SUBSEA WELL INTERVENTION RISK MANAGEMENT FRAMEWORK R1 REPORT

Disclaimer

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OFFSHORE OPERATORS COMMITTEE
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1 Executive Summary

1.1 Project Background

The Offshore Operators Committee (OOC) engaged both the United States Coast Guard Eighth District (USCG) and the Bureau of Safety & Environmental Enforcement (BSEE) in late 2015 concerning an emerging policy for vessels conducting well intervention operations. At that time the OOC expressed concern that they policy did not recognize the complexity and variety of well intervention activities on the OCS and that a risk-based approach would be more appropriate. The OOC, several of its member company representatives, USCG and BSEE then engaged in a series of meetings that followed the general action plan below:

1. ***STAGE ONE: Mapping***
   It is critical to first establish, with sufficient detail, the well intervention operation scenarios of concern. Within this stage it will be critical that not only well operational aspects are categorized, but also a list of potential events of concern to all stakeholders. At this stage it will be important to focus on well parameters, operational objectives, associated infrastructure, and practical constraints. The result of the mapping stage will be the foundation to which all of the framework will be built.

2. ***STAGE TWO: Bow-tie***
   Once the scenarios have been established, multi-disciplinary teams of technical experts will be assembled to develop a “bow-tie” diagram of controls and barriers for each scenario. It will be important to identify which controls and barriers are possible and establish which may be typically associated with one or more types of vessels. The variability of the types of controls and barriers must be captured in this phase in order to allow for inclusion in the framework.

3. ***STAGE THREE: Analysis***
   Once all of the scenarios are mapped with their possible controls and barriers, each control or barrier will have to be analyzed to provide order of magnitude influences on probability and consequence. Each risk event outcome will have to be assigned a consequence. Where required, progressive chains of events can be considered.

4. ***STAGE FOUR: Framework***
   When all of the scenarios, barriers, controls, and consequences have been mapped out and assigned order of magnitude influences, then a framework can be created. This framework would allow a stakeholder to categorize their operation and selected vessel (barriers and controls) and rapidly determine the level of risk generally associated with that scenario. In cases where the general risk is found to be high, a stakeholder could spend additional time to evaluate each individual risk component (barriers, controls, consequences, etc.) and provide detailed technical justification why the operation should be considered acceptable. In some instances, external factors may result in a high-level risk operation being acceptable (active leak scenario where intervention is most efficient method to address the leak).

1.2 Risk-Based Approach Foundation (BORA JIP)

This well intervention project had the benefit of building on the principles developed during the BlowOut Risk Assessment Joint Industry Project (BORA JIP), which industry and BSEE participated in during 2012 and 2013.

The BORA JIP was managed by the following professionals:

- Elmer "Bud" Danenberger
- Dr. Romney Duffey
- Dr. Malcolm Sharples
- Dr. E.G. "Skip" Ward
- Evan H. Zimmerman

The BORA JIP participants were:

- ABS
- Anadarko
- ATP Oil & Gas
- BHP Billiton
- BP
- BSEE
- Chevron
- Cobalt
- Deep Gulf Energy
- ENI
- Marathon Oil
- Nexen
- Noble Energy
- Repsol
- Shell
- Stone Energy
- U.S. Department of Energy

A key calibration point utilized in this project was the establishment of an acceptable level of risk. To establish such, the Comparative Risk Assessment (CRA) from the BORA JIP was utilized to determine the colors in the risk plots shown in Sections 3 and 4. Figure 1 illustrates the results of the CRA for financial impact. Figure 2 illustrates the results of the CRA for spill size.

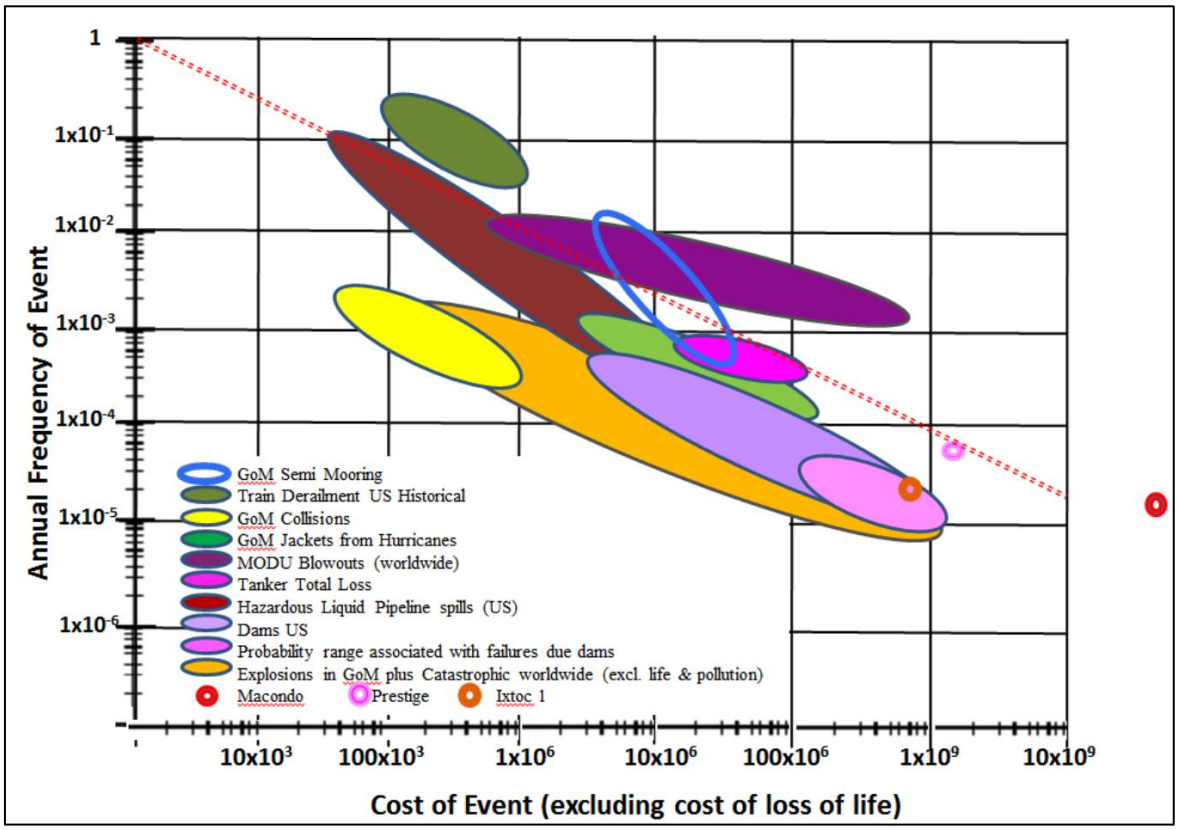

Figure 1 Comparative Risk Assessment Financial Impact Plot (BORA JIP)

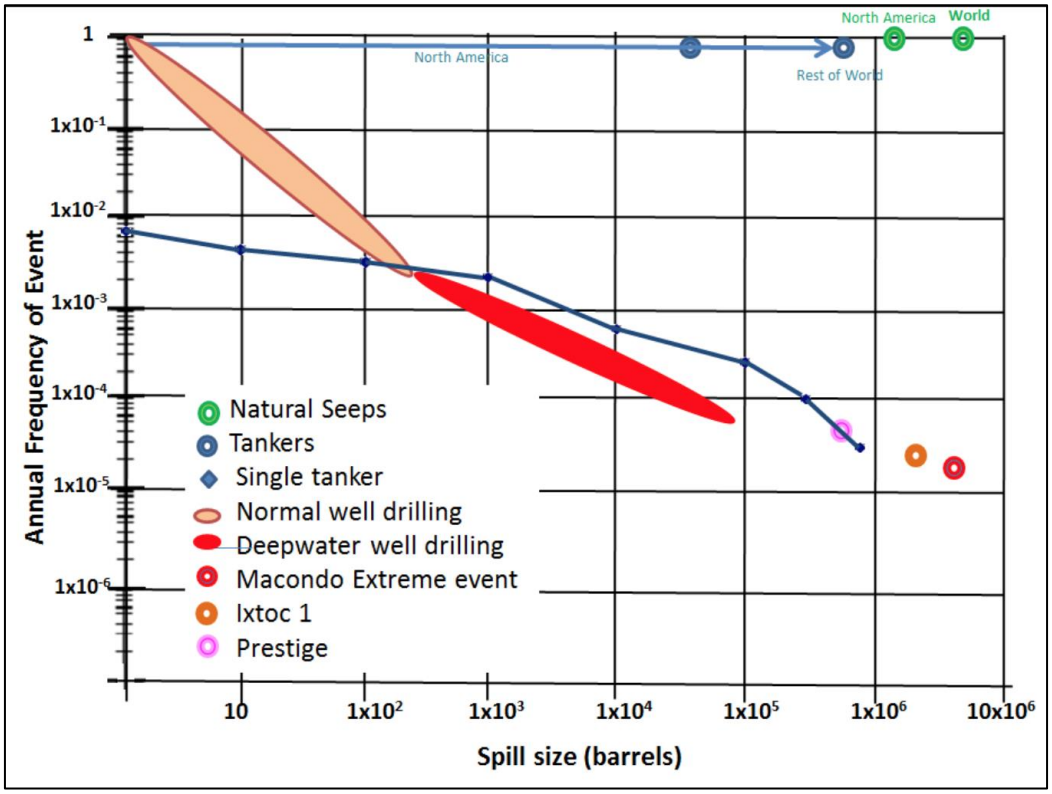

Figure 2 Comparative Risk Assessment Spill Plot (BORA JIP)

The BORA JIP also documented the industry event historic probabilities, which provided a calibration point for the factors developed in this probability model outlined in Section 2. An example of these historic probability values is shown in Table 1.

Table 1 Historic Blowout Event Probabilities (BORA JIP)

Blowout and Well Release Frequencies for Offshore Operations *Not* of North Sea Standard					
Operation	Category	Well Type	Frequency		Fraction Subsea
Production	Blowout (surface flow)	-	3.3×10^{-5}	per well year	0.43
	Blowout (underground flow)	-	4.7×10^{-6}	per well year	0[2]
	Diverted well release	-	0[1]	per well year	0
	Well release	-	9.5×10^{-6}	per well year	0
Workover	Blowout (surface flow)	-	1.0×10^{-3}	per workover	0.05
	Blowout (underground flow)	-	0[1]	per workover	0[2]
	Diverted well release	-	0[1]	per workover	0
	Well release	-	8.5×10^{-4}	per workover	0
Wireline	Blowout (surface flow)	-	1.1×10^{-5}	per wireline job	0
	Blowout (underground flow)	-	0[1]	per wireline job	0
	Diverted well release	-	0[1]	per wireline job	0
	Well release	-	1.1×10^{-5}	per wireline job	0

Notes

1. Based on no incidents to date. However, these scenarios are considered credible. Table 4.1 gives population data, from which estimates can be made of these frequencies if required.
2. For underground flow releases there are no topsides releases. For all other releases, fractions of releases occurring at topsides = (1 – fraction subea).
3. Only 2 occurrences, both located at subsea wellhead (see Section 4.1). Subsea fraction = 0 if wellheads are located at topsides.

The BORA JIP blowout cost model was utilized to estimate the total cost of a well intervention blowout with considerations for modern containment systems.

1.3 Well Intervention Scenarios Evaluated

This risk management project considered both subsea and surface BOP scenarios involving a wide variety of vessel types including:

- Mobile Offshore Drilling Unit (MODU)
- Multi-Service Vessel (MSV)
- Specialized Intervention Vessel (SIV)
- Offshore Supply Vessel (OSV)
- Frac Boat (FB)
- Crane Vessel (CV)
- Lift Boat (LB)

The scenarios consider the following well intervention operations:

- OP1: Rig Intervention (marine riser, BOP, subsea test tree, etc.)
- OP2: Riserless Intervention (API definition, wire-line, coil tubing, etc.)
- OP3: Riser Intervention (open water riser, non-marine riser)
- OP4: Hydraulic / Pumping Intervention

1.4 Risk Results

The results from analyzing the probabilities and consequences of the different well intervention scenarios lead the following conclusions:

1. All well intervention scenarios evaluated are low to medium risk levels when all available barriers are in place and functional.

2. The well parameters have a large impact on the probability of an event. This impact can range from reducing the probability by one order of magnitude to increasing the probability two orders of magnitude.

3. Many scenarios have the potential to reach high risk if possible barriers are not in place or not functional and well parameters indicate less predictability in the well.

4. Maintaining barriers and robust project planning can enable manageable risk levels for well intervention activities.

2 Project Overview and Methods

This section outlines the method utilized to develop a risk assessment for all of the scenarios captured in the tables below. The critical feature of this assessment was to enable stakeholders to evaluate the risk of an operation based on the functionality of the barriers in place and the key particulars of the well.

The scenarios address the following different vessel categories:

- Mobile Offshore Drilling Unit (MODU)
- Multi-Service Vessel (MSV)
- Specialized Intervention Vessel (SIV)
- Offshore Supply Vessel (OSV)
- Frac Boat (FB)
- Crane Vessel (CV)
- Lift Boat (LB)

The scenarios consider the following operations:

- OP1: Rig Intervention (marine riser, BOP, subsea test tree, etc.)
- OP2: Riser Intervention (open water riser, non-marine riser)
- OP3: Riserless Intervention (API definition, wire-line, coil tubing, etc.)
- OP4: Hydraulic / Pumping Intervention

Table 2 Subsea BOP Well Intervention Cases

Vessel Type	Operation	Equipment / Functionality				
		Wire-line	Coil Tubing	Well Stim/pump	Marine Riser w/ BOP/SSTT	Flowback
MODU	OP1	A1	A2	A3	A4	A5
MODU	OP2	A6	A7	A8		
MODU	OP3	A9	A10	A11		A12
MODU	OP4			A13		
MSV	OP2	A14	A15	A16		
MSV	OP3	A17	A18	A19		A20
MSV	OP4			A21		
SIV	OP2	A22	A23	A24		
SIV	OP3	A25	A26	A27		A28
SIV	OP4			A29		
OSV	OP2	A30	A31	A32		
OSV	OP4			A33		
FB	OP4			A34		
CV	OP2	A35	A36			
CV	OP3			A37		
CV	OP4	A38	A39	A40		A41
LB	OP2	A42	A43			
LB	OP3	A44	A45	A46		A47
LB	OP4			A48		

Table 3 Surface BOP Well Intervention Cases

2.1 Bowtie Assessment

A Bowtie method was utilized to identify and map out the many different barriers that help manage threats and consequences of a well intervention event. The Bowtie method is a risk evaluation method that can be used to analyze and demonstrate causal relationships in risk scenarios. The Bowtie diagrams gives both a visual summary of all plausible accident scenarios that could exist as well as, identifies control measures that one can enable to control those scenarios.

Detailed Bowties for each scenario can be found in Appendix A.

2.2 Barrier Assessment

The barrier assessment included a quantitative evaluation of each barrier identified in the bowtie exercise by industry and regulator workgroup members. The assessment captured this detail in orders of magnitude ranging from 0.1 to 0.0001 in barrier failure probability. In cases where the barrier had more than one order of magnitude in failure probability, the lower value was utilized in the risk calculations documented in this report. The results of the barrier assessments allow for calculation of probabilities required to calculate estimated risk.

2.3 Probability Benchmarking

A conservative method for calculation of probability was adopted and generally calibrated to the BlowOut Risk Assessment JIP (BORA JIP) phase 1 report. This JIP involved a detailed analysis of past blowout events, including workovers and wireline jobs in the Gulf of Mexico, and development of a risk model. The model is applied to the detailed bowtie analysis completed by the Well Intervention workgroup.

Well parameters were evaluated and assigned general probability factors that will either increase the probability of an event or decrease the probability of an event. These parameters are outlined in the following table:

Table 4 Well Parameter Factors

WELL PARAMETERS	Yes	No
Exposed perforations?	x 1.5	x 1
Sustained casing pressure?	x 1.5	x 1
Compromised well barriers (damaged tubing / casing)?	x 3	x 1
Known formation pressure & flow characteristics?	x 1	x 1.5
Hydrostatically dead?	x 0.1	x 1
Additional fluid type present (H2S, etc.)?	x 1.2	x 1
Difficult well accessibility?	x 1.5	x 1

2.4 Consequence Assessment

The consequence model was based on the BORA JIP and a progression of levels in an event chain. In general there are five (5) levels of consequence considered in this model, which are outlined below:

1) Level 1: such as hydrocarbons entering the wellbore during the operation, or one to two days of downtime. Example Value = $1,000,000
2) Level 2: such as hydrocarbons entering the conduit or riser, or hydrocarbons reaching the surface of the work platform. Example Value = $5,000,000
3) Level 3: such as a fire or explosion on the vessel. Example Value = $30,000,000
4) Level 4: such as a total loss of the work platform. Example Value = $500,000,000
5) Level 5: such as blowout to the environment with an estimated worst-case discharge value of 10,000 bpd. Value = $910,000,000 (BORA JIP)

The assumption was also made that shelf, or shallow water surface BOPs, would have consequence values ¼ of those in deepwater (other than MODU level 4).

The level 4 consequence assumptions are outlined in the following table.

Table 5 Level 4 Consequence Vessel Assumptions

Vessel Table	Level 4 (USD)	
Floating MODU (semisubmersible / drillship)	500,000,000	(A cases)
Multi Service Vessel (MSV)	100,000,000	
Specialized Intervention Vessel (SIV)	100,000,000	
Offshore Supply Vessel (OSV)	50,000,000	
Frac/fluids Boat (FB)	50,000,000	
Lift Boat (LB)	25,000,000	
Crane Vessel (CV)	50,000,000	
Fixed MODU (Jack-up)	250,000,000	(B cases)

2.5 Scenario Evaluations

The model is based on the following assumptions and steps:

a) Utilize the base probability of one of the most effective barriers.
b) Apply each additional independent barrier by multiplying the base probability by (0.5) to capture the additional impact of multiple barriers.
c) Evaluate the well parameters and apply the appropriate multiple factor.
d) Plot the resultant probability value to the corresponding consequence on the risk matrix.

2.5.1 Application of Scenario Specific Cases

The project report will contain risk matrix plot results for all of the identified scenario cases as well as document the many barriers assumed in each scenario. Application of these general evaluations to a specific case can be completed by:

a) Determine the general case scenario that best matches the specific case.
b) Review the documented barriers (especially the independent barriers) against the specific case.
c) Adjust the calculation of probability based on the number of barriers in the specific case.
d) Plot the specific case probability on the risk matrix.

2.5.2 Risk Evaluation

The evaluation of risk would first start with identification of the proper case and corresponding bowtie. The bowtie clearly outlines the barriers identified for each threat and consequence. These bowties could also be utilized by an operator or regulator to review case specific conditions by evaluating if the listed barriers were in place for an operation.

An example of a bowtie assessment barrier summary table is shown in the table below.

Table 6 Example Consequence Barrier Summary Table

Case A1 Consequence List		Dependent (D) or Independent (I)		1 in 10	1 in 100	1 in 1000	1 in 10000	Probability Calculation
Consequence 1: Explosion and Fire		Level 3						**0.000003125**
A1-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A1-C1-2	Structural Fire Protection	I				x	x	0.5
A1-C1-3	Deluge Systems	I			x	x		0.5
A1-C1-4	Fixed Fire Fighting System	I					x	0.5
A1-C1-5	Detection Systems	I			x	x		0.5
A1-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A1-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A1-C2-1	Capping / Containment Systems	I				x	x	0.001
A1-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A1-C2-3	Surface Skimming / Containment	I			x			0.5
A1-C2-4	Dispersant Applications	I				x		0.5
A1-C2-5	In Situ Burning	I				x		0.5
A1-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities and Injuries				**Consequence Value Not Analyzed**				
A1-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A1-C3-2	Structural Fire Protection	I					x	
A1-C3-3	Fixed Fire Fighting System	I					x	
A1-C3-4	Deluge Systems	I			x	x		
A1-C3-5	Detection Systems	I			x	x		
A1-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A1-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A1-C3-8	PPE	I		x	x			
A1-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability (Downflooding)		Level 4						**0.000025**
A1-C4-1	Damage Stability Requirements	I					x	0.0001
A1-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A1-C4-3	Ballast Control Systems	I				x		0.5
A1-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A1-C5-1	Rescue Boat	I				x		0.5
A1-C5-2	EEP	D	1,5,6,7		x	x		1
A1-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A1-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A1-C5-5	Railings	I					x	0.0001
A1-C5-6	Water Survival Equipment	I				x		0.5
A1-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A1-C6-1	Detection Systems	I			x	x		0.5
A1-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A1-C6-3	Ventilation Shutdown	D	1		x	x		1
A1-C6-4	PPE	I		x	x			0.5
A1-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A1-C6-6	H2S Compatible Equipment	I				x	x	0.001

An example of a conservative risk evaluation of Case A1 can be seen in the figure below.

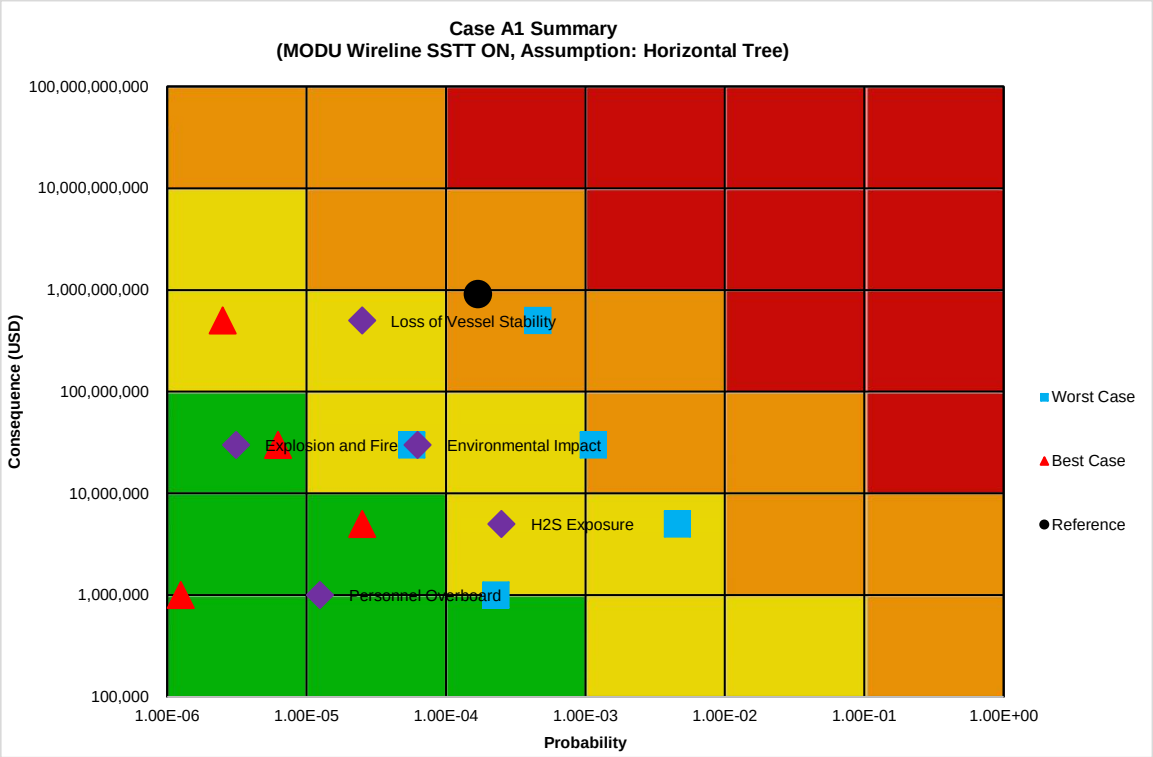

Figure 3 Example Case Chart

The figure contains a “base risk” that comes directly from the BORA JIP, which is plotted for reference and captures a full blowout, or level five event (shown as large black marker). The blue markers represent the levels one through four consequence events plotted out based on the bowtie barrier evaluations for the consequences of Case A1. Utilizing the Well Parameter factors, the red and light blue markers represent the range of each level consequence depending on the worst and best combination of those well parameter factors, based upon the initial consequence and calculated risk shown as purple data points.

2.5.3 Impact of Missing or Inoperable Barriers

This risk assessment methodology allows for consideration of missing or inoperable barriers in a scenario assessment.

3 Scenario Evaluations

This section documents the barrier assessment, consequences and plotted risk results for each scenario considered. Full bowties for each scenario can be found in Appendix A. It is important to note that the risk plots represent the levels of risk associated with the scenario assuming that all barriers identified are in place and functional. If barriers are not in place or not functional, then the risk should be re-evaluated, this is discussed in greater detail in section 4.

3.1 MODU Subsea BOP Cases

3.1.1 Case A1: MODU Wireline

The consequence barrier analysis for Case A1 is documented in the following table. The corresponding risk plot is shown in Figure 4.

Table 7 Case A1 Consequence Barrier List

Case A1 Consequence List		Dependent (D) or Independent (I)		1 in 10	1 in 100	1 in 1000	1 in 10000	Probability Calculation
Consequence 1: Explosion and Fire		Level 3						**0.000003125**
A1-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A1-C1-2	Structural Fire Protection	I				x	x	0.5
A1-C1-3	Deluge Systems	I			x	x		0.5
A1-C1-4	Fixed Fire Fighting System	I					x	0.5
A1-C1-5	Detection Systems	I			x	x		0.5
A1-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A1-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A1-C2-1	Capping / Containment Systems	I				x	x	0.001
A1-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A1-C2-3	Surface Skimming / Containment	I			x			0.5
A1-C2-4	Dispersant Applications	I				x		0.5
A1-C2-5	In Situ Burning	I				x		0.5
A1-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities and Injuries				**Consequence Value Not Analyzed**				
A1-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A1-C3-2	Structural Fire Protection	I					x	
A1-C3-3	Fixed Fire Fighting System	I					x	
A1-C3-4	Deluge Systems	I			x	x		
A1-C3-5	Detection Systems	I			x	x		
A1-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A1-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A1-C3-8	PPE	I		x	x			
A1-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability (Downflooding)		Level 4						**0.000025**
A1-C4-1	Damage Stability Requirements	I					x	0.0001
A1-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A1-C4-3	Ballast Control Systems	I				x		0.5
A1-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A1-C5-1	Rescue Boat	I				x		0.5
A1-C5-2	EEP	D	1,5,6,7		x	x		1
A1-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A1-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A1-C5-5	Railings	I					x	0.0001
A1-C5-6	Water Survival Equipment	I				x		0.5
A1-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A1-C6-1	Detection Systems	I			x	x		0.5
A1-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A1-C6-3	Ventilation Shutdown	D	1		x	x		1
A1-C6-4	PPE	I		x	x			0.5
A1-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A1-C6-6	H2S Compatible Equipment	I				x	x	0.001

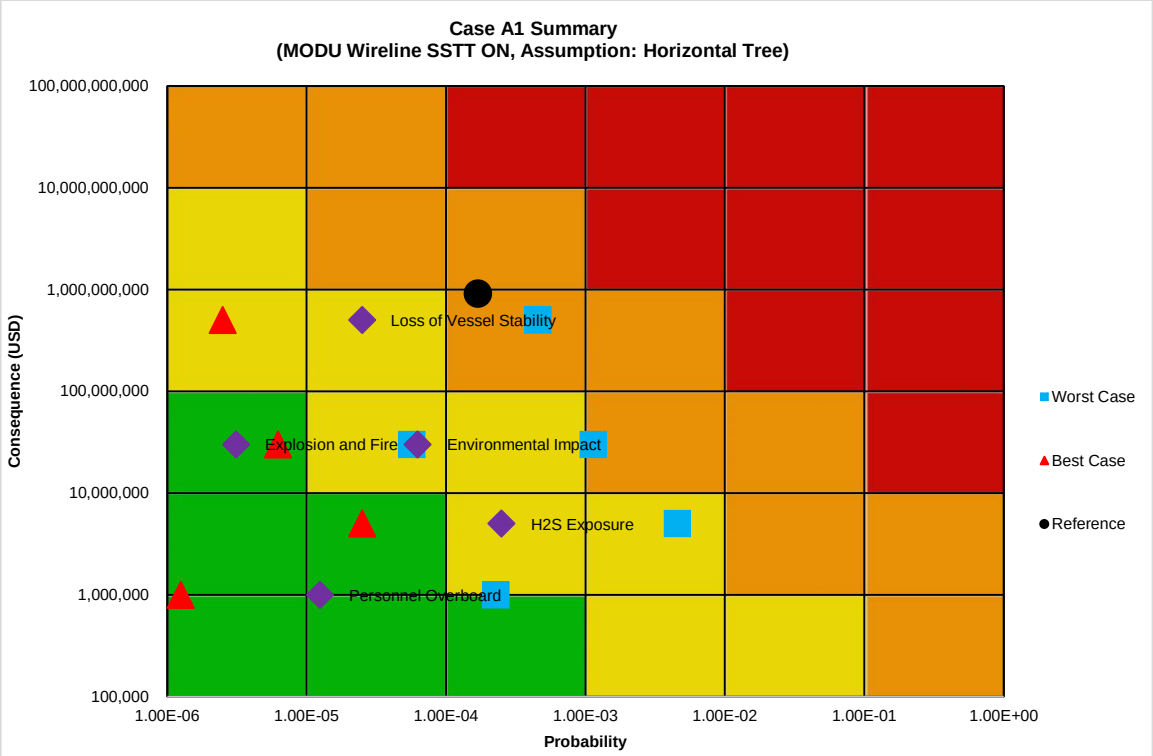

Figure 4 Case A1 Risk Plot

3.1.2 *Case A2: MODU Coil Tubing*

The consequence barrier analysis for Case A2 is documented in the following table. The corresponding risk plot is shown in Figure 5.

Table 8 Case A2 Consequence Barrier List

Case A2 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A2-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A2-C1-2	Structural Fire Protection	I				x	x	0.5
A2-C1-3	Deluge Systems	I			x	x		0.5
A2-C1-4	Fixed Fire Fighting System	I					x	0.5
A2-C1-5	Detection Systems	I			x	x		0.5
A2-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A2-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental impact		Level 3						**0.0000625**
A2-C2-1	Capping / Containment Systems	I				x	x	0.001
A2-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A2-C2-3	Surface Skimming / Containment	I			x			0.5
A2-C2-4	Dispersant Applications	I				x		0.5
A2-C2-5	In Situ Burning	I				x		0.5
A2-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A2-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A2-C3-2	Structural Fire Protection	I					x	
A2-C3-3	Fixed Fire Fighting System	I					x	
A2-C3-4	Deluge Systems	I			x	x		
A2-C3-5	Detection Systems	I			x	x		
A2-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A2-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A2-C3-8	PPE	I		x	x			
A2-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A2-C4-1	Damage Stability Requirements	I					x	0.0001
A2-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A2-C4-3	Ballast Control Systems	I				x		0.5
A2-C4-4	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A2-C5-1	Rescue Boat	I				x		0.5
A2-C5-2	EEP	D	1,5,6,7		x	x		1
A2-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A2-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A2-C5-5	Railings	I					x	0.0001
A2-C5-6	Water Survival Equipment	I				x		0.5
A2-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A2-C6-1	Detection Systems	I			x	x		0.5
A2-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A2-C6-3	Ventilation Shutdown	D	1		x	x		1
A2-C6-4	PPE	I		x	x			0.5
A2-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A2-C6-6	H2S Compatible Equipment	I				x	x	0.001

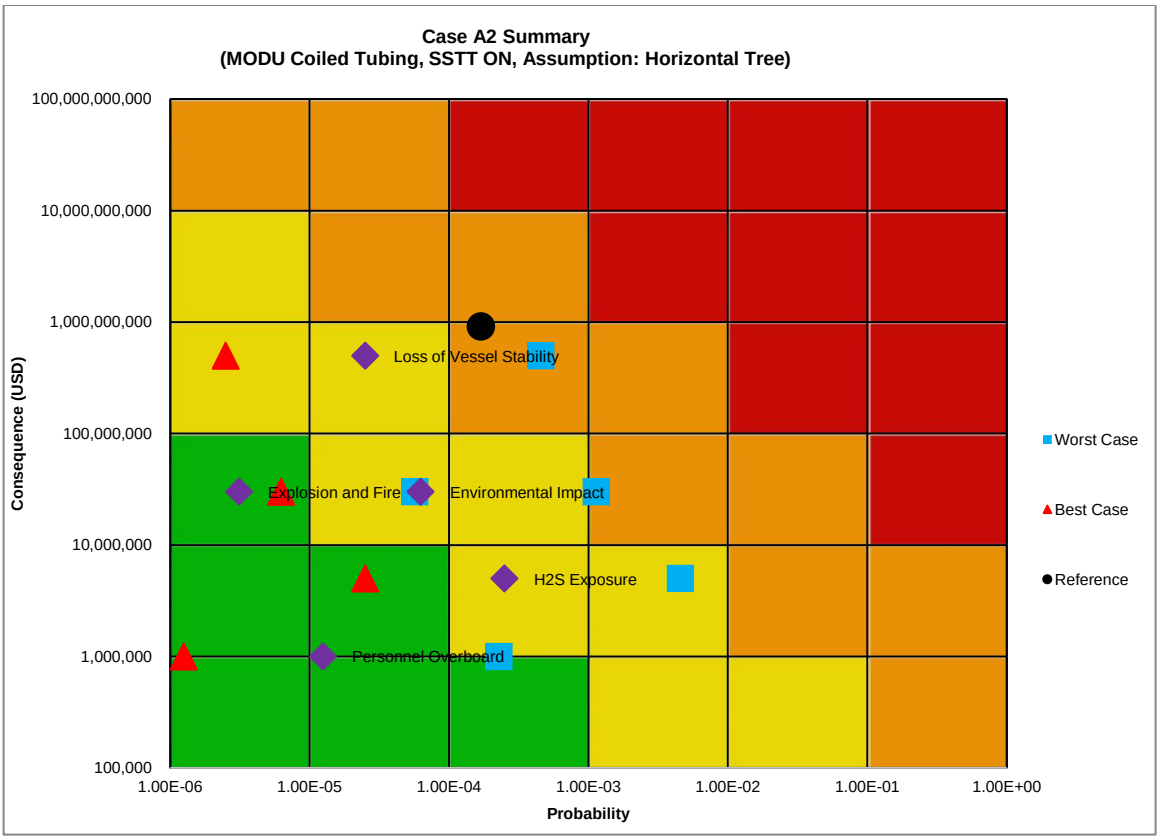

Figure 5 Case A2 Risk Plot

3.1.3 Case A3 MODU Well Stimulation / Pumping

The consequence barrier analysis for Case A3 is documented in the following table. The corresponding risk plot is shown in Figure 6.

Table 9 Case A3 Consequence Barrier List

Case A3 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A3-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A3-C1-2	Structural Fire Protection	I				x	x	0.5
A3-C1-3	Deluge Systems	I			x	x		0.5
A3-C1-4	Fixed Fire Fighting System	I					x	0.5
A3-C1-5	Detection Systems	I			x	x		0.5
A3-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A3-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A3-C2-1	Capping / Containment Systems	I				x	x	0.001
A3-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A3-C2-3	Surface Skimming / Containment	I			x			0.5
A3-C2-4	Dispersant Applications	I				x		0.5
A3-C2-5	In Situ Burning	I				x		0.5
A3-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A3-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A3-C3-2	Structural Fire Protection	I					x	
A3-C3-3	Fixed Fire Fighting System	I					x	
A3-C3-4	Deluge Systems	I			x	x		
A3-C3-5	Detection Systems	I			x	x		
A3-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A3-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A3-C3-8	PPE	I		x	x			
A3-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel		Level 4						**0.000025**
A3-C4-1	Damage Stability Requirements	I					x	0.0001
A3-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A3-C4-3	Ballast Control Systems	I				x		0.5
A3-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A3-C5-1	Rescue Boat	I				x		0.5
A3-C5-2	EEP	D	1,5,6,7		x	x		1
A3-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A3-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A3-C5-5	Railings	I					x	0.0001
A3-C5-6	Water Survival Equipment	I				x		0.5
A3-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000025**
A3-C7-1	Detection Systems	I			x	x		0.5
A3-C7-2	Contingency Plan	D	1,3,4,6		x	x		1
A3-C7-3	Ventilation Shutdown	D	1		x	x		1
A3-C7-4	PPE	I		x	x			0.5
A3-C7-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A3-C7-6	H2S Compatible Equipment	I				x	x	0.0001

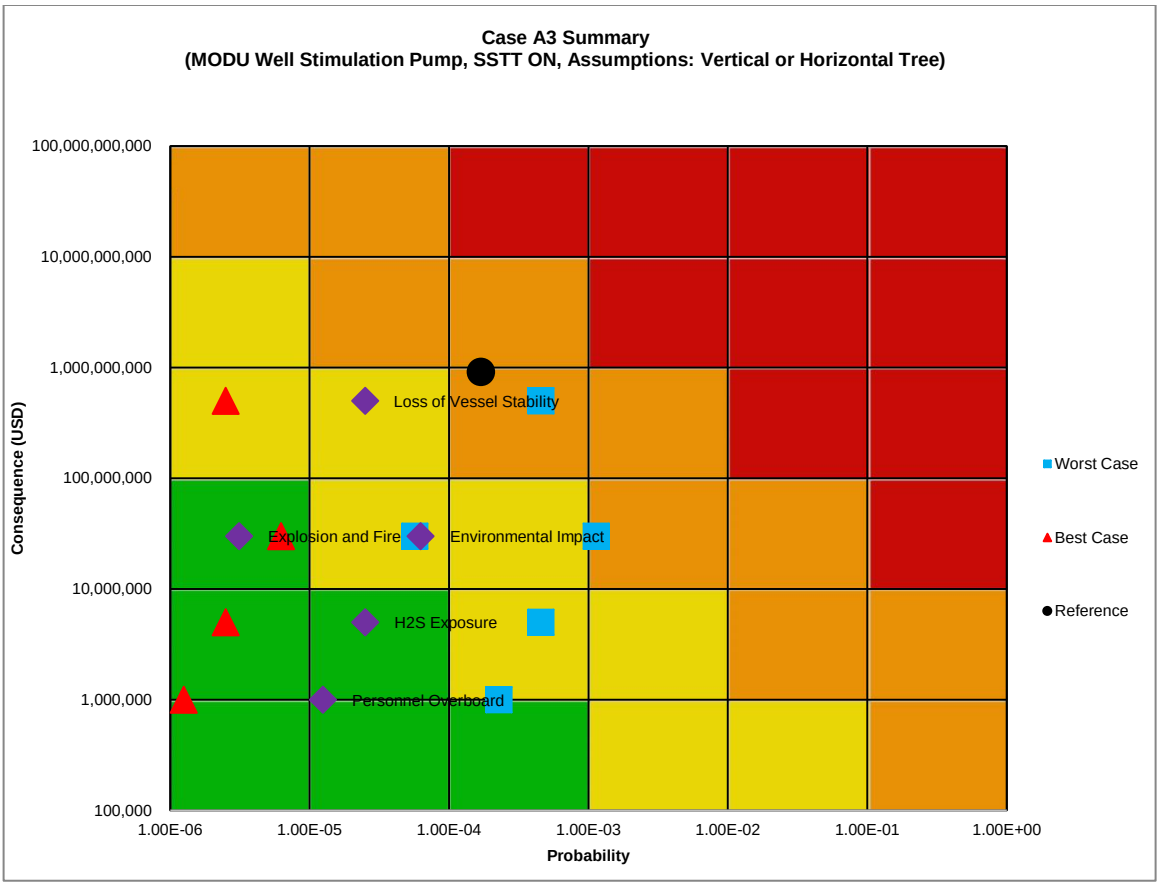

Figure 6 Case A3 Risk Plot

3.1.4 Case A4 MODU Marine Riser Intervention

The consequence barrier analysis for Case A4 is documented in the following table. The corresponding risk plot is shown in Figure 7.

Table 10 Case A4 Consequence Barrier List

Case A4 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A4-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A4-C1-2	Structural Fire Protection	I				x	x	0.5
A4-C1-3	Deluge Systems	I			x	x		0.5
A4-C1-4	Fixed Fire Fighting System	I					x	0.5
A4-C1-5	Detection Systems	I			x	x		0.5
A4-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A4-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A4-C2-1	Capping / Containment Systems	I				x	x	0.001
A4-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A4-C2-3	Surface Skimming / Containment	I			x			0.5
A4-C2-4	Dispersant Applications	I				x		0.5
A4-C2-5	In Situ Burning	I				x		0.5
A4-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A4-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A4-C3-2	Structural Fire Protection	I					x	
A4-C3-3	Fixed Fire Fighting System	I					x	
A4-C3-4	Deluge Systems	I			x	x		
A4-C3-5	Detection Systems	I			x	x		
A4-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A4-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A4-C3-8	PPE	I		x	x			
A4-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						0.000025
A4-C4-1	Damage Stability Requirements	I					x	0.0001
A4-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A4-C4-3	Ballast Control Systems	I				x		0.5
A4-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A4-C5-1	Rescue Boat	I				x		0.5
A4-C5-2	EEP	D	1,5,6,7		x	x		1
A4-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A4-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A4-C5-5	Railings	I					x	0.0001
A4-C5-6	Water Survival Equipment	I				x		0.5
A4-C5-7	Crane & Basket	I			x			0.5

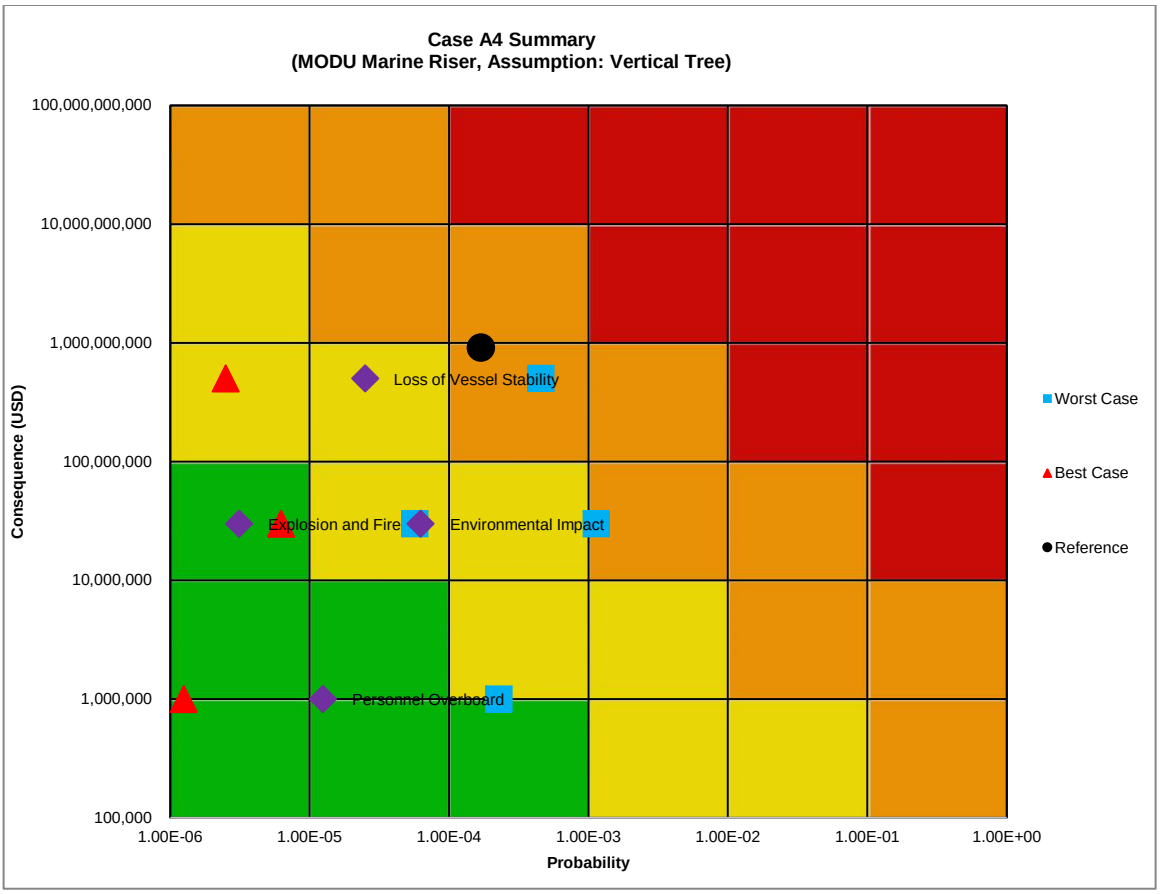

Figure 7 Case A4 Risk Plot

3.1.5 Case A5 MODU Flowback

The consequence barrier analysis for Case A5 is documented in the following table. The corresponding risk plot is shown in Figure 8.

