Safety in Design - Risk Register

	Safety in Design Risk Register
Project Number	1034-03-08
Project Name	South Boulder WWTP Inlet Works
Design Manager/Designer	G. Degebrodt, M. Wood
Date (Creation or Update)	21/03/2024

	Design Life Cycle:
CURRENT	**Design**
	Construction
	Operations & Maintenance
	Demolition

Hierarchy of Controls	**Treatment Control**
Elimination	Removing the hazard by designing it out. E.g. replacing slippery tiles with ceramic with a rougher finish.
Substitution	Replace a hazard or hazardous component with a less hazardous one. e.g. Replacing concrete panels with wood or steel where the spec completed and stabilised panels to be @ 30 deg.
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GUIDEWORD		**Work Description**	**Hazard Description**	**Description of Consequence**	**Initial**			**Reasoning or Risk Treatment / Mitigation Plan**	**Treatment Control Type**	**Reason why next highest treatment was not used**	**Revised as a Consequence of Design**			**Responsibility**	**By When**	**RFT018-2023/24 Bidder Response**
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Lifting Operations / Cranage	1	Crane installation of 99 tonne precast concrete channel, pipework, valves, penstocks, screens, launder, wash press, structural supports and platform gratings.	Collision impact due to inadequate crane operational area. Rigging / dogging failures. Ground instability including adjacent excavation for concrete structure.	Fatalities. Crush or Pinch Injuries. Equipment Damage. Restricted Operational Access.	5 Catastrophic	C Possible	E Extreme	Precast concrete structural design includes lifting lugs for centre of gravity lift and distributed load. CONTRACT SPECIFICATION INCLUDES: Lift Plan(s) to be issued and approved by competent authorised person. Crane capacity to be selected according to precast concrete structure weight and as appropriate for other equipment. Crane operator, rigging and dogging personnel licenced. Contractor to have appropriate insurances.	Administrative Control	Design investigated two-part concrete structure for lesser lift load - not accepted due to foundation settling or earthquake risk of dislodging pipework. Principal and Designer not licensed for lifting, dogging, rigging - Contractor to plan, be licensed and insured.	5 Catastrophic	D Unlikely	H High	Contractor	Construction	
Road Safety: **Including Movement of People and Materials**	2	Plant movements and haulage during Works (including disposals)	Oversize Overmas (OSOM) permitted haulage of concrete structure on Main Roads WA roads. Overhead power. Public roads interface with construction materials and/or plant freight. WWTP site operations interface with Contractor plant.	Fatalities Plant or Equipment Damage. Injuries.	4 Major	B Likely	E Extreme	Contractor - Haulage Plan to be prepared by Contractor including OMOS permitting and plant movement under overhead power outside of WWTP site. Contractor - Vehicle and Pedestrian Movement Plan to be prepared by Contractor with Operations Team. Principal - Specified laydown area away from works and operational areas. Accessible via two (2) alternative gates. Shown on Works drawings. Principal - install pipe sleeve under WWTP access road to avoid aboveground pipe. Principal - Alternative WWTP liquid waste receival route and location prepared.	Administrative Control	Checked with freight operators that precast concrete is designed with suitable dimensions for OSOM haulage. No further controls beyond MRWA permitting identified.	4 Major	D Unlikely	H High	Contractor	Construction	
