		0.272	8.14	0.175		0.175	6.78		0.175	7.01		0.175	8.14
Material Failure	5.26	0.272		0.272	7.22		0.272	7.38		0.272	8.14	0.175		0.175	6.78		0.175	7.01		0.175	8.14
NATURAL HAZARD	**10.53**	**0.544**	**(0.283)**	**0.261**	**6.92**	**(0.272)**	**0.272**	**7.38**	**(0.261)**	**0.283**	**8.48**	**0.350**	**(0.182)**	**0.168**	**6.50**	**(0.175)**	**0.175**	**7.01**	**(0.168)**	**0.182**	**8.48**
Mud Slide	10.53	0.544	(0.283)	0.261	6.92	(0.272)	0.272	7.38	(0.261)	0.283	8.48	0.350	(0.182)	0.168	6.50	(0.175)	0.175	7.01	(0.168)	0.182	8.48
Storm/ Hurricane																					
ARCTIC			**0.440**	**0.440**	**11.66**	**0.350**	**0.350**	**9.49**	**0.001**	**0.001**	**0.02**		**0.440**	**0.440**	**17.03**	**0.350**	**0.350**	**14.01**	**0.001**	**0.001**	**0.02**
Ice Gouging			0.3495	0.3495	9.26	0.2796	0.2796	7.58					0.3495	0.3495	13.52	0.2796	0.2796	11.19			
Strudel Scour			0.0021	0.0021	0.06								0.0021	0.0021	0.08						
Upheaval Buckling			0.0004	0.0004	0.01	0.0004	0.0004	0.01	0.0004	0.0004	0.01		0.0004	0.0004	0.02	0.0004	0.0004	0.02	0.0004	0.0004	0.02
Thaw Settlement																					
Other			0.0880	0.0880	2.33	0.0700	0.0700	1.90	0.0001	0.0001	0.00		0.0880	0.0880	3.41	0.0700	0.0700	2.80	0.0001	0.0001	0.00
UNKNOWN	**10.53**	**0.544**		**0.544**	**14.43**		**0.544**	**14.76**		**0.544**	**16.28**	**0.350**		**0.350**	**13.55**		**0.350**	**14.02**		**0.350**	**16.28**
TOTALS	**100.00**	**5.172**	**(1.399)**	**3.773**	**100.00**	**(1.484)**	**3.688**	**100.00**	**(1.827)**	**3.345**	**100.00**	**3.328**	**(0.744)**	**2.585**	**100.00**	**(0.830)**	**2.498**	**100.00**	**(1.176)**	**2.152**	**100.00**

Table 2.4
Arctic Pipeline Medium Spill Frequencies

CAUSE CLASSIFICATION	HIST. DISTRIBUTION %	MEDIUM SPILLS 100-999 bbl																			
		P/L Dia <10"										P/L Dia >=10"									
			Shallow			Medium			Deep				Shallow			Medium			Deep		
		FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %
CORROSION	**15.79**	**1.429**	**(0.656)**	**0.773**	**11.70**	**(0.656)**	**0.773**	**11.97**	**(0.656)**	**0.773**	**13.21**	**1.577**	**(0.724)**	**0.853**	**11.83**	**(0.724)**	**0.853**	**12.07**	**(0.724)**	**0.853**	**13.21**
External	5.26	0.476	(0.219)	0.258	3.90	(0.219)	0.258	3.99	(0.219)	0.258	4.40	0.526	(0.241)	0.284	3.94	(0.241)	0.284	4.02	(0.241)	0.284	4.40
Internal	10.53	0.953	(0.437)	0.515	7.80	(0.437)	0.515	7.98	(0.437)	0.515	8.81	1.051	(0.482)	0.569	7.88	(0.482)	0.569	8.05	(0.482)	0.569	8.81
THIRD PARTY IMPACT	**36.84**	**3.335**	**(1.667)**	**1.667**	**25.22**	**(1.677)**	**1.657**	**25.65**	**(1.687)**	**1.648**	**28.15**	**3.679**	**(1.839)**	**1.839**	**25.50**	**(1.850)**	**1.828**	**25.89**	**(1.861)**	**1.818**	**28.15**
Anchor Impact	31.58	2.858	(1.429)	1.429	21.62	(1.429)	1.429	22.12	(1.429)	1.429	24.42	3.153	(1.577)	1.577	21.86	(1.577)	1.577	22.32	(1.577)	1.577	24.42
Jackup Rig or Spud Barge																					
Trawl/Fishing Net	5.26	0.476	(0.238)	0.238	3.60	(0.248)	0.228	3.53	(0.258)	0.219	3.74	0.526	(0.263)	0.263	3.64	(0.274)	0.252	3.57	(0.284)	0.241	3.74
OPERATION IMPACT	**15.79**	**1.429**	**(0.399)**	**1.030**	**15.58**	**(0.399)**	**1.030**	**15.94**	**(0.399)**	**1.030**	**17.59**	**1.577**	**(0.441)**	**1.136**	**15.75**	**(0.441)**	**1.136**	**16.08**	**(0.441)**	**1.136**	**17.59**
Rig Anchoring	5.26	0.476	(0.133)	0.343	5.19	(0.133)	0.343	5.31	(0.133)	0.343	5.86	0.526	(0.147)	0.379	5.25	(0.147)	0.379	5.36	(0.147)	0.379	5.86
Work Boat Anchoring	10.53	0.953	(0.266)	0.686	10.38	(0.266)	0.686	10.62	(0.266)	0.686	11.73	1.051	(0.294)	0.757	10.50	(0.294)	0.757	10.72	(0.294)	0.757	11.73
MECHANICAL	**10.53**	**0.953**		**0.953**	**14.41**		**0.953**	**14.75**		**0.953**	**16.28**	**1.051**		**1.051**	**14.57**		**1.051**	**14.88**		**1.051**	**16.28**
Connection Failure	5.26	0.476		0.476	7.21		0.476	7.37		0.476	8.14	0.526		0.526	7.29		0.526	7.44		0.526	8.14
Material Failure	5.26	0.476		0.476	7.21		0.476	7.37		0.476	8.14	0.526		0.526	7.29		0.526	7.44		0.526	8.14
NATURAL HAZARD	**10.53**	**0.953**	**(0.496)**	**0.457**	**6.91**	**(0.476)**	**0.476**	**7.37**	**(0.457)**	**0.496**	**8.48**	**1.051**	**(0.547)**	**0.504**	**6.98**	**(0.526)**	**0.526**	**7.44**	**(0.504)**	**0.547**	**8.48**
Mud Slide	10.53	0.953	(0.496)	0.457	6.91	(0.476)	0.476	7.37	(0.457)	0.496	8.48	1.051	(0.547)	0.504	6.98	(0.526)	0.526	7.44	(0.504)	0.547	8.48
Storm/ Hurricane																					
ARCTIC			**0.778**	**0.778**	**11.77**	**0.619**	**0.619**	**9.58**	**0.001**	**0.001**	**0.02**		**0.778**	**0.778**	**10.79**	**0.619**	**0.619**	**8.76**	**0.001**	**0.001**	**0.01**
Ice Gouging			0.6178	0.6178	9.35	0.4943	0.4943	7.65					0.6178	0.6178	8.57	0.4943	0.4943	7.00			
Strudel Scour			0.0038	0.0038	0.06								0.0038	0.0038	0.05						
Upheaval Buckling			0.0008	0.0008	0.01	0.0008	0.0008	0.01	0.0008	0.0008	0.01		0.0008	0.0008	0.01	0.0008	0.0008	0.01	0.0008	0.0008	0.01
Thaw Settlement																					
Other			0.1556	0.1556	2.35	0.1238	0.1238	1.92	0.0002	0.0002	0.00		0.1556	0.1556	2.16	0.1238	0.1238	1.75	0.0002	0.0002	0.00
UNKNOWN	**10.53**	**0.953**		**0.953**	**14.41**		**0.953**	**14.75**		**0.953**	**16.28**	**1.051**		**1.051**	**14.57**		**1.051**	**14.88**		**1.051**	**16.28**
TOTALS	**100.00**	**9.051**	**(2.441)**	**6.610**	**100.00**	**(2.590)**	**6.461**	**100.00**	**(3.198)**	**5.853**	**100.00**	**9.985**	**(2.773)**	**7.212**	**100.00**	**(2.921)**	**7.063**	**100.00**	**(3.528)**	**6.457**	**100.00**

Table 2.5
Arctic Pipeline Large Spill Frequencies

CAUSE CLASSIFICATION	HIST. DISTRIBUTION %	LARGE SPILLS 1000-9999 bbl																			
		P/L Dia <10"										P/L Dia >=10"									
			Shallow			Medium			Deep				Shallow			Medium			Deep		
		FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %
CORROSION	**7.69**	**0.398**	**(0.183)**	**0.215**	**4.92**	**(0.183)**	**0.215**	**5.38**	**(0.183)**	**0.215**	**8.17**	**0.768**	**(0.353)**	**0.415**	**6.05**	**(0.353)**	**0.415**	**6.42**	**(0.353)**	**0.415**	**8.17**
External																					
Internal	7.69	0.398	(0.183)	0.215	4.92	(0.183)	0.215	5.38	(0.183)	0.215	8.17	0.768	(0.353)	0.415	6.05	(0.353)	0.415	6.42	(0.353)	0.415	8.17
THIRD PARTY IMPACT	**69.23**	**3.581**	**(1.790)**	**1.790**	**40.93**	**(1.823)**	**1.757**	**43.90**	**(1.855)**	**1.725**	**65.47**	**6.912**	**(3.456)**	**3.456**	**50.31**	**(3.520)**	**3.393**	**52.39**	**(3.582)**	**3.330**	**65.49**
Anchor Impact	30.77	1.591	(0.796)	0.796	18.19	(0.796)	0.796	19.88	(0.796)	0.796	30.20	3.072	(1.536)	1.536	22.36	(1.536)	1.536	23.72	(1.536)	1.536	30.21
Jackup Rig or Spud Barge	7.69	0.398	(0.199)	0.199	4.55	(0.199)	0.199	4.97	(0.199)	0.199	7.55	0.768	(0.384)	0.384	5.59	(0.384)	0.384	5.93	(0.384)	0.384	7.55
Trawl/Fishing Net	30.77	1.591	(0.796)	0.796	18.19	(0.829)	0.763	19.05	(0.861)	0.731	27.72	3.072	(1.536)	1.536	22.36	(1.600)	1.472	22.74	(1.662)	1.410	27.73
OPERATION IMPACT	**7.69**	**0.398**	**(0.111)**	**0.287**	**6.55**	**(0.111)**	**0.287**	**7.16**	**(0.111)**	**0.287**	**10.88**	**0.768**	**(0.215)**	**0.553**	**8.06**	**(0.215)**	**0.553**	**8.55**	**(0.215)**	**0.553**	**10.88**
Rig Anchoring																					
Work Boat Anchoring	7.69	0.398	(0.111)	0.287	6.55	(0.111)	0.287	7.16	(0.111)	0.287	10.88	0.768	(0.215)	0.553	8.06	(0.215)	0.553	8.55	(0.215)	0.553	10.88
MECHANICAL																					
Connection Failure																					
Material Failure																					
NATURAL HAZARD	**15.38**	**0.796**	**(0.406)**	**0.390**	**8.91**	**(0.398)**	**0.398**	**9.94**	**(0.390)**	**0.406**	**15.41**	**1.536**	**(0.784)**	**0.752**	**10.95**	**(0.768)**	**0.768**	**11.86**	**(0.752)**	**0.784**	**15.42**
Mud Slide	7.69	0.398	(0.207)	0.191	4.36	(0.199)	0.199	4.97	(0.191)	0.207	7.86	0.768	(0.400)	0.368	5.36	(0.384)	0.384	5.93	(0.368)	0.400	7.86
Storm/ Hurricane	7.69	0.398	(0.199)	0.199	4.55	(0.199)	0.199	4.97	(0.199)	0.199	7.55	0.768	(0.384)	0.384	5.59	(0.384)	0.384	5.93	(0.384)	0.384	7.55
ARCTIC			**1.692**	**1.692**	**38.69**	**1.346**	**1.346**	**33.62**	**0.002**	**0.002**	**0.08**		**1.692**	**1.692**	**24.63**	**1.346**	**1.346**	**20.78**	**0.002**	**0.002**	**0.04**
Ice Gouging			1.3438	1.3438	30.72	1.0750	1.0750	26.86					1.3438	1.3438	19.56	1.0750	1.0750	16.60			
Strudel Scour			0.0082	0.0082	0.19								0.0082	0.0082	0.12						
Upheaval Buckling			0.0016	0.0016	0.04	0.0016	0.0016	0.04	0.0016	0.0016	0.06		0.0016	0.0016	0.02	0.0016	0.0016	0.03	0.0016	0.0016	0.03
Thaw Settlement																					
Other			0.3384	0.3384	7.74	0.2692	0.2692	6.72	0.0004	0.0004	0.02		0.3384	0.3384	4.93	0.2692	0.2692	4.16	0.0004	0.0004	0.01
UNKNOWN																					
TOTALS	**100.00**	**5.172**	**(0.798)**	**4.374**	**100.00**	**(1.169)**	**4.003**	**100.00**	**(2.537)**	**2.635**	**100.00**	**9.985**	**(3.115)**	**6.869**	**100.00**	**(3.509)**	**6.475**	**100.00**	**(4.899)**	**5.085**	**100.00**

Table 2.6
Arctic Pipeline Huge Spill Frequencies

CAUSE CLASSIFICATION	HIST. DISTRIBUTION %	HUGE SPILLS =>10000 bbl																			
		P/L Dia <10"										P/L Dia >=10"									
			Shallow			Medium			Deep				Shallow			Medium			Deep		
		FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	FREQUENCY spills per 10^3km-year	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %
CORROSION	**7.69**	**0.099**	**(0.046)**	**0.054**	**4.70**	**(0.046)**	**0.054**	**5.17**	**(0.046)**	**0.054**	**8.17**	**0.256**	**(0.118)**	**0.138**	**6.30**	**(0.118)**	**0.138**	**6.64**	**(0.118)**	**0.138**	**8.17**
External																					
Internal	7.69	0.099	(0.046)	0.054	4.70	(0.046)	0.054	5.17	(0.046)	0.054	8.17	0.256	(0.118)	0.138	6.30	(0.118)	0.138	6.64	(0.118)	0.138	8.17
THIRD PARTY IMPACT	**69.23**	**0.895**	**(0.448)**	**0.448**	**39.12**	**(0.456)**	**0.439**	**42.20**	**(0.464)**	**0.431**	**65.46**	**2.304**	**(1.152)**	**1.152**	**52.38**	**(1.173)**	**1.131**	**54.20**	**(1.194)**	**1.110**	**65.50**
Anchor Impact	30.77	0.398	(0.199)	0.199	17.39	(0.199)	0.199	19.11	(0.199)	0.199	30.19	1.024	(0.512)	0.512	23.28	(0.512)	0.512	24.54	(0.512)	0.512	30.21
Jackup Rig or Spud Barge	7.69	0.099	(0.050)	0.050	4.35	(0.050)	0.050	4.78	(0.050)	0.050	7.55	0.256	(0.128)	0.128	5.82	(0.128)	0.128	6.13	(0.128)	0.128	7.55
Trawl/Fishing Net	30.77	0.398	(0.199)	0.199	17.39	(0.207)	0.191	18.32	(0.215)	0.183	27.72	1.024	(0.512)	0.512	23.28	(0.533)	0.491	23.52	(0.554)	0.470	27.74
OPERATION IMPACT	**7.69**	**0.099**	**(0.028)**	**0.072**	**6.26**	**(0.028)**	**0.072**	**6.88**	**(0.028)**	**0.072**	**10.88**	**0.256**	**(0.072)**	**0.184**	**8.39**	**(0.072)**	**0.184**	**8.84**	**(0.072)**	**0.184**	**10.88**
Rig Anchoring																					
Work Boat Anchoring	7.69	0.099	(0.028)	0.072	6.26	(0.028)	0.072	6.88	(0.028)	0.072	10.88	0.256	(0.072)	0.184	8.39	(0.072)	0.184	8.84	(0.072)	0.184	10.88
MECHANICAL																					
Connection Failure																					
Material Failure																					
NATURAL HAZARD	**15.38**	**0.199**	**(0.102)**	**0.097**	**8.51**	**(0.099)**	**0.099**	**9.55**	**(0.097)**	**0.102**	**15.41**	**0.512**	**(0.261)**	**0.251**	**11.40**	**(0.256)**	**0.256**	**12.27**	**(0.251)**	**0.261**	**15.42**
Mud Slide	7.69	0.099	(0.052)	0.048	4.17	(0.050)	0.050	4.78	(0.048)	0.052	7.86	0.256	(0.133)	0.123	5.58	(0.128)	0.128	6.13	(0.123)	0.133	7.87
Storm/ Hurricane	7.69	0.099	(0.050)	0.050	4.35	(0.050)	0.050	4.78	(0.050)	0.050	7.55	0.256	(0.128)	0.128	5.82	(0.128)	0.128	6.13	(0.128)	0.128	7.55
ARCTIC			**0.474**	**0.474**	**41.40**	**0.377**	**0.377**	**36.19**	**0.001**	**0.001**	**0.09**		**0.474**	**0.474**	**21.54**	**0.377**	**0.377**	**18.06**	**0.001**	**0.001**	**0.03**
Ice Gouging			0.3762	0.3762	32.88	0.3010	0.3010	28.91					0.3762	0.3762	17.11	0.3010	0.3010	14.42			
Strudel Scour			0.0023	0.0023	0.20								0.0023	0.0023	0.10						
Upheaval Buckling			0.0005	0.0005	0.04	0.0005	0.0005	0.04	0.0005	0.0005	0.07		0.0005	0.0005	0.02	0.0005	0.0005	0.02	0.0005	0.0005	0.03
Thaw Settlement																					
Other			0.0947	0.0947	8.28	0.0754	0.0754	7.24	0.0001	0.0001	0.02		0.0947	0.0947	4.31	0.0754	0.0754	3.61	0.0001	0.0001	0.01
UNKNOWN																					
TOTALS	**100.00**	**1.293**	**(0.149)**	**1.144**	**100.00**	**(0.252)**	**1.041**	**100.00**	**(0.634)**	**0.659**	**100.00**	**3.328**	**(1.129)**	**2.199**	**100.00**	**(1.242)**	**2.087**	**100.00**	**(1.633)**	**1.695**	**100.00**

Table 2.7
Platform Arctic Effect Derivation Summary

CAUSE CLASSIFICATION	Spill Size	Historical Expected Frequency Change %			Reason
		Shallow	Medium	Deep	
PROCESS FACILITY RLS.	**All**	(30)	(30)	(30)	State of the art now, High QC, High Inspection and Maintenance Requirements
STORAGE TANK RLS.	**All**	(30)	(30)	(30)	State of the art now, High QC, High Inspection and Maintenance Requirements
STRUCTURAL FAILURE	**All**	(20)	(20)	(20)	High safety factor, Monitoring Programs
HURRICANE/STORM	**All**	(50)	(40)	(30)	Less severe storms. More intensity in deep water.
COLLISION	**All**	(50)	(50)	(50)	Very low traffic density.
		Freq. Increment per 10^4 well-year			
		Expected	**Expected**	**Expected**	
		Mode	**Mode**	**Mode**	
ARCTIC					
Ice Force	**SM**	0.1447	0.2170	0.3256	Assumed 10,000 year return period ice force causes spill 4% of occurences (96% reliability). 85% of the spills are SM.
		0.0340	0.0510	0.0765	
	LH	0.0255	0.0383	0.0575	
		0.0060	0.0090	0.0135	
Facility Low Temperature	**SM**	0.1000	0.1000	0.1000	Assumed fraction of Historical Process Facilities release frequency with 6% for SM anfd 3% for LH spill sizes.
		0.1000	0.1000	0.1000	
	LH	0.0080	0.0080	0.0080	
		0.0080	0.0080	0.0080	
Other	**SM**	0.0244	0.0316	0.0424	10% of sum of above.
		0.0134	0.0151	0.0177	
	LH	0.0033	0.0046	0.0065	
		0.0014	0.0017	0.0022	

Table 2.8
Platform Arctic Effects Distribution Derivation Summary

CAUSE CLASSIFICATION	Spill Size	Shallow			Medium			Deep		
		Frequency Change %								
		Min	Mode	Max	Min	Mode	Max	Min	Mode	Max
PROCESS FACILITY RLS.	**All**	(60)	(30)	(10)	(60)	(30)	(10)	(60)	(30)	(10)
STORAGE TANK RLS.	**All**	(60)	(30)	(10)	(60)	(30)	(10)	(60)	(30)	(10)
STRUCTURAL FAILURE	**All**	(60)	(20)	(10)	(60)	(20)	(10)	(60)	(20)	(10)
HURRICANE/STORM	**All**	(90)	(50)	(10)	(90)	(40)	(10)	(90)	(30)	(10)
COLLISION	**All**	(90)	(50)	(10)	(90)	(50)	(10)	(90)	(50)	(10)
		Frequency Increment per 10^4 well-year								
ARCTIC										
Ice Force	**SM**	0.003	0.034	0.340	0.005	0.051	0.510	0.008	0.077	0.765
	LH	0.001	0.006	0.060	0.001	0.009	0.090	0.001	0.014	0.135
Facility Low Temperature	**SM**	0.050	0.100	0.150	0.050	0.100	0.150	0.050	0.100	0.150
	LH	0.004	0.008	0.012	0.004	0.008	0.012	0.004	0.008	0.012
Other	**SM**	0.005	0.013	0.049	0.006	0.015	0.066	0.006	0.018	0.092
	LH	0.000	0.001	0.007	0.000	0.002	0.010	0.001	0.002	0.015

Table 2.8A
Arctic Platforms Spill Frequency Expected Value Summary

Platform Spill Size	Historical Frequency spills per 10^4km-year	Arctic Frequency		
		Shallow	Medium	Deep
SMALL AND MEDIUM SPILLS 50-999 bbl	2.157	1.619	1.704	1.828
LARGE AND HUGE SPILLS =>1000 bbl	3.595	0.274	0.288	0.309

Table 2.9
Arctic Platform Small and Medium Spill Frequencies

CAUSE CLASSIFICATION	HIST. DISTRIBUTION %	SMALL AND MEDIUM SPILLS 50-999 bbl									
		FREQUENCY spills per 10^4well-year	Shallow			Medium			Deep		
			Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %
PROCESS FACILITY RLS.	**66.67**	**1.438**	**(0.488)**	**0.950**	**58.65**	**(0.488)**	**0.950**	**55.74**	**(0.488)**	**0.950**	**51.96**
STORAGE TANK RLS.	**5.56**	**0.120**	**(0.041)**	**0.079**	**4.89**	**(0.041)**	**0.079**	**4.65**	**(0.041)**	**0.079**	**4.33**
STRUCTURAL FAILURE	**5.56**	**0.120**	**(0.038)**	**0.082**	**5.04**	**(0.038)**	**0.082**	**4.79**	**(0.038)**	**0.082**	**4.46**
HURRICANE/STORM	**11.11**	**0.240**	**(0.120)**	**0.120**	**7.40**	**(0.115)**	**0.125**	**7.33**	**(0.110)**	**0.130**	**7.09**
COLLISION	**11.11**	**0.240**	**(0.120)**	**0.120**	**7.40**	**(0.120)**	**0.120**	**7.03**	**(0.120)**	**0.120**	**6.56**
ARCTIC			**0.269**	**0.269**	**16.62**	**0.349**	**0.349**	**20.46**	**0.468**	**0.468**	**25.60**
Ice Force			0.145	0.145	8.94	0.217	0.217	12.74	0.326	0.326	17.81
Facility Low Temperature			0.100	0.100	6.18	0.100	0.100	5.87	0.100	0.100	5.47
Other			0.024	0.024	1.51	0.032	0.032	1.86	0.042	0.042	2.32
TOTALS	**100.00**	**2.157**	**(0.538)**	**1.619**	**100.00**	**(0.453)**	**1.704**	**100.00**	**(0.329)**	**1.828**	**100.00**

Table 2.10
Arctic Platform Large and Huge Spill Frequencies

CAUSE CLASSIFICATION	HIST. DISTRIBUTION %	LARGE AND HUGE SPILLS =>1000 bbl									
		FREQUENCY spills per 10^{-4} well-year	Shallow			Medium			Deep		
			Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %	Frequency Change	New Frequency	New Distribution %
PROCESS FACILITY RLS.	**33.33**	**0.120**	**(0.041)**	**0.079**	**28.85**	**(0.041)**	**0.079**	**27.45**	**(0.041)**	**0.079**	**25.58**
STORAGE TANK RLS.	**66.67**	**0.240**	**(0.081)**	**0.158**	**57.70**	**(0.081)**	**0.158**	**54.89**	**(0.081)**	**0.158**	**51.16**
STRUCTURAL FAILURE											
HURRICANE/STORM											
COLLISION											
ARCTIC			**0.037**	**0.037**	**13.44**	**0.051**	**0.051**	**17.66**	**0.072**	**0.072**	**23.27**
Ice Force			0.026	0.026	9.31	0.038	0.038	13.28	0.057	0.057	18.57
Facility Low Temperature			0.008	0.008	2.92	0.008	0.008	2.77	0.008	0.008	2.59
Other			0.003	0.003	1.22	0.005	0.005	1.60	0.007	0.007	2.11
TOTALS	**100.00**	**0.360**	**(0.085)**	**0.274**	**100.00**	**(0.071)**	**0.288**	**100.00**	**(0.050)**	**0.309**	**100.00**

Table 2.11
Well Fault Tree Analysis Arctic Effect Summary

EVENT	FREQUENCY UNIT	Historical Expected Frequency Change %			Reason
		Shallow	Medium	Deep	
		Small and Medium Spills 50-999 bbl			
PRODUCTION WELL	spill per 10^4 well-year	(30)	(30)	(30)	State of the art now, High QC, High Inspection and Maintenance Requirements
EXPLORATION WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
		Large Spills 1000-9999 bbl			
PRODUCTION WELL	spill per 10^4 well-year	(30)	(30)	(30)	State of the art now, High QC, High Inspection and Maintenance Requirements
EXPLORATION WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
		Spill 10000-149999 bbl			
PRODUCTION WELL	spill per 10^4 well-year	(30)	(30)	(30)	State of the art now, High QC, High Inspection and Maintenance Requirements
EXPLORATION WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
		Spill >=150000 bbl			
PRODUCTION WELL	spill per 10^4 well-year	(30)	(30)	(30)	State of the art now, High QC, High Inspection and Maintenance Requirements
EXPLORATION WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	(30)	(20)	(10)	Highly qualified drilling contractor. Better logistics support in shallow water.

Table 2.12
Arctic Well Blowout Frequencies

EVENT	FREQUENCY UNIT	HISTORICAL FREQUENCY	Shallow		Medium		Deep	
			Frequency Change	New Frequency	Frequency Change	New Frequency	Frequency Change	New Frequency
		Small and Medium Spills 50-999 bbl						
PRODUCTION WELL	spill per 10^4 well-year	0.147	-0.044	0.103	-0.044	0.103	-0.044	0.103
EXPLORATION WELL DRILLING	spill per 10^4 wells	2.262	-0.678	1.583	-0.452	1.809	-0.226	2.035
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	0.692	-0.208	0.484	-0.138	0.554	-0.069	0.623
		Large Spills 1000-9999 bbl						
PRODUCTION WELL	spill per 10^4 well-year	1.026	-0.308	0.718	-0.308	0.718	-0.308	0.718
EXPLORATION WELL DRILLING	spill per 10^4 wells	15.824	-4.747	11.077	-3.165	12.659	-1.582	14.242
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	4.833	-1.450	3.383	-0.967	3.867	-0.483	4.350
		Spills 10000-149999 bbl						
PRODUCTION WELL	spill per 10^4 well-year	0.440	-0.132	0.308	-0.132	0.308	-0.132	0.308
EXPLORATION WELL DRILLING	spill per 10^4 wells	6.799	-2.040	4.759	-1.360	5.439	-0.680	6.119
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	2.076	-0.623	1.453	-0.415	1.661	-0.208	1.868
		Spills >=150000 bbl						
PRODUCTION WELL	spill per 10^4 well-year	0.293	-0.088	0.205	-0.088	0.205	-0.088	0.205
EXPLORATION WELL DRILLING	spill per 10^4 wells	3.936	-1.181	2.755	-0.787	3.149	-0.394	3.543
DEVELOPMENT WELL DRILLING	spill per 10^4 wells	2.076	-0.623	1.453	-0.415	1.661	-0.208	1.868

Table 2.13
Summary of Spill Size Distribution Parameters

	PIPELINE SPILL VOLUMES															
Spill Size	**Small Spills 50-99 bbl**				**Medium Spills 100-999 bbl**				**Large Spills 1000-9999 bbl**				**Huge Spills =>10000 bbl**			
Spill Expectation	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**
P/L Dia <10" Spill	50	58	99	71	100	226	999	485	1000	4436	9999	5279	10000	14423	20000	14880
P/L Dia > 10" Spill	50	58	99	71	100	387	999	516	1000	3932	9999	5176	10000	17705	20000	15552

	PLATFORM SPILL VOLUMES							
Spill Size	**Small and Medium Spills 50-999 bbl**				**Large and Huge Spills =>1000 bbl**			
Spill Expectation	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**
Platform Spill	50	158	999	452	1000	6130	10000	5631

	WELL SPILL VOLUMES															
Spill Size	**Small and Medium Spills 50-999 bbl**				**Large Spills 1000-9999 bbl**				**Spills 10000-149999 bbl**				**Spills =>150000 bbl**			
Spill Expectation	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**	**Low**	**Mode**	**High**	**Expected**
Well Spill	50	500	999	519	1000	4500	9999	5292	10000	20000	150000	68349	150000	200000	250000	200000

Figure 2.1
Small Spill Frequencies Pipeline Fault Tree

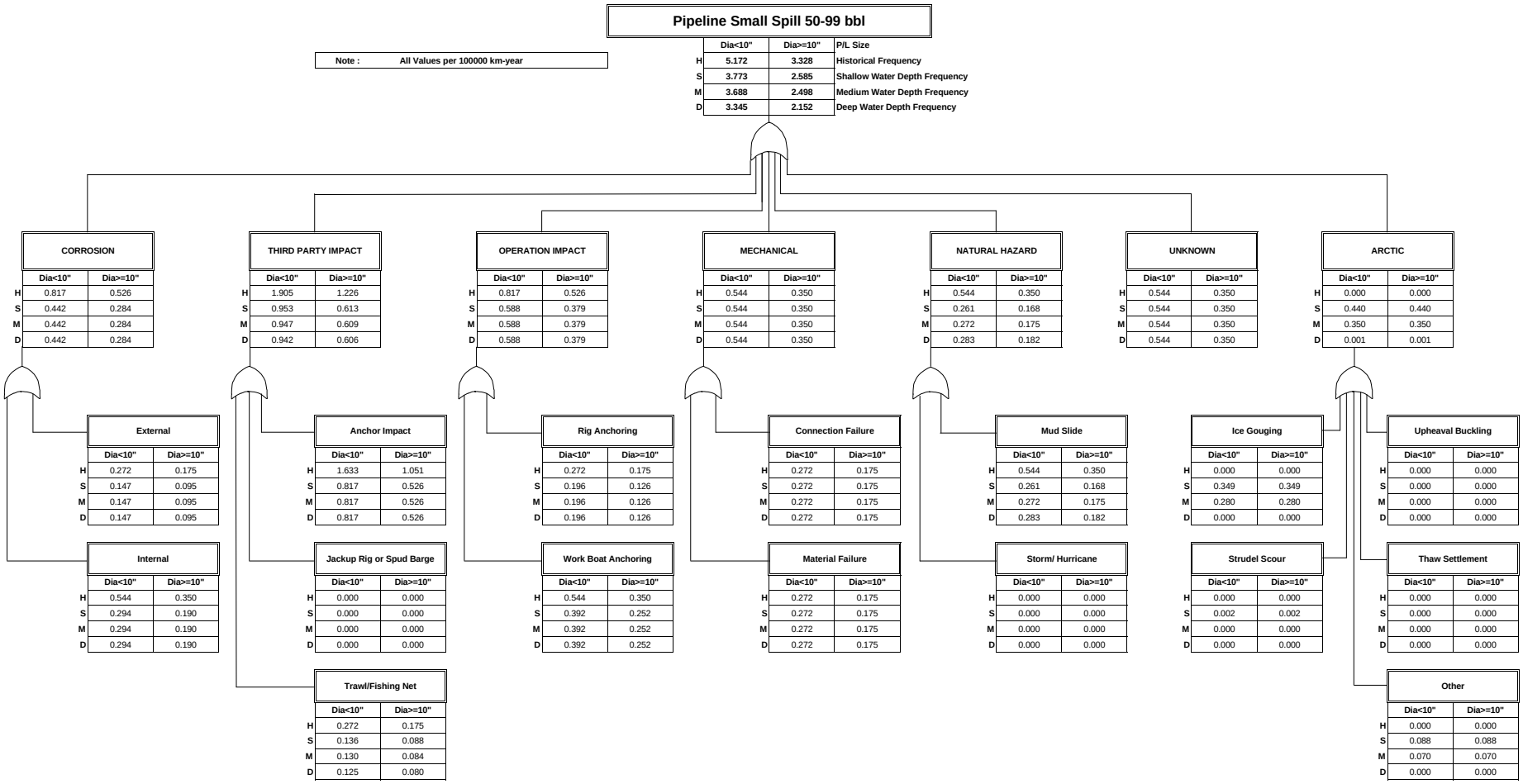


Figure 2.2
Medium Spill Frequencies Pipeline Fault Tree

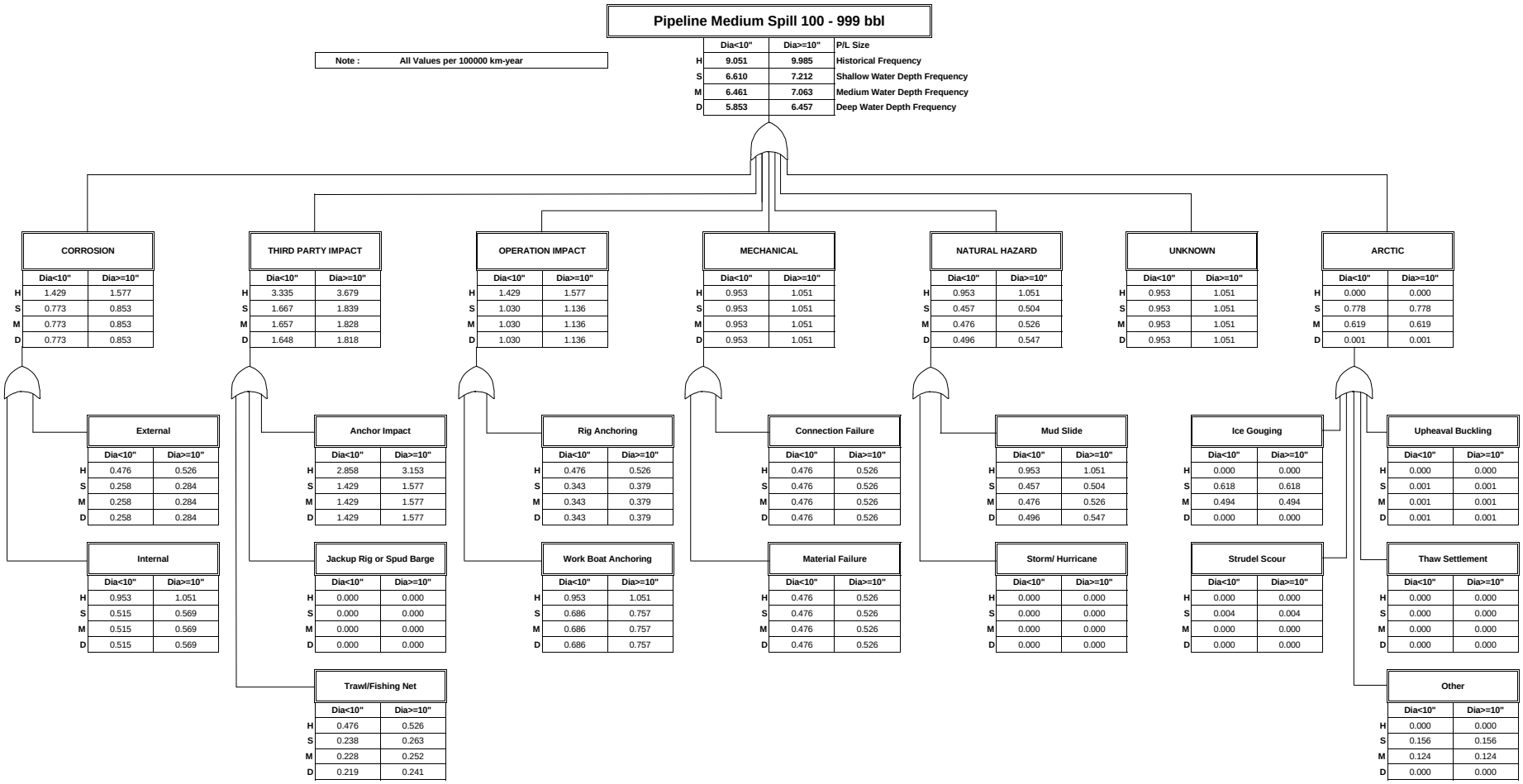


Figure 2.3
Large Spill Frequencies Pipeline Fault Tree

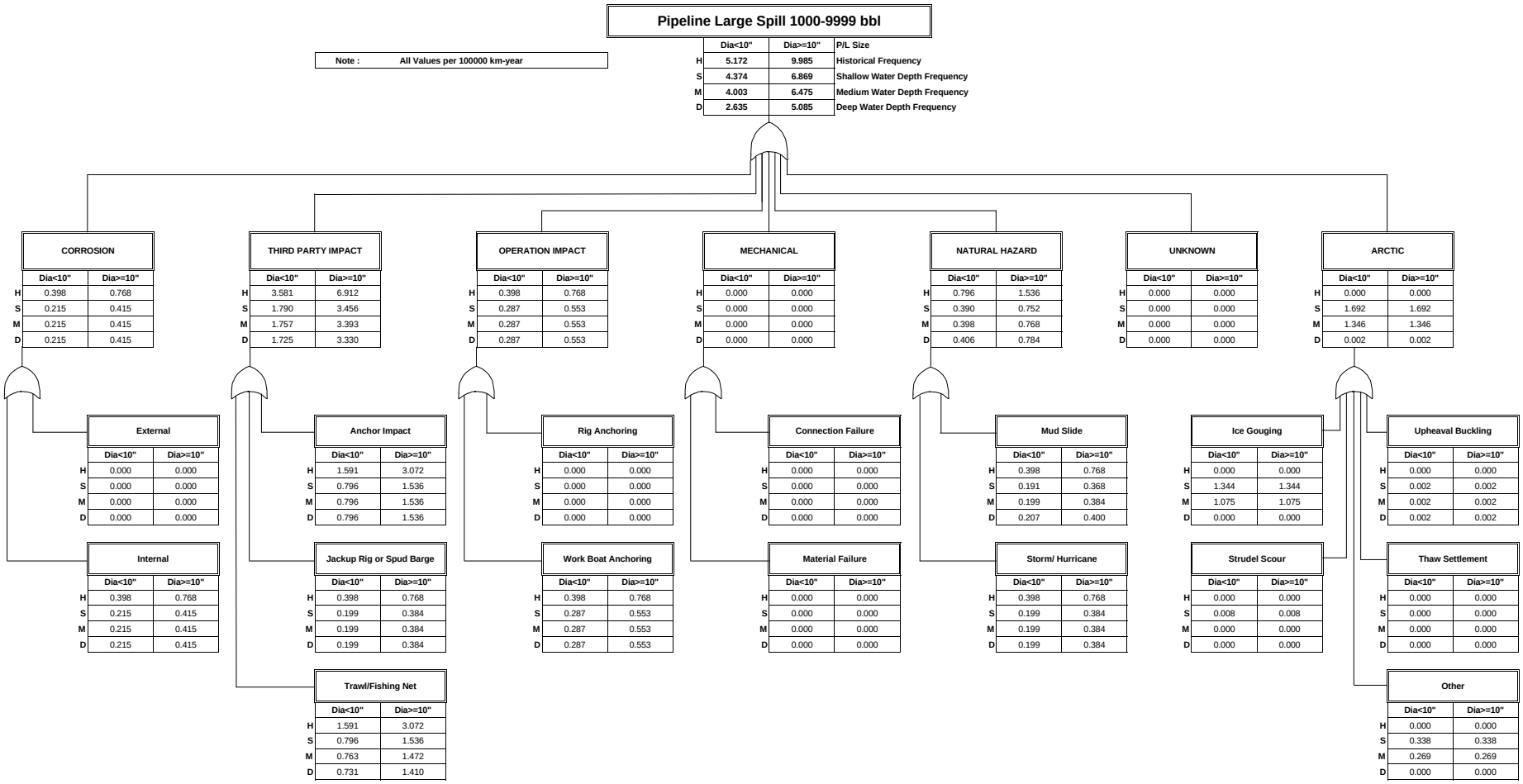


Figure 2.4
Huge Spill Frequencies Pipeline Fault Tree

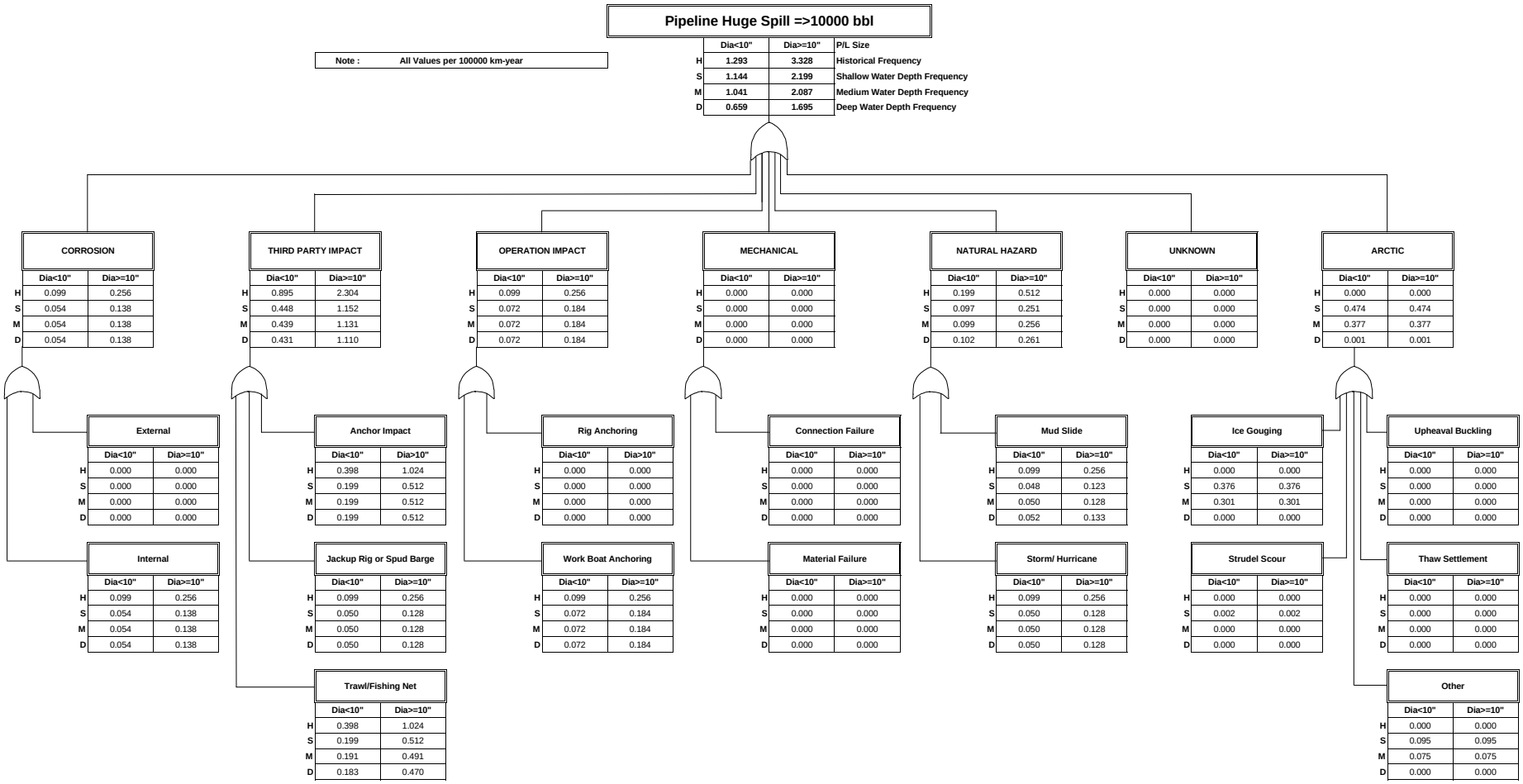
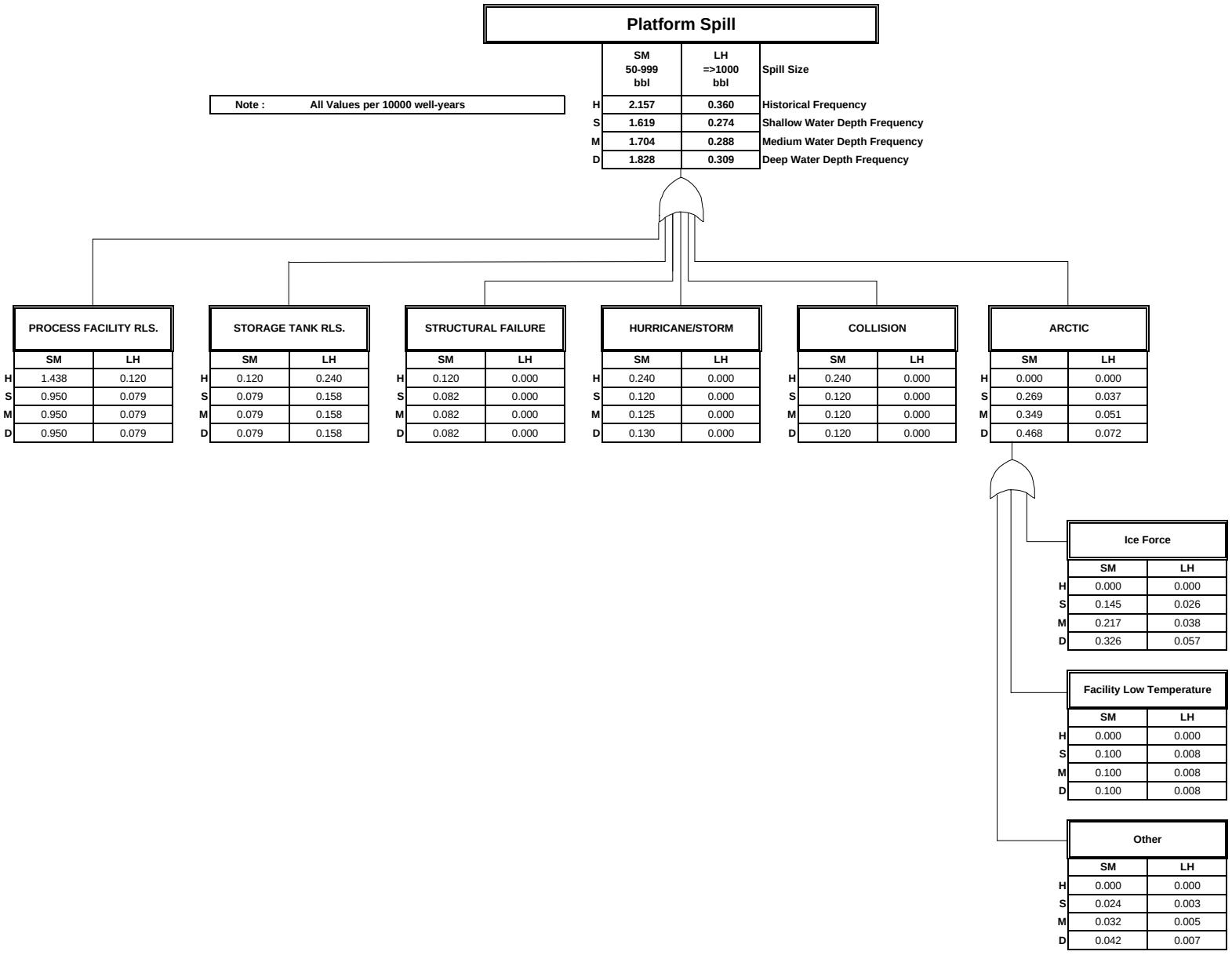


Figure 2.5
Spill Frequencies Platform Fault Tree



APPENDIX 3

Hazard Scenarios

Table 3.1
Chukchi Sea Development Data (2009-2044)

Year	Water Depth	Well Drilling		Production Platforms		On Platform Production Wells		Subsea Production Wells		Total Production Wells		In-use Pipeline Length [miles]						Production MMbbl
												Sum<10"		Sum >=10"		Sum All		
		Exploration	Development	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	
2009	Shallow																	
	Medium																	
	Deep	1																
	Total	**1**																
2010	Shallow																	
	Medium																	
	Deep	1																
	Total	**1**																
2011	Shallow																	
	Medium																	
	Deep		2															
	Total		**2**															
2012	Shallow																	
	Medium																	
	Deep		2															
	Total		**2**															
2013	Shallow																	
	Medium																	
	Deep		2															
	Total		**2**															
2014	Shallow																	
	Medium																	
	Deep	1																
	Total	**1**																
2015	Shallow																	
	Medium																	
	Deep	1																
	Total	**1**																
2016	Shallow																	
	Medium																	
	Deep																	
	Total																	
2017	Shallow																	
	Medium																	
	Deep																	
	Total																	
2018	Shallow																	
	Medium																	
	Deep																	
	Total																	
2019	Shallow																	
	Medium																	
	Deep		6					6	6	6	6							
	Total		**6**					**6**	**6**	**6**	**6**							
2020	Shallow																	
	Medium													30	30	30	30	
	Deep		11	1	1	5	5	6	12	11	17	10	10	60	60	70	70	54.0
	Total		**11**	**1**	**1**	**5**	**5**	**6**	**12**	**11**	**17**	**10**	**10**	**90**	**90**	100	100	**54.0**
2021	Shallow																	
	Medium														30		30	
	Deep		21		1	15	20	6	18	21	38	5	15		60	5	75	70.0
	Total		**21**		**1**	**15**	**20**	**6**	**18**	**21**	**38**	**5**	**15**		**90**	5	105	**70.0**
2022	Shallow																	
	Medium														30		30	
	Deep		21		1	15	35	6	24	21	59	5	20		60	5	80	82.0
	Total		**21**		**1**	**15**	**35**	**6**	**24**	**21**	**59**	**5**	**20**		**90**	5	110	**82.0**
2023	Shallow																	
	Medium														30		30	
	Deep		21		1	15	50	6	30	21	80	5	25		60	5	85	82.0
	Total		**21**		**1**	**15**	**50**	**6**	**30**	**21**	**80**	**5**	**25**		**90**	5	115	**82.0**
2024	Shallow																	
	Medium														30		30	
	Deep		12		1	6	56	6	36	12	92	5	30		60	5	90	82.0
	Total		**12**		**1**	**6**	**56**	**6**	**36**	**12**	**92**	**5**	**30**		**90**	5	120	**82.0**
2025	Shallow																	
	Medium														30		30	
	Deep		6		1	6	62		36	6	98		30		60		90	82.0
	Total		**6**		**1**	**6**	**62**		**36**	**6**	**98**		**30**		**90**		120	**82.0**
2026	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	72.2
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**72.2**
2027	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	63.5
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**63.5**
2028	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	55.9
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**55.9**

Table 3.1
Chukchi Sea Development Data (2009-2044)