Table 11 Case A5 Consequence Barrier List

Case A5 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A5-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A5-C1-2	Structural Fire Protection	I				x	x	0.5
A5-C1-3	Deluge Systems	I			x	x		0.5
A5-C1-4	Fixed Fire Fighting System	I					x	0.5
A5-C1-5	Detection Systems	I			x	x		0.5
A5-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A5-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A5-C2-1	Capping / Containment Systems	I				x	x	0.001
A5-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A5-C2-3	Surface Skimming / Containment	I			x			0.5
A5-C2-4	Dispersant Applications	I				x		0.5
A5-C2-5	In Situ Burning	I				x		0.5
A5-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A5-C3-1	Enclosed Fire-Protected Life Boats	I				x		0.5
A5-C3-2	Structural Fire Protection	I					x	0.5
A5-C3-3	Fixed Fire Fighting System	I					x	0.0001
A5-C3-4	Deluge Systems	I			x	x		0.5
A5-C3-5	Detection Systems	I			x	x		0.5
A5-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		1
A5-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		1
A5-C3-8	PPE	I		x	x			0.5
A5-C3-9	Medic / EMT	I		x	x			0.5
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A5-C4-1	Damage Stability Requirements	I					x	0.0001
A5-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A5-C4-3	Ballast Control Systems	I				x		0.5
A5-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A5-C5-1	Rescue Boat	I				x		0.5
A5-C5-2	EEP	D	1,5,6,7		x	x		1
A5-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A5-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A5-C5-5	Railings	I					x	0.0001
A5-C5-6	Water Survival Equipment	I				x		0.5
A5-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A5-C6-1	Detection Systems	I			x	x		0.5
A5-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A5-C6-3	Ventilation Shutdown	D	1		x	x		1
A5-C6-4	PPE	I		x	x			0.5
A5-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A5-C6-6	H2S Compatible Equipment	I				x	x	0.001

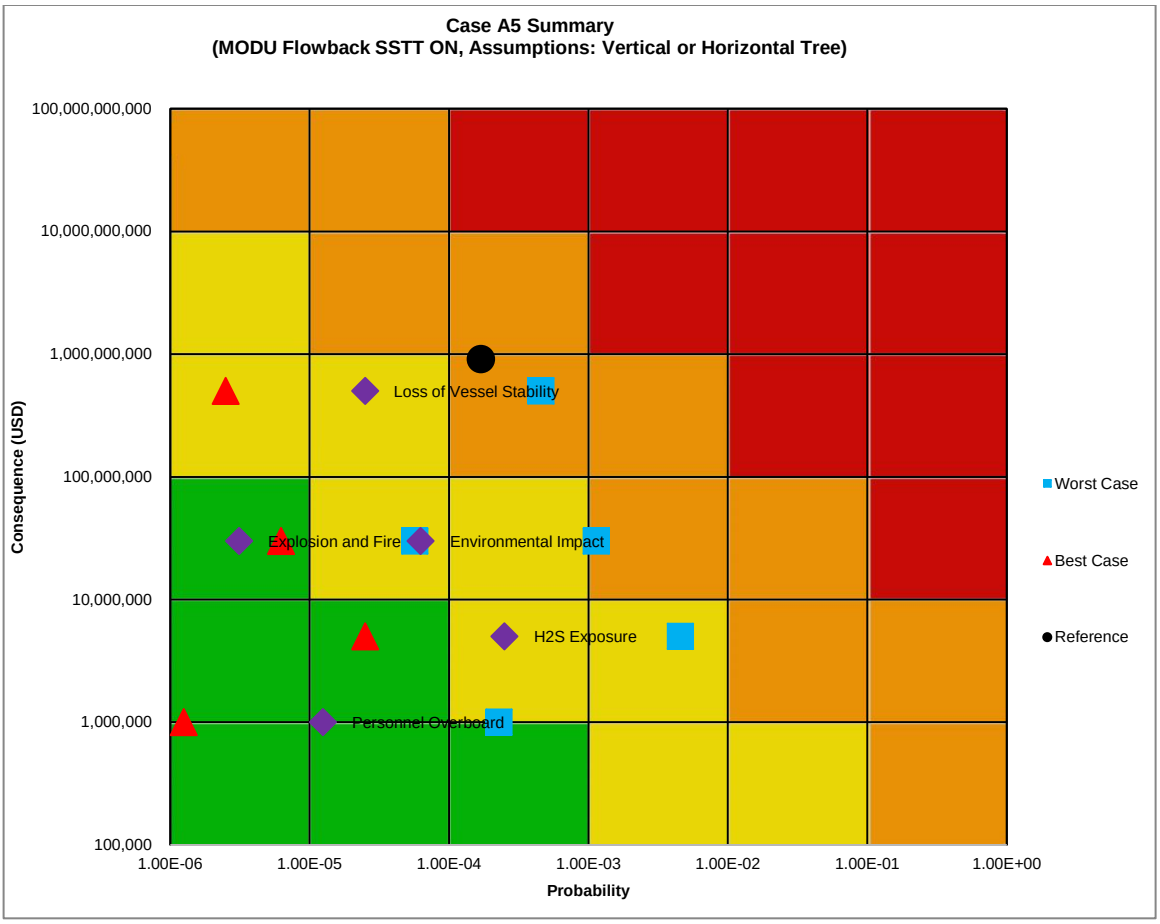

Figure 8 Case A5 Risk Plot

3.1.6 Case A6 MODU Riserless Wireline

The consequence barrier analysis for Case A6 is documented in the following table. The corresponding risk plot is shown in Figure 9.

Table 12 Case A6 Consequence Barrier List

Case A6 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A6-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A6-C1-2	Structural Fire Protection	I				x	x	0.5
A6-C1-3	Deluge Systems	I			x	x		0.5
A6-C1-4	Fixed Fire Fighting System	I					x	0.5
A6-C1-5	Detection Systems	I			x	x		0.5
A6-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A6-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A6-C2-1	Capping / Containment Systems	I				x	x	0.001
A6-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A6-C2-3	Surface Skimming / Containment	I			x			0.5
A6-C2-4	Dispersant Applications	I				x		0.5
A6-C2-5	In Situ Burning	I				x		0.5
A6-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A6-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A6-C3-2	Structural Fire Protection	I					x	
A6-C3-3	Fixed Fire Fighting System	I					x	
A6-C3-4	Deluge Systems	I			x	x		
A6-C3-5	Detection Systems	I			x	x		
A6-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A6-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A6-C3-8	PPE	I		x	x			
A6-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A6-C4-1	Damage Stability Requirements	I					x	0.0001
A6-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A6-C4-3	Ballast Control Systems	I				x		0.5
A6-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A6-C5-1	Rescue Boat	I				x		0.5
A6-C5-2	EEP	D	1,5,6,7		x	x		1
A6-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A6-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A6-C5-5	Railings	I					x	0.0001
A6-C5-6	Water Survival Equipment	I				x		0.5
A6-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A6-C6-1	Detection Systems	I			x	x		0.5
A6-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A6-C6-3	Ventilation Shutdown	D	1		x	x		1
A6-C6-4	PPE	I		x	x			0.5
A6-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A6-C6-6	H2S Compatible Equipment	I				x	x	0.001

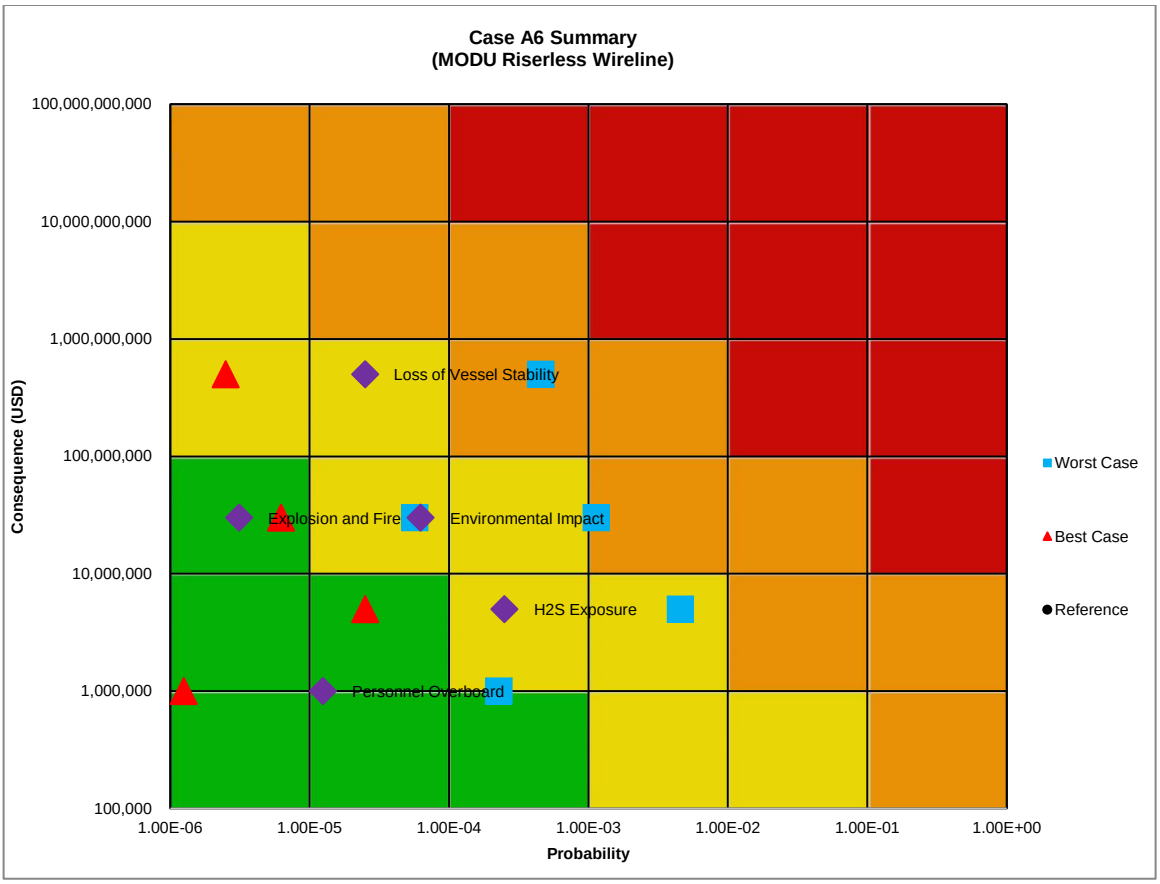

Figure 9 Case A6 Risk Plot

3.1.7 Case A7 MODU Riserless Coil Tubing

The consequence barrier analysis for Case A7 is documented in the following table. The corresponding risk plot is shown in Figure 10.

Table 13 Case A7 Consequence Barrier List

Case A7 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A7-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A7-C1-2	Structural Fire Protection	I				x	x	0.5
A7-C1-3	Deluge Systems	I			x	x		0.5
A7-C1-4	Fixed Fire Fighting System	I					x	0.5
A7-C1-5	Detection Systems	I			x	x		0.5
A7-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A7-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A7-C2-1	Capping / Containment Systems	I				x	x	0.001
A7-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A7-C2-3	Surface Skimming / Containment	I			x			0.5
A7-C2-4	Dispersant Applications	I				x		0.5
A7-C2-5	In Situ Burning	I				x		0.5
AT-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A7-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A7-C3-2	Structural Fire Protection	I					x	
A7-C3-3	Fixed Fire Fighting System	I					x	
A7-C3-4	Deluge Systems	I			x	x		
A7-C3-5	Detection Systems	I			x	x		
A7-C3-6	Drills & Training	D	1,2,3,4,5		x	x		
A7-C3-7	EEP	D	1,2,3,4,5,6		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A7-C4-1	Damage Stability Requirements	I					x	0.0001
A7-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A7-C4-3	Ballast Control Systems	I				x		0.5
A7-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A7-C5-1	Rescue Boat	I				x		0.5
A7-C5-2	EEP	D	1,5,6,7		x	x		1
A7-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A7-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A7-C5-5	Railings	I					x	0.0001
A7-C5-6	Water Survival Equipment	I				x		0.5
A7-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A7-C6-1	Detection Systems	I			x	x		0.5
A7-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A7-C6-3	Ventilation Shutdown	D	1		x	x		1
A7-C6-4	PPE	I		x	x			0.5
A7-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A7-C5-6	H2S Compatible Equipment	I				x	x	0.001

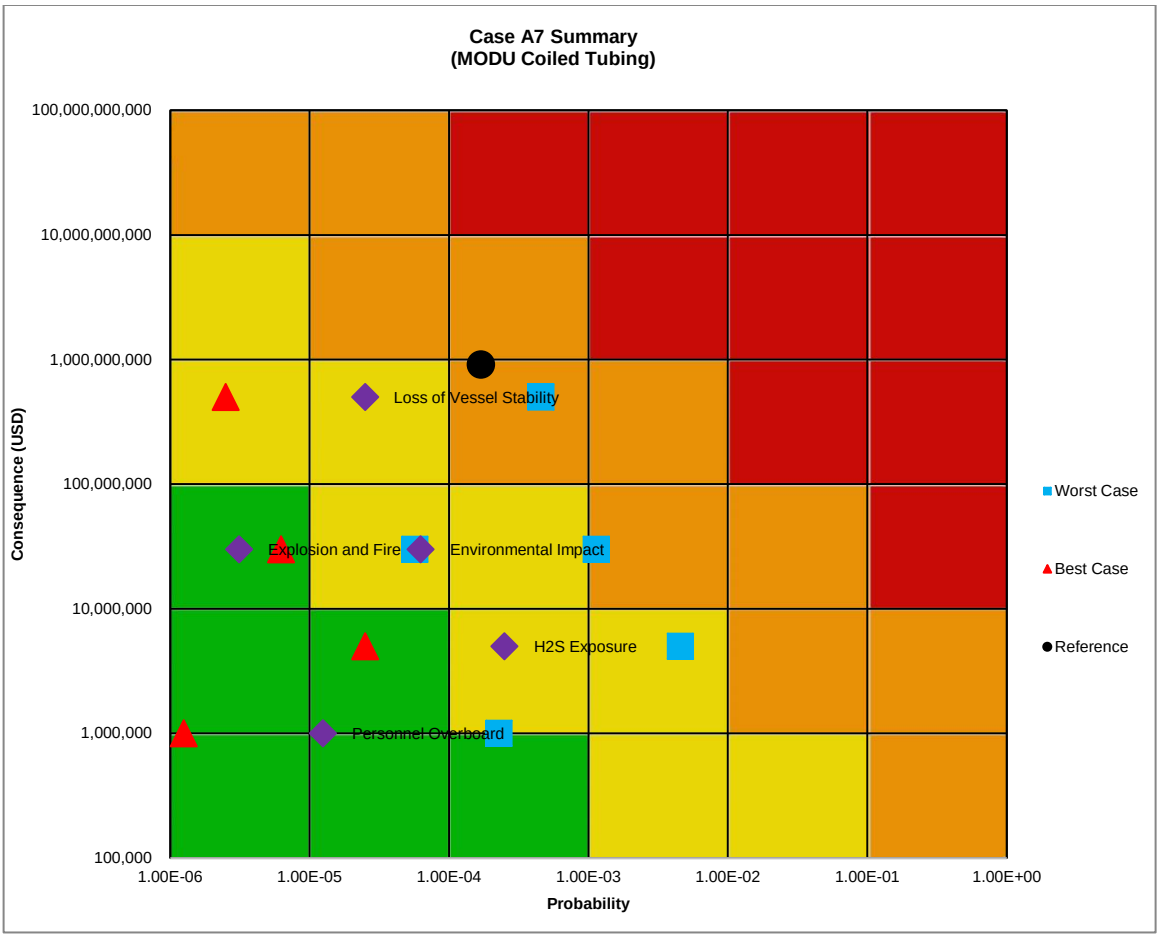

Figure 10 Case A7 Risk Plot

3.1.8 Case A8 MODU Riserless Well Stimulation / Pumping

The consequence barrier analysis for Case A8 is documented in the following table. The corresponding risk plot is shown in Figure 11.

Table 14 Case A8 Consequence Barrier List

Case A8 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.00000625**
A8-C1-1	Structural Fire Protection	I				x	x	0.5
A8-C1-2	Deluge Systems	I			x	x		0.5
A8-C1-3	Fixed FF System	I					x	0.0001
A8-C1-4	Detection Systems	I			x	x		0.5
A8-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A8-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0003125**
A8-C2-1	Top Hat Systems	I			x	x		0.01
A8-C2-2	ROV Override Tree Valves	I			x	x		0.5
A8-C2-3	Spill Response Plans & Training	D	1,2,4,5,6,7		x	x		1
A8-C2-4	Surface Skimming/Containment	I			x			0.5
A8-C2-5	Dispersant Applications	I				x		0.5
A8-C2-6	In Situ Burning	I				x		0.5
A8-C2-7	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A8-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A8-C3-2	Structural Fire Protection	I					x	
A8-C3-3	Fixed Fire Fighting System	I					x	
A8-C3-4	Deluge Systems	I			x	x		
A8-C3-5	Detection Systems	I			x	x		
A8-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A8-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A8-C3-8	PPE	I		x	x			
A8-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A8-C4-1	Damage Stability Requirements	I					x	0.0001
A8-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A8-C4-3	Ballast Control Systems	I				x		0.5
A8-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A8-C5-1	Rescue Boat	I				x		0.5
A8-C5-2	EEP	D	1,5,6,7		x	x		1
A8-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A8-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A8-C5-5	Railings	I					x	0.0001
A8-C5-6	Water Survival Equipment	I				x		0.5
A8-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A8-C6-1	Detection Systems	I			x	x		0.5
A8-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A8-C6-3	Ventilation Shutdown	D	1		x	x		1
A8-C6-4	PPE	I		x	x			0.5
A8-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A8-C6-6	H2S Compatible Equipment	I				x	x	0.001

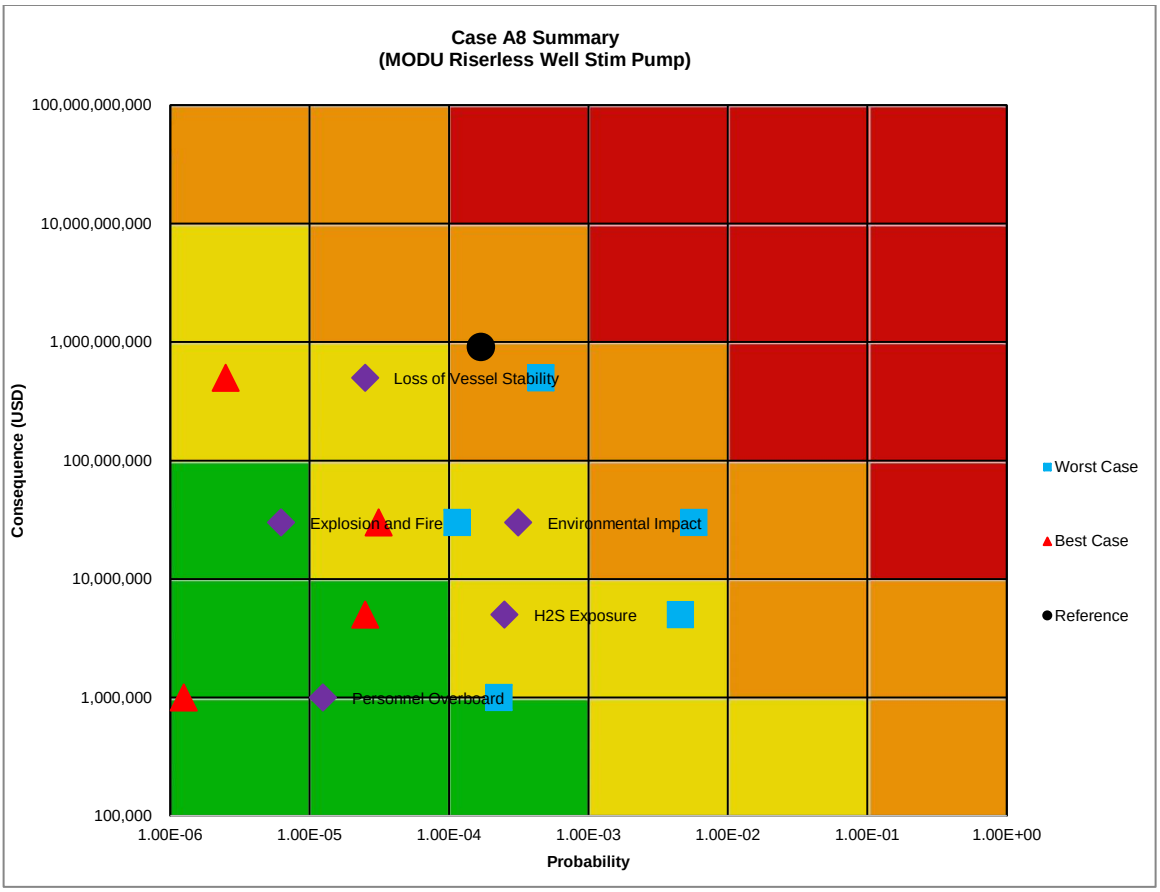

Figure 11 Case A8 Risk Plot

3.1.9 Case A9 MODU Riser Intervention Wireline Open Water

The consequence barrier analysis for Case A9 is documented in the following table. The corresponding risk plot is shown in Figure 12.

Table 15 Case A9 Consequence Barrier List

Case A9 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.00000625**
A9-C1-1	Structural Fire Protection	I				x	x	0.5
A9-C1-2	Deluge Systems	I			x	x		0.5
A9-C1-3	Fixed FF System	I					x	0.0001
A9-C1-4	Detection Systems	I			x	x		0.5
A9-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A9-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A9-C2-1	Capping / Containment Systems	I				x	x	0.001
A9-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A9-C2-3	Surface Skimming / Containment	I			x			0.5
A9-C2-4	Dispersant Applications	I				x		0.5
A9-C2-5	In Situ Burning	I				x		0.5
A9-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A9-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A9-C3-2	Structural Fire Protection	I					x	
A9-C3-3	Fixed Fire Fighting System	I					x	
A9-C3-4	Deluge Systems	I			x	x		
A9-C3-5	Detection Systems	I			x	x		
A9-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A9-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A9-C3-8	PPE	I		x	x			
A9-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		level 4						**0.000025**
A9-C4-1	Damage Stability Requirements	I					x	0.0001
A9-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A9-C4-3	Ballast Control Systems	I				x		0.5
A9-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A9-C5-1	Rescue Boat	I				x		0.5
A9-C5-2	EEP	D	1,5,6,7		x	x		1
A9-C5-3	Emergency Drills, Equipment and Training	D	1,5,6,7		x	x		1
A9-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A9-C5-5	Railings	I					x	0.0001
A9-C5-6	Water Survival Equipment	I				x		0.5
A9-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000025**
A9-C6-1	Detection Systems	I			x	x		0.5
A9-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A9-C6-3	Ventilation Shutdown	D	1		x	x		1
A9-C6-4	PPE	I		x	x			0.5
A9-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A9-C6-6	H2S Compatible Equipment	I				x	x	0.0001

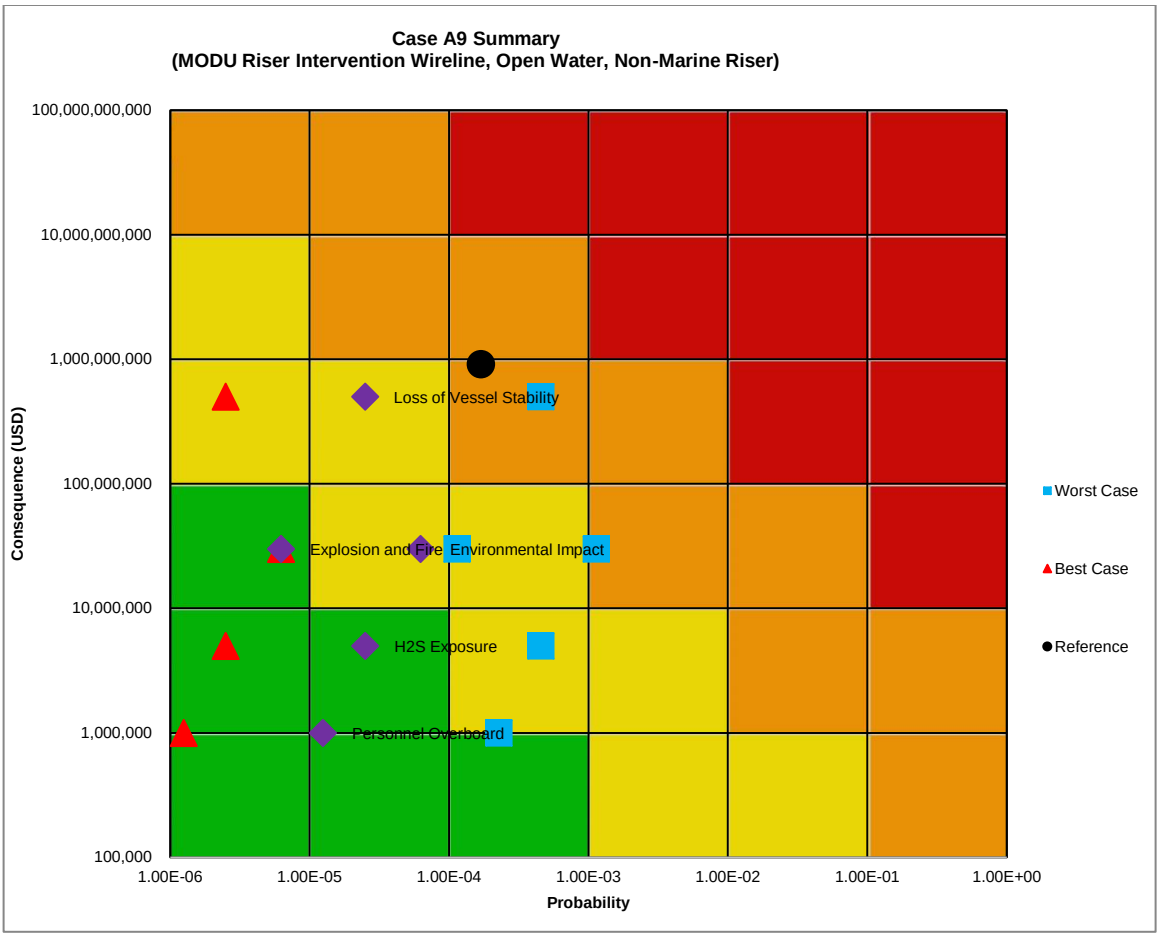

Figure 12 Case A9 Risk Plot

3.1.10 Case A10 MODU Riser Intervention Coil Tubing

The consequence barrier analysis for Case A10 is documented in the following table. The corresponding risk plot is shown in Figure 13.

Table 16 Case A10 Consequence Barrier List

Case A10 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.00000625**
A10-C1-1	Structural Fire Protection	I				x	x	0.5
A10-C1-2	Deluge Systems	I			x	x		0.5
A10-C1-3	Fixed FF System	I					x	0.0001
A10-C1-4	Detection Systems	I			x	x		0.5
A10-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A10-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A10-C2-1	Capping / Containment Systems	I				x	x	0.001
A10-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A10-C2-3	Surface Skimming / Containment	I			x			0.5
A10-C2-4	Dispersant Applications	I				x		0.5
A10-C2-5	In Situ Burning	I				x		0.5
A10-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A10-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A10-C3-2	Structural Fire Protection	I					x	
A10-C3-3	Fixed Fire Fighting System	I					x	
A10-C3-4	Deluge Systems	I			x	x		
A10-C3-5	Detection Systems	I			x	x		
A10-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A10-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A10-C3-8	PPE	I		x	x			
A10-C3-9	Medic / EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A10-C4-1	Damage Stability Requirements	I					x	0.0001
A10-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A10-C4-3	Ballast Control Systems	I				x		0.5
A10-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A10-C5-1	Rescue Boat	I				x		0.5
A10-C5-2	EEP	D	1,5,6,7,8		x	x		1
A10-C5-3	Emergency Drills, Equipment & Training	D	1,5,6,7,8		x	x		1
A10-C5-4	SAR Plans	D	1,5,6,7,8		x	x		1
A10-C5-5	Railings	I					x	0.0001
A10-C5-6	Water Survival Equipment	I				x		0.5
A10-C5-7	PPE (Fall Preventers, PFDs)	I		x	x			0.5
A10-C5-8	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A10-C6-1	Detection Systems	I			x	x		0.5
A10-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A10-C6-3	Ventilation Shutdown	D	1		x	x		1
A10-C6-4	PPE	I		x	x			0.5
A10-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A10-C6-6	H2S Compatible Equipment	I				x	x	0.001

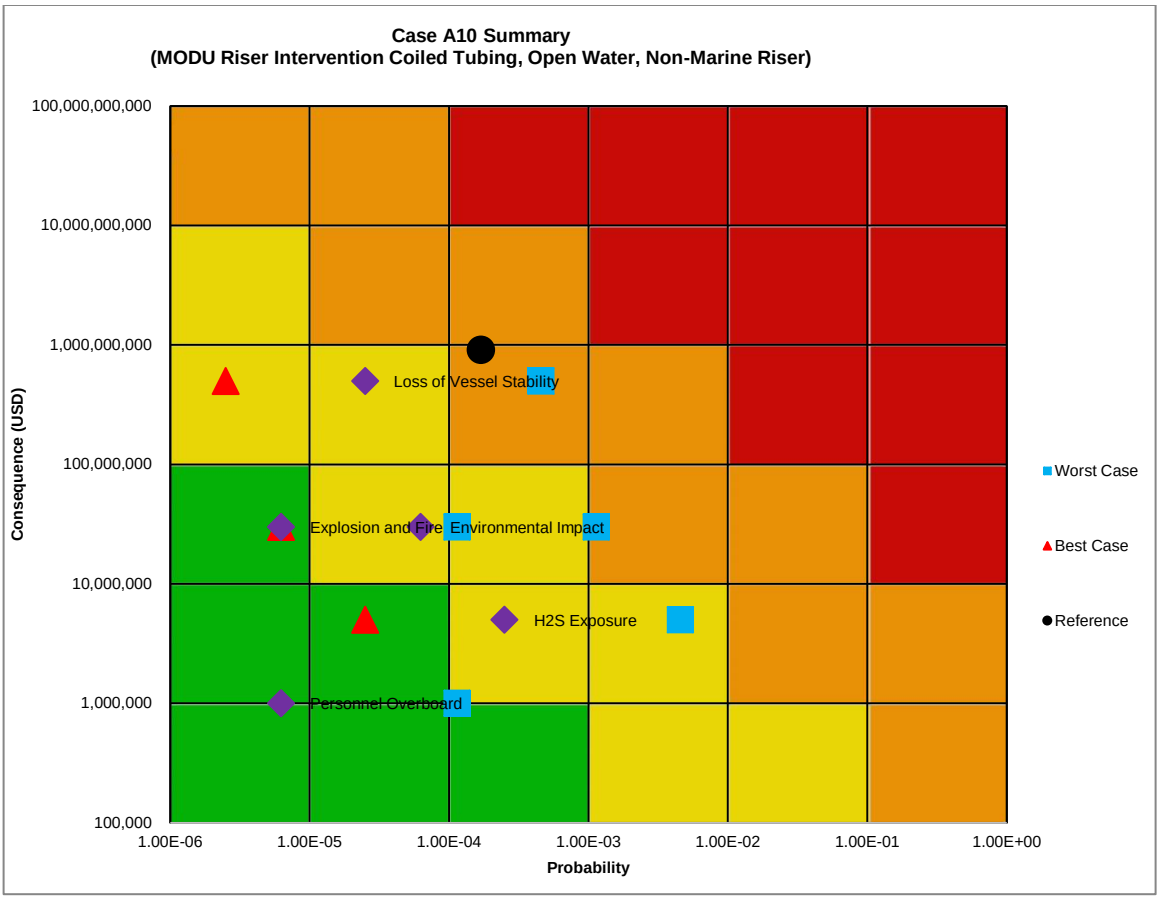

Figure 13 Case A10 Risk Plot

3.1.11 Case A11 MODU Riser Intervention Well Stimulation / Pumping

The consequence barrier analysis for Case A11 is documented in the following table. The corresponding risk plot is shown in Figure 14.

Table 17 Case A11 Consequence Barrier List

Case A11 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.00000625**
A11-C1-1	Structural Fire Protection	I				x	x	0.5
A11-C1-2	Deluge Systems	I			x	x		0.5
A11-C1-3	Fixed FF System	I					x	0.0001
A11-C1-4	Detection Systems	I			x	x		0.5
A11-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A11-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A11-C2-1	Capping / Containment Systems	I				x	x	0.001
A11-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A11-C2-3	Surface Skimming / Containment	I			x			0.5
A11-C2-4	Dispersant Applications	I				x		0.5
A11-C2-5	In Situ Burning	I				x		0.5
A11-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A11-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A11-C3-2	Structural Fire Protection	I					x	
A11-C3-3	Fixed FF System	I					x	
A11-C3-4	Deluge Systems	I			x	x		
A11-C3-5	Detection Systems	I			x	x		
A11-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A11-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A11-C3-8	PPE	I		x	x			
A11-C3-9	Medic/EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A11-C4-1	Damage Stability Requirements	I					x	0.0001
A11-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A11-C4-3	Ballast Control Systems	I				x		0.5
A11-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A11-C5-1	Rescue Boat	I				x		0.5
A11-C5-2	EEP	D	1,5,6,7,8		x	x		1
A11-C5-3	Emergency Drills, Equipment & Training	D	1,5,6,7,8		x	x		1
A11-C5-4	SAR Plans	D	1,5,6,7,8		x	x		1
A11-C5-5	Railings	I					x	0.0001
A11-C5-6	Water Survival Equipment	I				x		0.5
A11-C5-7	PPE (Fall Preventers, PFDs)	I		x	x			0.5
A11-C5-8	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A11-C6-1	Detection Systems	I			x	x		0.5
A11-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A11-C6-3	Ventilation Shutdown	D	1		x	x		1
A11-C6-4	PPE	I		x	x			0.5
A11-C6-5	Procedures, Drills and Training	D	1,2,3,4,6		x	x		1
A11-C6-6	H2S Compatible Equipment	I				x	x	0.001

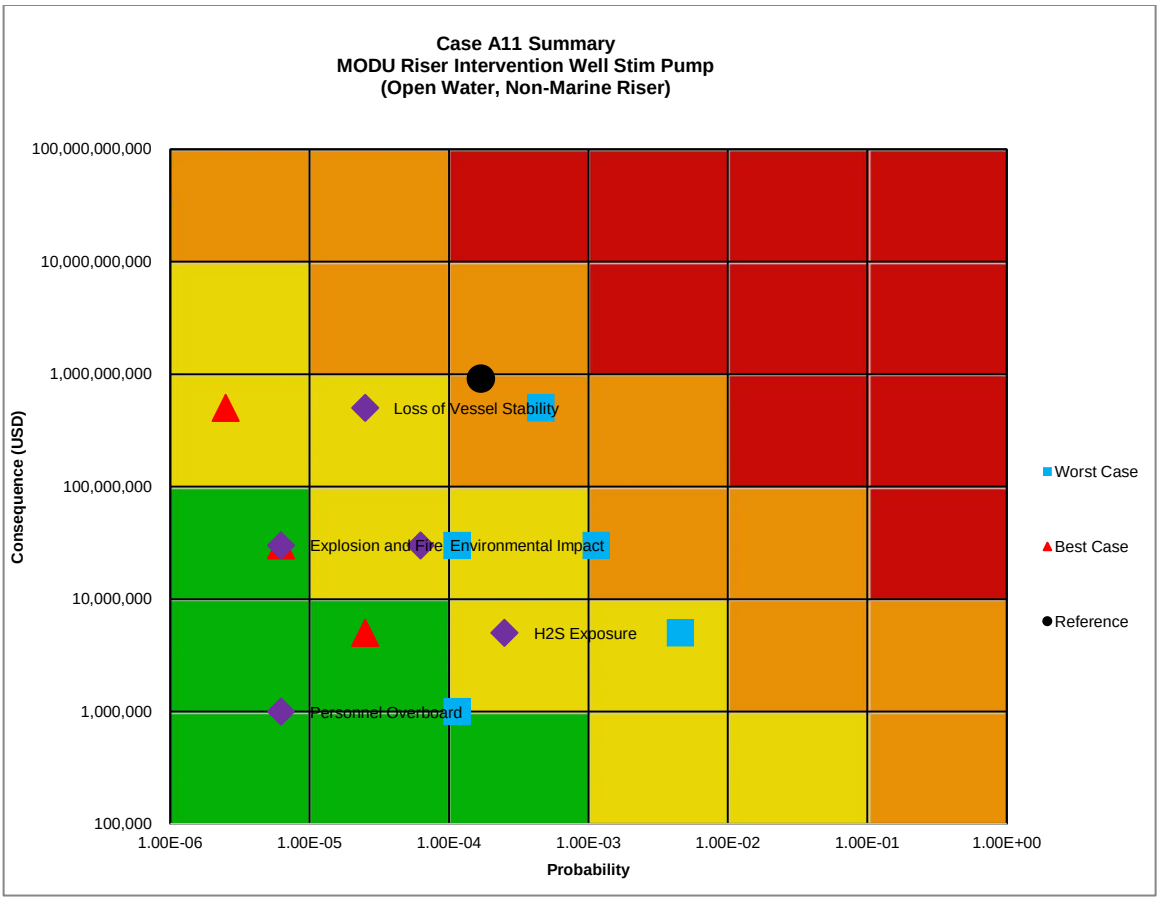

Figure 14 Case A11 Risk Plot

3.1.12 Case A12 MODU Riser Intervention Flowback

The consequence barrier analysis for Case A12 is documented in the following table. The corresponding risk plot is shown in Figure 15.

Table 18 Case A12 Consequence Barrier List

Case A12 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A12-C1-1	Diverter Systems (may not always be present)	I					x	0.0001
A12-C1-2	Structural Fire Protection	I				x	x	0.5
A12-C1-3	Deluge Systems	I			x	x		0.5
A12-C1-4	Fixed Fire Fighting System	I					x	0.5
A12-C1-5	Detection Systems	I			x	x		0.5
A12-C1-6	Emergency Response Plans and Training	D	1,2,3,4,5		x	x		1
A12-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A12-C2-1	Capping / Containment Systems	I				x	x	0.001
A12-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A12-C2-3	Surface Skimming / Containment	I			x			0.5
A12-C2-4	Dispersant Applications	I				x		0.5
A12-C2-5	In Situ Burning	I				x		0.5
A12-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A12-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A12-C3-2	Structural Fire Protection	I					x	
A12-C3-3	Fixed FF System	I					x	
A12-C3-4	Deluge Systems	I			x	x		
A12-C3-5	Detection Systems	I			x	x		
A12-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A12-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A12-C3-8	PPE	I		x	x			
A12-C3-9	Medic/EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A12-C4-1	Damage Stability Requirements	I					x	0.0001
A12-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A12-C4-3	Ballast Control Systems	I				x		0.5
A12-C4-4	Drilling and Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A12-C5-1	Rescue Boat	I				x		0.5
A12-C5-2	EEP	D	1,5,6,7		x	x		1
A12-C5-3	Emergency Drills, Equipment & Training	D	1,5,6,7		x	x		1
A12-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A12-C5-5	Railings	I					x	0.0001
A12-C5-6	Water Survival Equipment	I				x		0.5
A12-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A12-C6-1	Detection Systems	I			x	x		0.5
A12-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A12-C6-3	Ventilation	D	1		x	x		1
A12-C6-4	PPE	I		x	x			0.5
A12-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A12-C6-6	H2S Compatible Equipment	I				x	x	0.001

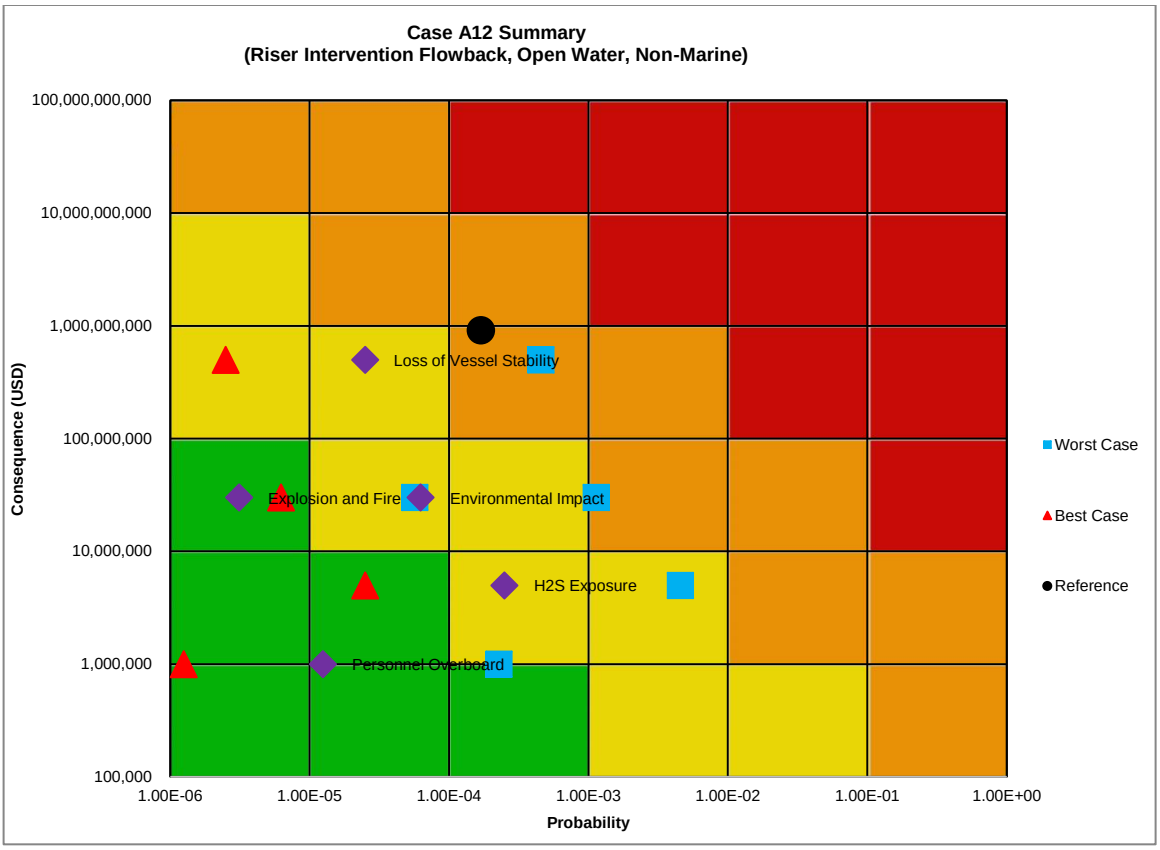

Figure 15 Case A12 Risk Plot

3.1.13 Case A13 MODU Hydraulic Well Stimulation

The consequence barrier analysis for Case A13 is documented in the following table. The corresponding risk plot is shown in Figure 16.

Table 19 Case A13 Consequence Barrier List

Case A13 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.00000625**
A13-C1-1	Structural Fire Protection	I				x	x	0.5
A13-C1-2	Deluge Systems	I			x	x		0.5
A13-C1-3	Fixed FF System	I					x	0.0001
A13-C1-4	Detection Systems	I			x	x		0.5
A13-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A13-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0003125**
A13-C2-1	Top Hat Systems	I			x	x		0.01
A13-C2-2	ROV Override Tree Valves	I			x	x		0.5
A13-C2-3	Spill Response Plans & Training	D	1,2,4,5,6,7		x	x		1
A13-C2-4	Surface Skimming/Containment	I			x			0.5
A13-C2-5	Dispersant Applications	I				x		0.5
A13-C2-6	In Situ Burning	I				x		0.5
A13-C2-7	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A13-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A13-C3-2	Structural Fire Protection	I					x	
A13-C3-3	Fixed FF System	I					x	
A13-C3-4	Deluge Systems	I			x	x		
A13-C3-5	Detection Systems	I			x	x		
A13-C3-6	Drills & Training	D	1,2,3,4,5,8,9		x	x		
A13-C3-7	EEP	D	1,2,3,4,5,8,9		x	x		
A13-C3-8	PPE	I		x	x			
A13-C3-9	Medic/EMT	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A13-C4-1	Damage Stability Requirements	I					x	0.0001
A13-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A13-C4-3	Ballast Control Systems	I				x		0.5
A13-C4-4	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A13-C5-1	Rescue Boat	I				x		0.5
A13-C5-2	EEP	D	1,5,6,7		x	x		1
A13-C5-3	Emergency Drills, Equipment & Training	D	1,5,6,7		x	x		1
A13-C5-4	SAR Plans	D	1,5,6,7		x	x		1
A13-C5-5	Railings	I					x	0.0001
A13-C5-6	Water Survival Equipment	I				x		0.5
A13-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A13-C6-1	Detection Systems	I			x	x		0.5
A13-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A13-C6-3	Ventilation	D	1		x	x		1
A13-C6-4	PPE	I		x	x			0.5
A13-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A13-C6-6	H2S Compatible Equipment	I				x	x	0.001

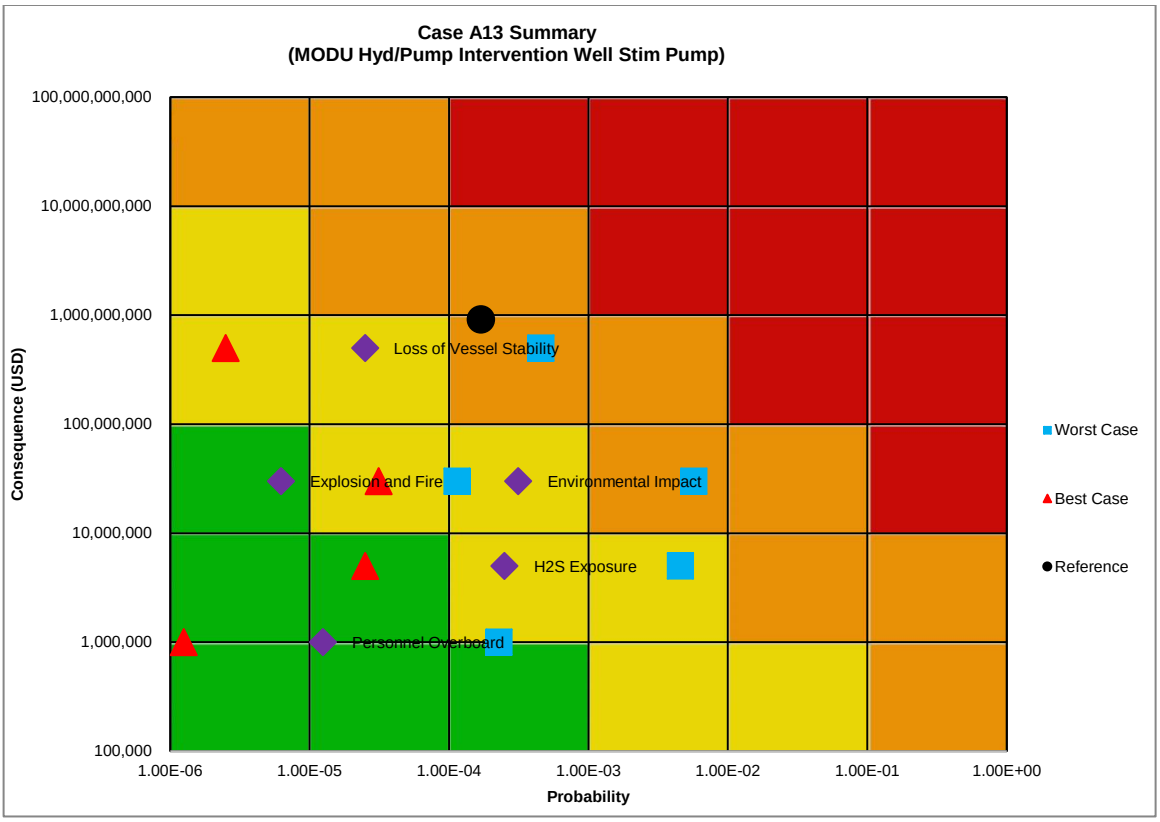

Figure 16 Case A13 Risk Plot

3.2 MSV Subsea BOP Cases

3.2.1 Case A14 MSV Riserless Wireline

The consequence barrier analysis for Case A14 is documented in the following table. The corresponding risk plot is shown in Figure 17.