Excavation / **Working at Heights**	3	Decommissioning and removal of existing inlet structure. Decommissioningof existing liquid waste pit and associated equipment (likely >3m depth). Installation of new inlet structure in excavation and associated pipework installations. Overflow pipework installation.	Excavation collapse, engulfment. Existing adjacent structures creating load on excavations. Working at 'height' decommissioning excavations. Undermining existing adjacent structures (e.g. shed).	Injury. Fatalities. Plant or Equipment Damage	5 Catastrophic	C Possible	E Extreme	Contractor to comply with Code of Practice - Excavation code of Practice, incl trench support or benching as required. Contractor - Spoil, plant or materials stored safe distance from excavation edge. Monitoring of adjacent structures during open excavations. Contractor - Adequate edge protection to be provided, Contractor - Qualified and authorised personnel to supervise and operate excavation equipment, use of spotters.	Administrative Control	No additional controls identified.	5 Catastrophic	D Unlikely	H High	Contractor	Construction	
Electrical - Adjacent structures	4	Mobile plant and equipment movement - potential impact on / to live electrical services	Transformer at Operations building. Solar Array.	Fatalities (Electrocution). Plant or Equipment Damage or Failure.	4 Major	C Possible	H High	Contractor to develop and implement safe working procedures and practices to minimise works around adjacent structures, to include traffic movement planning, lifting plans, transit routes and storage areas. Contractor - Positive location, identification and protection of all live services adjacent to or impacted by the Works. Principal to consider WWTP electrical isolation during the bypass pumping works.	Administrative Control	No additional controls identified. Not possible to relocate structures.	4 Major	D Unlikely	H High	Contractor	Construction	
Buried Services	5	Decommissioning and removal of old/existing plant and equipment, inlet screens, inlet flume, liquid waste pit and all associated equipment.	Multiple buried existing services within WWTP Site surrounding decommissioning works areas: Buried Power. Local Solar Sources. Water. Sewer. Comms.	Fatality (Electrocution). Plant or Equipment Damage or Failure. Contractor Remediation works costs.	4 Major	C Possible	H High	Designer - Undertake review available As Constructed Drawings to identify likely interfaces. Principal to plan to isolate and prove all sources of power to plant and equipment are disconnected and made safe prior to handover to Contractor. Contractor to locate, positively identify and protect all services prior to commencement of works, including existing liquid waste pit and inlet structure.	Isolation	No additional controls identified. Operational WWTP only certain areas can be electrically isolated.	4 Major	D Unlikely	H High	Designer, Principal & Contractor	Design	