Year	Water Depth	Well Drilling		Production Platforms		On Platform Production Wells		Subsea Production Wells		Total Production Wells		In-use Pipeline Length [miles]						Production MMbbl
												Sum<10"		Sum >=10"		Sum All		
		Exploration	Development	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	
2029	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	49.2
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**49.2**
2030	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	43.3
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**43.3**
2031	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	38.1
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**38.1**
2032	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	33.5
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**33.5**
2033	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	29.5
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**29.5**
2034	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	26.0
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**26.0**
2035	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	22.8
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**22.8**
2036	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	20.1
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**20.1**
2037	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	17.7
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**17.7**
2038	Shallow																	
	Medium														30		30	
	Deep				1		62		36		98		30		60		90	15.6
	Total				**1**		**62**		**36**		**98**		**30**		**90**		120	**15.6**
2039	Shallow																	
	Medium														30		30	
	Deep				1		62	-6	30	-6	92		30		60		90	13.7
	Total				**1**		**62**	**-6**	**30**	**-6**	**92**		**30**		**90**		120	**13.7**
2040	Shallow																	
	Medium														30		30	
	Deep				1	-5	57	-6	24	-11	81		30		60		90	12.1
	Total				**1**	**-5**	**57**	**-6**	**24**	**-11**	**81**		**30**		**90**		120	**12.1**
2041	Shallow																	
	Medium														30		30	
	Deep				1	-15	42	-6	18	-21	60		30		60		90	10.6
	Total				**1**	**-15**	**42**	**-6**	**18**	**-21**	**60**		**30**		**90**		120	**10.6**

Table 3.1
Chukchi Sea Development Data (2009-2044)

Year	Water Depth	Well Drilling		Production Platforms		On Platform Production Wells		Subsea Production Wells		Total Production Wells		In-use Pipeline Length [miles]						Production MMbbl
												Sum<10"		Sum >=10"		Sum All		
		Exploration	Development	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	Incr.	Cum.	
2042	Shallow																	
	Medium														30		30	
	Deep				1	-15	27	-6	12	-21	39		30		60		90	9.3
	Total				**1**	**-15**	**27**	**-6**	**12**	**-21**	**39**		**30**		**90**		120	**9.3**
2043	Shallow																	
	Medium														30		30	
	Deep				1	-15	12	-6	6	-21	18		30		60		90	8.2
	Total				**1**	**-15**	**12**	**-6**	**6**	**-21**	**18**		**30**		**90**		120	**8.2**
2044	Shallow																	
	Medium														30		30	
	Deep				1	-6	6	-6		-12	6		30		60		90	7.2
	Total				**1**	**-6**	**6**	**-6**		**-12**	**6**		**30**		**90**		120	**7.2**

Table 3.1A
Chukchi Sea Development Parameter Ranges (2009-2044)

Year	Water Depth	Well Drilling		Production Platforms	On Platform Production Wells				Subsea Production Wells				Total Production Wells				In-use Pipeline Length [miles]												Production MMbbl
																	Sum<10"				Sum >=10"				Sum All				
		Exploration	Development	Cum.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	
						0.80	1.20			0.80	1.20			0.80	1.20			0.33	1.67			0.33	1.67			0.33	1.67		
2009	Shallow																												
	Medium																												
	Deep	1																											
	Total	**1**																											
2010	Shallow																												
	Medium																												
	Deep	1																											
	Total	**1**																											
2011	Shallow																												
	Medium																												
	Deep		2																										
	Total		**2**																										
2012	Shallow																												
	Medium																												
	Deep		2																										
	Total		**2**																										
2013	Shallow																												
	Medium																												
	Deep		2																										
	Total		**2**																										
2014	Shallow																												
	Medium																												
	Deep	1																											
	Total	**1**																											
2015	Shallow																												
	Medium																												
	Deep	1																											
	Total	**1**																											
2016	Shallow																												
	Medium																												
	Deep																												
	Total																												
2017	Shallow																												
	Medium																												
	Deep																												
	Total																												
2018	Shallow																												
	Medium																												
	Deep																												
	Total																												
2019	Shallow																												
	Medium																												
	Deep		6						6	5	7	6	6	5	7	6													
	Total		**6**						**6**	**5**	**7**	**6**	**6**	**5**	**7**	**6**													
2020	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep		11	1	5	4	6	5	12	10	14	12	17	14	20	17	10	3	17	10	60	20	100	60	70	23	117	70	54.0
	Total		**11**	**1**	**5**	**4**	**6**	**5**	**12**	**10**	**14**	**12**	**17**	**14**	**20**	**17**	**10**	**3**	**17**	**10**	**90**	**30**	**150**	**90**	**100**	**33**	**167**	**100**	**54.0**
2021	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep		21	1	20	16	24	20	18	14	22	18	38	30	46	38	15	5	25	15	60	20	100	60	75	25	125	75	70.0
	Total		**21**	**1**	**20**	**16**	**24**	**20**	**18**	**14**	**22**	**18**	**38**	**30**	**46**	**38**	**15**	**5**	**25**	**15**	**90**	**30**	**150**	**90**	**105**	**35**	**175**	**105**	**70.0**
2022	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep		21	1	35	28	42	35	24	19	29	24	59	47	71	59	20	7	33	20	60	20	100	60	80	26	134	80	82.0
	Total		**21**	**1**	**35**	**28**	**42**	**35**	**24**	**19**	**29**	**24**	**59**	**47**	**71**	**59**	**20**	**7**	**33**	**20**	**90**	**30**	**150**	**90**	**110**	**36**	**184**	**110**	**82.0**
2023	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep		21	1	50	40	60	50	30	24	36	30	80	64	96	80	25	8	42	25	60	20	100	60	85	28	142	85	82.0
	Total		**21**	**1**	**50**	**40**	**60**	**50**	**30**	**24**	**36**	**30**	**80**	**64**	**96**	**80**	**25**	**8**	**42**	**25**	**90**	**30**	**150**	**90**	**115**	**38**	**192**	**115**	**82.0**
2024	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep		12	1	56	45	67	56	36	29	43	36	92	74	110	92	30	10	50	30	60	20	100	60	90	30	150	90	82.0
	Total		**12**	**1**	**56**	**45**	**67**	**56**	**36**	**29**	**43**	**36**	**92**	**74**	**110**	**92**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**82.0**

Table 3.1A
Chukchi Sea Development Parameter Ranges (2009-2044)

Year	Water Depth	Well Drilling		Production Platforms	On Platform Production Wells				Subsea Production Wells				Total Production Wells				In-use Pipeline Length [miles]												Production MMbbl
																	Sum<10"				Sum >=10"				Sum All				
		Exploration	Development	Cum.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	
						0.80	1.20			0.80	1.20			0.80	1.20			0.33	1.67			0.33	1.67			0.33	1.67		
2025	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep		6	1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	82.0
	Total		**6**	**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**82.0**
2026	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	72.2
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**72.2**
2027	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	63.5
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**63.5**
2028	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	55.9
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**55.9**
2029	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	49.2
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**49.2**
2030	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	43.3
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**43.3**
2031	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	38.1
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**38.1**
2032	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	33.5
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**33.5**
2033	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	29.5
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**29.5**
2034	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	26.0
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**26.0**
2035	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	22.8
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**22.8**
2036	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	20.1
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**20.1**
2037	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	17.7
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**17.7**
2038	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	36	29	43	36	98	78	118	98	30	10	50	30	60	20	100	60	90	30	150	90	15.6
	Total			**1**	**62**	**50**	**74**	**62**	**36**	**29**	**43**	**36**	**98**	**78**	**118**	**98**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**15.6**
2039	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	62	50	74	62	30	24	36	30	92	74	110	92	30	10	50	30	60	20	100	60	90	30	150	90	13.7
	Total			**1**	**62**	**50**	**74**	**62**	**30**	**24**	**36**	**30**	**92**	**74**	**110**	**92**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**13.7**
2040	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	57	46	68	57	24	19	29	24	81	65	97	81	30	10	50	30	60	20	100	60	90	30	150	90	12.1
	Total			**1**	**57**	**46**	**68**	**57**	**24**	**19**	**29**	**24**	**81**	**65**	**97**	**81**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**12.1**

Table 3.1A
Chukchi Sea Development Parameter Ranges (2009-2044)

Year	Water Depth	Well Drilling		Production Platforms	On Platform Production Wells				Subsea Production Wells				Total Production Wells				In-use Pipeline Length [miles]												Production MMbbl
																	Sum<10"				Sum >=10"				Sum All				
		Exploration	Development	Cum.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	Cum.	Range Factor		Unif. Dist. MD.	
						0.80	1.20			0.80	1.20			0.80	1.20			0.33	1.67			0.33	1.67			0.33	1.67		
2041	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	42	34	50	42	18	14	22	18	60	48	72	60	30	10	50	30	60	20	100	60	90	30	150	90	10.6
	Total			**1**	**42**	**34**	**50**	**42**	**18**	**14**	**22**	**18**	**60**	**48**	**72**	**60**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**10.6**
2042	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	27	22	32	27	12	10	14	12	39	31	47	39	30	10	50	30	60	20	100	60	90	30	150	90	9.3
	Total			**1**	**27**	**22**	**32**	**27**	**12**	**10**	**14**	**12**	**39**	**31**	**47**	**39**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**9.3**
2043	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	12	10	14	12	6	5	7	6	18	14	22	18	30	10	50	30	60	20	100	60	90	30	150	90	8.2
	Total			**1**	**12**	**10**	**14**	**12**	**6**	**5**	**7**	**6**	**18**	**14**	**22**	**18**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**8.2**
2044	Shallow																												
	Medium																				30	10	50	30	30	10	50	30	
	Deep			1	6	5	7	6					6	5	7	6	30	10	50	30	60	20	100	60	90	30	150	90	7.2
	Total			**1**	**6**	**5**	**7**	**6**					**6**	**5**	**7**	**6**	**30**	**10**	**50**	**30**	**90**	**30**	**150**	**90**	**120**	**40**	**200**	**120**	**7.2**

APPENDIX 4
Spill Occurrence

4.1
Arctic Spill Occurrence
Chukchi Sea

Table 4.1.1
Arctic Spill Occurrence Chukchi Sea P/L

Year	Water Depth	P/L Dia <10"													P/L Dia >= 10"												
		P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl		
			Expected Spill [bbl] =		71	Expected Spill [bbl] =		485	Expected Spill [bbl] =		5279	Expected Spill [bbl] =		14880		Expected Spill [bbl] =		71	Expected Spill [bbl] =		516	Expected Spill [bbl] =		5176	Expected Spill [bbl] =		15552
		Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2010	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2011	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2012	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2013	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2014	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2015	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2016	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2017	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2018	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2019	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041				2.498			7.063			6.475			2.087		
	Deep		3.345			5.853			2.635			0.659				2.152			6.457			5.085			1.695		
	Total																										
2020	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	10	3.345	0.538	0.04	5.853	0.942	0.46	2.635	0.424	2.24	0.659	0.106	1.58	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	10		**0.538**	**0.04**		**0.942**	**0.46**		**0.424**	**2.24**		**0.106**	**1.58**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2021	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	15	3.345	0.807	0.06	5.853	1.413	0.68	2.635	0.636	3.36	0.659	0.159	2.37	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	15		**0.807**	**0.06**		**1.413**	**0.68**		**0.636**	**3.36**		**0.159**	**2.37**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2022	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	20	3.345	1.076	0.08	5.853	1.884	0.91	2.635	0.848	4.48	0.659	0.212	3.15	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	20		**1.076**	**0.08**		**1.884**	**0.91**		**0.848**	**4.48**		**0.212**	**3.15**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2023	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	25	3.345	1.345	0.10	5.853	2.354	1.14	2.635	1.060	5.60	0.659	0.265	3.94	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	25		**1.345**	**0.10**		**2.354**	**1.14**		**1.060**	**5.60**		**0.265**	**3.94**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2024	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2025	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2026	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2027	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2028	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45

Table 4.1.1
Arctic Spill Occurrence Chukchi Sea P/L

Year	Water Depth	P/L Dia <10"													P/L Dia >= 10"												
		P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl		
			Expected Spill [bbl] =		71	Expected Spill [bbl] =		485	Expected Spill [bbl] =		5279	Expected Spill [bbl] =		14880		Expected Spill [bbl] =		71	Expected Spill [bbl] =		516	Expected Spill [bbl] =		5176	Expected Spill [bbl] =		15552
		Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2029	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2030	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2031	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2032	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2033	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2034	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2035	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2036	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2037	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2038	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2039	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2040	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2041	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2042	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2043	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**
2044	Shallow		3.773			6.610			4.374			1.144				2.585			7.212			6.869			2.199		
	Medium		3.688			6.461			4.003			1.041			30	2.498	1.206	0.09	7.063	3.409	1.76	6.475	3.126	16.18	2.087	1.007	15.66
	Deep	30	3.345	1.614	0.11	5.853	2.825	1.37	2.635	1.272	6.71	0.659	0.318	4.73	60	2.152	2.078	0.15	6.457	6.233	3.22	5.085	4.909	25.41	1.695	1.636	25.45
	Total	30		**1.614**	**0.11**		**2.825**	**1.37**		**1.272**	**6.71**		**0.318**	**4.73**	90		**3.284**	**0.23**		**9.643**	**4.98**		**8.035**	**41.59**		**2.644**	**41.11**

Table 4.1.2
Arctic Spill Occurrence - P/L - Summary

Year	Production [MMbbl]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009																						
2010																						
2011																						
2012																						
2013																						
2014																						
2015																						
2016																						
2017																						
2018																						
2019																						
2020	54.0	3.822	0.071	0.272	10.584	0.196	5.432	14.406	0.267	5.704	8.459	0.157	43.825	2.750	0.051	42.689	11.208	0.208	86.514	25.615	0.474	92.218
2021	70.0	4.091	0.058	0.291	11.055	0.158	5.660	15.146	0.216	5.951	8.671	0.124	44.944	2.803	0.040	43.478	11.473	0.164	88.422	26.620	0.380	94.373
2022	82.0	4.360	0.053	0.310	11.526	0.141	5.888	15.886	0.194	6.199	8.883	0.108	46.063	2.856	0.035	44.267	11.738	0.143	90.330	27.625	0.337	96.528
2023	82.0	4.629	0.056	0.330	11.997	0.146	6.117	16.626	0.203	6.446	9.095	0.111	47.182	2.909	0.035	45.055	12.003	0.146	92.238	28.630	0.349	98.684
2024	82.0	4.898	0.060	0.349	12.468	0.152	6.345	17.366	0.212	6.694	9.307	0.113	48.301	2.962	0.036	45.844	12.268	0.150	94.145	29.635	0.361	100.839
2025	82.0	4.898	0.060	0.349	12.468	0.152	6.345	17.366	0.212	6.694	9.307	0.113	48.301	2.962	0.036	45.844	12.268	0.150	94.145	29.635	0.361	100.839
2026	72.2	4.898	0.068	0.349	12.468	0.173	6.345	17.366	0.241	6.694	9.307	0.129	48.301	2.962	0.041	45.844	12.268	0.170	94.145	29.635	0.410	100.839
2027	63.5	4.898	0.077	0.349	12.468	0.196	6.345	17.366	0.273	6.694	9.307	0.147	48.301	2.962	0.047	45.844	12.268	0.193	94.145	29.635	0.467	100.839
2028	55.9	4.898	0.088	0.349	12.468	0.223	6.345	17.366	0.311	6.694	9.307	0.166	48.301	2.962	0.053	45.844	12.268	0.219	94.145	29.635	0.530	100.839
2029	49.2	4.898	0.100	0.349	12.468	0.253	6.345	17.366	0.353	6.694	9.307	0.189	48.301	2.962	0.060	45.844	12.268	0.249	94.145	29.635	0.602	100.839
2030	43.3	4.898	0.113	0.349	12.468	0.288	6.345	17.366	0.401	6.694	9.307	0.215	48.301	2.962	0.068	45.844	12.268	0.283	94.145	29.635	0.684	100.839
2031	38.1	4.898	0.129	0.349	12.468	0.327	6.345	17.366	0.456	6.694	9.307	0.244	48.301	2.962	0.078	45.844	12.268	0.322	94.145	29.635	0.778	100.839
2032	33.5	4.898	0.146	0.349	12.468	0.372	6.345	17.366	0.518	6.694	9.307	0.278	48.301	2.962	0.088	45.844	12.268	0.366	94.145	29.635	0.885	100.839
2033	29.5	4.898	0.166	0.349	12.468	0.423	6.345	17.366	0.589	6.694	9.307	0.315	48.301	2.962	0.100	45.844	12.268	0.416	94.145	29.635	1.005	100.839
2034	26.0	4.898	0.188	0.349	12.468	0.480	6.345	17.366	0.668	6.694	9.307	0.358	48.301	2.962	0.114	45.844	12.268	0.472	94.145	29.635	1.140	100.839
2035	22.8	4.898	0.215	0.349	12.468	0.547	6.345	17.366	0.762	6.694	9.307	0.408	48.301	2.962	0.130	45.844	12.268	0.538	94.145	29.635	1.300	100.839
2036	20.1	4.898	0.244	0.349	12.468	0.620	6.345	17.366	0.864	6.694	9.307	0.463	48.301	2.962	0.147	45.844	12.268	0.610	94.145	29.635	1.474	100.839
2037	17.7	4.898	0.277	0.349	12.468	0.704	6.345	17.366	0.981	6.694	9.307	0.526	48.301	2.962	0.167	45.844	12.268	0.693	94.145	29.635	1.674	100.839
2038	15.6	4.898	0.314	0.349	12.468	0.799	6.345	17.366	1.113	6.694	9.307	0.597	48.301	2.962	0.190	45.844	12.268	0.786	94.145	29.635	1.900	100.839
2039	13.7	4.898	0.358	0.349	12.468	0.910	6.345	17.366	1.268	6.694	9.307	0.679	48.301	2.962	0.216	45.844	12.268	0.896	94.145	29.635	2.163	100.839
2040	12.1	4.898	0.405	0.349	12.468	1.030	6.345	17.366	1.435	6.694	9.307	0.769	48.301	2.962	0.245	45.844	12.268	1.014	94.145	29.635	2.449	100.839
2041	10.6	4.898	0.462	0.349	12.468	1.176	6.345	17.366	1.638	6.694	9.307	0.878	48.301	2.962	0.279	45.844	12.268	1.157	94.145	29.635	2.796	100.839
2042	9.3	4.898	0.527	0.349	12.468	1.341	6.345	17.366	1.867	6.694	9.307	1.001	48.301	2.962	0.318	45.844	12.268	1.319	94.145	29.635	3.187	100.839
2043	8.2	4.898	0.597	0.349	12.468	1.520	6.345	17.366	2.118	6.694	9.307	1.135	48.301	2.962	0.361	45.844	12.268	1.496	94.145	29.635	3.614	100.839
2044	7.2	4.898	0.680	0.349	12.468	1.732	6.345	17.366	2.412	6.694	9.307	1.293	48.301	2.962	0.411	45.844	12.268	1.704	94.145	29.635	4.116	100.839
Total LOF	**1000.5**	**119.8**		**8.5**	**307.0**		**156.3**	**426.8**		**164.9**	**230.6**		**1196.3**	**73.5**		**1138.2**	**304.1**		**2334.6**	**730.8**		**2499.4**
Average LOF		**3.327**	**0.120**	**0.24**	**8.528**	**0.307**	**4.34**	**11.854**	**0.427**	**4.58**	**6.404**	**0.230**	**33.23**	**2.042**	**0.073**	**31.62**	**8.446**	**0.304**	**64.85**	**20.301**	**0.730**	**69.43**

Table 4.1.3
Arctic Spill Occurrence - Platforms

Year	Water Depth	N Platforms	N P Wells	Small and Medium Spills 50-999 bbl			Large and Huge Spills =>1000 bbl		
				Expected Spill [bbl] =		**452**	Expected Spill [bbl] =		**5631**
		Cum.	Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2010	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2011	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2012	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2013	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2014	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2015	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2016	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2017	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2018	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2019	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep			1.828			0.309		
	Total								
2020	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	5	1.828	0.914	0.41	0.309	0.155	0.87
	Total	1	5		**0.914**	**0.41**		**0.155**	**0.87**
2021	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	20	1.828	3.656	1.65	0.309	0.619	3.48
	Total	1	20		**3.656**	**1.65**		**0.619**	**3.48**
2022	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	35	1.828	6.398	2.89	0.309	1.083	6.10
	Total	1	35		**6.398**	**2.89**		**1.083**	**6.10**
2023	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	50	1.828	9.139	4.13	0.309	1.547	8.71
	Total	1	50		**9.139**	**4.13**		**1.547**	**8.71**
2024	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	56	1.828	10.236	4.63	0.309	1.733	9.76
	Total	1	56		**10.236**	**4.63**		**1.733**	**9.76**
2025	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2026	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2027	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2028	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2029	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
	Shallow			1.619			0.274		

Table 4.1.3
Arctic Spill Occurrence - Platforms

Year	Water Depth	N Platforms	N P Wells	Small and Medium Spills 50-999 bbl			Large and Huge Spills =>1000 bbl		
				Expected Spill [bbl] =		**452**	Expected Spill [bbl] =		**5631**
		Cum.	Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2030	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2031	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2032	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2033	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2034	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2035	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2036	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2037	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2038	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2039	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	62	1.828	11.333	5.12	0.309	1.918	10.80
	Total	1	62		**11.333**	**5.12**		**1.918**	**10.80**
2040	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	57	1.828	10.419	4.71	0.309	1.764	9.93
	Total	1	57		**10.419**	**4.71**		**1.764**	**9.93**
2041	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	42	1.828	7.677	3.47	0.309	1.300	7.32
	Total	1	42		**7.677**	**3.47**		**1.300**	**7.32**
2042	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	27	1.828	4.935	2.23	0.309	0.835	4.70
	Total	1	27		**4.935**	**2.23**		**0.835**	**4.70**
2043	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	12	1.828	2.193	0.99	0.309	0.371	2.09
	Total	1	12		**2.193**	**0.99**		**0.371**	**2.09**
2044	Shallow			1.619			0.274		
	Medium			1.704			0.288		
	Deep	1	6	1.828	1.097	0.50	0.309	0.186	1.05
	Total	1	6		**1.097**	**0.50**		**0.186**	**1.05**

Table 4.1.4
Arctic Spill Occurrence - Platforms - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large and Huge Spills =>1000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009													
2010													
2011													
2012													
2013													
2014													
2015													
2016													
2017													
2018													
2019													
2020	54.0	0.914	0.017	0.413	0.155	0.003	0.871	0.155	0.003	0.871	1.069	0.020	1.284
2021	70.0	3.656	0.052	1.652	0.619	0.009	3.485	0.619	0.009	3.485	4.275	0.061	5.137
2022	82.0	6.398	0.078	2.891	1.083	0.013	6.098	1.083	0.013	6.098	7.480	0.091	8.989
2023	82.0	9.139	0.111	4.130	1.547	0.019	8.711	1.547	0.019	8.711	10.686	0.130	12.842
2024	82.0	10.236	0.125	4.626	1.733	0.021	9.757	1.733	0.021	9.757	11.969	0.146	14.383
2025	82.0	11.333	0.138	5.122	1.918	0.023	10.802	1.918	0.023	10.802	13.251	0.162	15.924
2026	72.2	11.333	0.157	5.122	1.918	0.027	10.802	1.918	0.027	10.802	13.251	0.184	15.924
2027	63.5	11.333	0.178	5.122	1.918	0.030	10.802	1.918	0.030	10.802	13.251	0.209	15.924
2028	55.9	11.333	0.203	5.122	1.918	0.034	10.802	1.918	0.034	10.802	13.251	0.237	15.924
2029	49.2	11.333	0.230	5.122	1.918	0.039	10.802	1.918	0.039	10.802	13.251	0.269	15.924
2030	43.3	11.333	0.262	5.122	1.918	0.044	10.802	1.918	0.044	10.802	13.251	0.306	15.924
2031	38.1	11.333	0.297	5.122	1.918	0.050	10.802	1.918	0.050	10.802	13.251	0.348	15.924
2032	33.5	11.333	0.338	5.122	1.918	0.057	10.802	1.918	0.057	10.802	13.251	0.396	15.924
2033	29.5	11.333	0.384	5.122	1.918	0.065	10.802	1.918	0.065	10.802	13.251	0.449	15.924
2034	26.0	11.333	0.436	5.122	1.918	0.074	10.802	1.918	0.074	10.802	13.251	0.510	15.924
2035	22.8	11.333	0.497	5.122	1.918	0.084	10.802	1.918	0.084	10.802	13.251	0.581	15.924
2036	20.1	11.333	0.564	5.122	1.918	0.095	10.802	1.918	0.095	10.802	13.251	0.659	15.924
2037	17.7	11.333	0.640	5.122	1.918	0.108	10.802	1.918	0.108	10.802	13.251	0.749	15.924
2038	15.6	11.333	0.726	5.122	1.918	0.123	10.802	1.918	0.123	10.802	13.251	0.849	15.924
2039	13.7	11.333	0.827	5.122	1.918	0.140	10.802	13.251	0.967	15.924	13.251	0.967	15.924
2040	12.1	10.419	0.861	4.708	1.764	0.146	9.931	12.182	1.007	14.639	12.182	1.007	14.639
2041	10.6	7.677	0.724	3.469	1.300	0.123	7.318	8.977	0.847	10.787	8.977	0.847	10.787
2042	9.3	4.935	0.531	2.230	0.835	0.090	4.704	5.771	0.620	6.934	5.771	0.620	6.934
2043	8.2	2.193	0.267	0.991	0.371	0.045	2.091	2.565	0.313	3.082	2.565	0.313	3.082
2044	7.2	1.097	0.152	0.496	0.186	0.026	1.045	1.282	0.178	1.541	1.282	0.178	1.541
Total LOF	**1000.5**	**226.7**		**102.4**	**38.4**		**216.0**	**76.0**		**233.1**	**265.0**		**318.5**
Average LOF		**6.296**	**0.227**	**2.85**	**1.066**	**0.038**	**6.00**	**2.112**	**0.076**	**6.47**	**7.362**	**0.265**	**8.85**

Table 4.1.5
Arctic Spill Occurrence - Production Wells

Year	Water Depth	Production Wells Blowout														
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl		
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000
		Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2010	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2011	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2012	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2013	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2014	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2015	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2016	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2017	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2018	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep		0.103			0.718			0.308			0.205		
	Total													
2019	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	6	0.103	0.062	0.03	0.718	0.431	2.28	0.308	0.185	12.62	0.205	0.123	24.63
	Total	6		0.062	**0.03**		0.431	**2.28**		0.185	**12.62**		0.123	**24.63**
2020	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	17	0.103	0.174	0.09	0.718	1.221	6.46	0.308	0.523	35.77	0.205	0.349	69.78
	Total	17		0.174	**0.09**		1.221	**6.46**		0.523	**35.77**		0.349	**69.78**
2021	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	38	0.103	0.390	0.20	0.718	2.730	14.44	0.308	1.170	79.95	0.205	0.780	155.97
	Total	38		0.390	**0.20**		2.730	**14.44**		1.170	**79.95**		0.780	**155.97**
2022	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	59	0.103	0.605	0.31	0.718	4.238	22.43	0.308	1.816	124.14	0.205	1.211	242.17
	Total	59		0.605	**0.31**		4.238	**22.43**		1.816	**124.14**		1.211	**242.17**
2023	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	80	0.103	0.821	0.43	0.718	5.746	30.41	0.308	2.463	168.32	0.205	1.642	328.36
	Total	80		0.821	**0.43**		5.746	**30.41**		2.463	**168.32**		1.642	**328.36**
2024	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	92	0.103	0.944	0.49	0.718	6.608	34.97	0.308	2.832	193.57	0.205	1.888	377.62
	Total	92		0.944	**0.49**		6.608	**34.97**		2.832	**193.57**		1.888	**377.62**
2025	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2026	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**

Table 4.1.5
Arctic Spill Occurrence - Production Wells

Year	Water Depth	Production Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl		
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000
		Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2027	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2028	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2029	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2030	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2031	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2032	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2033	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2034	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2035	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2036	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2037	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2038	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	98	0.103	1.006	0.52	0.718	7.039	37.25	0.308	3.017	206.20	0.205	2.011	402.25
	Total	98		1.006	**0.52**		7.039	**37.25**		3.017	**206.20**		2.011	**402.25**
2039	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	92	0.103	0.944	0.49	0.718	6.608	34.97	0.308	2.832	193.57	0.205	1.888	377.62
	Total	92		0.944	**0.49**		6.608	**34.97**		2.832	**193.57**		1.888	**377.62**
2040	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	81	0.103	0.831	0.43	0.718	5.818	30.79	0.308	2.494	170.43	0.205	1.662	332.47
	Total	81		0.831	**0.43**		5.818	**30.79**		2.494	**170.43**		1.662	**332.47**
2041	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	60	0.103	0.616	0.32	0.718	4.310	22.81	0.308	1.847	126.24	0.205	1.231	246.27
	Total	60		0.616	**0.32**		4.310	**22.81**		1.847	**126.24**		1.231	**246.27**
2042	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	39	0.103	0.400	0.21	0.718	2.801	14.83	0.308	1.201	82.06	0.205	0.800	160.08
	Total	39		0.400	**0.21**		2.801	**14.83**		1.201	**82.06**		0.800	**160.08**
2043	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	18	0.103	0.185	0.10	0.718	1.293	6.84	0.308	0.554	37.87	0.205	0.369	73.88
	Total	18		0.185	**0.10**		1.293	**6.84**		0.554	**37.87**		0.369	**73.88**
2044	Shallow		0.103			0.718			0.308			0.205		
	Medium		0.103			0.718			0.308			0.205		
	Deep	6	0.103	0.062	0.03	0.718	0.431	2.28	0.308	0.185	12.62	0.205	0.123	24.63
	Total	6		0.062	**0.03**		0.431	**2.28**		0.185	**12.62**		0.123	**24.63**

Table 4.1.6
Arctic Spill Occurrence - Production Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-99 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009													
2010													
2011													
2012													
2013													
2014													
2015													
2016													
2017													
2018													
2019		0.062		0.032	0.185		2.281	0.308		37.252	0.554		39.564
2020	54.0	0.174	0.003	0.091	0.523	0.010	6.462	0.872	0.016	105.546	1.570	0.029	112.099
2021	70.0	0.390	0.006	0.203	1.170	0.017	14.445	1.950	0.028	235.926	3.509	0.050	250.574
2022	82.0	0.605	0.007	0.314	1.816	0.022	22.428	3.027	0.037	366.307	5.449	0.066	389.049
2023	82.0	0.821	0.010	0.426	2.463	0.030	30.410	4.105	0.050	496.687	7.388	0.090	527.524
2024	82.0	0.944	0.012	0.490	2.832	0.035	34.972	4.720	0.058	571.190	8.496	0.104	606.652
2025	82.0	1.006	0.012	0.522	3.017	0.037	37.253	5.028	0.061	608.441	9.051	0.110	646.216
2026	72.2	1.006	0.014	0.522	3.017	0.042	37.253	5.028	0.070	608.441	9.051	0.125	646.216
2027	63.5	1.006	0.016	0.522	3.017	0.048	37.253	5.028	0.079	608.441	9.051	0.143	646.216
2028	55.9	1.006	0.018	0.522	3.017	0.054	37.253	5.028	0.090	608.441	9.051	0.162	646.216
2029	49.2	1.006	0.020	0.522	3.017	0.061	37.253	5.028	0.102	608.441	9.051	0.184	646.216
2030	43.3	1.006	0.023	0.522	3.017	0.070	37.253	5.028	0.116	608.441	9.051	0.209	646.216
2031	38.1	1.006	0.026	0.522	3.017	0.079	37.253	5.028	0.132	608.441	9.051	0.238	646.216
2032	33.5	1.006	0.030	0.522	3.017	0.090	37.253	5.028	0.150	608.441	9.051	0.270	646.216
2033	29.5	1.006	0.034	0.522	3.017	0.102	37.253	5.028	0.170	608.441	9.051	0.307	646.216
2034	26.0	1.006	0.039	0.522	3.017	0.116	37.253	5.028	0.193	608.441	9.051	0.348	646.216
2035	22.8	1.006	0.044	0.522	3.017	0.132	37.253	5.028	0.221	608.441	9.051	0.397	646.216
2036	20.1	1.006	0.050	0.522	3.017	0.150	37.253	5.028	0.250	608.441	9.051	0.450	646.216
2037	17.7	1.006	0.057	0.522	3.017	0.170	37.253	5.028	0.284	608.441	9.051	0.511	646.216
2038	15.6	1.006	0.064	0.522	3.017	0.193	37.253	5.028	0.322	608.441	9.051	0.580	646.216
2039	13.7	0.944	0.069	0.490	2.832	0.207	34.972	4.720	0.345	571.190	8.496	0.620	606.652
2040	12.1	0.831	0.069	0.432	2.494	0.206	30.790	4.156	0.343	502.895	7.481	0.618	534.118
2041	10.6	0.616	0.058	0.320	1.847	0.174	22.808	3.078	0.290	372.515	5.541	0.523	395.643
2042	9.3	0.400	0.043	0.208	1.201	0.129	14.825	2.001	0.215	242.135	3.602	0.387	257.168
2043	8.2	0.185	0.023	0.096	0.554	0.068	6.842	0.924	0.113	111.755	1.662	0.203	118.693
2044	7.2	0.062	0.009	0.032	0.185	0.026	2.281	0.123	0.017	24.627	0.369	0.051	26.940

Table 4.1.7
Arctic Spill Occurrence - Exploration Wells

Year	Water Depth	Exploration Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep	1	2.035	0.204	0.11	14.242	1.424	7.54	6.119	0.612	41.82	3.543	0.354	70.85
	Total	1		0.204	**0.11**		1.424	**7.54**		0.612	**41.82**		0.354	**70.85**
2010	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep	1	2.035	0.204	0.11	14.242	1.424	7.54	6.119	0.612	41.82	3.543	0.354	70.85
	Total	1		0.204	**0.11**		1.424	**7.54**		0.612	**41.82**		0.354	**70.85**
2011	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2012	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2013	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2014	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep	1	2.035	0.204	0.11	14.242	1.424	7.54	6.119	0.612	41.82	3.543	0.354	70.85
	Total	1		0.204	**0.11**		1.424	**7.54**		0.612	**41.82**		0.354	**70.85**
2015	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep	1	2.035	0.204	0.11	14.242	1.424	7.54	6.119	0.612	41.82	3.543	0.354	70.85
	Total	1		0.204	**0.11**		1.424	**7.54**		0.612	**41.82**		0.354	**70.85**
2016	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2017	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2018	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2019	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2020	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2021	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2022	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2023	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2024	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2025	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2026	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2027	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2028	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		

Table 4.1.7
Arctic Spill Occurrence - Exploration Wells

Year	Water Depth	Exploration Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2028	Deep		2.035			14.242			6.119			3.543		
	Total													
2029	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2030	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2031	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2032	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2033	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2034	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2035	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2036	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2037	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2038	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2039	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2040	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2041	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2042	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2043	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													
2044	Shallow		1.583			11.077			4.759			2.755		
	Medium		1.809			12.659			5.439			3.149		
	Deep		2.035			14.242			6.119			3.543		
	Total													

Table 4.1.8
Arctic Spill Occurrence - Exploration Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-99 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2004		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2005		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2006													
2007													
2008													
2009		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2010		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2011													
2012													
2013													
2014													
2015	**54.0**												
2016	**70.0**												
2017	**82.0**												
2018	**82.0**												
2019	**82.0**												
2020	**82.0**												
2021	**72.2**												
2022	**63.5**												
2023	**55.9**												
2024	**49.2**												
2025	**43.3**												
2026	**38.1**												
2027	**33.5**												
2028	**29.5**												
2029	**26.0**												
2030	**22.8**												
2031	**20.1**												
2032	**17.7**												
2033	**15.6**												
2034	**13.7**												
2035	**12.1**												
2036	**10.6**												
2037	**9.3**												
2038	**8.2**												
2039	**7.2**												

Table 4.1.9
Arctic Spill Occurrence - Development Wells

Year	Water Depth	Development Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2010	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2011	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	2	0.623	0.012	0.01	4.350	0.087	0.46	1.868	0.037	2.55	1.868	0.037	7.47
	Total	2		0.012	**0.01**		0.087	**0.46**		0.037	**2.55**		0.037	**7.47**
2012	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	2	0.623	0.012	0.01	4.350	0.087	0.46	1.868	0.037	2.55	1.868	0.037	7.47
	Total	2		0.012	**0.01**		0.087	**0.46**		0.037	**2.55**		0.037	**7.47**
2013	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	2	0.623	0.012	0.01	4.350	0.087	0.46	1.868	0.037	2.55	1.868	0.037	7.47
	Total	2		0.012	**0.01**		0.087	**0.46**		0.037	**2.55**		0.037	**7.47**
2014	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2015	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2016	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2017	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2018	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2019	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	6	0.623	0.037	0.02	4.350	0.261	1.38	1.868	0.112	7.66	1.868	0.112	22.42
	Total	6		0.037	**0.02**		0.261	**1.38**		0.112	**7.66**		0.112	**22.42**
2020	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	11	0.623	0.069	0.04	4.350	0.479	2.53	1.868	0.206	14.05	1.868	0.206	41.11
	Total	11		0.069	**0.04**		0.479	**2.53**		0.206	**14.05**		0.206	**41.11**
2021	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	21	0.623	0.131	0.07	4.350	0.914	4.83	1.868	0.392	26.82	1.868	0.392	78.47
	Total	21		0.131	**0.07**		0.914	**4.83**		0.392	**26.82**		0.392	**78.47**
2022	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	21	0.623	0.131	0.07	4.350	0.914	4.83	1.868	0.392	26.82	1.868	0.392	78.47
	Total	21		0.131	**0.07**		0.914	**4.83**		0.392	**26.82**		0.392	**78.47**
2023	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	21	0.623	0.131	0.07	4.350	0.914	4.83	1.868	0.392	26.82	1.868	0.392	78.47
	Total	21		0.131	**0.07**		0.914	**4.83**		0.392	**26.82**		0.392	**78.47**
2024	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	12	0.623	0.075	0.04	4.350	0.522	2.76	1.868	0.224	15.32	1.868	0.224	44.84
	Total	12		0.075	**0.04**		0.522	**2.76**		0.224	**15.32**		0.224	**44.84**
2025	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep	6	0.623	0.037	0.02	4.350	0.261	1.38	1.868	0.112	7.66	1.868	0.112	22.42
	Total	6		0.037	**0.02**		0.261	**1.38**		0.112	**7.66**		0.112	**22.42**
2026	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2027	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2028	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		

Table 4.1.9
Arctic Spill Occurrence - Development Wells

Year	Water Depth	Development Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
~~2028~~	Deep		0.623			4.350			1.868			1.868		
	Total													
2029	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2030	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2031	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2032	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2033	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2034	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2035	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2036	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2037	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2038	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2039	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2040	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2041	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2042	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2043	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													
2044	Shallow		0.484			3.383			1.453			1.453		
	Medium		0.554			3.867			1.661			1.661		
	Deep		0.623			4.350			1.868			1.868		
	Total													

Table 4.1.10
Arctic Spill Occurrence - Development Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-99 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009													
2010													
2011		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
2012		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
2013		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
2014													
2015													
2016													
2017													
2018													
2019		0.037		0.019	0.112		1.381	0.224		30.084	0.374		31.484
2020	54.0	0.069	0.001	0.036	0.206	0.004	2.532	0.411	0.008	55.153	0.685	0.013	57.721
2021	70.0	0.131	0.002	0.068	0.392	0.006	4.834	0.785	0.011	105.292	1.308	0.019	110.195
2022	82.0	0.131	0.002	0.068	0.392	0.005	4.834	0.785	0.010	105.292	1.308	0.016	110.195
2023	82.0	0.131	0.002	0.068	0.392	0.005	4.834	0.785	0.010	105.292	1.308	0.016	110.195
2024	82.0	0.075	0.001	0.039	0.224	0.003	2.763	0.448	0.005	60.167	0.747	0.009	62.968
2025	82.0	0.037	0.000	0.019	0.112	0.001	1.381	0.224	0.003	30.084	0.374	0.005	31.484
2026	72.2												
2027	63.5												
2028	55.9												
2029	49.2												
2030	43.3												
2031	38.1												
2032	33.5												
2033	29.5												
2034	26.0												
2035	22.8												
2036	20.1												
2037	17.7												
2038	15.6												
2039	13.7												
2040	12.1												
2041	10.6												
2042	9.3												
2043	8.2												
2044	7.2												

Table 4.1.11
Arctic Spill Occurrence - Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2010		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2011		0.012		0.006	0.037		0.460	0.075		10.028	0.112		10.488	0.125		10.495
2012		0.012		0.006	0.037		0.460	0.075		10.028	0.112		10.488	0.125		10.495
2013		0.012		0.006	0.037		0.460	0.075		10.028	0.112		10.488	0.125		10.495
2014		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2015		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2016																
2017																
2018																
2019		0.099		0.051	0.297		3.662	0.532		67.335	0.829		70.997	0.928		71.048
2020	**54.0**	0.243	0.004	0.126	0.729	0.013	8.995	1.283	0.024	160.699	2.012	0.037	169.694	2.255	0.042	169.820
2021	**70.0**	0.521	0.007	0.270	1.562	0.022	19.279	2.734	0.039	341.219	4.297	0.061	360.498	4.817	0.069	360.768
2022	**82.0**	0.736	0.009	0.382	2.209	0.027	27.262	3.812	0.046	471.599	6.020	0.073	498.861	6.757	0.082	499.243
2023	**82.0**	0.952	0.012	0.494	2.855	0.035	35.245	4.889	0.060	601.979	7.744	0.094	637.224	8.696	0.106	637.718
2024	**82.0**	1.019	0.012	0.529	3.056	0.037	37.734	5.169	0.063	631.357	8.225	0.100	669.091	9.244	0.113	669.621
2025	**82.0**	1.043	0.013	0.542	3.129	0.038	38.634	5.252	0.064	638.525	8.381	0.102	677.159	9.424	0.115	677.701
2026	**72.2**	1.006	0.014	0.522	3.017	0.042	37.253	5.028	0.070	608.441	8.045	0.111	645.694	9.051	0.125	646.216
2027	**63.5**	1.006	0.016	0.522	3.017	0.048	37.253	5.028	0.079	608.441	8.045	0.127	645.694	9.051	0.143	646.216
2028	**55.9**	1.006	0.018	0.522	3.017	0.054	37.253	5.028	0.090	608.441	8.045	0.144	645.694	9.051	0.162	646.216
2029	**49.2**	1.006	0.020	0.522	3.017	0.061	37.253	5.028	0.102	608.441	8.045	0.164	645.694	9.051	0.184	646.216
2030	**43.3**	1.006	0.023	0.522	3.017	0.070	37.253	5.028	0.116	608.441	8.045	0.186	645.694	9.051	0.209	646.216
2031	**38.1**	1.006	0.026	0.522	3.017	0.079	37.253	5.028	0.132	608.441	8.045	0.211	645.694	9.051	0.238	646.216
2032	**33.5**	1.006	0.030	0.522	3.017	0.090	37.253	5.028	0.150	608.441	8.045	0.240	645.694	9.051	0.270	646.216
2033	**29.5**	1.006	0.034	0.522	3.017	0.102	37.253	5.028	0.170	608.441	8.045	0.273	645.694	9.051	0.307	646.216
2034	**26.0**	1.006	0.039	0.522	3.017	0.116	37.253	5.028	0.193	608.441	8.045	0.309	645.694	9.051	0.348	646.216
2035	**22.8**	1.006	0.044	0.522	3.017	0.132	37.253	5.028	0.221	608.441	8.045	0.353	645.694	9.051	0.397	646.216
2036	**20.1**	1.006	0.050	0.522	3.017	0.150	37.253	5.028	0.250	608.441	8.045	0.400	645.694	9.051	0.450	646.216
2037	**17.7**	1.006	0.057	0.522	3.017	0.170	37.253	5.028	0.284	608.441	8.045	0.455	645.694	9.051	0.511	646.216
2038	**15.6**	1.006	0.064	0.522	3.017	0.193	37.253	5.028	0.322	608.441	8.045	0.516	645.694	9.051	0.580	646.216
2039	**13.7**	0.944	0.069	0.490	2.832	0.207	34.972	4.720	0.345	571.190	7.552	0.551	606.162	8.496	0.620	606.652
2040	**12.1**	0.831	0.069	0.432	2.494	0.206	30.790	4.156	0.343	502.895	6.649	0.550	533.686	7.481	0.618	534.118
2041	**10.6**	0.616	0.058	0.320	1.847	0.174	22.808	3.078	0.290	372.515	4.925	0.465	395.323	5.541	0.523	395.643
2042	**9.3**	0.400	0.043	0.208	1.201	0.129	14.825	2.001	0.215	242.135	3.202	0.344	256.960	3.602	0.387	257.168
2043	**8.2**	0.185	0.023	0.096	0.554	0.068	6.842	0.924	0.113	111.755	1.478	0.180	118.597	1.662	0.203	118.693
2044	**7.2**	0.062	0.009	0.032	0.185	0.026	2.281	0.123	0.017	24.627	0.308	0.043	26.908	0.369	0.051	26.940
Total LOF	**1000.5**	**21.6**		**11.2**	**64.7**		**799.1**	**108.1**		**13128.4**	**172.9**		**13927.5**	**194.4**		**13938.7**
Average LOF		**0.599**	**0.022**	**0.31**	**1.798**	**0.065**	**22.20**	**3.004**	**0.108**	**364.68**	**4.802**	**0.173**	**386.88**	**5.401**	**0.194**	**387.19**

Table 4.1.12
Arctic Spill Occurrence - Summary

Year	Facility	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
			Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
	Development Wells													
	Total		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2010	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
	Development Wells													
	Total		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2011	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
	Total		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
2012	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
	Total		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
2013	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
	Total		0.012		0.006	0.037		0.460	0.075		10.028	0.125		10.495
2014	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
	Development Wells													
	Total		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2015	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
	Development Wells													
	Total		0.204		0.106	0.612		7.537	0.966		112.679	1.782		120.321
2016	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells													
	Total													
2017	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells													
	Total													
2018	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells													
	Total													
2019	Pipeline													
	Platforms													
	Production Wells		0.062		0.032	0.185		2.281	0.308		37.252	0.554		39.564
	Exploration Wells													
	Development Wells		0.037		0.019	0.112		1.381	0.224		30.084	0.374		31.484
	Total		0.099		0.051	0.297		3.662	0.532		67.335	0.928		71.048
2020	Pipeline	54.0	14.406	0.267	5.704	8.459	0.157	43.825	2.750	0.051	42.689	25.615	0.474	92.218
	Platforms		0.914	0.017	0.413	0.077	0.001	0.436	0.077	0.001	0.436	1.069	0.020	1.284
	Production Wells		0.174	0.003	0.091	0.523	0.010	6.462	0.872	0.016	105.546	1.570	0.029	112.099
	Exploration Wells													
	Development Wells		0.069	0.001	0.036	0.206	0.004	2.532	0.411	0.008	55.153	0.685	0.013	57.721
	Total		15.563	0.288	6.243	9.265	0.172	53.255	4.110	0.076	203.824	28.939	0.536	263.322
2021	Pipeline	70.0	15.146	0.216	5.951	8.671	0.124	44.944	2.803	0.040	43.478	26.620	0.380	94.373
	Platforms		3.656	0.052	1.652	0.309	0.004	1.742	0.309	0.004	1.742	4.275	0.061	5.137
	Production Wells		0.390	0.006	0.203	1.170	0.017	14.445	1.950	0.028	235.926	3.509	0.050	250.574
	Exploration Wells													
	Development Wells		0.131	0.002	0.068	0.392	0.006	4.834	0.785	0.011	105.292	1.308	0.019	110.195
	Total		19.323	0.276	7.874	10.542	0.151	65.965	5.846	0.084	386.439	35.712	0.510	460.278
2022	Pipeline	82.0	15.886	0.194	6.199	8.883	0.108	46.063	2.856	0.035	44.267	27.625	0.337	96.528
	Platforms		6.398	0.078	2.891	0.541	0.007	3.049	0.541	0.007	3.049	7.480	0.091	8.989
	Production Wells		0.605	0.007	0.314	1.816	0.022	22.428	3.027	0.037	366.307	5.449	0.066	389.049
	Exploration Wells													
	Development Wells		0.131	0.002	0.068	0.392	0.005	4.834	0.785	0.010	105.292	1.308	0.016	110.195
	Total		23.020	0.281	9.472	11.633	0.142	76.374	7.209	0.088	518.915	41.862	0.511	604.761
2023	Pipeline	82.0	16.626	0.203	6.446	9.095	0.111	47.182	2.909	0.035	45.055	28.630	0.349	98.684
	Platforms		9.139	0.111	4.130	0.774	0.009	4.356	0.774	0.009	4.356	10.686	0.130	12.842
	Production Wells		0.821	0.010	0.426	2.463	0.030	30.410	4.105	0.050	496.687	7.388	0.090	527.524
	Exploration Wells													
	Development Wells		0.131	0.002	0.068	0.392	0.005	4.834	0.785	0.010	105.292	1.308	0.016	110.195
	Total		26.717	0.326	11.071	12.724	0.155	86.782	8.571	0.105	651.390	48.012	0.586	749.244
2024	Pipeline	82.0	17.366	0.212	6.694	9.307	0.113	48.301	2.962	0.036	45.844	29.635	0.361	100.839
	Platforms		10.236	0.125	4.626	0.866	0.011	4.878	0.866	0.011	4.878	11.969	0.146	14.383
	Production Wells		0.944	0.012	0.490	2.832	0.035	34.972	4.720	0.058	571.190	8.496	0.104	606.652
	Exploration Wells													
	Development Wells		0.075	0.001	0.039	0.224	0.003	2.763	0.448	0.005	60.167	0.747	0.009	62.968
	Total		28.621	0.349	11.849	13.230	0.161	90.914	8.997	0.110	682.079	50.847	0.620	784.842
2025	Pipeline	82.0	17.366	0.212	6.694	9.307	0.113	48.301	2.962	0.036	45.844	29.635	0.361	100.839
	Platforms		11.333	0.138	5.122	0.959	0.012	5.401	0.959	0.012	5.401	13.251	0.162	15.924
	Production Wells		1.006	0.012	0.522	3.017	0.037	37.253	5.028	0.061	608.441	9.051	0.110	646.216
	Exploration Wells													
	Development Wells		0.037	0.000	0.019	0.112	0.001	1.381	0.224	0.003	30.084	0.374	0.005	31.484
	Total		29.742	0.363	12.357	13.395	0.163	92.336	9.173	0.112	689.770	52.310	0.638	794.463
2026	Pipeline	72.2	17.366	0.241	6.694	9.307	0.129	48.301	2.962	0.041	45.844	29.635	0.410	100.839
	Platforms		11.333	0.157	5.122	0.959	0.013	5.401	0.959	0.013	5.401	13.251	0.184	15.924
	Production Wells		1.006	0.014	0.522	3.017	0.042	37.253	5.028	0.070	608.441	9.051	0.125	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.411	12.338	13.283	0.184	90.955	8.949	0.124	659.687	51.936	0.719	762.979

