Table 4.1
3CR The Inorganic Chemicals Sector (EPR 4.03)

This BAT Assessment is for the new 3CR process only.

BAT Requirement	Specific Measures
BAT 1.1 Environmental Performance Indicator Indicative BAT You should where appropriate: 1. Monitor and benchmark your environmental performance, and review this at least once a year. Your plans for minimising environmental impacts should be incorporated into on-going Improvement Programmes. Indicators can be derived using the Horizontal Guidance Note H1 Environmental Risk Assessment (see GTBR Annex 1). It is suggested that indicators are based on tonnes of inorganics produced (tOP) as they provide a good basis for measuring performance within an installation or a single company year on year.	The Site has an EMS accredited to ISO 14001. The site's EMS will be updated to include all the features in BAT 1 relating to the 3CR process.
BAT 1.2 Accident Management In addition to the guidance in Getting the Basics Right, guidance prepared in support of the COMAH Regulations may help you in considering ways to reduce the risks and consequences of accidents, whether or not they are covered by the COMAH regime.	The site is an upper-tier COMAH site. Accident management at the site comprises the following procedures which will be updated to incorporate the new activities: • EHSMSP 105 Emergency Preparedness and Response. • EHSMSP 111 Accident and Incident Investigation. The above procedures will be reviewed every three years as a minimum, and after any reportable incident on Site. The documents will be continually improved in these reviews to include best practice and minimise the risk of accidents occurring. JM will also carry out detailed Hazard and Operability (HAZOP) Risk Assessments for the 3CR to inform the specific operating procedures for minimising the potential causes and consequences of accidents.

BAT Requirement	Specific Measures
BAT 1.3 - Efficient Use of Raw Materials Indicative BAT You should where appropriate: 1. Assess the environmental impact of each process and choose the one with the lowest environmental impact. (We recognise that your choice may be constrained, for example, by the integration of processes on a complex site).	The 3CR process uses specific materials for which there are no ready alternatives. Platinum used in the process is predominantly from re-cycled sources. The raw materials information will be held within the site's Raw Materials list which is reviewed frequently. A mass balance has been created for reagents used in the process (JM reference X2JM-225-000-SUM-0001-00001-00) to allow tracking of all reagents used.
BAT 1.4 Efficient Use of Water Indicative BAT You should where appropriate: 1. Maximise heat transfer between process streams where water is needed for cooling. Use a recirculating system with indirect heat exchangers and a cooling tower in preference to a once-through cooling system. 2. Where water is used in direct contact with process materials, recirculate the water after stripping out the absorbed substances. 3. Use cleaning techniques that reduce the quantity of water needed. 4. Establish opportunities for reuse using pinch analysis.	A mass balance has been created for water used in the process (JM reference X2JM-225-000-SUM-0001-00001-00) to allow tracking of all water utilised used. The plant has been designed to measure and control the volumes of water used within the process to keep consumption to a minimum using automated process control. The reactor systems have been chosen following industry standards for process efficiencies in aqueous processes. 1. The plant has been designed for efficient heat use, as follows: • Heat recovery opportunities include return of steam condensate to the boiler house via hot well. Where possible heat exchangers will be used to preheat feeds with waste heat energy, however these opportunities are limited due to scale of operation and relatively low temperature gradients across processes. • Waste heat is being recovered from the steam condensate recirculation system; • Heat exchangers using cooling water are designed for optimum heat transfer between process streams; and • A closed-loop evaporative cooling tower system will be utilised rather than a once through system for the facility.

