Assurance Case Tree for the BlueROV2 System:

- \*\*Goal G1: Hazards for BlueROV2 system addressed in accordance with ALARP principle.\*\*

- \*\*Strategy S1: Argument by risk reduction/elimination of each hazard.\*\*

- \*\*Goal G2: No intolerable risks present in the system.\*\*

- \*\*Context C1: Definition of "intolerable"\*\*

- \*\*Strategy S2: Argue that risk posed by any remaining hazards is negligible.\*\* (Undeveloped)

- \*\*Strategy S3: Argue that no other risks have been identified.\*\* (Undeveloped)

- \*\*Goal G3: Risk from obstacle encounter has been reduced as low as reasonably practicable.\*\*

- \*\*Context C2: Assigned severity class is Major.\*\* (Uninstantiated)

- \*\*Strategy S4: Apply ReSonAte to estimate level of risk from hazard condition obstacle encounter.\*\*

- \*\*Assumption A1: Function avoidance logic required by obstacle encounter BTD is available.\*\* (Uninstantiated)

- \*\*Goal G4: Model obstacle encounter BTD accurately describes possible propagation of hazard.\*\*

- \*\*Goal G6: Possible hazard propagation paths correctly captured in BTD.\*\* (Undeveloped)

- \*\*Goal G7: Barriers in the BTD correctly describe their respective control action including any required system functions.\*\* (Undeveloped)

- \*\*Goal G8: All non-negligible threats have been identified.\*\* (Undeveloped)

- \*\*Goal G5: Quantitative risk estimates are accurate and below acceptable threshold.\*\*

- \*\*Goal G9: State probability distribution used for risk estimation is an accurate representation of expected system states.\*\* (Undeveloped)

- \*\*Goal G10: Estimated probability of collision is below allowable threshold for severity class Major.\*\*

- \*\*Solution Sn1: Estimated risk level 0.001 per hour.\*\* (Uninstantiated)

This hierarchical tree representation identifies the goals, strategies, context, assumptions, and solutions while also mentioning which elements are uninstantiated or undeveloped. The nesting represents the supported by relationships, and contexts or assumptions for different goals are aligned to highlight their specific influence.

The placeholders in the goals and assumptions indicate the need for instantiation or further development, highlighting uncertainty or areas needing more data or confirmation. Embellishments such as "Major" used within placeholders highlight parameterization focused on specific hazard contexts related to the severity of potential risks, deriving from domain-specific information provided.