Table 4.1.12
Arctic Spill Occurrence - Summary

Year	Facility	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
			Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2027	Pipeline	63.5	17.366	0.273	6.694	9.307	0.147	48.301	2.962	0.047	45.844	29.635	0.467	100.839
	Platforms		11.333	0.178	5.122	0.959	0.015	5.401	0.959	0.015	5.401	13.251	0.209	15.924
	Production Wells		1.006	0.016	0.522	3.017	0.048	37.253	5.028	0.079	608.441	9.051	0.143	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.468	12.338	13.283	0.209	90.955	8.949	0.141	659.687	51.936	0.818	762.979
2028	Pipeline	55.9	17.366	0.311	6.694	9.307	0.166	48.301	2.962	0.053	45.844	29.635	0.530	100.839
	Platforms		11.333	0.203	5.122	0.959	0.017	5.401	0.959	0.017	5.401	13.251	0.237	15.924
	Production Wells		1.006	0.018	0.522	3.017	0.054	37.253	5.028	0.090	608.441	9.051	0.162	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.531	12.338	13.283	0.238	90.955	8.949	0.160	659.687	51.936	0.929	762.979
2029	Pipeline	49.2	17.366	0.353	6.694	9.307	0.189	48.301	2.962	0.060	45.844	29.635	0.602	100.839
	Platforms		11.333	0.230	5.122	0.959	0.019	5.401	0.959	0.019	5.401	13.251	0.269	15.924
	Production Wells		1.006	0.020	0.522	3.017	0.061	37.253	5.028	0.102	608.441	9.051	0.184	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.604	12.338	13.283	0.270	90.955	8.949	0.182	659.687	51.936	1.056	762.979
2030	Pipeline	43.3	17.366	0.401	6.694	9.307	0.215	48.301	2.962	0.068	45.844	29.635	0.684	100.839
	Platforms		11.333	0.262	5.122	0.959	0.022	5.401	0.959	0.022	5.401	13.251	0.306	15.924
	Production Wells		1.006	0.023	0.522	3.017	0.070	37.253	5.028	0.116	608.441	9.051	0.209	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.686	12.338	13.283	0.307	90.955	8.949	0.207	659.687	51.936	1.199	762.979
2031	Pipeline	38.1	17.366	0.456	6.694	9.307	0.244	48.301	2.962	0.078	45.844	29.635	0.778	100.839
	Platforms		11.333	0.297	5.122	0.959	0.025	5.401	0.959	0.025	5.401	13.251	0.348	15.924
	Production Wells		1.006	0.026	0.522	3.017	0.079	37.253	5.028	0.132	608.441	9.051	0.238	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.780	12.338	13.283	0.349	90.955	8.949	0.235	659.687	51.936	1.363	762.979
2032	Pipeline	33.5	17.366	0.518	6.694	9.307	0.278	48.301	2.962	0.088	45.844	29.635	0.885	100.839
	Platforms		11.333	0.338	5.122	0.959	0.029	5.401	0.959	0.029	5.401	13.251	0.396	15.924
	Production Wells		1.006	0.030	0.522	3.017	0.090	37.253	5.028	0.150	608.441	9.051	0.270	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	0.887	12.338	13.283	0.397	90.955	8.949	0.267	659.687	51.936	1.550	762.979
2033	Pipeline	29.5	17.366	0.589	6.694	9.307	0.315	48.301	2.962	0.100	45.844	29.635	1.005	100.839
	Platforms		11.333	0.384	5.122	0.959	0.033	5.401	0.959	0.033	5.401	13.251	0.449	15.924
	Production Wells		1.006	0.034	0.522	3.017	0.102	37.253	5.028	0.170	608.441	9.051	0.307	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	1.007	12.338	13.283	0.450	90.955	8.949	0.303	659.687	51.936	1.761	762.979
2034	Pipeline	26.0	17.366	0.668	6.694	9.307	0.358	48.301	2.962	0.114	45.844	29.635	1.140	100.839
	Platforms		11.333	0.436	5.122	0.959	0.037	5.401	0.959	0.037	5.401	13.251	0.510	15.924
	Production Wells		1.006	0.039	0.522	3.017	0.116	37.253	5.028	0.193	608.441	9.051	0.348	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	1.142	12.338	13.283	0.511	90.955	8.949	0.344	659.687	51.936	1.998	762.979
2035	Pipeline	22.8	17.366	0.762	6.694	9.307	0.408	48.301	2.962	0.130	45.844	29.635	1.300	100.839
	Platforms		11.333	0.497	5.122	0.959	0.042	5.401	0.959	0.042	5.401	13.251	0.581	15.924
	Production Wells		1.006	0.044	0.522	3.017	0.132	37.253	5.028	0.221	608.441	9.051	0.397	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	1.303	12.338	13.283	0.583	90.955	8.949	0.392	659.687	51.936	2.278	762.979
2036	Pipeline	20.1	17.366	0.864	6.694	9.307	0.463	48.301	2.962	0.147	45.844	29.635	1.474	100.839
	Platforms		11.333	0.564	5.122	0.959	0.048	5.401	0.959	0.048	5.401	13.251	0.659	15.924
	Production Wells		1.006	0.050	0.522	3.017	0.150	37.253	5.028	0.250	608.441	9.051	0.450	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	1.478	12.338	13.283	0.661	90.955	8.949	0.445	659.687	51.936	2.584	762.979
2037	Pipeline	17.7	17.366	0.981	6.694	9.307	0.526	48.301	2.962	0.167	45.844	29.635	1.674	100.839
	Platforms		11.333	0.640	5.122	0.959	0.054	5.401	0.959	0.054	5.401	13.251	0.749	15.924
	Production Wells		1.006	0.057	0.522	3.017	0.170	37.253	5.028	0.284	608.441	9.051	0.511	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	1.678	12.338	13.283	0.750	90.955	8.949	0.506	659.687	51.936	2.934	762.979
2038	Pipeline	15.6	17.366	1.113	6.694	9.307	0.597	48.301	2.962	0.190	45.844	29.635	1.900	100.839
	Platforms		11.333	0.726	5.122	0.959	0.061	5.401	0.959	0.061	5.401	13.251	0.849	15.924
	Production Wells		1.006	0.064	0.522	3.017	0.193	37.253	5.028	0.322	608.441	9.051	0.580	646.216
	Exploration Wells													
	Development Wells													
	Total		29.705	1.904	12.338	13.283	0.851	90.955	8.949	0.574	659.687	51.936	3.329	762.979
2039	Pipeline	13.7	17.366	1.268	6.694	9.307	0.679	48.301	2.962	0.216	45.844	29.635	2.163	100.839
	Platforms		11.333	0.827	5.122	0.959	0.070	5.401	0.959	0.070	5.401	13.251	0.967	15.924
	Production Wells		0.944	0.069	0.490	2.832	0.207	34.972	4.720	0.345	571.190	8.496	0.620	606.652
	Exploration Wells													
	Development Wells													
	Total		29.643	2.164	12.306	13.098	0.956	88.674	8.641	0.631	622.435	51.382	3.751	723.415
2040	Pipeline	12.1	17.366	1.435	6.694	9.307	0.769	48.301	2.962	0.245	45.844	29.635	2.449	100.839
	Platforms		10.419	0.861	4.708	0.882	0.073	4.965	0.882	0.073	4.965	12.182	1.007	14.639
	Production Wells		0.831	0.069	0.432	2.494	0.206	30.790	4.156	0.343	502.895	7.481	0.618	534.118
	Exploration Wells													
	Development Wells													
	Total		28.616	2.365	11.834	12.682	1.048	84.057	7.999	0.661	553.705	49.298	4.074	649.596
2041	Pipeline	10.6	17.366	1.638	6.694	9.307	0.878	48.301	2.962	0.279	45.844	29.635	2.796	100.839
	Platforms		7.677	0.724	3.469	0.650	0.061	3.659	0.650	0.061	3.659	8.977	0.847	10.787
	Production Wells		0.616	0.058	0.320	1.847	0.174	22.808	3.078	0.290	372.515	5.541	0.523	395.643
	Exploration Wells													
	Development Wells													
	Total		25.659	2.421	10.483	11.804	1.114	74.768	6.690	0.631	422.018	44.152	4.165	507.269
2042	Pipeline	9.3	17.366	1.867	6.694	9.307	1.001	48.301	2.962	0.318	45.844	29.635	3.187	100.839
	Platforms		4.935	0.531	2.230	0.418	0.045	2.352	0.418	0.045	2.352	5.771	0.620	6.934
	Production Wells		0.400	0.043	0.208	1.201	0.129	14.825	2.001	0.215	242.135	3.602	0.387	257.168
	Exploration Wells													
	Development Wells													
	Total		22.702	2.441	9.132	10.925	1.175	65.478	5.380	0.579	290.331	39.007	4.194	364.941
2043	Pipeline	8.2	17.366	2.118	6.694	9.307	1.135	48.301	2.962	0.361	45.844	29.635	3.614	100.839
	Platforms		2.193	0.267	0.991	0.186	0.023	1.045	0.186	0.023	1.045	2.565	0.313	3.082
	Production Wells		0.185	0.023	0.096	0.554	0.068	6.842	0.924	0.113	111.755	1.662	0.203	118.693
	Exploration Wells													
	Development Wells													
	Total		19.744	2.408	7.781	10.047	1.225	56.189	4.071	0.496	158.644	33.862	4.129	222.614
2044	Pipeline	7.2	17.366	2.412	6.694	9.307	1.293	48.301	2.962	0.411	45.844	29.635	4.116	100.839
	Platforms		1.097	0.152	0.496	0.093	0.013	0.523	0.093	0.013	0.523	1.282	0.178	1.541
	Production Wells		0.062	0.009	0.032	0.185	0.026	2.281	0.123	0.017	24.627	0.369	0.051	26.940

Table 4.1.12
Arctic Spill Occurrence - Summary

Year	Facility	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
			Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2044	Exploration Wells	7.2												
	Development Wells													
	Total		18.525	2.573	7.221	9.584	1.331	51.105	3.178	0.441	70.994	31.286	4.345	129.320

Table 4.1.13
Arctic Spill Occurrence - Annual Summary

Year	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2010		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2011		0.012		0.006	0.037		0.460	0.075		10.028	0.112		10.488	0.125		10.495
2012		0.012		0.006	0.037		0.460	0.075		10.028	0.112		10.488	0.125		10.495
2013		0.012		0.006	0.037		0.460	0.075		10.028	0.112		10.488	0.125		10.495
2014		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2015		0.204		0.106	0.612		7.537	0.966		112.679	1.578		120.216	1.782		120.321
2016																
2017																
2018																
2019		0.099		0.051	0.297		3.662	0.532		67.335	0.829		70.997	0.928		71.048
2020	**54.0**	15.563	0.288	6.243	9.265	0.172	53.255	4.110	0.076	203.824	13.375	0.248	257.079	28.939	0.536	263.322
2021	**70.0**	19.323	0.276	7.874	10.542	0.151	65.965	5.846	0.084	386.439	16.389	0.234	452.404	35.712	0.510	460.278
2022	**82.0**	23.020	0.281	9.472	11.633	0.142	76.374	7.209	0.088	518.915	18.842	0.230	595.289	41.862	0.511	604.761
2023	**82.0**	26.717	0.326	11.071	12.724	0.155	86.782	8.571	0.105	651.390	21.295	0.260	738.173	48.012	0.586	749.244
2024	**82.0**	28.621	0.349	11.849	13.230	0.161	90.914	8.997	0.110	682.079	22.226	0.271	772.993	50.847	0.620	784.842
2025	**82.0**	29.742	0.363	12.357	13.395	0.163	92.336	9.173	0.112	689.770	22.568	0.275	782.106	52.310	0.638	794.463
2026	**72.2**	29.705	0.411	12.338	13.283	0.184	90.955	8.949	0.124	659.687	22.232	0.308	750.641	51.936	0.719	762.979
2027	**63.5**	29.705	0.468	12.338	13.283	0.209	90.955	8.949	0.141	659.687	22.232	0.350	750.641	51.936	0.818	762.979
2028	**55.9**	29.705	0.531	12.338	13.283	0.238	90.955	8.949	0.160	659.687	22.232	0.398	750.641	51.936	0.929	762.979
2029	**49.2**	29.705	0.604	12.338	13.283	0.270	90.955	8.949	0.182	659.687	22.232	0.452	750.641	51.936	1.056	762.979
2030	**43.3**	29.705	0.686	12.338	13.283	0.307	90.955	8.949	0.207	659.687	22.232	0.513	750.641	51.936	1.199	762.979
2031	**38.1**	29.705	0.780	12.338	13.283	0.349	90.955	8.949	0.235	659.687	22.232	0.584	750.641	51.936	1.363	762.979
2032	**33.5**	29.705	0.887	12.338	13.283	0.397	90.955	8.949	0.267	659.687	22.232	0.664	750.641	51.936	1.550	762.979
2033	**29.5**	29.705	1.007	12.338	13.283	0.450	90.955	8.949	0.303	659.687	22.232	0.754	750.641	51.936	1.761	762.979
2034	**26.0**	29.705	1.142	12.338	13.283	0.511	90.955	8.949	0.344	659.687	22.232	0.855	750.641	51.936	1.998	762.979
2035	**22.8**	29.705	1.303	12.338	13.283	0.583	90.955	8.949	0.392	659.687	22.232	0.975	750.641	51.936	2.278	762.979
2036	**20.1**	29.705	1.478	12.338	13.283	0.661	90.955	8.949	0.445	659.687	22.232	1.106	750.641	51.936	2.584	762.979
2037	**17.7**	29.705	1.678	12.338	13.283	0.750	90.955	8.949	0.506	659.687	22.232	1.256	750.641	51.936	2.934	762.979
2038	**15.6**	29.705	1.904	12.338	13.283	0.851	90.955	8.949	0.574	659.687	22.232	1.425	750.641	51.936	3.329	762.979
2039	**13.7**	29.643	2.164	12.306	13.098	0.956	88.674	8.641	0.631	622.435	21.739	1.587	711.109	51.382	3.751	723.415
2040	**12.1**	28.616	2.365	11.834	12.682	1.048	84.057	7.999	0.661	553.705	20.681	1.709	637.762	49.298	4.074	649.596
2041	**10.6**	25.659	2.421	10.483	11.804	1.114	74.768	6.690	0.631	422.018	18.493	1.745	496.786	44.152	4.165	507.269
2042	**9.3**	22.702	2.441	9.132	10.925	1.175	65.478	5.380	0.579	290.331	16.305	1.753	355.809	39.007	4.194	364.941
2043	**8.2**	19.744	2.408	7.781	10.047	1.225	56.189	4.071	0.496	158.644	14.117	1.722	214.833	33.862	4.129	222.614
2044	**7.2**	18.525	2.573	7.221	9.584	1.331	51.105	3.178	0.441	70.994	12.762	1.772	122.099	31.286	4.345	129.320
Total LOF	**1000.5**	**675.0**		**278.5**	**314.5**		**2103.5**	**200.8**		**14374.6**	**515.3**		**16478.1**	**1190.3**		**16756.6**
Average LOF		**18.750**	**0.675**	**7.74**	**8.735**	**0.314**	**58.43**	**5.578**	**0.201**	**399.29**	**14.313**	**0.515**	**457.73**	**33.063**	**1.190**	**465.46**

Table 4.1.14
Year 2024 - Monte Carlo Results

Year 2024	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
	Frequency Spills per 10^3 years					Frequency Spills per 10^9 bbl Produced					Spill Index [bbl]				
Mean =	28.62	13.25	9.00	22.24	50.86	0.35	0.16	0.11	0.27	0.62	11.85	90.75	681.33	772.08	783.93
Std Deviation =	9.58	5.70	2.40	6.73	12.77	0.12	0.07	0.03	0.08	0.16	6.57	45.99	244.70	251.14	251.46
Variance =	91.791	32.506	5.743	45.293	163.102	0.014	0.005	0.001	0.007	0.024	43.199	2115.125	59877.300	63068.880	63234.000
Skewness =	0.57	1.10	0.55	0.83	0.54	0.57	1.10	0.55	0.83	0.54	1.21	1.23	0.60	0.59	0.59
Kurtosis =	3.24	4.37	3.33	3.82	3.29	3.24	4.37	3.33	3.82	3.29	4.92	5.54	3.45	3.44	3.44
Mode =	25.37	11.35	7.34	34.77	46.61	0.31	0.14	0.09	0.42	0.57	13.68	72.01	592.71	385.11	808.80
Minimum =	6.959	2.233	2.698	7.478	19.166	0.085	0.027	0.033	0.091	0.234	0.070	7.189	122.468	190.640	201.190
5% Perc =	14.801	6.186	5.498	13.138	31.932	0.180	0.075	0.067	0.160	0.389	3.883	31.924	322.006	406.207	416.050
10% Perc =	17.026	7.118	6.143	14.641	35.234	0.208	0.087	0.075	0.179	0.430	4.891	40.694	389.326	468.625	481.656
15% Perc =	18.780	7.812	6.565	15.653	37.731	0.229	0.095	0.080	0.191	0.460	5.644	47.454	436.771	520.138	530.393
20% Perc =	20.186	8.445	6.931	16.547	39.950	0.246	0.103	0.085	0.202	0.487	6.364	52.287	474.957	556.814	568.368
25% Perc =	21.421	9.056	7.289	17.285	41.730	0.261	0.110	0.089	0.211	0.509	7.047	57.930	506.613	591.448	603.815
30% Perc =	22.786	9.614	7.577	18.136	43.264	0.278	0.117	0.092	0.221	0.528	7.687	62.830	535.962	624.978	636.837
35% Perc =	24.053	10.251	7.881	18.906	45.020	0.293	0.125	0.096	0.231	0.549	8.330	67.786	566.772	654.256	666.580
40% Perc =	25.298	10.804	8.171	19.616	46.469	0.309	0.132	0.100	0.239	0.567	8.939	72.357	594.537	683.643	695.143
45% Perc =	26.372	11.402	8.452	20.381	48.104	0.322	0.139	0.103	0.249	0.587	9.694	77.248	624.378	716.518	728.524
50% Perc =	27.659	12.074	8.747	21.222	49.564	0.337	0.147	0.107	0.259	0.604	10.457	82.870	655.379	747.614	760.963
55% Perc =	28.854	12.696	9.047	22.026	51.248	0.352	0.155	0.110	0.269	0.625	11.293	88.617	687.216	779.291	791.385
60% Perc =	30.179	13.465	9.348	22.850	52.923	0.368	0.164	0.114	0.279	0.645	12.053	94.054	720.446	811.147	823.953
65% Perc =	31.604	14.284	9.662	23.826	54.763	0.385	0.174	0.118	0.291	0.668	12.949	99.517	754.067	844.205	856.545
70% Perc =	32.981	15.279	10.064	24.871	56.785	0.402	0.186	0.123	0.303	0.692	13.900	106.880	785.081	880.688	891.481
75% Perc =	34.572	16.337	10.461	26.089	58.812	0.422	0.199	0.128	0.318	0.717	15.164	113.996	826.945	922.591	933.668
80% Perc =	36.468	17.475	10.946	27.449	61.204	0.445	0.213	0.133	0.335	0.746	16.602	123.177	875.826	971.241	983.217
85% Perc =	38.630	19.073	11.507	29.141	64.459	0.471	0.233	0.140	0.355	0.786	18.547	135.503	936.725	1030.085	1040.930
90% Perc =	41.498	20.957	12.236	31.377	68.218	0.506	0.256	0.149	0.383	0.832	20.683	149.750	1008.444	1114.361	1129.230
95% Perc =	45.695	24.519	13.366	34.951	73.336	0.557	0.299	0.163	0.426	0.894	24.617	175.429	1123.291	1221.134	1231.424
Maximum =	71.083	40.789	19.820	54.524	113.299	0.867	0.497	0.242	0.665	1.382	54.955	342.292	1813.537	1897.859	1904.195

Table 4.1.15
LOF Average - Pipeline - Monte Carlo Results

Pipeline	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	11.84	6.40	2.04	8.44	20.29	0.43	0.23	0.07	0.30	0.73	4.52	32.97	31.53	64.50	69.02
Std Deviation =	4.40	3.28	1.09	3.48	5.64	0.16	0.12	0.04	0.13	0.20	3.05	24.51	18.28	30.89	31.08
Variance =	19.348	10.786	1.192	12.124	31.843	0.025	0.014	0.002	0.016	0.041	9.274	600.710	334.154	954.380	965.871
Skewness =	0.53	0.71	0.74	0.64	0.44	0.53	0.71	0.74	0.64	0.44	1.46	1.51	0.94	1.03	1.01
Kurtosis =	2.90	2.94	3.04	3.01	2.93	2.90	2.94	3.04	3.01	2.93	5.83	5.94	3.55	4.48	4.43
Mode =	8.60	3.77	1.28	6.39	15.55	0.43	0.14	0.05	0.11	0.49	2.75	19.67	20.14	61.43	53.06
Minimum =	1.738	0.642	0.151	1.682	6.395	0.063	0.023	0.005	0.061	0.230	-0.176	-6.560	2.383	8.213	12.493
5% Perc =	5.556	2.135	0.642	3.637	11.873	0.200	0.077	0.023	0.131	0.427	1.073	6.275	9.100	24.149	28.379
10% Perc =	6.562	2.646	0.793	4.379	13.311	0.236	0.095	0.029	0.158	0.479	1.435	8.793	11.613	29.860	33.817
15% Perc =	7.263	3.013	0.917	4.890	14.460	0.261	0.108	0.033	0.176	0.520	1.766	11.052	13.420	34.493	38.671
20% Perc =	7.973	3.416	1.029	5.328	15.289	0.287	0.123	0.037	0.192	0.550	2.045	13.214	15.432	37.929	42.310
25% Perc =	8.558	3.796	1.162	5.763	16.157	0.308	0.137	0.042	0.207	0.581	2.335	15.195	17.226	41.453	45.967
30% Perc =	9.120	4.185	1.286	6.177	16.889	0.328	0.151	0.046	0.222	0.608	2.613	17.289	19.251	44.938	49.510
35% Perc =	9.625	4.550	1.429	6.630	17.579	0.346	0.164	0.051	0.239	0.633	2.889	19.521	21.092	48.488	53.232
40% Perc =	10.153	4.923	1.558	7.036	18.371	0.365	0.177	0.056	0.253	0.661	3.162	21.810	23.138	52.575	56.777
45% Perc =	10.684	5.360	1.685	7.463	19.067	0.384	0.193	0.061	0.269	0.686	3.483	24.061	25.372	56.009	60.573
50% Perc =	11.287	5.817	1.847	7.907	19.758	0.406	0.209	0.066	0.284	0.711	3.769	26.844	27.420	59.632	63.911
55% Perc =	11.940	6.291	2.010	8.394	20.537	0.430	0.226	0.072	0.302	0.739	4.104	29.332	30.020	63.146	67.760
60% Perc =	12.563	6.784	2.153	8.898	21.268	0.452	0.244	0.077	0.320	0.765	4.482	32.302	32.382	67.019	71.944
65% Perc =	13.181	7.299	2.324	9.401	22.085	0.474	0.263	0.084	0.338	0.795	4.897	35.629	35.189	71.393	76.060
70% Perc =	13.892	7.864	2.540	10.035	22.955	0.500	0.283	0.091	0.361	0.826	5.343	39.254	38.532	75.963	80.572
75% Perc =	14.728	8.472	2.739	10.706	23.883	0.530	0.305	0.099	0.385	0.859	5.871	43.697	42.088	81.799	86.483
80% Perc =	15.583	9.249	2.991	11.392	25.110	0.561	0.333	0.108	0.410	0.904	6.566	49.323	46.313	88.197	92.703
85% Perc =	16.571	10.077	3.251	12.194	26.476	0.596	0.363	0.117	0.439	0.953	7.450	56.184	51.478	95.278	99.830
90% Perc =	17.975	11.108	3.622	13.343	28.040	0.647	0.400	0.130	0.480	1.009	8.600	66.722	58.675	105.176	109.731
95% Perc =	20.016	12.735	4.134	15.014	30.402	0.720	0.458	0.149	0.540	1.094	10.635	81.963	67.074	122.099	127.267
Maximum =	28.739	18.649	6.346	21.854	44.120	1.034	0.671	0.228	0.786	1.588	22.803	177.421	114.673	226.057	227.982

Table 4.1.16
LOF Average - Platforms - Monte Carlo Results

Platforms	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	6.30	0.53	0.53	1.07	7.37	0.23	0.02	0.02	0.04	0.27	2.87	2.99	2.99	5.99	8.86
Std Deviation =	3.44	0.30	0.30	0.60	3.48	0.12	0.01	0.01	0.02	0.13	2.67	2.33	2.33	4.66	5.41
Variance =	11.813	0.090	0.090	0.359	12.112	0.015	0.000	0.000	0.000	0.016	7.127	5.426	5.426	21.704	29.253
Skewness =	0.70	0.72	0.72	0.72	0.66	0.70	0.72	0.72	0.72	0.66	1.64	1.24	1.24	1.24	0.96
Kurtosis =	2.98	3.04	3.04	3.04	2.93	2.98	3.04	3.04	3.04	2.93	6.19	4.71	4.71	4.71	3.91
Mode =	4.87	0.28	0.28	0.56	6.61	0.18	0.01	0.01	0.02	0.20	4.53	1.56	1.56	3.13	5.72
Minimum =	0.616	0.019	0.019	0.039	0.814	0.022	0.001	0.001	0.001	0.029	-0.767	-0.841	-0.841	-1.683	-0.674
5% Perc =	1.790	0.140	0.140	0.279	2.683	0.064	0.005	0.005	0.010	0.097	0.194	0.302	0.302	0.604	1.958
10% Perc =	2.282	0.188	0.188	0.376	3.327	0.082	0.007	0.007	0.014	0.120	0.421	0.595	0.595	1.189	2.835
15% Perc =	2.762	0.227	0.227	0.454	3.772	0.099	0.008	0.008	0.016	0.136	0.579	0.843	0.843	1.685	3.542
20% Perc =	3.140	0.260	0.260	0.520	4.180	0.113	0.009	0.009	0.019	0.150	0.760	1.057	1.057	2.114	4.180
25% Perc =	3.537	0.292	0.292	0.583	4.610	0.127	0.010	0.010	0.021	0.166	0.934	1.258	1.258	2.517	4.818
30% Perc =	3.932	0.328	0.328	0.657	5.023	0.141	0.012	0.012	0.024	0.181	1.134	1.455	1.455	2.911	5.426
35% Perc =	4.386	0.362	0.362	0.723	5.462	0.158	0.013	0.013	0.026	0.196	1.327	1.687	1.687	3.373	6.016
40% Perc =	4.837	0.398	0.398	0.795	5.868	0.174	0.014	0.014	0.029	0.211	1.539	1.906	1.906	3.811	6.548
45% Perc =	5.244	0.433	0.433	0.867	6.329	0.189	0.016	0.016	0.031	0.228	1.775	2.162	2.162	4.323	7.142
50% Perc =	5.691	0.476	0.476	0.952	6.809	0.205	0.017	0.017	0.034	0.245	2.068	2.425	2.425	4.850	7.776
55% Perc =	6.194	0.525	0.525	1.049	7.305	0.223	0.019	0.019	0.038	0.263	2.327	2.688	2.688	5.377	8.475
60% Perc =	6.719	0.575	0.575	1.149	7.818	0.242	0.021	0.021	0.041	0.281	2.664	2.995	2.995	5.990	9.197
65% Perc =	7.294	0.622	0.622	1.244	8.340	0.262	0.022	0.022	0.045	0.300	3.047	3.328	3.328	6.657	9.948
70% Perc =	7.885	0.674	0.674	1.349	8.954	0.284	0.024	0.024	0.049	0.322	3.498	3.700	3.700	7.401	10.841
75% Perc =	8.600	0.725	0.725	1.450	9.669	0.309	0.026	0.026	0.052	0.348	3.955	4.187	4.187	8.374	11.905
80% Perc =	9.323	0.787	0.787	1.574	10.450	0.335	0.028	0.028	0.057	0.376	4.609	4.709	4.709	9.417	13.150
85% Perc =	10.089	0.864	0.864	1.728	11.280	0.363	0.031	0.031	0.062	0.406	5.442	5.409	5.409	10.817	14.671
90% Perc =	11.065	0.956	0.956	1.913	12.234	0.398	0.034	0.034	0.069	0.440	6.547	6.316	6.316	12.632	16.425
95% Perc =	12.813	1.096	1.096	2.193	13.863	0.461	0.039	0.039	0.079	0.499	8.306	7.544	7.544	15.089	19.075
Maximum =	19.119	1.776	1.776	3.551	19.990	0.688	0.064	0.064	0.128	0.719	19.140	15.819	15.819	31.637	34.329

Table 4.1.17
LOF Average - Wells - Monte Carlo Results

Wells	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	0.60	1.80	3.00	4.80	5.40	0.02	0.06	0.11	0.17	0.19	0.31	22.10	364.30	386.40	386.71
Std Deviation =	0.23	0.68	0.83	1.45	1.47	0.01	0.02	0.03	0.05	0.05	0.22	14.60	136.21	136.99	136.99
Variance =	0.052	0.467	0.683	2.092	2.148	0.000	0.001	0.001	0.003	0.003	0.047	213.264	18553.270	18765.030	18765.050
Skewness =	-0.01	-0.01	0.00	0.00	0.00	-0.01	-0.01	0.00	0.00	0.00	0.78	0.88	0.49	0.49	0.49
Kurtosis =	2.41	2.42	2.67	2.53	2.56	2.41	2.42	2.67	2.53	2.56	3.44	3.62	3.16	3.17	3.17
Mode =	0.64	1.85	3.23	2.54	5.92	0.02	0.07	0.12	0.09	0.22	0.32	14.40	287.18	318.95	418.46
Minimum =	0.040	0.130	0.660	0.895	1.145	0.001	0.005	0.024	0.032	0.041	-0.129	-4.646	50.321	74.939	75.448
5% Perc =	0.216	0.650	1.647	2.404	2.972	0.008	0.023	0.059	0.087	0.107	0.022	2.972	160.685	180.452	180.751
10% Perc =	0.288	0.868	1.917	2.870	3.461	0.010	0.031	0.069	0.103	0.125	0.060	5.387	195.760	216.465	216.767
15% Perc =	0.346	1.038	2.111	3.236	3.806	0.012	0.037	0.076	0.116	0.137	0.089	7.446	222.385	243.998	244.404
20% Perc =	0.396	1.184	2.268	3.520	4.103	0.014	0.043	0.082	0.127	0.148	0.119	9.470	244.315	266.559	266.646
25% Perc =	0.437	1.310	2.421	3.758	4.359	0.016	0.047	0.087	0.135	0.157	0.144	11.211	266.778	289.075	289.484
30% Perc =	0.473	1.426	2.549	3.991	4.577	0.017	0.051	0.092	0.144	0.165	0.170	12.752	285.826	307.005	307.370
35% Perc =	0.508	1.528	2.680	4.221	4.806	0.018	0.055	0.096	0.152	0.173	0.198	14.284	302.888	323.557	323.857
40% Perc =	0.541	1.622	2.787	4.430	5.022	0.019	0.058	0.100	0.159	0.181	0.225	15.993	319.194	342.617	342.958
45% Perc =	0.570	1.712	2.892	4.612	5.204	0.021	0.062	0.104	0.166	0.187	0.251	17.709	336.813	358.655	359.018
50% Perc =	0.601	1.802	3.002	4.800	5.396	0.022	0.065	0.108	0.173	0.194	0.278	19.621	352.882	374.943	375.324
55% Perc =	0.629	1.888	3.116	5.001	5.597	0.023	0.068	0.112	0.180	0.201	0.307	21.350	369.386	391.571	391.688
60% Perc =	0.659	1.972	3.230	5.200	5.793	0.024	0.071	0.116	0.187	0.208	0.335	23.446	386.894	409.249	409.549
65% Perc =	0.693	2.071	3.341	5.395	6.006	0.025	0.075	0.120	0.194	0.216	0.365	25.648	405.309	427.858	428.147
70% Perc =	0.728	2.171	3.457	5.600	6.204	0.026	0.078	0.124	0.201	0.223	0.401	27.884	427.483	449.470	449.741
75% Perc =	0.763	2.286	3.580	5.829	6.428	0.027	0.082	0.129	0.210	0.231	0.441	30.575	450.559	472.802	473.232
80% Perc =	0.806	2.407	3.713	6.078	6.705	0.029	0.087	0.134	0.219	0.241	0.487	33.351	475.309	498.438	498.661
85% Perc =	0.849	2.544	3.871	6.365	6.992	0.031	0.092	0.139	0.229	0.252	0.544	37.272	507.456	528.856	529.286
90% Perc =	0.905	2.716	4.088	6.701	7.327	0.033	0.098	0.147	0.241	0.264	0.618	42.369	545.759	568.775	568.983
95% Perc =	0.977	2.949	4.373	7.215	7.826	0.035	0.106	0.157	0.260	0.282	0.721	50.317	610.322	631.210	631.436
Maximum =	1.185	3.656	5.922	9.578	10.127	0.043	0.132	0.213	0.345	0.364	1.241	85.423	936.882	960.176	960.225

Table 4.1.18
LOF Average Platforms + Wells - Monte Carlo Results

Platforms + Wells	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	6.90	2.33	3.54	5.87	12.77	0.25	0.08	0.13	0.21	0.46	3.18	25.10	367.29	392.39	395.57
Std Deviation =	3.45	0.75	0.88	1.57	3.73	0.12	0.03	0.03	0.06	0.13	2.67	14.74	136.23	137.05	137.01
Variance =	11.870	0.559	0.774	2.458	13.930	0.015	0.001	0.001	0.003	0.018	7.155	217.224	18558.070	18782.550	18770.940
Skewness =	0.69	0.02	0.01	0.02	0.49	0.69	0.02	0.01	0.02	0.49	1.61	0.84	0.49	0.49	0.49
Kurtosis =	2.98	2.56	2.68	2.61	2.93	2.98	2.56	2.68	2.61	2.93	6.08	3.56	3.17	3.18	3.18
Mode =	8.06	2.36	3.61	6.01	12.47	0.20	0.08	0.13	0.22	0.45	1.13	32.46	364.11	315.39	498.41
Minimum =	0.873	0.305	0.840	1.148	3.062	0.031	0.011	0.030	0.041	0.110	-0.386	-2.180	52.163	76.453	77.406
5% Perc =	2.327	1.090	2.081	3.242	7.313	0.084	0.039	0.075	0.117	0.263	0.457	5.419	163.714	186.922	190.652
10% Perc =	2.908	1.328	2.376	3.782	8.224	0.105	0.048	0.085	0.136	0.296	0.699	8.301	198.845	222.995	226.515
15% Perc =	3.367	1.511	2.576	4.166	8.938	0.121	0.054	0.093	0.150	0.322	0.900	10.508	225.812	249.802	253.392
20% Perc =	3.762	1.668	2.761	4.473	9.555	0.135	0.060	0.099	0.161	0.344	1.085	12.335	246.930	272.146	275.806
25% Perc =	4.144	1.795	2.917	4.758	10.014	0.149	0.065	0.105	0.171	0.360	1.263	13.901	269.532	294.985	298.503
30% Perc =	4.541	1.912	3.066	5.006	10.482	0.163	0.069	0.110	0.180	0.377	1.453	15.631	288.446	314.022	316.965
35% Perc =	4.995	2.021	3.194	5.225	10.911	0.180	0.073	0.115	0.188	0.393	1.631	17.262	305.892	330.526	333.855
40% Perc =	5.410	2.136	3.310	5.455	11.443	0.195	0.077	0.119	0.196	0.412	1.849	19.041	322.554	348.128	351.286
45% Perc =	5.844	2.245	3.424	5.664	11.870	0.210	0.081	0.123	0.204	0.427	2.102	20.920	339.429	364.641	367.487
50% Perc =	6.309	2.334	3.548	5.877	12.350	0.227	0.084	0.128	0.211	0.444	2.354	22.631	356.128	380.643	384.235
55% Perc =	6.824	2.422	3.654	6.069	12.786	0.246	0.087	0.131	0.218	0.460	2.661	24.504	372.203	398.121	400.999
60% Perc =	7.347	2.521	3.758	6.269	13.387	0.264	0.091	0.135	0.226	0.482	3.012	26.523	389.732	415.097	418.027
65% Perc =	7.859	2.628	3.881	6.493	13.945	0.283	0.095	0.140	0.234	0.502	3.396	28.838	408.413	433.073	436.649
70% Perc =	8.508	2.742	4.018	6.738	14.557	0.306	0.099	0.145	0.242	0.524	3.766	31.000	430.075	455.627	458.752
75% Perc =	9.238	2.854	4.153	6.965	15.219	0.332	0.103	0.149	0.251	0.548	4.317	33.589	453.063	479.211	481.846
80% Perc =	9.888	2.995	4.296	7.237	15.919	0.356	0.108	0.155	0.260	0.573	4.951	36.720	478.262	504.749	507.511
85% Perc =	10.746	3.139	4.467	7.545	16.828	0.387	0.113	0.161	0.271	0.606	5.773	40.384	510.646	534.652	537.957
90% Perc =	11.694	3.310	4.681	7.928	17.877	0.421	0.119	0.168	0.285	0.643	6.882	45.594	548.244	573.899	576.545
95% Perc =	13.396	3.574	4.992	8.450	19.465	0.482	0.129	0.180	0.304	0.700	8.665	53.444	612.760	636.753	640.579
Maximum =	19.623	4.874	6.436	11.127	26.807	0.706	0.175	0.232	0.400	0.965	19.319	89.447	943.395	973.203	975.798

Table 4.1.19
LOF Average - Monte Carlo Results

Chukchi Sea	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	18.75	8.73	5.58	14.31	33.06	0.67	0.31	0.20	0.51	1.19	7.70	58.07	398.82	456.88	464.58
Std Deviation =	5.62	3.37	1.38	3.82	6.74	0.20	0.12	0.05	0.14	0.24	4.02	28.68	137.13	140.52	140.45
Variance =	31.532	11.369	1.917	14.581	45.482	0.041	0.015	0.002	0.019	0.059	16.173	822.613	18803.430	19745.690	19726.240
Skewness =	0.44	0.66	0.31	0.50	0.36	0.44	0.66	0.31	0.50	0.36	1.01	1.04	0.47	0.46	0.46
Kurtosis =	3.01	2.92	2.98	2.96	2.95	3.01	2.92	2.98	2.96	2.95	4.07	4.44	3.17	3.19	3.19
Mode =	13.64	5.58	5.47	12.54	32.44	0.49	0.20	0.18	0.45	1.04	5.00	56.26	374.54	373.31	408.73
Minimum =	4.092	1.256	1.723	4.762	14.153	0.147	0.045	0.062	0.171	0.509	0.268	2.243	77.191	108.764	113.130
5% Perc =	10.274	4.146	3.461	8.767	22.860	0.370	0.149	0.125	0.315	0.823	2.629	20.820	191.883	243.895	251.861
10% Perc =	11.775	4.813	3.906	9.689	24.705	0.424	0.173	0.141	0.349	0.889	3.294	26.142	229.978	283.065	290.558
15% Perc =	12.975	5.324	4.149	10.409	25.873	0.467	0.192	0.149	0.375	0.931	3.787	30.063	255.684	310.332	319.624
20% Perc =	13.811	5.767	4.381	11.024	27.075	0.497	0.208	0.158	0.397	0.974	4.274	33.808	278.816	334.991	342.824
25% Perc =	14.736	6.151	4.577	11.575	28.197	0.530	0.221	0.165	0.417	1.015	4.694	37.415	300.114	357.315	365.196
30% Perc =	15.426	6.510	4.776	12.048	29.062	0.555	0.234	0.172	0.434	1.046	5.145	40.505	319.479	377.038	384.128
35% Perc =	16.085	6.884	4.955	12.503	30.003	0.579	0.248	0.178	0.450	1.080	5.568	43.684	338.946	396.019	404.121
40% Perc =	16.808	7.275	5.130	12.915	30.931	0.605	0.262	0.185	0.465	1.113	6.035	46.871	355.618	413.597	421.117
45% Perc =	17.500	7.753	5.296	13.380	31.812	0.630	0.279	0.191	0.481	1.145	6.477	50.566	373.390	429.995	437.554
50% Perc =	18.217	8.187	5.486	13.832	32.690	0.655	0.295	0.197	0.498	1.176	6.888	53.548	387.586	445.359	452.860
55% Perc =	18.960	8.626	5.663	14.316	33.532	0.682	0.310	0.204	0.515	1.207	7.365	56.516	402.974	460.539	467.770
60% Perc =	19.722	9.147	5.864	14.799	34.420	0.710	0.329	0.211	0.532	1.238	7.878	60.107	420.690	478.827	487.006
65% Perc =	20.579	9.649	6.080	15.407	35.349	0.740	0.347	0.219	0.554	1.272	8.470	63.595	440.886	498.279	506.907
70% Perc =	21.477	10.248	6.265	16.075	36.318	0.773	0.369	0.225	0.578	1.307	9.176	68.042	461.899	521.269	529.353
75% Perc =	22.421	10.863	6.481	16.760	37.501	0.807	0.391	0.233	0.603	1.349	9.916	72.895	484.459	547.210	554.252
80% Perc =	23.482	11.595	6.744	17.553	38.677	0.845	0.417	0.243	0.632	1.392	10.782	78.550	509.542	572.186	580.116
85% Perc =	24.715	12.510	7.026	18.452	40.045	0.889	0.450	0.253	0.664	1.441	11.878	85.994	541.842	607.143	614.189
90% Perc =	26.291	13.580	7.445	19.677	42.051	0.946	0.489	0.268	0.708	1.513	13.217	96.880	579.196	645.235	651.907
95% Perc =	28.868	15.147	7.978	21.346	44.886	1.039	0.545	0.287	0.768	1.615	15.477	112.821	644.195	701.835	708.975
Maximum =	42.186	21.106	10.805	28.334	57.947	1.518	0.759	0.389	1.020	2.085	26.931	206.342	1002.925	1048.495	1052.608

Table 4.1.20
Composition of Spill Indicators - Year 2024

Spill Size	Spill Source									
	P/L		Platforms		Wells		Platforms and Wells		All	
	Year 2024 Spill Frequency per 10^3 years									
Small and Medium Spills 50-999 bbl	17.366	59%	10.236	86%	1.019	11%	11.255	53%	28.621	56%
Large Spills 1000-9999 bbl	9.307	31%	0.866	7%	3.056	33%	3.923	18%	13.230	26%
Huge Spills =>10000 bbl	2.962	10%	0.866	7%	5.169	56%	6.035	28%	8.997	18%
Significant Spills =>1000 bbl	12.268	41%	1.733	14%	8.225	89%	9.958	47%	22.226	44%
All Spills	**29.635**	**100%**	**11.969**	**100%**	**9.244**	**100%**	**21.212**	**100%**	**50.847**	**100%**
	Year 2024 Spill Frequency per 10^9 bbl produced									
Small and Medium Spills 50-999 bbl	0.212	59%	0.125	86%	0.012	11%	0.137	53%	0.349	56%
Large Spills 1000-9999 bbl	0.113	31%	0.011	7%	0.037	33%	0.048	18%	0.161	26%
Huge Spills =>10000 bbl	0.036	10%	0.011	7%	0.063	56%	0.074	28%	0.110	18%
Significant Spills =>1000 bbl	0.150	41%	0.021	14%	0.100	89%	0.121	47%	0.271	44%
All Spills	**0.361**	**100%**	**0.146**	**100%**	**0.113**	**100%**	**0.259**	**100%**	**0.620**	**100%**
	Year 2024 Spill Index [bbl]									
Small and Medium Spills 50-999 bbl	7	7%	5	32%	1	0%	5	1%	12	2%
Large Spills 1000-9999 bbl	48	48%	5	34%	38	6%	43	6%	91	12%
Huge Spills =>10000 bbl	46	45%	5	34%	631	94%	636	93%	682	87%
Significant Spills =>1000 bbl	94	93%	10	68%	669	100%	679	99%	773	98%
All Spills	**101**	**100%**	**14**	**100%**	**670**	**100%**	**684**	**100%**	**785**	**100%**

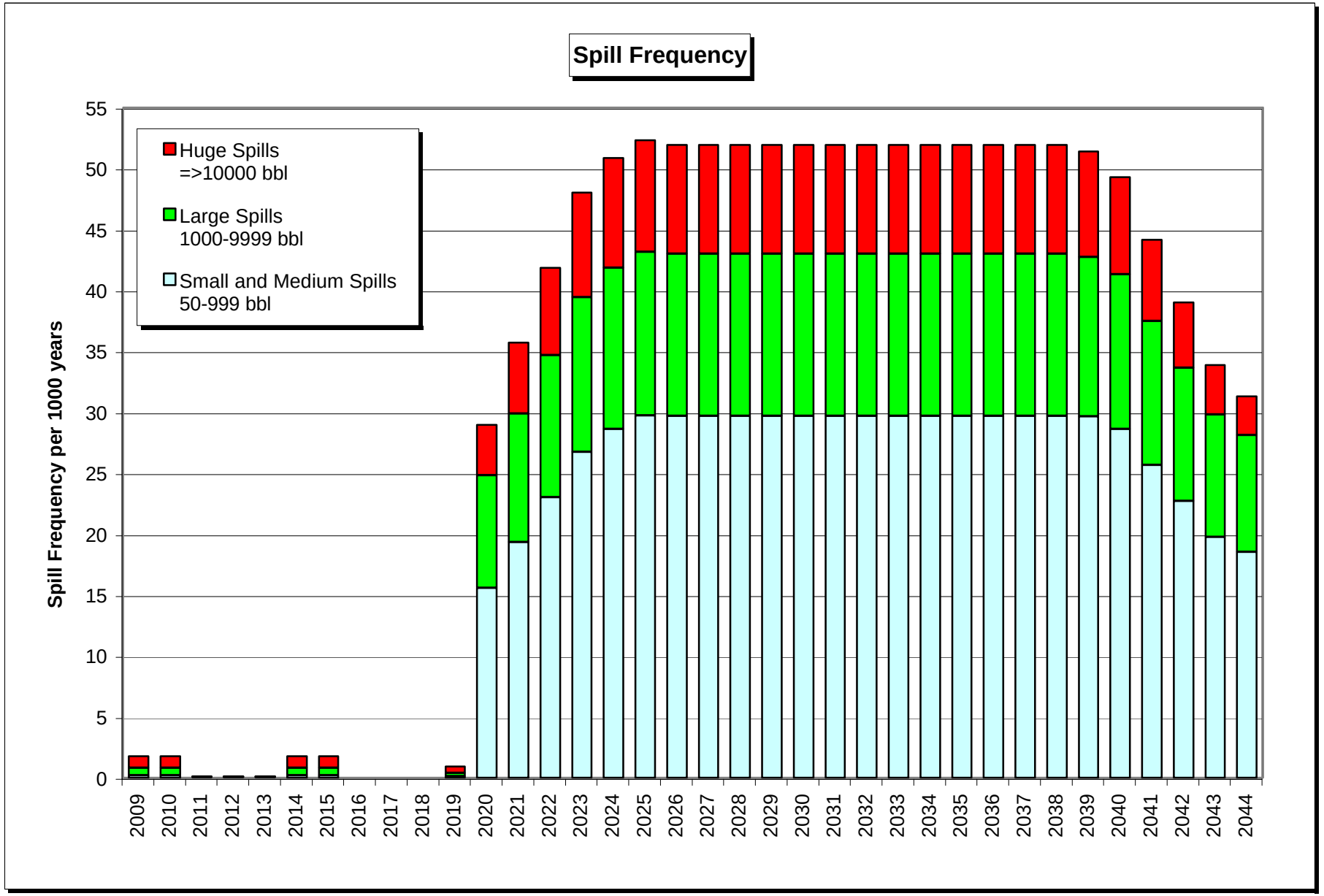
Spill Source	Spill Size									
	S+M 50-999 bbl		Large 1000-9999 bbl		Huge =>10000 bbl		Significant =>1000 bbl		All Spills	
	Year 2024 Spill Frequency per 10^3 years									
P/L	17.366	61%	9.307	70%	2.962	33%	12.268	55%	29.635	58%
Platforms	10.236	36%	0.866	7%	0.866	10%	1.733	8%	11.969	24%
Wells	1.019	4%	3.056	23%	5.169	57%	8.225	37%	9.244	18%
Platforms and Wells	11.255	39%	3.923	30%	6.035	67%	9.958	45%	21.212	42%
All	**28.621**	**100%**	**13.230**	**100%**	**8.997**	**100%**	**22.226**	**100%**	**50.847**	**100%**
	Year 2024 Spill Frequency per 10^9 bbl produced									
P/L	0.212	61%	0.113	70%	0.036	33%	0.150	55%	0.361	58%
Platforms	0.125	36%	0.011	7%	0.011	10%	0.021	8%	0.146	24%
Wells	0.012	4%	0.037	23%	0.063	57%	0.100	37%	0.113	18%
Platforms and Wells	0.137	39%	0.048	30%	0.074	67%	0.121	45%	0.259	42%
All	**0.349**	**100%**	**0.161**	**100%**	**0.110**	**100%**	**0.271**	**100%**	**0.620**	**100%**
	Year 2024 Spill Index [bbl]									
P/L	7	56%	48	53%	46	7%	94	12%	101	13%
Platforms	5	39%	5	5%	5	1%	10	1%	14	2%
Wells	1	4%	38	42%	631	93%	669	87%	670	85%
Platforms and Wells	5	44%	43	47%	636	93%	679	88%	684	87%
All	**12**	**100%**	**91**	**100%**	**682**	**100%**	**773**	**100%**	**785**	**100%**

Table 4.1.21
Composition of Spill Indicators - LOF Average

Spill Size	Spill Source									
	P/L		Platforms		Wells		Platforms and Wells		All	
	LOF Average Spill Frequency per 10^3 years									
Small and Medium Spills 50-999 bbl	11.854	58%	6.296	86%	0.599	11%	6.895	54%	18.750	57%
Large Spills 1000-9999 bbl	6.404	32%	0.533	7%	1.798	33%	2.331	18%	8.735	26%
Huge Spills =>10000 bbl	2.042	10%	0.533	7%	3.004	56%	3.536	28%	5.578	17%
Significant Spills =>1000 bbl	8.446	42%	1.066	14%	4.802	89%	5.867	46%	14.313	43%
All Spills	**20.301**	**100%**	**7.362**	**100%**	**5.401**	**100%**	**12.763**	**100%**	**33.063**	**100%**
	LOF Average Spill Frequency per 10^9 bbl produced									
Small and Medium Spills 50-999 bbl	0.427	58%	0.227	86%	0.022	11%	0.248	54%	0.675	57%
Large Spills 1000-9999 bbl	0.230	32%	0.019	7%	0.065	33%	0.084	18%	0.314	26%
Huge Spills =>10000 bbl	0.073	10%	0.019	7%	0.108	56%	0.127	28%	0.201	17%
Significant Spills =>1000 bbl	0.304	42%	0.038	14%	0.173	89%	0.211	46%	0.515	43%
All Spills	**0.730**	**100%**	**0.265**	**100%**	**0.194**	**100%**	**0.459**	**100%**	**1.190**	**100%**
	LOF Average Spill Index [bbl]									
Small and Medium Spills 50-999 bbl	5	7%	3	32%	0	0%	3	1%	8	2%
Large Spills 1000-9999 bbl	33	48%	3	34%	22	6%	25	6%	58	13%
Huge Spills =>10000 bbl	32	46%	3	34%	365	94%	368	93%	399	86%
Significant Spills =>1000 bbl	65	93%	6	68%	387	100%	393	99%	458	98%
All Spills	**69**	**100%**	**9**	**100%**	**387**	**100%**	**396**	**100%**	**465**	**100%**