BAT Requirement	Specific Measures
	2. Where product quality permits some water will be recirculated. 3. Bespoke lines for each production step are used, eliminating the need for cleaning between batches. Where a complete clean is necessary cleaning methods that minimise the use of cleaning agents will be used, specifically a high pressure (2 bar) water spray-ball cleaning. Water will be warmed to increase the efficiency of the cleaning of certain processes. These systems will be automated to ensure efficient use. 4. JM have considered the management of water using pinch analysis.
BAT 1.5 Avoidance, Recovery and Disposal of Wastes You should where appropriate: 1. Demonstrate that the chosen routes for recovery or disposal represent the best environmental option. Consider avenues for recycling back into the process or reworking for another process wherever possible. 2. Where you cannot avoid disposing of waste, provide a detailed assessment identifying the best environmental options for waste disposal.	1. JM aim to reduce the volume of wastes generated by undertaking a periodic review of waste management strategy. HCl acid in condensate streams will be recycled for local 3CR use as 7M acid and chlorinated solvents in waste streams with distillation will be re-used in the process where possible. Recovery of precious metals from suitable effluent streams will be undertaken. 2. The design intent of transferring processes into 3CR is to optimise the processes which will minimise the generation of wastes, minimise the working inventory of hazardous substances and significantly reduce the material movement and handling of hazardous materials when compared to the old refinery. The waste management strategy will be used to identify the best environmental options for waste disposal.
BAT 2.1 Design of a New Process Indicative BAT You should where appropriate: 1. Consider all potential environmental impacts from the outset in any new project for manufacturing chemicals.	1. Potential environmental impacts from the 3CR process have been considered as part of the design process. 2. A HAZOP assessment has been undertaken for 3CR.

BAT Requirement	Specific Measures
2. Undertake the appropriate stages of a formal HAZOP study as the project progresses through the process design and plant design phases. The HAZOP studies should consider amongst other things the points noted above.	
BAT 2.2 Storage and Handling of Raw Materials, Products and Wastes Indicative BAT You should where appropriate: 1. Store reactive chemicals in such a way that they remain stable, such as under a steady gas stream, for example. If chemical additions are necessary, then tests should be carried out to ensure the required chemical composition is maintained. Inhibitors may also be added to prevent reactions. 2. Vent storage tanks to a safe location. 3. Use measures to reduce the risk of contamination from large storage tanks. In addition to sealed bunds, use double-walled tanks and leak detection channels. 4. Use HAZOP studies to identify risks to the environment for all operations involving the storage and handling of chemicals and wastes. Where the risks are identified as significant, plans and timetables for improvements should be in place.	1.Reactive chemicals for the 3CR process will be stored in line with the site's Control if Major Accident Hazards (COMAH) requirements. 2. Where applicable, storage tanks will be vented to one of the scrubbers. 3.JM will be utilising the new infrastructure within the 3CR building, including a sealed floor, bunding and drainage lines with a sump that can be over pumped to the to the effluent treatment plant. Containment for the storage of chemicals and waste will be indoors and comprise palletised bunding and a locked chemical storage cabinet. 4.A HAZOP assessment has been undertaken for 3CR including storage and handling of chemicals.
BAT 2.3a Plant Systems and Equipment Indicative BAT You should where appropriate: 1. Formally consider potential emissions from plant systems and equipment and have plans and timetables for improvements, where the potential for	1.Refer to section 3.6 of the BATOT which considers potential emissions to air and sewer; fugitive emissions, odour and noise. 2. A HAZOP assessment has been undertaken for 3CR including potential risks to the environment.