Table 20 Case A14 Consequence Barrier List

Case A14 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-Likelihood Never Occurred In Industry		Level 3						**0.000003125**
A14-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A14-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A14-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A14-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A14-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A14-C1-6	Vessel Leaves Location	I				x	x	0.5
A14-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A14-C2-1	Capping / Containment Systems	I				x	x	0.001
A14-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A14-C2-3	Surface Skimming / Containment	I			x			0.5
A14-C2-4	Dispersant Applications	I				x		0.5
A14-C2-5	In Situ Burning	I				x		0.5
A14-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A14-C3-1	Enclosed Fire-Protected Life Boats	I				x		
A14-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A14-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A14-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A14-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A14-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A14-C3-7	PPE	I			x	x		
A14-C3-8	Medic/EMT-Optional	I		x	x			
A14-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A14-C4-1	Damage Stability Requirements	I					x	0.0001
A14-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A14-C4-3	Ballast Control Systems	I				x		0.5
A14-C4-4	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A14-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A14-C5-2	Standby Boat	I			x	x		0.5
A14-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A14-C5-4	SAR Plans	D	1,2,3		x	x		1
A14-C5-5	Railings	I					x	0.0001
A14-C5-6	Water Survival Equipment	I				x		0.5
A14-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-Likelihood Never Occurred in Industry		Level 2						**0.000125**
A14-C6-1	Detection Systems	I			x	x		0.5
A14-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A14-C6-3	Ventilation	D	1,7		x	x		1
A14-C6-4	PPE	I		x	x			0.5
A14-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A14-C6-6	Vessel Leaves Location	I				x	x	0.5
A14-C6-7	H2S Compatible Equipment	I				x	x	0.001

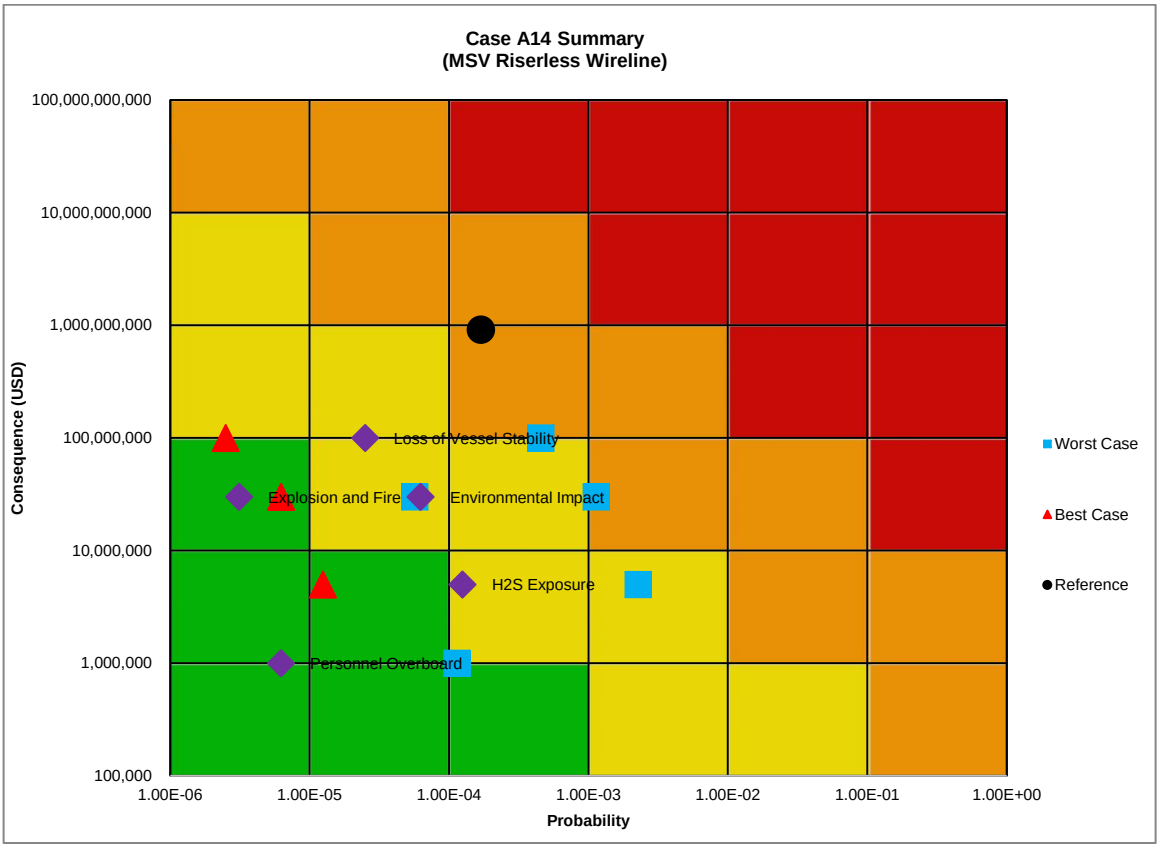

Figure 17 Case A14 Risk Plot

3.2.2 Case A15 MSV Riserless Coil Tubing

NO CASE FOUND

3.2.3 Case A16 MSV Riserless Well Stimulation / Pumping

The consequence barrier analysis for Case A16 is documented in the following table. The corresponding risk plot is shown in Figure 18.

Table 21 Case A16 Consequence Barrier List

Case A16 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A16-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A16-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A16-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A16-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A16-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A16-C1-6	Vessel Leaves Location	I				x	x	0.5
A16-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A16-C2-1	Capping / Containment Systems	I				x	x	0.001
A16-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A16-C2-3	Surface Skimming / Containment	I			x			0.5
A16-C2-4	Dispersant Applications	I				x		0.5
A16-C2-5	In Situ Burning	I				x		0.5
A16-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A16-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A16-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A16-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A16-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A16-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A16-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A16-C3-7	PPE	I			x	x		
A16-C3-8	Medic/EMT-Optional	I		x	x			
A16-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A16-C4-1	Damage Stability Requirements	I					x	0.0001
A16-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A16-C4-3	Ballast Control Systems	I				x		0.5
A16-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A16-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A16-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A16-C5-2	Standby Boat	I			x	x		0.5
A16-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A16-C5-4	SAR Plans	D	1,2,3		x	x		1
A16-C5-5	Railings	I					x	0.0001
A16-C5-6	Water Survival Equipment	I				x		0.5
A16-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A16-C6-1	Detection Systems	I			x	x		0.5
A16-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A16-C6-3	Ventilation	D	1,7		x	x		1
A16-C6-4	PPE	I		x	x			0.5
A16-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A16-C6-6	Vessel Leaves Location	I				x	x	0.5
A16-C6-7	H2S Compatible Equipment	I				x	x	0.001

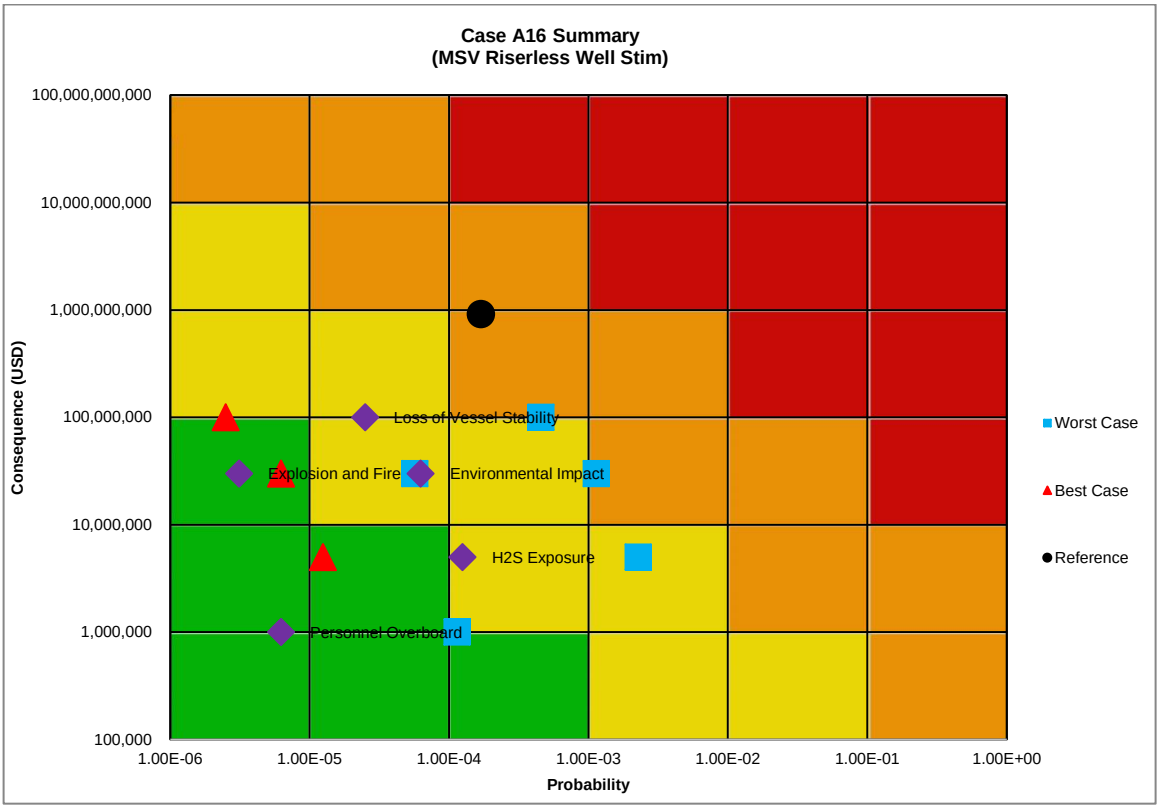

Figure 18 Case A16 Risk Plot

3.2.4 Case A17 MSV Riser Intervention Wireline

The consequence barrier analysis for Case A17 is documented in the following table. The corresponding risk plot is shown in Figure 19.

Table 22 Case A17 Consequence Barrier List

Case A17 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**1.5625E-06**
A17-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A17-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A17-C1-3	HC Handling System	I				x		0.5
A17-C1-4	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A17-C1-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A17-C1-6	Emergency Response Plans & Training	D	1,2,3,4,5,7,8		x	x		1
A17-C1-7	Vessel Leaves Location	I				x	x	0.5
A17-C1-8	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A17-C2-1	Capping / Containment Systems	I				x	x	0.001
A17-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A17-C2-3	Surface Skimming / Containment	I			x			0.5
A17-C2-4	Dispersant Applications	I				x		0.5
A17-C2-5	In Situ Burning	I				x		0.5
A17-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A17-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A17-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A17-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A17-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A17-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A17-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A17-C3-7	PPE	I		x	x			
A17-C3-8	Medic/EMT-Optional	I		x	x			
A17-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A17-C4-1	Damage Stability Design & Maintenance	I					x	0.0001
A17-C4-2	Intact Stability / Watertight Integrity	I					x	0.5
A17-C4-3	Ballast Control Systems	I				x		0.5
A17-C4-4	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A17-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A17-C5-2	Standby Boat	I			x	x		0.5
A17-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A17-C5-4	SAR Plans	D	1,2,3		x	x		1
A17-C5-5	Railings	I					x	0.0001
A17-C5-6	Water Survival Equipment	I				x		0.5
A17-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A17-C6-1	Detection Systems	I			x	x		0.5
A17-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A17-C6-3	Ventilation	D	1,7		x	x		1
A17-C6-4	PPE	I		x	x			0.5
A17-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A17-C6-6	Vessel Leaves Location	I				x	x	0.5
A17-C6-7	H2S Compatible Equipment	I				x	x	0.001

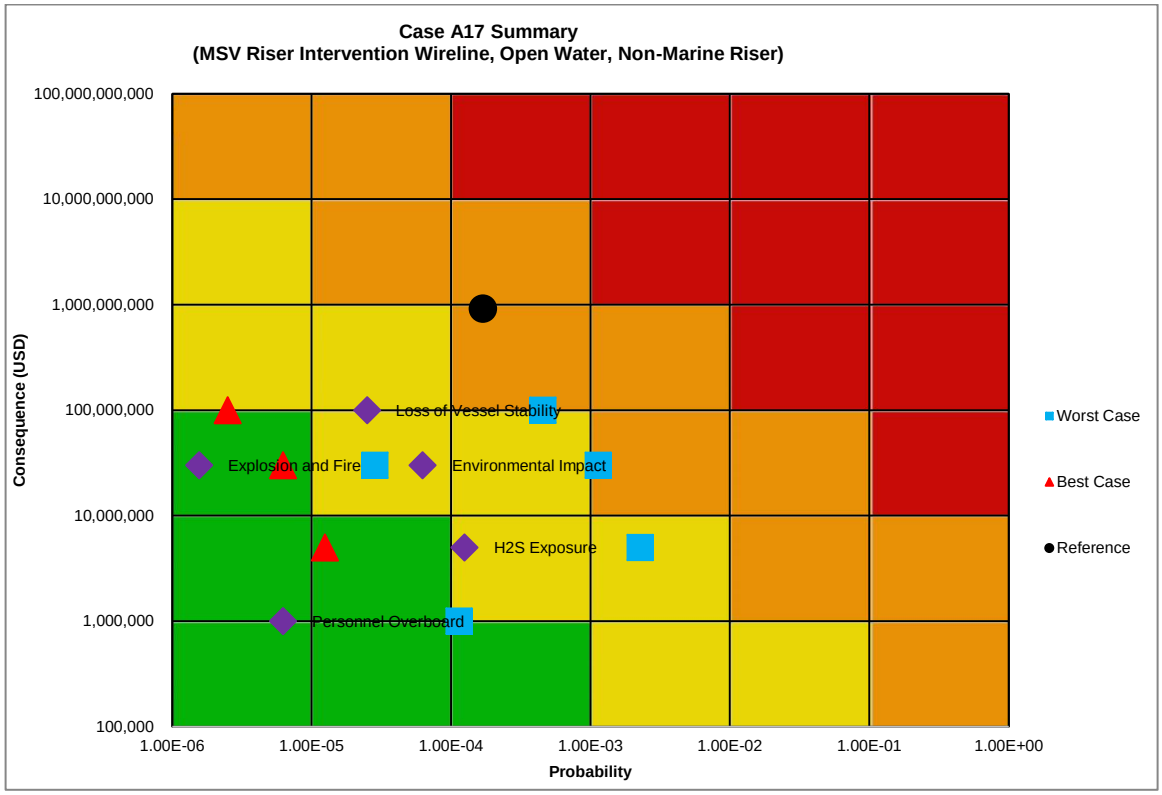

Figure 19 Case A17 Risk Plot

3.2.5 *Case A18 MSV Riser Intervention Coiled Tubing*

The consequence barrier analysis for Case A18 is documented in the following table. The corresponding risk plot is shown in Figure 20.

Table 23 Case A18 Consequence Barrier List

Case A18 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**1.5625E-06**
A18-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A18-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A18-C1-3	HC Handling System	I				x		0.5
A18-C1-4	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A18-C1-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A18-C1-6	Emergency Response Plans & Training	D	1,2,3,4,5,7,8		x	x		1
A18-C1-7	Vessel Leaves Location	I				x	x	0.5
A18-C1-8	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A18-C2-1	Capping / Containment Systems	I				x	x	0.001
A18-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A18-C2-3	Surface Skimming / Containment	I			x			0.5
A18-C2-4	Dispersant Applications	I				x		0.5
A18-C2-5	In Situ Burning	I				x		0.5
A18-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A18-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A18-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A18-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A18-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A18-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A18-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A18-C3-7	PPE	I		x	x			
A18-C3-8	Medic/EMT-Optional	I		x	x			
A18-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A18-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A18-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A18-C4-4	Ballast Control Systems	I				x		0.5
A18-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A18-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A18-C5-2	Standby Boat	I			x	x		0.5
A18-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A18-C5-4	SAR Plans	D	1,2,3		x	x		1
A18-C5-5	Railings	I					x	0.0001
A18-C5-6	Water Survival Equipment	I				x		0.5
A18-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A18-C6-1	Detection Systems	I			x	x		0.5
A18-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A18-C6-3	Ventilation	D	1,7		x	x		1
A18-C6-4	PPE	I		x	x			0.5
A18-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A18-C6-6	Vessel Leaves Location	I				x	x	0.5
A18-C6-7	H2S Compatible Equipment	I				x	x	0.001

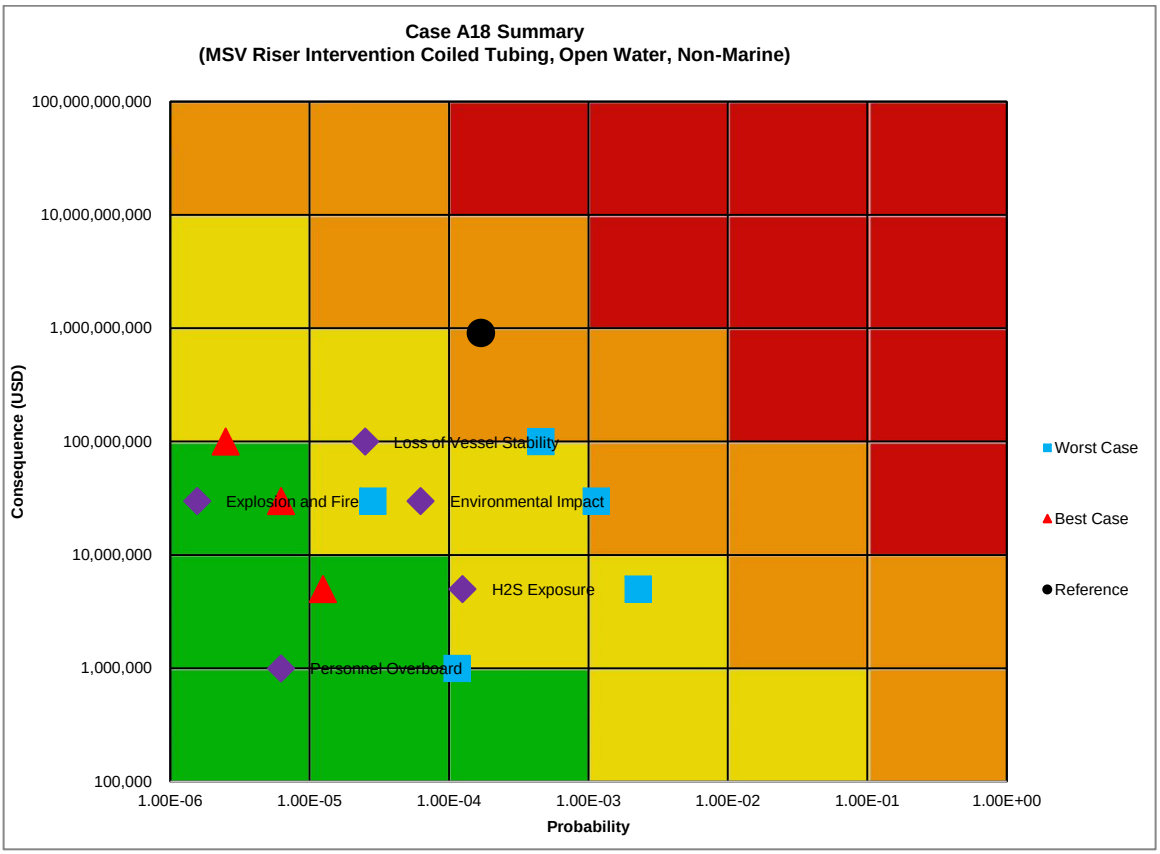

Figure 20 Case A18 Risk Plot

3.2.6 Case A19 MSV Riser Intervention Well Stimulation / Pumping

The consequence barrier analysis for Case A19 is documented in the following table. The corresponding risk plot is shown in Figure 21.

Table 24 Case A19 Consequence Barrier List

Case A19 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A19-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A19-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A19-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A19-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A19-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A19-C1-6	Vessel Leaves Location	I				x	x	0.5
A19-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A19-C2-1	Capping / Containment Systems	I				x	x	0.001
A19-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A19-C2-3	Surface Skimming / Containment	I			x			0.5
A19-C2-4	Dispersant Applications	I				x		0.5
A19-C2-5	In Situ Burning	I				x		0.5
A19-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A19-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A19-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A19-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A19-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A19-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A19-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A19-C3-7	PPE	I		x	x			
A19-C3-8	Medic/EMT-Optional	I		x	x			
A19-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A19-C4-1	Damage Stability Design & Maintenance	I					x	0.0001
A19-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A19-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		
A19-C4-4	Ballast Control Systems	I				x		0.5
A19-C4-5	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A19-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A19-C5-2	Standby Boat	I			x	x		0.5
A19-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A19-C5-4	SAR Plans	D	1,2,3		x	x		1
A19-C5-5	Railings	I					x	0.0001
A19-C5-6	Water Survival Equipment	I				x		0.5
A19-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A19-C6-1	Detection Systems	I			x	x		0.5
A19-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A19-C6-3	Ventilation	D	1,7		x	x		1
A19-C6-4	PPE	I		x	x			0.5
A19-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A19-C6-6	Vessel Leaves Location	I				x	x	0.5
A19-C6-7	H2S Compatible Equipment	I				x	x	0.001

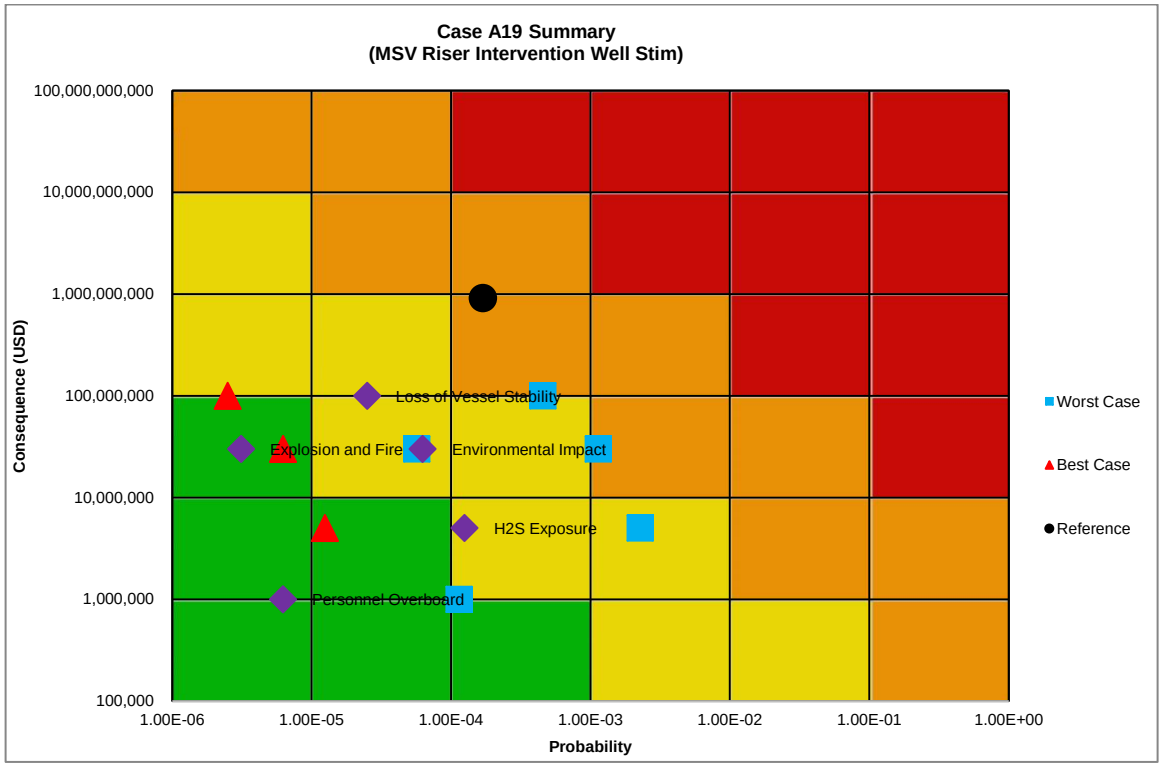

Figure 21 Case A19 Risk Plot

3.2.7 Case A20 MSV Riser Intervention Flowback

The consequence barrier analysis for Case A20 is documented in the following table. The corresponding risk plot is shown in Figure 22.

Table 25 Case A20 Consequence Barrier List

Case A20 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A20-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A20-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A20-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A20-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A20-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A20-C1-6	Vessel Leaves Location	I				x	x	0.5
A20-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A20-C2-1	Capping / Containment Systems	I				x	x	0.001
A20-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A20-C2-3	Surface Skimming / Containment	I			x			0.5
A20-C2-4	Dispersant Applications	I				x		0.5
A20-C2-5	In Situ Burning	I				x		0.5
A20-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A20-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A20-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A20-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A20-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A20-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A20-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A20-C3-7	PPE	I		x	x			
A20-C3-8	Medic/EMT-Optional	I		x	x			
A20-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A20-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A20-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A20-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A20-C4-4	Ballast Control Systems	I				x		0.5
A20-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A20-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A20-C5-2	Standby Boat	I			x	x		0.5
A20-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A20-C5-4	SAR Plans	D	1,2,3		x	x		1
A20-C5-5	Railings	I					x	0.0001
A20-C5-6	Water Survival Equipment	I				x		0.5
A20-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A20-C6-1	Detection Systems	I			x	x		0.5
A20-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A20-C6-3	Ventilation	D	1,7		x	x		1
A20-C6-4	PPE	I		x	x			0.5
A20-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A20-C6-6	Vessel Leaves Location	I				x	x	0.5
A20-C6-7	H2S Compatible Equipment	I				x	x	0.001

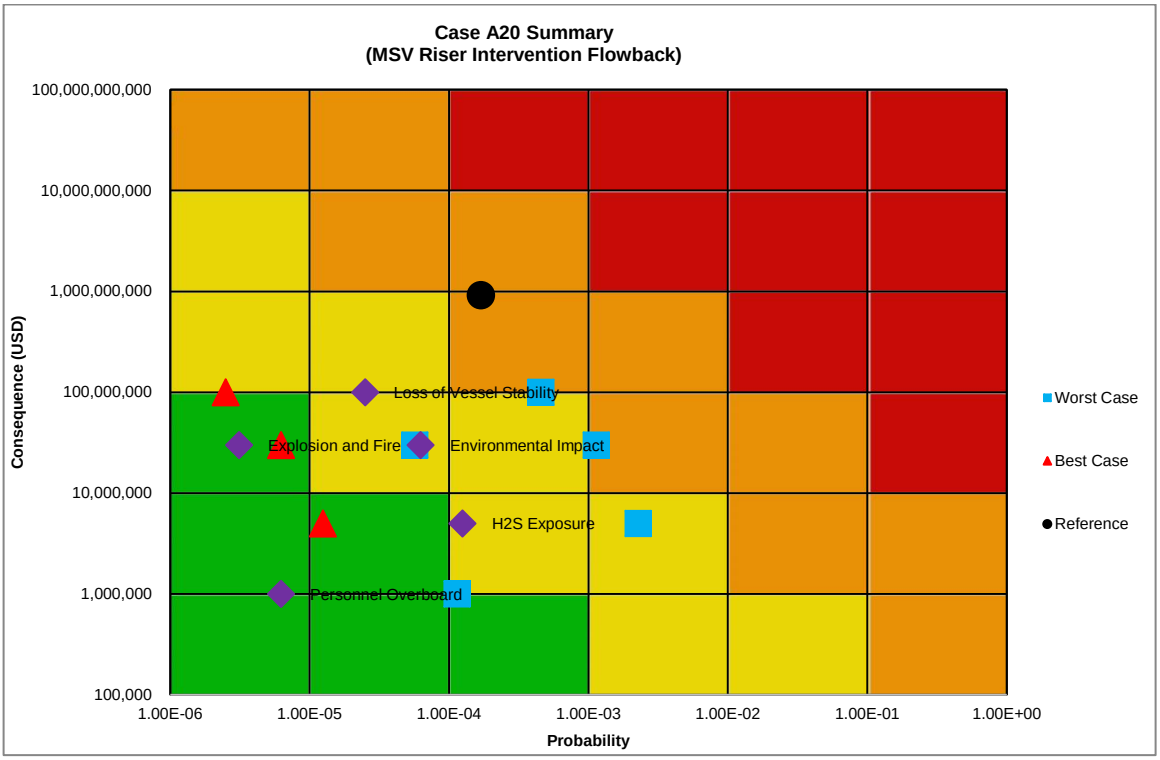

Figure 22 Case A20 Risk Plot

3.2.8 Case A21 MSV Well Stimulation / Pumping

The consequence barrier analysis for Case A21 is documented in the following table. The corresponding risk plot is shown in Figure 23.

Table 26 Case A21 Consequence Barrier List

Case A21 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A21-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A21-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A21-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A21-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A21-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A21-C1-6	Vessel Leaves Location	I				x	x	0.5
A21-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A21-C2-1	Capping / Containment Systems	I				x	x	0.001
A21-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A21-C2-3	Surface Skimming / Containment	I			x			0.5
A21-C2-4	Dispersant Applications	I				x		0.5
A21-C2-5	In Situ Burning	I				x		0.5
A21-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A21-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A21-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A21-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A21-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A21-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A21-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A21-C3-7	PPE	I		x	x			
A21-C3-8	Medic/EMT-Optional	I		x	x			
A21-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A21-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A21-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A21-C4-3	Ballast Control Systems	I				x		0.5
A21-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A21-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A21-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A21-C5-2	Standby Boat	I			x	x		0.5
A21-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A21-C5-4	SAR Plans	D	1,2,3		x	x		1
A21-C5-5	Railings	I					x	0.0001
A21-C5-6	Water Survival Equipment	I				x		0.5
A21-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A21-C6-1	Detection Systems	I			x	x		0.5
A21-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A21-C6-3	Ventilation	D	1,7		x	x		1
A21-C6-4	PPE	I		x	x			0.5
A21-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A21-C6-6	Vessel Leaves Location	I				x	x	0.5
A21-C6-7	H2S Compatible Equipment	I				x	x	0.001

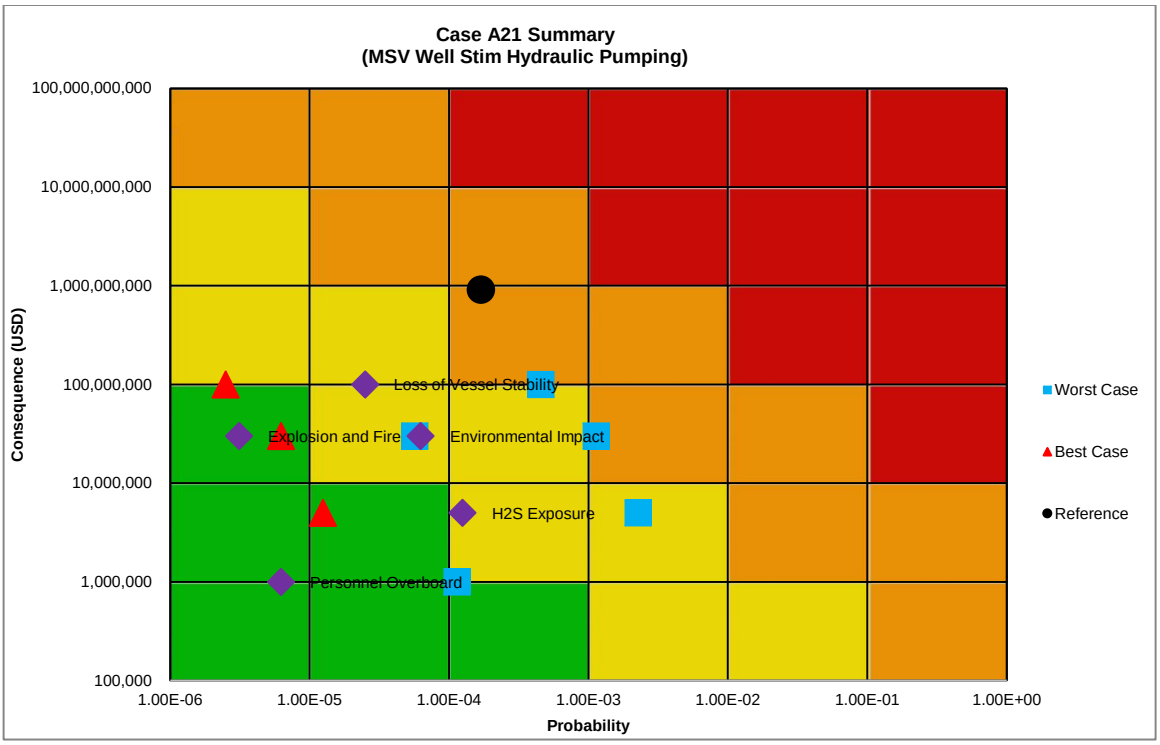

Figure 23 Case A21 Risk Plot

3.3 SIV Subsea BOP Cases

3.3.1 Case A22 SIV Riserless Wireline

The consequence barrier analysis for Case A22 is documented in the following table. The corresponding risk plot is shown in Figure 24.

Table 27 Case A22 Consequence Barrier List

Case A22 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK THAN RISER CASE		Level 3						**0.000003125**
A22-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A22-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A22-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A22-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A22-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A22-C1-6	Vessel Leaves Location	I				x	x	0.5
A22-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A22-C2-1	Capping / Containment Systems	I				x	x	0.001
A22-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A22-C2-3	Surface Skimming / Containment	I			x			0.5
A22-C2-4	Dispersant Applications	I				x		0.5
A22-C2-5	In Situ Burning	I				x		0.5
A22-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A22-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A22-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A22-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A22-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A22-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A22-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A22-C3-7	PPE	I		x	x			
A22-C3-8	Medic/EMT-Optional	I		x	x			
A22-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A22-C4-1	Design & Maintenance Requirements	I					x	0.0001
A22-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A22-C4-3	Ballast Control Systems	I				x		0.5
A22-C4-4	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A22-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A22-C5-2	Standby Boat	I			x	x		0.5
A22-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A22-C5-4	SAR Plans	D	1,2,3		x	x		1
A22-C5-5	Railings	I					x	0.0001
A22-C5-6	Water Survival Equipment	I				x		0.5
A22-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK THAN RISER CASE		Level 2						**0.000125**
A22-C6-1	Detection Systems	I			x	x		0.5
A22-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A22-C6-3	Ventilation	D	1,7		x	x		1
A22-C6-4	PPE	I		x	x			0.5
A22-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A22-C6-6	Vessel Leaves Location	I				x	x	0.5
A22-C6-7	H2S Compatible Equipment	I				x	x	0.001

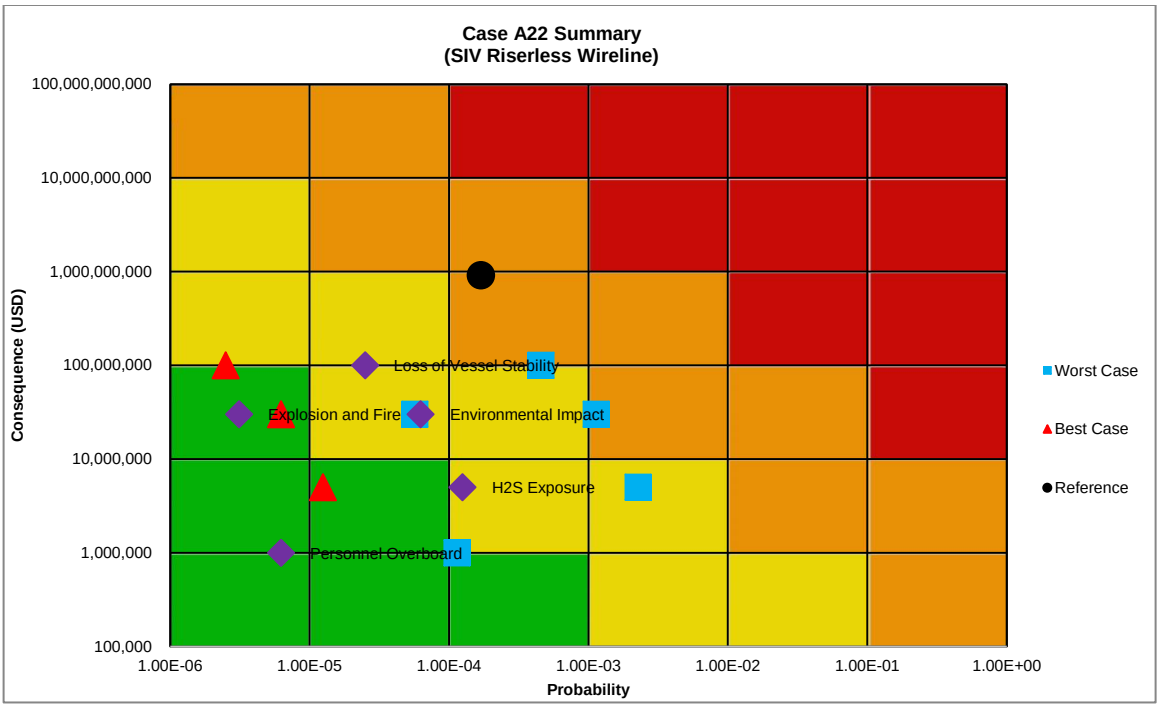

Figure 24 Case A22 Risk Plot

3.3.2 Case A23 SIV Riserless Coil Tubing

NO CASE FOUND

3.3.3 Case A24 SIV Riserless Well Stimulation / Pumping

The consequence barrier analysis for Case A24 is documented in the following table. The corresponding risk plot is shown in Figure 25.

Table 28 Case A24 Consequence Barrier List

Case A24 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK THAN RISER CASE		Level 3						**0.000003125**
A24-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A24-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A24-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A24-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A24-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A24-C1-6	Vessel Leaves Location	I				x	x	0.5
A24-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A24-C2-1	Capping / Containment Systems	I				x	x	0.001
A24-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A24-C2-3	Surface Skimming / Containment	I			x			0.5
A24-C2-4	Dispersant Applications	I				x		0.5
A24-C2-5	In Situ Burning	I				x		0.5
A24-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A24-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A24-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A24-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A24-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A24-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A24-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A24-C3-7	PPE	I		x	x			
A24-C3-8	Medic/EMT-Optional	I		x	x			
A24-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A24-C4-1	Design & Maintenance Requirements	I					x	0.0001
A24-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A24-C4-3	Ballast Control Systems	I				x		0.5
A24-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A24-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A24-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A24-C5-2	Standby Boat	I			x	x		0.5
A24-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A24-C5-4	SAR Plans	D	1,2,3		x	x		1
A24-C5-5	Railings	I					x	0.0001
A24-C5-6	Water Survival Equipment	I				x		0.5
A24-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK THAN RISER CASE		Level 2						**0.000125**
A24-C6-1	Detection Systems	I			x	x		0.5
A24-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A24-C6-3	Ventilation	D	1,7		x	x		1
A24-C6-4	PPE	I		x	x			0.5
A24-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A24-C6-6	Vessel Leaves Location	I				x	x	0.5
A24-C6-7	H2S Compatible Equipment	I				x	x	0.001

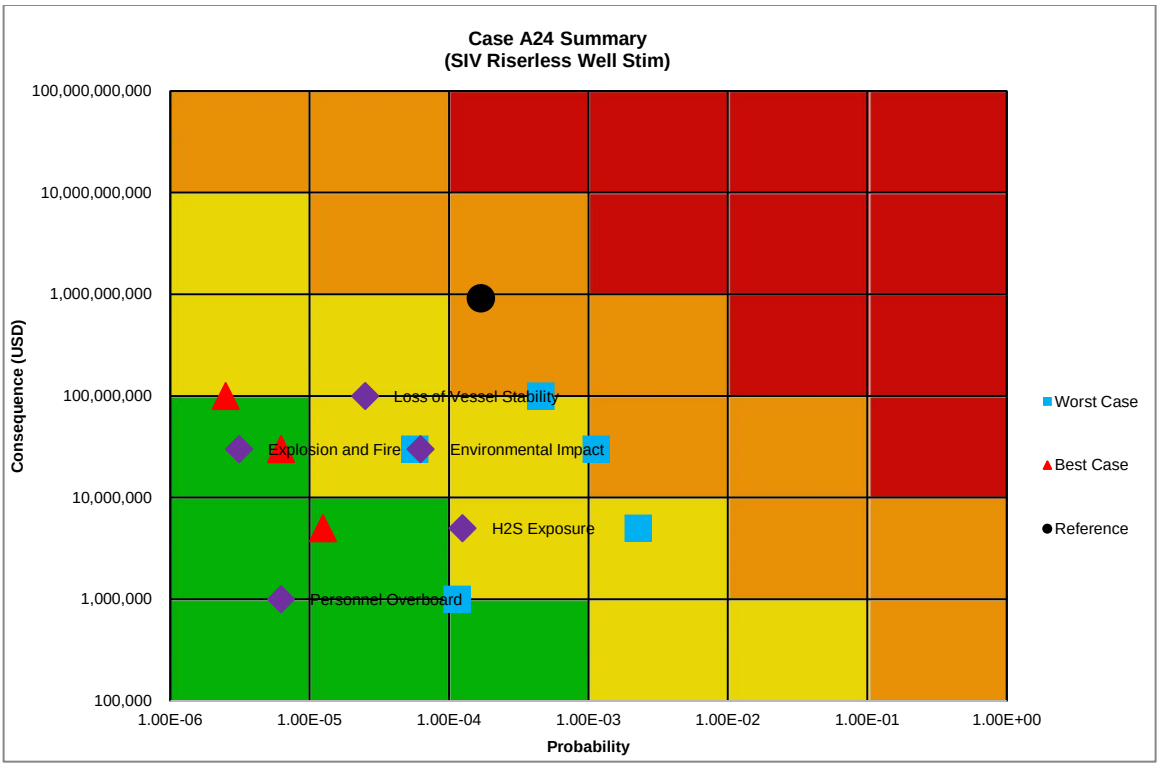

Figure 25 Case A24 Risk Plot

3.3.4 *Case A25 SIV Riser Intervention Wireline*

The consequence barrier analysis for Case A25 is documented in the following table. The corresponding risk plot is shown in Figure 26.