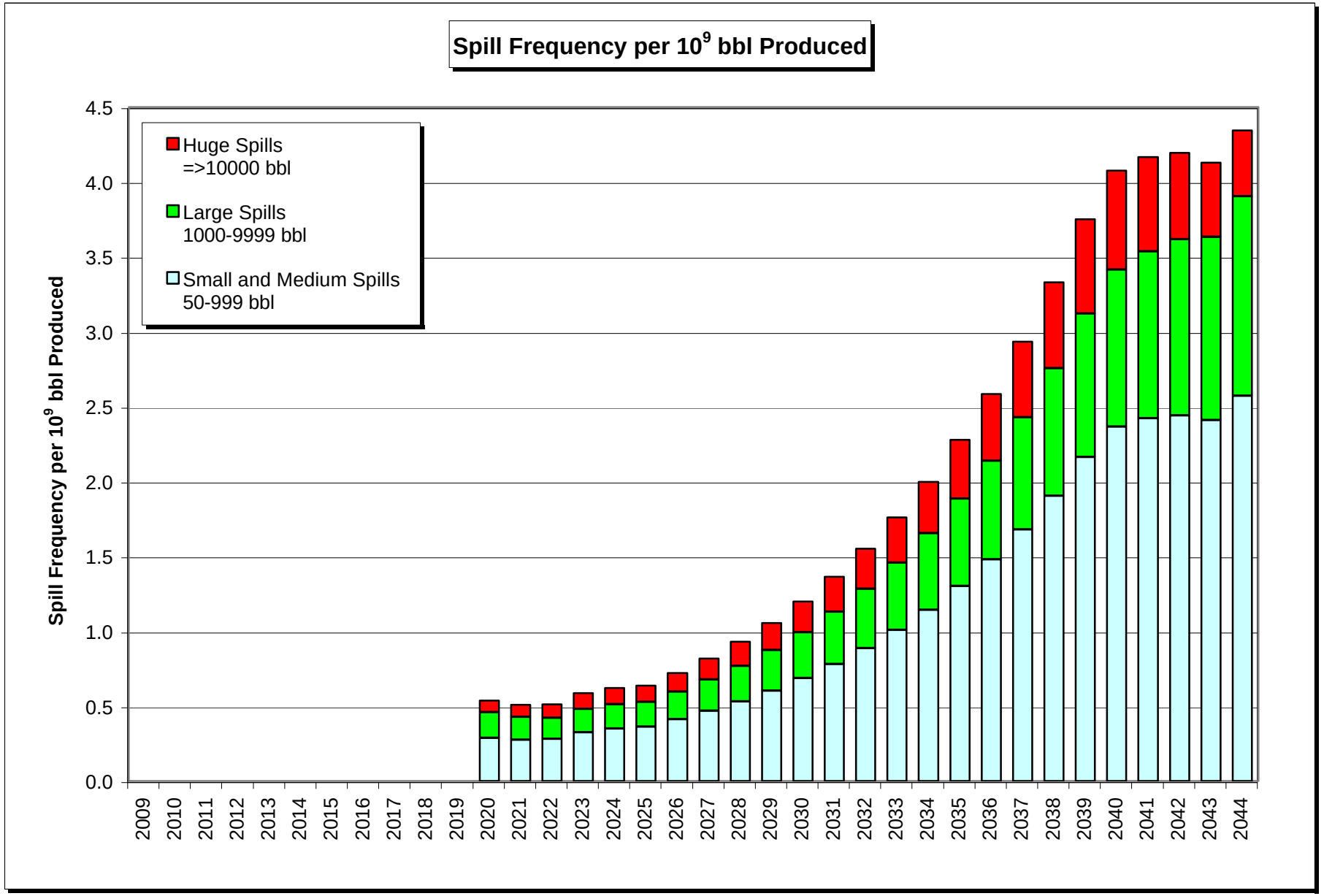
Spill Source	Spill Size									
	S+M 50-999 bbl		Large 1000-9999 bbl		Huge =>10000 bbl		Significant =>1000 bbl		All Spills	
	LOF Average Spill Frequency per 10^3 years									
P/L	11.854	63%	6.404	73%	2.042	37%	8.446	59%	20.301	61%
Platforms	6.296	34%	0.533	6%	0.533	10%	1.066	7%	7.362	22%
Wells	0.599	3%	1.798	21%	3.004	54%	4.802	34%	5.401	16%
Platforms and Wells	6.895	37%	2.331	27%	3.536	63%	5.867	41%	12.763	39%
All	**18.750**	**100%**	**8.735**	**100%**	**5.578**	**100%**	**14.313**	**100%**	**33.063**	**100%**
	LOF Average Spill Frequency per 10^9 bbl produced									
P/L	0.427	63%	0.230	73%	0.073	37%	0.304	59%	0.730	61%
Platforms	0.227	34%	0.019	6%	0.019	10%	0.038	7%	0.265	22%
Wells	0.022	3%	0.065	21%	0.108	54%	0.173	34%	0.194	16%
Platforms and Wells	0.248	37%	0.084	27%	0.127	63%	0.211	41%	0.459	39%
All	**0.675**	**100%**	**0.314**	**100%**	**0.201**	**100%**	**0.515**	**100%**	**1.190**	**100%**
	LOF Average Spill Index [bbl]									
P/L	5	59%	33	57%	32	8%	65	14%	69	15%
Platforms	3	37%	3	5%	3	1%	6	1%	9	2%
Wells	0	4%	22	38%	365	91%	387	85%	387	83%
Platforms and Wells	3	41%	25	43%	368	92%	393	86%	396	85%
All	**8**	**100%**	**58**	**100%**	**399**	**100%**	**458**	**100%**	**465**	**100%**

Figure 4.1.1



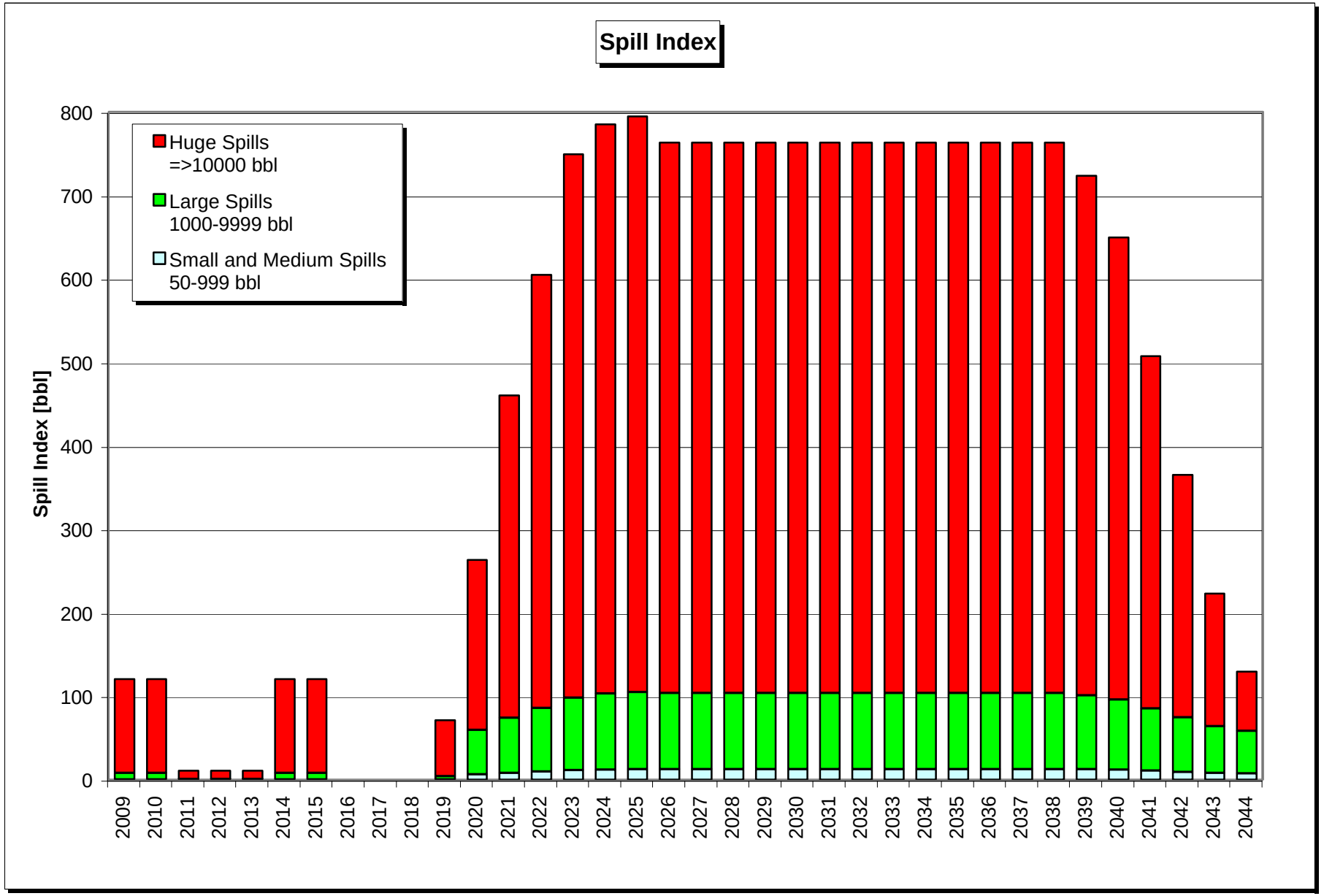
C4_1ChukchiSea.xlsF4101

Figure 4.1.2



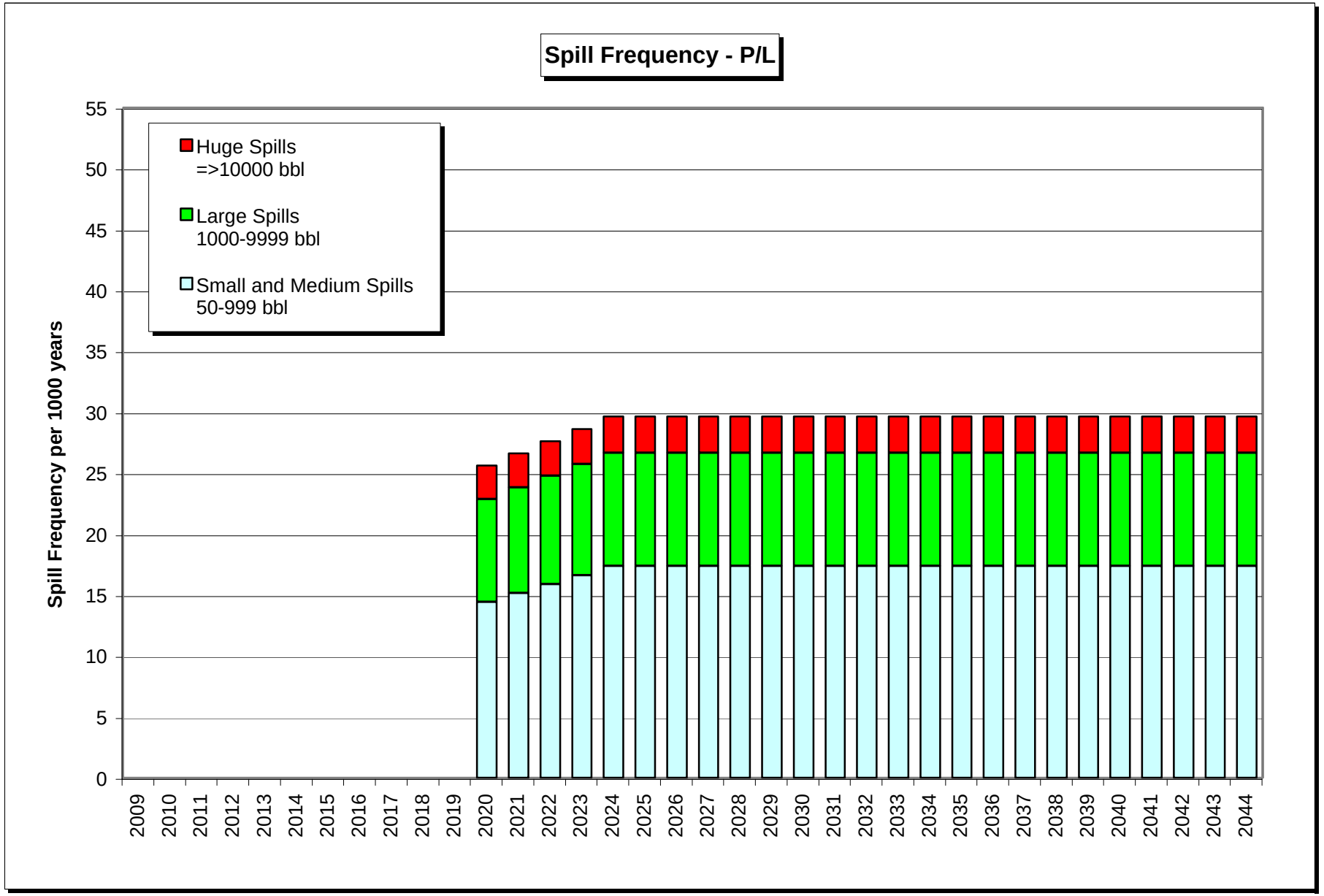
C4_1ChukchiSea.xlsF4102

Figure 4.1.3



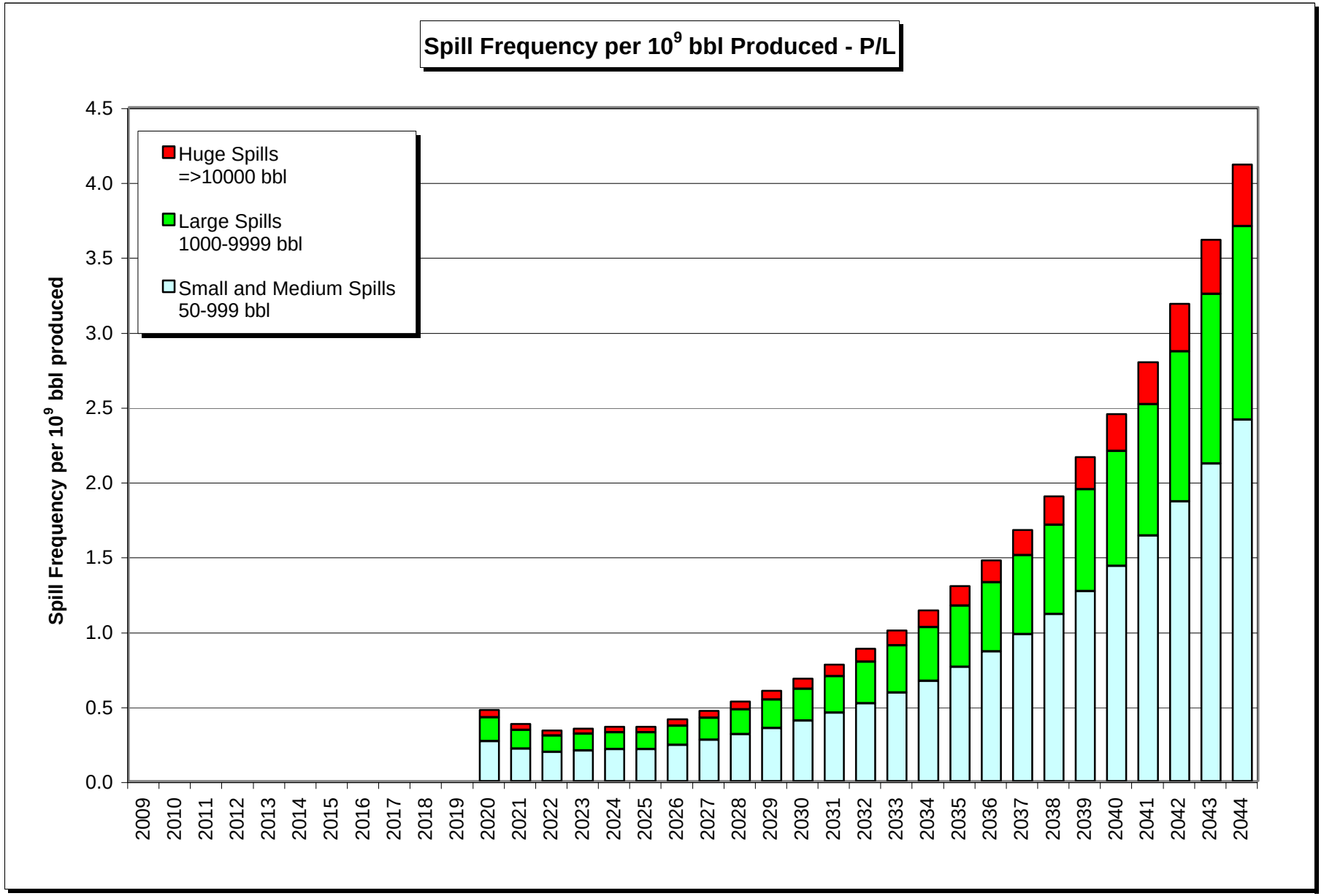
C4_1ChukchiSea.xlsF4103

Figure 4.1.4



C4_1ChukchiSea.xlsF4104

Figure 4.1.5



C4_1ChukchiSea.xlsF4105

Figure 4.1.6

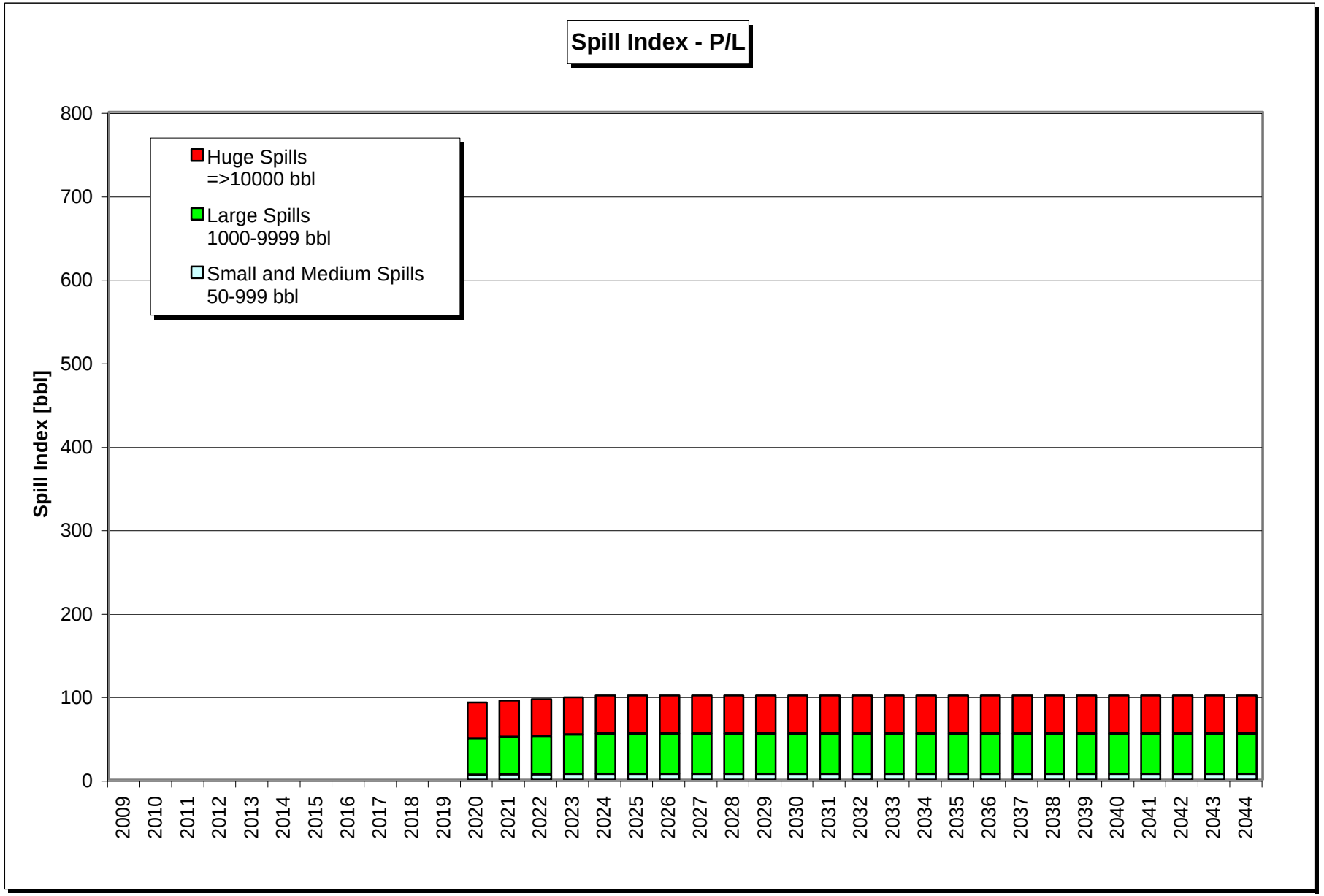
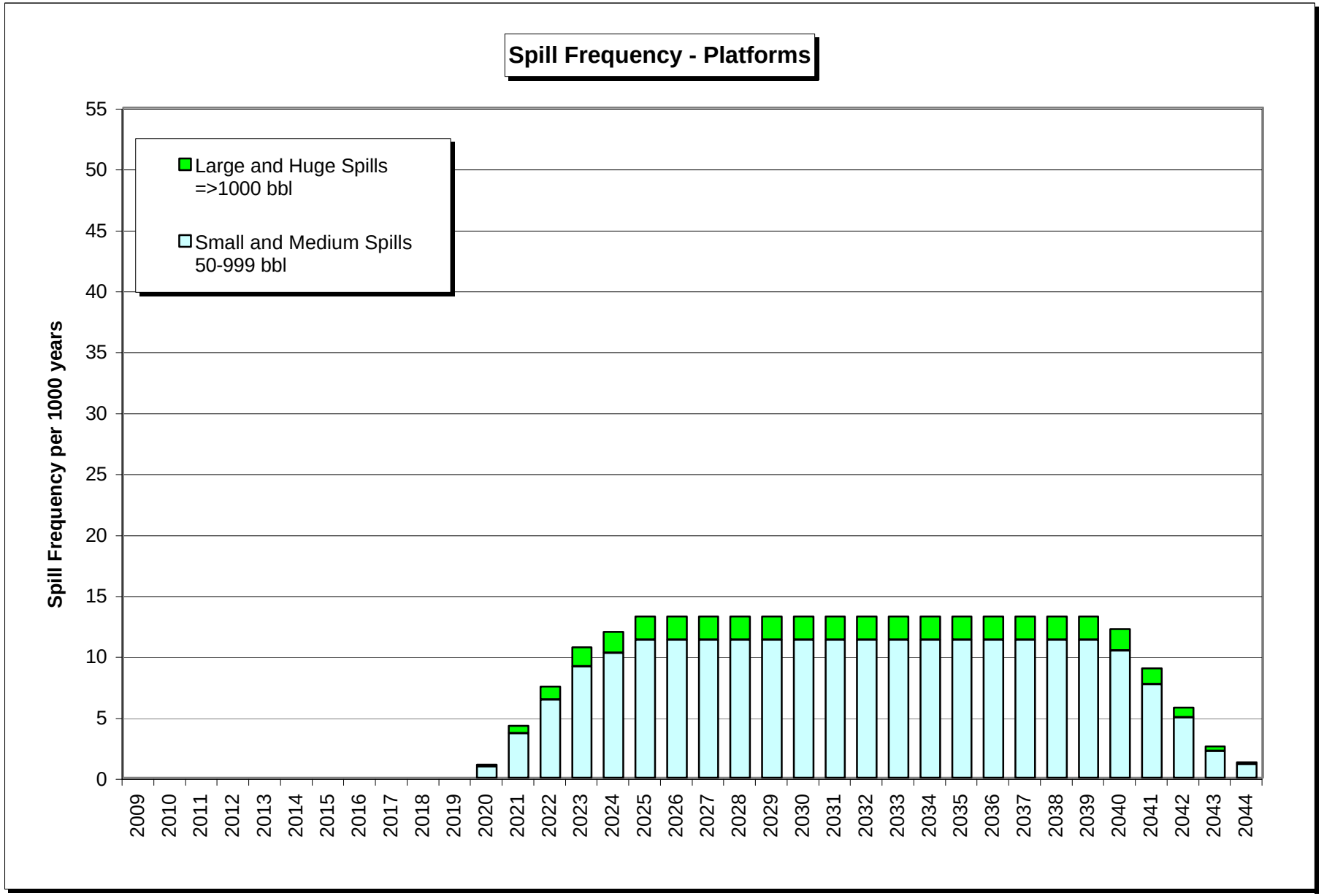
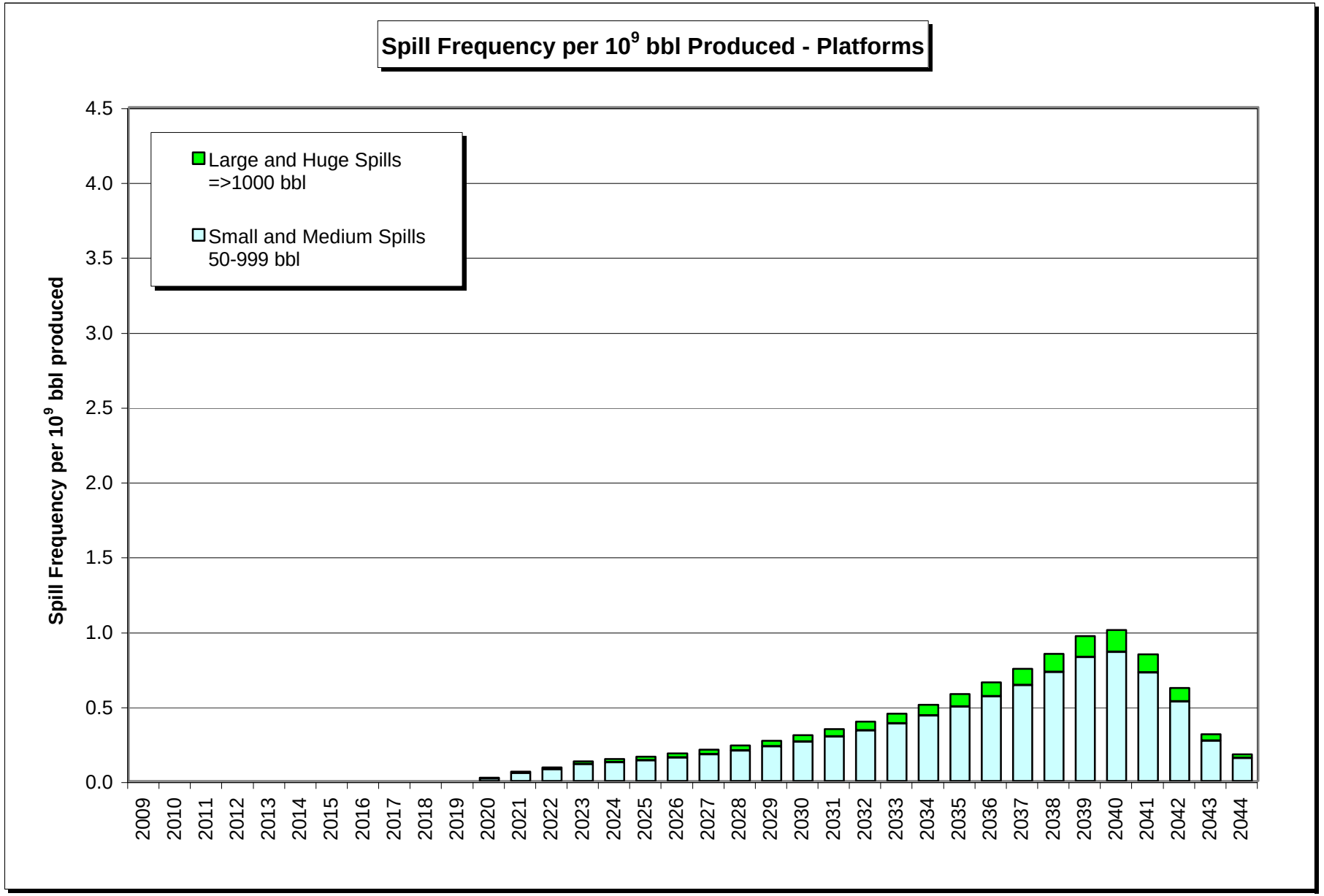

Spill Index - P/L
Huge Spills
=>10000 bbl
Large Spills
1000-9999 bbl
Small and Medium Spills
50-999 bbl
Spill Index [bbl]
800
700
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044

Figure 4.1.7



C4_1ChukchiSea.xlsF4107

Figure 4.1.8



C4_1ChukchiSea.xlsF4108

Figure 4.1.9

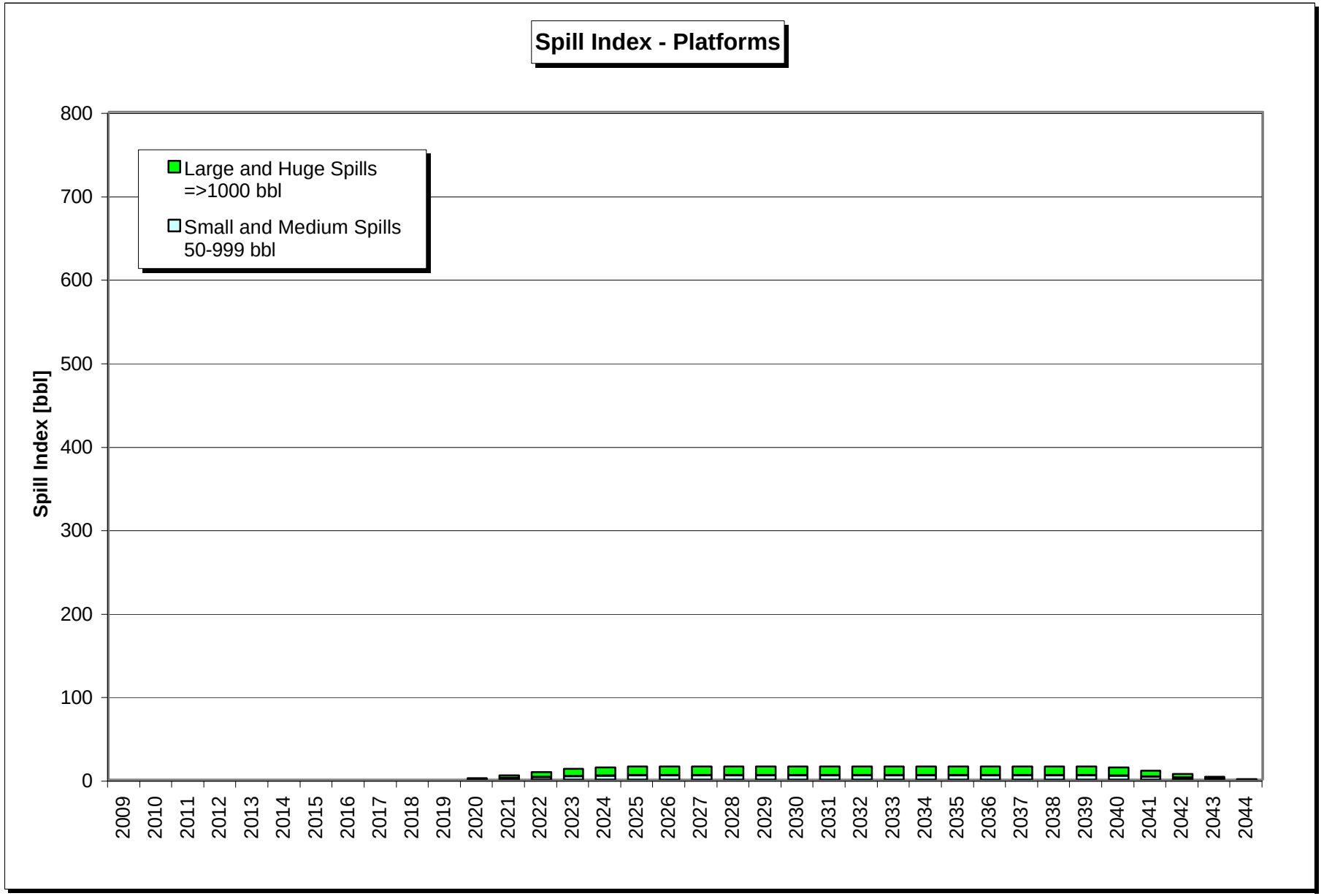
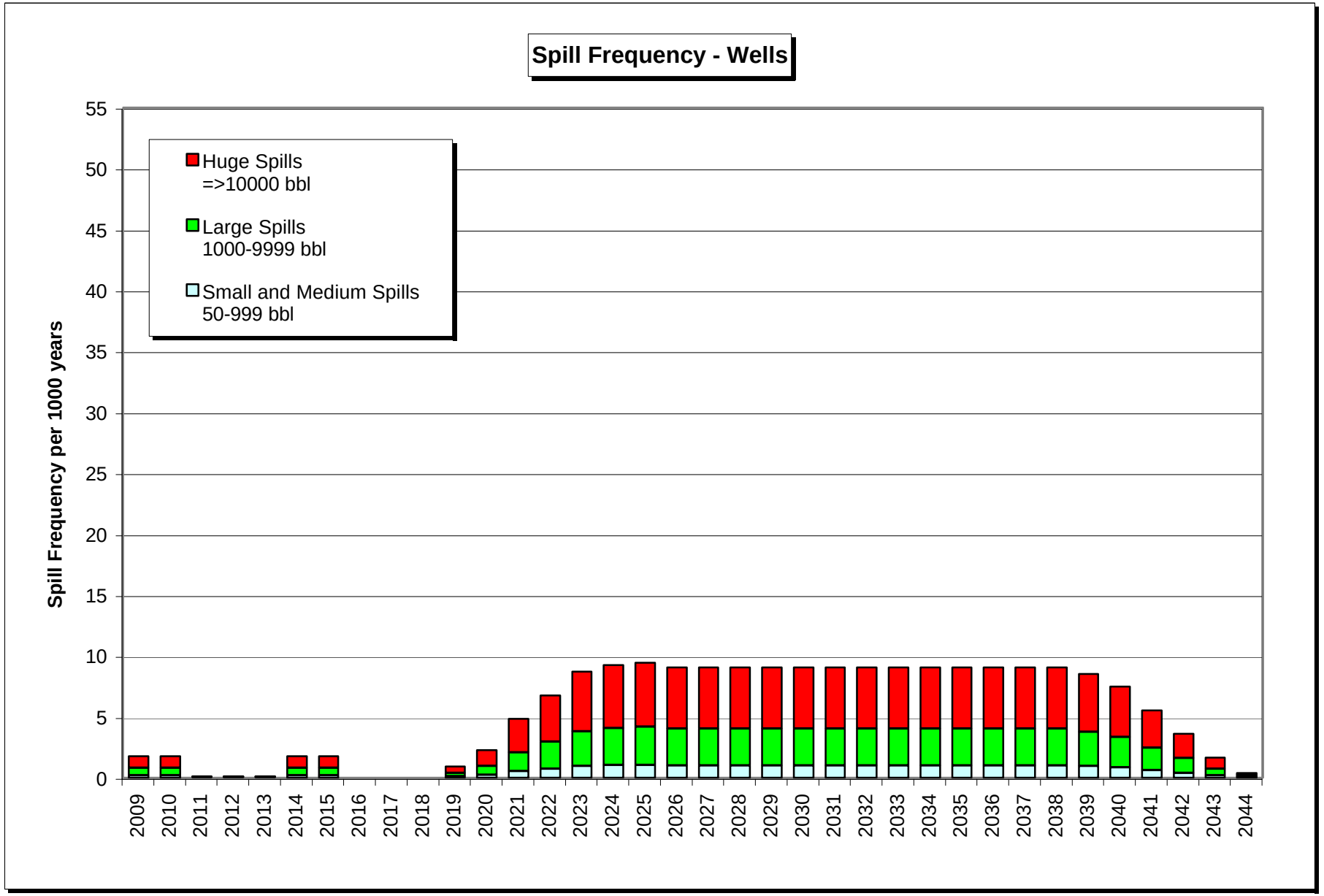
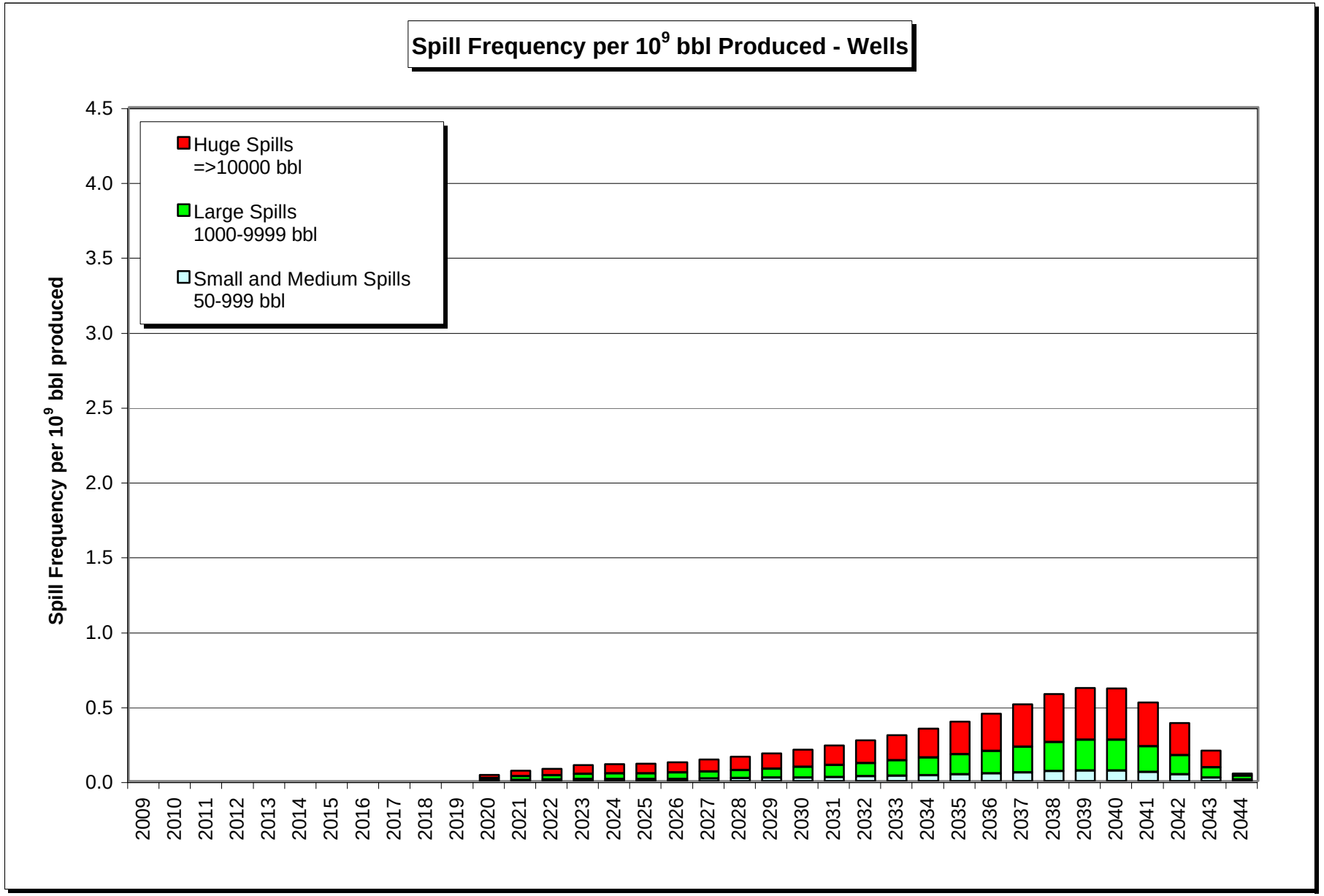

Spill Index - Platforms
Large and Huge Spills =>1000 bbl
Small and Medium Spills 50-999 bbl
Spill Index [bbl]
800
700
600
500
400
300
200
100
0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044

Figure 4.1.10



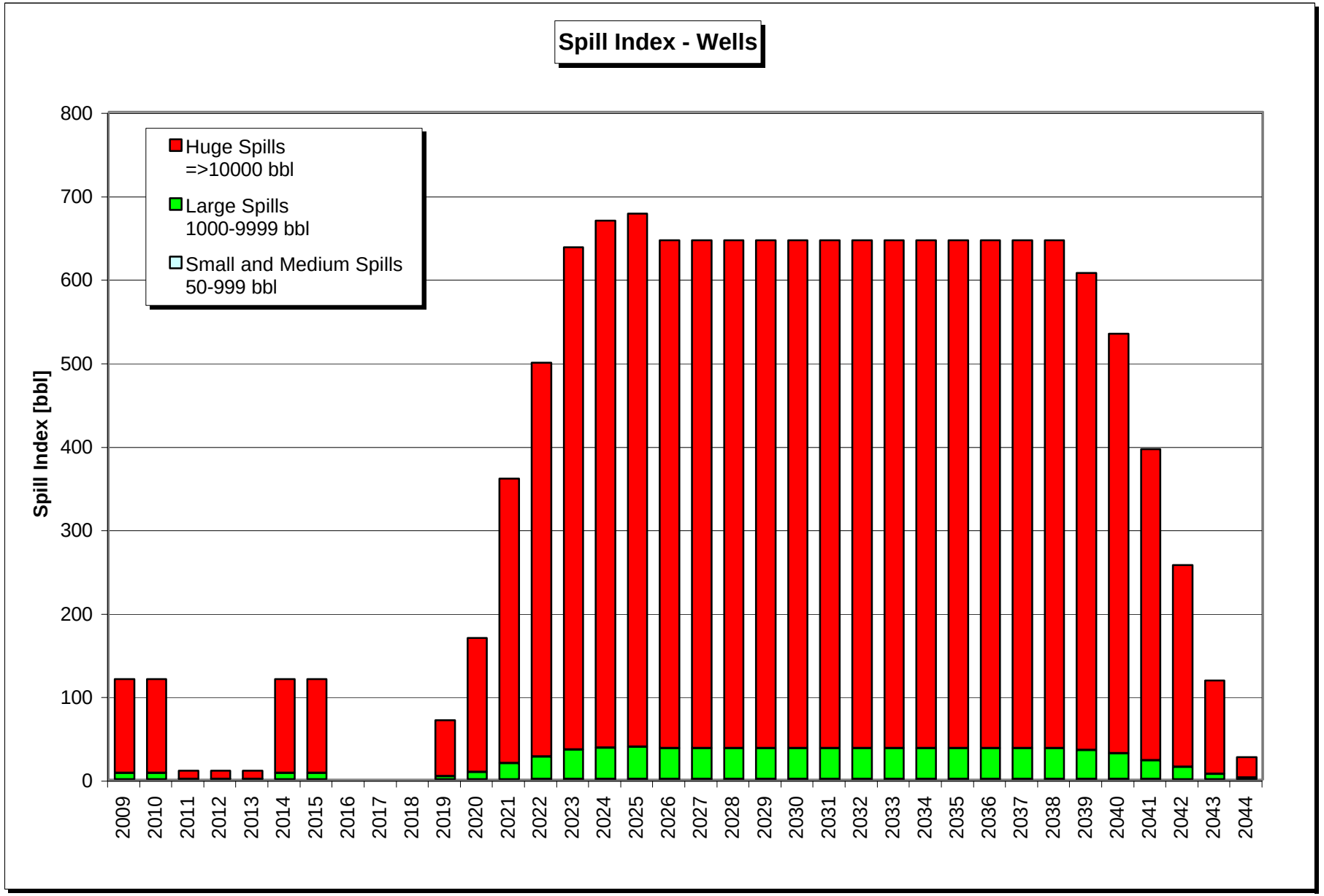
C4_1ChukchiSea.xlsF4110

Figure 4.1.11



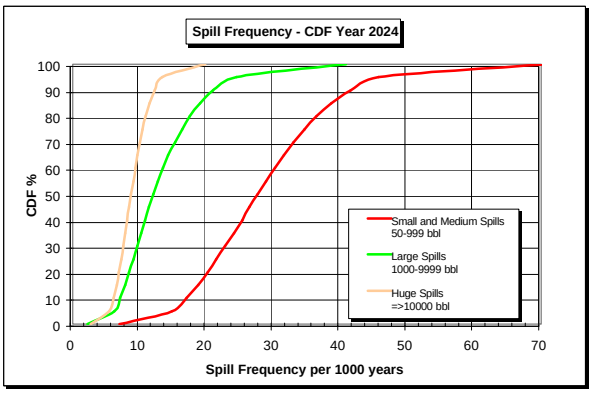
C4_1ChukchiSea.xlsF4111

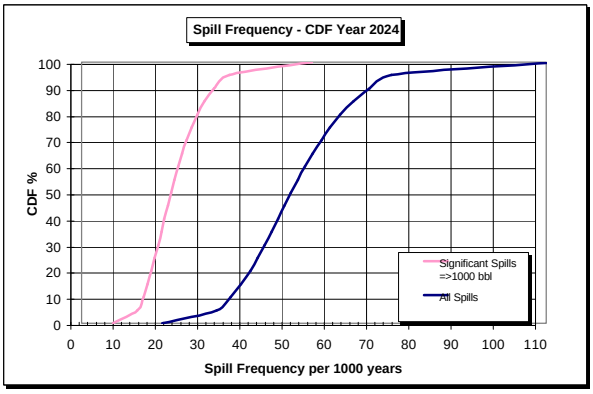
Figure 4.1.12

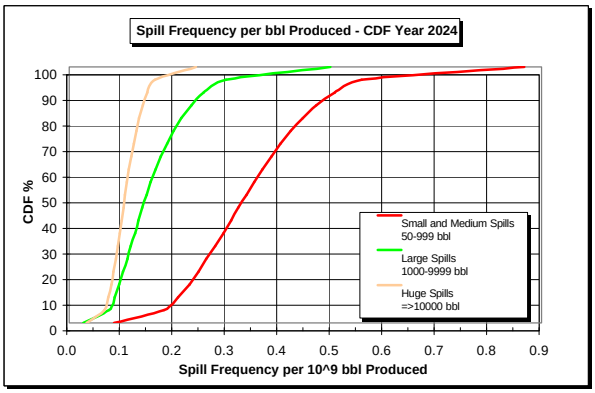


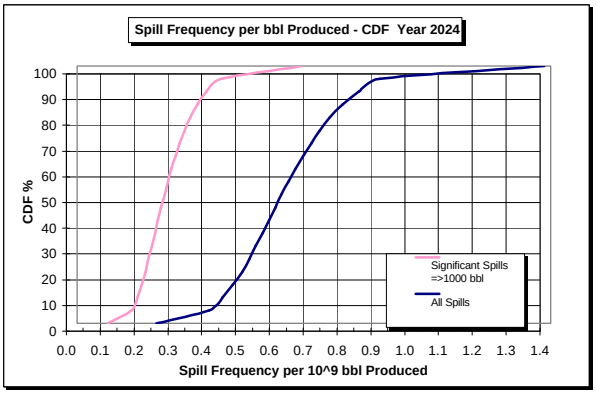
C4_1ChukchiSea.xlsF4112

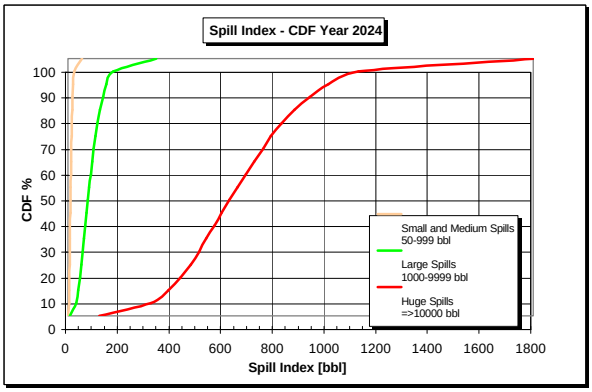
Figure 4.1.13
Spill Indicators - CDF - Year 2024











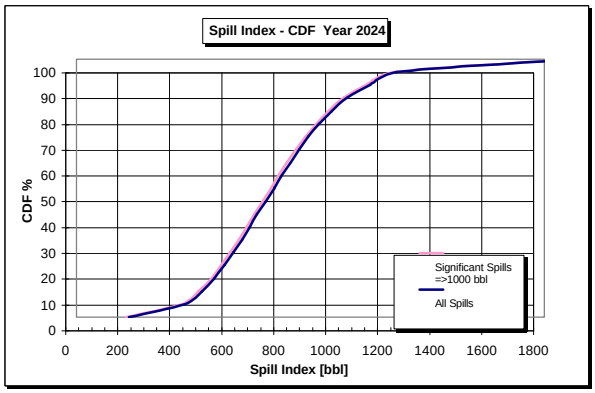
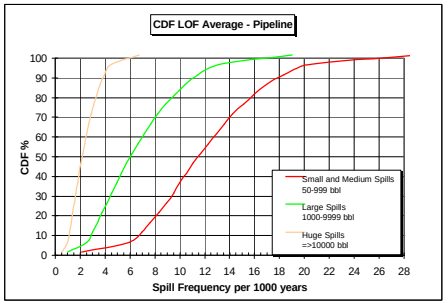
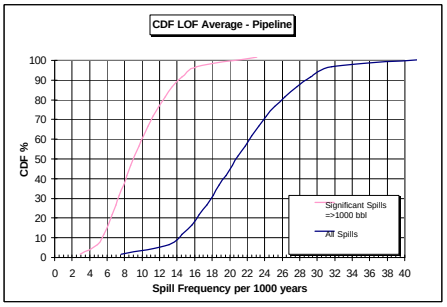
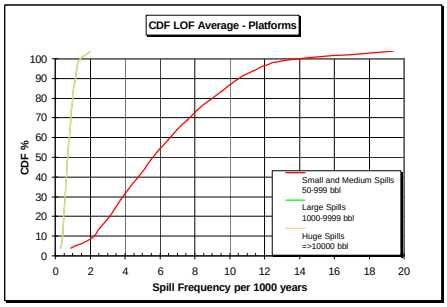
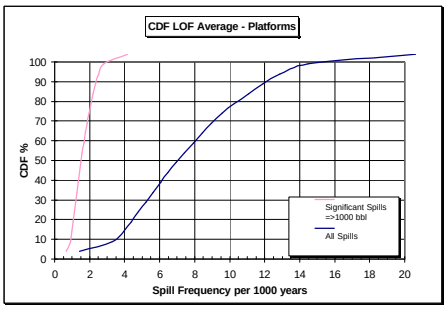


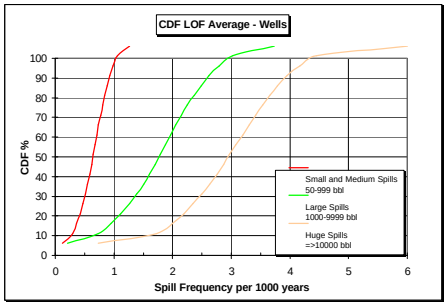
Figure 4.1.14
Spill Frequency - CDF

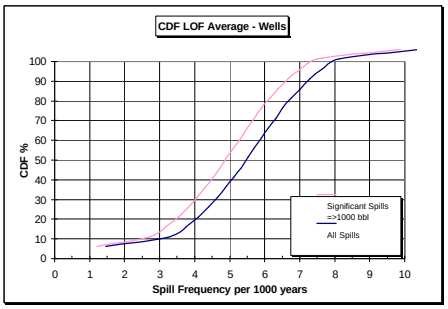


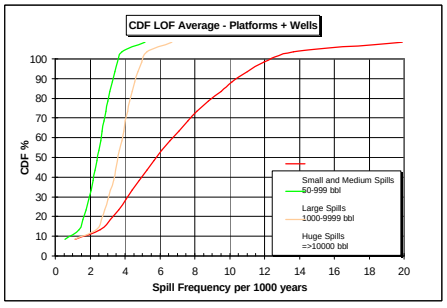


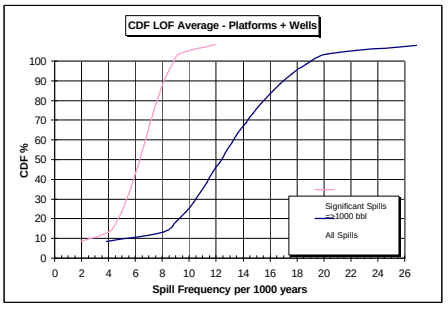


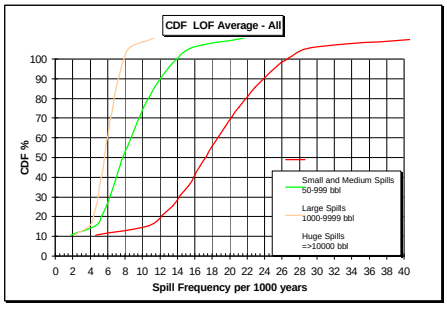












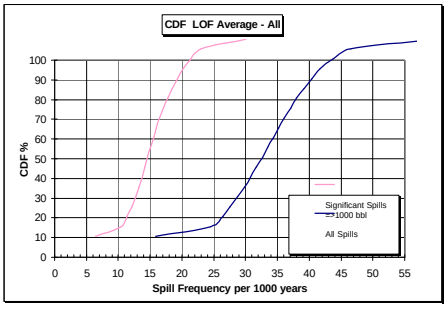
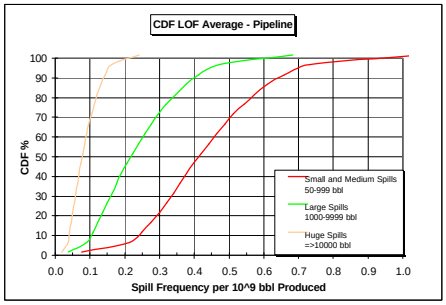
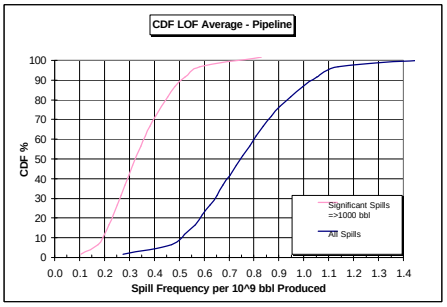
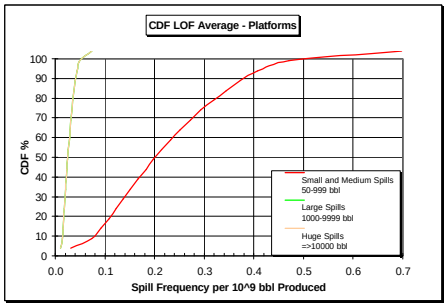
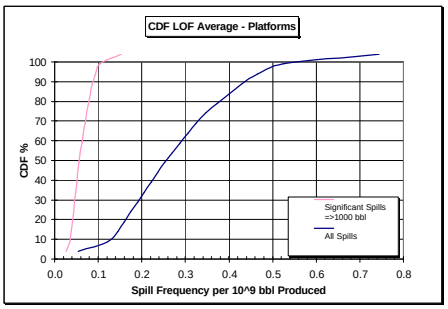