BAT Requirement	Specific Measures
substance or noise pollution from plant systems and equipment has been identified. 2. Carry out systematic HAZOP studies on all plant systems and equipment to identify and quantify risks to the environment. 3. Choose vacuum systems that are designed for the load and keep them well maintained. Install sufficient instrumentation to detect reduced performance and to warn that remedial action should be taken.	3. 3CR will include a new vacuum system including a vacuum catch pot and scrubber which will replace the existing site vacuum system. The exhaust gases from the vacuum system will be routed to the new acid scrubbed draught. The vacuum system will be maintained as part of the PPM system and has been designed for the process. Vacuum systems will be monitored by an onsite computerised system in order to monitor performance.
BAT 2.3b Plant Systems and Equipment Indicative BAT You should where appropriate: 1. Carry out a systematic HAZOP study for all relief systems, to identify and quantify significant risks to the environment from the technique chosen. 2. Identify procedures to protect against overpressure of equipment. This requires the identification of all conceivable over-pressure situations, calculation of relief rates, selection of relief method, design of the vent system, discharge and disposal considerations, and dispersion calculations. In some cases, careful design can provide intrinsic protection against all conceivable over-pressure scenarios, so relief systems and their consequential emissions can be avoided. 3. Maintain in a state of readiness all equipment installed in the venting system even though the system is rarely used.	1.A HAZOP assessment has been undertaken for 3CR for pressure relief systems. 2. Pressure relief systems will be designed in accordance with the JM Pressure relief Engineering Guide JMC 815 013. Details of equipment over-pressure hazard identification process will be found in the ductwork design and HAZOP. Every line and every vessel in the Process & Instrumentation Diagram (P&ID) will be considered for factors that could cause more pressure in the line or vessel than the design intention. Where required, bursting discs will be installed to fail safely if the design pressure is exceeded, these will be continuously monitored by use of the tell-tales. These will vent into a dedicated relief vent header on each building. A high degree of automation and instrumentation will be built into the new plant to minimise operator error (e.g., Level control management). 3.The venting system will be managed under the site's PPM.
BAT 2.3c. Heat Exchangers and Cooling Systems Indicative BAT You should where appropriate: 1. Consider leak detection, corrosion monitoring and materials of construction, preferably in a formal HAZOP study. Plans and timetables for	1. The HAZOP study incorporated heating and cooling systems. 2. Any potential process leaks to the cooling water system will be picked up at source by condensate system conductivity checks.

BAT Requirement	Specific Measures
improved procedures or replacement by higher integrity designs should be in place where the risks are identified as significant. 2. If corrosion is likely, ensure methods for rapid detection of leaks are in place and a regime of corrosion monitoring in operation at critical points. Alternatively, use materials of construction that are inert to the process and heating/cooling fluids under the conditions of operation. 3. For cooling water systems, use techniques that compare favourably with relevant techniques described in the "Industrial Cooling Systems" BREF.	3. The design of the wet cooling towers (mechanical draught system) was undertaken in line with the Industrial Cooling Systems BREF and will have a small footprint and low temperature applications.
BAT 2.3d Purging facilities Indicative BAT You should where appropriate: 1. Assess the potential for the release to air of VOCs and other pollutants along with discharged purge gas and use abatement where necessary.	Refer to the Table 3.1 EU WGC BRef BATc for a description of how emissions to air will be managed.
BAT 2.4a Reaction stage Indicative BAT You should where appropriate: 1. With a clear understanding of the physical chemistry, evaluate options for suitable reactor types using chemical engineering principles. 2. Select the reactor system from a number of potentially suitable reactor designs – conventional stirred tank reactor (STR), process-intensive or novel-technology - by formal comparison of costs and business risks against the assessment of raw material efficiencies and environmental impacts for each of the options. 3. Undertake studies to review reactor design options based on process-optimisation where the activity is an existing activity and achieved raw material efficiencies and waste generation suggest there is significant	1. JM undertook an assessment for selecting the reactors for use in the 3CR process. 2. Glass lined steel vessels heated by steam and cooled with water have been selected for the aqueous processes. These are industry standard vessels for corrosive acidic aqueous processes. Thermoplastic reaction vessels will also be used. 3. Reactor systems have been selected following industry standards, process efficiencies and site standards for aqueous processes, which is a proven system representing the lowest environmental and business risk. 4. All processes will be designed to ensure maximum yields are achieved. 5. All emissions from pressure release systems will be abated through the new abatement system.