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Fall Prevention: Working at Heights, Falling Objects	6	Installation of new inlet screens, pipework in chamber, penstocks and associated structures and equipment (pipeline tie-ins), prior to FRP platforms installation.	Installing equipment prior to gratings, handrails, backfill etc. Falls from height. Dropped tools or items.	Injury. Fatalities. Plant or Equipment Damage	4 Major	C Possible	H High	Temporary fencing, barricading, scaffolding or similar to be adequate during construction and commissioning. No working above others. Minor changes in height to be highlighted with edge painting or similar (i.e. kerbs in pedestrian traffic areas) for operations. Design includes FRP grating access openings for operational works.	Administrative Control	No additional controls identified.	4 Major	D Unlikely	H High	Contractor	Construction	
Ground Conditions	7	Construction in existing structure locations, ground conditions not considered to change.	Unstable foundation or consolidation under new inlet concrete structure causing pipe break or hydraulic issues. Rock in or adjacent to planned new infrastructure preventing construction as per design.	Sewage spill. Loss of inlet screens function. Additional costs for rock breaking or design amendments.	4 Major	C Possible	H High	Contractor's geotechnical engineer to sign off on subgrade. Hold point for blinding concrete installation. Design for pumped concrete under inlet structure for structural stability. Design accounts for known rock levels and gradual increasing height towards the west. Rock in ponds around 332.2m, structures designed circa 2m above.	Engineering Control	No additional controls identified.	4 Major	D Unlikely	H High	Designer and Principal	Construction	
Isolation - Sewer	8	Temporary sewer diversion for Works: - Decommissioning existing concrete inlet structure and associated equipment. - Decommissioning existing liquid waste pit and associated equipment. - Install precast concrete structure, asscoiated equipment and connecting pipework	Uncontrolled energy release (sewer) Sewage overflow (6.5 ML/day)	Injury. Environmental impact / contaminated site. Breach of DWER license. Erosion.	4 Major	C Possible	H High	Critical works plan to be completed to minimise sewer diversion time, including ITP and QA inspections. Double isolation of Sewer lines where possible, i.e. Bypass pumping Access Chamber T1 (ID10564) and T2 (ID 10560) for installation of isolations to WWTP inlet. See CKB Intra Maps. Management of sewer isolations to permit the cutting and reconnection of new inlet works. Duty - standby bypass pumping to be provided for variable flow rates to suit works inflows (see data for kill/day flow range).	Isolation	Sewer inflows can not be halted. License mandates all sewage must be directed into the WWTP. No additional controls identified.	4 Major	E Rare	M Moderate	Contractor	Construction	
Confined Space - Sewer	9	Installation, operation and removal of temporary bypass pumping. Decommission existing inlet concrete structure Installation of DN600 PE connection pipe in the existing IDEA plant screen pit. Decommissioning of existing liquid waste pit and associated equipment.	Toxic Gas. Asphyxiation. Flammable atmospheres. Limited access and egress.	Fatality. Injury.	4 Major	C Possible	H High	Contractor to comply with Code of Practice - Working in Confined Space.	Administrative Control	No additional controls identified. Live Sewer risk can not be eliminated.	4 Major	E Rare	M Moderate	Contractor	Construction	
Isolation - Screen installations	10	Installation of new screens and associated equipment in dual train inlet chamber while the inlet works is operational.	Uncontrolled energy release (sewer).	Injury. Slips or trips. Also refer to Biological.	3 Moderate	C Possible	H High	Inlet chamber designed with dual train operation to enable isolation of either train while operational. Double isolation with penstock and stop board upstream and single penstock isolation on the downstream for clean out and screen installation. Clean out of isolated section to avoid biologial pathogen risk. Designed with scheme water taps adjacent.	Engineering Control	Inlet concrete structure designed for dual train operation to enable a single train to be isolated for operational works, including penstock and stopboard isolations.	3 Moderate	D Unlikely	M Moderate	Contractor	Construction	
Biological	11	Decommissioning of wastewater plant and equipment. Temporary bypass works. Installation of second screen.	Working with Sewage: Sharps. Pathogens. Parasites. Gasses,	Localised Illness. Hospitalisation. Permanent Injury (Hepatitis, Leptospirosis)	4 Major	C Possible	H High	Follow Department of Health WA 'Guidance Workers Handling Sewage' Contractor to offer personnel immunisations. Provide adequate hygiene facilities and implement hygiene procedures.	Administrative Control	No additional controls identified.	3 Moderate	D Unlikely	M Moderate	Contractor	Construction	
Community / Public Interaction or Access	12	Temporary sewer diversion works: Temporary equipment and open sewer access chamber is external to WWTP security fence and adjacent to main road.	Public exposure to live sewer. Theft or vandalism causing overflow or other failures. Open sewer odours.	Public injury. Environmental impact / contaminated site. Breach of DWER license. Erosion.	3 Moderate	C Possible	H High	Contractor to install temporary security of site and equipment.	Isolation	No additional controls identified.	4 Major	E Rare	M Moderate	Principal	Construction	