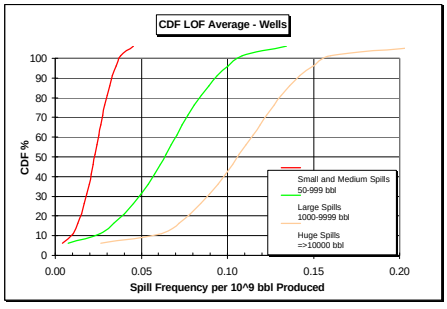
Figure 4.1.15
Spill Frequency per bbl produced - CDF

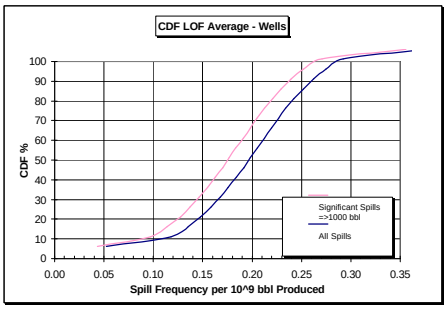


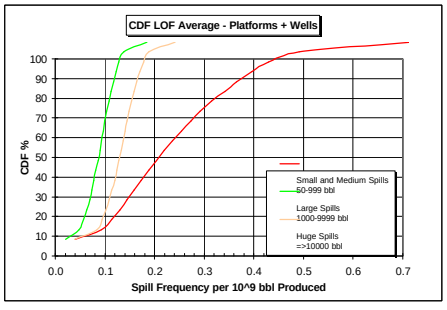


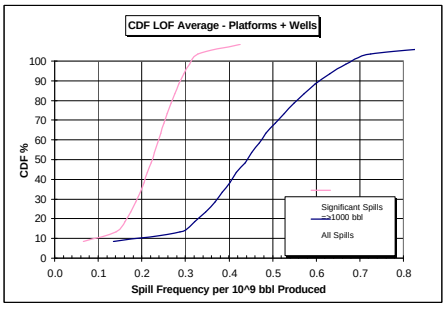


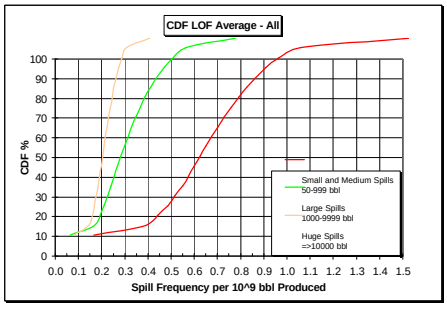












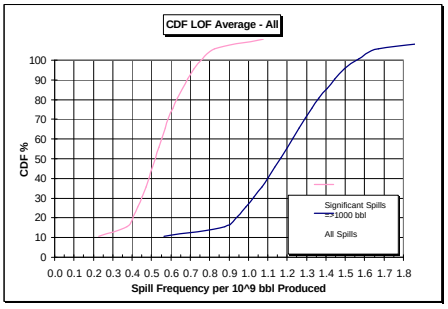
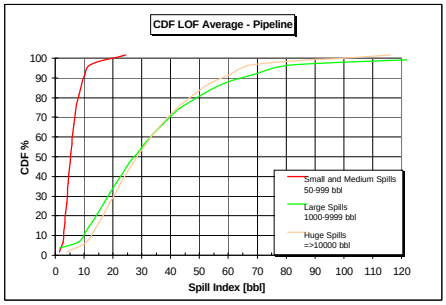
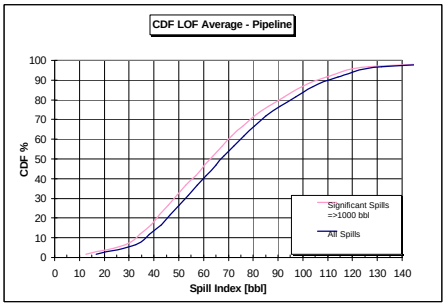
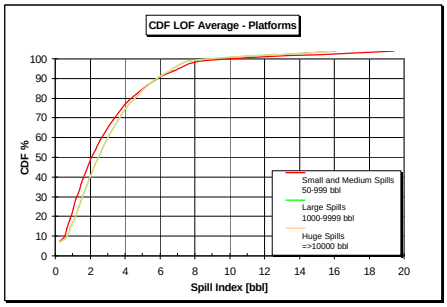
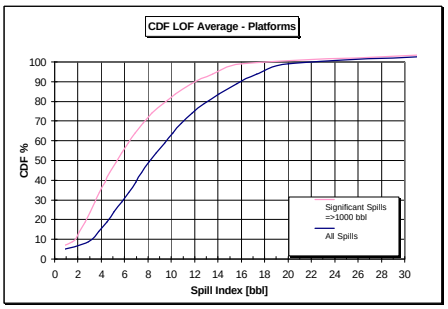


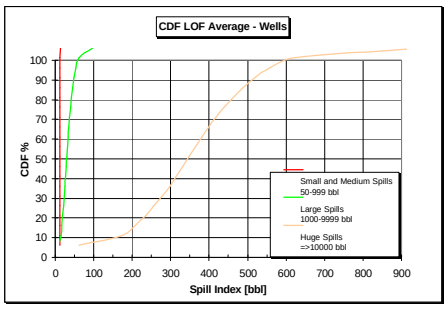
Figure 4.1.16
Spill Index [bbl] - CDF

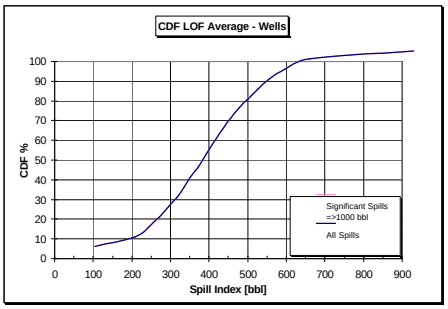


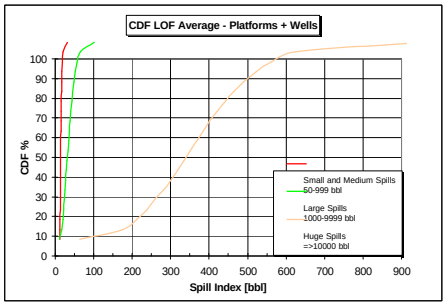


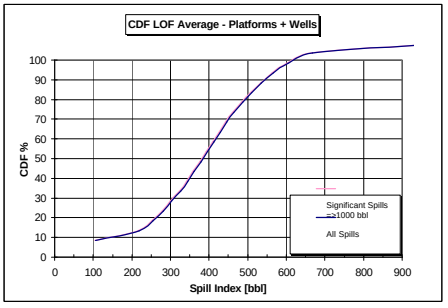


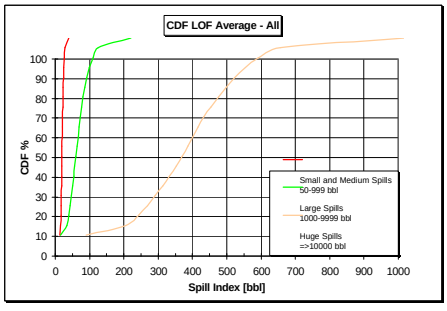












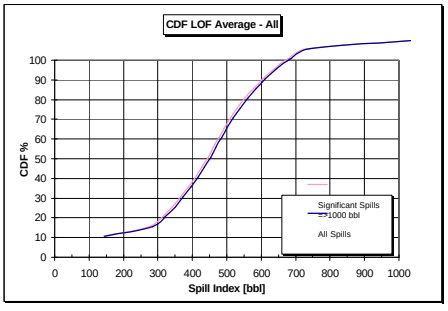
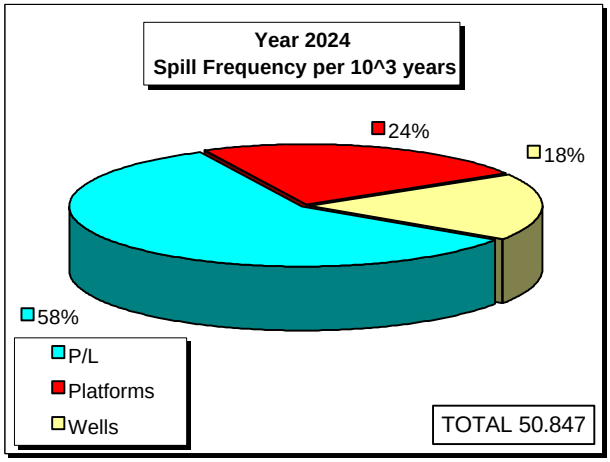
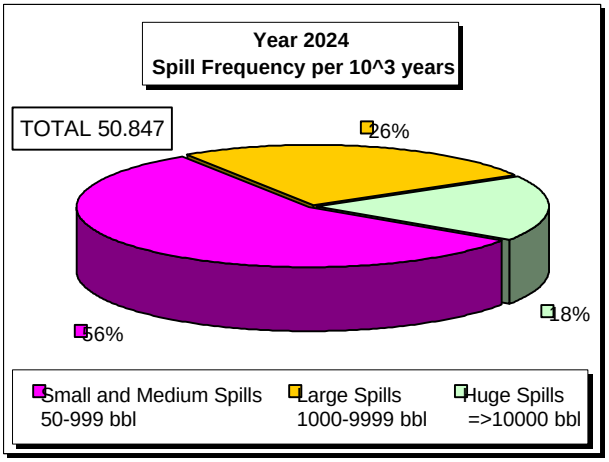


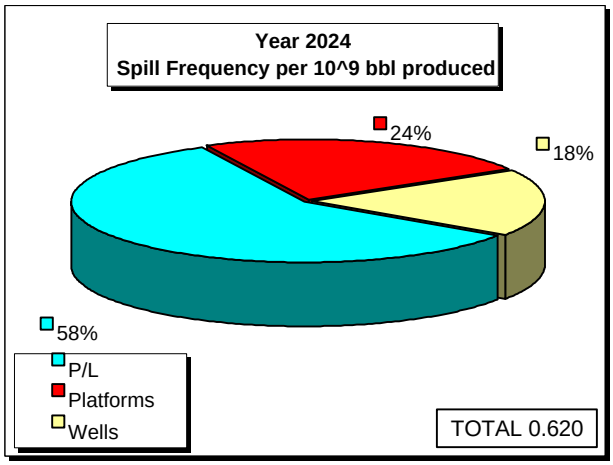
Figure 4.1.17
Year 2024 - Spill Indicators

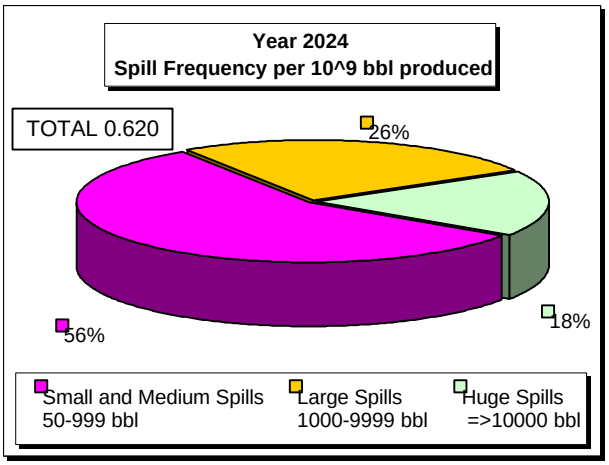
BY SPILL SOURCE

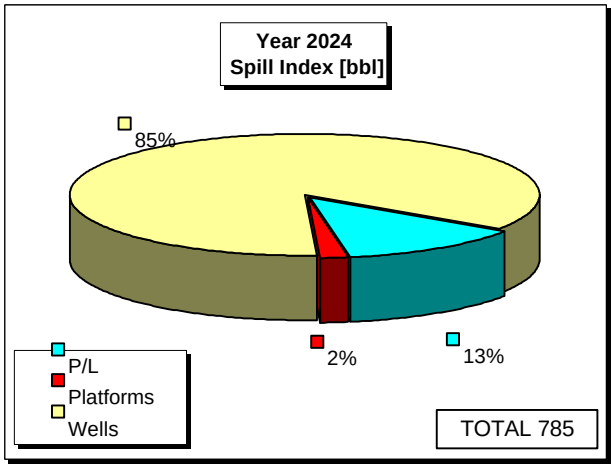


BY SPILL SIZE









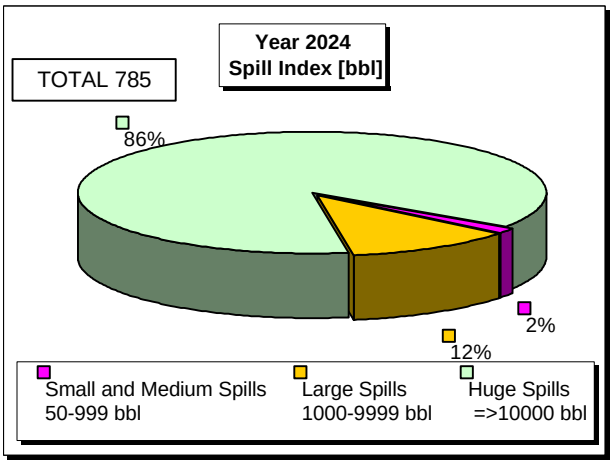
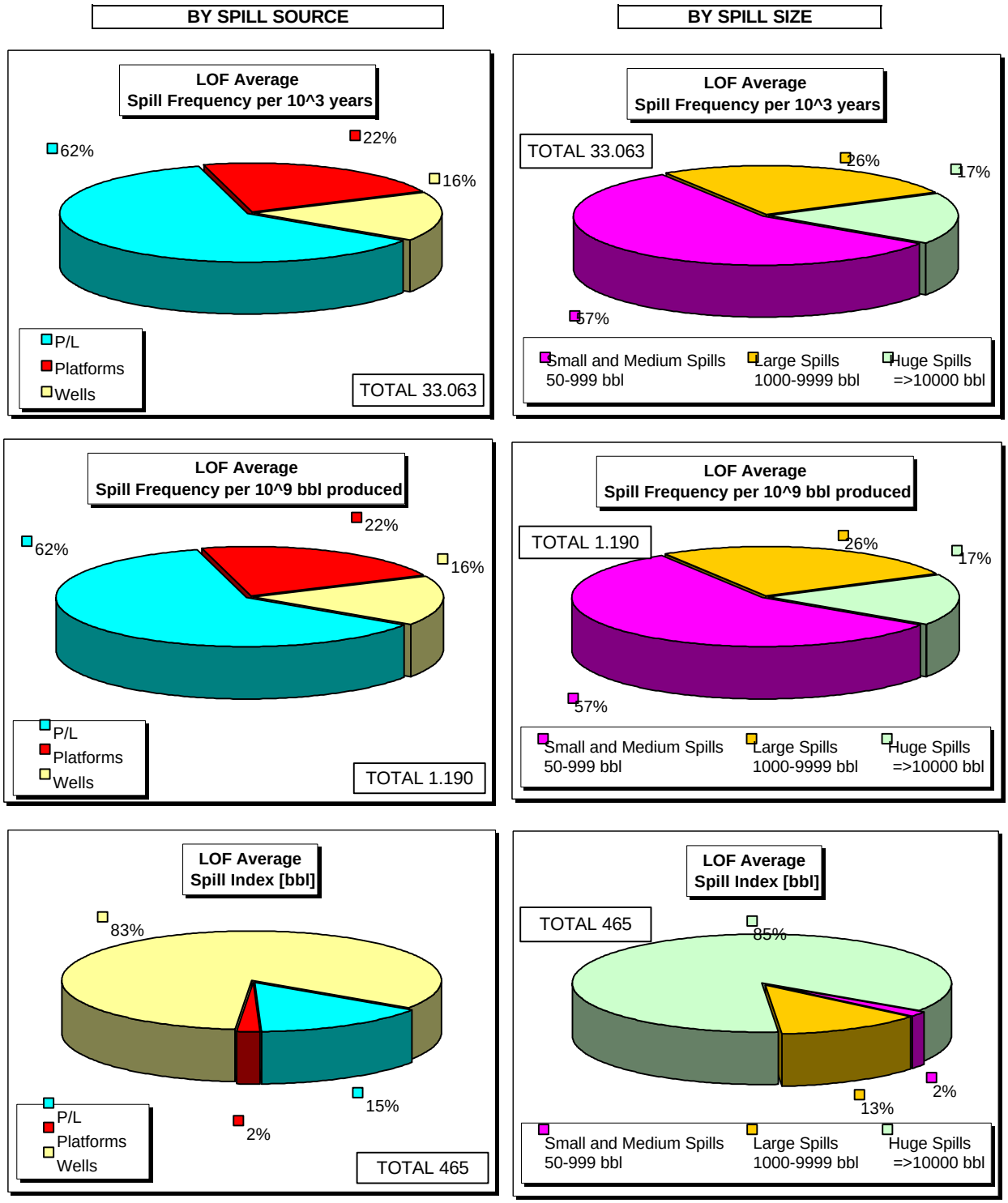


Figure 4.1.18
LOF Average Spill Indicators



APPENDIX 4
Spill Occurrence

4.2
Arctic Spill Occurrence
Chukchi Sea Non-Arctic

Table 4.2.1
Non Arctic Spill Occurrence Chukchi Sea P/L

Year	Water Depth	P/L Dia <10"													P/L Dia >= 10"											
		P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl		
			Expected Spill [bbl] =		71	Expected Spill [bbl] =		485	Expected Spill [bbl] =		5279	Expected Spill [bbl] =		14880		Expected Spill [bbl] =		71	Expected Spill [bbl] =		516	Expected Spill [bbl] =		5176	Expected Spill [bbl] =		15552
		Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2010	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2011	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2012	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2013	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2014	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2015	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2016	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2017	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2018	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2019	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Deep		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Total																										
2020	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	10	5.172	0.832	0.06	9.051	1.456	0.71	5.172	0.832	4.39	1.293	0.208	3.10	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	10		**0.832**	**0.06**		**1.456**	**0.71**		**0.832**	**4.39**		**0.208**	**3.10**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2021	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	15	5.172	1.248	0.09	9.051	2.184	1.06	5.172	1.248	6.59	1.293	0.312	4.64	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	15		**1.248**	**0.09**		**2.184**	**1.06**		**1.248**	**6.59**		**0.312**	**4.64**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2022	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	20	5.172	1.664	0.12	9.051	2.913	1.41	5.172	1.664	8.79	1.293	0.416	6.19	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	20		**1.664**	**0.12**		**2.913**	**1.41**		**1.664**	**8.79**		**0.416**	**6.19**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2023	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	25	5.172	2.080	0.15	9.051	3.641	1.77	5.172	2.080	10.98	1.293	0.520	7.74	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	25		**2.080**	**0.15**		**3.641**	**1.77**		**2.080**	**10.98**		**0.520**	**7.74**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2024	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2025	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2026	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2027	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2028	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97

Table 4.2.1
Non Arctic Spill Occurrence Chukchi Sea P/L

Year	Water Depth	P/L Dia <10"													P/L Dia >= 10"											
		P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			P/L [miles]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl		
			Expected Spill [bbl] =		71	Expected Spill [bbl] =		485	Expected Spill [bbl] =		5279	Expected Spill [bbl] =		14880		Expected Spill [bbl] =		71	Expected Spill [bbl] =		516	Expected Spill [bbl] =		5176	Expected Spill [bbl] =		15552
		Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Unif. Dist. MD.	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^5km-year	Frequency spills per 10^3years	Spill Index bbl
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2029	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2030	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2031	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2032	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2033	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2034	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2035	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2036	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2037	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2038	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2039	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2040	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2041	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2042	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2043	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**
2044	Shallow		5.172			9.051			5.172			1.293				3.328			9.985			9.985			3.328		
	Medium		5.172			9.051			5.172			1.293			30	3.328	1.607	0.11	9.985	4.820	2.49	9.985	4.820	24.94	3.328	1.607	24.98
	Deep	30	5.172	2.497	0.18	9.051	4.369	2.12	5.172	2.497	13.18	1.293	0.624	9.29	60	3.328	3.213	0.23	9.985	9.639	4.97	9.985	9.639	49.89	3.328	3.213	49.97
	Total	30		**2.497**	**0.18**		**4.369**	**2.12**		**2.497**	**13.18**		**0.624**	**9.29**	90		**4.820**	**0.34**		**14.459**	**7.46**		**14.459**	**74.83**		**4.820**	**74.95**

Table 4.2.2
Non Arctic Spill Occurrence - P/L - Summary

Year	Production [MMbbl]	Small Spills 50-99 bbl			Medium Spills 100-999 bbl			Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009																						
2010																						
2011																						
2012																						
2013																						
2014																						
2015																						
2016																						
2017																						
2018																						
2019																						
2020	54.0	5.652	0.105	0.402	15.915	0.295	8.166	21.567	0.399	8.568	15.291	0.283	79.227	5.028	0.093	78.049	20.318	0.376	157.276	41.885	0.776	165.844
2021	70.0	6.068	0.087	0.432	16.643	0.238	8.519	22.711	0.324	8.951	15.707	0.224	81.424	5.132	0.073	79.597	20.839	0.298	161.020	43.550	0.622	169.971
2022	82.0	6.484	0.079	0.462	17.371	0.212	8.872	23.855	0.291	9.334	16.123	0.197	83.620	5.236	0.064	81.145	21.359	0.260	164.765	45.214	0.551	174.098
2023	82.0	6.900	0.084	0.491	18.099	0.221	9.225	24.999	0.305	9.716	16.539	0.202	85.817	5.340	0.065	82.692	21.879	0.267	168.509	46.878	0.572	178.225
2024	82.0	7.316	0.089	0.521	18.828	0.230	9.578	26.144	0.319	10.099	16.955	0.207	88.013	5.444	0.066	84.240	22.399	0.273	172.253	48.543	0.592	182.352
2025	82.0	7.316	0.089	0.521	18.828	0.230	9.578	26.144	0.319	10.099	16.955	0.207	88.013	5.444	0.066	84.240	22.399	0.273	172.253	48.543	0.592	182.352
2026	72.2	7.316	0.101	0.521	18.828	0.261	9.578	26.144	0.362	10.099	16.955	0.235	88.013	5.444	0.075	84.240	22.399	0.310	172.253	48.543	0.672	182.352
2027	63.5	7.316	0.115	0.521	18.828	0.296	9.578	26.144	0.412	10.099	16.955	0.267	88.013	5.444	0.086	84.240	22.399	0.353	172.253	48.543	0.764	182.352
2028	55.9	7.316	0.131	0.521	18.828	0.337	9.578	26.144	0.468	10.099	16.955	0.303	88.013	5.444	0.097	84.240	22.399	0.401	172.253	48.543	0.868	182.352
2029	49.2	7.316	0.149	0.521	18.828	0.383	9.578	26.144	0.531	10.099	16.955	0.345	88.013	5.444	0.111	84.240	22.399	0.455	172.253	48.543	0.987	182.352
2030	43.3	7.316	0.169	0.521	18.828	0.435	9.578	26.144	0.604	10.099	16.955	0.392	88.013	5.444	0.126	84.240	22.399	0.517	172.253	48.543	1.121	182.352
2031	38.1	7.316	0.192	0.521	18.828	0.494	9.578	26.144	0.686	10.099	16.955	0.445	88.013	5.444	0.143	84.240	22.399	0.588	172.253	48.543	1.274	182.352
2032	33.5	7.316	0.218	0.521	18.828	0.562	9.578	26.144	0.780	10.099	16.955	0.506	88.013	5.444	0.162	84.240	22.399	0.669	172.253	48.543	1.449	182.352
2033	29.5	7.316	0.248	0.521	18.828	0.638	9.578	26.144	0.886	10.099	16.955	0.575	88.013	5.444	0.185	84.240	22.399	0.759	172.253	48.543	1.646	182.352
2034	26.0	7.316	0.281	0.521	18.828	0.724	9.578	26.144	1.006	10.099	16.955	0.652	88.013	5.444	0.209	84.240	22.399	0.861	172.253	48.543	1.867	182.352
2035	22.8	7.316	0.321	0.521	18.828	0.826	9.578	26.144	1.147	10.099	16.955	0.744	88.013	5.444	0.239	84.240	22.399	0.982	172.253	48.543	2.129	182.352
2036	20.1	7.316	0.364	0.521	18.828	0.937	9.578	26.144	1.301	10.099	16.955	0.844	88.013	5.444	0.271	84.240	22.399	1.114	172.253	48.543	2.415	182.352
2037	17.7	7.316	0.413	0.521	18.828	1.064	9.578	26.144	1.477	10.099	16.955	0.958	88.013	5.444	0.308	84.240	22.399	1.265	172.253	48.543	2.743	182.352
2038	15.6	7.316	0.469	0.521	18.828	1.207	9.578	26.144	1.676	10.099	16.955	1.087	88.013	5.444	0.349	84.240	22.399	1.436	172.253	48.543	3.112	182.352
2039	13.7	7.316	0.534	0.521	18.828	1.374	9.578	26.144	1.908	10.099	16.955	1.238	88.013	5.444	0.397	84.240	22.399	1.635	172.253	48.543	3.543	182.352
2040	12.1	7.316	0.605	0.521	18.828	1.556	9.578	26.144	2.161	10.099	16.955	1.401	88.013	5.444	0.450	84.240	22.399	1.851	172.253	48.543	4.012	182.352
2041	10.6	7.316	0.690	0.521	18.828	1.776	9.578	26.144	2.466	10.099	16.955	1.600	88.013	5.444	0.514	84.240	22.399	2.113	172.253	48.543	4.579	182.352
2042	9.3	7.316	0.787	0.521	18.828	2.024	9.578	26.144	2.811	10.099	16.955	1.823	88.013	5.444	0.585	84.240	22.399	2.408	172.253	48.543	5.220	182.352
2043	8.2	7.316	0.892	0.521	18.828	2.296	9.578	26.144	3.188	10.099	16.955	2.068	88.013	5.444	0.664	84.240	22.399	2.732	172.253	48.543	5.920	182.352
2044	7.2	7.316	1.016	0.521	18.828	2.615	9.578	26.144	3.631	10.099	16.955	2.355	88.013	5.444	0.756	84.240	22.399	3.111	172.253	48.543	6.742	182.352
Total LOF	**1000.5**	**178.7**		**12.7**	**463.4**		**235.9**	**642.2**		**248.7**	**419.7**		**2178.4**	**135.1**		**2090.5**	**554.8**		**4268.9**	**1196.9**		**4517.5**
Average LOF		**4.965**	**0.179**	**0.35**	**12.872**	**0.463**	**6.55**	**17.838**	**0.642**	**6.91**	**11.659**	**0.420**	**60.51**	**3.751**	**0.135**	**58.07**	**15.410**	**0.554**	**118.58**	**33.248**	**1.196**	**125.49**

Table 4.2.3
Non Arctic Spill Occurrence - Platforms

Year	Water Depth	N Platforms	N P Wells	Small and Medium Spills 50-999 bbl			Large and Huge Spills =>1000 bbl		
				Expected Spill [bbl] =		**452**	Expected Spill [bbl] =		**5631**
		Cum.	Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2010	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2011	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2012	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2013	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2014	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2015	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2016	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2017	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2018	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2019	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep			2.157			0.360		
	Total								
2020	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	5	2.157	1.079	0.49	0.360	0.180	1.01
	Total	1	5		**1.079**	**0.49**		**0.180**	**1.01**
2021	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	20	2.157	4.314	1.95	0.360	0.719	4.05
	Total	1	20		**4.314**	**1.95**		**0.719**	**4.05**
2022	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	35	2.157	7.550	3.41	0.360	1.258	7.09
	Total	1	35		**7.550**	**3.41**		**1.258**	**7.09**
2023	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	50	2.157	10.786	4.87	0.360	1.798	10.12
	Total	1	50		**10.786**	**4.87**		**1.798**	**10.12**
2024	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	56	2.157	12.080	5.46	0.360	2.013	11.34
	Total	1	56		**12.080**	**5.46**		**2.013**	**11.34**
2025	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2026	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2027	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2028	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2029	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
	Shallow			2.157			0.360		

Table 4.2.3
Non Arctic Spill Occurrence - Platforms

Year	Water Depth	N Platforms	N P Wells	Small and Medium Spills 50-999 bbl			Large and Huge Spills =>1000 bbl		
				Expected Spill [bbl] =		452	Expected Spill [bbl] =		5631
		Cum.	Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2030	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2031	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2032	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2033	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2034	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2035	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2036	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2037	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2038	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2039	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	62	2.157	13.374	6.04	0.360	2.229	12.55
	Total	1	62		**13.374**	**6.04**		**2.229**	**12.55**
2040	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	57	2.157	12.296	5.56	0.360	2.049	11.54
	Total	1	57		**12.296**	**5.56**		**2.049**	**11.54**
2041	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	42	2.157	9.060	4.09	0.360	1.510	8.50
	Total	1	42		**9.060**	**4.09**		**1.510**	**8.50**
2042	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	27	2.157	5.824	2.63	0.360	0.971	5.47
	Total	1	27		**5.824**	**2.63**		**0.971**	**5.47**
2043	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	12	2.157	2.589	1.17	0.360	0.431	2.43
	Total	1	12		**2.589**	**1.17**		**0.431**	**2.43**
2044	Shallow			2.157			0.360		
	Medium			2.157			0.360		
	Deep	1	6	2.157	1.294	0.58	0.360	0.216	1.21
	Total	1	6		**1.294**	**0.58**		**0.216**	**1.21**

Table 4.2.4
Non Arctic Spill Occurrence - Platforms - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large and Huge Spills =>1000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009													
2010													
2011													
2012													
2013													
2014													
2015													
2016													
2017													
2018													
2019													
2020	54.0	1.079	0.020	0.487	0.180	0.003	1.012	0.180	0.003	1.012	1.258	0.023	1.500
2021	70.0	4.314	0.062	1.950	0.719	0.010	4.049	0.719	0.010	4.049	5.033	0.072	5.999
2022	82.0	7.550	0.092	3.412	1.258	0.015	7.086	1.258	0.015	7.086	8.808	0.107	10.498
2023	82.0	10.786	0.132	4.874	1.798	0.022	10.122	1.798	0.022	10.122	12.583	0.153	14.997
2024	82.0	12.080	0.147	5.459	2.013	0.025	11.337	2.013	0.025	11.337	14.093	0.172	16.796
2025	82.0	13.374	0.163	6.044	2.229	0.027	12.552	2.229	0.027	12.552	15.603	0.190	18.596
2026	72.2	13.374	0.185	6.044	2.229	0.031	12.552	2.229	0.031	12.552	15.603	0.216	18.596
2027	63.5	13.374	0.211	6.044	2.229	0.035	12.552	2.229	0.035	12.552	15.603	0.246	18.596
2028	55.9	13.374	0.239	6.044	2.229	0.040	12.552	2.229	0.040	12.552	15.603	0.279	18.596
2029	49.2	13.374	0.272	6.044	2.229	0.045	12.552	2.229	0.045	12.552	15.603	0.317	18.596
2030	43.3	13.374	0.309	6.044	2.229	0.051	12.552	2.229	0.051	12.552	15.603	0.360	18.596
2031	38.1	13.374	0.351	6.044	2.229	0.059	12.552	2.229	0.059	12.552	15.603	0.410	18.596
2032	33.5	13.374	0.399	6.044	2.229	0.067	12.552	2.229	0.067	12.552	15.603	0.466	18.596
2033	29.5	13.374	0.453	6.044	2.229	0.076	12.552	2.229	0.076	12.552	15.603	0.529	18.596
2034	26.0	13.374	0.514	6.044	2.229	0.086	12.552	2.229	0.086	12.552	15.603	0.600	18.596
2035	22.8	13.374	0.587	6.044	2.229	0.098	12.552	2.229	0.098	12.552	15.603	0.684	18.596
2036	20.1	13.374	0.665	6.044	2.229	0.111	12.552	2.229	0.111	12.552	15.603	0.776	18.596
2037	17.7	13.374	0.756	6.044	2.229	0.126	12.552	2.229	0.126	12.552	15.603	0.882	18.596
2038	15.6	13.374	0.857	6.044	2.229	0.143	12.552	2.229	0.143	12.552	15.603	1.000	18.596
2039	13.7	13.374	0.976	6.044	2.229	0.163	12.552	15.603	1.139	18.596	15.603	1.139	18.596
2040	12.1	12.296	1.016	5.557	2.049	0.169	11.539	14.345	1.186	17.096	14.345	1.186	17.096
2041	10.6	9.060	0.855	4.094	1.510	0.142	8.503	10.570	0.997	12.597	10.570	0.997	12.597
2042	9.3	5.824	0.626	2.632	0.971	0.104	5.466	6.795	0.731	8.098	6.795	0.731	8.098
2043	8.2	2.589	0.316	1.170	0.431	0.053	2.429	3.020	0.368	3.599	3.020	0.368	3.599
2044	7.2	1.294	0.180	0.585	0.216	0.030	1.215	1.510	0.210	1.800	1.510	0.210	1.800
Total LOF	**1000.5**	**267.5**		**120.9**	**44.6**		**251.0**	**89.0**		**271.1**	**312.1**		**371.9**
Average LOF		**7.430**	**0.267**	**3.36**	**1.238**	**0.045**	**6.97**	**2.473**	**0.089**	**7.53**	**8.668**	**0.312**	**10.33**

Table 4.2.5
Non Arctic Spill Occurrence - Production Wells

Year	Water Depth	Production Wells Blowout														
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl		
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000
		Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2010	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2011	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2012	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2013	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2014	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2015	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2016	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2017	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2018	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep		0.147			1.026			0.440			0.293		
	Total													
2019	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	6	0.147	0.088	0.05	1.026	0.616	3.26	0.440	0.264	18.03	0.293	0.176	35.18
	Total	6		0.088	**0.05**		0.616	**3.26**		0.264	**18.03**		0.176	**35.18**
2020	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	17	0.147	0.249	0.13	1.026	1.744	9.23	0.440	0.748	51.10	0.293	0.498	99.68
	Total	17		0.249	**0.13**		1.744	**9.23**		0.748	**51.10**		0.498	**99.68**
2021	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	38	0.147	0.557	0.29	1.026	3.899	20.64	0.440	1.671	114.22	0.293	1.114	222.82
	Total	38		0.557	**0.29**		3.899	**20.64**		1.671	**114.22**		1.114	**222.82**
2022	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	59	0.147	0.865	0.45	1.026	6.054	32.04	0.440	2.595	177.34	0.293	1.730	345.95
	Total	59		0.865	**0.45**		6.054	**32.04**		2.595	**177.34**		1.730	**345.95**
2023	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	80	0.147	1.173	0.61	1.026	8.209	43.44	0.440	3.518	240.46	0.293	2.345	469.09
	Total	80		1.173	**0.61**		8.209	**43.44**		3.518	**240.46**		2.345	**469.09**
2024	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	92	0.147	1.349	0.70	1.026	9.440	49.96	0.440	4.046	276.53	0.293	2.697	539.45
	Total	92		1.349	**0.70**		9.440	**49.96**		4.046	**276.53**		2.697	**539.45**
2025	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2026	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**

Table 4.2.5
Non Arctic Spill Occurrence - Production Wells

Year	Water Depth	Production Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl		
			Expected Spill [bbl] =		**519**	Expected Spill [bbl] =		**5292**	Expected Spill [bbl] =		**68349**	Expected Spill [bbl] =		**200000**
		Unif. Dist. MD.	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4well-year	Frequency spills per 10^3years	Spill Index bbl
2027	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2028	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2029	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2030	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2031	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2032	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2033	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2034	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2035	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2036	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2037	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2038	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	98	0.147	1.437	0.75	1.026	10.056	53.22	0.440	4.310	294.57	0.293	2.873	574.64
	Total	98		1.437	**0.75**		10.056	**53.22**		4.310	**294.57**		2.873	**574.64**
2039	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	92	0.147	1.349	0.70	1.026	9.440	49.96	0.440	4.046	276.53	0.293	2.697	539.45
	Total	92		1.349	**0.70**		9.440	**49.96**		4.046	**276.53**		2.697	**539.45**
2040	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	81	0.147	1.187	0.62	1.026	8.312	43.99	0.440	3.562	243.47	0.293	2.375	474.95
	Total	81		1.187	**0.62**		8.312	**43.99**		3.562	**243.47**		2.375	**474.95**
2041	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	60	0.147	0.880	0.46	1.026	6.157	32.58	0.440	2.639	180.35	0.293	1.759	351.82
	Total	60		0.880	**0.46**		6.157	**32.58**		2.639	**180.35**		1.759	**351.82**
2042	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	39	0.147	0.572	0.30	1.026	4.002	21.18	0.440	1.715	117.23	0.293	1.143	228.68
	Total	39		0.572	**0.30**		4.002	**21.18**		1.715	**117.23**		1.143	**228.68**
2043	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	18	0.147	0.264	0.14	1.026	1.847	9.77	0.440	0.792	54.10	0.293	0.528	105.55
	Total	18		0.264	**0.14**		1.847	**9.77**		0.792	**54.10**		0.528	**105.55**
2044	Shallow		0.147			1.026			0.440			0.293		
	Medium		0.147			1.026			0.440			0.293		
	Deep	6	0.147	0.088	0.05	1.026	0.616	3.26	0.440	0.264	18.03	0.293	0.176	35.18
	Total	6		0.088	**0.05**		0.616	**3.26**		0.264	**18.03**		0.176	**35.18**

Table 4.2.6
Non Arctic Spill Occurrence - Production Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-99 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009													
2010													
2011													
2012													
2013													
2014													
2015													
2016													
2017													
2018													
2019		0.088		0.046	0.264		3.258	0.440		53.216	0.792		56.520
2020	54.0	0.249	0.005	0.129	0.748	0.014	9.232	1.246	0.023	150.780	2.243	0.042	160.141
2021	70.0	0.557	0.008	0.289	1.671	0.024	20.636	2.785	0.040	337.038	5.013	0.072	357.962
2022	82.0	0.865	0.011	0.449	2.595	0.032	32.039	4.324	0.053	523.295	7.784	0.095	555.784
2023	82.0	1.173	0.014	0.609	3.518	0.043	43.443	5.864	0.072	709.553	10.555	0.129	753.605
2024	82.0	1.349	0.016	0.700	4.046	0.049	49.960	6.743	0.082	815.986	12.138	0.148	866.646
2025	82.0	1.437	0.018	0.746	4.310	0.053	53.218	7.183	0.088	869.202	12.929	0.158	923.166
2026	72.2	1.437	0.020	0.746	4.310	0.060	53.218	7.183	0.099	869.202	12.929	0.179	923.166
2027	63.5	1.437	0.023	0.746	4.310	0.068	53.218	7.183	0.113	869.202	12.929	0.204	923.166
2028	55.9	1.437	0.026	0.746	4.310	0.077	53.218	7.183	0.128	869.202	12.929	0.231	923.166
2029	49.2	1.437	0.029	0.746	4.310	0.088	53.218	7.183	0.146	869.202	12.929	0.263	923.166
2030	43.3	1.437	0.033	0.746	4.310	0.100	53.218	7.183	0.166	869.202	12.929	0.299	923.166
2031	38.1	1.437	0.038	0.746	4.310	0.113	53.218	7.183	0.189	869.202	12.929	0.339	923.166
2032	33.5	1.437	0.043	0.746	4.310	0.129	53.218	7.183	0.214	869.202	12.929	0.386	923.166
2033	29.5	1.437	0.049	0.746	4.310	0.146	53.218	7.183	0.243	869.202	12.929	0.438	923.166
2034	26.0	1.437	0.055	0.746	4.310	0.166	53.218	7.183	0.276	869.202	12.929	0.497	923.166
2035	22.8	1.437	0.063	0.746	4.310	0.189	53.218	7.183	0.315	869.202	12.929	0.567	923.166
2036	20.1	1.437	0.071	0.746	4.310	0.214	53.218	7.183	0.357	869.202	12.929	0.643	923.166
2037	17.7	1.437	0.081	0.746	4.310	0.243	53.218	7.183	0.406	869.202	12.929	0.730	923.166
2038	15.6	1.437	0.092	0.746	4.310	0.276	53.218	7.183	0.460	869.202	12.929	0.829	923.166
2039	13.7	1.349	0.098	0.700	4.046	0.295	49.960	6.743	0.492	815.986	12.138	0.886	866.646
2040	12.1	1.187	0.098	0.617	3.562	0.294	43.986	5.937	0.491	718.422	10.686	0.883	763.025
2041	10.6	0.880	0.083	0.457	2.639	0.249	32.582	4.398	0.415	532.165	7.916	0.747	565.204
2042	9.3	0.572	0.061	0.297	1.715	0.184	21.179	2.859	0.307	345.907	5.145	0.553	367.382
2043	8.2	0.264	0.032	0.137	0.792	0.097	9.775	1.319	0.161	159.649	2.375	0.290	169.561
2044	7.2	0.088	0.012	0.046	0.264	0.037	3.258	0.176	0.024	35.182	0.528	0.073	38.486

Table 4.2.7
Non Arctic Spill Occurrence - Exploration Wells

Year	Water Depth	Exploration Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl		
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep	1	2.262	0.226	0.12	15.824	1.582	8.37	6.799	0.680	46.47	3.936	0.394	78.73
	Total	1		0.226	**0.12**		1.582	**8.37**		0.680	**46.47**		0.394	**78.73**
2010	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep	1	2.262	0.226	0.12	15.824	1.582	8.37	6.799	0.680	46.47	3.936	0.394	78.73
	Total	1		0.226	**0.12**		1.582	**8.37**		0.680	**46.47**		0.394	**78.73**
2011	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2012	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2013	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2014	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep	1	2.262	0.226	0.12	15.824	1.582	8.37	6.799	0.680	46.47	3.936	0.394	78.73
	Total	1		0.226	**0.12**		1.582	**8.37**		0.680	**46.47**		0.394	**78.73**
2015	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep	1	2.262	0.226	0.12	15.824	1.582	8.37	6.799	0.680	46.47	3.936	0.394	78.73
	Total	1		0.226	**0.12**		1.582	**8.37**		0.680	**46.47**		0.394	**78.73**
2016	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2017	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2018	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2019	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2020	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2021	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2022	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2023	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2024	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2025	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2026	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2027	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2028	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		

Table 4.2.7
Non Arctic Spill Occurrence - Exploration Wells

Year	Water Depth	Exploration Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2028	Deep		2.262			15.824			6.799			3.936		
	Total													
2029	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2030	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2031	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2032	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2033	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2034	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2035	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2036	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2037	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2038	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2039	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2040	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2041	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2042	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2043	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													
2044	Shallow		2.262			15.824			6.799			3.936		
	Medium		2.262			15.824			6.799			3.936		
	Deep		2.262			15.824			6.799			3.936		
	Total													

Table 4.2.8
Non Arctic Spill Occurrence - Exploration Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-99 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2004		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2005		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2006													
2007													
2008													
2009		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2010		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2011													
2012													
2013													
2014													
2015	**54.0**												
2016	**70.0**												
2017	**82.0**												
2018	**82.0**												
2019	**82.0**												
2020	**82.0**												
2021	**72.2**												
2022	**63.5**												
2023	**55.9**												
2024	**49.2**												
2025	**43.3**												
2026	**38.1**												
2027	**33.5**												
2028	**29.5**												
2029	**26.0**												
2030	**22.8**												
2031	**20.1**												
2032	**17.7**												
2033	**15.6**												
2034	**13.7**												
2035	**12.1**												
2036	**10.6**												
2037	**9.3**												
2038	**8.2**												
2039	**7.2**												

Table 4.2.9
Non Arctic Spill Occurrence - Development Wells

Year	Water Depth	Development Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2009	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2010	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2011	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	2	0.692	0.014	0.01	4.833	0.097	0.51	2.076	0.042	2.84	2.076	0.042	8.30
	Total	2		0.014	**0.01**		0.097	**0.51**		0.042	**2.84**		0.042	**8.30**
2012	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	2	0.692	0.014	0.01	4.833	0.097	0.51	2.076	0.042	2.84	2.076	0.042	8.30
	Total	2		0.014	**0.01**		0.097	**0.51**		0.042	**2.84**		0.042	**8.30**
2013	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	2	0.692	0.014	0.01	4.833	0.097	0.51	2.076	0.042	2.84	2.076	0.042	8.30
	Total	2		0.014	**0.01**		0.097	**0.51**		0.042	**2.84**		0.042	**8.30**
2014	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2015	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2016	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2017	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2018	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2019	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	6	0.692	0.042	0.02	4.833	0.290	1.53	2.076	0.125	8.51	2.076	0.125	24.91
	Total	6		0.042	**0.02**		0.290	**1.53**		0.125	**8.51**		0.125	**24.91**
2020	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	11	0.692	0.076	0.04	4.833	0.532	2.81	2.076	0.228	15.61	2.076	0.228	45.67
	Total	11		0.076	**0.04**		0.532	**2.81**		0.228	**15.61**		0.228	**45.67**
2021	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	21	0.692	0.145	0.08	4.833	1.015	5.37	2.076	0.436	29.80	2.076	0.436	87.19
	Total	21		0.145	**0.08**		1.015	**5.37**		0.436	**29.80**		0.436	**87.19**
2022	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	21	0.692	0.145	0.08	4.833	1.015	5.37	2.076	0.436	29.80	2.076	0.436	87.19
	Total	21		0.145	**0.08**		1.015	**5.37**		0.436	**29.80**		0.436	**87.19**
2023	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	21	0.692	0.145	0.08	4.833	1.015	5.37	2.076	0.436	29.80	2.076	0.436	87.19
	Total	21		0.145	**0.08**		1.015	**5.37**		0.436	**29.80**		0.436	**87.19**
2024	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	12	0.692	0.083	0.04	4.833	0.580	3.07	2.076	0.249	17.03	2.076	0.249	49.83
	Total	12		0.083	**0.04**		0.580	**3.07**		0.249	**17.03**		0.249	**49.83**
2025	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep	6	0.692	0.042	0.02	4.833	0.290	1.53	2.076	0.125	8.51	2.076	0.125	24.91
	Total	6		0.042	**0.02**		0.290	**1.53**		0.125	**8.51**		0.125	**24.91**
2026	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2027	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2028	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		

Table 4.2.9
Non Arctic Spill Occurrence - Development Wells

Year	Water Depth	Development Wells Blowout													
		N Wells	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Spills 10000-149999 bbl			Spills =>150000 bbl			
			Expected Spill [bbl] =		519	Expected Spill [bbl] =		5292	Expected Spill [bbl] =		68349	Expected Spill [bbl] =		200000	
		Cum.	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl	Frequency spills per 10^4wells	Frequency spills per 10^3years	Spill Index bbl
2028	Deep		0.692			4.833			2.076			2.076		
	Total													
2029	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2030	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2031	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2032	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2033	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2034	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2035	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2036	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2037	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2038	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2039	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2040	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2041	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2042	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2043	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													
2044	Shallow		0.692			4.833			2.076			2.076		
	Medium		0.692			4.833			2.076			2.076		
	Deep		0.692			4.833			2.076			2.076		
	Total													

Table 4.2.10
Non Arctic Spill Occurrence - Development Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-99 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009													
2010													
2011		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
2012		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
2013		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
2014													
2015													
2016													
2017													
2018													
2019		0.042		0.022	0.125		1.535	0.249		33.426	0.415		34.982
2020	54.0	0.076	0.001	0.040	0.228	0.004	2.814	0.457	0.008	61.281	0.761	0.014	64.135
2021	70.0	0.145	0.002	0.075	0.436	0.006	5.372	0.872	0.012	116.992	1.453	0.021	122.439
2022	82.0	0.145	0.002	0.075	0.436	0.005	5.372	0.872	0.011	116.992	1.453	0.018	122.439
2023	82.0	0.145	0.002	0.075	0.436	0.005	5.372	0.872	0.011	116.992	1.453	0.018	122.439
2024	82.0	0.083	0.001	0.043	0.249	0.003	3.069	0.498	0.006	66.852	0.830	0.010	69.965
2025	82.0	0.042	0.001	0.022	0.125	0.002	1.535	0.249	0.003	33.426	0.415	0.005	34.982
2026	72.2												
2027	63.5												
2028	55.9												
2029	49.2												
2030	43.3												
2031	38.1												
2032	33.5												
2033	29.5												
2034	26.0												
2035	22.8												
2036	20.1												
2037	17.7												
2038	15.6												
2039	13.7												
2040	12.1												
2041	10.6												
2042	9.3												
2043	8.2												
2044	7.2												

Table 4.2.11
Non Arctic Spill Occurrence - Wells - Summary

Year	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2010		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2011		0.014		0.007	0.042		0.512	0.083		11.142	0.125		11.654	0.138		11.661
2012		0.014		0.007	0.042		0.512	0.083		11.142	0.125		11.654	0.138		11.661
2013		0.014		0.007	0.042		0.512	0.083		11.142	0.125		11.654	0.138		11.661
2014		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2015		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2016																
2017																
2018																
2019		0.129		0.067	0.388		4.793	0.689		86.643	1.077		91.436	1.207		91.503
2020	**54.0**	0.325	0.006	0.169	0.976	0.018	12.045	1.703	0.032	212.061	2.679	0.050	224.107	3.004	0.056	224.276
2021	**70.0**	0.702	0.010	0.365	2.107	0.030	26.007	3.657	0.052	454.029	5.764	0.082	480.036	6.467	0.092	480.401
2022	**82.0**	1.010	0.012	0.525	3.031	0.037	37.411	5.196	0.063	640.287	8.227	0.100	677.698	9.237	0.113	678.222
2023	**82.0**	1.318	0.016	0.685	3.954	0.048	48.815	6.736	0.082	826.544	10.690	0.130	875.359	12.008	0.146	876.044
2024	**82.0**	1.432	0.017	0.744	4.295	0.052	53.029	7.241	0.088	882.838	11.536	0.141	935.867	12.968	0.158	936.611
2025	**82.0**	1.478	0.018	0.768	4.434	0.054	54.753	7.432	0.091	902.628	11.866	0.145	957.381	13.345	0.163	958.149
2026	**72.2**	1.437	0.020	0.746	4.310	0.060	53.218	7.183	0.099	869.202	11.493	0.159	922.420	12.929	0.179	923.166
2027	**63.5**	1.437	0.023	0.746	4.310	0.068	53.218	7.183	0.113	869.202	11.493	0.181	922.420	12.929	0.204	923.166
2028	**55.9**	1.437	0.026	0.746	4.310	0.077	53.218	7.183	0.128	869.202	11.493	0.206	922.420	12.929	0.231	923.166
2029	**49.2**	1.437	0.029	0.746	4.310	0.088	53.218	7.183	0.146	869.202	11.493	0.234	922.420	12.929	0.263	923.166
2030	**43.3**	1.437	0.033	0.746	4.310	0.100	53.218	7.183	0.166	869.202	11.493	0.265	922.420	12.929	0.299	923.166
2031	**38.1**	1.437	0.038	0.746	4.310	0.113	53.218	7.183	0.189	869.202	11.493	0.302	922.420	12.929	0.339	923.166
2032	**33.5**	1.437	0.043	0.746	4.310	0.129	53.218	7.183	0.214	869.202	11.493	0.343	922.420	12.929	0.386	923.166
2033	**29.5**	1.437	0.049	0.746	4.310	0.146	53.218	7.183	0.243	869.202	11.493	0.390	922.420	12.929	0.438	923.166
2034	**26.0**	1.437	0.055	0.746	4.310	0.166	53.218	7.183	0.276	869.202	11.493	0.442	922.420	12.929	0.497	923.166
2035	**22.8**	1.437	0.063	0.746	4.310	0.189	53.218	7.183	0.315	869.202	11.493	0.504	922.420	12.929	0.567	923.166
2036	**20.1**	1.437	0.071	0.746	4.310	0.214	53.218	7.183	0.357	869.202	11.493	0.572	922.420	12.929	0.643	923.166
2037	**17.7**	1.437	0.081	0.746	4.310	0.243	53.218	7.183	0.406	869.202	11.493	0.649	922.420	12.929	0.730	923.166
2038	**15.6**	1.437	0.092	0.746	4.310	0.276	53.218	7.183	0.460	869.202	11.493	0.737	922.420	12.929	0.829	923.166
2039	**13.7**	1.349	0.098	0.700	4.046	0.295	49.960	6.743	0.492	815.986	10.789	0.788	865.945	12.138	0.886	866.646
2040	**12.1**	1.187	0.098	0.617	3.562	0.294	43.986	5.937	0.491	718.422	9.499	0.785	762.408	10.686	0.883	763.025
2041	**10.6**	0.880	0.083	0.457	2.639	0.249	32.582	4.398	0.415	532.165	7.036	0.664	564.747	7.916	0.747	565.204
2042	**9.3**	0.572	0.061	0.297	1.715	0.184	21.179	2.859	0.307	345.907	4.574	0.492	367.086	5.145	0.553	367.382
2043	**8.2**	0.264	0.032	0.137	0.792	0.097	9.775	1.319	0.161	159.649	2.111	0.257	169.424	2.375	0.290	169.561
2044	**7.2**	0.088	0.012	0.046	0.264	0.037	3.258	0.176	0.024	35.182	0.440	0.061	38.440	0.528	0.073	38.486
Total LOF	**1000.5**	**30.4**		**15.8**	**91.1**		**1124.5**	**152.0**		**18446.2**	**243.1**		**19570.6**	**273.4**		**19586.4**
Average LOF		**0.843**	**0.030**	**0.44**	**2.530**	**0.091**	**31.23**	**4.222**	**0.152**	**512.39**	**6.752**	**0.243**	**543.63**	**7.595**	**0.273**	**544.07**