Table 29 Case A25 Consequence Barrier List

Case A25 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**1.5625E-06**
A25-C1-1	Diverter System-Varies by Vessel	I					x	0.5
A25-C1-2	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A25-C1-3	Deluge Systems-Varies by Vessel	I			x	x		0.5
A25-C1-4	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A25-C1-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A25-C1-6	Emergency Response Plans & Training	D	1,2,3,4,5,7,8		x	x		1
A25-C1-7	Vessel Leaves Location	I				x	x	0.5
A25-C1-8	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A25-C2-1	Capping / Containment Systems	I				x	x	0.001
A25-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A25-C2-3	Surface Skimming / Containment	I			x			0.5
A25-C2-4	Dispersant Applications	I				x		0.5
A25-C2-5	In Situ Burning	I				x		0.5
A25-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A25-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A25-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A25-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A25-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A25-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A25-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A25-C3-7	PPE	I		x	x			
A25-C3-8	Medic/EMT-Optional	I		x	x			
A25-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A25-C4-1	Damage Stability Design & Maintenance	I					x	0.0001
A25-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A25-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A25-C4-4	Ballast Control Systems	I				x		0.5
A25-C4-5	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A25-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A25-C5-2	Standby Boat	I			x	x		0.5
A25-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A25-C5-4	SAR Plans	D	1,2,3		x	x		1
A25-C5-5	Railings	I					x	0.0001
A25-C5-6	Water Survival Equipment	I				x		0.5
A25-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK THAN RISER CASE		Level 2						**0.000125**
A25-C6-1	Detection Systems	I			x	x		0.5
A25-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A25-C6-3	Ventilation	D	1,7		x	x		1
A25-C6-4	PPE	I		x	x			0.5
A25-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A25-C6-6	Vessel Leaves Location	I				x	x	0.5
A25-C6-7	H2S Compatible Equipment	I				x	x	0.001

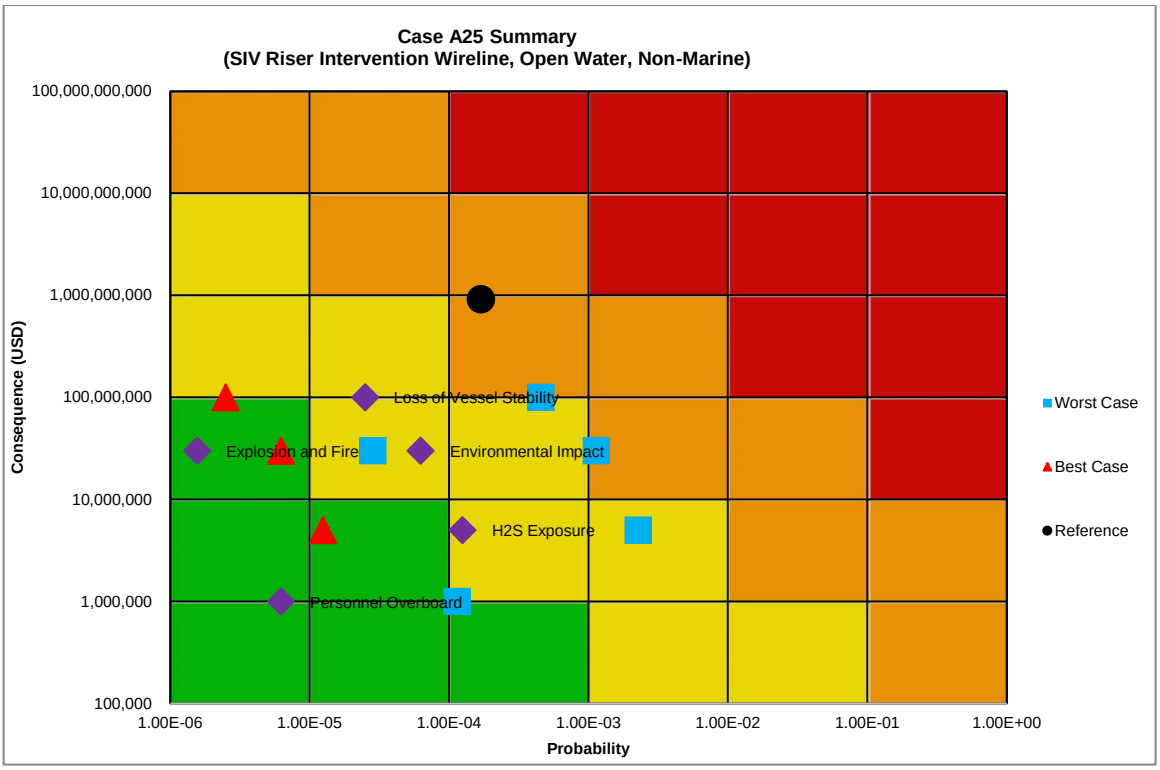

Figure 26 Case A25 Risk Plot

3.3.5 *Case A26 SIV Riser Intervention Coiled Tubing*

The consequence barrier analysis for Case A26 is documented in the following table. The corresponding risk plot is shown in Figure 27.

Table 30 Case A26 Consequence Barrier List

Case A26 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**1.5625E-06**
A26-C1-1	Diverter System-Varies by Vessel	I					x	0.0001
A26-C1-2	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A26-C1-3	Deluge Systems-Varies by Vessel	I			x	x		0.5
A26-C1-4	Fixed FF System-Machinery Spaces Only	I					x	0.5
A26-C1-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A26-C1-6	Emergency Response Plans & Training	D	1,2,3,4,5,7,8		x	x		1
A26-C1-7	Vessel Leaves Location	I				x	x	0.5
A26-C1-8	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A26-C2-1	Capping / Containment Systems	I				x	x	0.001
A26-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A26-C2-3	Surface Skimming / Containment	I			x			0.5
A26-C2-4	Dispersant Applications	I				x		0.5
A26-C2-5	In Situ Burning	I				x		0.5
A26-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A26-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A26-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A26-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A26-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A26-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A26-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A26-C3-7	PPE	I		x	x			
A26-C3-8	Medic/EMT-Optional	I		x	x			
A26-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A26-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A26-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A26-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A26-C4-4	Ballast Control Systems	I				x		0.5
A26-C4-5	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A26-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A26-C5-2	Standby Boat	I			x	x		0.5
A26-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A26-C5-4	SAR Plans	D	1,2,3		x	x		1
A26-C5-5	Railings	I					x	0.0001
A26-C5-6	Water Survival Equipment	I				x		0.5
A26-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK THAN RISER CASE		Level 2						**0.000125**
A26-C6-1	Detection Systems	I			x	x		0.5
A26-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A26-C6-3	Ventilation	D	1,7		x	x		1
A26-C6-4	PPE	I		x	x			0.5
A26-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A26-C6-6	Vessel Leaves Location	I				x	x	0.5
A26-C6-7	H2S Compatible Equipment	I				x	x	0.001

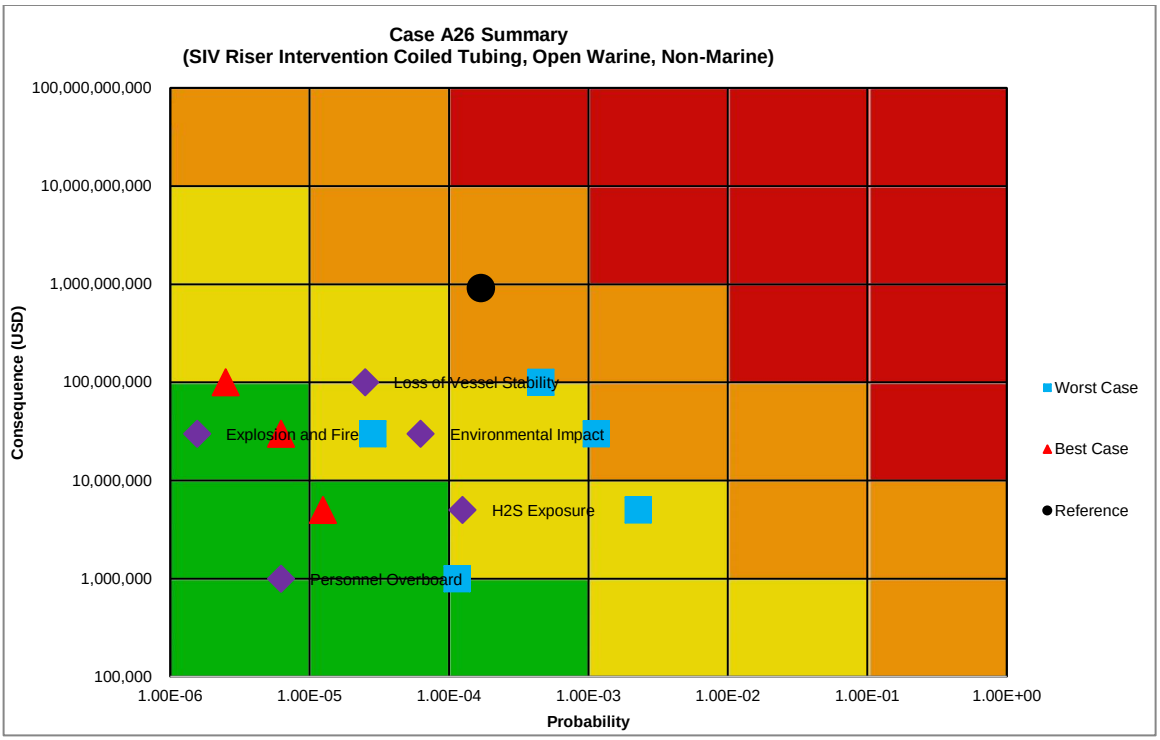

Figure 27 Case A26 Risk Plot

3.3.6 *Case A27 SIV Riser Intervention Well Stimulation / Pumping*

The consequence barrier analysis for Case A27 is documented in the following table. The corresponding risk plot is shown in Figure 28.

Table 31 Case A27 Consequence Barrier List

Case A27 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A27-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A27-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A27-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A27-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A27-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A27-C1-6	Vessel Leaves Location	I				x	x	0.5
A27-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A27-C2-1	Capping / Containment Systems	I				x	x	0.001
A27-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A27-C2-3	Surface Skimming / Containment	I			x			0.5
A27-C2-4	Dispersant Applications	I				x		0.5
A27-C2-5	In Situ Burning	I				x		0.5
A27-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A27-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A27-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A27-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A27-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A27-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A27-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A27-C3-7	PPE	I		x	x			
A27-C3-8	Medic/EMT-Optional	I		x	x			
A27-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A27-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A27-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A27-C4-3	Ballast Control Systems	I				x		0.5
A27-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A27-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A27-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A27-C5-2	Standby Boat	I			x	x		0.5
A27-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A27-C5-4	SAR Plans	D	1,2,3		x	x		1
A27-C5-5	Railings	I					x	0.0001
A27-C5-6	Water Survival Equipment	I				x		0.5
A27-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A27-C6-1	Detection Systems	I			x	x		0.5
A27-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A27-C6-3	Ventilation	D	1,7		x	x		1
A27-C6-4	PPE	I		x	x			0.5
A27-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A27-C6-6	Vessel Leaves Location	I				x	x	0.5
A27-C6-7	H2S Compatible Equipment	I				x	x	0.001

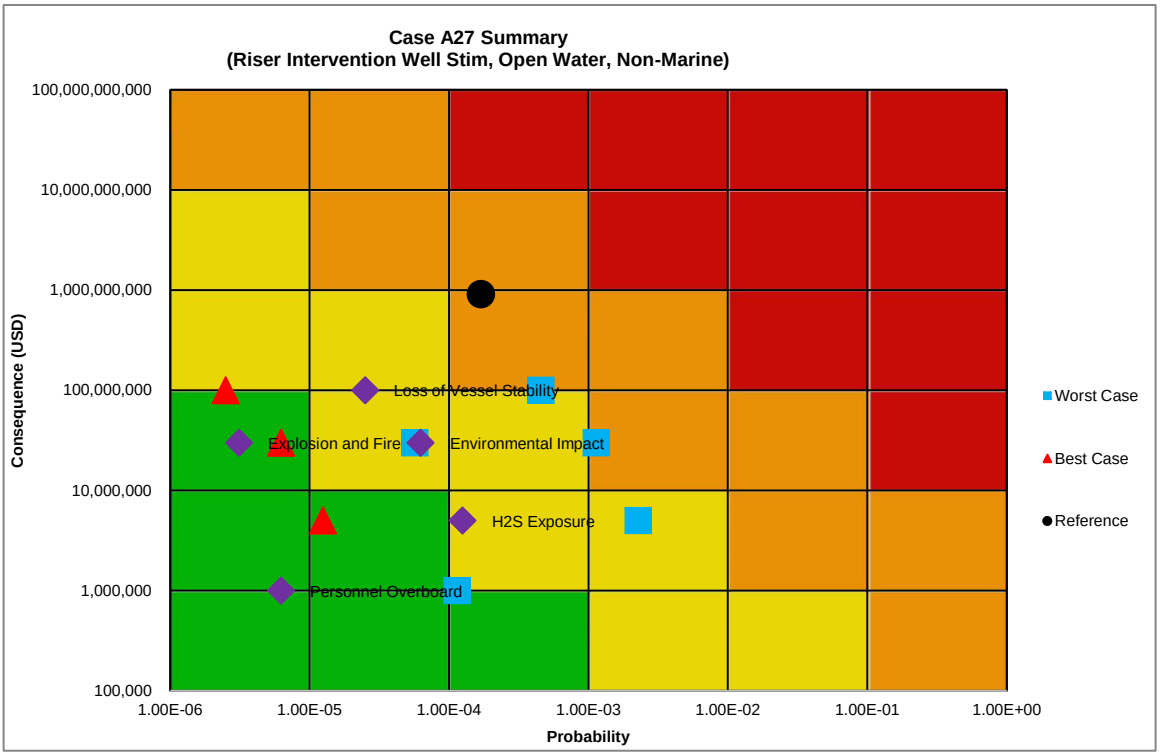

Figure 28 Case A27 Risk Plot

3.3.7 Case A28 SIV Riser Intervention Flowback

The consequence barrier analysis for Case A28 is documented in the following table. The corresponding risk plot is shown in Figure 29.

Table 32 Case A28 Consequence Barrier List

Case A28 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A28-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A28-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A28-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A28-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A28-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7,8		x	x		1
A28-C1-6	Vessel Leaves Location	I				x	x	0.5
A28-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A28-C2-1	Capping / Containment Systems	I				x	x	0.001
A28-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A28-C2-3	Surface Skimming / Containment	I			x			0.5
A28-C2-4	Dispersant Applications	I				x		0.5
A28-C2-5	In Situ Burning	I				x		0.5
A28-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A28-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A28-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A28-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A28-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A28-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A28-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A28-C3-7	PPE	I		x	x			
A28-C3-8	Medic/EMT-Optional	I		x	x			
A28-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A28-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A28-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A28-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A28-C4-4	Ballast Control Systems	I				x		0.5
A28-C4-5	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A28-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A28-C5-2	Standby Boat	I			x	x		0.5
A28-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A28-C5-4	SAR Plans	D	1,2,3		x	x		1
A28-C5-5	Railings	I					x	0.0001
A28-C5-6	Water Survival Equipment	I				x		0.5
A28-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A28-C6-1	Detection Systems	I			x	x		0.5
A28-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A28-C6-3	Ventilation	D	1,7		x	x		1
A28-C6-4	PPE	I		x	x			0.5
A28-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A28-C6-6	Vessel Leaves Location	I				x	x	0.5
A28-C6-7	H2S Compatible Equipment	I				x	x	0.001

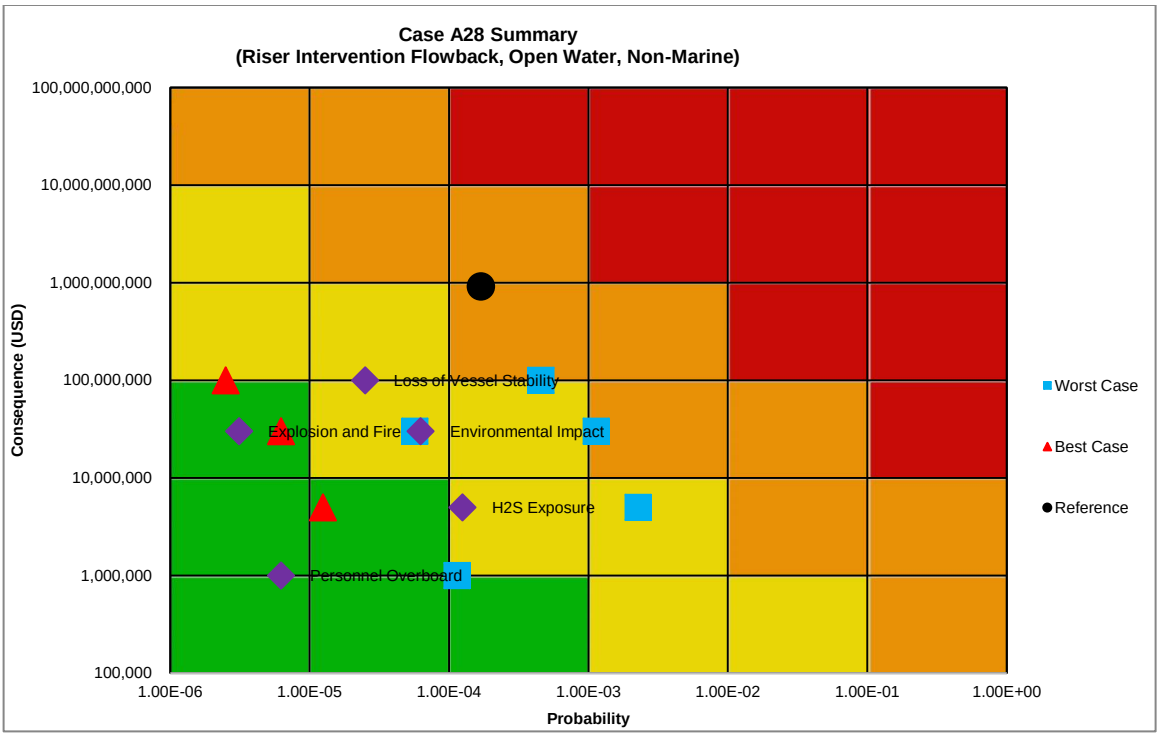

Figure 29 Case A28 Risk Plot

3.3.8 Case A29 SIV Well Stimulation / Pumping

The consequence barrier analysis for Case A29 is documented in the following table. The corresponding risk plot is shown in Figure 30.

Table 33 Case A29 Consequence Barrier List

Case A29 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A29-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A29-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A29-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A29-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A29-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A29-C1-6	Vessel Leaves Location	I				x	x	0.5
A29-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A29-C2-1	Capping / Containment Systems	I				x	x	0.001
A29-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A29-C2-3	Surface Skimming / Containment	I			x			0.5
A29-C2-4	Dispersant Applications	I				x		0.5
A29-C2-5	In Situ Burning	I				x		0.5
A29-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A29-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A29-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A29-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A29-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A29-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A29-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A29-C3-7	PPE	I		x	x			
A29-C3-8	Medic/EMT-Optional	I		x	x			
A29-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A29-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A29-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A29-C4-3	Ballast Control Systems	I				x		0.5
A29-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A29-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A29-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A29-C5-2	Standby Boat	I			x	x		0.5
A29-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A29-C5-4	SAR Plans	D	1,2,3		x	x		1
A29-C5-5	Railings	I					x	0.0001
A29-C5-6	Water Survival Equipment	I				x		0.5
A29-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A29-C6-1	Detection Systems	I			x	x		0.5
A29-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A29-C6-3	Ventilation	D	1,7		x	x		1
A29-C6-4	PPE	I		x	x			0.5
A29-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A29-C6-6	Vessel Leaves Location	I				x	x	0.5
A29-C6-7	H2S Compatible Equipment	I				x	x	0.001

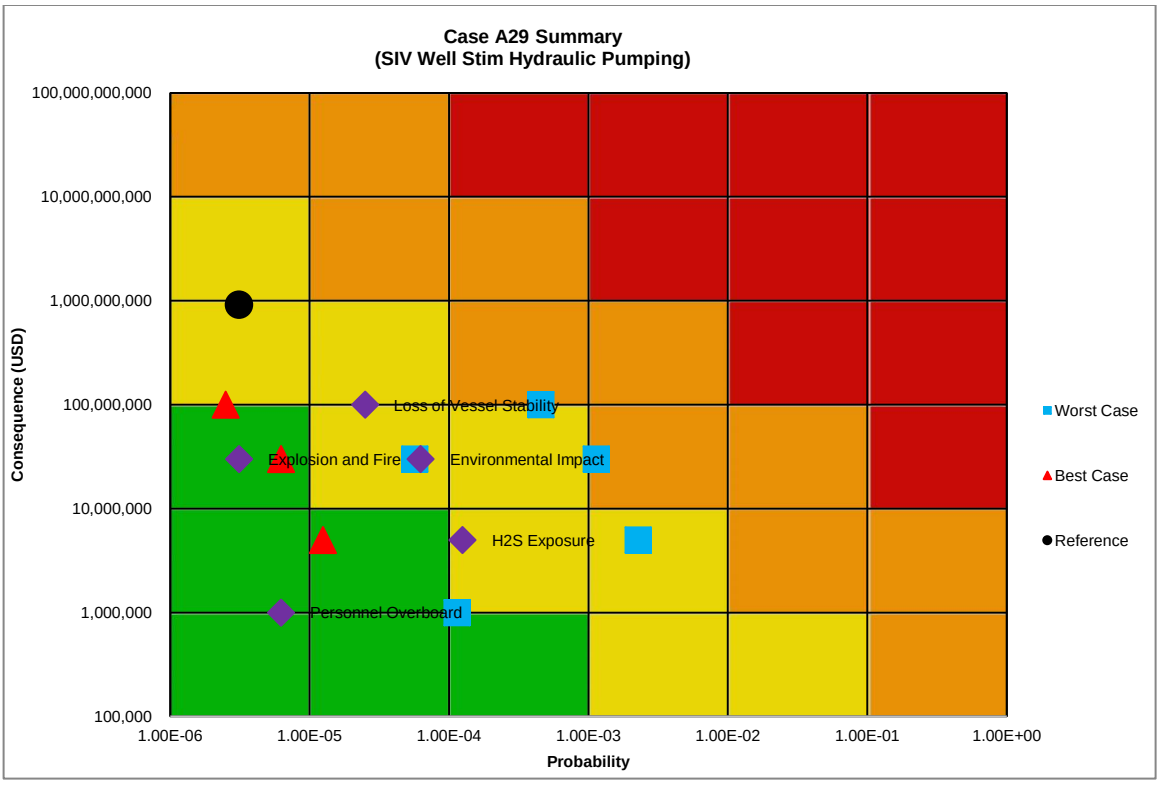

Figure 30 Case A29 Risk Plot

3.4 OSV Subsea BOP Cases

3.4.1 Case A30 OSV Riserless Wireline

The consequence barrier analysis for Case A30 is documented in the following table. The corresponding risk plot is shown in Figure 31.

Table 34 Case A30 Consequence Barrier List

Case A30 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK NO RISER		Level 3						**1.5625E-06**
A30-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A30-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A30-C1-3	HC Handling System	I				x		0.5
A30-C1-4	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A30-C1-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A30-C1-6	Emergency Response Plans & Training	D	1,2,3,4,5,7,8		x	x		1
A30-C1-7	Vessel Leaves Location	I				x	x	0.5
A30-C1-8	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A30-C2-1	Capping / Containment Systems	I				x	x	0.001
A30-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A30-C2-3	Surface Skimming / Containment	I			x			0.5
A30-C2-4	Dispersant Applications	I				x		0.5
A30-C2-5	In Situ Burning	I				x		0.5
A30-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A30-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A30-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A30-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A30-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A30-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A30-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A30-C3-7	PPE	I		x	x			
A30-C3-8	Medic/EMT-Optional	I		x	x			
A30-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A30-C4-1	Damage Stability Requirements	I					x	0.0001
A30-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A30-C4-3	Ballast Control Systems	I				x		0.5
A30-C4-4	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.000025**
A30-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A30-C5-3	Emergency Drills, Equipment & Training	D	1,5,6		x	x		1
A30-C5-4	SAR Plans	D	1,5,6		x	x		1
A30-C5-5	Railings	I					x	0.0001
A30-C5-6	Water Survival Equipment	I				x		0.5
Consequence 6: H2S Exposure-LOWER RISK NO RISER		Level 2						**0.000125**
A30-C6-1	Detection Systems	I			x	x		0.5
A30-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A30-C6-3	Ventilation	D	1,7		x	x		1
A30-C6-4	PPE	I		x	x			0.5
A30-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A30-C6-6	Vessel Leaves Location	I				x	x	0.5
A30-C6-7	H2S Compatible Equipment	I				x	x	0.001

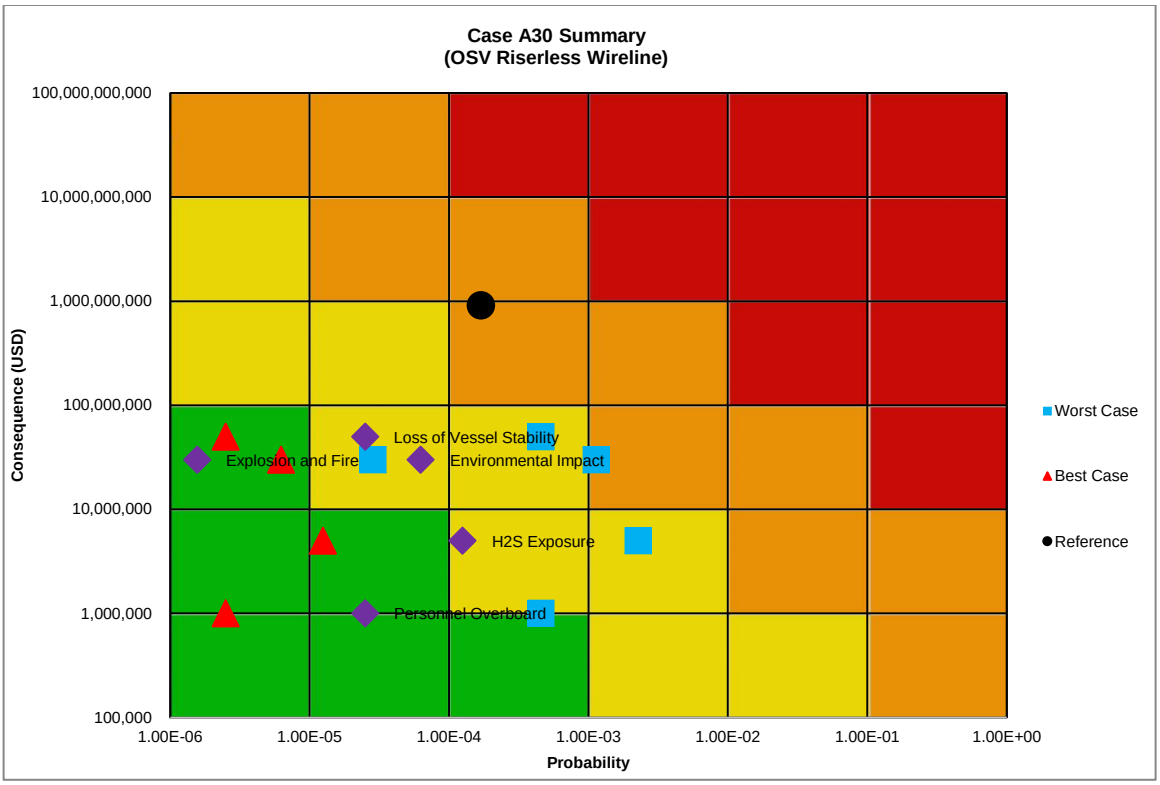

Figure 31 Case A30 Risk Plot

3.4.2 Case A31 OSV Riserless Coil Tubing

NO CASE FOUND

3.4.3 Case A32 OSV Riserless Well Stimulation / Pumping

The consequence barrier analysis for Case A32 is documented in the following table. The corresponding risk plot is shown in Figure 32.

Table 35 Case A32 Consequence Barrier List

Case A32 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A32-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A32-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A32-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A32-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A32-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A32-C1-6	Vessel Leaves Location	I				x	x	0.5
A32-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A32-C2-1	Capping / Containment Systems	I				x	x	0.001
A32-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A32-C2-3	Surface Skimming / Containment	I			x			0.5
A32-C2-4	Dispersant Applications	I				x		0.5
A32-C2-5	In Situ Burning	I				x		0.5
A32-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A32-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A32-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A32-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A32-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A32-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A32-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A32-C3-7	PPE	I		x	x			
A32-C3-8	Medic/EMT-Optional	I		x	x			
A32-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A32-C4-1	Damage Stability Design & Maintenance	I					x	0.5
A32-C4-2	Intact Stability/Watertight Integrity	I					x	0.0001
A32-C4-3	Ballast Control Systems	I				x		0.5
A32-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A32-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A32-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A32-C5-2	Standby Boat	I			x	x		0.5
A32-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A32-C5-4	SAR Plans	D	1,2,3		x	x		1
A32-C5-5	Railings	I					x	0.0001
A32-C5-6	Water Survival Equipment	I				x		0.5
A32-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A32-C6-1	Detection Systems	I			x	x		0.5
A32-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A32-C6-3	Ventilation	D	1,7		x	x		1
A32-C6-4	PPE	I		x	x			0.5
A32-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A32-C6-6	Vessel Leaves Location	I				x	x	0.5
A32-C6-7	H2S Compatible Equipment	I				x	x	0.001

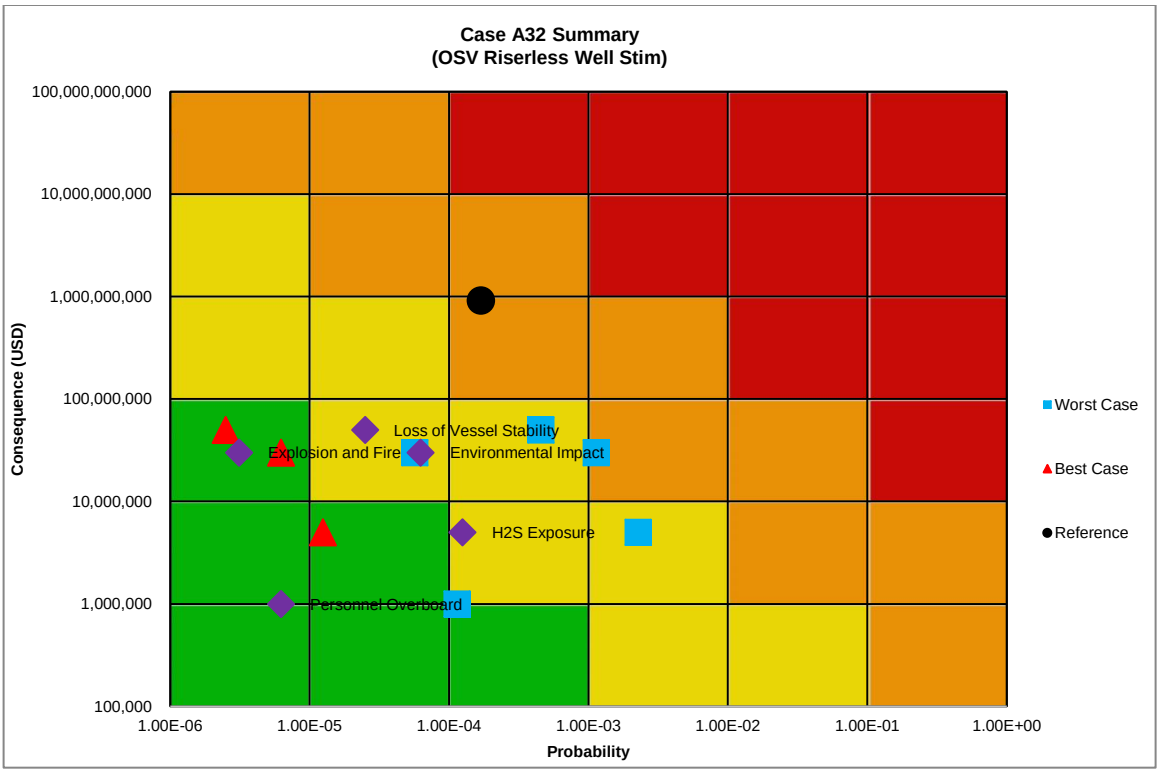

Figure 32 Case A32 Risk Plot

3.4.4 Case A33 OSV Hydraulic Stimulation / Pumping

The consequence barrier analysis for Case A33 is documented in the following table. The corresponding risk plot is shown in Figure 33.

Table 36 Case A33 Consequence Barrier List

Case A33 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A33-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A33-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A33-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A33-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A33-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A33-C1-6	Vessel Leaves Location	I				x	x	0.5
A33-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A33-C2-1	Capping / Containment Systems	I				x	x	0.001
A33-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A33-C2-3	Surface Skimming / Containment	I			x			0.5
A33-C2-4	Dispersant Applications	I				x		0.5
A33-C2-5	In Situ Burning	I				x		0.5
A33-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A33-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A33-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A33-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A33-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A33-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A33-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A33-C3-7	PPE	I		x	x			
A33-C3-8	Medic/EMT-Optional	I		x	x			
A33-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A33-C4-1	Damage Stability Requirements	I					x	0.0001
A33-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A33-C4-3	Ballast Control Systems	I				x		0.5
A33-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A33-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A33-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A33-C5-2	Standby Boat	I			x	x		0.5
A33-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A33-C5-4	SAR Plans	D	1,2,3		x	x		1
A33-C5-5	Railings	I					x	0.0001
A33-C5-6	Water Survival Equipment	I				x		0.5
A33-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A33-C6-1	Detection Systems	I			x	x		0.5
A33-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A33-C6-3	Ventilation	D	1,7		x	x		1
A33-C6-4	PPE	I		x	x			0.5
A33-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A33-C6-6	Vessel Leaves Location	I				x	x	0.5
A33-C6-7	H2S Compatible Equipment	I				x	x	0.001

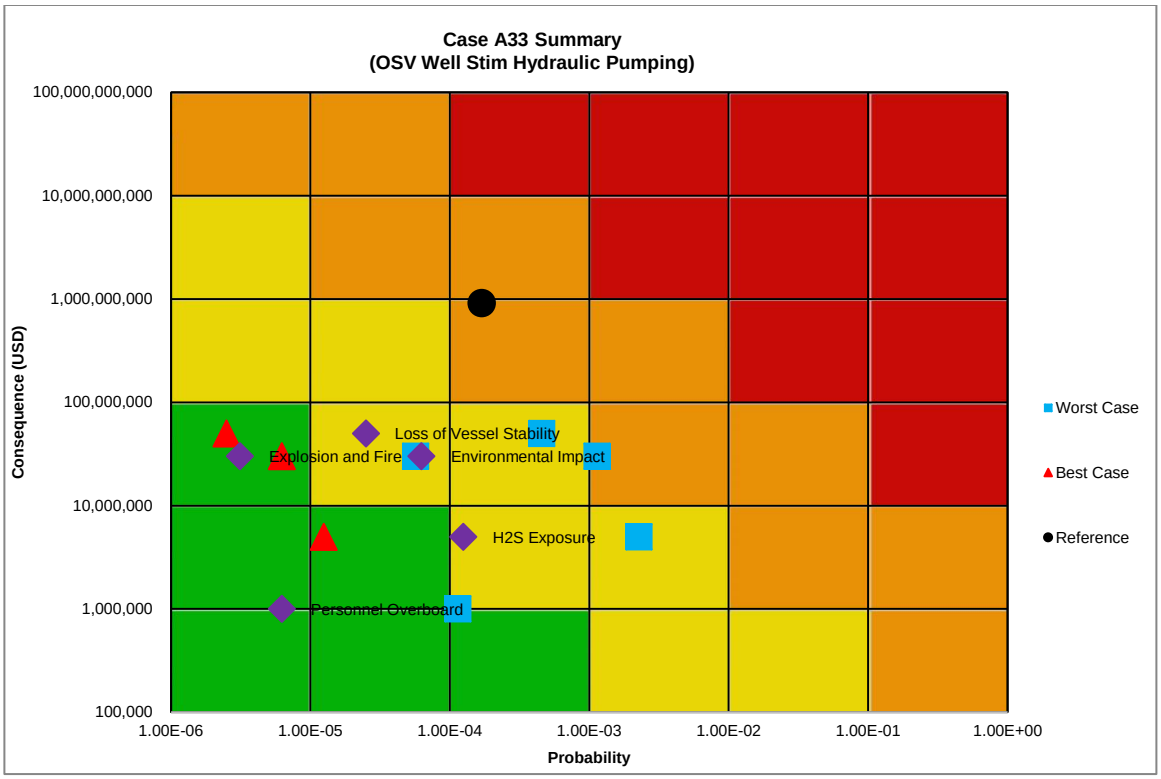

Figure 33 Case A33 Risk Plot

3.5 Frac Boat Subsea BOP Cases

3.5.1 Case A34 FB Hydraulic Stimulation / Pumping

The consequence barrier analysis for Case A34 is documented in the following table. The corresponding risk plot is shown in Figure 34.

Table 37 Case A34 Consequence Barrier List

Case A34 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A34-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A34-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A34-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A34-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A34-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A34-C1-6	Vessel Leaves Location	I				x	x	0.5
A34-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A34-C2-1	Capping / Containment Systems	I				x	x	0.001
A34-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A34-C2-3	Surface Skimming / Containment	I			x			0.5
A34-C2-4	Dispersant Applications	I				x		0.5
A34-C2-5	In Situ Burning	I				x		0.5
A34-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A34-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A34-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A34-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A34-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A34-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A34-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A34-C3-7	PPE	I		x	x			
A34-C3-8	Medic/EMT-Optional	I		x	x			
A34-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A34-C4-1	Damage Stability Requirements	I					x	0.0001
A34-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A34-C4-3	Ballast Control Systems	I				x		0.5
A34-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A34-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A34-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A34-C5-2	Standby Boat	I			x	x		0.5
A34-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A34-C5-4	SAR Plans	D	1,2,3		x	x		1
A34-C5-5	Railings	I					x	0.0001
A34-C5-6	Water Survival Equipment	I				x		0.5
A34-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A34-C6-1	Detection Systems	I			x	x		0.5
A34-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A34-C6-3	Ventilation	D	1,7		x	x		1
A34-C6-4	PPE	I		x	x			0.5
A34-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A34-C6-6	Vessel Leaves Location	I				x	x	0.5
A34-C6-7	H2S Compatible Equipment	I				x	x	0.001

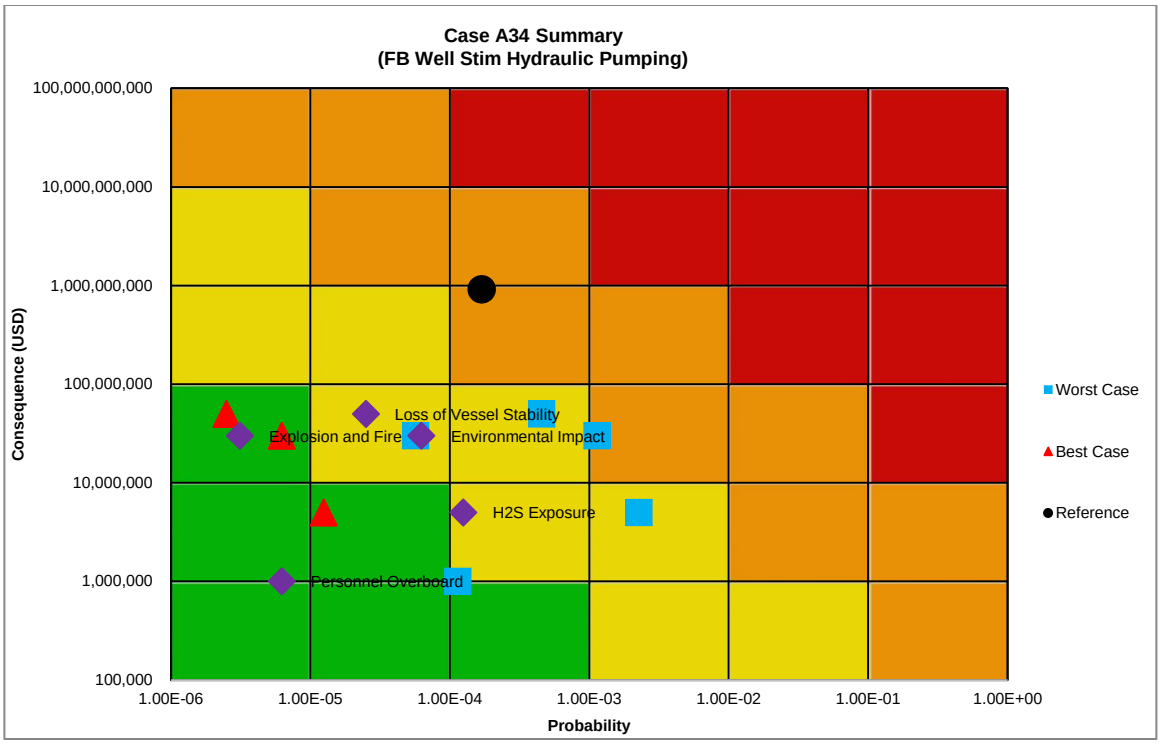

Figure 34 Case A34 Risk Plot

3.6 Crane Vessel Subsea BOP Cases

3.6.1 Case A35 CV Riserless Wireline

The consequence barrier analysis for Case A35 is documented in the following table. The corresponding risk plot is shown in Figure 35.

Table 38 Case A35 Consequence Barrier List

Figure 35 Case A35 Risk Plot

3.6.2 Case A36 CV Riserless Coil Tubing

The consequence barrier analysis for Case A36 is documented in the following table. The corresponding risk plot is shown in Figure 36.

Table 39 Case A36 Consequence Barrier List

Case A36 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.00000625**
A36-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A36-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A36-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A36-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A36-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A36-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A36-C2-1	Capping / Containment Systems	I				x	x	0.001
A36-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A36-C2-3	Surface Skimming / Containment	I			x			0.5
A36-C2-4	Dispersant Applications	I				x		0.5
A36-C2-5	In Situ Burning	I				x		0.5
A36-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A36-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A36-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A36-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A36-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A36-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A36-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A36-C3-7	PPE	I		x	x			
A36-C3-8	Medic/EMT-Optional	I		x	x			
A36-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A36-C4-1	Damage Stability Requirements	I					x	0.0001
A36-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A36-C4-3	Drive Off/Drift Off Analysis	D	1,2,4			x		1
A36-C4-4	Ballast Control Systems	I				x		0.5
A36-C4-5	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A36-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A36-C5-2	Standby Boat	I			x	x		0.5
A36-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A36-C5-4	SAR Plans	D	1,2,3		x	x		1
A36-C5-5	Railings	I					x	0.0001
A36-C5-6	Water Survival Equipment	I				x		0.5
A36-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A36-C6-1	Detection Systems	I			x	x		0.5
A36-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A36-C6-3	Ventilation	D	1		x	x		1
A36-C6-4	PPE	I		x	x			0.5
A36-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A36-C6-6	H2S Compatible Equipment	I				x	x	0.001

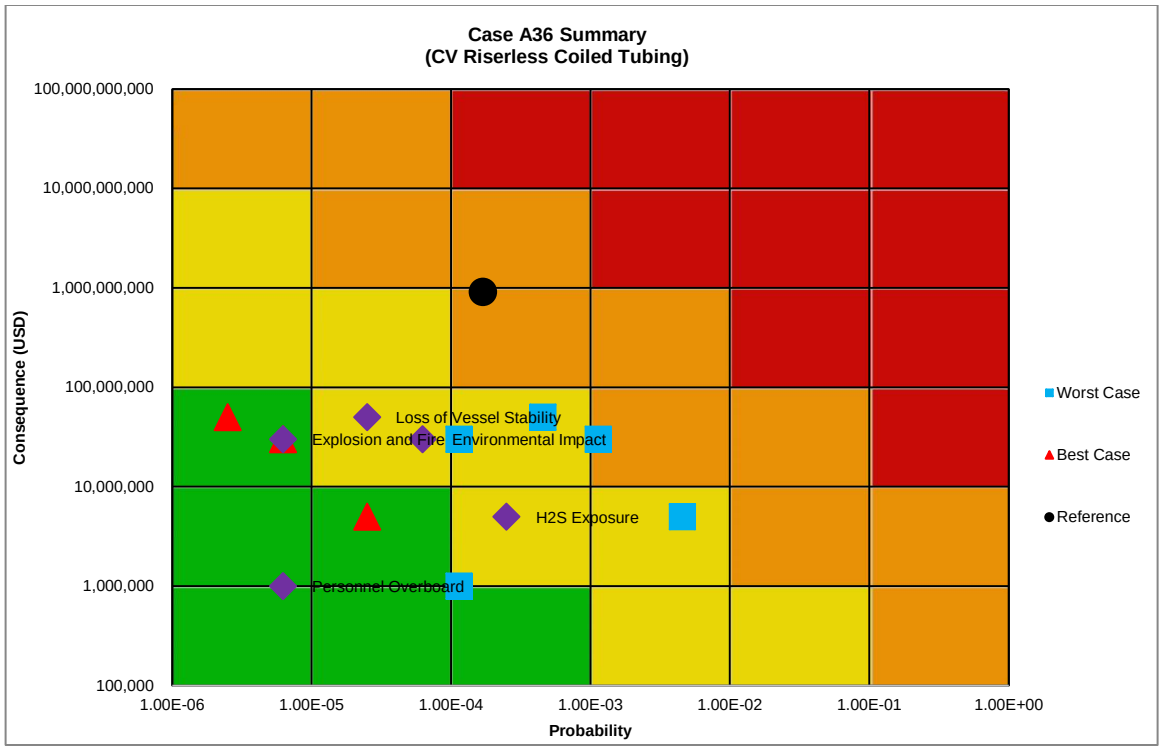

Figure 36 Case A36 Risk Plot

3.6.3 Case A37 CV Hydraulic Stimulation / Pumping

The consequence barrier analysis for Case A37 is documented in the following table. The corresponding risk plot is shown in Figure 37.