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Hazardous Substances: Asbestos	13	Existing Asbestos Cement (AC) pipework tie-ins. Decommissioning and removal of existing inlet structure and associated equipment. Decommissioning and removal of existing liquid waste pit associated equipment.	Unexpected asbestos found during decommissioning or construction i.e. pipes, switchboards, cladding etc.	Long term illness.	4 Major	C Possible	H High	Contractor to identify any Asbestos Containing Materials (ACM) and notify the Principal immediately. Contractor to comply with Code of Practice - Safe Removal of Asbestos.	Administrative Control	No additional controls identified. Risk of unexpected find during excavation or in existing assets uncontrolled.	4 Major	E Rare	M Moderate	Contractor	Construction	
Brownfield Sites	14	Construction Works in operational WWTP site.	Laydown area within operational area with previous biosolids stockpiling. Operational Equipment Storage areas. Surface Drainage channels (v drains). Site Security damage.	Rectification of damage, costs, reputation, environmental, etc.	3 Moderate	C Possible	H High	Contractor to complete and issue pre and post construction Dilapidation report and evidence. Principal identified Contractor Laydown Area with additional access gate, no operational access during Works (diversion of liquid waste carriers, and rubbish collection trucks). Contractor to demarcate Site.	Administrative Control	No additional controls identified	3 Moderate	D Unlikely	M Moderate	Contractor	Construction	
Extreme Weather	16	Temporary bypass works.	Rain event causing surge in sewer flows - refer Isolation - Sewer.	DWER Breach of Licence. Sewage contamination of ground.	3 Moderate	C Possible	H High	Bypass pumping to be able to handle maximum flows.	Engineering Control	No additional controls identified.	3 Moderate	D Unlikely	M Moderate	Contractor	Construction	
Construction Interfaces	17	Commissioning of new screens, launder and wash press by others. Electrical and communications tie-ins at Operations building by others. Overflow pipework installation requiring lowering of pond 1A water level. Liquid waste carriers interim operations at WWTP site. Operations of remaining WWTP by Principal.	Third Party Interactions: - Operational and Construction works running concurrently. - Operators, - Liquid Waste Drivers, - Deliveries to WWTP, - Electrical Connections.	Moving plant, vehicle, pedestrian impact. Works delay.	3 Moderate	B Likely	H High	Define Possession of Site Area for Construction Works and Laydown. Milestone identification of Electrical Works Commencement in Baseline Schedule (Principals Milestone). Principals WWTP Operator to be involved in fortnightly progress meetings and look ahead schedule.	Administrative Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal & Contractor	Construction	
Corrosion	18	Stainless steel pipework contact with carbon steels causing corrosion - concrete reinforcing, fixings, other. Use of tools containing carbon steel.	Incompatible materials leading to corrosion.	Reduced asset life. Increased maintenance. Increased costs.	3 Moderate	C Possible	H High	Contractor placement of stainless steel pipe specials in precast concrete structure, particularly risk of concrete reinforcing contact, to prevent dissimilar metal contact. Design removed incompatible materials where possible. Dissimilar metals to be avoided or isolated. Contractor not to use tools containing carbon steel in stainless steel pipe fabrication.	Isolation	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Construction	
Water	19	Installation of overflow pipe from inlet Works to ponds.	Working in or above water.	Drowning. Also refer to Biological.	4 Major	D Unlikely	H High	Principal to lower lagoon water level during construction to allow the pipe trenching.	Administrative Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal and Contractor	Construction	
Adjacent Structures	20	Adjacent buildings, sheds, infrastructure and assets.	Limited access or space to perform operational or construction works.	Structural Damage. Injuries, strains. Limited amenity. Service Interruption.	2 Minor	C Possible	M Moderate	Access ways included in the consideration and design of the new inlet works, including existing and new structures to ensure operability. Suitable plant to be utilised for works.	Administrative Control	No additional controls identified.	2 Minor	D Unlikely	L Low	Contractor	Construction	
Guarding, Fencing, Security	21	Construction works.	Plant Operations risks during construction works	Unauthorised Access - Operations during construction.	1 Insignificant	E Rare	L Low	Separation of construction site and operations area by adequate temporary fencing.	Isolation	No additional controls identified.	1 Insignificant	E Rare	L Low	Contractor and Principal	Construction	
Groundwater	22	Construction in existing structure locations, Ground Water not considered an issue at location.	N/A	N/A	1 Insignificant	E Rare	L Low	6 monitoring bores around the WWTP, levels are below works levels.	N/A	N/A	N/A	N/A	#N/A	N/A	N/A	

