Humber River Basin District : Climate change risk assessment

	Severe impact (score 4)	Medium impact (score 3)	Mild impact (score 2)	Minor impact (score 1)
Highly likely (score 4)	16	12	8	4
Likely (score 3)	12	9	6	3
Low likelihood (score 2)	8	6	4	2
Unlikely (score 1)	4	3	2	1

Potential changing climate variable	**A Impact**	**B Likelihood**	**C Severity**	**D Risk (BxC)**	**E Mitigation**	**F Likelihood [after mitigation]**	**G Severity [after mitigation]**	**H Risk (FxG) [after mitigation]**
Summer daily max temp. may be around 6deg. higher compared to average summer temp.	Greater potential for odour from received and stored waste due to direct heating from sun.	3	3	9	• Waste unloaded and stored within building preventing direct heating. • Combustion air drawn from building removing any odour. • Building maintained at sub-atmospheric pressure containing any odour. • Waste inventory minimised during shutdowns. • Effective odour management & housekeeping procedures.	1	1	1

					• "Turning" of stored wastes to prevent heat build-up. Potential additional mitigation • Addition of odour suppression sprays.			
	Greater potential for odour from received and stored waste due to increased ambient temperatures.	3	3	9	• Waste unloaded and stored within building. • Combustion air drawn from building removing any odour. • Building maintained at sub-atmospheric pressure containing any odour. • Waste inventory minimised during shutdowns. • Effective odour management & housekeeping procedures. • "Turning" of stored wastes to prevent heat build-up. Potential additional mitigation • Addition of odour suppression sprays.	3	1	3
	Greater potential for pests attracted by received and stored waste due to increased ambient temperatures.	3	3	9	• Waste unloaded and stored within building. • Waste inventory and residence times minimised, normal operation & during shutdowns. • Effective pest management & housekeeping procedures.	2	1	2
	Increased risk of fire, depending on	2	3	6	• Waste unloaded and stored within building.	1	2	2

	waste storage and management				• Waste inventory and residence times minimised, normal operation & during shutdowns. • Effective housekeeping procedures. • Effective fire prevention plan • Appropriate fugitive or diffuse emissions abatement/control equipment & procedures			
Winter daily max temp could be 4deg more than current average, with the potential for more extreme temp, both warmer and cooler than present	Increased winter ambient temperatures.	1	1	1	• No significant impact on operations etc.	1	1	1
	Extreme low temperatures could lead to pipes freezing and associated process disruption. But risks are likely to be low due to most pipework being internal. The main risk is likely to be freezing of condensate from air-cooled condensers, particularly under lower plant load.	3	3	9	• Nearly all vulnerable pipework within buildings or buried. • Urea solution storage tank located within building. • Effective maintenance systems. • Steam & condensate pipework lagged to prevent heat loss/H&S hazard). • Other vulnerable pipework lagged, especially in exposed areas of the site. • Drain down for shutdown etc. considered in pipework design. • Effective shutdown procedures' ensuring all equipment is drained down when appropriate.	1	2	2
The biggest rainfall events are up to 20% more than	Extreme rainfall could result in off-site surface flood water flowing on to	2	4	8	• Site operational areas are ≥3.7mAOD. • All critical equipment installed ≥4.3mAOD.	1	3	3

current extremes	site impacting on operations.				• Stallingborough Beck flood defences reduce risk of local flooding. (4.0 mAOD). • Buildings (specifically waste hall) have upstands/sleeping policemen (600mm).			
	Onsite flooding leading to: • damage to on-site equipment • possible flooding of the waste bunker	2	4	8	• Site operational areas are ≥3.7mAOD. • All critical equipment installed ≥4.3mAOD. • Buildings (specifically waste hall) have upstands/sleeping policemen (600mm). • Effective maintain of drainage systems, interceptors and trap etc. • Drain design based on extreme event (1:100yr rainfall event + 40% for climate change).	1	2	2
	The site may experience flash flooding issues due to onsite rainfall. The capacity of surface water discharge points may become overwhelmed.	2	4	8	• Site operational areas are ≥3.7mAOD. • All critical equipment installed ≥4.3mAOD. • Buildings (specifically waste hall) have upstands/sleeping policemen (600mm). • Drain design based on extreme event (1:100yr rainfall event + 40% for climate change). • Drain design based on discharge reduced to greenfield run off rate and includes lagoon	1	2	2

					capacity of 1,440 m^3. • Flood Management Plan ensuring drainage system managed correctly. • Pre-emptive identification of alternative emergency disposal options (also considered in system design). • Registered to receive EA flood warnings etc.			
	Potential for contaminated floodwater or surface water run-off from site causing pollution.	2	3	6	• Suitable secure storage of chemicals (e.g. proprietary bunded stores, external bunds (to CIRIA 736) etc. • Urea storage tank located within a building designed to act as a bund. • Drain design based on extreme event (1:100yr rainfall event + 40% for climate change). • Drain design based on discharge reduced to greenfield run off rate and includes lagoon capacity of 1,440 m^3. • Flood Management Plan ensuring drainage system managed correctly. • Effective maintenance of drainage systems, interceptors and trap etc. • Flood Management Plan ensuring drainage system managed correctly.	1	3	3