Table 40 Case A37 Consequence Barrier List

Case A37 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A37-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A37-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A37-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A37-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A37-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A37-C1-6	Vessel Leaves Location	I				x	x	0.5
A37-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A37-C2-1	Capping / Containment Systems	I				x	x	0.001
A37-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A37-C2-3	Surface Skimming / Containment	I			x			0.5
A37-C2-4	Dispersant Applications	I				x		0.5
A37-C2-5	In Situ Burning	I				x		0.5
A37-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A37-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A37-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A37-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A37-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A37-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A37-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A37-C3-7	PPE	I		x	x			
A37-C3-8	Medic/EMT-Optional	I		x	x			
A37-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A37-C4-1	Damage Stability Requirements	I					x	0.0001
A37-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A37-C4-3	Ballast Control Systems	I				x		0.5
A37-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A37-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A37-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A37-C5-2	Standby Boat	I			x	x		0.5
A37-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A37-C5-4	SAR Plans	D	1,2,3		x	x		1
A37-C5-5	Railings	I					x	0.0001
A37-C5-6	Water Survival Equipment	I				x		0.5
A37-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A37-C6-1	Detection Systems	I			x	x		0.5
A37-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A37-C6-3	Ventilation	D	1,7		x	x		1
A37-C6-4	PPE	I		x	x			0.5
A37-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A37-C6-6	Vessel Leaves Location	I				x	x	0.5
A37-C6-7	H2S Compatible Equipment	I				x	x	0.001

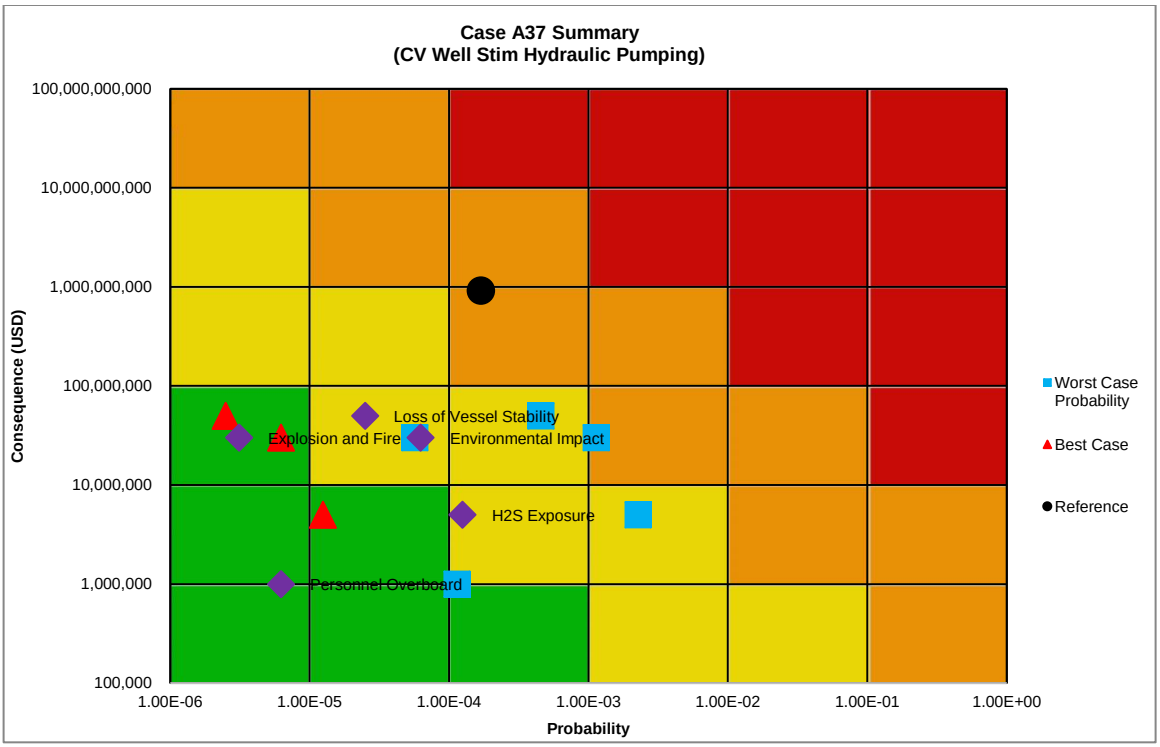

Figure 37 Case A37 Risk Plot

3.6.4 Case A38 CV Riser Intervention Wireline

The consequence barrier analysis for Case A38 is documented in the following table. The corresponding risk plot is shown in Figure 38.

Table 41 Case A38 Consequence Barrier List

Case A38 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A38-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A38-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A38-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A38-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A38-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A38-C1-6	Vessel Leaves Location	I				x	x	0.5
A38-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A38-C2-1	Capping / Containment Systems	I				x	x	0.001
A38-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A38-C2-3	Surface Skimming / Containment	I			x			0.5
A38-C2-4	Dispersant Applications	I				x		0.5
A38-C2-5	In Situ Burning	I				x		0.5
A38-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A38-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A38-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A38-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A38-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A38-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A38-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A38-C3-7	PPE	I		x	x			
A38-C3-8	Medic/EMT-Optional	I		x	x			
A38-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level4						**0.000025**
A38-C4-1	Damage Stability Design & Maintenance	I					x	0.0001
A38-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A38-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A38-C4-4	Ballast Control Systems	I				x		0.5
A38-C4-5	Drive Off/Drift Off Analysis	D	1,2,4			x		1
A38-C4-6	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A38-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A38-C5-2	Emergency Drills, Equipment & Training	I			x	x		0.5
A38-C5-3	SAR Plans	D	1,2,4,5,6,7		x	x		1
A38-C5-4	Railings	D	1,2,3		x	x		1
A38-C5-5	Water Survival Equipment	I					x	0.0001
A38-C5-6	PPE	I				x		0.5
A38-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A38-C6-1	Detection Systems	I			x	x		0.5
A38-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A38-C6-3	Ventilation	D	1,7		x	x		1
A38-C6-4	PPE	I		x	x			0.5
A38-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A38-C6-6	Vessel Leaves Location	I				x	x	0.5
A38-C6-7	H2S Compatible Equipment	I				x	x	0.001

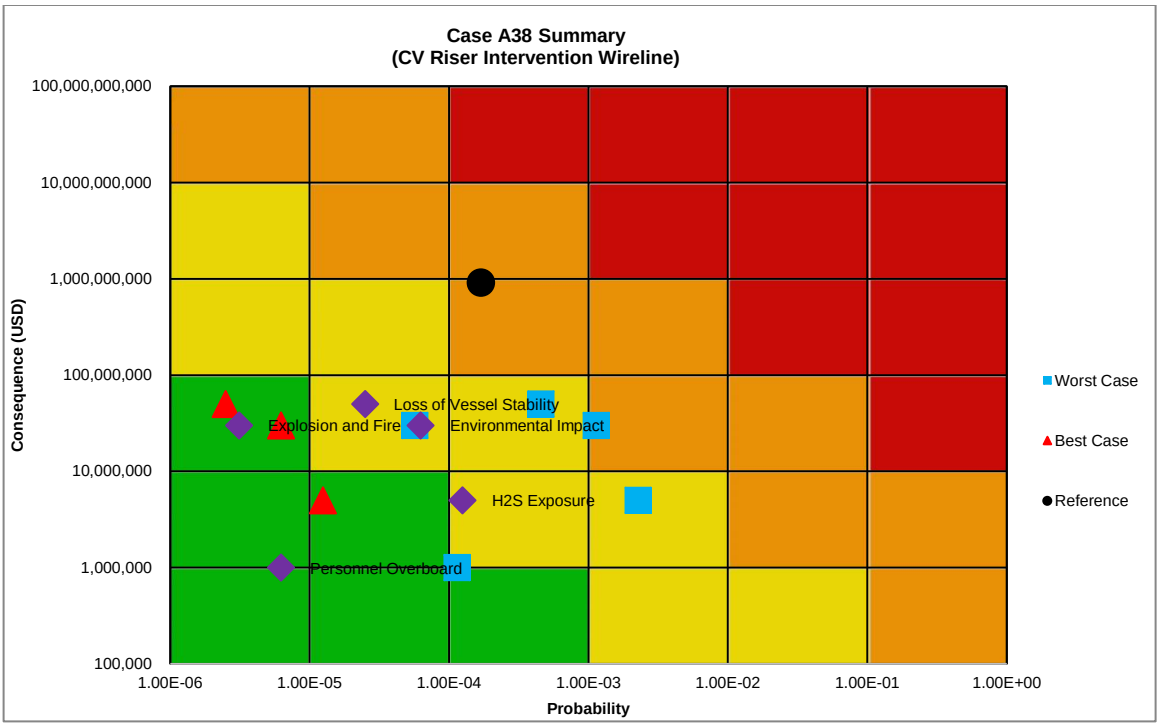

Figure 38 Case A38 Risk Plot

3.6.5 Case A39 CV Riser Intervention Coil Tubing

The consequence barrier analysis for Case A39 is documented in the following table. The corresponding risk plot is shown in Figure 39.

Table 42 Case A39 Consequence Barrier List

Case A39 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A39-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A39-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A39-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A39-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A39-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A39-C1-6	Vessel Leaves Location	I				x	x	0.5
A39-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A39-C2-1	Capping / Containment Systems	I				x	x	0.001
A39-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A39-C2-3	Surface Skimming / Containment	I			x			0.5
A39-C2-4	Dispersant Applications	I				x		0.5
A39-C2-5	In Situ Burning	I				x		0.5
A39-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A39-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A39-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A39-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A39-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A39-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A39-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A39-C3-7	PPE	I		x	x			
A39-C3-8	Medic/EMT-Optional	I		x	x			
A39-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A39-C4-1	Damage Stability Requirements	I					x	0.0001
A39-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A39-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A39-C4-4	Ballast Control Systems	I				x		0.5
A39-C4-5	Drive Off/Drift Off Analysis	D	1,2,4			x		1
A39-C4-6	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A39-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A39-C5-2	Emergency Drills, Equipment & Training	I			x	x		0.5
A39-C5-3	SAR Plans	D	1,2,4,5,6,7		x	x		1
A39-C5-4	Railings	D	1,2,3		x	x		1
A39-C5-5	Water Survival Equipment	I					x	0.0001
A39-C5-6	PPE	I				x		0.5
A39-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A39-C6-1	Detection Systems	I			x	x		0.5
A39-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A39-C6-3	Ventilation	D	1,7		x	x		1
A39-C6-4	PPE	I		x	x			0.5
A39-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A39-C6-6	Vessel Leaves Location	I				x	x	0.5
A39-C6-7	H2S Compatible Equipment	I				x	x	0.001

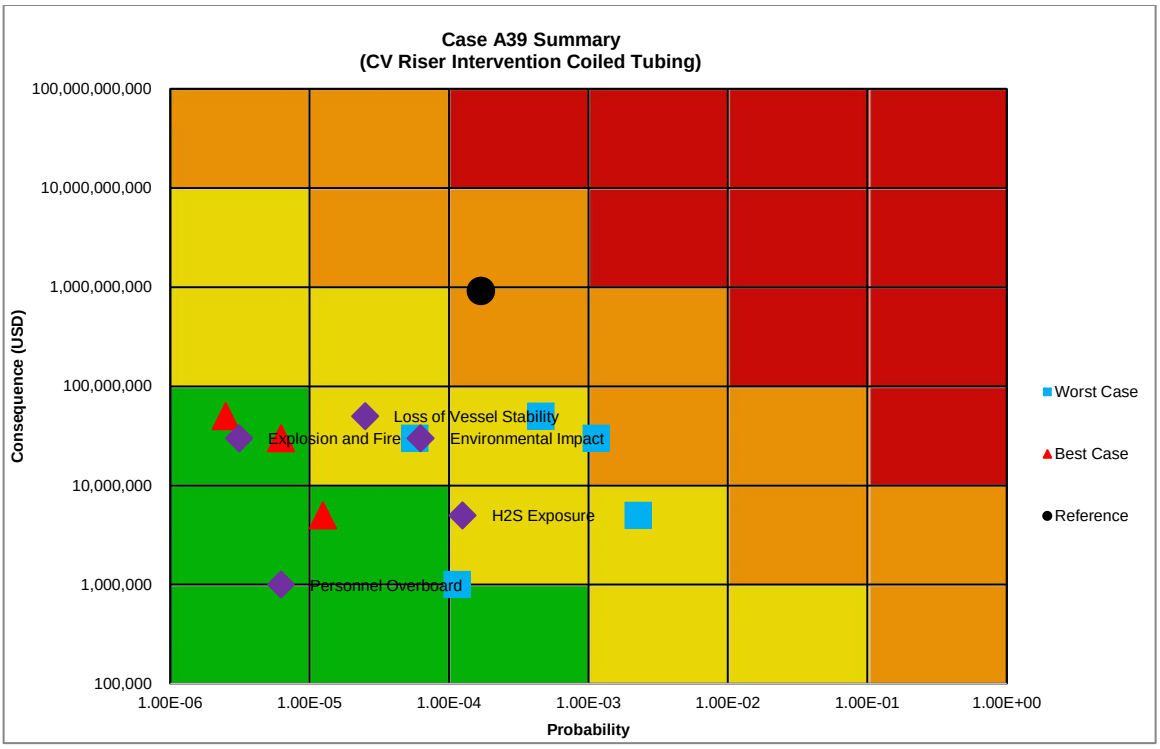

Figure 39 Case A39 Risk Plot

3.6.6 Case A40 CV Riser Intervention Well Stimulation / Pumping

The consequence barrier analysis for Case A40 is documented in the following table. The corresponding risk plot is shown in Figure 40.

Table 43 Case A40 Consequence Barrier List

Case A40 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A40-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A40-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A40-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A40-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A40-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A40-C1-6	Vessel Leaves Location	I				x	x	0.5
A40-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A40-C2-1	Capping / Containment Systems	I				x	x	0.001
A40-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A40-C2-3	Surface Skimming / Containment	I			x			0.5
A40-C2-4	Dispersant Applications	I				x		0.5
A40-C2-5	In Situ Burning	I				x		0.5
A40-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A40-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A40-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A40-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A40-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A40-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A40-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A40-C3-7	PPE	I		x	x			
A40-C3-8	Medic/EMT-Optional	I		x	x			
A40-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A40-C4-1	Damage Stability Requirements	I					x	0.0001
A40-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A40-C4-3	Ballast Control Systems	I				x		0.5
A40-C4-4	On Board Stability Spreadsheet (3rd party equipment & fluid)	D	1,2,3		x			1
A40-C4-5	Drills & Training	D	1,2,3		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A40-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A40-C5-2	Standby Boat	I			x	x		0.5
A40-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A40-C5-4	SAR Plans	D	1,2,3		x	x		1
A40-C5-5	Railings	I					x	0.0001
A40-C5-6	Water Survival Equipment	I				x		0.5
A40-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A40-C6-1	Detection Systems	I			x	x		0.5
A40-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A40-C6-3	Ventilation	D	1,7		x	x		1
A40-C6-4	PPE	I		x	x			0.5
A40-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A40-C6-6	Vessel Leaves Location	I				x	x	0.5
A40-C6-7	H2S Compatible Equipment	I				x	x	0.001

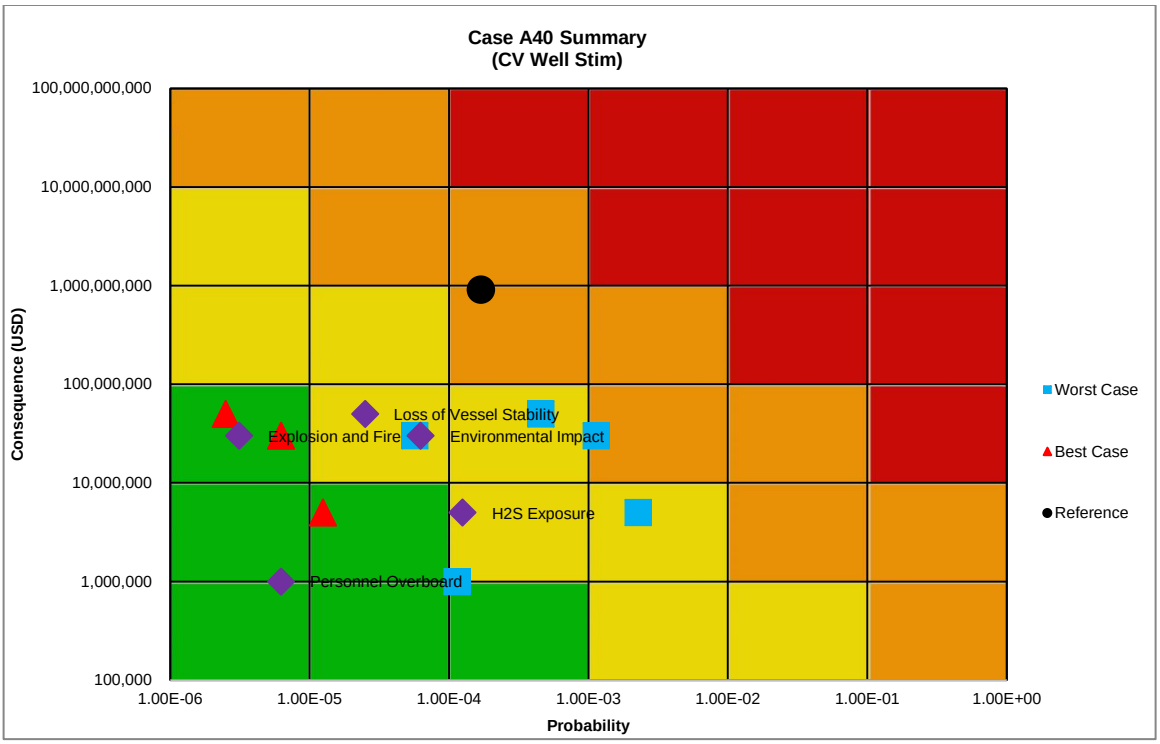

Figure 40 Case A40 Risk Plot

3.6.7 Case A41 CV Riser Intervention Flowback

The consequence barrier analysis for Case A41 is documented in the following table. The corresponding risk plot is shown in Figure 41.

Table 44 Case A41 Consequence Barrier List

Case A41 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A41-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A41-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A41-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A41-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A41-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A41-C1-6	Vessel Leaves Location	I				x	x	0.5
A41-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A41-C2-1	Capping / Containment Systems	I				x	x	0.001
A41-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A41-C2-3	Surface Skimming / Containment	I			x			0.5
A41-C2-4	Dispersant Applications	I				x		0.5
A41-C2-5	In Situ Burning	I				x		0.5
A41-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A41-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A41-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A41-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A41-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A41-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A41-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A41-C3-7	PPE	I		x	x			
A41-C3-8	Medic/EMT-Optional	I		x	x			
A41-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.000025**
A41-C4-1	Damage Stability Requirements	I					x	0.0001
A41-C4-2	Intact Stability/Watertight Integrity	I					x	0.5
A41-C4-3	Stability Maintenance & Inspection	D	1,2		x	x		1
A41-C4-4	Ballast Control Systems	I				x		0.5
A41-C4-5	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A41-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A41-C5-2	Standby Boat	I			x	x		0.5
A41-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A41-C5-4	SAR Plans	D	1,2,3		x	x		1
A41-C5-5	Railings	I					x	0.0001
A41-C5-6	Water Survival Equipment	I				x		0.5
A41-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.000125**
A41-C6-1	Detection Systems	I			x	x		0.5
A41-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A41-C6-3	Ventilation	D	1,7		x	x		1
A41-C6-4	PPE	I		x	x			0.5
A41-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A41-C6-6	Vessel Leaves Location	I				x	x	0.5
A41-C6-7	H2S Compatible Equipment	I				x	x	0.001

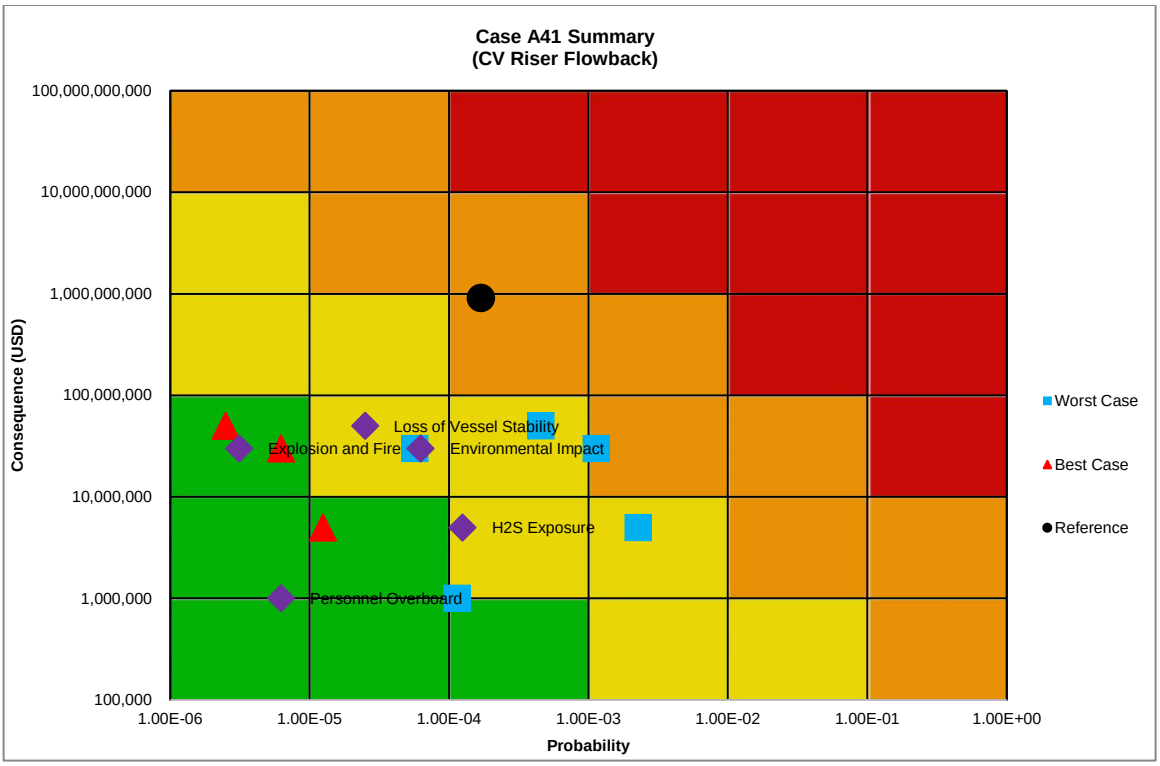

Figure 41 Case A41 Risk Plot

3.7 Lift Boat Subsea BOP Cases

3.7.1 Case A42 LB Riserless Wireline

The consequence barrier analysis for Case A42 is documented in the following table. The corresponding risk plot is shown in Figure 42.

Table 45 Case A42 Consequence Barrier List

Case A42 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK NO RISER		Level 3						**0.00000625**
A42-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A42-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A42-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A42-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A42-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A42-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A42-C2-1	Capping / Containment Systems	I				x	x	0.001
A42-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A42-C2-3	Surface Skimming / Containment	I			x			0.5
A42-C2-4	Dispersant Applications	I				x		0.5
A42-C2-5	In Situ Burning	I				x		0.5
A42-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A42-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A42-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A42-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A42-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A42-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A42-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A42-C3-7	PPE	I		x	x			
A42-C3-8	Medic/EMT-Optional	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.0005**
A42-C4-1	Geotechnical Analysis	I			x	x		0.5
A42-C4-2	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A42-C4-3	Drills & Training	D	1,2		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A42-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A42-C5-2	Emergency Drills, Equipment & Training	D	1,4,5,6		x	x		1
A42-C5-3	SAR Plans	D	1,4,5,6		x	x		1
A42-C5-4	Railings	I					x	0.0001
A42-C5-5	Water Survival Equipment	I				x		0.5
A42-C5-6	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK NO RISER		Level 2						**0.000125**
A42-C6-1	Detection Systems	I			x	x		0.5
A42-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A42-C6-3	Ventilation	D	1,7		x	x		1
A42-C6-4	PPE	I		x	x			0.5
A42-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A42-C6-6	Vessel Leaves Location	I				x	x	0.5
A42-C6-7	H2S Compatible Equipment	I				x	x	0.001

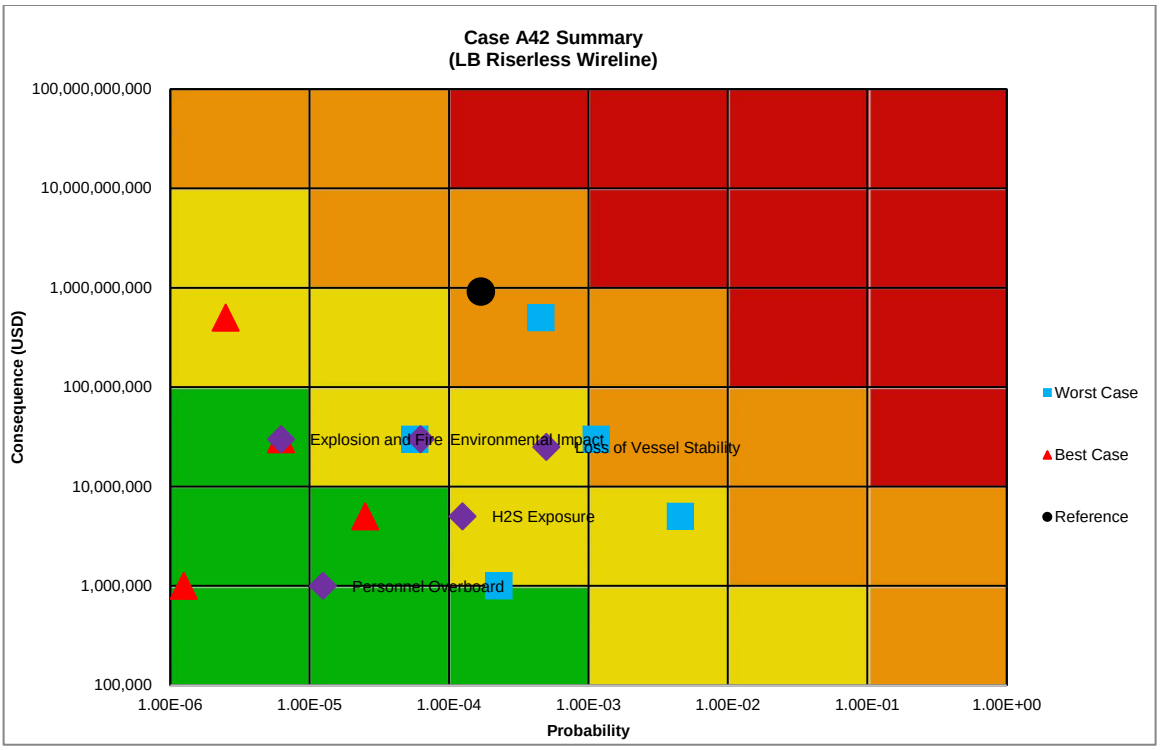

Figure 42 Case A42 Risk Plot

3.7.2 Case A43 LB Riserless Coil Tubing

The consequence barrier analysis for Case A43 is documented in the following table. The corresponding risk plot is shown in Figure 43.

Table 46 Case A43 Consequence Barrier List

Case A43 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK NO RISER		Level 3						**0.00000625**
A43-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A43-C1-2	Deluge Systems-Varies by Vessel	I			x	x		0.5
A43-C1-3	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A43-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A43-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6		x	x		1
A43-C1-6	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A43-C2-1	Capping / Containment Systems	I				x	x	0.001
A43-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A43-C2-3	Surface Skimming / Containment	I			x			0.5
A43-C2-4	Dispersant Applications	I				x		0.5
A43-C2-5	In Situ Burning	I				x		0.5
A43-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A43-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A43-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A43-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A43-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A43-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A43-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A43-C3-7	PPE	I		x	x			
A43-C3-8	Medic/EMT-Optional	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.0005**
A43-C4-1	Geotechnical Analysis	I			x	x		0.5
A43-C4-2	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A43-C4-3	Drills & Training	D	1,2		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.0000125**
A43-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A43-C5-2	Emergency Drills, Equipment & Training	D	1,4,5,6		x	x		1
A43-C5-3	SAR Plans	D	1,4,5,6		x	x		1
A43-C5-4	Railings	I					x	0.0001
A43-C5-5	Water Survival Equipment	I				x		0.5
A43-C5-6	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK NO RISER		Level 2						**0.000125**
A43-C6-1	Detection Systems	I			x	x		0.5
A43-C6-2	Contingency Plan	D	1,3,4,6,7		x	x		1
A43-C6-3	Ventilation	D	1,7		x	x		1
A43-C6-4	PPE	I		x	x			0.5
A43-C6-5	Procedures, Drills & Training	D	1,2,3,4,6,7		x	x		1
A43-C6-6	Vessel Leaves Location	I				x	x	0.5
A43-C6-7	H2S Compatible Equipment	I				x	x	0.001

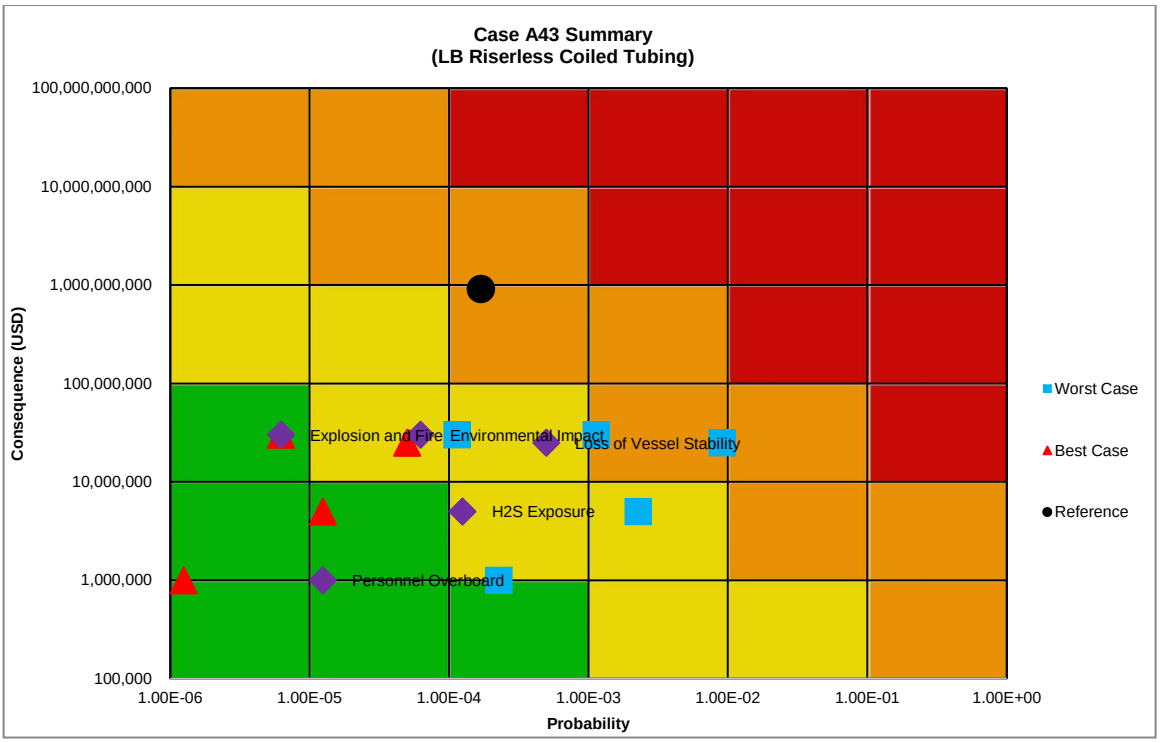

Figure 43 Case A43 Risk Plot

3.7.3 Case A44 LB Riser Intervention Wireline

The consequence barrier analysis for Case A44 is documented in the following table. The corresponding risk plot is shown in Figure 44.

Table 47 Case A44 Consequence Barrier List

Case A44 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK NO RISER		Level 3						**0.00125**
A44-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A44-C1-2	Fixed FF System-Machinery Spaces Only	I			x	x		0.01
A44-C1-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A44-C1-4	Emergency Response Plans & Training	D	1,2,3,5		x	x		1
A44-C1-5	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A44-C2-1	Capping / Containment Systems	I				x	x	0.001
A44-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A44-C2-3	Surface Skimming / Containment	I			x			0.5
A44-C2-4	Dispersant Applications	I				x		0.5
A44-C2-5	In Situ Burning	I				x		0.5
A44-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A44-C3-1	Structural Fire Protection-Varies per Vessel	I					x	
A44-C3-2	Fixed FF System-Machinery Spaces Only	I					x	
A44-C3-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A44-C3-4	Drills & Training	D	1,2,3,5,6		x	x		
A44-C3-5	PPE	I		x	x			
A44-C3-6	Medic/EMT-Optional	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.001**
A44-C4-1	Site/Bottom Survey	D	2		x	x		1
A44-C4-2	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A44-C4-3	Operating Manual	D	2			x		1
A44-C4-4	Weather Monitoring	D	3			x		1
A44-C4-5	Drills & Training	D	2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A44-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A44-C5-2	Emergency Drills, Equipment & Training	D	1,4,5,6,7		x	x		1
A44-C5-3	SAR Plans	D	1,4,5,6,7		x	x		1
A44-C5-4	Railings	I					x	0.0001
A44-C5-5	Water Survival Equipment	I				x		0.5
A44-C5-6	PPE	I		x	x			0.5
A44-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK NO RISER		Level 2						**0.00025**
A44-C6-1	Detection Systems	I			x	x		0.5
A44-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A44-C6-3	Ventilation	D	1		x	x		1
A44-C6-4	PPE	I		x	x			0.5
A44-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A44-C6-6	H2S Compatible Equipment	I				x	x	0.001

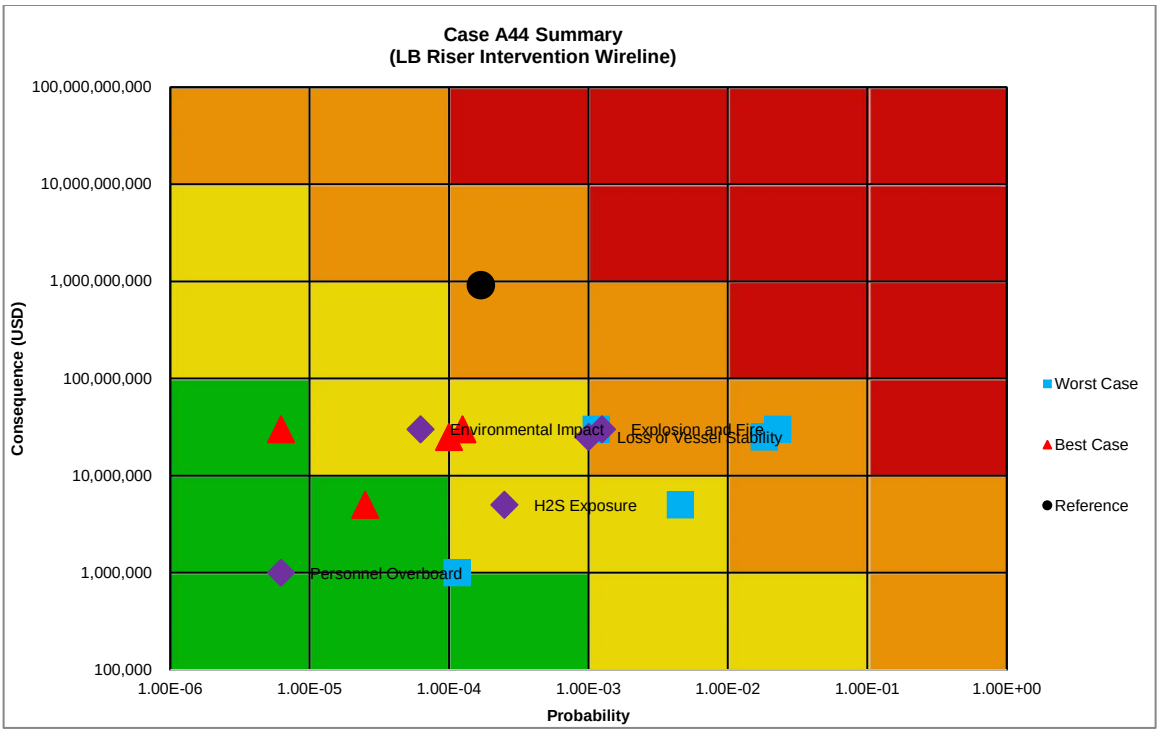

Figure 44 Case A44 Risk Plot

3.7.4 Case A45 LB Riser Intervention Coil Tubing

The consequence barrier analysis for Case A45 is documented in the following table. The corresponding risk plot is shown in Figure 45.

Table 48 Case A45 Consequence Barrier List

Case A 45 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire-LOWER RISK NO RISER		Level 3						**0.0000125**
A45-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A45-C1-2	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A45-C1-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A45-C1-4	Emergency Response Plans & Training	D	1,2,3,5		x	x		1
A45-C1-5	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A45-C2-1	Capping / Containment Systems	I				x	x	0.001
A45-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A45-C2-3	Surface Skimming / Containment	I			x			0.5
A45-C2-4	Dispersant Applications	I				x		0.5
A45-C2-5	In Situ Burning	I				x		0.5
A45-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A45-C3-1	Structural Fire Protection-Varies per Vessel	I					x	
A45-C3-2	Fixed FF System-Machinery Spaces Only	I					x	
A45-C3-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A45-C3-4	Drills & Training	D	1,2,3,5,6		x	x		
A45-C3-5	PPE	I		x	x			
A45-C3-6	Medic/EMT-Optional	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.001**
A45-C4-1	Site/Bottom Survey	D	2		x	x		1
A45-C4-2	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A45-C4-3	Operating Manual	D	2			x		1
A45-C4-4	Weather Monitoring	D	3			x		1
A45-C4-5	Drills & Training	D	2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A45-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A45-C5-2	Emergency Drills, Equipment & Training	D	1,4,5,6,7		x	x		1
A45-C5-3	SAR Plans	D	1,4,5,6,7		x	x		1
A45-C5-4	Railings	I					x	0.0001
A45-C5-5	Water Survival Equipment	I				x		0.5
A45-C5-6	PPE	I		x	x			0.5
A45-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-LOWER RISK NO RISER		Level 2						**0.00025**
A45-C6-1	Detection Systems	I			x	x		0.5
A45-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A45-C6-3	Ventilation	D	1		x	x		1
A45-C6-4	PPE	I		x	x			0.5
A45-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A45-C6-6	H2S Compatible Equipment	I				x	x	0.001

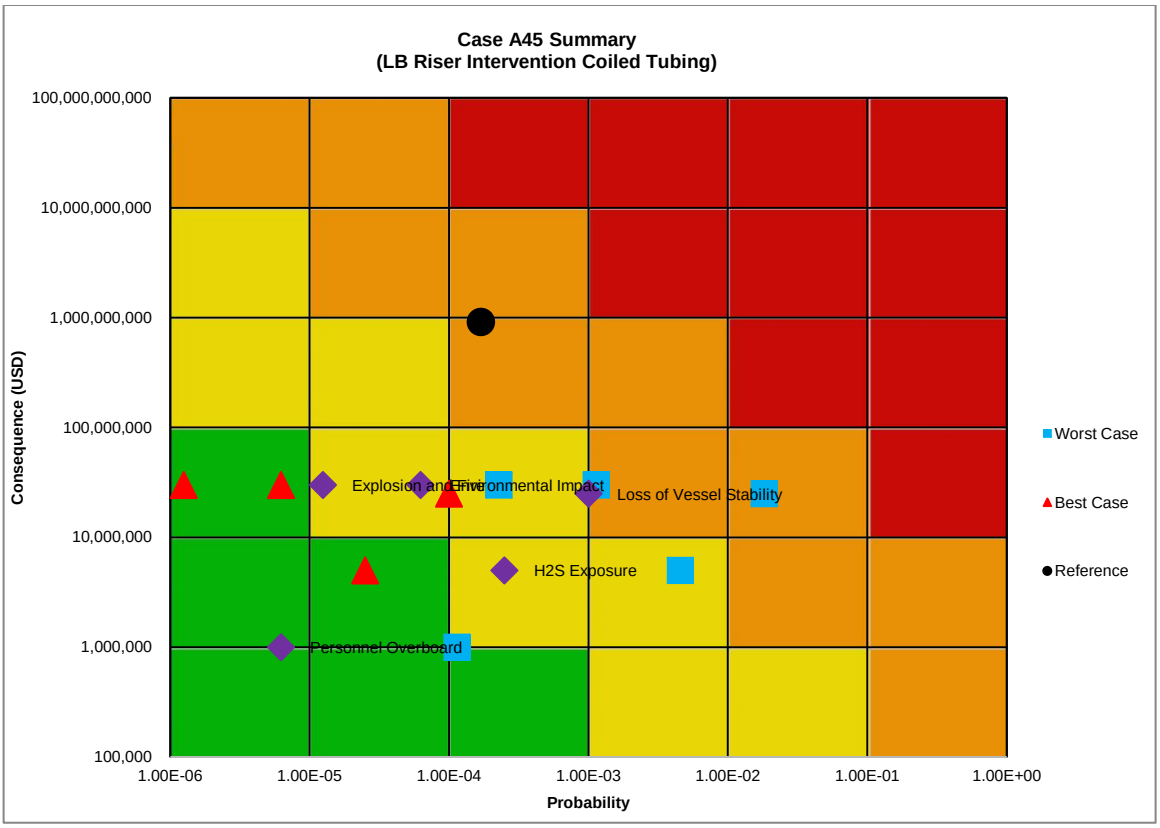

Figure 45 Case A45 Risk Plot

3.7.5 Case A46 LB Riser Intervention Well Stimulation / Pumping

The consequence barrier analysis for Case A46 is documented in the following table. The corresponding risk plot is shown in Figure 46.

Table 49 Case A46 Consequence Barrier List

Case A46 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.0000125**
A46-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A46-C1-2	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A46-C1-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A46-C1-4	Emergency Response Plans & Training	D	1,2,3,5		x	x		1
A46-C1-5	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A46-C2-1	Capping / Containment Systems	I				x	x	0.001
A46-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A46-C2-3	Surface Skimming / Containment	I			x			0.5
A46-C2-4	Dispersant Applications	I				x		0.5
A46-C2-5	In Situ Burning	I				x		0.5
A46-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A46-C3-1	Structural Fire Protection-Varies per Vessel	I					x	
A46-C3-2	Fixed FF System-Machinery Spaces Only	I					x	
A46-C3-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A46-C3-4	Drills & Training	D	1,2,3,5,6		x	x		
A46-C3-5	PPE	I		x	x			
A46-C3-6	Medic/EMT-Optional	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.0005**
A46-C4-1	Site/Bottom Survey	D	2,3		x	x		1
A46-C4-2	Geotechnical/Pre-Load Analysis	I			x	x		0.5
A46-C4-3	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A46-C4-4	Operating Manual	D	1,2,3,5			x		1
A46-C4-5	Weather Monitoring	D	4			x		1
A46-C4-6	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A46-C5-1	Rescue Boat	I				x		0.5
A46-C5-2	Emergency Drills, Equipment & Training	D	1,4,5,6,7		x	x		1
A46-C5-3	SAR Plans	D	1,4,5,6,7		x	x		1
A46-C5-4	Railings	I					x	0.0001
A46-C5-5	Water Survival Equipment	I				x		0.5
A46-C5-6	PPE	I		x	x			0.5
A46-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-Site Specific		Level 2						**0.00025**
A46-C6-1	Detection Systems	I			x	x		0.5
A46-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A46-C6-3	Ventilation	D	1		x	x		1
A46-C6-4	PPE	I		x	x			0.5
A46-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A46-C6-6	H2S Compatible Equipment	I				x	x	0.001

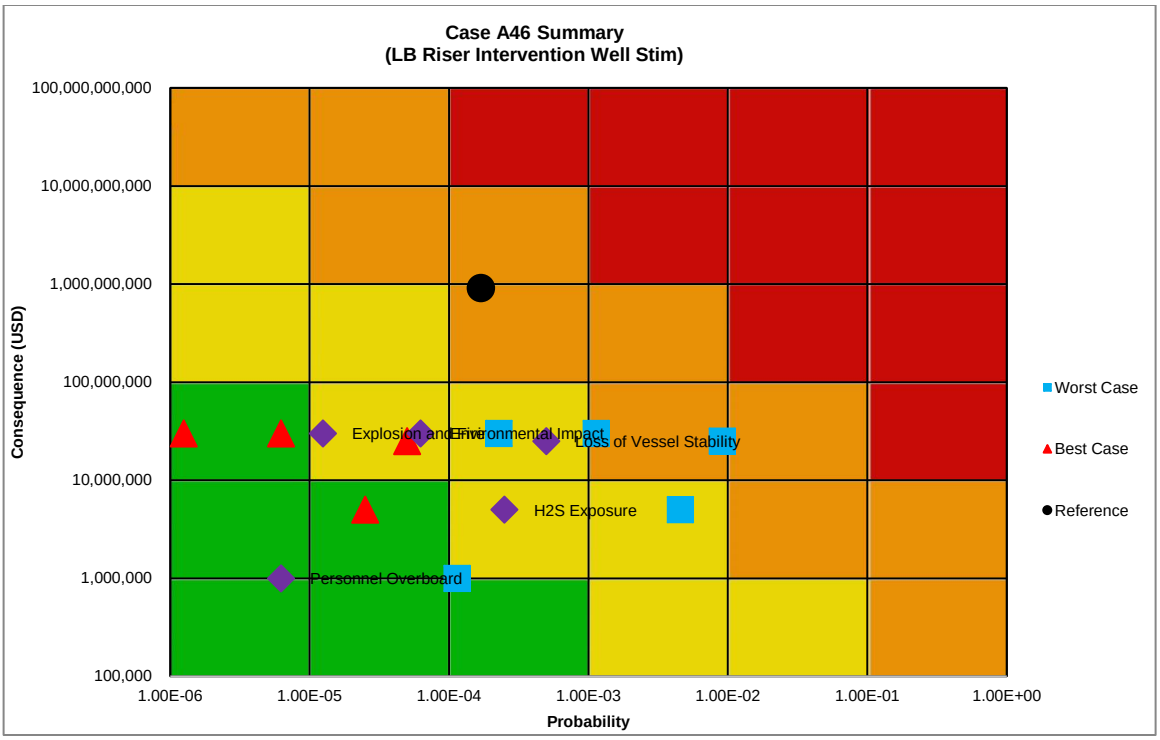

Figure 46 Case A46 Risk Plot

3.7.6 Case A47 LB Riser Intervention Flowback

The consequence barrier analysis for Case A47 is documented in the following table. The corresponding risk plot is shown in Figure 47.