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Confined Space	23	Inlet Works Operation and Maintenance	Toxic Gas. Asphyxiation. Flammable Atmospheres.	Fatality. Injury.	4 Major	B Likely	E Extreme	Grit Pits and Chambers designed for mechanical cleaning. Confined spaces to be inaccessible, i.e. grating, guard railing use of long spindles for valves or penstocks, remote drives and Provide open ventilation where practicable. Bypass inlet works for duration of construction. Confined Space Safe Work Procedures to be developed for maintenance of items in high risk areas, i.e. Screens, mag flow chamber etc.	Substitution	No additional controls identified. Live Sewerage treatment the risk can not be eliminated.	3 Moderate	D Unlikely	M Moderate	Designer	Operations & Maintenance	
Biological	24	Inlet Works Operation and Maintenance	Working with Sewage: Sharps. Pathogens. Parasites. Gasses,	Localised Illness. Hospitalisation. Permanent Injury (Hepatitis, Leptospirosis)	4 Major	B Likely	E Extreme	Follow Department of Health WA 'Guidance Workers Handling Sewage' Consider immunisations. Provide adequate hygiene facilities and implement hygiene procedures. Duty standby screens provided. Screens fully enclosed and include wash sprays. Automatic screenings handling and storage to minimise direct contact. Screenings bin movements only, washdown back to upstream of inlet screens. Liquid waste discharge controlled by pipework offloading. Operational and Maintenance Procedures for screens, augers, hoppers and chutes.	Isolation	No additional controls identified. Maintenance tasks can not be eliminated.	3 Moderate	D Unlikely	M Moderate	Principal	Operations & Maintenance	
Manual handling	25	Inlet Works Operation and Maintenance	Emptying Screenings bins. Lifting stop boards.	Personal Injury. Plant or equipment damage.	3 Moderate	C Possible	H High	Design removes need to lift or handle screenings, bins on wheels provided. Valves and handwheels at accessible level. Stop boards designed to accommodate mechanical lifting, Hiab or other suitably rated lifting equipment.	Engineering Control	No additional controls identified.	3 Moderate	D Unlikely	M Moderate	Principal	Operations & Maintenance	
Temporary works	26	Inlet Works Operation and Maintenance.	Access into channels or chambers for maintenance. Emptying of grit sumps. Also see Confined Space.	Personal injury from trips or falls from poor access to chambers etc. to maintain screens or empty grit sumps.	4 Major	C Possible	H High	Safe Working Procedures to be developed for temporary access to channels and chambers, to include grating removal and storage, access and egress. Grit pits designed for removable sections of guardrails for ease of digging out chambers with excavator, i.e. no need to access physically. Temporary barriers will be required to fence off the area, to be included in Safe Working Procedure.	Administrative Control	No additional controls identified.	4 Major	E Rare	M Moderate	Principal	Operations & Maintenance	
Waste	27	Inlet Works Operation and Maintenance.	Disposal or reuse of waste.	Increased waste disposal costs.	2 Minor	A Almost Certain	H High	Principal to increase disposal budget for screenings and periodic grit sump emptying.	Administrative Control	No additional controls identified.	2 Minor	C Possible	M Moderate	Principal	Operations & Maintenance	
Stored Energy (Mechanical, Electrical)	28	Inlet Works Operation and Maintenance.	High Pressure, electrical charge/discharge, mechanical tension.	Personal Injury from tension release of belts, chains or drives. Injury from high pressure fluid release. Fatality or injury from electrical discharges.	4 Major	C Possible	H High	Inlet works maximum inflow head set by hydraulic profile at approximate 1m head. Screen belt assembly includes blockage and overload monitoring in control system. Augers are direct drive with limited risk of over torque or storing energy, with overload protection. Liquid waste discharge pipework open ended with no isolation to prevent over pressurisation.	Engineering Control	No additional controls identified.	2 Minor	E Rare	L Low	Principal	Operations & Maintenance	

