Below is the assurance case for the BlueROV2 system based on the provided assurance case pattern in a hierarchical tree format:

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- G1: Hazards for BlueROV2 addressed in accordance with ALARP principle

- S1: Argument by risk reduction/elimination of each hazard

- G2: No intolerable risks present in the system

- C1: Definition of "intolerable"

- G2.1: No other risks have been identified (undeveloped)

- G2.2: Risk posed by any remaining hazards is negligible (undeveloped)

- G3: Risk from obstacle encounter hazard has been reduced as low as reasonably practicable

- C2: Assigned severity class is Major

- S4: Apply ReSonAte to estimate level of risk from hazard condition obstacle encounter

- A1: Function avoidance logic required by obstacle encounter BTD is available

- G4: Model obstacle encounter BTD accurately describes possible propagation of hazard obstacle encounter

- G6: Possible hazard propagation paths correctly captured in BTD (undeveloped)

- G7: Barriers in the BTD correctly describe their respective control action including any required system functions (undeveloped)

- G8: All non-negligible threats have been identified (undeveloped)

- G5: Quantitative risk estimates are accurate and below acceptable threshold

- G9: State probability distribution used for risk estimation is an accurate representation of expected system states (undeveloped)

- G10: Estimated probability of collision is below allowable threshold for severity class

- Sn1: Estimated risk level 10^-3 per hour

- G3: Risk from deviation from the operating area has been reduced as low as reasonably practicable

- C2: Assigned severity class is Minor

- S4: Apply ReSonAte to estimate level of risk from hazard condition deviation from the operating area

- A1: Function command authority required by deviation from the operating area BTD is available

- G4: Model deviation from the operating area BTD accurately describes possible propagation of hazard deviation from the operating area

- G6: Possible hazard propagation paths correctly captured in BTD (undeveloped)

- G7: Barriers in the BTD correctly describe their respective control action including any required system functions (undeveloped)

- G8: All non-negligible threats have been identified (undeveloped)

- G5: Quantitative risk estimates are accurate and below acceptable threshold

- G9: State probability distribution used for risk estimation is an accurate representation of expected system states (undeveloped)

- G10: Estimated probability of collision is below allowable threshold for severity class

- Sn1: Estimated risk level 10^-6 per mission

- G3: Risk from loss of pipeline has been reduced as low as reasonably practicable

- C2: Assigned severity class is Minor

- S4: Apply ReSonAte to estimate level of risk from hazard condition loss of pipeline

- A1: Function obstacle detection required by loss of pipeline BTD is available

- G4: Model loss of pipeline BTD accurately describes possible propagation of hazard loss of pipeline

- G6: Possible hazard propagation paths correctly captured in BTD (undeveloped)

- G7: Barriers in the BTD correctly describe their respective control action including any required system functions (undeveloped)

- G8: All non-negligible threats have been identified (undeveloped)

- G5: Quantitative risk estimates are accurate and below acceptable threshold

- G9: State probability distribution used for risk estimation is an accurate representation of expected system states (undeveloped)

- G10: Estimated probability of collision is below allowable threshold for severity class

- Sn1: Estimated risk level 10^-6 per mission

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This assurance case applies the customizations needed for the BlueROV2 system, focusing on relevant hazards such as obstacle encounters, deviation from operating area, and loss of pipeline. The context, assumptions, solutions, and additional elements have been instantiated to reflect the specifics of the BlueROV2 system.