Table 50 Case A47 Consequence Barrier List

Case A47 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.000003125**
A47-C1-1	Structural Fire Protection-Varies per Vessel	I					x	0.5
A47-C1-2	Deluge Systems-Varies by Vessel	I				x	x	0.5
A47-C1-3	Fixed FF System-Machinery Spaces Only	I			x	x		0.5
A47-C1-4	Detection Systems-Fire Detection but May Not Have Gas Detection	I					x	0.0001
A47-C1-5	Emergency Response Plans & Training	D	1,2,3,4,6,7		x	x		1
A47-C1-6	Vessel Leaves Location	I				x	x	0.5
A47-C1-7	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A47-C2-1	Capping / Containment Systems	I				x	x	0.001
A47-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A47-C2-3	Surface Skimming / Containment	I			x			0.5
A47-C2-4	Dispersant Applications	I				x		0.5
A47-C2-5	In Situ Burning	I				x		0.5
A47-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A47-C3-1	Enclosed Fire-Protected Life Boats-Varies by Vessel	I				x		
A47-C3-2	Structural Fire Protection-Varies per Vessel	I					x	
A47-C3-3	Fixed FF System-Machinery Spaces Only	I					x	
A47-C3-4	Deluge Systems-Varies by Vessel	I			x	x		
A47-C3-5	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A47-C3-6	Drills & Training	D	1,2,3,4,5,7,8		x	x		
A47-C3-7	PPE	I		x	x			
A47-C3-8	Medic/EMT-Optional	I		x	x			
A47-C3-9	SMS-Vessel	D	1,2,3,4,5,7,8		x	x		
Consequence 4: Loss of Vessel Stability		Level 4						**0.0005**
A47-C4-1	Site/Bottom Survey	D	2,3		x	x		1
A47-C4-2	Geotechnical/Pre-Load Analysis	I			x	x		0.5
A47-C4-3	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A47-C4-4	Operating Manual	D	1,2,3,5			x		1
A47-C4-5	Weather Monitoring	D	4			x		1
A47-C4-6	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A47-C5-1	Rescue Boat-Varies by Vessel	I				x		0.5
A47-C5-2	Standby Boat	I			x	x		0.5
A47-C5-3	Emergency Drills, Equipment & Training	D	1,2,4,5,6,7		x	x		1
A47-C5-4	SAR Plans	D	1,2,3		x	x		1
A47-C5-5	Railings	I					x	0.0001
A47-C5-6	Water Survival Equipment	I				x		0.5
A47-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure		Level 2						**0.00025**
A47-C6-1	Detection Systems	I			x	x		0.5
A47-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A47-C6-3	Ventilation	D	1		x	x		1
A47-C6-4	PPE	I		x	x			0.5
A47-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A47-C6-6	H2S Compatible Equipment	I				x	x	0.001

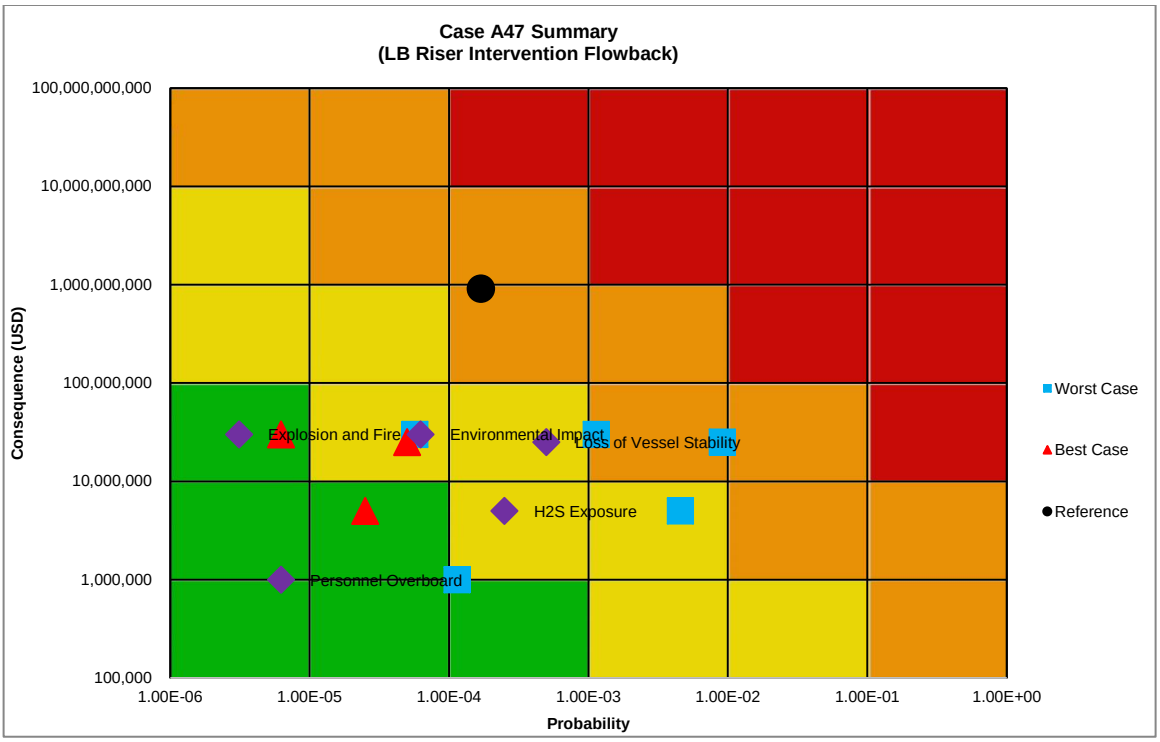

Figure 47 Case A47 Risk Plot

3.7.7 Case A48 LB Hydraulic Stimulation / Pumping

The consequence barrier analysis for Case A48 is documented in the following table. The corresponding risk plot is shown in Figure 48.

Table 51 Case A48 Consequence Barrier List

Case A48 Consequence List		Independent (I) or Dependent (D)		1 in 10	1 in 100	1 in 1000	1 in 10,000	Probability Calculation
Consequence 1: Explosion & Fire		Level 3						**0.0000125**
A48-C1-1	Structural Fire Protection-Varies per Vessel	I				x	x	0.5
A48-C1-2	Fixed FF System-Machinery Spaces Only	I					x	0.0001
A48-C1-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		0.5
A48-C1-4	Emergency Response Plans & Training	D	1,2,3,5		x	x		1
A48-C1-5	Classification of Hazardous Areas Executed Properly	I			x	x		0.5
Consequence 2: Environmental Impact		Level 3						**0.0000625**
A48-C2-1	Capping / Containment Systems	I				x	x	0.001
A48-C2-2	Spill Response Plans and Training	D	1,3,4,5,6		x	x		1
A48-C2-3	Surface Skimming / Containment	I			x			0.5
A48-C2-4	Dispersant Applications	I				x		0.5
A48-C2-5	In Situ Burning	I				x		0.5
A48-C2-6	Relief Well	I					x	0.5
Consequence 3: Fatalities & Injuries				**Consequence Value Not Analyzed**				
A48-C3-1	Structural Fire Protection-Varies per Vessel	I					x	
A48-C3-2	Fixed FF System-Machinery Spaces Only	I					x	
A48-C3-3	Detection Systems-Fire Detection but May Not Have Gas Detection	I			x	x		
A48-C3-4	Drills & Training	D	1,2,3,5,6		x	x		
A48-C3-5	PPE	I		x	x			
A48-C3-6	Medic/EMT-Optional	I		x	x			
Consequence 4: Loss of Vessel Stability		Level 4						**0.0005**
A48-C4-1	Site/Bottom Survey	D	2,3		x	x		1
A48-C4-2	Geotechnical/Pre-Load Analysis	I			x	x		0.5
A48-C4-3	Jacking System & Locks Inspection & Maintenance	I				x	x	0.001
A48-C4-4	Operating Manual	D	1,2,3,5			x		1
A48-C4-5	Weather Monitoring	D	4			x		1
A48-C4-6	Drills & Training	D	1,2,3,4		x	x		1
Consequence 5: Personnel Overboard		Level 1						**0.00000625**
A48-C5-1	Rescue Boat	I				x		0.5
A48-C5-2	Emergency Drills, Equipment & Training	D	1,4,5,6,7		x	x		1
A48-C5-3	SAR Plans	D	1,4,5,6,7		x	x		1
A48-C5-4	Railings	I					x	0.0001
A48-C5-5	Water Survival Equipment	I				x		0.5
A48-C5-6	PPE	I		x	x			0.5
A48-C5-7	Crane & Basket	I			x			0.5
Consequence 6: H2S Exposure-Site Specific		Level 2						**0.00025**
A48-C6-1	Detection Systems	I			x	x		0.5
A48-C6-2	Contingency Plan	D	1,3,4,6		x	x		1
A48-C6-3	Ventilation	D	1		x	x		1
A48-C6-4	PPE	I		x	x			0.5
A48-C6-5	Procedures, Drills & Training	D	1,2,3,4,6		x	x		1
A48-C6-6	H2S Compatible Equipment	I				x	x	0.001

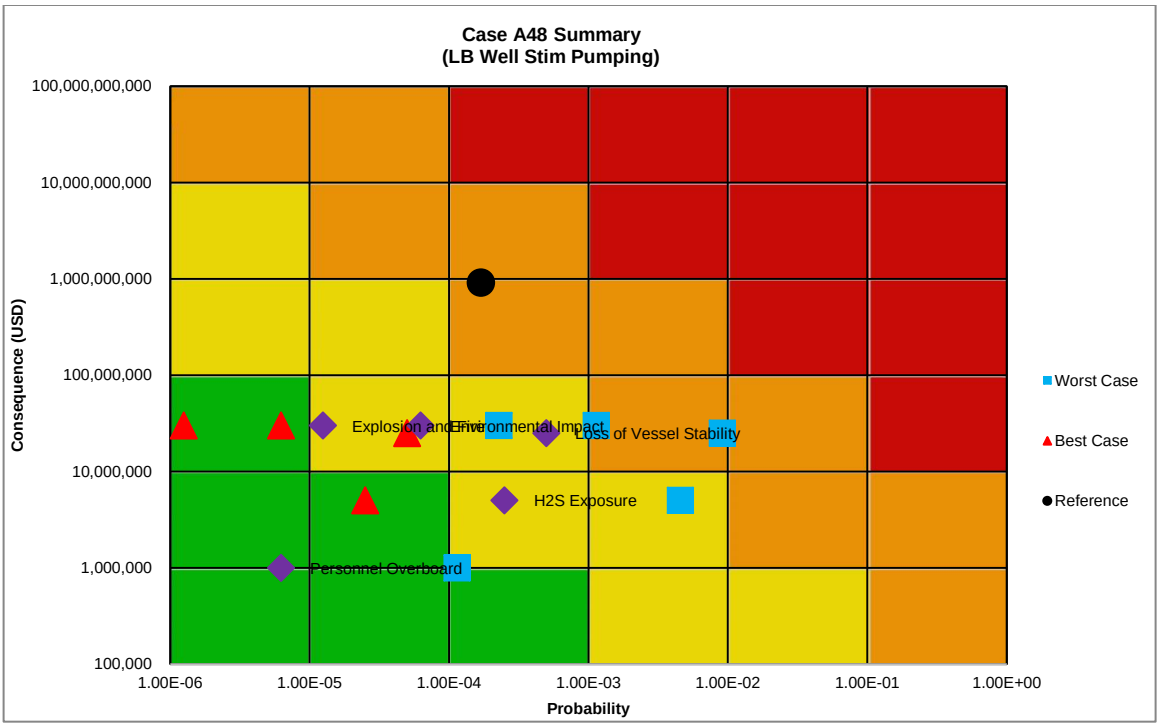

Figure 48 Case A48 Risk Plot

4 Subsea BOP Threats

The left hand side of the Bowtie deal with the threats that could contribute to an event occurring which in turn could cause one of the consequences capture in the right hand side of each Bowtie. This section outlines the threats and barriers to those threats for each scenario. It can be valuable to verify the presence of these barriers in your planning and assessment phase as a risk management activity.

4.1 Case A1 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 52 Case A1 Threats and Associated Barriers

CASE A1 - OP1 MODU Wireline SSTT ON (Assumptions: Horizontal tree)		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail			
Threat 1: BOP Failure				1 in	1 in	1 in	1 in
A1-T1-1	Surface PCE Equipment	I				x	x
A1-T1-2	SSTT / Landing String	I					x
A1-T1-3	Independent 3rd Party BOP Certification	D	2,6		x	x	
A1-T1-4	BOP Testing	D	2,6		x	x	
A1-T1-5	Maintenance Program	D	1,2,3,4,6		x		
A1-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of HC							
A1-T2-1	Surface HC Processing Systems	I				x	
A1-T2-2	Monitoring / Kick Detection Equipment	I				x	
A1-T2-3	BOP	I				x	
A1-T2-4	Surface PCE	I				x	x
A1-T2-5	Well Control Procedures & Training	D	1,2,3,4,6		x	x	
A1-T2-6	SSTT	I					x
Threat 3: Loss of Station Keeping							
A1-T3-1	Well Specific Operating Procedures and Training	D	4,5,6		x	x	
A1-T3-2	MetOcean & Position Monitoring	I				x	x
A1-T3-3	DPO Protocols and Training	D	1,2,4,5,6		x	x	
A1-T3-4	Maintenance Program	D	1,2,3,5,6		x		
A1-T3-5	Power and System Redundancy	I			x	x	
A1-T3-6	Manual Override / Control	D	1,3,4,5			x	x
Threat 4: Accidental Disconnect (Drive Off/Drift Off)							
A1-T4-1	SSTT Sealing Systems	I					x
A1-T4-2	System Maintenance	D	1,4		x	x	
A1-T4-3	Weak Point Analysis	D	1,4			x	x
A1-T4-4	Auto-Shear Functionality	I				x	x
A1-T4-5	Training	D	1,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A1-T5-1	EDS Procedures and Training	D	2,3		x	x	
A1-T5-2	EDS Modes	D	1,3				x
A1-T5-3	EDS System	I					x
Threat 6: Riser Tensioner Lock-up							
A1-T6-1	Tensioner System & Redundancy	I					x
A1-T6-2	Operational Limitation Procedures and Training	D	1,3		x	x	
A1-T6-3	Maintenance Program	D	1,2		x		
Threat 7: Dropped Object Striking Equipment (Assume lifting object that could cause SS							
A1-T7-1	Training	D	3,4,5,6,7		x	x	
A1-T7-2	Housekeeping	I			x	x	
A1-T7-3	Permitted Lift Plans	I				x	x
A1-T7-4	Dropped Object Risk Assessment	I				x	x
A1-T7-5	Safe Approach Plans & DOZ	I				x	x
A1-T7-6	SIMOPS Plan / Shut-in	I				x	x
A1-T7-7	EDS Systems	I					x
Threat 8: Complete Loss of Power (Black Ship)							
A1-T8-1	UPS	I			x	x	
A1-T8-2	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A1-T8-3	Procedures, Drills and Training	D	1,2,4,5,6		x	x	
A1-T8-4	Emergency Generators / Redundant Engine Rooms	I			x	x	
A1-T8-5	External ROV Override	I				x	x
A1-T8-6	Dead Man Functionality	I				x	x
Threat 9: Pressure Control Head Failure (Grease Head Failure)							
A1-T9-1	Maintenance Program	D	2,3,4		x	x	
A1-T9-2	Procedures	D	1,3,4		x	x	
A1-T9-3	Intervention Stack	I				x	x
A1-T9-4	Pack Off (3-2 Active / 1 Redundant)	I				x	x
Threat 10: Cyber-Threat / Virus / Malware							
A1-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A1-T10-2	Training	D	1,3,4,5		x	x	
A1-T10-3	System Architecture/Firewalls	I				x	
A1-T10-4	Protective Software	I			x		

4.2 Case A2 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 53 Case A2 Threats and Associated Barriers

CASE A2 - OP1 MODU Coiled Tubing, SSTT ON (Assumptions: Horizontal tree)		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to			
Threat 1: Subsea BOP Failure				1 in	1 in	1 in	1 in
A2-T1-1	Surface PCE Equipment	I				x	x
A2-T1-2	SSTT/Landing String	I					x
A2-T1-3	Independent 3rd Party BOP Certification	D	2,6		x	x	
A2-T1-4	BOP Testing	D	2,6		x	x	
A2-T1-5	Maintenance Program	D	1,2,3,4,6		x		
A2-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of HC							
A2-T2-1	Coil Tubing BOP System	I				x	
A2-T2-2	Surface HC Processing Systems	I				x	
A2-T2-3	Monitoring/Kick Detection	I				x	
A2-T2-4	Subsea BOP	I				x	
A2-T2-5	Surface PCE Equipment	I				x	x
A2-T2-6	Well Control Procedures & Training	D	1,2,3,4,5		x	x	
Threat 3: Loss of Station Keeping (DP)							
A2-T3-1	Well Specific Operating Procedures and Training	D	4,5,6		x	x	
A2-T3-2	MetOcean & Position Monitoring	I				x	x
A2-T3-3	DPO Protocols and Training	D	1,2,4,5,6		x	x	
A2-T3-4	Maintenance Program	D	1,2,3,5,6			x	
A2-T3-5	Power and System Redundancy	I			x	x	
A2-T3-6	Manual Override / Control	D	1,3,4,5			x	x
Threat 4: Accidental Disconnect							
A2-T4-1	SSTT Sealing Systems	I					x
A2-T4-2	System Maintenance	D	1,4		x	x	
A2-T4-3	Weak Point Analysis	D	1,4			x	x
A2-T4-4	Auto-Shear Functionality	I				x	x
A2-T4-5	Training	D	1,4		x	x	
Threat 5:Controlled Disconnect not Executed Properly							
A2-T5-1	Retraction System/Capability	I				x	
A2-T5-2	EDS Procedures & Training	D	2, 3		x	x	
A2-T5-3	EDS Modes	D	1, 3				x
Threat 6: Riser Tensioner Lock-up							
A2-T6-1	Tensioner System & Redundancy	I					x
A2-T6-2	Operational Limitation Procedures and Training	D	1,3		x	x	
A2-T6-3	Maintenance Program	D	1,2		x	x	
Threat 7: Dropped Object Striking Equipment							
A2-T7-1	Training	D	3,4,5,6,7		x	x	
A2-T7-2	Housekeeping	I			x	x	
A2-T7-3	Permitted Lift Plans	I				x	x
A2-T7-4	Dropped Object Risk Assessment	I				x	x
A2-T7-5	Safe Approach Plans & DOZ	I				x	x
A2-T7-6	SIMOPS Plan / Shut-in	I				x	x
A2-T7-7	EDS Systems	I					x
Threat 8: Surface BOP Failure							
A2-T8-1	Kill Line & Flowhead	I				x	
A2-T8-2	Maintenance Program	D	1,3,4,5,6			x	
A2-T8-3	Downhole Check Valves	I				x	
A2-T8-4	BOP Testing	D	2,3,5,6		x	x	
A2-T8-5	Injector Head System	I				x	
A2-T8-6	Independent 3rd Party BOP Certification-Shear Rams	D	2,3,4,5		x	x	
Threat 9: Complete Power Loss (Black Ship)							
A2-T9-1	UPS	I			x	x	
A2-T9-2	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A2-T9-3	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A2-T9-4	Emergency Generators/Redundant Engine Rooms	I			x	x	
A2-T9-5	External ROV Over ride	I				x	x
A2-T9-6	Dead Man Functionality	I				x	x
Threat 10: Cyber-Threat/Virus/Malware							
A2-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A2-T10-2	Training	D	1,3,4,5		x	x	
A2-T10-3	System Architecture/Firewalls	I				x	
A2-T10-4	Protective Software	I			x		
A2-T10-5	System Integrity/Security	I			x		

4.3 Case A3 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 54 Case A3 Threats and Associated Barriers

CASE A3 - OP1 MODU Well Stimulation Pump, SSTT ON (Assumptions: Vertical or Horizontal tree)		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A3-T1-1	Surface PCE Equipment	I				x	x
A3-T1-2	Well Tree-Vertical Tree Only	I				x	
A3-T1-3	SSTT/Landing String-Horz Only	I					x
A3-T1-4	Independent 3rd Party BOP Certification	D	2,7		x	x	
A3-T1-5	BOP Testing	D	2,7		x	x	
A3-T1-6	Maintenance Program	D	1,2,3,4,5,7		x		
A3-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of HC							
A3-T2-1	Surface HC Processing Systems	I				x	
A3-T2-2	Monitoring/Kick Detection	I				x	
A3-T2-3	Subsea BOP	I				x	
A3-T2-4	Surface PCE	I				x	x
A3-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A3-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A3-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A3-T3-3	MetOcean & Position Monitoring	I				x	x
A3-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A3-T3-5	Maintenance Program	D	1,2,4			x	
A3-T3-6	Power & System Redundancy	I			x	x	
A3-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Accidental Disconnect							
A3-T4-1	SSTT Sealing Systems	I					x
A3-T4-2	System Maintenance	D	1,4		x	x	
A3-T4-3	Weak Point Analysis	D	1,4			x	x
A3-T4-4	Auto-Shear Functionality	I				x	x
A3-T4-5	Training	D	1,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A3-T5-1	Retraction System/Capability	I				x	
A3-T5-2	EDS Procedures & Training	D	2,3		x	x	
A3-T5-3	EDS Modes	D	1,3				x
Threat 6: Riser Tensioner Lock-up							
A3-T6-1	Tensioner System & Redundancy	I					x
A3-T6-2	Operational Limitation Procedures and Training	D	1,3		x	x	
A3-T6-3	Maintenance Program	D	1,2		x	x	
Threat 7: Dropped Object Striking Equipment							
A3-T7-1	Training	D	3,4,5,6,7		x	x	
A3-T7-2	Housekeeping	I			x	x	
A3-T7-3	Permitted Lift Plans	I				x	x
A3-T7-4	Dropped Object Risk Assessment	I				x	x
A3-T7-5	Safe Approach Plans	I				x	x
A3-T7-6	SIMOPS Plan/Shut-In	I				x	x
A3-T7-7	ESD Systems	I					x
Threat 8: Complete Power Loss (Black Ship)							
A3-T8-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A3-T8-2	UPS	I			x	x	
A3-T8-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A3-T8-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A3-T8-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A3-T8-6	External ROV Over ride	I				x	x
A3-T8-7	Dead Man Functionality	I				x	x
Threat 9: Cyber-Threat/Virus/Malware							
A3-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A3-T9-2	Training	D	1,3,4,5		x	x	
A3-T9-3	System Architecture/Firewalls	I				x	
A3-T9-4	Protective Software	I			x		
A3-T9-5	System Integrity/Security	I			x		

4.4 Case A4 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 55 Case A4 Threats and Associated Barriers

CASE A4 - OP1 MODU Marine Riser, (Assumptions: Vertical tree)		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A4-T1-1	Well Tree	I				x	
A4-T1-2	Independent 3rd Party Certification	D	2,5		x	x	
A4-T1-3	BOP Testing	D	2,5		x	x	
A4-T1-4	Maintenance Program	D	1,2,3,5		x		
A4-T1-5	Redundant Controls	I				x	x
Threat 2: Influx of HC							
A4-T2-1	Well Tree	I				x	
A4-T2-2	Surface HC Processing Systems	I				x	
A4-T2-3	Monitoring/Kick Detection	I				x	
A4-T2-4	BOP	I				x	
A4-T2-5	Surface PCE	I				x	x
A4-T2-6	Well Control Procedures & Training	D	1,2,3,4,5		x	x	
Threat 3: Loss of Station Keeping (DP)							
A4-T3-1	Well Specific Operating Procedures and Training	D	4,5,6		x	x	
A4-T3-2	MetOcean & Position Monitoring	I				x	x
A4-T3-3	DPO Protocols and Training	D	1,2,4,5,6		x	x	
A4-T3-4	Maintenance Program	D	1,2,3,5,6			x	
A4-T3-5	Power and System Redundancy	I			x	x	
A4-T3-6	Manual Override / Control	D	1,3,4,5			x	x
Threat 4: Accidental Disconnect							
A4-T4-1	System Maintenance	D	2,4		x	x	
A4-T4-2	Well Tree	I				x	
A4-T4-3	Weak Point Analysis	D	2,4			x	x
A4-T4-4	Auto-Shear Functionality	I				x	x
A4-T4-5	Training	D	2,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A4-T5-1	Safety Valve	I				x	
A4-T5-2	Well Tree	I				x	
A4-T5-3	EDS Procedures & Training	D	1,2,4		x	x	
A4-T5-4	EDS Modes	D	1,2,3				x
Threat 6: Riser Tensioner Lock-up							
A4-T6-1	Tensioner System & Redundancy	I					x
A4-T6-2	Operational Limitation Procedures and Training	D	1,3		x	x	
A4-T6-3	Maintenance Program	D	1,2		x	x	
Threat 7: Non-Shearables in BOP Stack							
A4-T7-1	Shear-Testing	D	2,3		x	x	
A4-T7-2	BOP Shear Calculations	D	1,3		x		
A4-T7-3	Well Specific Operating Procedures & Training	D	1,2		x	x	
Threat 8: Dropped Object Striking Equipment							
A4-T8-1	Training	D	3,4,5,6,7		x	x	
A4-T8-2	Housekeeping	I			x	x	
A4-T8-3	Permitted Lift Plans	I				x	x
A4-T8-4	Dropped Object Risk Assessment	I				x	x
A4-T8-5	Safe Approach Plans & DOZ	I				x	x
A4-T8-6	SIMOPS Plan / Shut-in	I				x	x
A4-T8-7	EDS Systems	I					x
Threat 9: Complete Power Loss (Black Ship)							
A4-T9-1	UPS	I			x	x	
A4-T9-2	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A4-T9-3	Procedures, Drills and Training	D	1,2,4,5,6		x	x	
A4-T9-4	Emergency Generators / Redundant Engine Rooms	I			x	x	
A4-T9-5	External ROV Override	I				x	x
A4-T9-6	Dead Man Functionality	I				x	x
Threat 10: Cyber-Threat/Virus/Malware							
A4-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A4-T10-2	Training	D	1,3,4,5		x	x	
A4-T10-3	System Architecture/Firewalls	I				x	
A4-T10-4	Protective Software	I			x		
A4-T10-5	System Integrity/Security	I			x		

4.5 Case A5 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 56 Case A5 Threats and Associated Barriers

CASE A5 - OP1 MODU Flowback SSTT On, (Assumptions: Vertical or Horizontal Tree)		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A5-T1-1	Surface PCE Equipment	I				x	x
A5-T1-2	Well Tree-Vertical Tree Only	I				x	
A5-T1-3	SSTT/Landing String-Horz Only	I					x
A5-T1-4	Independent 3rd Party BOP Certification	D	2,3,5,6,7		x	x	
A5-T1-5	BOP Testing	D	2,3,4,6,7		x	x	
A5-T1-6	Maintenance Program	D	1,2,3,4,5,7		x		
A5-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A5-T2-1	Surface Processing Systems	I				x	
A5-T2-2	Monitoring/Kick Detection	I				x	
A5-T2-3	Subsea BOP	I				x	
A5-T2-4	Surface PCE	I				x	x
A5-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A5-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A5-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A5-T3-3	MetOcean & Position Monitoring	I				x	x
A5-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A5-T3-5	Maintenance Program	D	1,2,4			x	
A5-T3-6	Power & System Redundancy	I			x	x	
A5-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Accidental Disconnect							
A5-T4-1	SSTT Sealing Systems	I					x
A5-T4-2	System Maintenance	D	1,4		x	x	
A5-T4-3	Weak Point Analysis	D	1,4			x	x
A5-T4-4	Auto-Shear Functionality	I				x	x
A5-T4-5	Training	D	1,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A5-T5-1	Retraction System/Capability	I				x	
A5-T5-2	EDS Procedures & Training	D	1,3		x	x	
A5-T5-3	EDS Modes	D	1,2				x
Threat 6: Riser Tensioner Lock-up							
A5-T6-1	Tensioner System & Redundancy	I					x
A5-T6-2	Operational Limitation Procedures and Training	D	1,3		x	x	
A5-T6-3	Maintenance Program	D	1,2		x	x	
Threat 7: Dropped Object Striking Equipment							
A5-T7-1	Training	D	3,4,5,6,7		x	x	
A5-T7-2	Housekeeping	I			x	x	
A5-T7-3	Permitted Lift Plans	I				x	x
A5-T7-4	Dropped Object Risk Assessment	I				x	x
A5-T7-5	Safe Approach Plans & DOZ	I				x	x
A5-T7-6	SIMOPS Plan / Shut-in	I				x	x
A5-T7-7	EDS Systems	I					x
Threat 8: Complete Power Loss (Black Ship)							
A5-T8-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A5-T8-2	UPS	I			x	x	
A5-T8-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A5-T8-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A5-T8-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A5-T8-6	External ROV Over ride	I				x	x
A5-T8-7	Dead Man Functionality	I				x	x
Threat 9: Cyber Threat/Virus/Malware							
A5-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A5-T9-2	Training	D	1,3,4,5		x	x	
A5-T9-3	System Architecture/Firewalls	I				x	
A5-T9-4	Protective Software	I			x		
A5-T9-5	System Integrity/Security	I			x		

4.6 Case A6 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 57 Case A6 Threats and Associated Barriers

CASE A6 - OP2 MODU Riserless Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A6-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A6-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A6-T1-3	Lubricator Testing	D	2,7,8		x	x	
A6-T1-4	Well Tree-Vertical Tree Only	I				x	
A6-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A6-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A6-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A6-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A6-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A6-T2-2	Subsea Intervention Stack	I				x	x
A6-T2-3	Surface Processing Systems	I				x	
A6-T2-4	Monitoring/Kick Detection	I				x	
A6-T2-5	Surface PCE	I				x	x
A6-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A6-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A6-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A6-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A6-T3-3	MetOcean & Position Monitoring	I				x	x
A6-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A6-T3-5	Maintenance Program	D	1,2,4			x	
A6-T3-6	Power & System Redundancy	I			x	x	
A6-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Accidental Disconnect of Coil							
A6-T4-1	System Maintenance	D	4		x	x	
A6-T4-2	Weak Point Analysis	D	4			x	x
A6-T4-3	Auto-Shear Functionality	I				x	x
A6-T4-4	Training	D	4		x	x	
Threat 5: Controlled Disconnect of Coil not Executed Properly							
A6-T5-1	Break Away System/Capability	I			x		
A6-T5-2	Pay Out until Regain Station Keeping	I			x		
A6-T5-3	EDS Procedures & Training	D	1,2		x	x	
A6-T5-4	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A6-T6-1	Training	D	3,4,5,6,7		x	x	
A6-T6-2	Housekeeping	I			x	x	
A6-T6-3	Permitted Lift Plans	I				x	x
A6-T6-4	Dropped Object Risk Assessment	I				x	x
A6-T6-5	Safe Approach Plans & DOZ	I				x	x
A6-T6-6	SIMOPS Plan / Shut-in	I				x	x
A6-T6-7	EDS Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A6-T7-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A6-T7-2	UPS	I			x	x	
A6-T7-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A6-T7-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A6-T7-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A6-T7-6	External ROV Over ride	I				x	x
A6-T7-7	Dead Man Functionality	I				x	x
Threat 8: Pressure Control Head Failure (Grease Head Failure)							
A6-T8-1	Maintenance Program	D	2,3,4		x	x	
A6-T8-2	Procedures	D	1,3,4		x	x	
A6-T8-3	Intervention Stack	I				x	x
A6-T8-4	Pack Off (3-2 Active / 1 Redundant)	I				x	x
Threat 9: Cyber-Threat/Virus/Malware							
A6-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A6-T9-2	Training	D	1,3,4,5		x	x	
A6-T9-3	System Architecture/Firewalls	I				x	
A6-T9-4	Protective Software	I			x		
A6-T9-5	System Integrity/Security	I			x		

4.7 Case A7 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 58 Case A7 Threats and Associated Barriers

CASE A7 - OP2 MODU Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A7-T1-1	Independent 3rd Party BOP Certification	D	2,4		x	x	
A7-T1-2	BOP Testing	D	2,4		x	x	
A7-T1-3	Maintenance Program	D	1,2,4		x		
A7-T1-4	Redundant Controls	I				x	x
Threat 2: Influx of HC							
A7-T2-1	Surface HC Processing Systems	I				x	
A7-T2-2	Monitoring / Kick Detection Equipment	I				x	
A7-T2-3	BOP	I				x	
A7-T2-4	Surface PCE	I				x	x
A7-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A7-T3-1	MetOcean & Position Monitoring	I				x	x
A7-T3-2	DPO Protocols & Training	D	1,3,4,5,6		x	x	
A7-T3-3	Maintenance Program	D	1,2,4,5,6			x	
A7-T3-4	Power Redundancy	I			x	x	
A7-T3-5	System Redundancy	I			x	x	
A7-T3-6	Manual Over Ride/Control	D	3,4,5			x	x
Threat 4: Accidental Disconnect							
A7-T4-1	Auto-Shear Functionality	I				x	x
A7-T4-2	Training	D	1		x	x	
Threat 5: Controlled Disconnect							
A7-T5-1	EDS Procedures & Training	D	2		x	x	
A7-T5-2	EDS Modes	D	1				x
Threat 6: Tensioner Lock-up							
A7-T6-1	Tensioner System & Redundancy	I					x
A7-T6-2	Operational Limitation Procedures and Training	D	1,3		x	x	
A7-T6-3	Maintenance Program	D	1,2		x	x	
Threat 7: Non-Shearables in BOP Stack							
A7-T7-1	BOP Shear Calculations	D	2		x		
A7-T7-2	Well Specific Operating Procedures & Training	D	1		x	x	
Threat 8: Cyber-Threat/Virus/Malware							
A7-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A7-T8-2	Training	D	1,3,4,5		x	x	
A7-T8-3	System Architecture/Firewalls	I				x	
A7-T8-4	Protective Software	I			x		
A7-T8-5	System Integrity/Security	I			x		

4.8 Case A8 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 59 Case A8 Threats and Associated Barriers

CASE A8 - OP2 MODU Riserless Well Stim Pump		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A8-T1-1	Well Tree	I				x	
A8-T1-2	Barrier Valves-Minimum 2 btwn tree & surface	I				x	
A8-T1-3	Choke Insert Valve	I				x	
A8-T1-4	Stim Package Testing	D	1,2,3,6		x	x	
A8-T1-5	Maintenance Program	D	1,2,3,4,6		x		
A8-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A8-T2-1	Surface Processing Systems	I				x	
A8-T2-2	Surface PCE	I				x	x
A8-T2-3	Dual Barrier Choke/Kill Lines	I				x	
A8-T2-4	Well Control Procedures & Training	D	1,2,3		x	x	
Threat 3: Loss of Station Keeping (DP)							
A8-T3-1	Well Specific Operating Procedures and Training	D	4,5,6		x	x	
A8-T3-2	MetOcean & Position Monitoring	I				x	x
A8-T3-3	DPO Protocols and Training	D	1,2,4,5,6		x	x	
A8-T3-4	Maintenance Program	D	1,2,3,5,6			x	
A8-T3-5	Power and System Redundancy	I			x	x	
A8-T3-6	Manual Override / Control	D	1,3,4,5			x	x
Threat 4: Accidental Disconnect of Coil							
A8-T4-1	System Maintenance	D	2,4,5		x	x	
A8-T4-2	Break Away System/Capability	I			x		
A8-T4-3	Fail Safe Closed Valves	I				x	
A8-T4-4	Weak Point Analysis	D	2,3			x	x
A8-T4-5	Training	D	1,2,3		x	x	
Threat 5: Controlled Disconnect of Coil							
A8-T5-1	Pay Out until Regain Station Keeping	I			x		
A8-T5-2	EDS Procedures & Training	D	1,3		x	x	
A8-T5-3	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A8-T6-1	Training	D	3,4,5,6,7		x	x	
A8-T6-2	Housekeeping	I			x	x	
A8-T6-3	Permitted Lift Plans	I				x	x
A8-T6-4	Dropped Object Risk Assessment	I				x	x
A8-T6-5	Safe Approach Plans & DOZ	I				x	x
A8-T6-6	SIMOPS Plan / Shut-in	I				x	x
A8-T6-7	EDS Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A8-T7-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A8-T7-2	UPS	I			x	x	
A8-T7-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A8-T7-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A8-T7-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A8-T7-6	External ROV Over ride	I				x	x
A8-T7-7	Dead Man Functionality	I				x	x
Threat 8: Cyber-Threat/Virus/Malware							
A8-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A8-T8-2	Training	D	1,3,4,5		x	x	
A8-T8-3	System Architecture/Firewalls	I				x	
A8-T8-4	Protective Software	I			x		
A8-T8-5	System Integrity/Security	I			x		

4.9 Case A9 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 60 Case A9 Threats and Associated Barriers

CASE A9 - OP3 MODU Riser Intervention (open water, non-marine riser) Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A9-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A9-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A9-T1-3	Lubricator Testing	D	2,7,8		x	x	
A9-T1-4	Well Tree-Vertical Tree Only	I				x	
A9-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A9-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A9-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A9-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A9-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A9-T2-2	Subsea Intervention Stack	I				x	x
A9-T2-3	Surface Processing Systems	I				x	
A9-T2-4	Monitoring/Kick Detection	I				x	
A9-T2-5	Surface PCE	I				x	x
A9-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A9-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A9-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A9-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A9-T3-3	MetOcean & Position Monitoring	I				x	x
A9-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A9-T3-5	Maintenance Program	D	1,2,4			x	
A9-T3-6	Power & System Redundancy	I			x	x	
A9-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Dropped Object Striking Equipment							
A9-T4-1	Training	D	3,4,5,6,7		x	x	
A9-T4-2	Housekeeping	I			x	x	
A9-T4-3	Permitted Lift Plans	I				x	x
A9-T4-4	Dropped Object Risk Assessment	I				x	x
A9-T4-5	Safe Approach Plans & DOZ	I				x	x
A9-T4-6	SIMOPS Plan / Shut-in	I				x	x
A9-T4-7	EDS Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A9-T5-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A9-T5-2	UPS	I			x	x	
A9-T5-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A9-T5-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A9-T5-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A9-T5-6	External ROV Over ride	I				x	x
A9-T5-7	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A9-T6-1	Intervention Stack	I				x	x
A9-T6-2	Pressure Testing	D	1,3,4		x		
A9-T6-3	Maintenance Program	D	2,4		x	x	
A9-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A9-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A9-T7-2	Riser Analysis	D	3,4,5		x		
A9-T7-3	Connection Design & Selection	D	2,4,5		x		
A9-T7-4	Intervention Stack	I				x	x
A9-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Cyber-Threat/Virus/Malware							
A9-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A9-T8-2	Training	D	1,3,4,5		x	x	
A9-T8-3	System Architecture/Firewalls	I				x	
A9-T8-4	Protective Software	I			x		
A9-T8-5	System Integrity/Security	I			x		

4.10 Case A10 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 61 Case A10 Threats and Associated Barriers

CASE A10 - OP# MODU Riser Intervention (open water, non-marine riser) Coiled Tubing		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A10-T1-1	HPU Maintenance & Inspection	D	2,6		x		
A10-T1-2	Well Tree-Vertical Tree Only	I				x	
A10-T1-3	Independent 3rd Party BOP Certification	D	2,6		x	x	
A10-T1-4	Intervention Stack Testing	D	2,6		x	x	
A10-T1-5	Maintenance Program	D	1,2		x		
A10-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A10-T2-1	Coiled Tubing BOP Installed	I				x	
A10-T2-2	Subsea Intervention Stack	I				x	x
A10-T2-3	Surface Processing Systems	I				x	
A10-T2-4	Monitoring/Kick Detection	I				x	
A10-T2-5	Surface PCE	I				x	x
A10-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A10-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A10-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A10-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A10-T3-3	MetOcean & Position Monitoring	I				x	x
A10-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A10-T3-5	Maintenance Program	D	1,2,4			x	
A10-T3-6	Power & System Redundancy	I			x	x	
A10-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Dropped Object Striking Equipment							
A10-T4-1	Training	D	3,4,5,6,7		x	x	
A10-T4-2	Housekeeping	I			x	x	
A10-T4-3	Permitted Lift Plans	I				x	x
A10-T4-4	Dropped Object Risk Assessment	I				x	x
A10-T4-5	Safe Approach Plans & DOZ	I				x	x
A10-T4-6	SIMOPS Plan / Shut-in	I				x	x
A10-T4-7	EDS Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A10-T5-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A10-T5-2	UPS	I			x	x	
A10-T5-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A10-T5-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A10-T5-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A10-T5-6	External ROV Over ride	I				x	x
A10-T5-7	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A10-T6-1	Intervention Stack	I				x	x
A10-T6-2	Pressure Testing	D	1,3,4		x		
A10-T6-3	Maintenance Program	D	2,4		x	x	
A10-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A10-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A10-T7-2	Riser Analysis	D	3,4,5		x		
A10-T7-3	Connection Design & Selection	D	2,4,5		x		
A10-T7-4	Intervention Stack	I				x	x
A10-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Cyber-Threat/Virus/Malware							
A10-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A10-T8-2	Training	D	1,3,4,5		x	x	
A10-T8-3	System Architecture/Firewalls	I				x	
A10-T8-4	Protective Software	I			x		
A10-T8-5	System Integrity/Security	I			x		

4.11 Case A11 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 62 Case A11 Threats and Associated Barriers

CASE A11 - OP3 MODU Riser Intervention (open water, non-marine riser) Well Stim Pump		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A11-T1-1	HPU Maintenance & Inspection	D	2,6		x		
A11-T1-2	Well Tree-Vertical Tree Only	I				x	
A11-T1-3	Independent 3rd Party BOP Certification	D	2,6		x	x	
A11-T1-4	Intervention Stack Testing	D	2,6		x	x	
A11-T1-5	Maintenance Program	D	1,2		x		
A11-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A11-T2-1	Coiled Tubing BOP Installed	I				x	
A11-T2-2	Subsea Intervention Stack	I				x	x
A11-T2-3	Surface Processing Systems	I				x	
A11-T2-4	Monitoring/Kick Detection	I				x	
A11-T2-5	Surface PCE	I				x	x
A11-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A11-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A11-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A11-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A11-T3-3	MetOcean Monitoring	I				x	x
A11-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A11-T3-5	Maintenance Program	D	1,2,4			x	
A11-T3-6	Power & System Redundancy	I			x	x	
A11-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Dropped Object Striking Equipment							
A11-T4-1	Training	D	3,4,5,6,7		x	x	
A11-T4-2	Housekeeping	I			x	x	
A11-T4-3	Permitted Lift Plans	I				x	x
A11-T4-4	Dropped Object Risk Assessment	I				x	x
A11-T4-5	Safe Approach Plans	I				x	x
A11-T4-6	SIMOPS Plan/Shut-In	I				x	x
A11-T4-7	ESD Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A11-T5-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A11-T5-2	UPS	I			x	x	
A11-T5-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A11-T5-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A11-T5-5	Auxiliary Power Systems	I			x	x	
A11-T5-6	External ROV Over Ride	I				x	x
A11-T5-7	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A11-T6-1	Intervention Stack	I				x	x
A11-T6-2	Pressure Testing	D	1,3,4		x		
A11-T6-3	Maintenance Program	D	2,4		x	x	
A11-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A11-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A11-T7-2	Riser Analysis	D	3,4,5		x		
A11-T7-3	Connection Design & Selection	D	2,4,5		x		
A11-T7-4	Intervention Stack	I				x	x
A11-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Surface Processing Equipment Failure							
A11-T8-1	Maintenance Program	D	2,3,6		x		
A11-T8-2	Intervention Stack	I				x	x
A11-T8-3	Surface PCE	I				x	x
A11-T8-4	Pressure Testing	D	1,2,3,6		x		
A11-T8-5	ESD & Safety Systems	I					x
A11-T8-6	Operating Procedures	D	1,2,3,4,5		x	x	
Threat 9: Cyber-Threat/Virus/Malware							
A11-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A11-T9-2	Training	D	1,3,4,5		x	x	
A11-T9-3	System Architecture/Firewalls	I				x	
A11-T9-4	Protective Software	I			x		
A11-T9-5	System Integrity/Security	I			x		

4.12 Case A12 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 63 Case A12 Threats and Associated Barriers

CASE A12 - OP3 Rider Intervention (open water, non-marine) Flowback		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A12-T1-1	Surface PCE Equipment	I				x	x
A12-T1-2	Well Tree-Vertical Tree Only	I				x	
A12-T1-3	SSTT/Landing String-Horz Only	I					x
A12-T1-4	Independent 3rd Party BOP Certification	D	2,3,6		x	x	
A12-T1-5	BOP Testing	D	2,3,6		x	x	
A12-T1-6	Maintenance Program	D	1,2,3,4,5		x		
A12-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A12-T2-1	Surface Processing Systems	I				x	
A12-T2-2	Monitoring/Kick Detection	I				x	
A12-T2-3	Subsea BOP	I				x	
A12-T2-4	Surface PCE	I				x	x
A12-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A12-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A12-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A12-T3-3	MetOcean Monitoring	I				x	x
A12-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A12-T3-5	Maintenance Program	D	1,2,4		x		
A12-T3-6	Power & System Redundancy	I			x	x	
A12-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Accidental Disconnect							
A12-T4-1	SSTT Sealing Systems - Horizontal Tree Only	I					x
A12-T4-2	System Maintenance	D	1,4		x	x	
A12-T4-3	Weak Point Analysis	D	1,4			x	x
A12-T4-4	Auto-Shear Functionality	I				x	x
A12-T4-5	Training	D	1,2,3,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A12-T5-1	Retraction System/Capability	I				x	
A12-T5-2	EDS Procedures & Training	D	1,3		x	x	
A12-T5-3	EDS Modes	D	1,2				x
Threat 6: Riser Tensioner Lock-up							
A12-T6-1	Tensioner Redundancy	I					x
A12-T6-2	Operational Limitations Procedures & Training	D	1,3		x	x	
A12-T6-3	Maintenance Program	D	1,2		x		
Threat 7: Dropped Object Striking Equipment							
A12-T7-1	Training	D	3,4,5,6,7		x	x	
A12-T7-2	Housekeeping	I			x	x	
A12-T7-3	Permitted Lift Plans	I				x	x
A12-T7-4	Dropped Object Risk Assessment	I				x	x
A12-T7-5	Safe Approach Plans	I				x	x
A12-T7-6	SIMOPS Plan/Shut-In	I				x	x
A12-T7-7	ESD Systems	I					x
Threat 8: Complete Power Loss (Black Ship)							
A12-T8-1	SMS-Vessel	D	2,3,4,5,6		x	x	
A12-T8-2	UPS	I			x	x	
A12-T8-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A12-T8-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A12-T8-5	Emergency Generators/Redundant Engine Rooms	I			x	x	
A12-T8-6	External ROV Over Ride	I				x	x
Threat 9: Cyber-Threat/Virus/Malware							
A12-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A12-T9-2	Training	D	1,3,4,5		x	x	
A12-T9-3	System Architecture/Firewalls	I				x	
A12-T9-4	Protective Software	I			x		
A12-T9-5	System Integrity/Security	I			x		