Table 4.2.12
Non Arctic Spill Occurrence - Summary

Year	Facility	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
			Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
	Development Wells													
	Total		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2010	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
	Development Wells													
	Total		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2011	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
	Total		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
2012	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
	Total		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
2013	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
	Total		0.014		0.007	0.042		0.512	0.083		11.142	0.138		11.661
2014	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
	Development Wells													
	Total		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2015	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
	Development Wells													
	Total		0.226		0.117	0.680		8.374	1.074		125.199	1.980		133.690
2016	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells													
	Total													
2017	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells													
	Total													
2018	Pipeline													
	Platforms													
	Production Wells													
	Exploration Wells													
	Development Wells													
	Total													
2019	Pipeline													
	Platforms													
	Production Wells		0.088		0.046	0.264		3.258	0.440		53.216	0.792		56.520
	Exploration Wells													
	Development Wells		0.042		0.022	0.125		1.535	0.249		33.426	0.415		34.982
	Total		0.129		0.067	0.388		4.793	0.689		86.643	1.207		91.503
2020	Pipeline	54.0	21.567	0.399	8.568	15.291	0.283	79.227	5.028	0.093	78.049	41.885	0.776	165.844
	Platforms		1.079	0.020	0.487	0.090	0.002	0.506	0.090	0.002	0.506	1.258	0.023	1.500
	Production Wells		0.249	0.005	0.129	0.748	0.014	9.232	1.246	0.023	150.780	2.243	0.042	160.141
	Exploration Wells													
	Development Wells		0.076	0.001	0.040	0.228	0.004	2.814	0.457	0.008	61.281	0.761	0.014	64.135
	Total		22.971	0.425	9.225	16.357	0.303	91.779	6.820	0.126	290.616	46.148	0.855	391.620
2021	Pipeline	70.0	22.711	0.324	8.951	15.707	0.224	81.424	5.132	0.073	79.597	43.550	0.622	169.971
	Platforms		4.314	0.062	1.950	0.360	0.005	2.024	0.360	0.005	2.024	5.033	0.072	5.999
	Production Wells		0.557	0.008	0.289	1.671	0.024	20.636	2.785	0.040	337.038	5.013	0.072	357.962
	Exploration Wells													
	Development Wells		0.145	0.002	0.075	0.436	0.006	5.372	0.872	0.012	116.992	1.453	0.021	122.439
	Total		27.728	0.396	11.266	18.174	0.260	109.455	9.148	0.131	535.650	55.049	0.786	656.371
2022	Pipeline	82.0	23.855	0.291	9.334	16.123	0.197	83.620	5.236	0.064	81.145	45.214	0.551	174.098
	Platforms		7.550	0.092	3.412	0.629	0.008	3.543	0.629	0.008	3.543	8.808	0.107	10.498
	Production Wells		0.865	0.011	0.449	2.595	0.032	32.039	4.324	0.053	523.295	7.784	0.095	555.784
	Exploration Wells													
	Development Wells		0.145	0.002	0.075	0.436	0.005	5.372	0.872	0.011	116.992	1.453	0.018	122.439
	Total		32.415	0.395	13.270	19.783	0.241	124.574	11.061	0.135	724.974	63.259	0.771	862.818
2023	Pipeline	82.0	24.999	0.305	9.716	16.539	0.202	85.817	5.340	0.065	82.692	46.878	0.572	178.225
	Platforms		10.786	0.132	4.874	0.899	0.011	5.061	0.899	0.011	5.061	12.583	0.153	14.997
	Production Wells		1.173	0.014	0.609	3.518	0.043	43.443	5.864	0.072	709.553	10.555	0.129	753.605
	Exploration Wells													
	Development Wells		0.145	0.002	0.075	0.436	0.005	5.372	0.872	0.011	116.992	1.453	0.018	122.439
	Total		37.103	0.452	15.275	21.392	0.261	139.693	12.974	0.158	914.298	71.469	0.872	1069.266
2024	Pipeline	82.0	26.144	0.319	10.099	16.955	0.207	88.013	5.444	0.066	84.240	48.543	0.592	182.352
	Platforms		12.080	0.147	5.459	1.007	0.012	5.668	1.007	0.012	5.668	14.093	0.172	16.796
	Production Wells		1.349	0.016	0.700	4.046	0.049	49.960	6.743	0.082	815.986	12.138	0.148	866.646
	Exploration Wells													
	Development Wells		0.083	0.001	0.043	0.249	0.003	3.069	0.498	0.006	66.852	0.830	0.010	69.965
	Total		39.655	0.484	16.302	22.257	0.271	146.711	13.692	0.167	972.747	75.604	0.922	1135.759
2025	Pipeline	82.0	26.144	0.319	10.099	16.955	0.207	88.013	5.444	0.066	84.240	48.543	0.592	182.352
	Platforms		13.374	0.163	6.044	1.115	0.014	6.276	1.115	0.014	6.276	15.603	0.190	18.596
	Production Wells		1.437	0.018	0.746	4.310	0.053	53.218	7.183	0.088	869.202	12.929	0.158	923.166
	Exploration Wells													
	Development Wells		0.042	0.001	0.022	0.125	0.002	1.535	0.249	0.003	33.426	0.415	0.005	34.982
	Total		40.996	0.500	16.911	22.504	0.274	149.042	13.990	0.171	993.144	77.490	0.945	1159.097
2026	Pipeline	72.2	26.144	0.362	10.099	16.955	0.235	88.013	5.444	0.075	84.240	48.543	0.672	182.352
	Platforms		13.374	0.185	6.044	1.115	0.015	6.276	1.115	0.015	6.276	15.603	0.216	18.596
	Production Wells		1.437	0.020	0.746	4.310	0.060	53.218	7.183	0.099	869.202	12.929	0.179	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	0.567	16.889	22.380	0.310	147.507	13.741	0.190	959.718	77.075	1.068	1124.114

Table 4.2.12
Non Arctic Spill Occurrence - Summary

Year	Facility	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
			Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2027	Pipeline	63.5	26.144	0.412	10.099	16.955	0.267	88.013	5.444	0.086	84.240	48.543	0.764	182.352
	Platforms		13.374	0.211	6.044	1.115	0.018	6.276	1.115	0.018	6.276	15.603	0.246	18.596
	Production Wells		1.437	0.023	0.746	4.310	0.068	53.218	7.183	0.113	869.202	12.929	0.204	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	0.645	16.889	22.380	0.352	147.507	13.741	0.216	959.718	77.075	1.214	1124.114
2028	Pipeline	55.9	26.144	0.468	10.099	16.955	0.303	88.013	5.444	0.097	84.240	48.543	0.868	182.352
	Platforms		13.374	0.239	6.044	1.115	0.020	6.276	1.115	0.020	6.276	15.603	0.279	18.596
	Production Wells		1.437	0.026	0.746	4.310	0.077	53.218	7.183	0.128	869.202	12.929	0.231	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	0.733	16.889	22.380	0.400	147.507	13.741	0.246	959.718	77.075	1.379	1124.114
2029	Pipeline	49.2	26.144	0.531	10.099	16.955	0.345	88.013	5.444	0.111	84.240	48.543	0.987	182.352
	Platforms		13.374	0.272	6.044	1.115	0.023	6.276	1.115	0.023	6.276	15.603	0.317	18.596
	Production Wells		1.437	0.029	0.746	4.310	0.088	53.218	7.183	0.146	869.202	12.929	0.263	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	0.832	16.889	22.380	0.455	147.507	13.741	0.279	959.718	77.075	1.567	1124.114
2030	Pipeline	43.3	26.144	0.604	10.099	16.955	0.392	88.013	5.444	0.126	84.240	48.543	1.121	182.352
	Platforms		13.374	0.309	6.044	1.115	0.026	6.276	1.115	0.026	6.276	15.603	0.360	18.596
	Production Wells		1.437	0.033	0.746	4.310	0.100	53.218	7.183	0.166	869.202	12.929	0.299	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	0.946	16.889	22.380	0.517	147.507	13.741	0.317	959.718	77.075	1.780	1124.114
2031	Pipeline	38.1	26.144	0.686	10.099	16.955	0.445	88.013	5.444	0.143	84.240	48.543	1.274	182.352
	Platforms		13.374	0.351	6.044	1.115	0.029	6.276	1.115	0.029	6.276	15.603	0.410	18.596
	Production Wells		1.437	0.038	0.746	4.310	0.113	53.218	7.183	0.189	869.202	12.929	0.339	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	1.075	16.889	22.380	0.587	147.507	13.741	0.361	959.718	77.075	2.023	1124.114
2032	Pipeline	33.5	26.144	0.780	10.099	16.955	0.506	88.013	5.444	0.162	84.240	48.543	1.449	182.352
	Platforms		13.374	0.399	6.044	1.115	0.033	6.276	1.115	0.033	6.276	15.603	0.466	18.596
	Production Wells		1.437	0.043	0.746	4.310	0.129	53.218	7.183	0.214	869.202	12.929	0.386	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	1.223	16.889	22.380	0.668	147.507	13.741	0.410	959.718	77.075	2.301	1124.114
2033	Pipeline	29.5	26.144	0.886	10.099	16.955	0.575	88.013	5.444	0.185	84.240	48.543	1.646	182.352
	Platforms		13.374	0.453	6.044	1.115	0.038	6.276	1.115	0.038	6.276	15.603	0.529	18.596
	Production Wells		1.437	0.049	0.746	4.310	0.146	53.218	7.183	0.243	869.202	12.929	0.438	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	1.388	16.889	22.380	0.759	147.507	13.741	0.466	959.718	77.075	2.613	1124.114
2034	Pipeline	26.0	26.144	1.006	10.099	16.955	0.652	88.013	5.444	0.209	84.240	48.543	1.867	182.352
	Platforms		13.374	0.514	6.044	1.115	0.043	6.276	1.115	0.043	6.276	15.603	0.600	18.596
	Production Wells		1.437	0.055	0.746	4.310	0.166	53.218	7.183	0.276	869.202	12.929	0.497	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	1.575	16.889	22.380	0.861	147.507	13.741	0.529	959.718	77.075	2.964	1124.114
2035	Pipeline	22.8	26.144	1.147	10.099	16.955	0.744	88.013	5.444	0.239	84.240	48.543	2.129	182.352
	Platforms		13.374	0.587	6.044	1.115	0.049	6.276	1.115	0.049	6.276	15.603	0.684	18.596
	Production Wells		1.437	0.063	0.746	4.310	0.189	53.218	7.183	0.315	869.202	12.929	0.567	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	1.796	16.889	22.380	0.982	147.507	13.741	0.603	959.718	77.075	3.380	1124.114
2036	Pipeline	20.1	26.144	1.301	10.099	16.955	0.844	88.013	5.444	0.271	84.240	48.543	2.415	182.352
	Platforms		13.374	0.665	6.044	1.115	0.055	6.276	1.115	0.055	6.276	15.603	0.776	18.596
	Production Wells		1.437	0.071	0.746	4.310	0.214	53.218	7.183	0.357	869.202	12.929	0.643	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	2.038	16.889	22.380	1.113	147.507	13.741	0.684	959.718	77.075	3.835	1124.114
2037	Pipeline	17.7	26.144	1.477	10.099	16.955	0.958	88.013	5.444	0.308	84.240	48.543	2.743	182.352
	Platforms		13.374	0.756	6.044	1.115	0.063	6.276	1.115	0.063	6.276	15.603	0.882	18.596
	Production Wells		1.437	0.081	0.746	4.310	0.243	53.218	7.183	0.406	869.202	12.929	0.730	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	2.314	16.889	22.380	1.264	147.507	13.741	0.776	959.718	77.075	4.355	1124.114
2038	Pipeline	15.6	26.144	1.676	10.099	16.955	1.087	88.013	5.444	0.349	84.240	48.543	3.112	182.352
	Platforms		13.374	0.857	6.044	1.115	0.071	6.276	1.115	0.071	6.276	15.603	1.000	18.596
	Production Wells		1.437	0.092	0.746	4.310	0.276	53.218	7.183	0.460	869.202	12.929	0.829	923.166
	Exploration Wells													
	Development Wells													
	Total		40.955	2.625	16.889	22.380	1.435	147.507	13.741	0.881	959.718	77.075	4.941	1124.114
2039	Pipeline	13.7	26.144	1.908	10.099	16.955	1.238	88.013	5.444	0.397	84.240	48.543	3.543	182.352
	Platforms		13.374	0.976	6.044	1.115	0.081	6.276	1.115	0.081	6.276	15.603	1.139	18.596
	Production Wells		1.349	0.098	0.700	4.046	0.295	49.960	6.743	0.492	815.986	12.138	0.886	866.646
	Exploration Wells													
	Development Wells													
	Total		40.867	2.983	16.844	22.116	1.614	144.249	13.301	0.971	906.502	76.284	5.568	1067.594
2040	Pipeline	12.1	26.144	2.161	10.099	16.955	1.401	88.013	5.444	0.450	84.240	48.543	4.012	182.352
	Platforms		12.296	1.016	5.557	1.025	0.085	5.770	1.025	0.085	5.770	14.345	1.186	17.096
	Production Wells		1.187	0.098	0.617	3.562	0.294	43.986	5.937	0.491	718.422	10.686	0.883	763.025
	Exploration Wells													
	Development Wells													
	Total		39.627	3.275	16.272	21.542	1.780	137.769	12.405	1.025	808.432	73.574	6.080	962.474
2041	Pipeline	10.6	26.144	2.466	10.099	16.955	1.600	88.013	5.444	0.514	84.240	48.543	4.579	182.352
	Platforms		9.060	0.855	4.094	0.755	0.071	4.251	0.755	0.071	4.251	10.570	0.997	12.597
	Production Wells		0.880	0.083	0.457	2.639	0.249	32.582	4.398	0.415	532.165	7.916	0.747	565.204
	Exploration Wells													
	Development Wells													
	Total		36.083	3.404	14.650	20.349	1.920	124.847	10.596	1.000	620.656	67.028	6.323	760.153
2042	Pipeline	9.3	26.144	2.811	10.099	16.955	1.823	88.013	5.444	0.585	84.240	48.543	5.220	182.352
	Platforms		5.824	0.626	2.632	0.485	0.052	2.733	0.485	0.052	2.733	6.795	0.731	8.098
	Production Wells		0.572	0.061	0.297	1.715	0.184	21.179	2.859	0.307	345.907	5.145	0.553	367.382
	Exploration Wells													
	Development Wells													
	Total		32.540	3.499	13.028	19.156	2.060	111.925	8.788	0.945	432.880	60.483	6.504	557.833
2043	Pipeline	8.2	26.144	3.188	10.099	16.955	2.068	88.013	5.444	0.664	84.240	48.543	5.920	182.352
	Platforms		2.589	0.316	1.170	0.216	0.026	1.215	0.216	0.026	1.215	3.020	0.368	3.599
	Production Wells		0.264	0.032	0.137	0.792	0.097	9.775	1.319	0.161	159.649	2.375	0.290	169.561
	Exploration Wells													
	Development Wells													
	Total		28.996	3.536	11.406	17.963	2.191	99.002	6.979	0.851	245.104	53.937	6.578	355.513
2044	Pipeline	7.2	26.144	3.631	10.099	16.955	2.355	88.013	5.444	0.756	84.240	48.543	6.742	182.352
	Platforms		1.294	0.180	0.585	0.108	0.015	0.607	0.108	0.015	0.607	1.510	0.210	1.800
	Production Wells		0.088	0.012	0.046	0.264	0.037	3.258	0.176	0.024	35.182	0.528	0.073	38.486

Table 4.2.12
Non Arctic Spill Occurrence - Summary

Year	Facility	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			All Spills		
			Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3 years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2044	Exploration Wells	7.2												
	Development Wells													
	Total		27.526	3.823	10.730	17.327	2.407	91.879	5.727	0.795	120.029	50.580	7.025	222.638

Table 4.2.13
Non Arctic Spill Occurrence - Annual Summary

Year	Production [MMbbl]	Small and Medium Spills 50-999 bbl			Large Spills 1000-9999 bbl			Huge Spills =>10000 bbl			Significant Spills =>1000 bbl			All Spills		
		Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]	Frequency Spills per 103years	Frequency Spills per 109 bbl Produced	Spill Index [bbl]	Frequency Spills per 10^3years	Frequency Spills per 10^9 bbl Produced	Spill Index [bbl]
2009		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2010		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2011		0.014		0.007	0.042		0.512	0.083		11.142	0.125		11.654	0.138		11.661
2012		0.014		0.007	0.042		0.512	0.083		11.142	0.125		11.654	0.138		11.661
2013		0.014		0.007	0.042		0.512	0.083		11.142	0.125		11.654	0.138		11.661
2014		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2015		0.226		0.117	0.680		8.374	1.074		125.199	1.753		133.573	1.980		133.690
2016																
2017																
2018																
2019		0.129		0.067	0.388		4.793	0.689		86.643	1.077		91.436	1.207		91.503
2020	**54.0**	22.971	0.425	9.225	16.357	0.303	91.779	6.820	0.126	290.616	23.177	0.429	382.395	46.148	0.855	391.620
2021	**70.0**	27.728	0.396	11.266	18.174	0.260	109.455	9.148	0.131	535.650	27.322	0.390	645.105	55.049	0.786	656.371
2022	**82.0**	32.415	0.395	13.270	19.783	0.241	124.574	11.061	0.135	724.974	30.844	0.376	849.548	63.259	0.771	862.818
2023	**82.0**	37.103	0.452	15.275	21.392	0.261	139.693	12.974	0.158	914.298	34.366	0.419	1053.990	71.469	0.872	1069.266
2024	**82.0**	39.655	0.484	16.302	22.257	0.271	146.711	13.692	0.167	972.747	35.949	0.438	1119.457	75.604	0.922	1135.759
2025	**82.0**	40.996	0.500	16.911	22.504	0.274	149.042	13.990	0.171	993.144	36.494	0.445	1142.186	77.490	0.945	1159.097
2026	**72.2**	40.955	0.567	16.889	22.380	0.310	147.507	13.741	0.190	959.718	36.121	0.500	1107.225	77.075	1.068	1124.114
2027	**63.5**	40.955	0.645	16.889	22.380	0.352	147.507	13.741	0.216	959.718	36.121	0.569	1107.225	77.075	1.214	1124.114
2028	**55.9**	40.955	0.733	16.889	22.380	0.400	147.507	13.741	0.246	959.718	36.121	0.646	1107.225	77.075	1.379	1124.114
2029	**49.2**	40.955	0.832	16.889	22.380	0.455	147.507	13.741	0.279	959.718	36.121	0.734	1107.225	77.075	1.567	1124.114
2030	**43.3**	40.955	0.946	16.889	22.380	0.517	147.507	13.741	0.317	959.718	36.121	0.834	1107.225	77.075	1.780	1124.114
2031	**38.1**	40.955	1.075	16.889	22.380	0.587	147.507	13.741	0.361	959.718	36.121	0.948	1107.225	77.075	2.023	1124.114
2032	**33.5**	40.955	1.223	16.889	22.380	0.668	147.507	13.741	0.410	959.718	36.121	1.078	1107.225	77.075	2.301	1124.114
2033	**29.5**	40.955	1.388	16.889	22.380	0.759	147.507	13.741	0.466	959.718	36.121	1.224	1107.225	77.075	2.613	1124.114
2034	**26.0**	40.955	1.575	16.889	22.380	0.861	147.507	13.741	0.529	959.718	36.121	1.389	1107.225	77.075	2.964	1124.114
2035	**22.8**	40.955	1.796	16.889	22.380	0.982	147.507	13.741	0.603	959.718	36.121	1.584	1107.225	77.075	3.380	1124.114
2036	**20.1**	40.955	2.038	16.889	22.380	1.113	147.507	13.741	0.684	959.718	36.121	1.797	1107.225	77.075	3.835	1124.114
2037	**17.7**	40.955	2.314	16.889	22.380	1.264	147.507	13.741	0.776	959.718	36.121	2.041	1107.225	77.075	4.355	1124.114
2038	**15.6**	40.955	2.625	16.889	22.380	1.435	147.507	13.741	0.881	959.718	36.121	2.315	1107.225	77.075	4.941	1124.114
2039	**13.7**	40.867	2.983	16.844	22.116	1.614	144.249	13.301	0.971	906.502	35.417	2.585	1050.750	76.284	5.568	1067.594
2040	**12.1**	39.627	3.275	16.272	21.542	1.780	137.769	12.405	1.025	808.432	33.947	2.806	946.201	73.574	6.080	962.474
2041	**10.6**	36.083	3.404	14.650	20.349	1.920	124.847	10.596	1.000	620.656	30.945	2.919	745.503	67.028	6.323	760.153
2042	**9.3**	32.540	3.499	13.028	19.156	2.060	111.925	8.788	0.945	432.880	27.943	3.005	544.805	60.483	6.504	557.833
2043	**8.2**	28.996	3.536	11.406	17.963	2.191	99.002	6.979	0.851	245.104	24.941	3.042	344.107	53.937	6.578	355.513
2044	**7.2**	27.526	3.823	10.730	17.327	2.407	91.879	5.727	0.795	120.029	23.054	3.202	211.908	50.580	7.025	222.638
Total LOF	**1000.5**	**940.0**		**385.3**	**533.1**		**3428.3**	**309.3**		**20662.2**	**842.4**		**24090.6**	**1782.4**		**24475.9**
Average LOF		**26.111**	**0.940**	**10.70**	**14.808**	**0.533**	**95.23**	**8.593**	**0.309**	**573.95**	**23.401**	**0.842**	**669.18**	**49.512**	**1.782**	**679.89**

Table 4.2.14
Non Arctic Year 2024 - Monte Carlo Results

Year 2024	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
	Frequency Spills per 10^3 years					Frequency Spills per 10^9 bbl Produced					Spill Index [bbl]				
Mean =	39.61	22.29	13.68	35.97	75.57	0.48	0.27	0.17	0.44	0.92	16.25	147.10	975.52	1122.62	1138.87
Std Deviation =	14.33	10.36	4.04	11.94	20.40	0.17	0.13	0.05	0.15	0.25	9.19	79.83	364.84	378.50	378.71
Variance =	205.475	107.361	16.320	142.557	416.278	0.031	0.016	0.002	0.021	0.062	84.399	6373.027	133109.100	143259.700	143422.100
Skewness =	0.58	0.95	0.54	0.81	0.54	0.58	0.95	0.54	0.81	0.54	1.19	1.28	0.62	0.60	0.60
Kurtosis =	3.32	3.81	3.20	3.68	3.29	3.32	3.81	3.20	3.68	3.29	4.94	5.69	3.40	3.38	3.38
Mode =	48.49	17.15	9.85	29.46	66.31	0.35	0.21	0.20	0.36	0.90	9.73	115.68	884.71	994.36	894.67
Minimum =	6.161	2.815	4.161	9.945	26.998	0.075	0.034	0.051	0.121	0.329	1.385	2.140	168.693	246.687	255.484
5% Perc =	18.698	9.169	7.786	19.774	45.380	0.228	0.112	0.095	0.241	0.553	5.003	47.729	453.884	572.888	589.701
10% Perc =	22.125	10.904	8.874	22.407	50.796	0.270	0.133	0.108	0.273	0.619	6.339	60.965	540.527	666.563	684.214
15% Perc =	25.056	12.183	9.559	24.284	54.685	0.305	0.149	0.117	0.296	0.667	7.416	72.064	602.377	737.262	755.237
20% Perc =	27.252	13.288	10.220	25.813	57.952	0.332	0.162	0.125	0.315	0.707	8.499	81.146	656.578	797.800	814.339
25% Perc =	29.098	14.345	10.716	27.242	60.953	0.355	0.175	0.131	0.332	0.743	9.478	90.551	710.277	849.281	865.661
30% Perc =	30.931	15.468	11.241	28.633	63.480	0.377	0.189	0.137	0.349	0.774	10.408	98.843	756.107	898.357	915.005
35% Perc =	32.790	16.582	11.713	29.819	66.131	0.399	0.202	0.143	0.364	0.806	11.329	106.722	803.265	945.708	962.444
40% Perc =	34.632	17.673	12.213	31.132	68.708	0.422	0.216	0.149	0.380	0.838	12.300	115.071	847.012	990.286	1005.391
45% Perc =	36.334	18.960	12.711	32.495	71.337	0.443	0.231	0.155	0.396	0.870	13.282	122.962	887.959	1032.693	1048.627
50% Perc =	38.171	20.254	13.219	33.937	73.772	0.465	0.247	0.161	0.414	0.900	14.366	132.104	935.077	1078.488	1094.215
55% Perc =	39.897	21.562	13.789	35.513	76.154	0.487	0.263	0.168	0.433	0.929	15.487	140.671	979.465	1130.261	1145.573
60% Perc =	42.025	23.039	14.372	37.260	78.846	0.512	0.281	0.175	0.454	0.961	16.711	150.356	1027.417	1177.157	1194.776
65% Perc =	44.007	24.738	14.935	38.966	81.688	0.537	0.302	0.182	0.475	0.996	18.083	161.545	1077.752	1231.870	1248.323
70% Perc =	46.249	26.357	15.548	40.868	84.591	0.564	0.321	0.190	0.498	1.031	19.548	173.467	1134.828	1287.830	1303.058
75% Perc =	48.563	28.305	16.212	42.742	87.718	0.592	0.345	0.198	0.521	1.070	21.006	187.084	1198.622	1355.410	1371.069
80% Perc =	51.178	30.543	17.034	45.399	91.741	0.624	0.372	0.208	0.554	1.119	22.913	202.561	1272.914	1431.628	1448.247
85% Perc =	54.371	33.170	17.956	48.435	97.000	0.663	0.405	0.219	0.591	1.183	25.471	224.540	1359.666	1524.364	1539.185
90% Perc =	58.840	36.657	19.060	52.315	103.387	0.718	0.447	0.232	0.638	1.261	28.878	254.009	1468.854	1630.356	1647.771
95% Perc =	65.448	42.328	20.971	58.634	112.435	0.798	0.516	0.256	0.715	1.371	34.057	299.713	1630.911	1808.828	1829.329
Maximum =	101.006	68.824	30.817	91.383	173.744	1.232	0.839	0.376	1.114	2.119	68.862	709.552	2586.863	2901.651	2936.397

Table 4.2.15
Non Arctic LOF Average - Pipeline - Monte Carlo Results

Pipeline	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	17.84	11.66	3.75	15.41	33.25	0.64	0.42	0.14	0.55	1.20	6.87	59.83	57.71	117.55	124.41
Std Deviation =	6.67	6.14	2.03	6.49	9.44	0.24	0.22	0.07	0.23	0.34	4.64	44.40	33.36	55.59	55.92
Variance =	44.496	37.741	4.119	42.168	89.154	0.058	0.049	0.005	0.055	0.115	21.573	1971.008	1112.577	3090.054	3126.988
Skewness =	0.46	0.54	0.56	0.51	0.34	0.46	0.54	0.56	0.51	0.34	1.32	1.35	0.77	0.83	0.82
Kurtosis =	2.67	2.53	2.51	2.64	2.79	2.67	2.53	2.51	2.64	2.79	5.04	5.00	3.08	3.74	3.74
Mode =	15.94	15.53	1.56	7.08	35.01	0.57	0.56	0.06	0.25	1.26	4.18	31.73	26.23	85.48	98.73
Minimum =	3.362	0.633	0.142	2.375	8.272	0.121	0.023	0.005	0.085	0.298	-0.849	-6.892	2.155	9.629	12.701
5% Perc =	8.296	3.357	1.051	6.279	18.878	0.299	0.121	0.038	0.226	0.679	1.559	9.878	14.964	42.580	49.072
10% Perc =	9.706	4.341	1.368	7.511	21.221	0.349	0.156	0.049	0.270	0.764	2.132	15.051	19.920	53.763	60.104
15% Perc =	10.895	5.133	1.617	8.697	23.206	0.392	0.185	0.058	0.313	0.835	2.586	19.293	23.736	61.698	68.547
20% Perc =	11.895	5.952	1.841	9.535	24.817	0.428	0.214	0.066	0.343	0.893	2.975	23.350	27.404	68.905	75.701
25% Perc =	12.762	6.736	2.099	10.326	26.252	0.459	0.242	0.076	0.372	0.945	3.421	27.399	31.022	76.114	82.472
30% Perc =	13.530	7.410	2.329	11.114	27.579	0.487	0.267	0.084	0.400	0.992	3.845	31.437	34.609	82.629	89.048
35% Perc =	14.362	8.146	2.587	11.932	29.007	0.517	0.293	0.093	0.429	1.044	4.288	35.072	38.550	88.782	95.309
40% Perc =	15.228	8.890	2.858	12.751	30.230	0.548	0.320	0.103	0.459	1.088	4.736	39.469	42.793	95.424	102.268
45% Perc =	16.001	9.770	3.118	13.650	31.471	0.576	0.352	0.112	0.491	1.132	5.239	43.694	47.113	102.360	108.745
50% Perc =	16.902	10.646	3.424	14.446	32.644	0.608	0.383	0.123	0.520	1.175	5.737	47.969	51.424	108.647	115.734
55% Perc =	17.899	11.599	3.721	15.378	33.905	0.644	0.417	0.134	0.553	1.220	6.291	53.384	56.001	116.046	123.396
60% Perc =	19.006	12.593	4.052	16.402	35.191	0.684	0.453	0.146	0.590	1.266	6.866	59.366	61.035	123.704	130.788
65% Perc =	20.129	13.641	4.386	17.467	36.533	0.724	0.491	0.158	0.628	1.315	7.507	65.579	66.555	131.013	138.495
70% Perc =	21.255	14.708	4.724	18.699	37.892	0.765	0.529	0.170	0.673	1.363	8.248	72.633	72.694	140.035	147.359
75% Perc =	22.491	15.942	5.174	19.946	39.464	0.809	0.574	0.186	0.718	1.420	9.097	80.449	78.760	151.166	158.001
80% Perc =	23.689	17.372	5.612	21.242	41.172	0.852	0.625	0.202	0.764	1.481	10.171	90.256	85.735	162.904	170.213
85% Perc =	25.370	18.770	6.129	22.757	43.341	0.913	0.675	0.221	0.819	1.559	11.399	102.000	94.589	174.396	181.677
90% Perc =	27.270	20.591	6.755	24.591	45.983	0.981	0.741	0.243	0.885	1.655	13.469	122.241	105.919	191.612	199.793
95% Perc =	29.807	23.029	7.484	27.175	50.053	1.073	0.829	0.269	0.978	1.801	16.082	151.872	121.959	222.448	229.780
Maximum =	39.923	33.543	10.047	36.878	65.947	1.437	1.207	0.362	1.327	2.373	32.811	317.831	186.969	406.513	422.782

Table 4.2.16
Non Arctic LOF Average - Platforms - Monte Carlo Results

Platforms	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	7.43	0.62	0.62	1.24	8.67	0.27	0.02	0.02	0.04	0.31	3.35	3.47	3.47	6.95	10.29
Std Deviation =	5.04	0.42	0.42	0.84	5.13	0.18	0.02	0.02	0.03	0.18	3.47	3.08	3.08	6.16	7.02
Variance =	25.426	0.177	0.177	0.706	26.306	0.033	0.000	0.000	0.001	0.034	12.038	9.474	9.474	37.896	49.339
Skewness =	0.57	0.57	0.57	0.57	0.54	0.57	0.57	0.57	0.57	0.54	1.73	1.26	1.26	1.26	1.01
Kurtosis =	2.40	2.41	2.41	2.41	2.41	2.40	2.41	2.41	2.41	2.41	6.48	4.43	4.43	4.43	3.93
Mode =	13.85	0.17	0.17	0.34	18.48	0.04	0.03	0.03	0.07	0.17	2.01	4.05	4.05	8.10	7.07
Minimum =	0.026	0.003	0.003	0.006	0.179	0.001	0.000	0.000	0.000	0.006	-0.931	-1.479	-1.479	-2.958	-1.765
5% Perc =	0.850	0.071	0.071	0.142	1.836	0.031	0.003	0.003	0.005	0.066	0.130	0.206	0.206	0.413	1.678
10% Perc =	1.398	0.117	0.117	0.234	2.553	0.050	0.004	0.004	0.008	0.092	0.286	0.386	0.386	0.773	2.499
15% Perc =	1.986	0.165	0.165	0.330	3.211	0.071	0.006	0.006	0.012	0.115	0.455	0.609	0.609	1.217	3.329
20% Perc =	2.572	0.213	0.213	0.426	3.817	0.093	0.008	0.008	0.015	0.137	0.637	0.822	0.822	1.643	4.138
25% Perc =	3.161	0.264	0.264	0.527	4.387	0.114	0.009	0.009	0.019	0.158	0.845	1.063	1.063	2.127	4.918
30% Perc =	3.801	0.317	0.317	0.635	5.046	0.136	0.011	0.011	0.023	0.181	1.039	1.316	1.316	2.632	5.656
35% Perc =	4.454	0.370	0.370	0.740	5.721	0.160	0.013	0.013	0.027	0.206	1.285	1.623	1.623	3.246	6.360
40% Perc =	5.142	0.427	0.427	0.854	6.374	0.185	0.015	0.015	0.031	0.229	1.549	1.931	1.931	3.862	7.126
45% Perc =	5.814	0.484	0.484	0.968	7.063	0.209	0.017	0.017	0.035	0.254	1.844	2.261	2.261	4.521	7.930
50% Perc =	6.554	0.547	0.547	1.094	7.805	0.236	0.020	0.020	0.039	0.281	2.171	2.608	2.608	5.217	8.822
55% Perc =	7.328	0.612	0.612	1.223	8.620	0.264	0.022	0.022	0.044	0.310	2.542	3.000	3.000	6.000	9.795
60% Perc =	8.167	0.683	0.683	1.366	9.467	0.294	0.025	0.025	0.049	0.341	3.043	3.452	3.452	6.904	10.789
65% Perc =	9.029	0.754	0.754	1.508	10.281	0.325	0.027	0.027	0.054	0.370	3.502	3.932	3.932	7.863	11.840
70% Perc =	9.955	0.831	0.831	1.662	11.244	0.358	0.030	0.030	0.060	0.404	4.008	4.430	4.430	8.860	12.967
75% Perc =	10.983	0.918	0.918	1.835	12.325	0.395	0.033	0.033	0.066	0.443	4.685	5.076	5.076	10.151	14.273
80% Perc =	12.118	1.010	1.010	2.020	13.460	0.436	0.036	0.036	0.073	0.484	5.535	5.770	5.770	11.540	15.816
85% Perc =	13.383	1.117	1.117	2.235	14.669	0.482	0.040	0.040	0.080	0.528	6.700	6.697	6.697	13.394	17.569
90% Perc =	14.975	1.241	1.241	2.481	16.201	0.539	0.045	0.045	0.089	0.583	8.165	7.841	7.841	15.682	20.136
95% Perc =	16.933	1.406	1.406	2.812	18.395	0.609	0.051	0.051	0.101	0.662	10.674	9.753	9.753	19.507	23.951
Maximum =	21.517	1.855	1.855	3.710	23.267	0.774	0.067	0.067	0.134	0.837	24.321	17.595	17.595	35.189	44.462

Table 4.2.17
Non Arctic LOF Average - Wells - Monte Carlo Results

Wells	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	0.84	2.53	4.22	6.75	7.60	0.03	0.09	0.15	0.24	0.27	0.44	31.22	511.70	542.92	543.36
Std Deviation =	0.32	0.98	1.17	2.05	2.08	0.01	0.04	0.04	0.07	0.07	0.31	20.79	194.68	195.90	195.90
Variance =	0.105	0.951	1.364	4.209	4.343	0.000	0.001	0.002	0.005	0.006	0.095	432.084	37901.900	38377.100	38377.080
Skewness =	0.00	-0.01	0.01	0.00	0.00	0.00	-0.01	0.01	0.00	0.00	0.86	0.86	0.47	0.46	0.46
Kurtosis =	2.41	2.41	2.69	2.54	2.60	2.41	2.41	2.69	2.54	2.60	3.69	3.56	3.16	3.17	3.17
Mode =	0.61	2.48	4.12	6.23	10.30	0.04	0.10	0.16	0.28	0.34	0.66	22.49	645.40	367.92	485.27
Minimum =	0.051	0.145	0.512	0.731	1.650	0.002	0.005	0.018	0.026	0.059	-0.174	-8.114	57.907	87.645	88.312
5% Perc =	0.302	0.885	2.296	3.360	4.160	0.011	0.032	0.083	0.121	0.150	0.030	3.984	217.474	243.970	244.306
10% Perc =	0.405	1.217	2.708	4.001	4.825	0.015	0.044	0.097	0.144	0.174	0.086	7.376	272.532	301.716	302.025
15% Perc =	0.484	1.446	2.989	4.539	5.349	0.017	0.052	0.108	0.163	0.192	0.129	10.396	310.424	341.590	342.054
20% Perc =	0.552	1.656	3.209	4.957	5.757	0.020	0.060	0.115	0.178	0.207	0.169	12.980	341.359	374.212	374.797
25% Perc =	0.610	1.831	3.386	5.286	6.125	0.022	0.066	0.122	0.190	0.220	0.204	15.433	369.025	401.420	401.538
30% Perc =	0.666	1.987	3.582	5.616	6.466	0.024	0.071	0.129	0.202	0.233	0.241	17.802	394.858	427.035	427.596
35% Perc =	0.713	2.136	3.765	5.924	6.751	0.026	0.077	0.135	0.213	0.243	0.279	20.381	422.138	452.333	452.482
40% Perc =	0.757	2.280	3.924	6.211	7.043	0.027	0.082	0.141	0.224	0.253	0.313	22.633	446.998	478.682	479.010
45% Perc =	0.803	2.415	4.067	6.472	7.336	0.029	0.087	0.146	0.233	0.264	0.349	24.891	474.171	503.921	504.386
50% Perc =	0.842	2.539	4.212	6.747	7.607	0.030	0.091	0.152	0.243	0.274	0.385	27.266	499.217	529.695	530.133
55% Perc =	0.887	2.655	4.372	7.026	7.856	0.032	0.096	0.157	0.253	0.283	0.425	29.983	520.870	552.938	553.192
60% Perc =	0.927	2.786	4.517	7.281	8.137	0.033	0.100	0.163	0.262	0.293	0.466	32.790	547.462	578.179	578.674
65% Perc =	0.977	2.914	4.683	7.558	8.418	0.035	0.105	0.168	0.272	0.303	0.513	35.991	575.172	606.112	606.603
70% Perc =	1.022	3.076	4.864	7.884	8.719	0.037	0.111	0.175	0.284	0.314	0.565	39.496	604.205	634.470	635.031
75% Perc =	1.074	3.226	5.027	8.204	9.063	0.039	0.116	0.181	0.295	0.326	0.619	43.532	635.547	666.506	666.736
80% Perc =	1.133	3.415	5.222	8.583	9.433	0.041	0.123	0.188	0.309	0.339	0.679	47.935	668.148	702.796	703.197
85% Perc =	1.202	3.605	5.457	8.974	9.847	0.043	0.130	0.196	0.323	0.354	0.756	53.211	713.735	747.150	747.315
90% Perc =	1.283	3.847	5.738	9.465	10.346	0.046	0.138	0.206	0.341	0.372	0.857	60.291	769.392	801.609	802.244
95% Perc =	1.381	4.165	6.162	10.169	11.101	0.050	0.150	0.222	0.366	0.399	1.029	70.773	859.076	892.719	893.067
Maximum =	1.628	5.139	7.595	12.416	13.302	0.059	0.185	0.273	0.447	0.479	1.756	121.609	1290.106	1369.357	1369.691

Table 4.2.18
Non Arctic LOF Average Platforms + Wells - Monte Carlo Results

Platforms + Wells	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	8.27	3.15	4.84	7.99	16.27	0.30	0.11	0.17	0.29	0.59	3.79	34.69	515.18	549.87	553.65
Std Deviation =	5.06	1.06	1.24	2.21	5.55	0.18	0.04	0.04	0.08	0.20	3.48	21.04	194.73	196.04	196.04
Variance =	25.582	1.123	1.536	4.897	30.795	0.033	0.001	0.002	0.006	0.040	12.137	442.707	37918.840	38432.220	38432.820
Skewness =	0.56	0.02	0.03	0.03	0.45	0.56	0.02	0.03	0.03	0.45	1.71	0.83	0.47	0.46	0.46
Kurtosis =	2.41	2.54	2.77	2.65	2.55	2.41	2.54	2.77	2.65	2.55	6.43	3.52	3.16	3.17	3.16
Mode =	2.81	2.88	4.29	6.72	18.61	0.10	0.17	0.15	0.24	0.48	0.67	25.06	512.40	606.06	454.41
Minimum =	0.507	0.377	0.884	1.475	3.747	0.018	0.014	0.032	0.053	0.135	-0.838	-7.338	59.916	91.663	93.413
5% Perc =	1.687	1.365	2.775	4.338	8.359	0.061	0.049	0.100	0.156	0.301	0.454	6.842	220.903	250.726	255.348
10% Perc =	2.248	1.748	3.253	5.076	9.619	0.081	0.063	0.117	0.183	0.346	0.683	10.432	275.643	308.469	311.442
15% Perc =	2.814	1.992	3.532	5.589	10.476	0.101	0.072	0.127	0.201	0.377	0.882	13.508	314.345	349.351	352.725
20% Perc =	3.374	2.203	3.774	6.050	11.258	0.121	0.079	0.136	0.218	0.405	1.084	16.275	346.226	379.929	383.492
25% Perc =	4.043	2.397	3.989	6.458	11.995	0.145	0.086	0.144	0.232	0.432	1.282	18.788	373.236	407.891	411.794
30% Perc =	4.649	2.571	4.185	6.815	12.669	0.167	0.093	0.151	0.245	0.456	1.515	21.549	398.710	432.983	437.306
35% Perc =	5.309	2.731	4.352	7.109	13.399	0.191	0.098	0.157	0.256	0.482	1.746	23.934	425.350	459.792	463.320
40% Perc =	5.973	2.870	4.513	7.386	14.060	0.215	0.103	0.162	0.266	0.506	2.001	26.019	450.712	484.550	488.306
45% Perc =	6.661	3.004	4.657	7.685	14.728	0.240	0.108	0.168	0.277	0.530	2.281	28.401	477.634	511.492	516.064
50% Perc =	7.382	3.150	4.830	7.985	15.509	0.266	0.113	0.174	0.287	0.558	2.630	30.814	502.985	536.524	540.565
55% Perc =	8.181	3.297	4.996	8.254	16.237	0.294	0.119	0.180	0.297	0.584	3.029	33.678	524.341	559.841	563.482
60% Perc =	9.002	3.426	5.141	8.558	17.060	0.324	0.123	0.185	0.308	0.614	3.488	36.459	551.096	584.820	587.889
65% Perc =	9.926	3.575	5.319	8.850	18.065	0.357	0.129	0.191	0.318	0.650	3.939	39.535	578.845	614.257	618.357
70% Perc =	10.817	3.724	5.492	9.183	19.079	0.389	0.134	0.198	0.330	0.686	4.485	43.235	607.310	642.396	645.347
75% Perc =	11.787	3.913	5.685	9.535	20.114	0.424	0.141	0.205	0.343	0.724	5.138	47.342	639.280	672.211	676.723
80% Perc =	13.019	4.089	5.901	9.934	21.273	0.468	0.147	0.212	0.357	0.765	5.987	51.732	671.192	709.519	712.868
85% Perc =	14.244	4.305	6.159	10.379	22.647	0.513	0.155	0.222	0.373	0.815	7.117	57.014	718.778	755.440	758.945
90% Perc =	15.839	4.532	6.466	10.862	24.293	0.570	0.163	0.233	0.391	0.874	8.615	64.025	773.183	808.237	812.314
95% Perc =	17.859	4.882	6.876	11.610	26.360	0.643	0.176	0.247	0.418	0.948	11.090	74.233	860.211	898.146	901.743
Maximum =	22.987	6.252	8.565	14.543	34.430	0.827	0.225	0.308	0.523	1.239	24.865	123.541	1295.034	1379.213	1381.047

Table 4.2.19
Non Arctic LOF Average - Monte Carlo Results

Chukchi Sea	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills	Small and Medium Spills 50-999 bbl	Large Spills 1000-9999 bbl	Huge Spills =>10000 bbl	Significant Spills =>1000 bbl	All Spills
All years Average LOF	**Frequency Spills per 10^3 years**					**Frequency Spills per 10^9 bbl Produced**					**Spill Index [bbl]**				
Mean =	26.11	14.81	8.59	23.40	49.51	0.94	0.53	0.31	0.84	1.78	10.65	94.52	572.89	667.41	678.07
Std Deviation =	8.39	6.22	2.37	6.83	10.92	0.30	0.22	0.09	0.25	0.39	5.78	49.22	197.68	204.23	204.21
Variance =	70.378	38.718	5.630	46.699	119.260	0.091	0.050	0.007	0.060	0.154	33.372	2422.869	39077.630	41709.120	41700.440
Skewness =	0.32	0.52	0.35	0.44	0.25	0.32	0.52	0.35	0.44	0.25	0.98	1.08	0.47	0.45	0.44
Kurtosis =	2.76	2.54	2.72	2.69	2.78	2.76	2.54	2.72	2.69	2.78	4.09	4.46	3.16	3.16	3.16
Mode =	22.04	9.29	6.86	18.71	34.21	0.79	0.83	0.25	0.67	1.84	4.84	77.63	547.07	526.96	540.08
Minimum =	5.871	1.166	2.434	6.876	19.845	0.211	0.042	0.088	0.247	0.714	-0.060	3.198	88.560	146.325	149.223
5% Perc =	13.191	6.290	5.025	13.597	32.416	0.475	0.226	0.181	0.489	1.166	3.307	32.424	277.370	357.243	369.342
10% Perc =	15.466	7.478	5.672	15.174	35.602	0.556	0.269	0.204	0.546	1.281	4.224	40.726	327.522	416.663	427.551
15% Perc =	17.293	8.380	6.137	16.387	37.973	0.622	0.302	0.221	0.590	1.365	4.961	47.605	367.604	456.831	467.065
20% Perc =	18.617	9.086	6.491	17.341	39.829	0.670	0.327	0.234	0.624	1.433	5.601	53.266	400.904	489.267	499.725
25% Perc =	19.816	9.843	6.821	18.205	41.492	0.713	0.354	0.245	0.655	1.493	6.240	59.114	428.010	519.404	529.940
30% Perc =	21.042	10.568	7.134	19.035	43.045	0.757	0.380	0.257	0.685	1.549	6.885	64.635	455.393	547.299	558.359
35% Perc =	22.133	11.341	7.466	19.883	44.722	0.796	0.408	0.269	0.715	1.609	7.546	69.888	482.539	575.864	586.937
40% Perc =	23.323	12.045	7.762	20.759	46.262	0.839	0.433	0.279	0.747	1.665	8.183	74.884	507.912	601.695	613.731
45% Perc =	24.483	12.828	8.075	21.569	47.712	0.881	0.462	0.291	0.776	1.717	8.901	79.776	534.460	627.259	638.061
50% Perc =	25.677	13.744	8.367	22.510	49.169	0.924	0.495	0.301	0.810	1.769	9.604	84.814	558.738	653.071	663.489
55% Perc =	26.898	14.794	8.684	23.454	50.660	0.968	0.532	0.312	0.844	1.823	10.324	91.231	585.597	680.534	691.519
60% Perc =	28.004	15.864	9.035	24.556	51.942	1.008	0.571	0.325	0.884	1.869	11.031	97.423	610.320	706.954	717.776
65% Perc =	29.224	16.888	9.386	25.700	53.471	1.052	0.608	0.338	0.925	1.924	11.969	103.209	638.397	734.172	745.290
70% Perc =	30.383	17.931	9.828	26.772	55.117	1.093	0.645	0.354	0.963	1.983	12.898	110.711	665.876	764.862	775.792
75% Perc =	31.613	19.044	10.211	28.059	56.703	1.138	0.685	0.367	1.010	2.040	13.805	119.500	696.014	796.068	806.100
80% Perc =	33.243	20.576	10.685	29.430	58.640	1.196	0.740	0.384	1.059	2.110	15.167	129.956	735.137	832.151	842.988
85% Perc =	35.096	22.020	11.170	31.029	61.147	1.263	0.792	0.402	1.116	2.200	16.779	143.497	778.814	878.282	889.511
90% Perc =	37.466	23.751	11.852	32.988	64.036	1.348	0.855	0.426	1.187	2.304	18.640	163.304	836.741	937.814	946.099
95% Perc =	40.806	26.129	12.775	35.751	68.316	1.468	0.940	0.460	1.286	2.458	21.518	189.462	922.834	1032.875	1045.397
Maximum =	59.687	35.189	17.916	46.900	90.206	2.148	1.266	0.645	1.688	3.246	38.574	346.013	1375.006	1518.520	1543.394