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Fall Prevention: Working at Heights, Falling Objects	29	Inlet Works Operation and Maintenance - Maintenance Access to Screens. - Launder and Wash press Access. - Grit Sump and Liquid Waste Pit Excavation.	Working around changes in height, i.e. inlet works Chambers, pits and channels.	Falls from height. Dropped tools or items.	4 Major	C Possible	H High	Open pits or chambers to be barricaded to prevent access, guard rails, lids or similar. Mezzanine flooring provided where practicable. Stairs and hand rails to be provided to frequent access areas. Design to eliminate access requirement where possible. Minor changes in height to be highlighted with edge painting or similar (i.e. kerbs in pedestrian traffic areas).	Isolation	No additional controls identified.	3 Moderate	E Rare	L Low	Designer & Principal	Design	
Construction Method	30	Decommissioning and removal of Existing Inlet Flume Structure and associated equipment. Decommissioning and removal of Existing Liquid Waste Pit and Apron Structures and associated equipment. Installation, testing and commissioning of new Inlet Works and associated structures and equipment (valves, penstocks, stop boards, screens, launders etc.) Overflow and Sewer main pipework installation.	Works are not constructable.	Delays to process improvements. Increased time and costs for client to realise benefits.	4 Major	C Possible	H High	Experienced, competent designer engineers to complete design. Constructability workshop.	Administrative Control	No additional controls identified.	3 Moderate	E Rare	L Low	Designer & Principal	Design	
Isolation	31	Inlet Works Operation and Maintenance	Uncontrolled energy release (water, sewer, electricity).	Fatality. Injury. Drowning. Electrocution.	4 Major	C Possible	H High	Isolation provided on both screen channels, with double isolation penstocks and stop board upstream, and single penstock downstream. Magflow meters provided with isolation valves and dismantling joints and supports. Electrical installations provided to all drives in accordance with Electrical regulations, local isolation where possible.	Engineering Control	No additional controls identified.	3 Moderate	E Rare	L Low	Designer	Design	
Ergonomics	32	Inlet Works Operation and Maintenance	Twisting or reaching. Working above shoulder heights.	Injuries and strains.	3 Moderate	C Possible	H High	Handwheels, spindles, and items requiring access or maintenance located for ease of access and operation. Screens selected with Operator for best maintenance and performance. Access platforms provided for safe access to wash press and launder. Design of stopbard channels (tapered at top) considered safe installation of stopboards.	Elimination	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Operations & Maintenance	
Flow	33	Inlet Works Operation and Maintenance	Chamber or pipe Blockages, buildup of detritus in chambers or pipes reducing flow or creating overflow situation. Excessive flow conditions - Storm or other event causes excessive flows in sewer main. Also see 8.1 Isolation, above.	Service interruption - flooding of Inlet works and WWTP access. Overflows from Sewer Access Chambers and Maintenance Shafts. Environmental non-conformances.	4 Major	D Unlikely	H High	Install the largest practicable overflow bypass around the inlet works, directing excessive flows to the Lagoon 1A, whilst maintaining screening and inlet works operation ability.	Engineering Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Operations & Maintenance	