4.13 Case A13 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 64 Case A13 Threats and Associated Barriers

CASE A13 - OP2 MODU Hyd/Pump Intervention Well Stim Pump		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A13-T1-1	Well Tree	I				x	
A13-T1-2	Barrier Valves-Minimum 2 btwn tree & surface	I				x	
A13-T1-3	Choke Insert Valve	I				x	
A13-T1-4	Stim Package Testing	D	1,2,3,6		x	x	
A13-T1-5	Maintenance Program	D	1,2,3,6		x		
A13-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A13-T2-1	Surface Processing Systems	I				x	
A13-T2-2	Surface PCE	I				x	x
A13-T2-3	Dual Barrier Choke/Kill Lines	I				x	
A13-T2-4	Well Control Procedures & Training	D	1,2,3		x	x	
Threat 3: Loss of Station Keeping (DP)							
A13-T3-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A13-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7		x	x	
A13-T3-3	MetOcean Monitoring	I				x	x
A13-T3-4	DPO Protocols & Training	D	1,2,3,6,7		x	x	
A13-T3-5	Maintenance Program	D	1,2,4		x		
A13-T3-6	Power & System Redundancy	I			x	x	
A13-T3-7	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Accidental Disconnect of Coil							
A13-T4-1	System Maintenance	D	2,4		x	x	
A13-T4-2	Break Away System/Capability	I			x		
A13-T4-3	Fail Safe Closed Valves	I				x	
A13-T4-4	Weak Point Analysis	D	2,3			x	x
A13-T4-5	Training	D	2,3,4		x	x	
Threat 5: Controlled Disconnect of Coil not Executed Properly							
A13-T5-1	Pay Out until Regain Station Keeping	I			x		
A13-T5-2	EDS Procedures & Training	D	1,3		x	x	
A13-T5-3	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A13-T6-1	Training	D	3,4,5,6,7		x	x	
A13-T6-2	Housekeeping	I			x	x	
A13-T6-3	Permitted Lift Plans	I				x	x
A13-T6-4	Dropped Object Risk Assessment	I				x	x
A13-T6-5	Safe Approach Plans	I				x	x
A13-T6-6	SIMOPS Plan/Shut-In	I				x	x
A13-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A13-T7-1	SMS-Vessel	D	2,3,4,5,6,7		x	x	
A13-T7-2	UPS	I			x	x	
A13-T7-3	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A13-T7-4	Procedures, Drills & Training	D	1,2,4,5,6		x	x	
A13-T7-5	Auxiliary Power Systems	I			x	x	
A13-T7-6	External ROV Over Ride	I				x	x
A13-T7-7	Dead Man Functionality	I				x	x
Threat 8: Cyber-Threat/Virus/Malware							
A13-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A13-T8-2	Training	D	1,3,4,5		x	x	
A13-T8-3	System Architecture/Firewalls	I				x	
A13-T8-4	Protective Software	I			x		
A13-T8-5	System Integrity/Security	I			x		

4.14 Case A14 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 65 Case A14 Threats and Associated Barriers

CASE A14 - OP2 MSV Riserless Wireline		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A14-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A14-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A14-T1-3	Lubricator Testing	D	2,7,8		x	x	
A14-T1-4	Well Tree-Vertical Tree Only	I				x	
A14-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A14-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A14-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A14-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A14-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A14-T2-2	Subsea Intervention Stack	I				x	x
A14-T2-3	Surface Processing Systems	I				x	
A14-T2-4	Monitoring/Kick Detection	I				x	
A14-T2-5	Surface PCE	I				x	x
A14-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A14-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A14-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A14-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A14-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A14-T3-4	MetOcean Monitoring	I				x	x
A14-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A14-T3-6	Maintenance Program	D	1,2,4		x		
A14-T3-7	Power & System Redundancy	I			x	x	
A14-T3-8	Manual Over Ride/Control	D	1,2,3,4,7			x	x
Threat 4: Dropped Object Striking Equipment							
A14-T4-1	Training	D	3,4,5,6,7		x	x	
A14-T4-2	Housekeeping	I			x	x	
A14-T4-3	Permitted Lift Plans	I				x	x
A14-T4-4	Dropped Object Risk Assessment	I				x	x
A14-T4-5	Safe Approach Plans	I				x	x
A14-T4-6	SIMOPS Plan/Shut-In	I				x	x
A14-T4-7	ESD Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A14-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A14-T5-2	UPS	I			x	x	
A14-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A14-T5-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A14-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A14-T5-6	Auxiliary Power Systems	I			x	x	
A14-T5-7	External ROV Over Ride	I				x	x
A14-T5-8	Dead Man Functionality	I				x	x
Threat 6: Pressure Control Head Failure (Grease Head Failure)							
A14-T6-1	Maintenance Program	D	2,3,4		x		
A14-T6-2	Procedures	D	1,3,4		x	x	
A14-T6-3	Intervention Stack	I				x	x
A14-T6-4	Pack Off (3-2 active/1 redundant)	I				x	x
Threat 7: Vessel SIMOPS-Collision/Interference/Other Transfers							
A14-T7-1	SIMOPS Plan	D	2,3,4			x	
A14-T7-2	Drive Off/Drift Off Analysis	D	1,4			x	
A14-T7-3	Frequency Management Plans	D	1,2,4		x		
A14-T7-4	COLREGS Systems	I				x	
Threat 8: Cyber-Threat/Virus/Malware							
A14-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A14-T8-2	Training	D	1,3,4,5		x	x	
A14-T8-3	System Architecture/Firewalls	I				x	
A14-T8-4	Protective Software	I			x		
A15-T8-5	System Integrity/Security	I			x		

4.15 Case A16 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 66 Case A16 Threats and Associated Barriers

CASE A16 - OP2 MSV Riserless Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Simulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A16-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A16-T1-2	Well Tree	I				x	
A16-T1-3	Disconnect/Drive Off	I				x	x
A16-T1-4	Stim Package Testing	D	1,2,6		x	x	
A16-T1-5	Maintenance Program	D	1,2,6		x		
A16-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A16-T2-1	Subsea Intervention Stack	I				x	x
A16-T2-2	Surface Processing Systems	I				x	
A16-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A16-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A16-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	1,3,4,5,6,7,8		x	x	
A16-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A16-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A16-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,6,7,8		x	x	
A16-T3-6	Maintenance Program	D	1,2,4		x		
A16-T3-7	Power & System Redundancy	I			x	x	
A16-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A16-T4-1	Training	D	3,4,5,6,7		x	x	
A16-T4-2	Housekeeping	I			x	x	
A16-T4-3	Permitted Lift Plans	I				x	x
A16-T4-4	Dropped Object Risk Assessment	I				x	x
A16-T4-5	Safe Approach Plans	I				x	x
A16-T4-6	Establish a Watch Circle	D	1,3,4,5,7			x	
A16-T4-7	SIMOPS Plan/Shut-In	I				x	x
A16-T4-8	ESD Systems	I					x
A16-T4-9	Elevation Survey of Subsea Architecture	I				x	
A16-T4-10	Weak Point Analysis	D	3,4,5,9			x	x
Threat 5: Complete Power Loss (Black Ship)							
A16-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A16-T5-2	UPS	I			x	x	
A16-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A16-T5-4	Auto Recovery of Power Systems	I			x	x	
A16-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A16-T5-6	Auxiliary Power Systems	I			x	x	
A16-T5-7	External ROV Over Ride	I				x	x
A16-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A16-T6-1	SIMOPS Plan	D	2,3,4			x	
A16-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A16-T6-3	Frequency Management Plans	D	1,2,4		x		
A16-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A16-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A16-T7-2	Training	D	1,3,4,5		x	x	
A16-T7-3	System Architecture/Firewalls	I				x	
A16-T7-4	Protective Software	I			x		
A16-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A16-T8-1	Pressure Testing	D	2,3,4		x		
A16-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A16-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A16-T8-4	Pressure Relief Valves	I				x	x

4.16 Case A17 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 67 Case A17 Threats and Associated Barriers

CASE A17 - OP3 MSV Riser Intervention (open water, non-marine) Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A17-T1-1	HPU Maintenance & Inspection	D	2,3,7,8,9		x		
A17-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A17-T1-3	Lubricator Testing	D	2,7,8,9		x	x	
A17-T1-4	Surface PCE	I				x	x
A17-T1-5	Well Tree-Vertical Tree Only	I				x	
A17-T1-6	Independent 3rd Party BOP Certification	D	5,8,9		x	x	
A17-T1-7	Intervention Stack Testing	D	2,5,6		x	x	
A17-T1-8	Maintenance Program	D	1,2,3,4,5,6,7,9		x		
A17-T1-9	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A17-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A17-T2-2	Subsea Intervention Stack	I				x	x
A17-T2-3	Surface Processing Systems	I				x	
A17-T2-4	Monitoring/Kick Detection	I				x	
A17-T2-5	Surface PCE	I				x	x
A17-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A17-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A17-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A17-T3-2	Well Specific Operating Procedures & Training	D	2,3,4,5,6,8,9,10,11		x	x	
A17-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8,10,11			x	
A17-T3-4	Riser Analysis	D	7,9		x		
A17-T3-5	ESD Sequences	I					x
A17-T3-6	Emergency Disconnect Sequence	D	5			x	
A17-T3-7	MetOcean Monitoring	I				x	x
A17-T3-8	DPO Protocols & Training	D	1,2,3,5,6,10,11		x	x	
A17-T3-9	Maintenance Program	D	2		x		
A17-T3-10	Power & System Redundancy	I			x	x	
A17-T3-11	Manual Over Ride/Control	D	1,2,3,5,6,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A17-T4-1	Training	D	3,4,5,6,7		x	x	
A17-T4-2	Housekeeping	I			x	x	
A17-T4-3	Permitted Lift Plans	I				x	x
A17-T4-4	Dropped Object Risk Assessment	I				x	x
A17-T4-5	Safe Approach Plans	I				x	x
A17-T4-6	SIMOPS Plan/Shut-In	I				x	x
A17-T4-7	ESD Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A17-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A17-T5-2	UPS	I			x	x	
A17-T5-3	Drift Off Analysis	D	2,4,5,6,7,8,9,11			x	
A17-T5-4	Riser Analysis	D	11		x		
A17-T5-5	ESD Sequences	I					x
A17-T5-6	Emergency Disconnect Sequence	D	5,7,9,10,11			x	
A17-T5-7	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A17-T5-8	Procedures, Drills & Training	D	1,5,6,7,9,10,11		x	x	
A17-T5-9	Auxiliary Power Systems	I			x	x	
A17-T5-10	External ROV Over Ride	I				x	x
A17-T5-11	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A17-T6-1	Intervention Stack	I				x	x
A17-T6-2	Pressure Testing	D	1,3,4		x		
A17-T6-3	Maintenance Program	D	2,4		x		
A17-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A17-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A17-T7-2	Riser Analysis	D	3,4,5		x		
A17-T7-3	Connection Design & Selection	D	2,4,5		x		
A17-T7-4	Intervention Stack	I				x	x
A17-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A17-T8-1	SIMOPS Plan	D	2,3,4			x	
A17-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A17-T8-3	Frequency Management Plans	D	1,2,4		x		
A17-T8-4	COLREGS System	I				x	
Threat 9: Cyber-Threat/Virus/Malware							
A17-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A17-T9-2	Training	D	1,3,4,5		x	x	
A17-T9-3	System Architecture/Firewalls	I				x	
A17-T9-4	Protective Software	I			x		
A17-T9-5	System Integrity/Security	I			x		

4.17 Case A18 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 68 Case A18 Threats and Associated Barriers

CASE A18 - OP3 MSV Riser Intervention (open water, non-marine) Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A18-T1-1	HPU Maintenance & Inspection	D	2,3,7		x		
A18-T1-2	Surface PCE	I				x	x
A18-T1-3	Well Tree-Vertical Tree Only	I				x	
A18-T1-4	Independent 3rd Party BOP Certification	D	2,3,7		x	x	
A18-T1-5	Intervention Stack Testing	D	2,3,7		x	x	
A18-T1-6	Maintenance Program	D	2,3,7		x		
A18-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A18-T2-1	Pressure Control Head Installed	I				x	
A18-T2-2	Subsea Intervention Stack	I				x	x
A18-T2-3	Surface Processing Systems	I				x	
A18-T2-4	Monitoring/Kick Detection	I				x	
A18-T2-5	Surface PCE	I				x	x
A18-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A18-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A18-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A18-T3-2	Well Specific Operating Procedures & Training	D	2,3,4,5,6,8,9,10,11		x	x	
A18-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8,10,11			x	
A18-T3-4	Riser Analysis	D	7,9		x		
A18-T3-5	ESD Sequences	I					x
A18-T3-6	Emergency Disconnect Sequence	D	5			x	
A18-T3-7	MetOcean Monitoring	I				x	x
A18-T3-8	DPO Protocols & Training	D	1,2,3,5,6,10,11		x	x	
A18-T3-9	Maintenance Program	D	2		x		
A18-T3-10	Power & System Redundancy	I			x	x	
A18-T3-11	Manual Over Ride/Control	D	1,2,3,5,6,8			x	x
Threat 4: Dropped Object Striking Equipment							
A18-T4-1	Training	D	3,4,5,6,7		x	x	
A18-T4-2	Housekeeping	I			x	x	
A18-T4-3	Permitted Lift Plans	I				x	x
A18-T4-4	Dropped Object Risk Assessment	I				x	x
A18-T4-5	Safe Approach Plans	I				x	x
A18-T4-6	SIMOPS Plan/Shut-In	I				x	x
A18-T4-7	ESD Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A18-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A18-T5-2	UPS	I			x	x	
A18-T5-3	Drift Off Analysis	D	2,4,5,6,7,8,9,11			x	
A18-T5-4	Riser Analysis	D	11		x		
A18-T5-5	ESD Sequences	I					x
A18-T5-6	Emergency Disconnect Sequence	D	5,7,9,10,11			x	
A18-T5-7	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A18-T5-8	Procedures, Drills & Training	D	1,5,6,7,9,10,11		x	x	
A18-T5-9	Auxiliary Power Systems	I			x	x	
A18-T5-10	External ROV Over Ride	I				x	x
A18-T5-11	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A18-T6-1	Intervention Stack	I				x	x
A18-T6-2	Pressure Testing	D	1,3,4		x		
A18-T6-3	Maintenance Program	D	2,4		x		
A18-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A18-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A18-T7-2	Riser Analysis	D	3,4,5		x		
A18-T7-3	Connection Design & Selection	D	2,4,5		x		
A18-T7-4	Intervention Stack	I				x	x
A18-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A18-T8-1	SIMOPS Plan	D	2,3,4			x	
A18-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A18-T8-3	Frequency Management Plans	D	1,2,4		x		
A18-T8-4	COLREGS System	I				x	
Threat 9: Cyber-Threat/Virus/Malware							
A18-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A18-T9-2	Training	D	1,3,4,5		x	x	
A18-T9-3	System Architecture/Firewalls	I				x	
A18-T9-4	Protective Software	I			x		
A18-T9-5	System Integrity/Security	I			x		

4.18 Case A19 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 69 Case A19 Threats and Associated Barriers

CASE A19 - OP3 MSV Riser Intervention Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A19-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A19-T1-2	Well Tree	I				x	
A19-T1-3	Disconnect	I				x	
A19-T1-4	Stim Package Testing	D	1,2,6		x	x	
A19-T1-5	Maintenance Program	D	1,2,6		x		
A19-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A19-T2-1	Subsea Intervention Stack	I				x	x
A19-T2-2	Surface Processing Systems	I				x	
A19-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A19-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A19-T3-2	Well Specific Operating Procedures & Training	D	3,4,6,7,8		x	x	
A19-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8			x	
A19-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A19-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,4,6,7,8		x	x	
A19-T3-6	Maintenance Program	D	7,8		x		
A19-T3-7	Power & System Redundancy	I			x	x	
A19-T3-8	Manual Over Ride/Control	D	3,5,6,7			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A19-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A19-T4-2	Housekeeping	I			x	x	
A19-T4-3	Permitted Lift Plans	I				x	x
A19-T4-4	Dropped Object Risk Assessment	I				x	x
A19-T4-5	Safe Approach Plans	I				x	x
A19-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A19-T4-7	SIMOPS Plan/Shut-In	I				x	x
A19-T4-8	ESD Systems	I					x
A19-T4-9	Elevation Survey of Subsea Architecture	I				x	
A19-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A19-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A19-T5-2	UPS	I			x	x	
A19-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A19-T5-4	Auto Recovery of Power Systems	I			x	x	
A19-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A19-T5-6	Auxiliary Power Systems	I			x	x	
A19-T5-7	External ROV Over Ride	I				x	x
A19-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A19-T6-1	SIMOPS Plan	D	2,3,4			x	
A19-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A19-T6-3	Frequency Management Plans	D	1,2,4		x		
A19-T6-4	COLREGS System	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A19-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A19-T7-2	Training	D	1,3,4,5		x	x	
A19-T7-3	System Architecture/Firewalls	I				x	
A19-T7-4	Protective Software	I			x		
A19-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A19-T8-1	Pressure Testing	D	2,3,4		x		
A19-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A19-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A19-T8-4	Pressure Relief Valves	I				x	x

4.19 Case A20 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 70 Case A20 Threats and Associated Barriers

CASE A20 - OP3 MSV Riser Intervention Flowback		Independent (I) or Dependent (D)	if D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A20-T1-1	Surface PCE Equipment	I				x	x
A20-T1-2	Well Tree-Vertical Tree Only	I				x	
A20-T1-3	SSTT/Landing String-Horz Only	I					x
A20-T1-4	Independent 3rd Party BOP Certification	D	2,3,6		x	x	
A20-T1-5	BOP Testing	D	2,3,6		x	x	
A20-T1-6	Maintenance Program	D	1,2,3,4,5		x		
A20-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A20-T2-1	Surface Processing Systems	I				x	
A20-T2-2	Monitoring/Kick Detection	I				x	
A20-T2-3	Subsea BOP	I				x	
A20-T2-4	Surface PCE	I				x	x
A20-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A20-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A20-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A20-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A20-T3-4	MetOcean Monitoring	I				x	x
A20-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A20-T3-6	Maintenance Program	D	1,2,4		x		
A20-T3-7	Power & System Redundancy	I			x	x	
A20-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Accidental Disconnect							
A20-T4-1	SSTT Sealing Systems Horz Tree Only	I					x
A20-T4-2	System Maintenance	D	1,4		x	x	
A20-T4-3	Weak Point Analysis	D	1,4			x	x
A20-T4-4	Auto-Shear Functionality	I				x	x
A20-T4-5	Training	D	1,2,3,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A20-T5-1	Retraction System/Capability	I				x	
A20-T5-2	EDS Procedures & Training	D	1,3		x	x	
A20-T5-3	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A20-T6-1	Training	D	3,4,5,6,7		x	x	
A20-T6-2	Housekeeping	I			x	x	
A20-T6-3	Permitted Lift Plans	I				x	x
A20-T6-4	Dropped Object Risk Assessment	I				x	x
A20-T6-5	Safe Approach Plans	I				x	x
A20-T6-6	SIMOPS Plan/Shut-In	I				x	x
A20-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A20-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A20-T7-2	UPS	I			x	x	
A20-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A20-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A20-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A20-T7-6	Emergency Generators/Redundant Engine Rooms	I			x	x	
A20-T7-7	External ROV Over Ride	I				x	x
A20-T7-8	Dead Man Functionality	I				x	x
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A20-T8-1	SIMOPS Plan	D	2,3,4			x	
A20-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A20-T8-3	Frequency Management Plans	D	1,2,4		x		
A20-T8-4	COLREGS Systems	I				x	
Threat 9: Cyber Threat/Virus/Malware							
A20-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A20-T9-2	Training	D	1,3,4,5		x	x	
A20-T9-3	System Architecture/Firewalls	I				x	
A20-T9-4	Protective Software	I			x		
A20-T9-5	System Integrity/Security	I			x		

4.20 Case A21 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 71 Case A21 Threats and Associated Barriers

CASE A21 - OP4 MSV Well Stim Hydraulic Pumping		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A21-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A21-T1-2	Well Tree	I				x	
A21-T1-3	Disconnect/Drive Off	I				x	
A21-T1-4	Stim Package Testing	D	1,2,6		x	x	
A21-T1-5	Maintenance Program	D	1,2,6		x		
A21-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A21-T2-1	Subsea Stack	I				x	
A21-T2-2	Surface Processing Systems	I				x	
A21-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A21-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A21-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	1,3,4,5,6,7,8		x	x	
A21-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A21-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A21-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,6,7,8		x	x	
A21-T3-6	Maintenance Program	D	1,2,4		x		
A21-T3-7	Power & System Redundancy	I			x	x	
A21-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A21-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A21-T4-2	Housekeeping	I			x	x	
A21-T4-3	Permitted Lift Plans	I				x	x
A21-T4-4	Dropped Object Risk Assessment	I				x	x
A21-T4-5	Safe Approach Plans	I				x	x
A21-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A21-T4-7	SIMOPS Plan/Shut-In	I				x	x
A21-T4-8	ESD Systems	I					x
A21-T4-9	Elevation Survey of Subsea Architecture	I				x	
A21-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A21-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A21-T5-2	UPS	I			x	x	
A21-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A21-T5-4	Auto Recovery of Power Systems	I			x	x	
A21-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A21-T5-6	Auxiliary Power Systems	I			x	x	
A21-T5-7	External ROV Over Ride	I				x	x
A21-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A21-T6-1	SIMOPS Plan	D	2,3,4			x	
A21-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A21-T6-3	Frequency Management Plans	D	1,2,4		x		
A21-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A21-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A21-T7-2	Training	D	1,3,4,5		x	x	
A21-T7-3	System Architecture/Firewalls	I				x	
A21-T7-4	Protective Software	I			x		
A21-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A21-T8-1	Pressure Testing	D	2,3,4		x		
A21-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A21-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A21-T8-4	Pressure Relief Valves	I				x	x

4.21 Case A22 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 72 Case A22 Threats and Associated Barriers

CASE A22 - OP2 SIV Riserless Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A22-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A22-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A22-T1-3	Lubricator Testing	D	2,7,8		x	x	
A22-T1-4	Well Tree-Vertical Tree Only	I				x	
A22-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A22-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A22-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A22-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A22-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A22-T2-2	Subsea Intervention Stack	I				x	x
A22-T2-3	Surface Processing Systems	I				x	
A22-T2-4	Dual Barrier Choke/Kill Lines	I				x	
A22-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A22-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8,9		x	x	
A22-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8,9		x	x	
A22-T3-3	Drive Off/Drift Off Analysis	D	5,7			x	
A22-T3-4	ESD Sequencing	I					x
A22-T3-5	MetOcean Monitoring	I				x	x
A22-T3-6	DPO Protocols & Training	D	1,2,3,4,5,7,8,9		x	x	
A22-T3-7	Maintenance Program	D	1,2,5		x		
A22-T3-8	Power & System Redundancy	I			x	x	
A22-T3-9	Manual Over Ride/Control	D	1,2,3,5,6			x	x
Threat 4: Accidental Disconnect of Coil							
A22-T4-1	System of Maintenance	D	2,3		x	x	
A22-T4-2	Weak Point Analysis	D	1,3			x	x
A22-T4-3	Training	D	1,2		x	x	
Threat 5: Controlled Disconnect of Coil							
A22-T5-1	Break Away System/Capability	I			x		
A22-T5-2	Pay Out until Regain Station Keeping-Varies per Vessel?	I			x		
A22-T5-3	EDS Procedures & Training	D	1,2		x	x	
A22-T5-4	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A22-T6-1	Training	D	3,4,5,6,7		x	x	
A22-T6-2	Housekeeping	I			x	x	
A22-T6-3	Permitted Lift Plans	I				x	x
A22-T6-4	Dropped Object Risk Assessment	I				x	x
A22-T6-5	Safe Approach Plans	I				x	x
A22-T6-6	SIMOPS Plan/Shut-in	I				x	x
A22-T6-7	ESD System	I					x
Threat 7: Complete Power Loss (Black Ship)							
A22-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A22-T7-2	UPS	I			x	x	
A22-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A22-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A22-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A22-T7-6	Auxiliary Power Systems	I			x	x	
A22-T7-7	External ROV Over Ride	I				x	x
A22-T7-8	Dead Man Functionality	I				x	x
Threat 8: Pressure Control Head Failure (Grease Head Failure)							
A22-T8-1	Maintenance Program	D	2,3,4		x		
A22-T8-2	Procedures, Drills & Training	D	1,3,4		x	x	
A22-T8-3	Intervention Stack	I				x	x
A22-T8-4	Pack Off (3-2 active/1 redundant)	I				x	x
Threat 9: Vessel SIMOPS-Collision/Interference/Other Transfers							
A22-T9-1	SIMOPS Plan	D	2,3,4			x	
A22-T9-2	Drive Off/Drift Off Analysis	D	1,4			x	
A22-T9-3	Frequency Management Plans	D	1,2,4		x		
A22-T9-4	COLREGS Systems	I				x	
Threat 10: Vessel SIMOPS-Collision/Interference/Other Transfers							
A22-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A22-T10-2	Training	D	1,3,4,5		x	x	
A22-T10-3	System Architecture/Firewalls	I				x	
A22-T10-4	Protective Software	I			x		
A22-T10-5	System Integrity/Security	I			x		

4.22 Case A24 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 73 Case A24 Threats and Associated Barriers

CASE A24 - OP2 SIV Riserless Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A24-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A24-T1-2	Well Tree	I				x	
A24-T1-3	Disconnect/Drive Off	I				x	
A24-T1-4	Stim Package Testing	D	1,2,6		x	x	
A24-T1-5	Maintenance Program	D	1,2,6		x		
A24-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A24-T2-1	Subsea Intervention Stack	I				x	x
A24-T2-2	Surface Processing Systems	I				x	
A24-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A24-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A24-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	1,3,4,5,6,7,8		x	x	
A24-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A24-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A24-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,6,7,8		x	x	
A24-T3-6	Maintenance Program	D	1,2,4		x		
A24-T3-7	Power & System Redundancy	I			x	x	
A24-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A24-T4-1	Training	D	3,4,5,6,7		x	x	
A24-T4-2	Housekeeping	I			x	x	
A24-T4-3	Permitted Lift Plans	I				x	x
A24-T4-4	Dropped Object Risk Assessment	I				x	x
A24-T4-5	Safe Approach Plans	I				x	x
A24-T4-6	Establish a Watch Circle	D	1,3,4,5,7			x	
A24-T4-7	SIMOPS Plan/Shut-in	I				x	x
A24-T4-8	ESD Systems	I					x
A24-T4-9	Elevation Survey of Subsea Architecture	I				x	
A24-T4-10	Weak Point Analysis	D	3,4,5,9			x	x
Threat 5: Complete Power Loss (Black Ship)							
A24-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A24-T5-2	UPS	I			x	x	
A24-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A24-T5-4	Auto Recovery of Power Systems	I			x	x	
A24-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A24-T5-6	Auxiliary Power Systems	I			x	x	
A24-T5-7	External ROV Over Ride	I				x	x
A24-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIOMPS-Collision/Interference/Other Transfers							
A24-T6-1	SIMOPS Plan	D	2,3,4			x	x
A24-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A24-T6-3	Frequency Management Plans	D	1,2,4		x		
A24-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A24-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A24-T7-2	Training	D	1,3,4,5		x	x	
A24-T7-3	System Architecture/Firewalls	I				x	
A24-T7-4	Protective Software	I			x		
A24-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A24-T8-1	Pressure Testing	D	2,3,4		x		
A24-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A24-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A24-T8-4	Pressure Relief Valves	I				x	x

4.23 Case A25 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 74 Case A25 Threats and Associated Barriers

CASE A25 - OP3 SIV Riser Intervention (open water, non-marine) Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A25-T1-1	HPU Maintenance & Inspection	D	2,3,6,7,8		x		
A25-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A25-T1-3	Lubricator Testing	D	2,6,7,8		x	x	
A25-T1-4	Well Tree-Vertical Tree Only	I				x	
A25-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A25-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A25-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A25-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A25-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A25-T2-2	Subsea Intervention Stack	I				x	x
A25-T2-3	Surface Processing Systems	I				x	
A25-T2-4	Monitoring/Kick Detection	I				x	
A25-T2-5	Surface PCE	I				x	x
A25-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A25-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A25-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A25-T3-2	Well Specific Operating Procedures & Training	D	3,4,6,7,8		x	x	
A25-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8			x	
A25-T3-4	MetOcean Monitoring	I				x	x
A25-T3-5	DPO Protocols & Training	D	1,2,3,4,6,7,8		x	x	
A25-T3-6	Maintenance Program	D	7,8		x		
A25-T3-7	Power & System Redundancy	I			x	x	
A25-T3-8	Manual Over Ride/Control	D	3,5,6,7			x	x
Threat 4: Dropped Object Striking Equipment							
A25-T4-1	Training	D	3,4,5,6,7		x	x	
A25-T4-2	Housekeeping	I			x	x	
A25-T4-3	Permitted Lift Plans	I				x	x
A25-T4-4	Dropped Object Risk Assessment	I				x	x
A25-T4-5	Safe Approach Plans	I				x	x
A25-T4-6	SIMOPS Plan/Shut-in	I				x	x
A25-T4-7	ESD System	I					x
Threat 5: Complete Power Loss (Black Ship)							
A25-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A25-T5-2	UPS	I			x	x	
A25-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A25-T5-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A25-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A25-T5-6	Auxiliary Power Systems	I			x	x	
A25-T5-7	External ROV Over Ride	I				x	x
A25-T5-8	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A25-T6-1	Intervention Stack	I				x	x
A25-T6-2	Pressure Testing	D	1,3,4		x		
A25-T6-3	Maintenance Program	D	2,4		x		
A25-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A25-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A25-T7-2	Riser Analysis	D	3,4,5		x		
A25-T7-3	Connection Design & Selection	D	2,4,5		x		
A25-T7-4	Intervention Stack	I				x	x
A25-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A25-T8-1	SIMOPS Plan	D	2,3,4			x	
A25-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A25-T8-3	Frequency Management Plans	D	1,2,4		x		
A25-T8-4	COLREGS Systems	I				x	
Threat 9: Cyber-Threat/Virus/Malware							
A25-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A25-T9-2	Training	D	1,3,4,5		x	x	
A25-T9-3	System Architecture/Firewalls	I				x	
A25-T9-4	Protective Software	I			x		
A25-T9-5	System Integrity/Security	I			x		

4.24 Case A26 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 75 Case A26 Threats and Associated Barriers

CASE A26 - OP3 SIV Riser Intervention (open water, non-marine) Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A26-T1-1	HPU Maintenance & Inspection	D	2,3,7		x		
A26-T1-2	Surface PCE	I				x	x
A26-T1-3	Well Tree-Vertical Tree Only	I				x	
A26-T1-4	Independent 3rd Party BOP Certification	D	2,3,7		x	x	
A26-T1-5	Intervention Stack Testing	D	2,3,7		x	x	
A26-T1-6	Maintenance Program	D	2,3,7		x		
A26-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A26-T2-1	Pressure Control Head Installed	I				x	
A26-T2-2	Subsea Intervention Stack	I				x	x
A26-T2-3	Surface Processing Systems	I				x	
A26-T2-4	Monitoring/Kick Detection	I				x	
A26-T2-5	Surface PCE	I				x	x
A26-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A26-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A26-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A26-T3-2	Well Specific Operating Procedures & Training	D	2,3,4,5,6,8,9,10,11		x	x	
A26-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8,10,11			x	
A26-T3-4	Riser Analysis	D	7,9		x		
A26-T3-5	ESD Sequences	I					x
A26-T3-6	Emergency Disconnect Sequences	D	5			x	
A26-T3-7	MetOcean Monitoring	I				x	x
A26-T3-8	DPO Protocols & Training	D	1,2,3,5,6,10,11		x	x	
A26-T3-9	Maintenance Program	D	2		x		
A26-T3-10	Power & System Redundancy	I			x	x	
A26-T3-11	Manual Over Ride/Control	D	1,2,3,5,6,8			x	x
Threat 4: Dropped Object Striking Equipment							
A26-T4-1	Training	D	3,4,5,6,7		x	x	
A26-T4-2	Housekeeping	I			x	x	
A26-T4-3	Permitted Lift Plans	I				x	x
A26-T4-4	Dropped Object Risk Assessment	I				x	x
A26-T4-5	Safe Approach Plans	I				x	x
A26-T4-6	SIMOPS Plan/Shut-in	I				x	x
A26-T4-7	ESD System	I					x
Threat 5: Complete Power Loss (Black Ship)							
A26-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A26-T5-2	UPS	I			x	x	
A26-T5-3	Drift Off Analysis	D	2,4,5,6,7,8,9,11			x	
A26-T5-4	Riser Analysis	D	11		x		
A26-T5-5	ESD Sequences	I					x
A26-T5-6	Emergency Disconnect Sequences	D	5,7,9,10,11			x	
A26-T5-7	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A26-T5-8	Procedures, Drills & Training	D	1,5,6,7,9,10,11		x	x	
A26-T5-9	Auxiliary Power Systems	I			x	x	
A26-T5-10	External ROV Over Ride	I				x	x
A26-T5-11	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A26-T6-1	Intervention Stack	I				x	x
A26-T6-2	Pressure Testing	D	1,3,4		x		
A26-T6-3	Maintenance Program	D	2,4		x		
A26-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A26-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A26-T7-2	Riser Analysis	D	3,4,5		x		
A26-T7-3	Connection Design & Selection	D	2,4,5		x		
A26-T7-4	Intervention Stack	I				x	x
A26-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A26-T8-1	SIMOPS Plan	D	2,3,4			x	
A26-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A26-T8-3	Frequency Management Plans	D	1,2,4		x		
A26-T8-4	COLREGS Systems	I				x	
Threat 9: Cyber-Threat/Virus/Malware							
A26-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A26-T9-2	Training	D	1,3,4,5		x	x	
A26-T9-3	System Architecture/Firewalls	I				x	
A26-T9-4	Protective Software	I			x		
A26-T9-5	System Integrity/Security	I			x		

4.25 Case A27 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 76 Case A27 Threats and Associated Barriers

CASE A27 - OP3 Riser Intervention (open water, non-marine) Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A27-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A27-T1-2	Well Tree	I				x	
A27-T1-3	Disconnect/Drive Off	I				x	
A27-T1-4	Stim Package Testing	D	1,2,6		x	x	
A27-T1-5	Maintenance Program	D	1,2,6		x		
A27-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A27-T2-1	Subsea Intervention Stack	I				x	x
A27-T2-2	Surface Processing Systems	I				x	
A27-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A27-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A27-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	3,4,6,7,8		x	x	
A27-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8			x	
A27-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A27-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,4,6,7,8		x	x	
A27-T3-6	Maintenance Program	D	7,8		x		
A27-T3-7	Power & System Redundancy	I			x	x	
A27-T3-8	Manual Over Ride/Control	D	3,5,6,7			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A27-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A27-T4-2	Housekeeping	I			x	x	
A27-T4-3	Permitted Lift Plans	I				x	x
A27-T4-4	Dropped Object Risk Assessment	I				x	x
A27-T4-5	Safe Approach Plans	I				x	x
A27-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A27-T4-7	SIMOPS Plan/Shut-In	I				x	x
A27-T4-8	ESD Systems	I					x
A27-T4-9	Elevation Survey of Subsea Architecture	I				x	
A27-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A27-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A27-T5-2	UPS	I			x	x	
A27-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A27-T5-4	Auto Recovery of Power Systems	I			x	x	
A27-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A27-T5-6	Auxiliary Power Systems	I			x	x	
A27-T5-7	External ROV Over Ride	I				x	x
A27-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A27-T6-1	SIMOPS Plan	D	2,3,4			x	
A27-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A27-T6-3	Frequency Management Plans	D	1,2,4		x		
A27-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A27-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A27-T7-2	Training	D	1,3,4,5		x	x	
A27-T7-3	System Architecture/Firewalls	I				x	
A27-T7-4	Protective Software	I			x		
A27-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A27-T8-1	Pressure Testing	D	2,3,4		x		
A27-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A27-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A27-T8-4	Pressure Relief Valves	I				x	x

4.26 Case A28 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 77 Case A28 Threats and Associated Barriers

CASE A28 - OP3 Riser Intervention (open water, non-marine) Flowback		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A28-T1-1	Surface PCE Equipment	I				x	x
A28-T1-2	Well Tree-Vertical Tree Only	I				x	
A28-T1-3	SSTT/Landing String-Horz Only	I					x
A28-T1-4	Independent 3rd Party BOP Certification	D	2,3,6		x	x	
A28-T1-5	BOP Testing	D	2,3,6		x	x	
A28-T1-6	Maintenance Program	D	1,2,3,4,5		x		
A28-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A28-T2-1	Surface Processing Systems	I				x	
A28-T2-2	Monitoring/Kick Detection	I				x	
A28-T2-3	Subsea BOP	I				x	
A28-T2-4	Surface PCE	I				x	x
A28-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A28-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A28-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A28-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A28-T3-4	MetOcean Monitoring	I				x	x
A28-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A28-T3-6	Maintenance Program	D	1,2,4		x		
A28-T3-7	Power & System Redundancy	I			x	x	
A28-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Accidental Disconnect							
A28-T4-1	SSTT Sealing Systems Horz Tree Only	I					x
A28-T4-2	System Maintenance	D	1,4		x	x	
A28-T4-3	Weak Point Analysis	D	1,4			x	x
A28-T4-4	Auto-Shear Functionality	I				x	x
A28-T4-5	Training	D	1,2,3,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A28-T5-1	Retraction System/Capability	I				x	
A28-T5-2	EDS Procedures & Training	D	1,3		x	x	
A28-T5-3	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A28-T6-1	Training	D	3,4,5,6,7		x	x	
A28-T6-2	Housekeeping	I			x	x	
A28-T6-3	Permitted Lift Plans	I				x	x
A28-T6-4	Dropped Object Risk Assessment	I				x	x
A28-T6-5	Safe Approach Plans	I				x	x
A28-T6-6	SIMOPS Plan/Shut-In	I				x	x
A28-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A28-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A28-T7-2	UPS	I			x	x	
A28-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A28-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A28-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A28-T7-6	Emergency Generators/Redundant Engine Rooms	I			x	x	
A28-T7-7	External ROV Over Ride	I				x	x
A28-T7-8	Dead Man Functionality	I				x	x
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A28-T8-1	SIMOPS Plan	D	2,3,4			x	
A28-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A28-T8-3	Frequency Management Plans	D	1,2,4		x		
A28-T8-4	COLREGS Systems	I				x	
Threat 9: Cyber Threat/Virus/Malware							
A28-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A28-T8-2	Training	D	1,3,4,5		x	x	
A28-T8-3	System Architecture/Firewalls	I				x	
A28-T8-4	Protective Software	I			x		
A28-T8-5	System Integrity/Security	I			x		

4.27 Case A29 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 78 Case A29 Threats and Associated Barriers

CASE A29 - OP4 SIV Well Stim Hydraulic Pumping		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A29-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A29-T1-2	Well Tree	I				x	
A29-T1-3	Disconnect/Drive Off	I				x	
A29-T1-4	Stim Package Testing	D	1,2,6		x	x	
A29-T1-5	Maintenance Program	D	1,2,6		x		
A29-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A29-T2-1	Subsea Intervention Stack	I				x	x
A29-T2-2	Surface Processing Systems	I				x	
A29-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A29-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A29-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	3,4,6,7,8		x	x	
A29-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8			x	
A29-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A29-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,4,6,7,8		x	x	
A29-T3-6	Maintenance Program	D	7,8		x		
A29-T3-7	Power & System Redundancy	I			x	x	
A29-T3-8	Manual Over Ride/Control	D	3,5,6,7			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A29-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A29-T4-2	Housekeeping	I			x	x	
A29-T4-3	Permitted Lift Plans	I				x	x
A29-T4-4	Dropped Object Risk Assessment	I				x	x
A29-T4-5	Safe Approach Plans	I				x	x
A29-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A29-T4-7	SIMOPS Plan/Shut-In	I				x	x
A29-T4-8	ESD Systems	I					x
A29-T4-9	Elevation Survey of Subsea Architecture	I				x	
A29-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A29-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A29-T5-2	UPS	I			x	x	
A29-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A29-T5-4	Auto Recovery of Power Systems	I			x	x	
A29-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A29-T5-6	Auxiliary Power Systems	I			x	x	
A29-T5-7	External ROV Over Ride	I				x	x
A29-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A29-T6-1	SIMOPS Plan	D	2,3,4			x	
A29-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A29-T6-3	Frequency Management Plans	D	1,2,4		x		
A29-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A29-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A29-T7-2	Training	D	1,3,4,5		x	x	
A29-T7-3	System Architecture/Firewalls	I				x	
A29-T7-4	Protective Software	I			x		
A29-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A29-T8-1	Pressure Testing	D	2,3,4		x		
A29-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A29-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A29-T8-4	Pressure Relief Valves	I				x	x

4.28 Case A30 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 79 Case A30 Threats and Associated Barriers

CASE A30 - OP2 OSV Riserless Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A30-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A30-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A30-T1-3	Lubricator Testing	D	2,7,8		x	x	
A30-T1-4	Well Tree-Vertical Tree Only	I				x	
A30-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A30-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A30-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A30-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A30-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A30-T2-2	Subsea Intervention Stack	I				x	x
A30-T2-3	Surface Processing Systems	I				x	
A30-T2-4	Monitoring/Kick Detection	I				x	
A30-T2-5	Surface PCE	I				x	x
A30-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A30-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A30-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A30-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A30-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A30-T3-4	MetOcean Monitoring	I				x	x
A30-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A30-T3-6	Maintenance Program	D	1,2,4		x		
A30-T3-7	Power & System Redundancy	I			x	x	
A30-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Accidental Disconnect of Coil							
A30-T4-1	System Maintenance	D	2		x	x	
A30-T4-2	Weak Point Analysis	D	1			x	x
A30-T4-3	Auto-Shear Functionality	I				x	x
A30-T4-4	Training	D	1,2,3		x	x	
Threat 5: Controlled Disconnect of Coil not Executed Properly							
A30-T5-1	Break Away System/Capability	I			x		
A30-T5-2	Pay Out until Regain Station Keeping	I			x		
A30-T5-3	EDS Procedures & Training	D	2,4		x	x	
A30-T5-4	EDS Modes	D	2,3				x
Threat 6: Dropped Object Striking Equipment							
A30-T6-1	Training	D	3,4,5,6,7		x	x	
A30-T6-2	Housekeeping	I			x	x	
A30-T6-3	Permitted Lift Plans	I				x	x
A30-T6-4	Dropped Object Risk Assessment	I				x	x
A30-T6-5	Safe Approach Plans	I				x	x
A30-T6-6	SIMOPS Plan/Shut-In	I				x	x
A30-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A30-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A30-T7-2	UPS	I			x	x	
A30-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A30-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A30-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A30-T7-6	Auxiliary Power Systems	I			x	x	
A30-T7-7	External ROV Over Ride	I				x	x
A30-T7-8	Dead Man Functionality	I				x	x
Threat 8: Pressure Control Head Failure (Grease Head Failure)							
A30-T8-1	Maintenance Program	D	2,3,4		x		
A30-T8-2	Procedures	D	1,3,4		x	x	
A30-T8-3	Intervention Stack	I				x	x
A30-T8-4	Pack Off (3-2 active/1 redundant)	I				x	x
Threat 9: Vessel SIMOPS-Collision/Interference/Other Transfers							
A30-T9-1	SIMOPS Plan	D	2,3,4			x	
A30-T9-2	Drive Off/Drift Off Analysis	D	1,4			x	
A30-T9-3	Frequency Management Plans	D	1,2,4		x		
A30-T9-4	COLREGS System	I				x	
Threat 10: Cyber-Threat/Virus/Malware							
A30-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A30-T10-2	Training	D	1,3,4,5		x	x	
A30-T10-3	System Architecture/Firewalls	I				x	
A30-T10-4	Protective Software	I			x		
A30-T10-5	System Integrity/Security	I			x		