Table 4.2.20
Non Arctic Composition of Spill Indicators - Year 2024

Spill Size	Spill Source									
	P/L		Platforms		Wells		Platforms and Wells		All	
	Year 2024 Spill Frequency per 10^3 years									
Small and Medium Spills 50-999 bbl	26.144	54%	12.080	86%	1.432	11%	13.512	50%	39.655	52%
Large Spills 1000-9999 bbl	16.955	35%	1.007	7%	4.295	33%	5.302	20%	22.257	29%
Huge Spills =>10000 bbl	5.444	11%	1.007	7%	7.241	56%	8.248	30%	13.692	18%
Significant Spills =>1000 bbl	22.399	46%	2.013	14%	11.536	89%	13.550	50%	35.949	48%
All Spills	**48.543**	**100%**	**14.093**	**100%**	**12.968**	**100%**	**27.061**	**100%**	**75.604**	**100%**
	Year 2024 Spill Frequency per 10^9 bbl produced									
Small and Medium Spills 50-999 bbl	0.319	54%	0.147	86%	0.017	11%	0.165	50%	0.484	52%
Large Spills 1000-9999 bbl	0.207	35%	0.012	7%	0.052	33%	0.065	20%	0.271	29%
Huge Spills =>10000 bbl	0.066	11%	0.012	7%	0.088	56%	0.101	30%	0.167	18%
Significant Spills =>1000 bbl	0.273	46%	0.025	14%	0.141	89%	0.165	50%	0.438	48%
All Spills	**0.592**	**100%**	**0.172**	**100%**	**0.158**	**100%**	**0.330**	**100%**	**0.922**	**100%**
	Year 2024 Spill Index [bbl]									
Small and Medium Spills 50-999 bbl	10	6%	5	33%	1	0%	6	1%	16	1%
Large Spills 1000-9999 bbl	88	48%	6	34%	53	6%	59	6%	147	13%
Huge Spills =>10000 bbl	84	46%	6	34%	883	94%	889	93%	973	86%
Significant Spills =>1000 bbl	172	94%	11	67%	936	100%	947	99%	1119	99%
All Spills	**182**	**100%**	**17**	**100%**	**937**	**100%**	**953**	**100%**	**1136**	**100%**

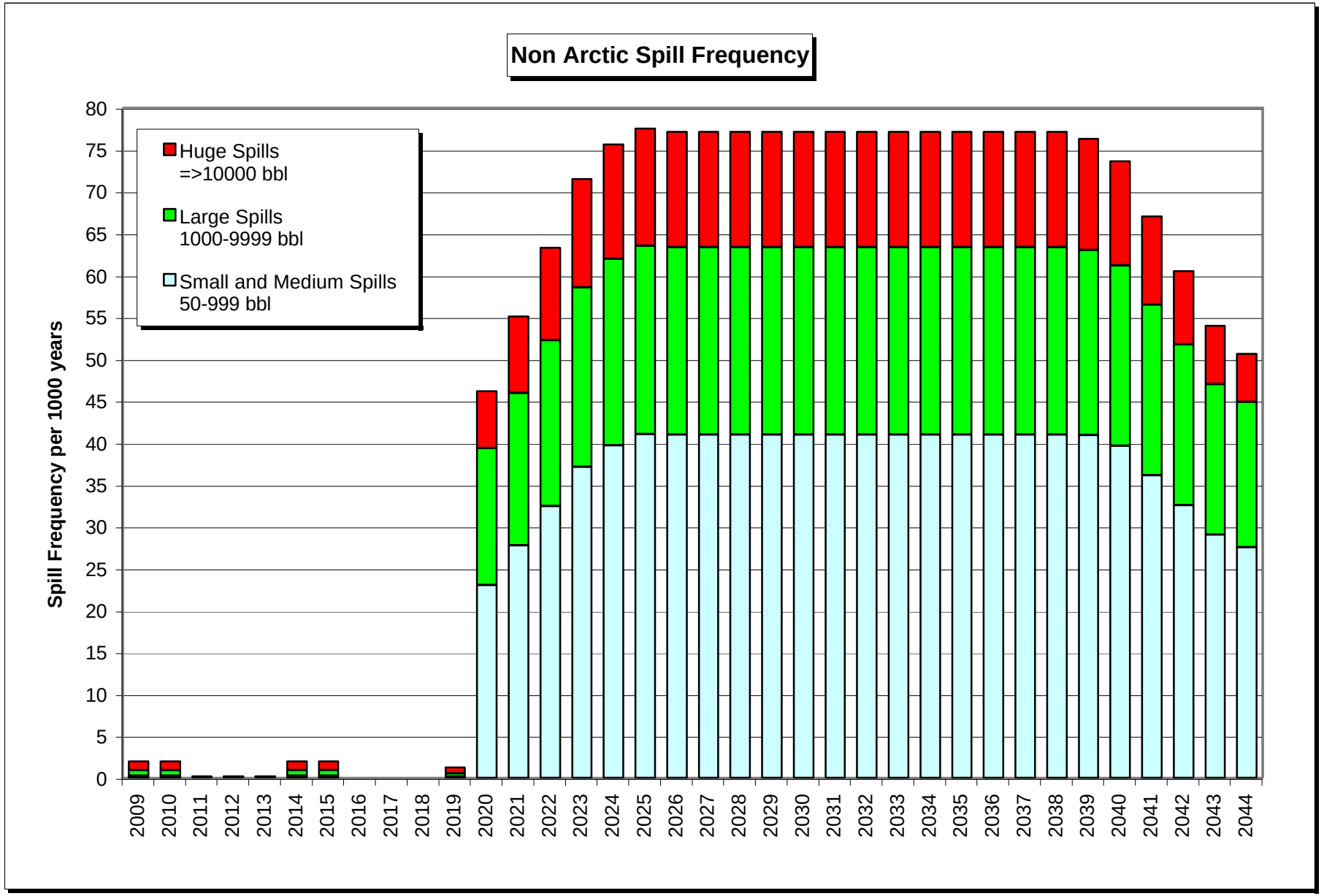
Spill Source	Spill Size									
	S+M 50-999 bbl		Large 1000-9999 bbl		Huge =>10000 bbl		Significant =>1000 bbl		All Spills	
	Year 2024 Spill Frequency per 10^3 years									
P/L	26.144	66%	16.955	76%	5.444	40%	22.399	62%	48.543	64%
Platforms	12.080	30%	1.007	5%	1.007	7%	2.013	6%	14.093	19%
Wells	1.432	4%	4.295	19%	7.241	53%	11.536	32%	12.968	17%
Platforms and Wells	13.512	34%	5.302	24%	8.248	60%	13.550	38%	27.061	36%
All	**39.655**	**100%**	**22.257**	**100%**	**13.692**	**100%**	**35.949**	**100%**	**75.604**	**100%**
	Year 2024 Spill Frequency per 10^9 bbl produced									
P/L	0.319	66%	0.207	76%	0.066	40%	0.273	62%	0.592	64%
Platforms	0.147	30%	0.012	5%	0.012	7%	0.025	6%	0.172	19%
Wells	0.017	4%	0.052	19%	0.088	53%	0.141	32%	0.158	17%
Platforms and Wells	0.165	34%	0.065	24%	0.101	60%	0.165	38%	0.330	36%
All	**0.484**	**100%**	**0.271**	**100%**	**0.167**	**100%**	**0.438**	**100%**	**0.922**	**100%**
	Year 2024 Spill Index [bbl]									
P/L	10	62%	88	60%	84	9%	172	15%	182	16%
Platforms	5	33%	6	4%	6	1%	11	1%	17	1%
Wells	1	5%	53	36%	883	91%	936	84%	937	82%
Platforms and Wells	6	38%	59	40%	889	91%	947	85%	953	84%
All	**16**	**100%**	**147**	**100%**	**973**	**100%**	**1119**	**100%**	**1136**	**100%**

Table 4.2.21
Non Arctic Composition of Spill Indicators - LOF Average

Spill Size	Spill Source									
	P/L		Platforms		Wells		Platforms and Wells		All	
	LOF Average Spill Frequency per 10^3 years									
Small and Medium Spills 50-999 bbl	17.838	54%	7.430	86%	0.843	11%	8.273	51%	26.111	53%
Large Spills 1000-9999 bbl	11.659	35%	0.619	7%	2.530	33%	3.149	19%	14.808	30%
Huge Spills =>10000 bbl	3.751	11%	0.619	7%	4.222	56%	4.842	30%	8.593	17%
Significant Spills =>1000 bbl	15.410	46%	1.238	14%	6.752	89%	7.991	49%	23.401	47%
All Spills	**33.248**	**100%**	**8.668**	**100%**	**7.595**	**100%**	**16.264**	**100%**	**49.512**	**100%**
	LOF Average Spill Frequency per 10^9 bbl produced									
Small and Medium Spills 50-999 bbl	0.642	54%	0.267	86%	0.030	11%	0.298	51%	0.940	53%
Large Spills 1000-9999 bbl	0.420	35%	0.022	7%	0.091	33%	0.113	19%	0.533	30%
Huge Spills =>10000 bbl	0.135	11%	0.022	7%	0.152	56%	0.174	30%	0.309	17%
Significant Spills =>1000 bbl	0.554	46%	0.045	14%	0.243	89%	0.288	49%	0.842	47%
All Spills	**1.196**	**100%**	**0.312**	**100%**	**0.273**	**100%**	**0.585**	**100%**	**1.782**	**100%**
	LOF Average Spill Index [bbl]									
Small and Medium Spills 50-999 bbl	7	6%	3	33%	0	0%	4	1%	11	2%
Large Spills 1000-9999 bbl	61	48%	3	34%	31	6%	35	6%	95	14%
Huge Spills =>10000 bbl	58	46%	3	34%	512	94%	516	93%	574	84%
Significant Spills =>1000 bbl	119	94%	7	67%	544	100%	551	99%	669	98%
All Spills	**125**	**100%**	**10**	**100%**	**544**	**100%**	**554**	**100%**	**680**	**100%**

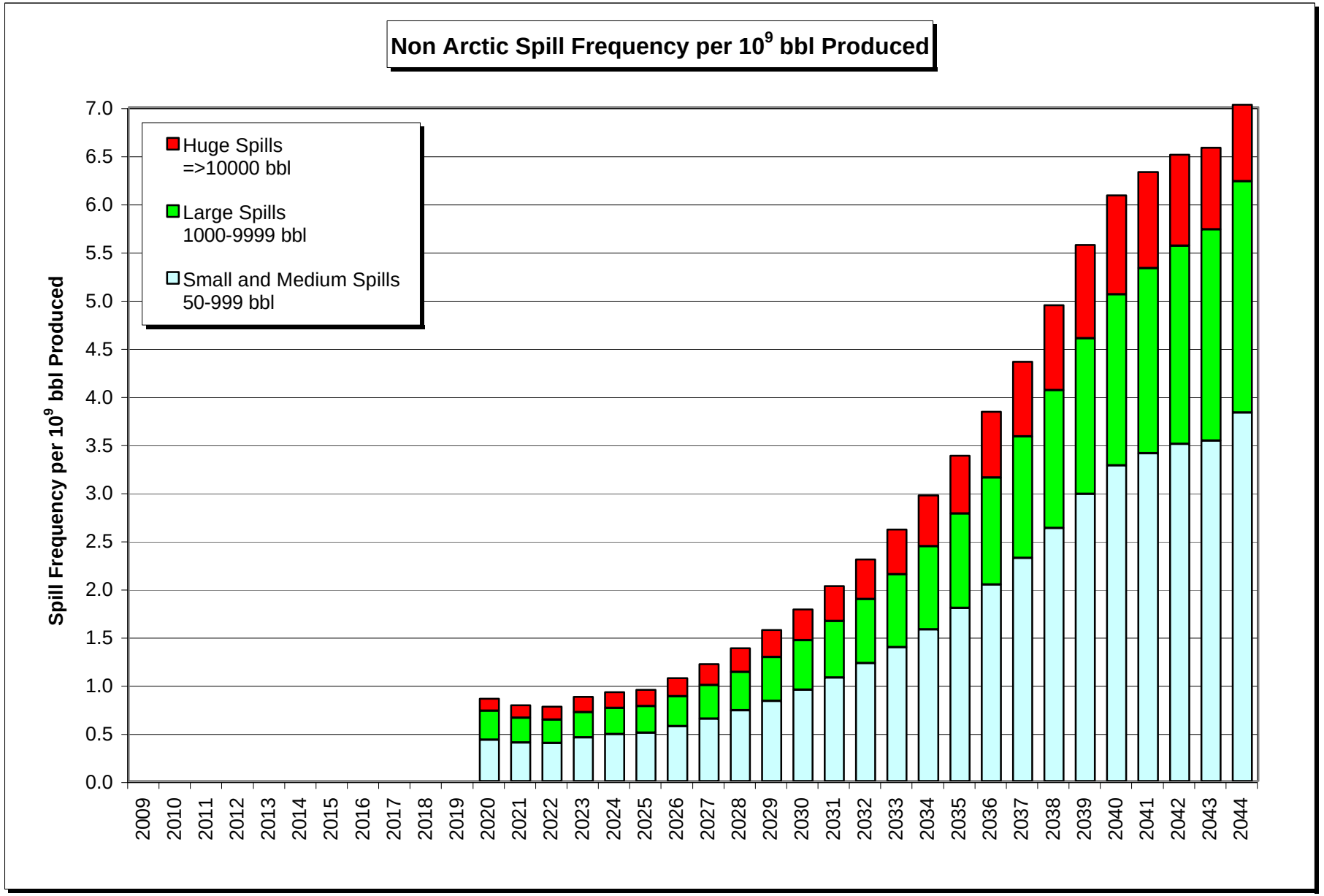
Spill Source	Spill Size									
	S+M 50-999 bbl		Large 1000-9999 bbl		Huge =>10000 bbl		Significant =>1000 bbl		All Spills	
	LOF Average Spill Frequency per 10^3 years									
P/L	17.838	68%	11.659	79%	3.751	44%	15.410	66%	33.248	67%
Platforms	7.430	28%	0.619	4%	0.619	7%	1.238	5%	8.668	18%
Wells	0.843	3%	2.530	17%	4.222	49%	6.752	29%	7.595	15%
Platforms and Wells	8.273	32%	3.149	21%	4.842	56%	7.991	34%	16.264	33%
All	**26.111**	**100%**	**14.808**	**100%**	**8.593**	**100%**	**23.401**	**100%**	**49.512**	**100%**
	LOF Average Spill Frequency per 10^9 bbl produced									
P/L	0.642	68%	0.420	79%	0.135	44%	0.554	66%	1.196	67%
Platforms	0.267	28%	0.022	4%	0.022	7%	0.045	5%	0.312	18%
Wells	0.030	3%	0.091	17%	0.152	49%	0.243	29%	0.273	15%
Platforms and Wells	0.298	32%	0.113	21%	0.174	56%	0.288	34%	0.585	33%
All	**0.940**	**100%**	**0.533**	**100%**	**0.309**	**100%**	**0.842**	**100%**	**1.782**	**100%**
	LOF Average Spill Index [bbl]									
P/L	7	65%	61	64%	58	10%	119	18%	125	18%
Platforms	3	31%	3	4%	3	1%	7	1%	10	2%
Wells	0	4%	31	33%	512	89%	544	81%	544	80%
Platforms and Wells	4	35%	35	36%	516	90%	551	82%	554	82%
All	**11**	**100%**	**95**	**100%**	**574**	**100%**	**669**	**100%**	**680**	**100%**

Figure 4.2.1



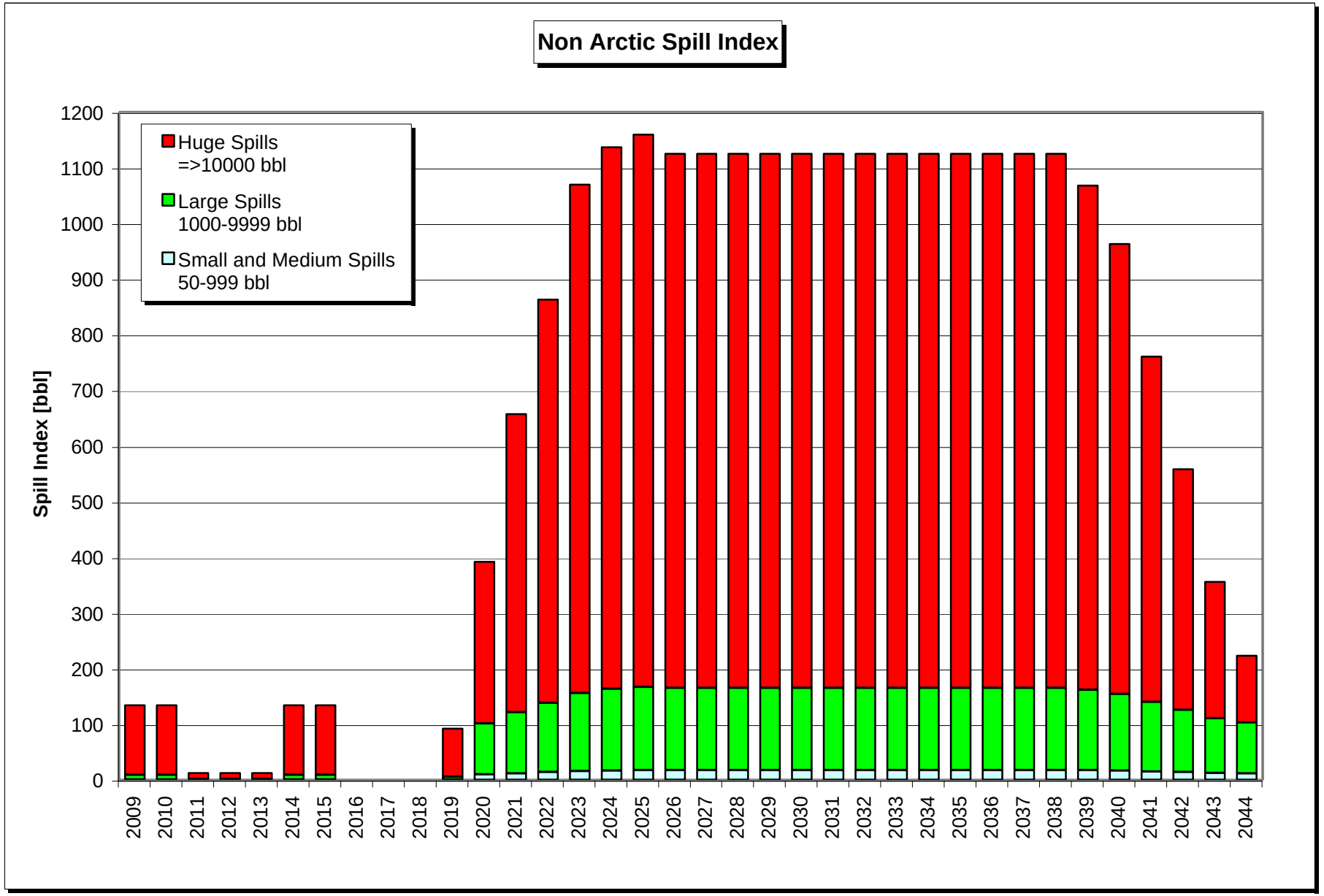
C4_2ChukchiSeaNonArctic.xlsF4201

Figure 4.2.2



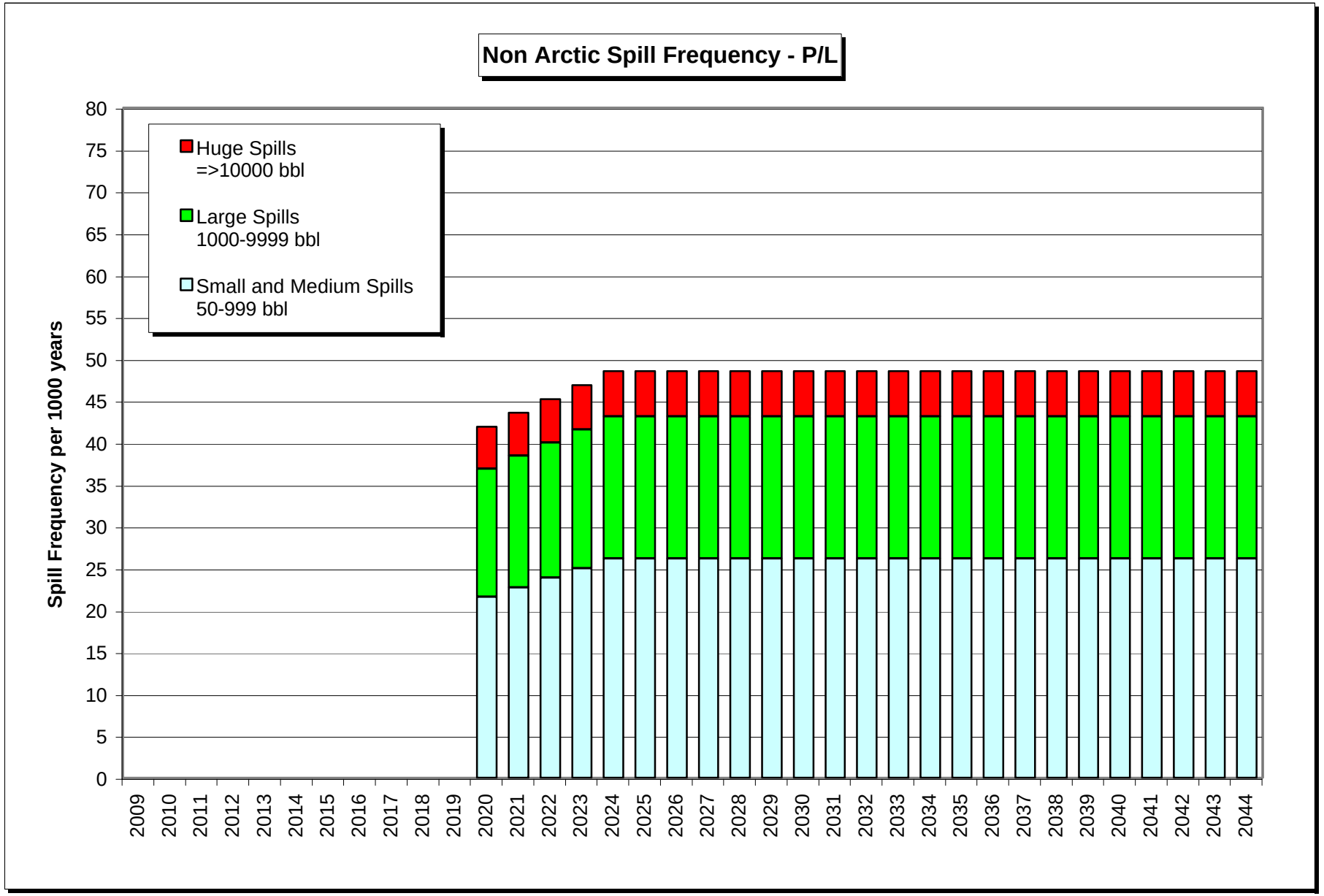
C4_2ChukchiSeaNonArctic.xlsF4202

Figure 4.2.3



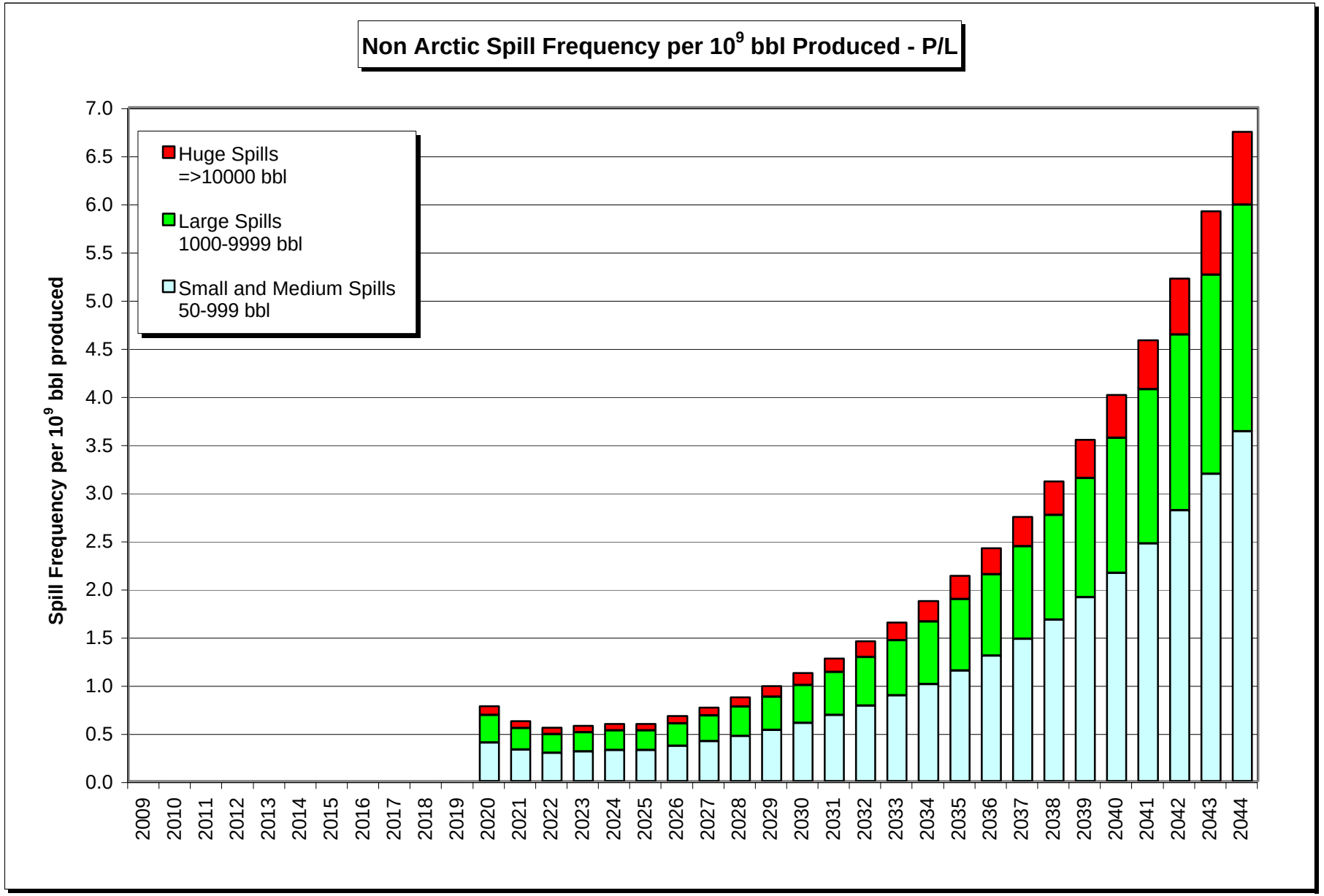
C4_2ChukchiSeaNonArctic.xlsF4203

Figure 4.2.4



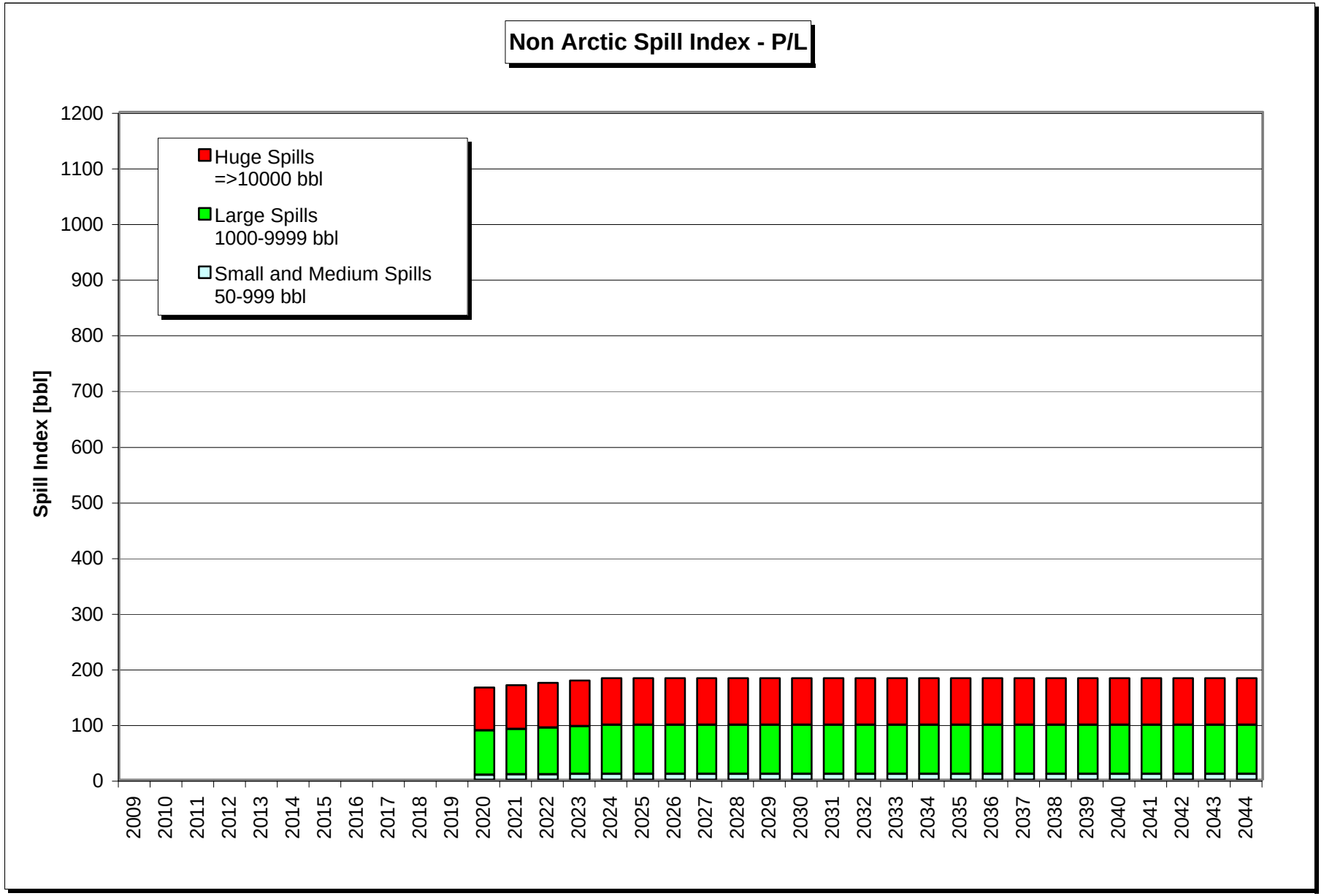
C4_2ChukchiSeaNonArctic.xlsF4204

Figure 4.2.5



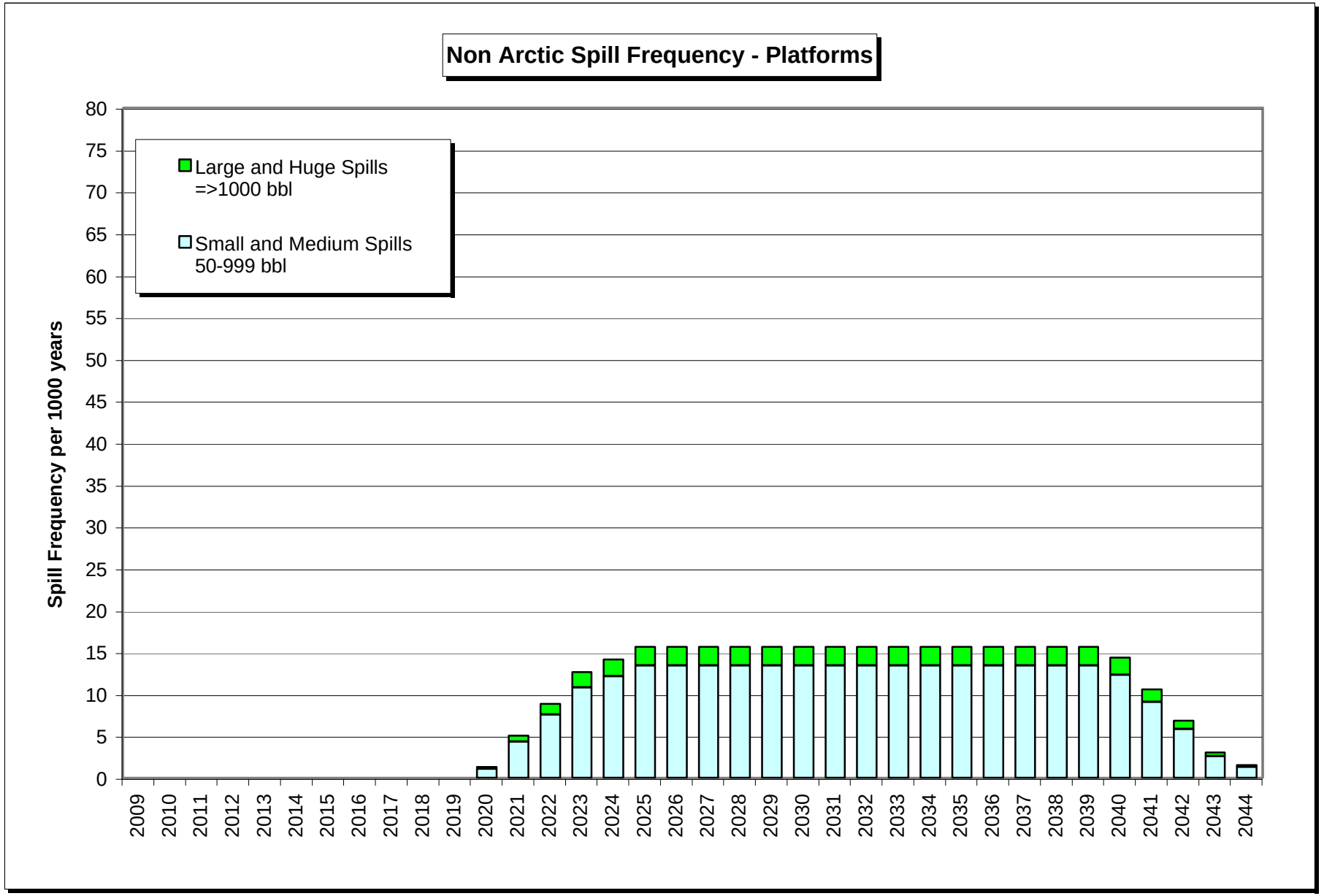
C4_2ChukchiSeaNonArctic.xlsF4205

Figure 4.2.6



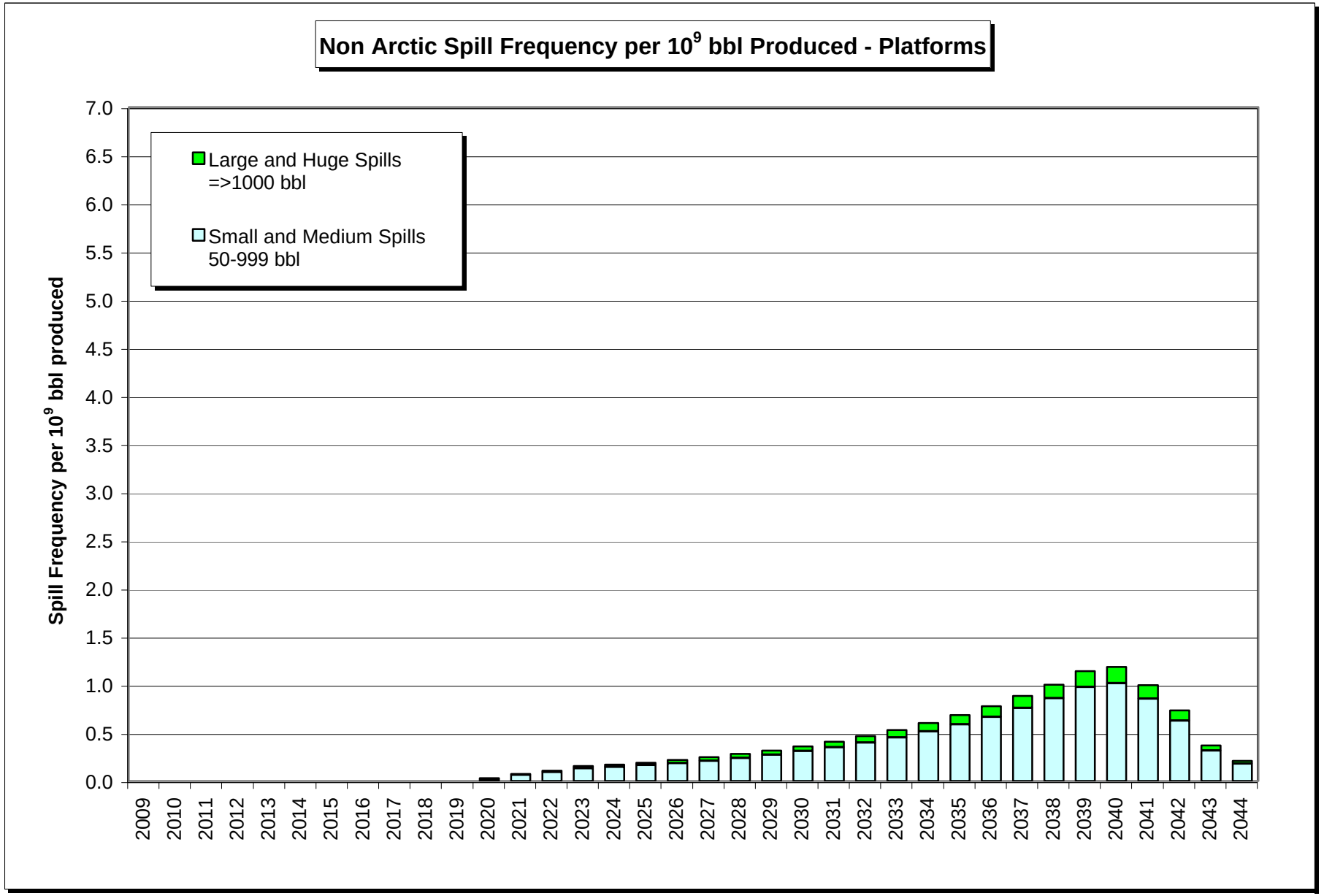
C4_2ChukchiSeaNonArctic.xlsF4206

Figure 4.2.7



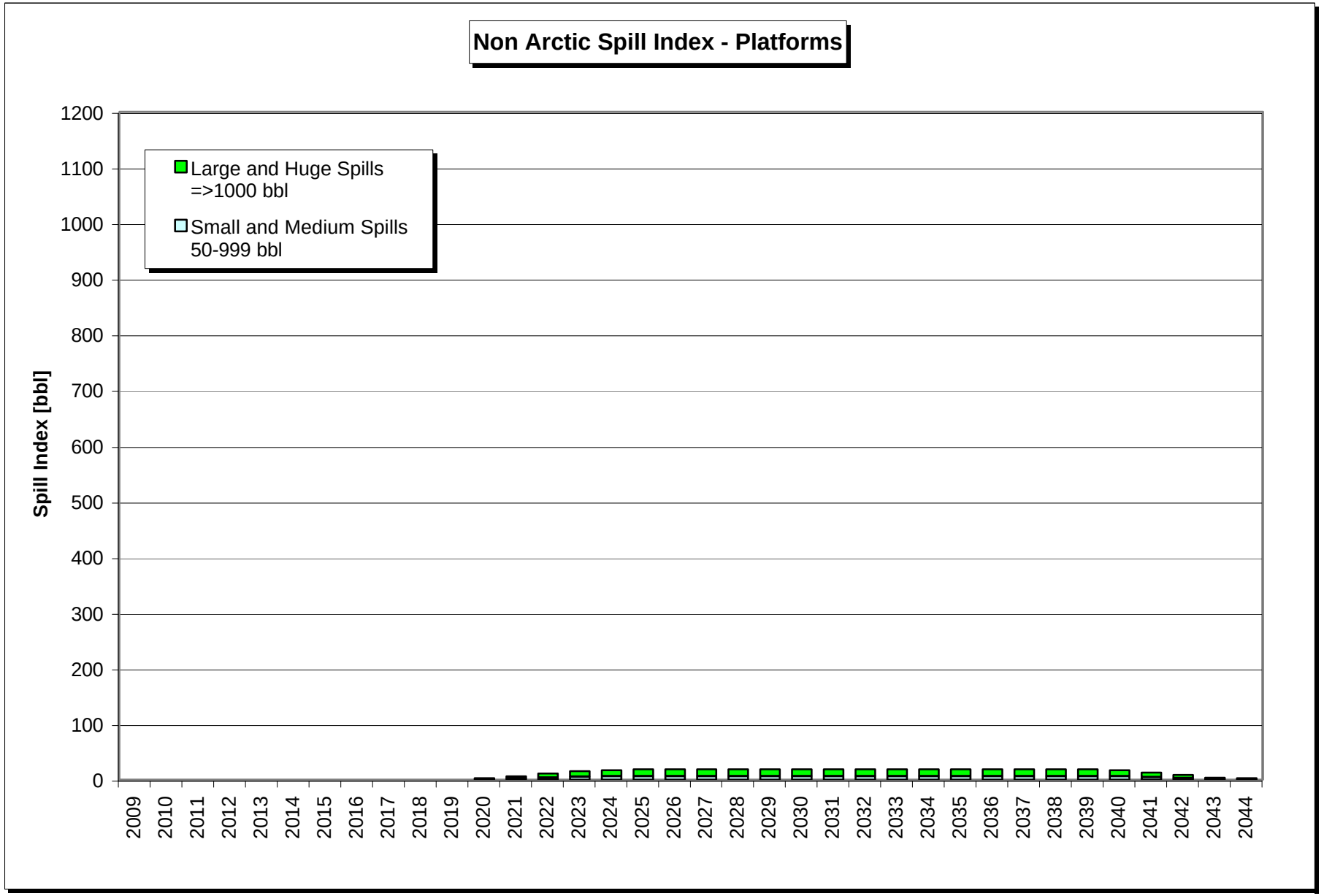
C4_2ChukchiSeaNonArctic.xlsF4207

Figure 4.2.8



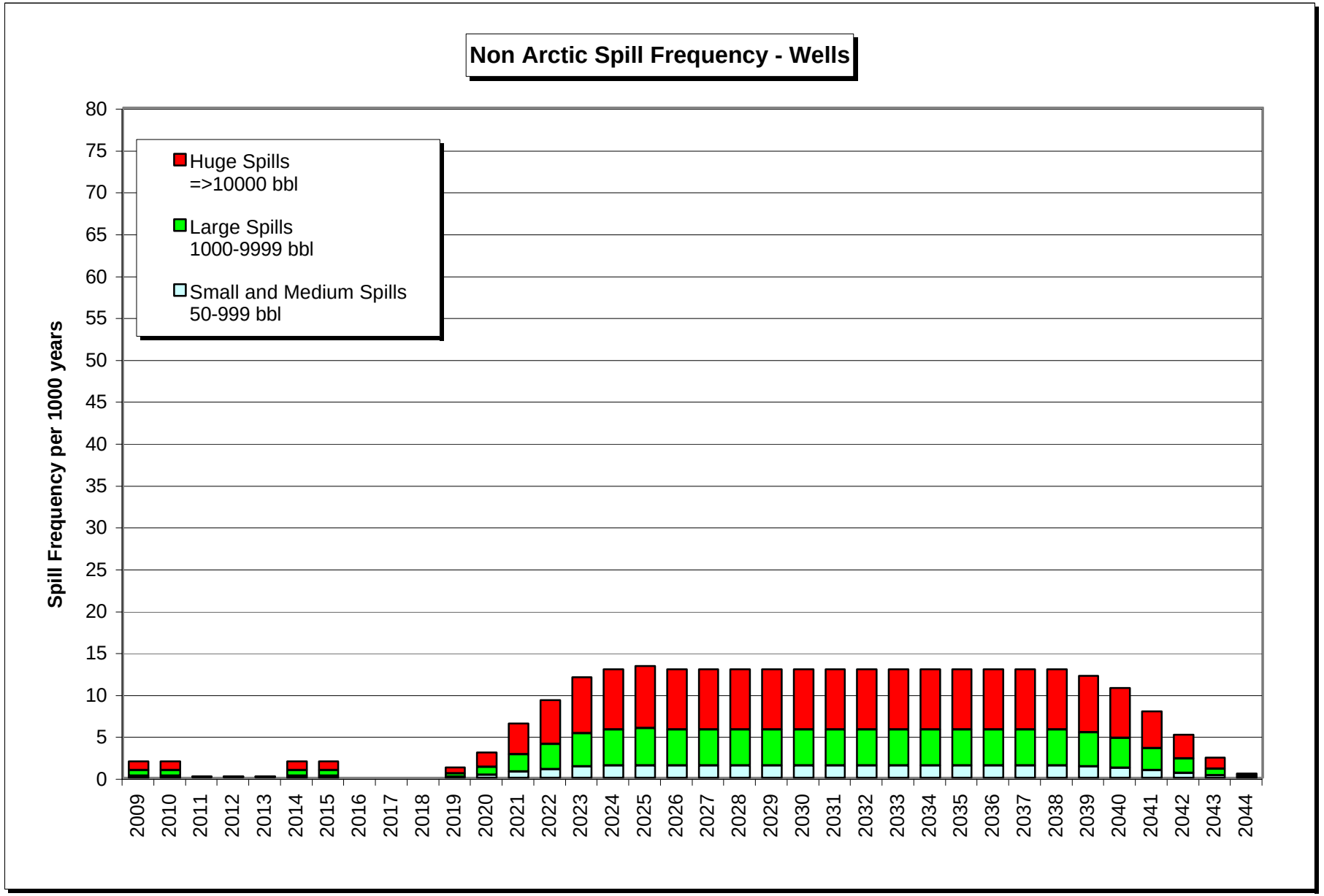
C4_2ChukchiSeaNonArctic.xlsF4208

Figure 4.2.9



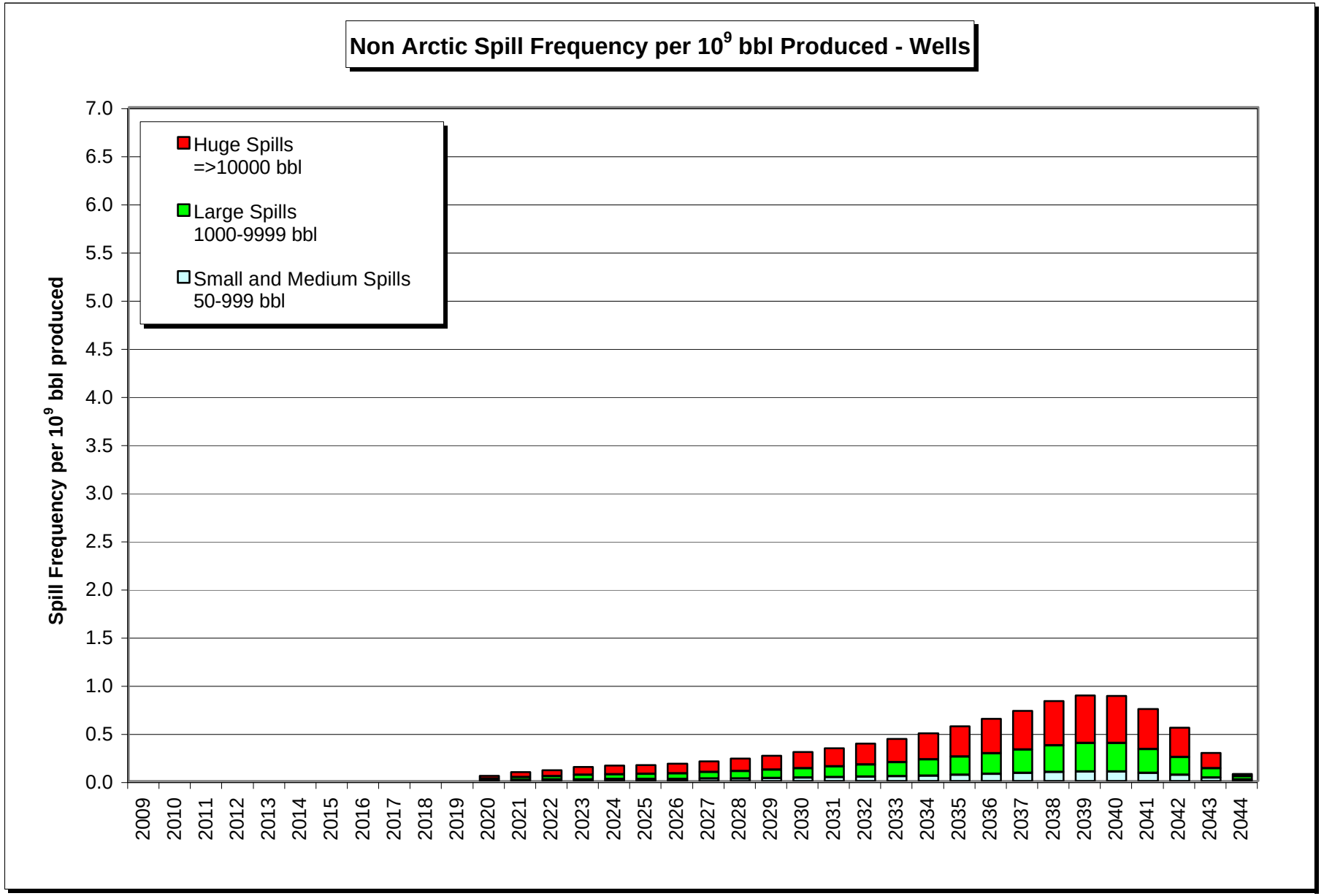
C4_2ChukchiSeaNonArctic.xlsF4209

Figure 4.2.10



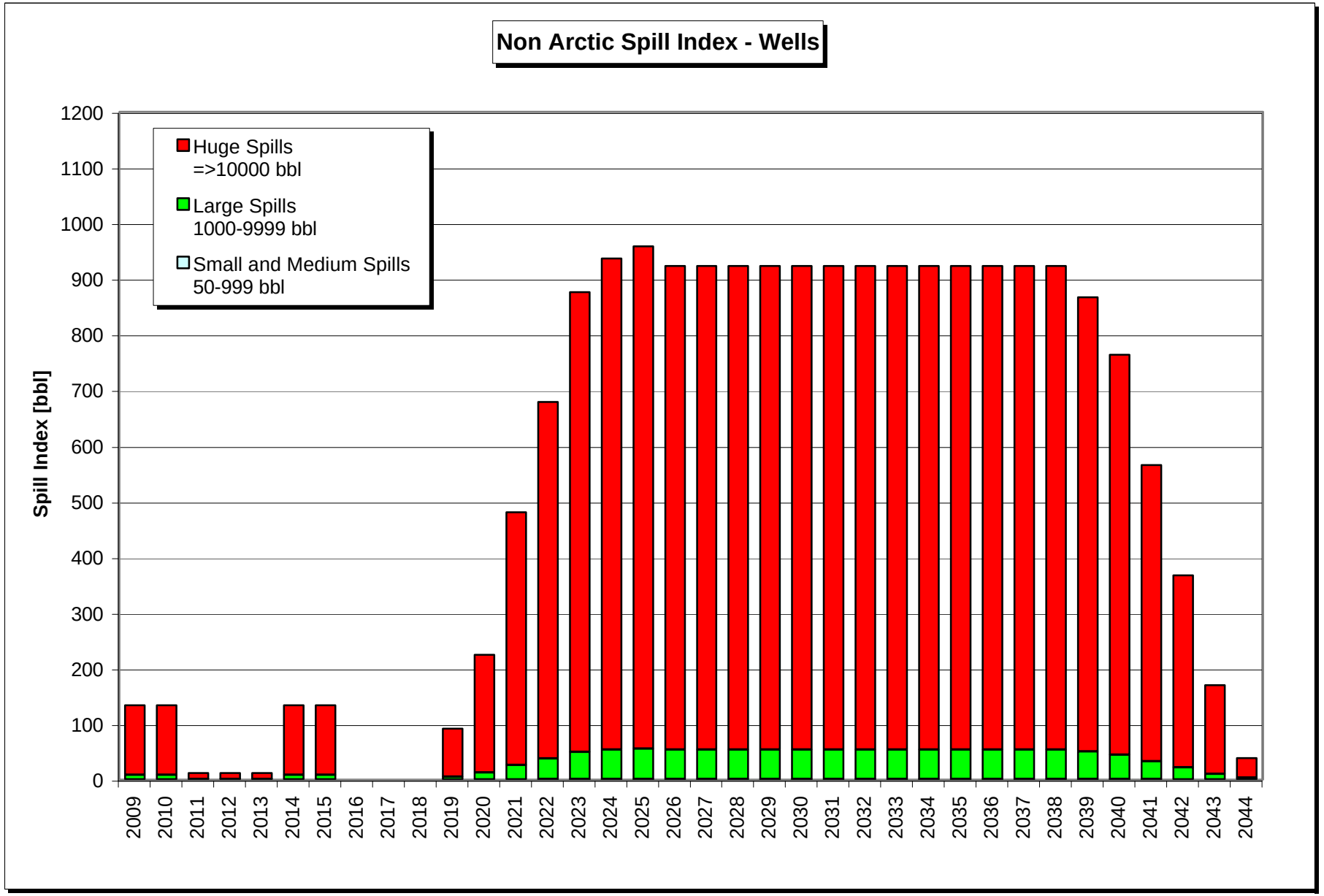
C4_2ChukchiSeaNonArctic.xlsF4210

Figure 4.2.11



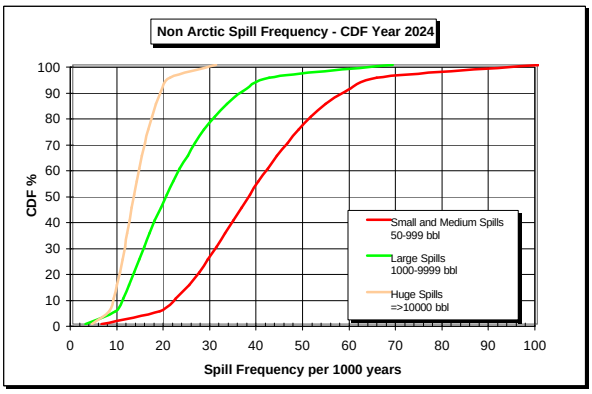
C4_2ChukchiSeaNonArctic.xlsF4211

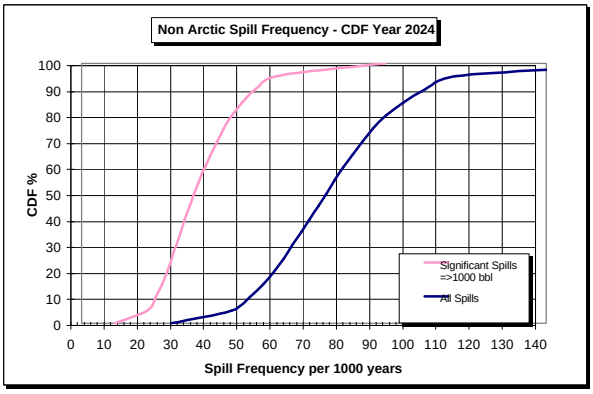
Figure 4.2.12

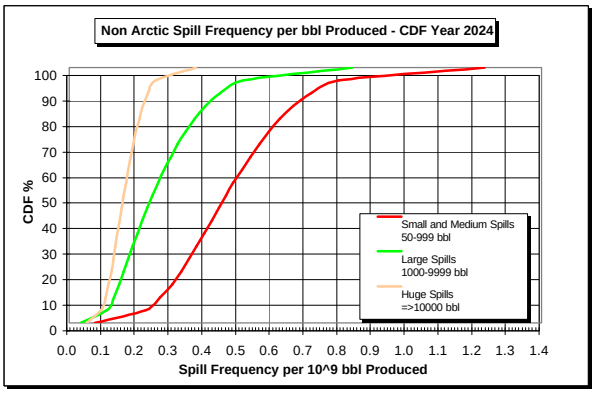


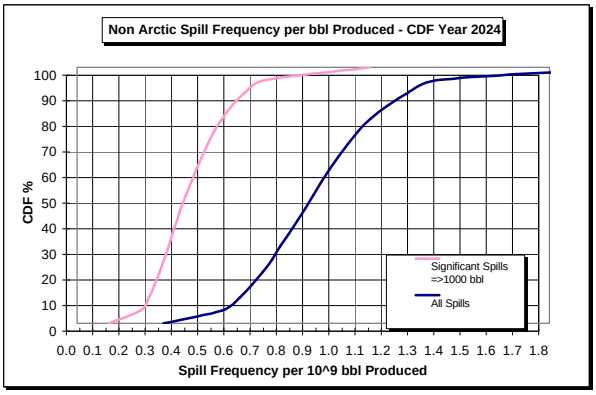
C4_2ChukchiSeaNonArctic.xlsF4212

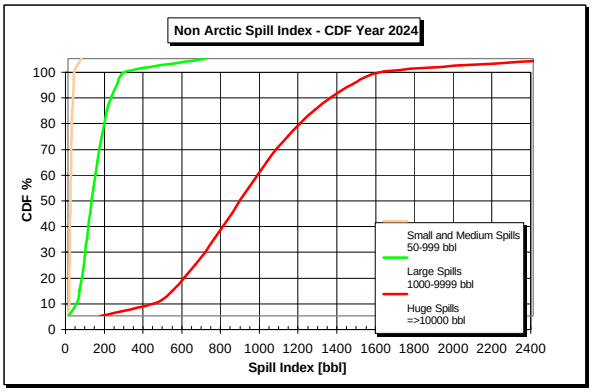
Figure 4.2.13
Non Arctic Spill Indicators - CDF - Year 2024