					• Registered to receive EA flood warnings etc. • Pre-emptive identification of alternative emergency disposal routes options (also considered in system design) for any contaminated water.			
	Other related extreme daily rainfall events may damage building structures, with increased potential for fugitive odour emissions.	2	2	4	• Site operational areas are ≥3.7mAOD. • All critical equipment installed ≥4.3mAOD. • Buildings (specifically waste hall) have upstands/sleeping policemen (600mm). • Building designs include consideration of potential water loadings (velocity & depth) identified in the flood risk assessment.	1	2	2
Average winter rainfall may increase by 29% on todays average	Increase in average rainfall over winter period.	1	1	1	• No significant impact on operations etc.	1	1	1
	Prolonged extreme rainfall could result in the site experiencing flooding issues due to onsite rainfall. The capacity of surface water discharge points may become overwhelmed.	2	2	4	• Mitigation as for “The biggest rainfall events are up to 20% more than current extremes” above. • However there will be significantly increased warning allowing more time to implement suitable procedures etc.	2	1	2

	Prolonged extreme rainfall could result in on-site surface flood water flowing on to site impacting site operations & onsite flooding leading to: • damage to on-site equipment • possible flooding of the waste bunker	2	2	4	• Mitigation as for "The biggest rainfall events are up to 20% more than current extremes" above. • However there will be significantly increased warning allowing more time to implement suitable procedures etc.	2	1	2
Sea level could be 0.6m higher than compared to todays level	If located near the coast, a site could experience increased: • risk of flooding and associated impacts	3	3	9	• Current EA policy is to maintain current levels of protection as sea level rises. • Regular review of EA/Local Authority sea defence polices and plans. • Site operational areas are ≥3.7mAOD. • All critical equipment installed ≥4.3mAOD. • Buildings (specifically waste hall) have upstands/sleeping policemen (600mm). • Effective maintenance of drainage systems, interceptors and trap etc. • Drain design based on extreme event (1:100yr rainfall event +	2	2	4

					40% for climate change).			
	There could be localised issues with surface water discharge, leading to backing up and worsening site flooding.	2	4	8	• Current local policy position is to maintain current levels of protection as sea level rises. • Regular review of EA/Local Authority sea defence polices and plans. • Mitigation as for "The biggest rainfall events are up to 20% more than current extremes" above.	1	3	3
Drier summers potentially up to 34% less rain than now	Potential increased use or reliance on mains water (direct or indirect) for dust suppression and cleaning, particularly at incinerators.	2	4	8	• Drainage systems designed to maximise optimal rainwater recovery during extreme rainfall events. • Procedures are in place to review and minimise water use and maximise collection and use of rainfall • Mains water capacity is adequate, taking into account reduced availability of rainwater for activities such as dust suppression and cleaning.	1	4	4
	There is potential for increased reliance on potable water for incinerator bottom ash (IBA) quenching.	2	2	4	• Drainage systems designed to maximise optimal rainwater recovery during extreme rainfall events. • Procedures are in place to review and minimise water use and maximise collection and use of rainfall • Mains water capacity is	1	2	2

					adequate, taking into account reduced availability of rainwater for activities such as dust suppression and cleaning. • Sources of water for dust suppression and IBA quench are sufficient and not directly reliant on rainfall.			
	There is likely to be more dust from the waste and the ash produced on site.	2	2	4	• Dust producing activities (waste handling, IBA handling etc.) are within buildings. • Sources of water for dust suppression are not directly reliant on rainfall.	1	2	2
At peak the watercourses could be 30% more than now, and at its lowest it could be 65% less than now	At low flow there is likely to be increased stress on a river if the plant is discharging into it.	2	2	4	• Pre-emptive identification of alternative emergency disposal routes options (also considered in system design) for any contaminated water. • Manage the discharge flow rate to avoid impacts. • Drain design based on discharge reduced to greenfield run off rate and includes lagoon capacity of 1,440 m^3.	2	1	2