Safety in Design - Risk Register

	Safety in Design Risk Register
Project Number	1034-03-08
Project Name	South Boulder WWTP Inlet Works
Design Manager/Designer	G. Degebrodt, M. Wood
Date (Creation or Update)	21/03/2024

	Design Life Cycle:
CURRENT	**Design**
	Construction
	Operations & Maintenance
	Demolition

Hierarchy of Controls	**Treatment Control**
Elimination	Removing the hazard by designing it out. E.g. replacing slippery tiles with ceramic with a rougher finish.
Substitution	Replace a hazard or hazardous component with a less hazardous one. e.g. Replacing concrete panels with wood or steel where the spec completed and stabilised panels to be @ 30 deg.
Isolation	Isolating or separating the hazards from people in the general work area.
Engineering Control	A guard or barrier to protect people from the hazard.
Administrative Control	Noting on the design the work practices needed to reduce risk such as providing procedure, instruction and training. E.g. off site assembly to reduce noise or dust.

GUIDEWORD		**Work Description**	**Hazard Description**	**Description of Consequence**	**Initial**			**Reasoning or Risk Treatment / Mitigation Plan**	**Treatment Control Type**	**Reason why next highest treatment was not used**	**Revised as a Consequence of Design**			**Responsibility**	**By When**	**RFT018-2023/24 Bidder Response**
					Consequence Rating	**Likelihood Rating**	**Risk Rating**				**Consequence Severity (Rating)**	**Risk Event Likelihood (Rating)**	**Risk Level (Rating)**			
Describes General Area of the Hazard	**ITEM NUMBER**	Activity or Location	Description of the hazard	What could happen and who could be affected	Refer Consequence Rating Sheet **Drop Down**	Refer Likelihood Rating Sheet **Drop Down**	**DO NOT ENTER DATA**	What is the planned mitigation in detail? What will be done to address the hazard?	What Control is Used to Reduce the Risk	Reason why next highest treatment was not used	Consequence after treatment (1-5) OR BLANK (Unknown)	Likelihood after treatment (A-E) OR BLANK (Unknown)	Rating after treatment (L,M,H,E) OR "**?**" If risk to be passed on	Who is responsible for the treatment?	When will it be done?	Field to later record if treatment has been completed
Maintainability & Operability	34	Inlet Works Operation and Maintenance	Inlet Works operation and maintenance.	Unable to maintain plant. Service Interruptions.	3 Moderate	B Likely	H High	Design allows for duty standby at 100% capacity on screens. Consulted with Mackay City Council (two comparable treatment plants), for maintenance recommendations. Inlet chambers designed to accommodate machine access for excavating grit chambers, including removable guardrails. As far as practicable all plant at ground level. Screen and associated plant selected for good maintainability, including widening the access hatches for accessibility and the access platform to the launder hatches. The Wash Press was lowered and the drain from this is to the head of the works via a flap valve. Screenings bin access and removal reviewed. Washdown facilities reviewed and provided.	Engineering Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Operations & Maintenance	
Operations, Including Work Practices	35	Inlet Works Operation and Maintenance	Unfamiliar plant and equipment. Different procedures or practices from current plant.	Injuries and strains. Accidental Damage of Equipment from incorrect operation.	3 Moderate	B Likely	H High	Design includes new types of equipment and operator familiarisation and training will be required. Update procedures and training requirements.	Administrative Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal & Contractor	Operations & Maintenance	
Contamination	36	Inlet Works Operation and Maintenance	Creation or location of contaminated sites.	DWER Breach of Licence. Sewage contamination of ground.	2 Minor	A Almost Certain	H High	Design contains and controls inflow and debris removal from inflows, thus minimising further contamination. Liquid Waste offloading changed to a piped discharge to minimise sprays or splashes contaminating surroundings. Coupling with large mis-alignment capacity. Outlet Chambers have a cast in waterproof liner. Removal of existing Liquid waste chamber. Bunded liquid waste hard stand area. All wet areas graded and drained back to head of the works.	Engineering Control	No additional controls identified.	2 Minor	D Unlikely	L Low	Principal	Operations & Maintenance	
Pressure	37	Inlet Works Operation and Maintenance.	Potable water system rupture or leak.	Environmental Contamination. Illness.	3 Moderate	C Possible	H High	Potable water system designed to pressure rating exceeding pump capacity. Sewer system gravity fed, no overpressure, open end mains. Inlet works overflow to Lagoon 1A.	Engineering Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Operations & Maintenance	
Slips/trips/falls	38	Inlet Works Operation and Maintenance.	Uneven surfaces or changes in level.	Personnel injury (long to mid term injury).	3 Moderate	C Possible	H High	Design considers access and walkways. Changes in level to be highlighted in walkways, i.e. painting kerbs. Anti-slip stair nosing to be provided. Access provided to design specific level changes. Floor grating provided with level floor areas to access valves etc for operational activities. Guardrails provides around open pits or chambers.	Engineering Control	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Operations & Maintenance	
Start-Up / Shutdown	39	Inlet Works Operation and Maintenance.	Start up or shutdown hazards.	Personnel injury (pinch, crush, engulfment, drowning).	4 Major	C Possible	H High	Screens start and stop on inlet chamber level, sewers are subject to flow patterns mostly under gravity. Screens are full enclosed and provide tool opened, mesh guarded inspection hatches. The open area for screening are installed in channels covered with floor grating to prevent operational access to moving parts. Inlet works design incorporates duty standby streams to allow isolation and maintenance of one screen unit, this includes penstocks and stop boards for isolation.	Isolation	No additional controls identified.	3 Moderate	E Rare	L Low	Principal	Operations & Maintenance	