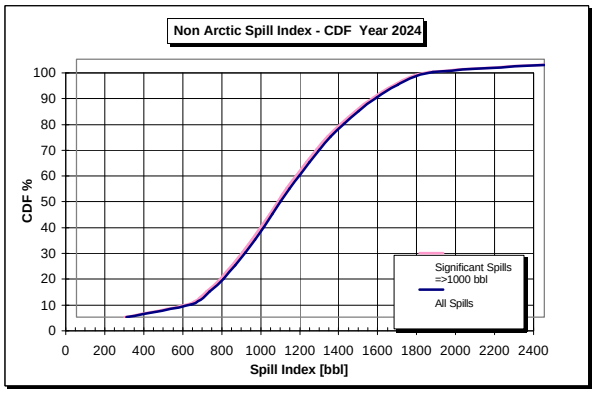
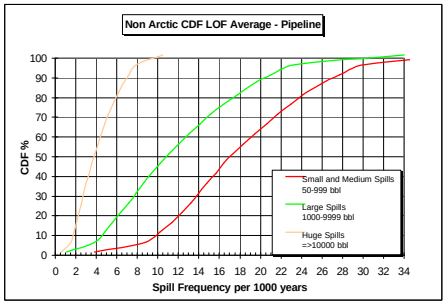
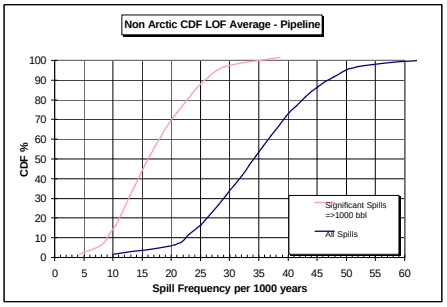
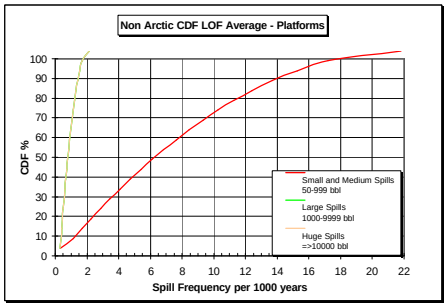
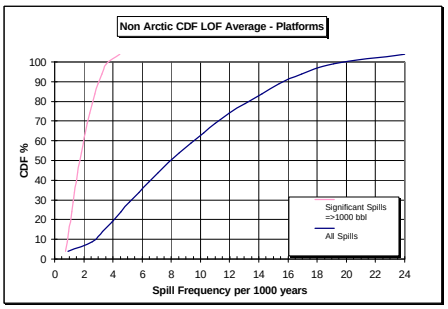


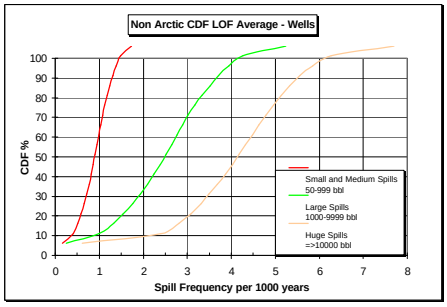
Figure 4.2.14
Non Arctic Spill Frequency - CDF

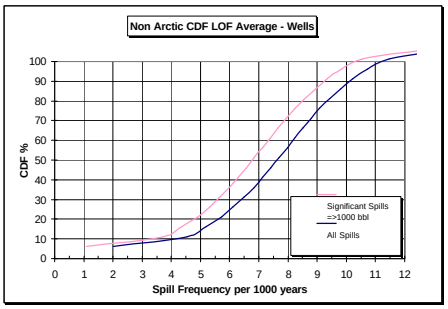


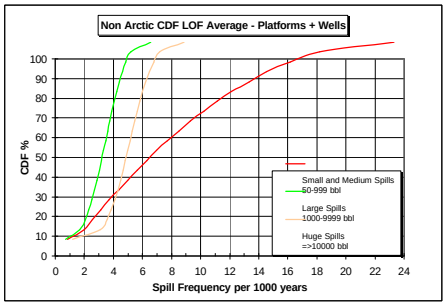


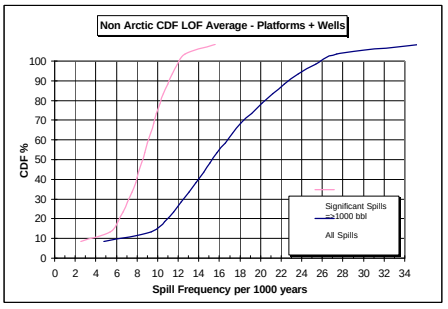


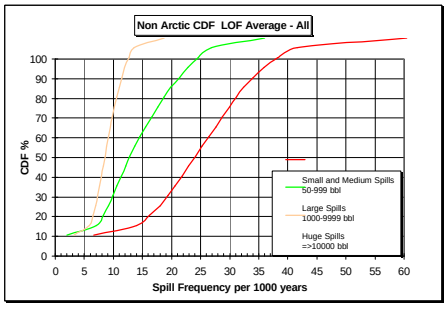












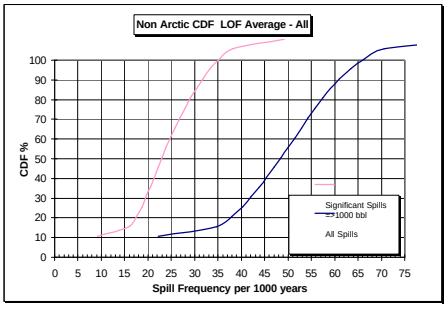
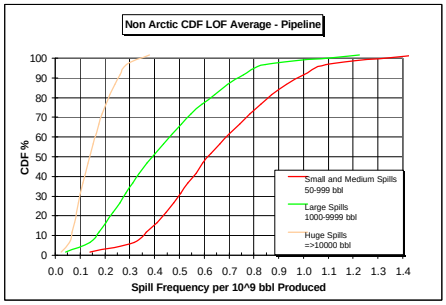
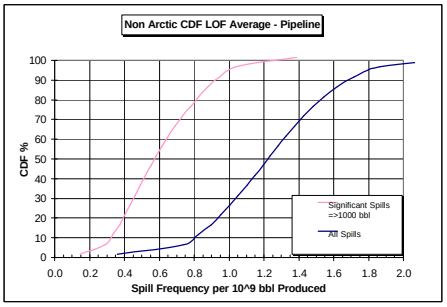
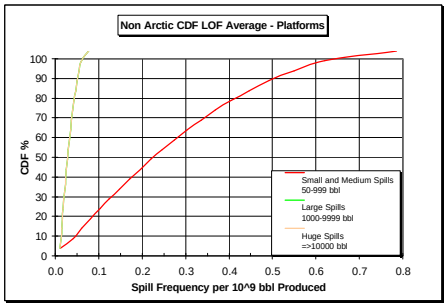
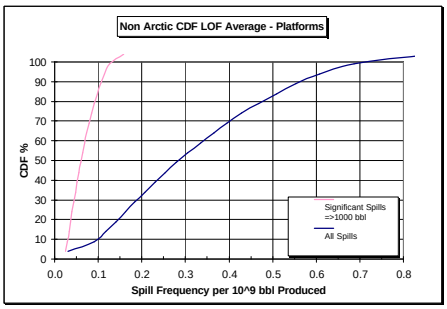


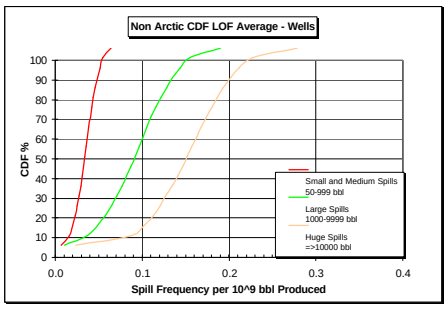
Figure 4.2.15
Non Arctic Spill Frequency per bbl produced - CDF

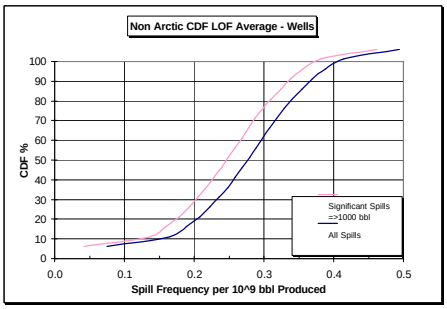


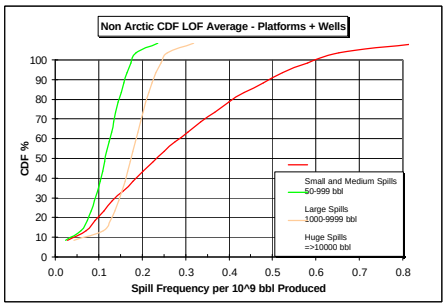


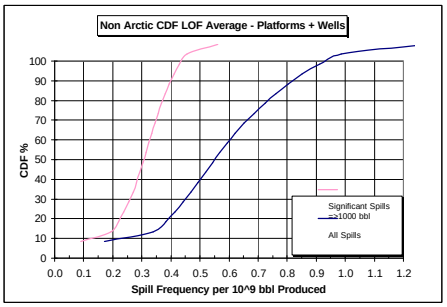


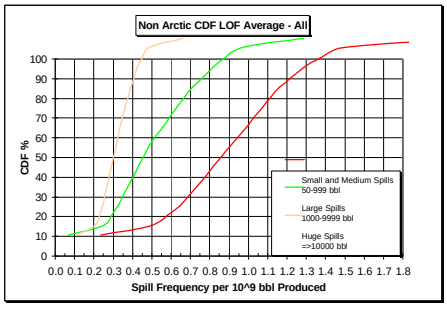












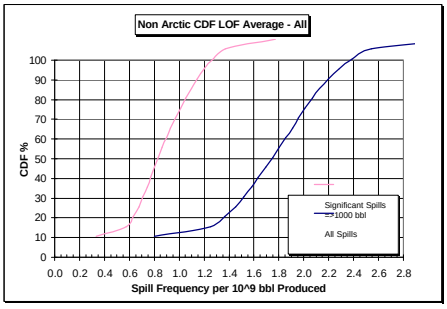
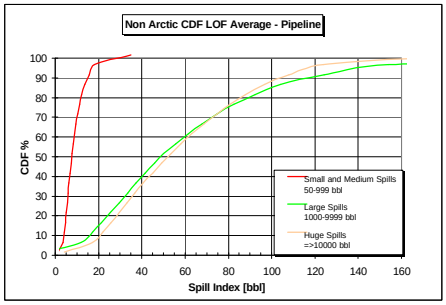
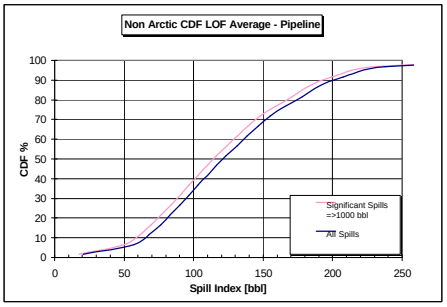
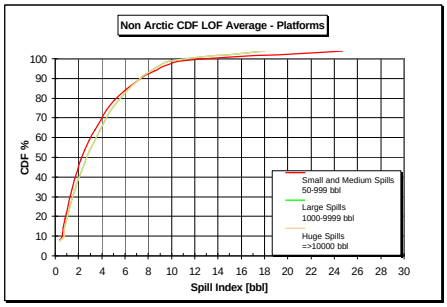
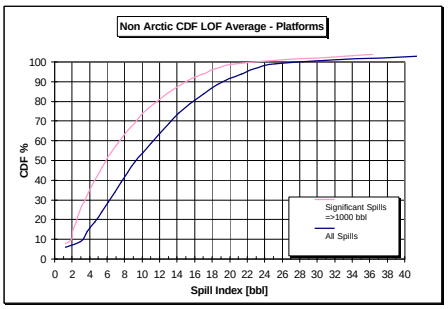


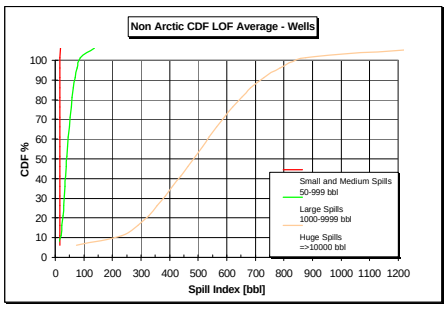
Figure 4.2.16
Non Arctic Spill Index [bbl] - CDF

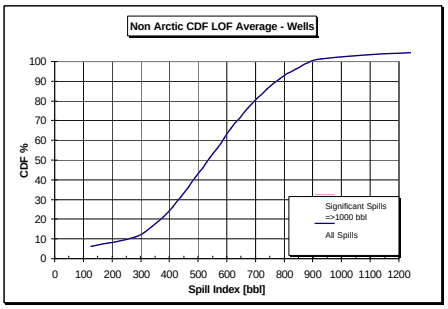


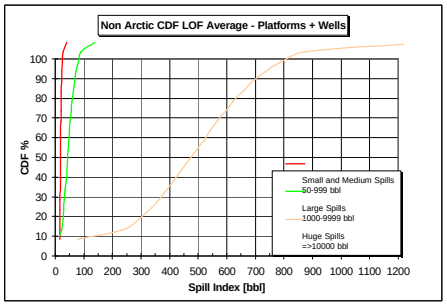


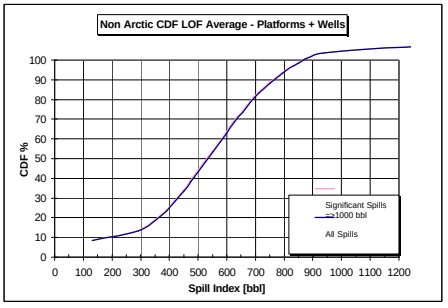


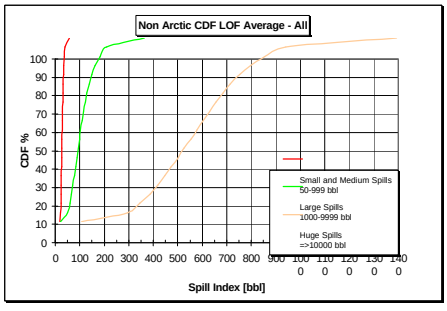












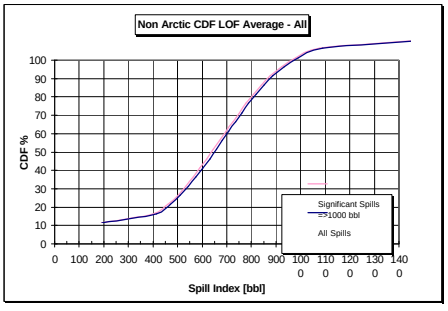
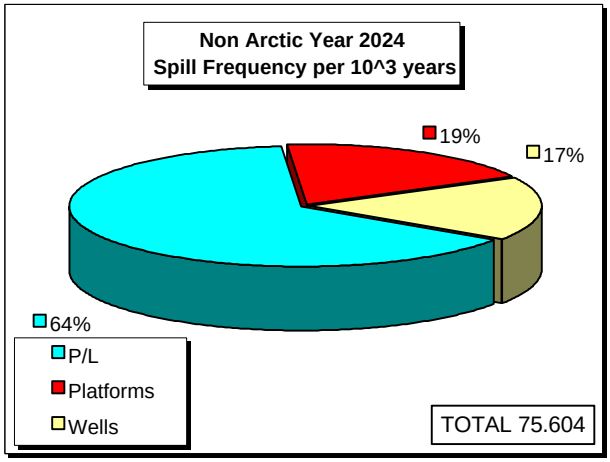
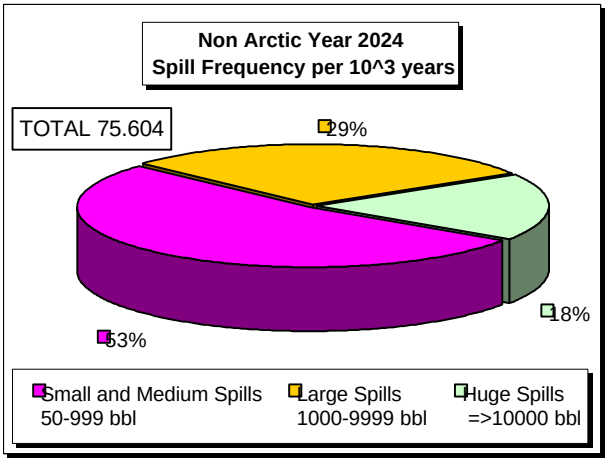


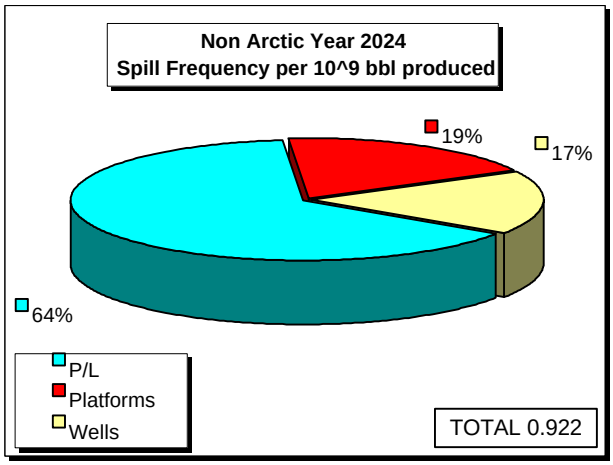
Figure 4.2.17
Year 2024 - Non Arctic Spill Indicators

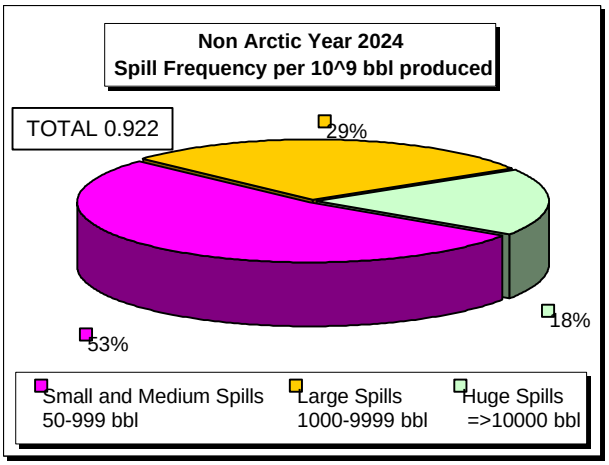
BY SPILL SOURCE

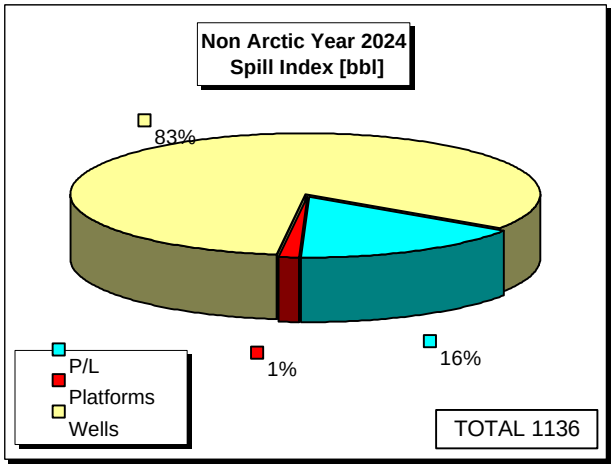


BY SPILL SIZE









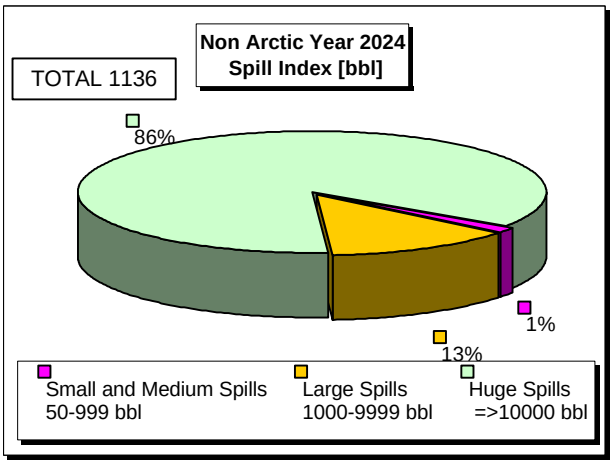
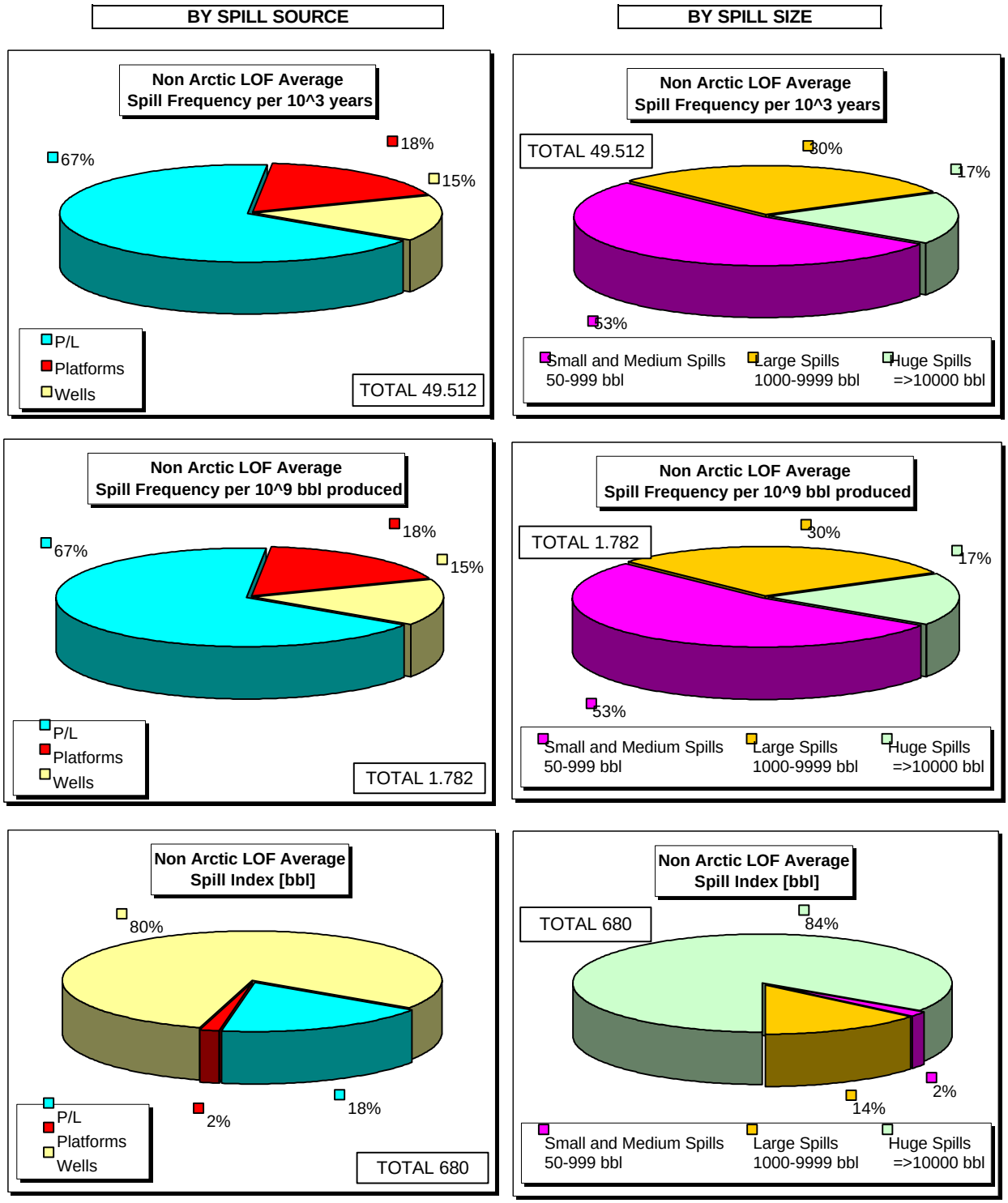


Figure 4.2.18
LOF Average Non arctic Spill Indicators



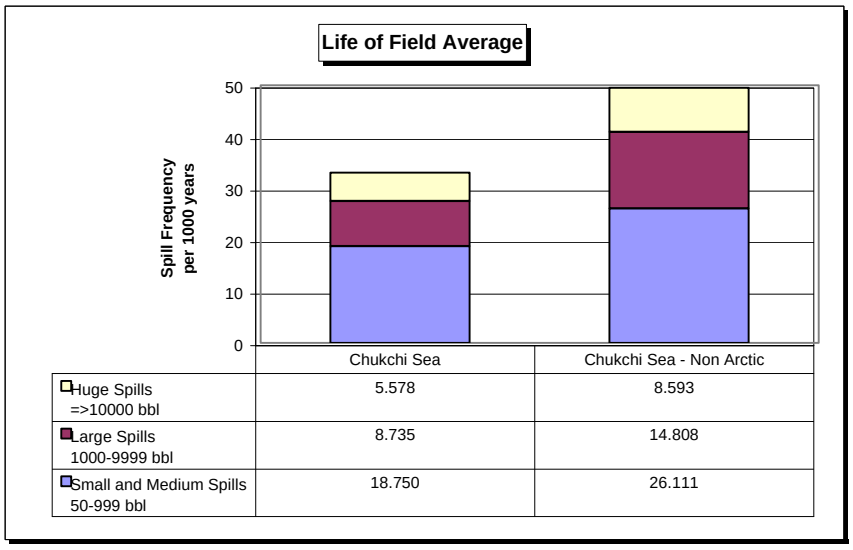
APPENDIX 5

Conclusions

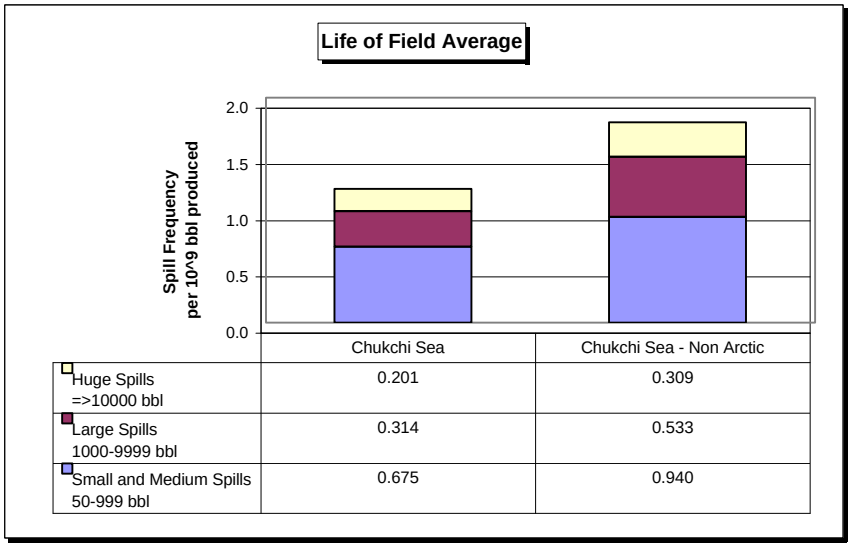
Table 5.1
Summary of Life of Field Average Spill Indicators by Spill Source and Size

Spill Indicators LOF Average	Chukchi Sea			Chukchi Sea - Non Arctic		
	Spill Frequency per 10^3 years	Spill Frequency per 10^9 bbl produced	Spill Index [bbl]	Spill Frequency per 10^3 years	Spill Frequency per 10^9 bbl produced	Spill Index [bbl]
Small and Medium Spills 50-999 bbl	18.750	0.675	8	26.111	0.940	11
	57%	**57%**	**2%**	**53%**	**53%**	**2%**
Large Spills 1000-9999 bbl	8.735	0.314	58	14.808	0.533	95
	26%	**26%**	**13%**	**30%**	**30%**	**14%**
Huge Spills =>10000 bbl	5.578	0.201	399	8.593	0.309	574
	17%	**17%**	**86%**	**17%**	**17%**	**84%**
Significant Spills =>1000 bbl	14.313	0.515	458	23.401	0.842	669
	43%	**43%**	**98%**	**47%**	**47%**	**98%**
All Spills	33.063	1.190	465	49.512	1.782	680
	100%	**100%**	**100%**	**100%**	**100%**	**100%**
Pipeline Spills	20.301	0.730	69	33.248	1.196	125
	61%	**61%**	**15%**	**67%**	**67%**	**18%**
Platform Spills	7.362	0.265	9	8.668	0.312	10
	22%	**22%**	**2%**	**18%**	**18%**	**2%**
Well Spills	5.401	0.194	387	7.595	0.273	544
	16%	**16%**	**83%**	**15%**	**15%**	**80%**
Platform and Well Spills	12.763	0.459	396	16.264	0.585	554
	39%	**39%**	**85%**	**33%**	**33%**	**82%**
All Spills	33.063	1.190	465	49.512	1.782	680
	100%	**100%**	**100%**	**100%**	**100%**	**100%**

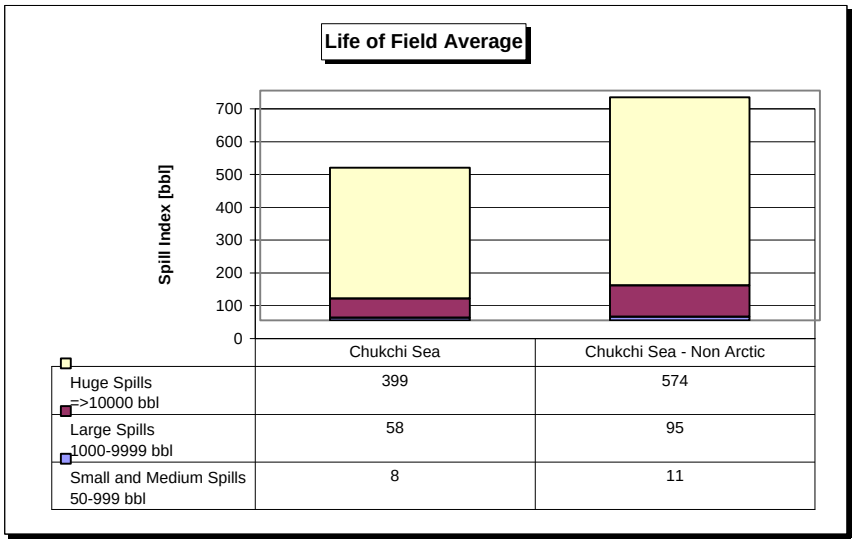
Figure 5.1
LOF Spill Indicators - By Size



	Chukchi Sea	Chukchi Sea - Non Arctic
Huge Spills =>10000 bbl	5.578	8.593
Large Spills 1000-9999 bbl	8.735	14.808
Small and Medium Spills 50-999 bbl	18.750	26.111

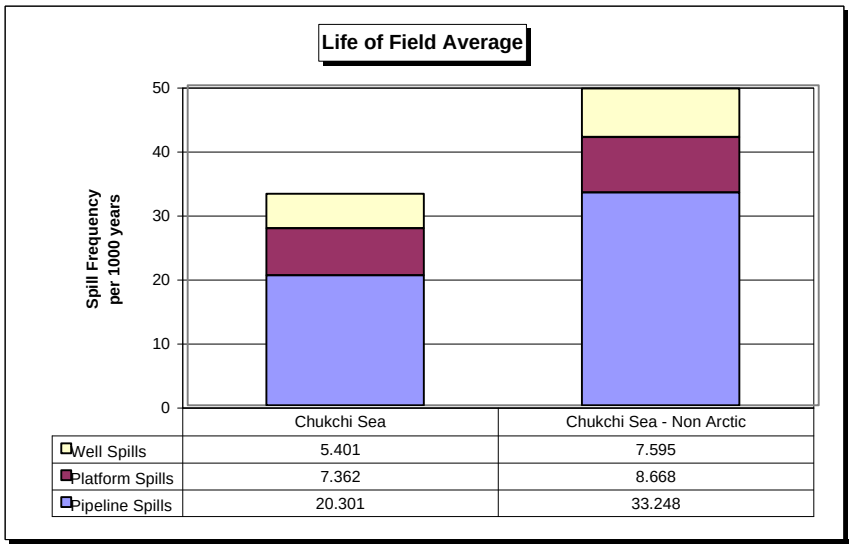


	Chukchi Sea	Chukchi Sea - Non Arctic
Huge Spills =>10000 bbl	0.201	0.309
Large Spills 1000-9999 bbl	0.314	0.533
Small and Medium Spills 50-999 bbl	0.675	0.940

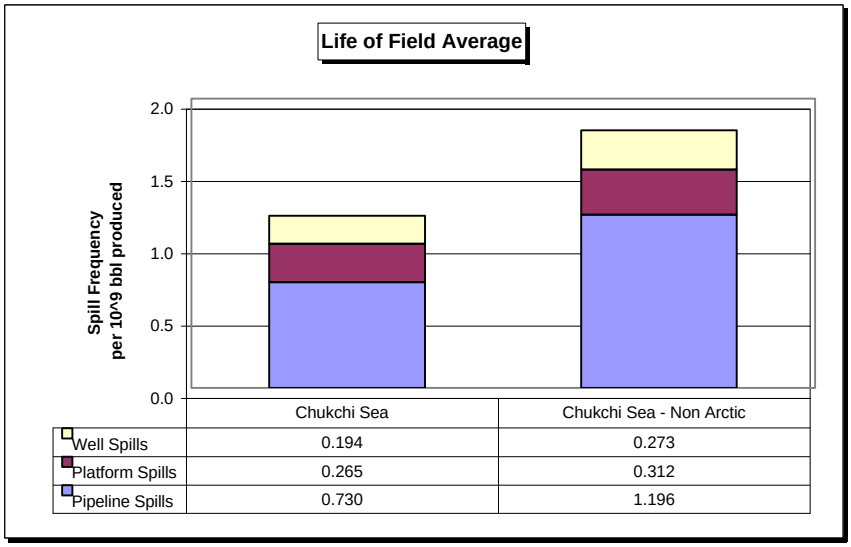


	Chukchi Sea	Chukchi Sea - Non Arctic
Huge Spills =>10000 bbl	399	574
Large Spills 1000-9999 bbl	58	95
Small and Medium Spills 50-999 bbl	8	11

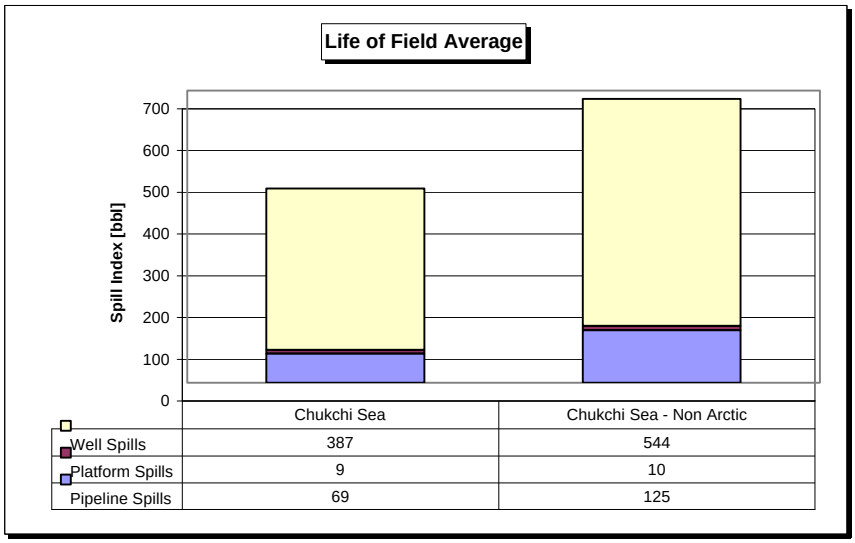
Figure 5.2
LOF Spill Indicators - By Source



	Chukchi Sea	Chukchi Sea - Non Arctic
Well Spills	5.401	7.595
Platform Spills	7.362	8.668
Pipeline Spills	20.301	33.248



	Chukchi Sea	Chukchi Sea - Non Arctic
Well Spills	0.194	0.273
Platform Spills	0.265	0.312
Pipeline Spills	0.730	1.196



	Chukchi Sea	Chukchi Sea - Non Arctic
Well Spills	387	544
Platform Spills	9	10
Pipeline Spills	69	125

Figure 5.3

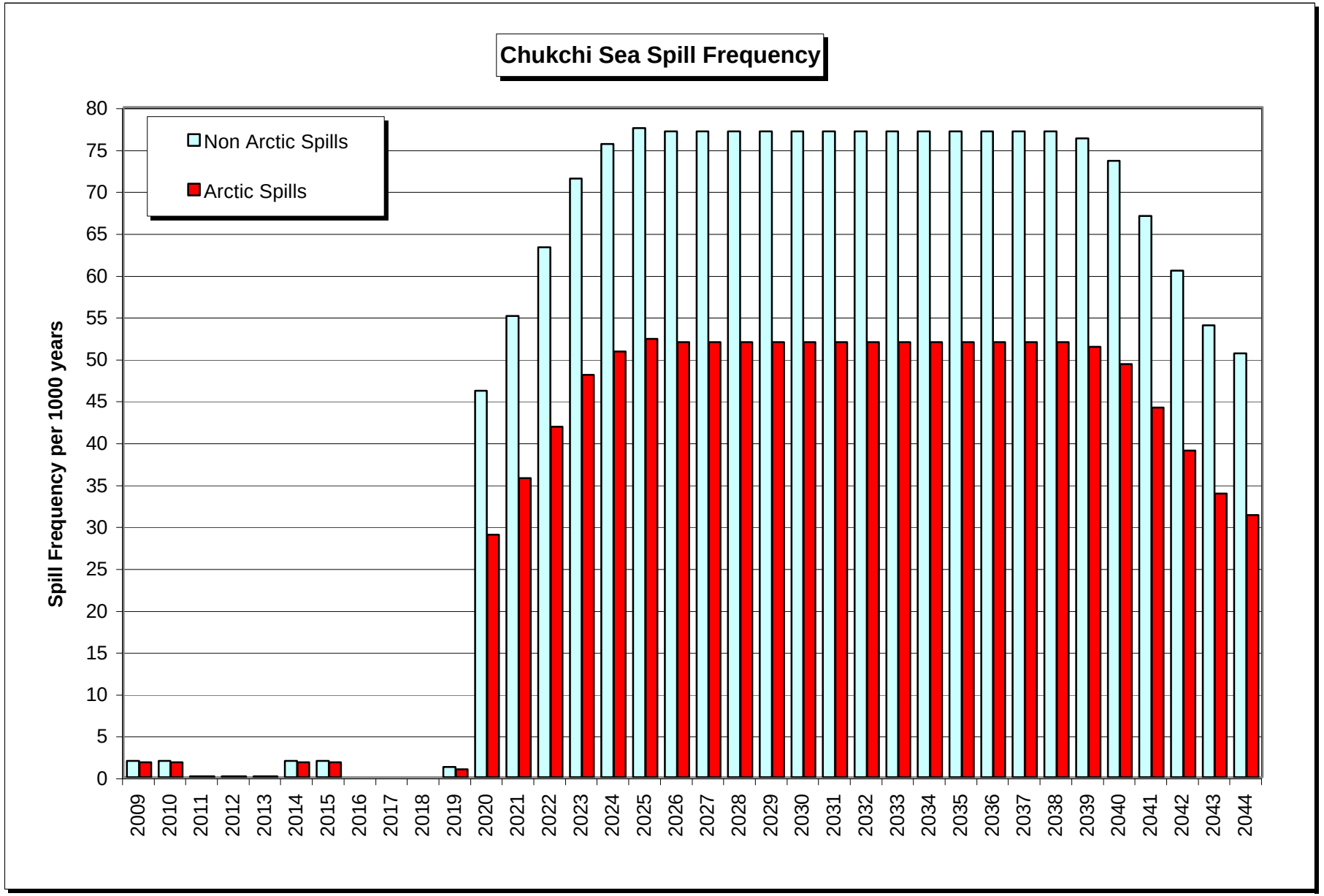

Chukchi Sea Spill Frequency
Non Arctic Spills
Arctic Spills
Spill Frequency per 1000 years
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044

Figure 5.4

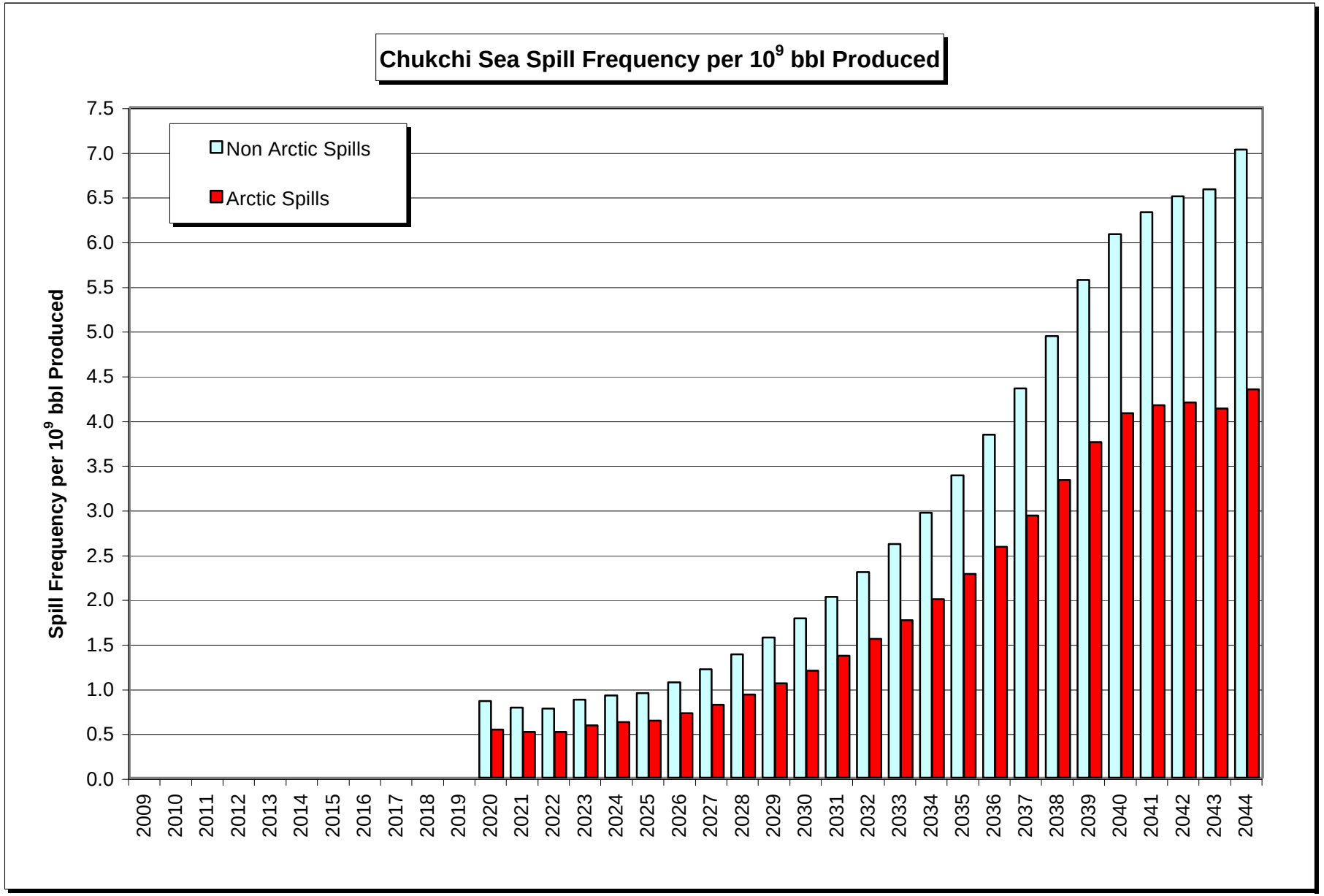
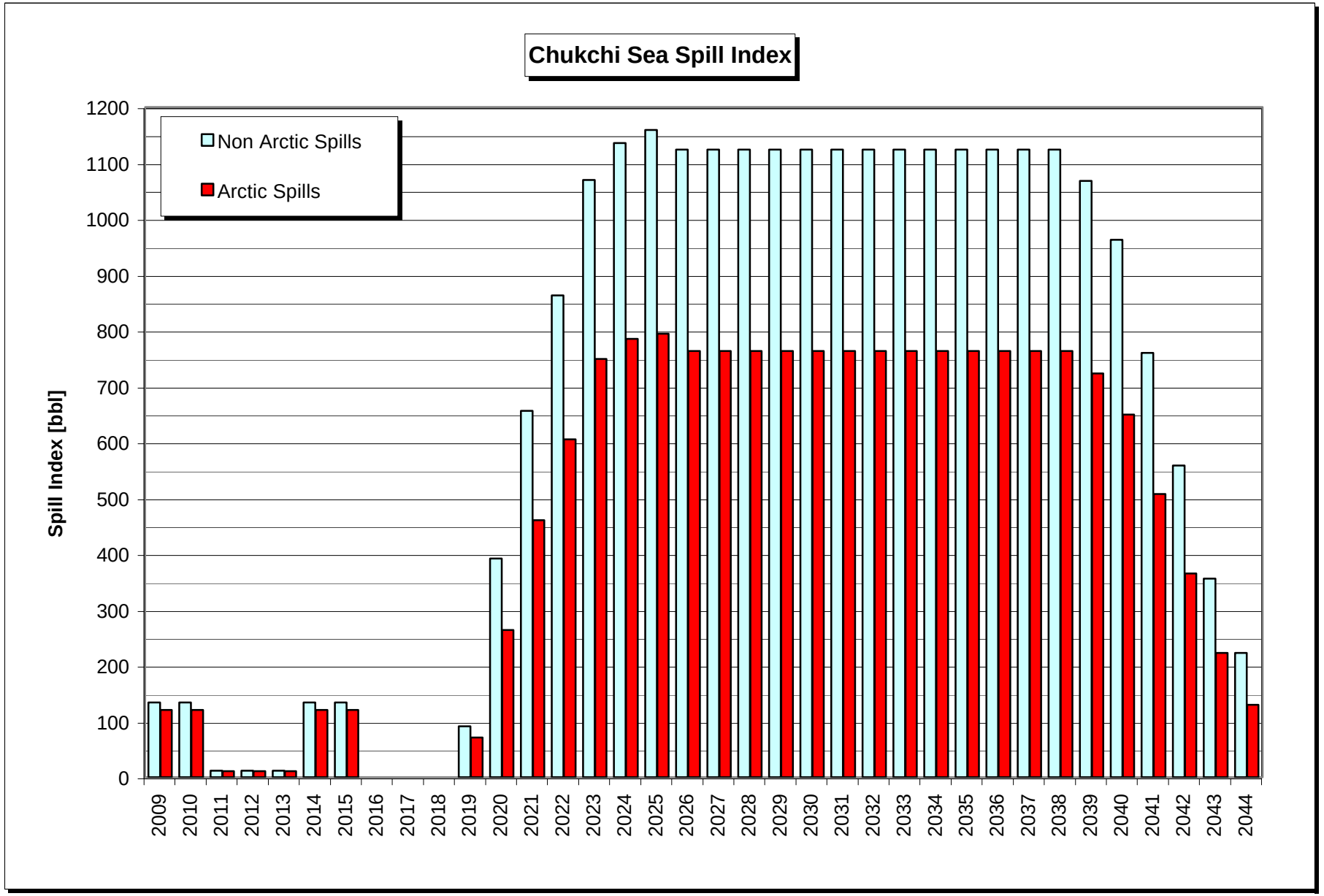

Chukchi Sea Spill Frequency per 10^9 bbl Produced
Non Arctic Spills
Arctic Spills
Spill Frequency per 10^9 bbl Produced
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044

Figure 5.5


Chukchi Sea Spill Index
Non Arctic Spills
Arctic Spills
Spill Index [bbl]
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.