4.29 Case A32 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 80 Case A32 Threats and Associated Barriers

CASE A32 - OP2 OSV Riserless Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A32-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A32-T1-2	Well Tree	I				x	
A32-T1-3	Disconnect/Drive Off	I				x	
A32-T1-4	Stim Package Testing	D	1,2,6		x	x	
A32-T1-5	Maintenance Program	D	1,2,6		x		
A32-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A32-T2-1	Subsea Intervention Stack	I				x	x
A32-T2-2	Surface Processing Systems	I				x	
A32-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A32-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A32-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	1,3,4,5,6,7,8		x	x	
A32-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A32-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A32-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,6,7,8		x	x	
A32-T3-6	Maintenance Program	D	1,2,4		x		
A32-T3-7	Power & System Redundancy	I			x	x	
A32-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A32-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A32-T4-2	Housekeeping	I			x	x	
A32-T4-3	Permitted Lift Plans	I				x	x
A32-T4-4	Dropped Object Risk Assessment	I				x	x
A32-T4-5	Safe Approach Plans	I				x	x
A32-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A32-T4-7	SIMOPS Plan/Shut-In	I				x	x
A32-T4-8	ESD Systems	I					x
A32-T4-9	Elevation Survey of Subsea Architecture	I				x	
A32-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A32-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A32-T5-2	UPS	I			x	x	
A32-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A32-T5-4	Auto Recovery of Power Systems	I			x	x	
A32-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A32-T5-6	Auxiliary Power Systems	I			x	x	
A32-T5-7	External ROV Over Ride	I				x	x
A32-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A32-T6-1	SIMOPS Plan	D	2,3,4			x	
A32-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A32-T6-3	Frequency Management Plans	D	1,2,4		x		
A32-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A32-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A32-T7-2	Training	D	1,3,4,5		x	x	
A32-T7-3	System Architecture/Firewalls	I				x	
A32-T7-4	Protective Software	I			x		
A32-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A32-T8-1	Pressure Testing	D	2,3,4		x		
A32-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A32-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A32-T8-4	Pressure Relief Valves	I				x	x

4.30 Case A33 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 81 Case A33 Threats and Associated Barriers

CASE A33 - OP4 OSV Well Stim Hydraulic Pumping		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A33-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A33-T1-2	Well Tree	I				x	
A33-T1-3	Disconnect/Drive Off	I				x	
A33-T1-4	Stim Package Testing	D	1,2,6		x	x	
A33-T1-5	Maintenance Program	D	1,2,6		x		
A33-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A33-T2-1	Subsea Intervention Stack	I				x	x
A33-T2-2	Surface Processing Systems	I				x	
A33-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A33-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A33-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	1,3,4,5,6,7,8		x	x	
A33-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A33-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A33-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,6,7,8		x	x	
A33-T3-6	Maintenance Program	D	1,2,4		x		
A33-T3-7	Power & System Redundancy	I			x	x	
A33-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A33-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A33-T4-2	Housekeeping	I			x	x	
A33-T4-3	Permitted Lift Plans	I				x	x
A33-T4-4	Dropped Object Risk Assessment	I				x	x
A33-T4-5	Safe Approach Plans	I				x	x
A33-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A33-T4-7	SIMOPS Plan/Shut-In	I				x	x
A33-T4-8	ESD Systems	I					x
A33-T4-9	Elevation Survey of Subsea Architecture	I				x	
A33-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A33-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A33-T5-2	UPS	I			x	x	
A33-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A33-T5-4	Auto Recovery of Power Systems	I			x	x	
A33-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A33-T5-6	Auxiliary Power Systems	I			x	x	
A33-T5-7	External ROV Over Ride	I				x	x
A33-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A33-T6-1	SIMOPS Plan	D	2,3,4			x	
A33-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A33-T6-3	Frequency Management Plans	D	1,2,4		x		
A33-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A33-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A33-T7-2	Training	D	1,3,4,5		x	x	
A33-T7-3	System Architecture/Firewalls	I				x	
A33-T7-4	Protective Software	I			x		
A33-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A33-T8-1	Pressure Testing	D	2,3,4		x		
A33-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A33-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A33-T8-4	Pressure Relief Valves	I				x	x

4.31 Case A34 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 82 Case A34 Threats and Associated Barriers

CASE A34 - OP4 FB Well Stim Hydraulic Pumping		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A34-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A34-T1-2	Well Tree	I				x	
A34-T1-3	Disconnect/Drive Off	I				x	
A34-T1-4	Stim Package Testing	D	1,2,6		x	x	
A34-T1-5	Maintenance Program	D	1,2,6		x		
A34-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A34-T2-1	Subsea Intervention Stack	I				x	x
A34-T2-2	Surface Processing Systems	I				x	
A34-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A34-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A34-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	1,3,4,5,6,7,8		x	x	
A34-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A34-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A34-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,6,7,8		x	x	
A34-T3-6	Maintenance Program	D	1,2,4		x		
A34-T3-7	Power & System Redundancy	I			x	x	
A34-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A34-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A34-T4-2	Housekeeping	I			x	x	
A34-T4-3	Permitted Lift Plans	I				x	x
A34-T4-4	Dropped Object Risk Assessment	I				x	x
A34-T4-5	Safe Approach Plans	I				x	x
A34-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A34-T4-7	SIMOPS Plan/Shut-In	I				x	x
A34-T4-8	ESD Systems	I					x
A34-T4-9	Elevation Survey of Subsea Architecture	I				x	
A34-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A34-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A34-T5-2	UPS	I			x	x	
A34-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A34-T5-4	Auto Recovery of Power Systems	I			x	x	
A34-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A34-T5-6	Auxiliary Power Systems	I			x	x	
A34-T5-7	External ROV Over Ride	I				x	x
A34-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A34-T6-1	SIMOPS Plan	D	2,3,4			x	
A34-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A34-T6-3	Frequency Management Plans	D	1,2,4		x		
A34-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A34-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A34-T7-2	Training	D	1,3,4,5		x	x	
A34-T7-3	System Architecture/Firewalls	I				x	
A34-T7-4	Protective Software	I			x		
A34-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A34-T8-1	Pressure Testing	D	2,3,4		x		
A34-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A34-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A34-T8-4	Pressure Relief Valves	I				x	x

4.32 Case A36 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 83 Case A36 Threats and Associated Barriers

CASE A36 - OP2 CV Riserless Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A36-T1-1	HPU Maintenance & Inspection	D	2,3,7		x		
A36-T1-2	Surface PCE	I				x	x
A36-T1-3	Well Tree-Vertical Tree Only	I				x	
A36-T1-4	Independent 3rd Party BOP Certification	D	2,3,7		x	x	
A36-T1-5	Intervention Stack Testing	D	2,3,7		x	x	
A36-T1-6	Maintenance Program	D	2,3,7		x		
A36-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A36-T2-1	Pressure Control Head Installed	I					x
A36-T2-2	Subsea Intervention Stack	I				x	x
A36-T2-3	Surface Processing Systems	I				x	
A36-T2-4	Monitoring/Kick Detection	I				x	
A36-T2-5	Surface PCE	I				x	x
A36-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A36-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A36-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A36-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A36-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A36-T3-4	MetOcean Monitoring	I				x	x
A36-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A36-T3-6	Maintenance Program	D	1,2,4		x		
A36-T3-7	Power & System Redundancy	I			x	x	
A36-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Accidental Disconnect of Coil							
A36-T4-1	System Maintenance	D	3		x	x	
A36-T4-2	Weak Point Analysis	D	3			x	x
A36-T4-3	Auto-Shear Functionality	I				x	x
A36-T4-4	Training	D	1,2,3		x	x	
Threat 5: Controlled Disconnect of Coil not Executed Properly							
A36-T5-1	Break Away System/Capability	I			x		
A36-T5-2	Pay Out until Regain Station Keeping	I			x		
A36-T5-3	EDS Procedures & Training	D	1,2		x	x	
A36-T5-4	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A36-T6-1	Training	D	3,4,5,6,7		x	x	
A36-T6-2	Housekeeping	I			x	x	
A36-T6-3	Permitted Lift Plans	I				x	x
A36-T6-4	Dropped Object Risk Assessment	I				x	x
A36-T6-5	Safe Approach Plans	I				x	x
A36-T6-6	SIMOPS Plan/Shut-In	I				x	x
A36-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A36-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A36-T7-2	UPS	I			x	x	
A36-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A36-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A36-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A36-T7-6	Auxiliary Power Systems	I			x	x	
A36-T7-7	External ROV Over Ride	I				x	x
A36-T7-8	Dead Man Functionality	I				x	x
Threat 8: Pressure Control Head Failure (Grease Head Failure)							
A36-T8-1	Maintenance Program	D	2,3,4		x		
A36-T8-2	Procedures	D	1,3,4		x	x	
A36-T8-3	Intervention Stack	I				x	x
A36-T8-4	Pack Off (3-2 active/1 redundant)	I				x	x
Threat 9: Vessel SIMOPS-Collision/Interference/Other Transfers							
A36-T9-1	SIMOPS Plan	D	2,3,4			x	
A36-T9-2	Drive Off/Drift Off Analysis	D	1,4			x	
A36-T9-3	Frequency Management Plans	D	1,2,4		x		
A36-T9-4	COLREGS System	I				x	
Threat 10: Cyber-Threat/Virus/Malware							
A36-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A36-T10-2	Training	D	1,3,4,5		x	x	
A36-T10-3	System Architecture/Firewalls	I				x	
A36-T10-4	Protective Software	I			x		
A36-T10-5	System Integrity/Security	I			x		

4.33 Case A37 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 84 Case A37 Threats and Associated Barriers

CASE A37 - OP4 CV Well Stim Hydraulic Pumping		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A37-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A37-T1-2	Well Tree	I				x	
A37-T1-3	Disconnect/Drive Off	I				x	
A37-T1-4	Stim Package Testing	D	1,2,6		x	x	
A37-T1-5	Maintenance Program	D	1,2,6		x		
A37-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A37-T2-1	Subsea Intervention Stack	I				x	x
A37-T2-2	Surface Processing Systems	I				x	
A37-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A37-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A37-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	3,4,6,7,8		x	x	
A37-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8			x	
A37-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A37-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,4,6,7,8		x	x	
A37-T3-6	Maintenance Program	D	7,8		x		
A37-T3-7	Power & System Redundancy	I			x	x	
A37-T3-8	Manual Over Ride/Control	D	3,5,6,7			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A37-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A37-T4-2	Housekeeping	I			x	x	
A37-T4-3	Permitted Lift Plans	I				x	x
A37-T4-4	Dropped Object Risk Assessment	I				x	x
A37-T4-5	Safe Approach Plans	I				x	x
A37-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A37-T4-7	SIMOPS Plan/Shut-In	I				x	x
A37-T4-8	ESD Systems	I					x
A37-T4-9	Elevation Survey of Subsea Architecture	I				x	
A37-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A37-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A37-T5-2	UPS	I			x	x	
A37-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A37-T5-4	Auto Recovery of Power Systems	I			x	x	
A37-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A37-T5-6	Auxiliary Power Systems	I			x	x	
A37-T5-7	External ROV Over Ride	I				x	x
A37-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A37-T6-1	SIMOPS Plan	D	2,3,4			x	
A37-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A37-T6-3	Frequency Management Plans	D	1,2,4		x		
A37-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A37-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A37-T7-2	Training	D	1,3,4,5		x	x	
A37-T7-3	System Architecture/Firewalls	I				x	
A37-T7-4	Protective Software	I			x		
A37-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A37-T8-1	Pressure Testing	D	2,3,4		x		
A37-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A37-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A37-T8-4	Pressure Relief Valves	I				x	x

4.34 Case A38 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 85 Case A38 Threats and Associated Barriers

CASE A38 - OP3 CV Riser Intervention (open water, non-marine riser) Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A38-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A38-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A38-T1-3	Lubricator Testing	D	2,7,8		x	x	
A38-T1-4	Well Tree-Vertical Tree Only	I				x	
A38-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A38-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A38-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A38-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A38-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A38-T2-2	Subsea Intervention Stack	I				x	x
A38-T2-3	Surface Processing Systems	I				x	
A38-T2-4	Monitoring/Kick Detection	I				x	
A38-T2-5	Surface PCE	I				x	x
A38-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A38-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A38-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A38-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A38-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A38-T3-4	MetOcean Monitoring	I				x	x
A38-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A38-T3-6	Maintenance Program	D	1,2,4		x		
A38-T3-7	Power & System Redundancy	I			x	x	
A38-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Dropped Object Striking Equipment							
A38-T4-1	Training	D	3,4,5,6,7		x	x	
A38-T4-2	Housekeeping	I			x	x	
A38-T4-3	Permitted Lift Plans	I				x	x
A38-T4-4	Dropped Object Risk Assessment	I				x	x
A38-T4-5	Safe Approach Plans	I				x	x
A38-T4-6	SIMOPS Plan/Shut-In	I				x	x
A38-T4-7	ESD Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A38-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A38-T5-2	UPS	I			x	x	
A38-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A38-T5-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A38-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A38-T5-6	Auxiliary Power Systems	I			x	x	
A38-T5-7	External ROV Over Ride	I				x	x
A38-T5-8	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A38-T6-1	Intervention Stack	I				x	x
A38-T6-2	Pressure Testing	D	1,3,4		x		
A38-T6-3	Maintenance Program	D	2,4		x		
A38-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A38-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A38-T7-2	Riser Analysis	D	3,4,5		x		
A38-T7-3	Connection Design & Selection	D	2,4,5		x		
A38-T7-4	Intervention Stack	I				x	x
A38-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A38-T8-1	SIMOPS Plan	D	2,3,4			x	
A38-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A38-T8-3	Frequency Management Plans	D	1,2,4		x		
A38-T8-4	COLREGS System	I				x	
Threat 9: Cyber-Threat/Virus/Malware							
A38-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A38-T9-2	Training	D	1,3,4,5		x	x	
A38-T9-3	System Architecture/Firewalls	I				x	
A38-T9-4	Protective Software	I			x		
A38-T9-5	System Integrity/Security	I			x		

4.35 Case A39 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 86 Case A39 Threats and Associated Barriers

CASE A39 - OP3 CV Riser Intervention (open water, non-marine riser) Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A39-T1-1	HPU Maintenance & Inspection	D	2,3,7		x		
A39-T1-2	Surface PCE	I				x	x
A39-T1-3	Well Tree-Vertical Tree Only	I				x	
A39-T1-4	Independent 3rd Party BOP Certification	D	2,3,7		x	x	
A39-T1-5	Intervention Stack Testing	D	2,3,7		x	x	
A39-T1-6	Maintenance Program	D	2,3,7		x		
A39-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A39-T2-1	Pressure Control Head Installed	I				x	
A39-T2-2	Subsea Intervention Stack	I				x	x
A39-T2-3	Surface Processing Systems	I				x	
A39-T2-4	Monitoring/Kick Detection	I				x	
A39-T2-5	Surface PCE	I				x	x
A39-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A39-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Station Keeping (DP)							
A39-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A39-T3-2	Well Specific Operating Procedures & Training	D	2,3,4,5,6,8,9,10,11		x	x	
A39-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8,10,11			x	
A39-T3-4	Riser Analysis	D	7,9		x		
A39-T3-5	ESD Sequences	I					x
A39-T3-6	Emergency Disconnect Sequences	D	5			x	
A39-T3-7	MetOcean Monitoring	I				x	x
A39-T3-8	DPO Protocol Training	D	1,2,3,5,6,10,11		x	x	
A39-T3-9	Maintenance Program	D	2		x		
A39-T3-10	Power & System Redundancy	I			x	x	
A39-T3-11	Manual Over Ride/Control	D	1,2,3,5,6,8			x	x
Threat 4: Dropped Object Striking Equipment							
A39-T4-1	Training	D	3,4,5,6,7		x	x	
A39-T4-2	Housekeeping	I			x	x	
A39-T4-3	Permitted Lift Plans	I				x	x
A39-T4-4	Dropped Object Risk Assessment	I				x	x
A39-T4-5	Safe Approach Plans	I				x	x
A39-T4-6	SIMOPS Plan/Shut-In	I				x	x
A39-T4-7	ESD Systems	I					x
Threat 5: Complete Power Loss (Black Ship)							
A39-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8,9,10,11		x	x	
A39-T5-2	UPS	I			x	x	
A39-T5-3	Drift Off Analysis	D	2,4,5,6,7,8,9,11			x	
A39-T5-4	Riser Analysis	D	11		x		
A39-T5-5	ESD Sequences	I					x
A39-T5-6	Emergency Disconnect Sequences	D	5,7,9,10,11			x	
A39-T5-7	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A39-T5-8	Procedures, Drills & Training	D	1,5,6,7,9,10,11		x	x	
A39-T5-9	Auxiliary Power Systems	I			x	x	
A39-T5-10	External ROV Override	I				x	x
A39-T5-11	Dead Man Functionality	I				x	x
Threat 6: Surface PCE Failure							
A39-T6-1	Intervention Stack	I				x	x
A39-T6-2	Pressure Testing	D	1,3,4		x		
A39-T6-3	Maintenance Program	D	2,4		x		
A39-T6-4	3rd Party Verification	D	1,2,3		x	x	
Threat 7: Non-Marine Riser Failure							
A39-T7-1	Pressure Testing & Inspections	D	2,3,4,5		x		
A39-T7-2	Riser Analysis	D	3,4,5		x		
A39-T7-3	Connection Design & Selection	D	2,4,5		x		
A39-T7-4	Intervention Stack	I				x	x
A39-T7-5	Well Tree-Vertical Tree Only	I				x	
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A39-T8-1	SIMOPS Plan	D	2,3,4			x	
A39-T8-2	Drive Off/Drift Off Analysis	D	1,4			x	
A39-T8-3	Frequency Management Plans	D	1,2,4		x		
A39-T8-4	COLREGS Systems	I				x	
Threat 9: Cyber-Threat/Virus/Malware							
A39-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A39-T9-2	Training	D	1,3,4,5		x	x	
A39-T9-3	System Architecture/Firewalls	I				x	
A39-T9-4	Protective Software	I			x		
A39-T9-5	System Integrity/Security	I			x		

4.36 Case A40 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 87 Case A40 Threats and Associated Barriers

CASE A40 - OP3 CV Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A40-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A40-T1-2	Well Tree	I				x	
A40-T1-3	Disconnect/Drive Off	I				x	
A40-T1-4	Stim Package Testing	D	1,2,6		x	x	
A40-T1-5	Maintenance Program	D	1,2,6		x		
A40-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A40-T2-1	Subsea Intervention Stack	I				x	x
A40-T2-2	Surface Processing Systems	I				x	
A40-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Station Keeping (DP Class 2)							
A40-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A40-T3-2	Well Specific Operating Procedures & Training-Not Reg Required	D	3,4,6,7,8		x	x	
A40-T3-3	Drive Off/Drift Off Analysis	D	4,5,6,7,8			x	
A40-T3-4	MetOcean Monitoring-Not Reg Required	I				x	x
A40-T3-5	DPO Protocols & Training-Not Reg Required	D	1,2,3,4,6,7,8		x	x	
A40-T3-6	Maintenance Program	D	7,8		x		
A40-T3-7	Power & System Redundancy	I			x	x	
A40-T3-8	Manual Over Ride/Control	D	3,5,6,7			x	x
Threat 4: Dropped/Dragged Object Striking Equipment							
A40-T4-1	Training	D	3,4,5,6,7,8,10		x	x	
A40-T4-2	Housekeeping	I			x	x	
A40-T4-3	Permitted Lift Plans	I				x	x
A40-T4-4	Dropped Object Risk Assessment	I				x	x
A40-T4-5	Safe Approach Plans	I				x	x
A40-T4-6	Establish a Watch Circle	D	3,4,5,7			x	
A40-T4-7	SIMOPS Plan/Shut-In	I				x	x
A40-T4-8	ESD Systems	I					x
A40-T4-9	Elevation Survey of Subsea Architecture	I				x	
A40-T4-10	Weak Point Analysis	D	3,4,5,7			x	x
Threat 5: Complete Power Loss (Black Ship)							
A40-T5-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A40-T5-2	UPS	I			x	x	
A40-T5-3	Drift Off Analysis	D	2,4,6,7,8			x	
A40-T5-4	Auto Recovery of Power Systems	I			x	x	
A40-T5-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A40-T5-6	Auxiliary Power Systems	I			x	x	
A40-T5-7	External ROV Over Ride	I				x	x
A40-T5-8	Dead Man Functionality	I				x	x
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A40-T6-1	SIMOPS Plan	D	2,3,4			x	
A40-T6-2	Drive Off/Drift Off Analysis	D	1,4			x	
A40-T6-3	Frequency Management Plans	D	1,2,4		x		
A40-T6-4	COLREGS Systems	I				x	
Threat 7: Cyber-Threat/Virus/Malware							
A40-T7-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A40-T7-2	Training	D	1,3,4,5		x	x	
A40-T7-3	System Architecture/Firewalls	I				x	
A40-T7-4	Protective Software	I			x		
A40-T7-5	System Integrity/Security	I			x		
Threat 8: Fluid Conduit Failure							
A40-T8-1	Pressure Testing	D	2,3,4		x		
A40-T8-2	Fatigue/Riser Analysis	D	3,4		x		
A40-T8-3	Pressure Rating Design Criteria	D	2,4			x	
A40-T8-4	Pressure Relief Valves	I				x	x

4.37 Case A41 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 88 Case A41 Threats and Associated Barriers

CASE A41 - OP3 CV Riser Flowback		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A41-T1-1	Surface PCE Equipment	I				x	x
A41-T1-2	Well Tree-Vertical Tree Only	I				x	
A41-T1-3	SSTT/Landing String-Horz Only	I					x
A41-T1-4	Independent 3rd Party BOP Certification	D	2,3,6		x	x	
A41-T1-5	BOP Testing	D	2,3,6		x	x	
A41-T1-6	Maintenance Program	D	1,2,3,4,5		x		
A41-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A41-T2-1	Surface Processing Systems	I				x	
A41-T2-2	Monitoring/Kick Detection	I				x	
A41-T2-3	Subsea BOP	I				x	
A41-T2-4	Surface PCE	I				x	x
A41-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Station Keeping (DP)							
A41-T3-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A41-T3-2	Well Specific Operating Procedures & Training	D	1,3,4,5,6,7,8		x	x	
A41-T3-3	Drive Off/Drift Off Analysis	D	4,6			x	
A41-T3-4	MetOcean Monitoring	I				x	x
A41-T3-5	DPO Protocols & Training	D	1,2,3,6,7,8		x	x	
A41-T3-6	Maintenance Program	D	1,2,4		x		
A41-T3-7	Power & System Redundancy	I			x	x	
A41-T3-8	Manual Over Ride/Control	D	1,2,3,4,7,8			x	x
Threat 4: Accidental Disconnect							
A41-T4-1	SSTT Sealing Systems Horz Tree Only	I					x
A41-T4-2	System Maintenance	D	1,4		x	x	
A41-T4-3	Weak Point Analysis	D	1,4			x	x
A41-T4-4	Auto-Shear Functionality	I				x	x
A41-T4-5	Training	D	1,2,3,4		x	x	
Threat 5: Controlled Disconnect not Executed Properly							
A41-T5-1	Retraction System/Capability	I				x	
A41-T5-2	EDS Procedures & Training	D	1,3		x	x	
A41-T5-3	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A41-T6-1	Training	D	3,4,5,6,7		x	x	
A41-T6-2	Housekeeping	I			x	x	
A41-T6-3	Permitted Lift Plans	I				x	x
A41-T6-4	Dropped Object Risk Assessment	I				x	x
A41-T6-5	Safe Approach Plans	I				x	x
A41-T6-6	SIMOPS Plan/Shut-In	I				x	x
A41-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A41-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A41-T7-2	UPS	I			x	x	
A41-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A41-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A41-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A41-T7-6	Emergency Generators/Redundant Engine Rooms	I			x	x	
A41-T7-7	External ROV Over Ride	I				x	x
A41-T7-8	Dead Man Functionality	I				x	x
Threat 8: Vessel SIMOPS-Collision/Interference/Other Transfers							
A41-T8-1	SIMOPS Plan	D	2,3			x	
A41-T8-2	Drive Off/Drift Off Analysis	D	1,3			x	
A41-T8-3	Frequency Management Plans	I			x		
A41-T8-4	COLREGS Systems	I				x	
Threat 9: Cyber Threat/Virus/Malware							
A41-T9-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A41-T9-2	Training	D	1,3,4,5		x	x	
A41-T9-3	System Architecture/Firewalls	I				x	
A41-T9-4	Protective Software	I			x		
A41-T9-5	System Integrity/Security	I			x		

4.38 Case A42 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 89 Case A42 Threats and Associated Barriers

CASE A42 - OP2 LB Riserless Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A42-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A42-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A42-T1-3	Lubricator Testing	D	2,7,8		x	x	
A42-T1-4	Well Tree-Vertical Tree Only	I				x	
A42-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A42-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A42-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A42-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A42-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A42-T2-2	Subsea Intervention Stack	I				x	x
A42-T2-3	Surface Processing Systems	I				x	
A42-T2-4	Monitoring/Kick Detection	I				x	
A42-T2-5	Surface PCE	I				x	x
A42-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A42-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Stability							
A42-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A42-T3-2	Structural Pre-Loading	I			x	x	
A42-T3-3	MetOcean Monitoring	I				x	x
A42-T3-4	Geotechnical Analysis	I			x	x	
A42-T3-5	Leg Structural Inspection & Maintenance	D	1,2,3,4		x	x	
Threat 4: Accidental Disconnect of Coil							
A42-T4-1	System Maintenance	D	3		x	x	
A42-T4-2	Weak Point Analysis	D	3			x	x
A42-T4-3	Auto-Shear Functionality	I				x	x
A42-T4-4	Training	D	1,2,3		x	x	
Threat 5: Controlled Disconnect of Coil							
A42-T5-1	Break Away System/Capability	I			x		
A42-T5-2	Pay Out until Regain Station Keeping	I			x		
A42-T5-3	EDS Procedures & Training	D	1,2		x	x	
A42-T5-4	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A42-T6-1	Training	D	3,4,5,6,7		x	x	
A42-T6-2	Housekeeping	I			x	x	
A42-T6-3	Permitted Lift Plans	I				x	x
A42-T6-4	Dropped Object Risk Assessment	I				x	x
A42-T6-5	Safe Approach Plans	I				x	x
A42-T6-6	SIMOPS Plan/Shut-In	I				x	x
A42-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A42-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A42-T7-2	UPS	I			x	x	
A42-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A42-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A42-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A42-T7-6	Auxiliary Power Systems	I			x	x	
A42-T7-7	External ROV Over Ride	I				x	x
A42-T7-8	Dead Man Functionality	I				x	x
Threat 8: Pressure Control Head Failure (Grease Head Failure)							
A42-T8-1	Maintenance Program	D	2,3,4		x		
A42-T8-2	Procedures	D	1,3,4		x	x	
A42-T8-3	Intervention Stack	I				x	x
A42-T8-4	Pack Off (3-2 active/1 redundant)	I				x	x
Threat 9: Vessel SIMOPS-Collision/Interference/Other Transfers							
A42-T9-1	SIMOPS Plan	D	2,3			x	
A42-T9-2	Frequency Management Plans	D	1,3		x		
A42-T9-3	COLREGS System	I				x	
Threat 10: Cyber-Threat/Virus/Malware							
A42-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A42-T10-2	Training	D	1,3,4,5		x	x	
A42-T10-3	System Architecture/Firewalls	I				x	
A42-T10-4	Protective Software	I			x		
A42-T10-5	System Integrity/Security	I			x		

4.39 Case A43 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 90 Case A43 Threats and Associated Barriers

CASE A43 - OP2 LB Riserless Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A43-T1-1	HPU Maintenance & Inspection	D	2,3,7,8		x		
A43-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A43-T1-3	Lubricator Testing	D	2,7,8		x	x	
A43-T1-4	Well Tree-Vertical Tree Only	I				x	
A43-T1-5	Independent 3rd Party BOP Certification	D	4,7,8		x	x	
A43-T1-6	Intervention Stack Testing	D	2,4,5		x	x	
A43-T1-7	Maintenance Program	D	1,2,3,4,5,6,8		x		
A43-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A43-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A43-T2-2	Subsea Intervention Stack	I				x	x
A43-T2-3	Surface Processing Systems	I				x	
A43-T2-4	Monitoring/Kick Detection	I				x	
A43-T2-5	Surface PCE	I				x	x
A43-T2-6	Dual Barrier Choke/Kill Lines	I				x	
A43-T2-7	Well Control Procedures & Training	D	1,2,3,4,5,6		x	x	
Threat 3: Loss of Stability							
A43-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A43-T3-2	Structural Pre-Loading	I			x	x	
A43-T3-3	MetOcean Monitoring	I				x	x
A43-T3-4	Geotechnical Analysis	I			x	x	
A43-T3-5	Leg Structural Inspection & Maintenance	D	1,2,3,4		x	x	
Threat 4: Accidental Disconnect of Coil							
A43-T4-1	System Maintenance	D	3		x	x	
A43-T4-2	Weak Point Analysis	D	3			x	x
A43-T4-3	Auto-Shear Functionality	I				x	x
A43-T4-4	Training	D	1,2,3		x	x	
Threat 5: Controlled Disconnect of Coil							
A43-T5-1	Break Away System/Capability	I			x		
A43-T5-2	Pay Out until Regain Station Keeping	I			x		
A43-T5-3	EDS Procedures & Training	D	1,2		x	x	
A43-T5-4	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A43-T6-1	Training	D	3,4,5,6,7		x	x	
A43-T6-2	Housekeeping	I			x	x	
A43-T6-3	Permitted Lift Plans	I				x	x
A43-T6-4	Dropped Object Risk Assessment	I				x	x
A43-T6-5	Safe Approach Plans	I				x	x
A43-T6-6	SIMOPS Plan/Shut-In	I				x	x
A43-T6-7	ESD Systems	I					x
Threat 7: Complete Power Loss (Black Ship)							
A43-T7-1	SMS-Vessel	D	2,3,4,5,6,7,8		x	x	
A43-T7-2	UPS	I			x	x	
A43-T7-3	Drift Off Analysis	D	2,4,6,7,8			x	
A43-T7-4	Auto Recovery of Power Systems (DP Rigs)	I			x	x	
A43-T7-5	Procedures, Drills & Training	D	1,2,4,5,6,7		x	x	
A43-T7-6	Auxiliary Power Systems	I			x	x	
A43-T7-7	External ROV Over Ride	I				x	x
A43-T7-8	Dead Man Functionality	I				x	x
Threat 8: Pressure Control Head Failure (Grease Head Failure)							
A43-T8-1	Maintenance Program	D	2,3,4		x		
A43-T8-2	Procedures	D	1,3,4		x	x	
A43-T8-3	Intervention Stack	I				x	x
A43-T8-4	Pack Off (3-2 active/1 redundant)	I				x	x
Threat 9: Vessel SIMOPS-Collision/Interference/Other Transfers							
A43-T9-1	SIMOPS Plan	D	2,3			x	
A43-T9-2	Frequency Management Plans	D	1,3		x		
A43-T9-3	COLREGS System	I				x	
Threat 10: Cyber-Threat/Virus/Malware							
A43-T10-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A43-T10-2	Training	D	1,3,4,5		x	x	
A43-T10-3	System Architecture/Firewalls	I				x	
A43-T10-4	Protective Software	I			x		
A43-T10-5	System Integrity/Security	I			x		

4.40 Case A44 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 91 Case A44 Threats and Associated Barriers

CASE A44 - OP3 LB Riser Intervention Wireline		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure-Varies by Operation-May not have Intervention Stack				1 in 10	1 in 100	1 in 1000	1 in 10,000
A44-T1-1	HPU Maintenance & Inspection	D	2,3,7,8,9		x		
A44-T1-2	Lubricator/Pressure Control Head Installed	I				x	
A44-T1-3	Lubricator Testing	D	2,7,8,9		x	x	
A44-T1-4	Well Tree	I				x	
A44-T1-5	Surface Tree and/or Surface BOP	I				x	
A44-T1-6	Independent 3rd Party BOP Certification	D	5,8,9		x	x	
A44-T1-7	Intervention Stack Testing	D	2,5,6		x	x	
A44-T1-8	Maintenance Program	D	1,2,3,4,5,6,7,9		x		
A44-T1-9	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A44-T2-1	Lubricator/Pressure Control Head Installed	I				x	
A44-T2-2	Subsea Intervention Stack	I				x	x
A44-T2-3	Surface Processing Systems	I				x	
A44-T2-4	Surface PCE	I				x	x
A44-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Stability							
A44-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A44-T3-2	Structural Pre-Loading	I			x	x	
A44-T3-3	MetOcean Monitoring	I				x	x
A44-T3-4	Site/Bottom Survey	D	3		x	x	
A44-T3-5	Leg Structural Inspection & Maintenance	D	1,2,3,4		x	x	
Threat 4: Dropped Object Striking Equipment							
A44-T4-1	Training	D	3,4,5,6,7		x	x	
A44-T4-2	Housekeeping	I			x	x	
A44-T4-3	Permitted Lift Plans	I				x	x
A44-T4-4	Dropped Object Risk Assessment	I				x	x
A44-T4-5	Safe Approach Plans	I				x	x
A44-T4-6	SIMOPS Plan/Shut-In	I				x	x
A44-T4-7	ESD Systems	I					x
Threat 5: Surface PCE Failure							
A44-T5-1	Intervention Stack-If Applicable	I				x	x
A44-T5-2	Subsea Valve(s)	I				x	
A44-T5-3	Pressure Testing	D	1,2		x		
A44-T5-4	Maintenance Program	D	1,2,3		x		
A44-T5-5	3rd Party Verification	D	1,2,3,4		x	x	
Threat 6: Cyber-Threat/Virus/Malware							
A44-T6-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A44-T6-2	Training	D	1,3,4,5		x	x	
A44-T6-3	System Architecture/Firewalls	I				x	
A44-T6-4	Protective Software	I			x		
A44-T6-5	System Integrity/Security	I			x		
Threat 7: Vessel SIMOPS-Collision/Interference							
A44-T7-1	SIMOPS Plan	D	2,3			x	
A44-T7-2	Frequency Management Plans	D	1,3		x		
A44-T7-3	COLREGS System	I				x	

4.41 Case A45 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 92 Case A45 Threats and Associated Barriers

CASE A45 - OP3 LB Riser Intervention Coiled Tubing		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Intervention Stack Failure-Varies by Operation-May not have Intervention Stack				1 in 10	1 in 100	1 in 1000	1 in 10,000
A45-T1-1	HPU Maintenance & Inspection	D	2,3,4,8		x		
A45-T1-2	Surface PCE	I				x	x
A45-T1-3	Well Tree	I				x	
A45-T1-4	BOP	I				x	
A45-T1-5	Independent 3rd Party BOP Certification	D	2,3,4,8		x	x	
A45-T1-6	Intervention Stack Testing	D	2,3,4,8		x	x	
A45-T1-7	Maintenance Program	D	2,3,4,8		x		
A45-T1-8	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A45-T2-1	Pressure Control Head Installed	I				x	
A45-T2-2	Subsea Intervention Stack	I				x	x
A45-T2-3	Surface Processing Systems	I				x	
A45-T2-4	Surface PCE	I				x	x
A45-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Stability							
A45-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A45-T3-2	Structural Pre-Loading	I			x	x	
A45-T3-3	MetOcean Monitoring	I				x	x
A45-T3-4	Site/Bottom Survey	D	3		x	x	
A45-T3-5	Leg Structural Inspection & Maintenance	D	1,2,3,4		x	x	
Threat 4: Dropped Object Striking Equipment							
A45-T4-1	Training	D	3,4,5,6,7		x	x	
A45-T4-2	Housekeeping	I			x	x	
A45-T4-3	Permitted Lift Plans	I				x	x
A45-T4-4	Dropped Object Risk Assessment	I				x	x
A45-T4-5	Safe Approach Plans	I				x	x
A45-T4-6	SIMOPS Plan/Shut-In	I				x	x
A45-T4-7	ESD Systems	I					x
Threat 5: Surface PCE Failure							
A45-T5-1	Intervention Stack-If Applicable	I				x	x
A45-T5-2	Subsea Valve(s)	I				x	
A45-T5-3	Pressure Testing	D	1,2		x		
A45-T5-4	Maintenance Program	D	1,2,3		x		
A45-T5-5	3rd Party Verification	D	1,2,3,4		x	x	
Threat 6: Cyber-Threat/Virus/Malware							
A45-T6-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A45-T6-2	Training	D	1,3,4,5		x	x	
A45-T6-3	System Architecture/Firewalls	I				x	
A45-T6-4	Protective Software	I			x		
A45-T6-5	System Integrity/Security	I			x		
Threat 7: Vessel SIMOPS-Collision/Interference							
A45-T7-1	SIMOPS Plan	D	2,3			x	
A45-T7-2	Frequency Management Plans	D	1,3		x		
A45-T7-3	COLREGS System	I				x	

4.42 Case A46 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 93 Case A46 Threats and Associated Barriers

CASE A46 - OP3 LB Riser Intervention Well Stim		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A46-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A46-T1-2	Well Tree	I				x	
A46-T1-3	Disconnect/Drive Off	I				x	
A46-T1-4	Stim Package Testing	D	1,2,6		x	x	
A46-T1-5	Maintenance Program	D	1,2,6		x		
A46-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A46-T2-1	Subsea Intervention Stack	I				x	x
A46-T2-2	Surface Processing Systems	I				x	
A46-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Stability							
A46-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A46-T3-2	Structural Pre-Loading	I			x	x	
A46-T3-3	MetOcean Monitoring-Not Reg Required	I				x	x
A46-T3-4	Geotechnical Analysis	I			x	x	
A46-T3-5	Site/Bottom Survey	D	3		x	x	
A46-T3-6	Leg Structural Inspection & Maintenance	D	1,2,3,4,5		x	x	
Threat 4: Dropped/Dragged Object Striking Equipment							
A46-T4-1	Training	D	3,4,5,6,7		x	x	
A46-T4-2	Housekeeping	I			x	x	
A46-T4-3	Permitted Lift Plans	I				x	x
A46-T4-4	Dropped Object Risk Assessment	I				x	x
A46-T4-5	Safe Approach Plans	I				x	x
A46-T4-6	SIMOPS Plan/Shut-In	I				x	x
A46-T4-7	ESD Systems	I					x
Threat 5: Cyber-Threat/Virus/Malware							
A46-T5-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A46-T5-2	Training	D	1,3,4,5		x	x	
A46-T5-3	System Architecture/Firewalls	I				x	
A46-T5-4	Protective Software	I			x		
A46-T5-5	System Integrity/Security	I			x		
Threat 6: Vessel SIMOPS-Collision/Interference/Other Transfers							
A46-T6-1	SIMOPS Plan	D	2,3			x	
A46-T6-2	Frequency Management Plans	D	1,3		x		
A46-T6-3	COLREGS Systems	I				x	
Threat 7: Fluid Conduit Failure							
A46-T7-1	Pressure Testing	D	2,3,4		x		
A46-T7-2	Fatigue/Riser Analysis	D	3,4		x		
A46-T7-3	Pressure Rating Design Criteria	D	2,4			x	
A46-T7-4	Pressure Relief Valves	I				x	x

4.43 Case A47 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 94 Case A47 Threats and Associated Barriers

CASE A47 - OP3 LB Riser Intervention Flowback		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Subsea BOP Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A47-T1-1	Surface PCE Equipment	I				x	x
A47-T1-2	Well Tree-Vertical Tree Only	I				x	
A47-T1-3	SSTT/Landing String-Horz Only	I					x
A47-T1-4	Independent 3rd Party BOP Certification	D	2,3,6		x	x	
A47-T1-5	BOP Testing	D	2,3,6		x	x	
A47-T1-6	Maintenance Program	D	1,2,3,4,5		x		
A47-T1-7	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A47-T2-1	Surface Processing Systems	I				x	
A47-T2-2	Monitoring/Kick Detection	I				x	
A47-T2-3	Subsea BOP	I				x	
A47-T2-4	Surface PCE	I				x	x
A47-T2-5	Well Control Procedures & Training	D	1,2,3,4		x	x	
Threat 3: Loss of Stability							
A47-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A47-T3-2	Structural Pre-Loading	I			x	x	
A47-T3-3	MetOcean Monitoring	I				x	x
A47-T3-4	Geotechnical Analysis	I			x	x	
A47-T3-5	Site/Bottom Survey	D	3		x	x	
A47-T3-6	Leg Structural Inspection & Maintenance	D	1,2,3,4,5		x	x	
Threat 4: Accidental Disconnect							
A47-T4-1	SSTT Sealing Systems Horz Tree Only	I					x
A47-T4-2	System Maintenance	D	1,4		x	x	
A47-T4-3	Weak Point Analysis	D	1,4			x	x
A47-T4-4	Auto-Shear Functionality	I				x	x
A47-T4-5	Training	D	1,2,3,4		x	x	
Threat 5: Controlled Disconnect							
A47-T5-1	Retraction System/Capability	I				x	
A47-T5-2	EDS Procedures & Training	D	1,3		x	x	
A47-T5-3	EDS Modes	D	1,2				x
Threat 6: Dropped Object Striking Equipment							
A47-T6-1	Training	D	3,4,5,6,7		x	x	
A47-T6-2	Housekeeping	I			x	x	
A47-T6-3	Permitted Lift Plans	I				x	x
A47-T6-4	Dropped Object Risk Assessment	I				x	x
A47-T6-5	Safe Approach Plans	I				x	x
A47-T6-6	SIMOPS Plan/Shut-In	I				x	x
A47-T6-7	ESD Systems	I					x
Threat 7: Vessel SIMOPS-Collision/Interference/Other Transfers							
A47-T7-1	SIMOPS Plan	D	2,3,4			x	
A47-T7-2	Drive Off/Drift Off Analysis	D	1,4			x	
A47-T7-3	Frequency Management Plans	D	1,2,4		x		
A47-T7-4	COLREGS Systems	I				x	
Threat 8: Cyber-Threat/Virus/Malware							
A47-T8-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A47-T8-2	Training	D	1,3,4,5		x	x	
A47-T8-3	System Architecture/Firewalls	I				x	
A47-T8-4	Protective Software	I			x		
A47-T8-5	System Integrity/Security	I			x		

4.44 Case A48 Threats

The following table contains the threats and associated barriers available to manage those threats.

Table 95 Case A48 Threats and Associated Barriers

CASE A48 - OP4 LB Well Stim Pumping		Independent (I) or Dependent (D)	If D, which dependent on?	How many times would this barrier fail to be effective?			
Threat 1: Stimulation Package Failure				1 in 10	1 in 100	1 in 1000	1 in 10,000
A48-T1-1	Barrier Valves-Minimum 2 Valves btwn tree & surface	I				x	
A48-T1-2	Well Tree	I				x	
A48-T1-3	Disconnect/Drive Off	I				x	
A48-T1-4	Stim Package Testing	D	1,2,6		x	x	
A48-T1-5	Maintenance Program	D	1,2,6		x		
A48-T1-6	Redundant Controls	I				x	x
Threat 2: Influx of Liquids/Gases							
A48-T2-1	Subsea Intervention Stack	I				x	x
A48-T2-2	Surface Processing Systems	I				x	
A48-T2-3	Well Control Procedures & Training	D	1,2		x	x	
Threat 3: Loss of Stability							
A48-T3-1	Jacking System & Locks Inspection & Maintenance	I				x	x
A48-T3-2	MetOcean Monitoring	I				x	x
A48-T3-3	Geotechnical Analysis	I			x	x	
A48-T3-4	Site/Bottom Survey	I			x	x	
A48-T3-5	Leg Structural Inspection & Maintenance	D	1,2,3,4		x	x	
Threat 4: Dropped/Dragged Object Striking Equipment							
A48-T4-1	Training	D	3,4,5,6,7		x	x	
A48-T4-2	Housekeeping	I			x	x	
A48-T4-3	Permitted Lift Plans	I				x	x
A48-T4-4	Dropped Object Risk Assessment	I				x	x
A48-T4-5	Safe Approach Plans	I				x	x
A48-T4-6	SIMOPS Plan/Shut-In	I				x	x
A48-T4-7	ESD Systems	I					x
Threat 5: Cyber-Threat/Virus/Malware							
A48-T5-1	Cyber-Risk Management Procedures	D	2,3,4,5		x	x	
A48-T5-2	Training	D	1,3,4,5		x	x	
A48-T5-3	System Architecture/Firewalls	I				x	
A48-T5-4	Protective Software	I			x		
A48-T5-5	System Integrity/Security	I			x		
Threat 6: Vessel SIMOPS-Collision/Interference							
A48-T6-1	SIMOPS Plan	D	2,3			x	
A48-T6-2	Frequency Management Plans	D	1,3		x		
A48-T6-3	COLREGS Systems	I				x	
Threat 7: Fluid Conduit Failure							
A48-T7-1	Pressure Testing	D	2,3,4		x		
A48-T7-2	Fatigue/Riser Analysis	D	3,4		x		
A48-T7-3	Pressure Rating Design Criteria	D	2,4			x	
A48-T7-4	Pressure Relief Valves	I				x	x

5 Conclusion

The results of this project have indicated that the wide variety of well intervention activities performed from a wide variety of vessels or work platforms are within acceptable risk levels if barriers are maintained and managed. This project provides a common framework for which industry and regulators can communicate and manage risk together.

5.1 Communication Tool

Whether a stakeholder is an operator or contractor, this framework allows either to have open communication over the existence, health and responsibility for barriers to both the threats identified in this project and the consequences. In the planning phase, the bowties can be utilized to assist project teams in assessing risk and confirming needed barriers are in place. During the permitting phase, the barrier lists and well parameter factors can help focus dialog between the project team and regulators by focusing in on higher risk operations. During execution the bowties and barrier lists can be tools to communicate and manage risk at the job site.

5.2 Barriers

As with many offshore well operations, the key to managing risk is by understanding and maintaining barriers. While every operational scope covered by this report may not have every listed barrier implemented, the process of risk assessing the operation and identifying the barriers in place does help manage risk. Risk mitigating barriers may drive verification efforts or barrier testing when assessed risk levels are high.