Safety in Design - Risk Register

	Safety in Design Risk Register
Project Number	1034-03-08
Project Name	South Boulder WWTP Inlet Works
Design Manager/Designer	G. Degebrodt, M. Wood
Date (Creation or Update)	21/03/2024

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CURRENT	**Design**
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	Operations & Maintenance
	Demolition

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GUIDEWORD		Work Description	Hazard Description	Description of Consequence	Initial			Reasoning or Risk Treatment / Mitigation Plan	Treatment Control Type	Reason why next highest treatment was not used	Revised as a Consequence of Design			Responsibility	By When	RFT018-2023/24 Bidder Response
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Dust, Fumes, Vapours	40	Inlet Works Operation and Maintenance	Production of dust, fumes or vapours.	Odours. Respiratory complications.	2 Minor	C Possible	M Moderate	Screens are enclosed and include wash sprays to reduce detritus build up. Principal evaluated low odour risk within odour buffer, odour plumbing on screens for future requirements. Screenings are drained and transferred to skip bins for off site disposal at licenced facility. Liquid waste offloading changed to a piped discharge to minimise sprays, splashing or vapours.	Engineering Control	No additional controls identified.	2 Minor	D Unlikely	L Low	Principal	Operations & Maintenance	
Movement of machinery/contaminants	41	Inlet Works Operation and Maintenance	Vehicles reversing.	Impact of machinery to other objects.	2 Minor	C Possible	M Moderate	One-way liquid waste truck route. Existing Screenings bin truck slab to have flared entry to mitigate turning circle. Separation of liquid waste and other vehicles at entry to site (separate directions).	Administrative Control	No additional controls identified.	2 Minor	E Rare	L Low	Principal	Operations & Maintenance	
Programmable Logic Controllers (PLC)	42	Inlet Works Operation and Maintenance.	Failure of PLC systems. Interfacing existing and new control systems.	Reduced operational performance. Plant damage.	2 Minor	C Possible	M Moderate	AIT surveyed the Electrical and Controls equipment within the building. System logic designed to fail to a safe mode as far as practicable. Experienced PLC engineers to be employed in the manufacture and updating of all software (Tender evaluation). Software to be Factory and Site Acceptance tested for modes of failure. System Control logic designed to have both automatic and interlocked (safety) manual operation.	Engineering Control	No additional controls identified.	2 Minor	E Rare	L Low	Designer and Principal	Operations & Maintenance	
Storage	43	Inlet Works Operation and Maintenance.	Inadequate storage of spares or consumables.	Personal injury from trips or falls from poor housekeeping.	2 Minor	C Possible	M Moderate	Operational liaison has confirmed adequate storage for level of spares required.	Administrative Control	No additional controls identified.	2 Minor	E Rare	L Low	Principal	Operations & Maintenance	
Lighting	44	Inlet Works Operation and Maintenance	Poor or inadequate lighting	Personal Injury. Service Interruptions	2 Minor	D Unlikely	L Low	Existing Site Lighting to be re-orientated as required. Inlet screens are duty/standby so failures can be carried out during normal working hours. Light pole is relocated to LWF as illumination is required for discharge operations in early morning winter conditions.	Engineering Control	No additional controls identified.	2 Minor	D Unlikely	L Low	Principal	Operations & Maintenance	