BAT Requirement	Specific Measures
potential for improvement. The studies should formally compare the costs and business risks, and raw material efficiencies and environmental impacts of the alternative systems with those of the existing system. The scope and depth of the studies should be in proportion to the potential for environmental improvement over the existing reaction system. 4. Maximise process yields from the selected reactor design, and minimise losses and emissions, by the formalised use of optimised process control and management procedures (both manual and computerised where appropriate). 5. Minimise the potential for the release of vapours to air from pressure relief systems and the potential for emissions of organic solvents into air or water, by formal consideration at the design stage - or formal review of the existing arrangements if that stage has passed.	
BAT 2.4b. Minimisation of Liquid Losses from Reaction Systems Indicative BAT You should where appropriate use the following features that contribute to a reduction in waste arisings from clean-outs: • Low-inventory continuous throughput reactors with minimum surface area for cleaning; • Minimum internals such as baffles and coils in the reactor; • Smooth reactor walls, no crevices; • Flush bottom outlet on reaction vessels; • All associated piping to slope back to the reactor or to a drain point; • Sufficient headroom under the reactor for collection of all concentrated drainings in drums or other suitable vessel, if necessary;	Refer to Section 3.4.15.2 of the BATOT report on how JM will minimise liquid losses from reaction systems.

BAT Requirement	Specific Measures
• Minimal pipework, designed to eliminate hold-up and to assist drainage; • Pipework designed to allow air or nitrogen blowing. • System kept warm during emptying to facilitate draining; • HAZOP studies used to assess the potential for the choking of lines by high-melting-point material; • Campaigns sequenced so that cleaning between batches is minimised; • Campaigns made as long as possible to reduce the number of products change-overs; • Where a complete clean is necessary, use cleaning methods that minimise the use of cleaning agents, (e.g. steam-cleaning, rotating spray jets or high-pressure cleaning) or use a solvent which can be re-used; • Carry out HAZOP studies to minimise the generation of wastes and to examine their treatment/disposal; • Consider use of disposable plastic pipe-liners; • Eliminate or minimise locations for solids to settle-out; and • Consider duplicate or dedicated equipment where it can reduce the need for cleaning that is difficult.	
BAT 2.4c Minimisation of Vapour Losses Indicative BAT You should where appropriate: 1. Review your operating practices and review vent flows to see if improvements need to be made. 2. Consider opportunities to enhance the performance of abatement systems.	1.The products are of low volatility and each draught route is reviewed within the Hazard Study with the aim to minimising vapour losses. 2.To enhance the performance of the abatement systems, sulphuric acid will be employed instead of hydrogen chloride.
BAT 2.5a Separation Stage Indicative BAT You should where appropriate:	1. All separation steps have been chosen following a detailed process design and have been subject to a HAZOP study. Formal operating

BAT Requirement	Specific Measures
1. Choose your separation technique following a detailed process design and HAZOP study. Follow formal operating instructions to ensure effective separation and minimisation of losses. Adhere to design conditions such as heat input, reflux flows and ratios, etc. 2. Install instrumentation to warn of faults in the system, such as a temperature, pressure or low coolant-flow alarms.	instructions will be issued before commissioning to ensure effective separation and minimisation of losses. 2. Design conditions will be specified in the process design stage and adhered too. Instrumentation to warn of faults in the system will be implemented in the design.
BAT 2.5b Liquid Liquid Separations Indicative BAT You should where appropriate: 1. Use techniques which maximise physical separation of the phases (and also aim to minimise mutual solubility) where practicable. 2. When the phases are separated, use techniques which prevent (or minimise the probability and size of) breakthrough of the organics phase into a waste-water stream. This is particularly important where the environmental consequences of subsequent releases of organics to air or into controlled waters may be significant (e.g. where the effluent is treated in a DAF unit or some of the organic components are resistant to biological treatment). 3. When a separation is done by hand, use a "dead man's handle", backed-up by good management, to improve the chance of the flow being properly controlled as the phase boundary approaches. 4. Consider if automatic detection of the interface is practicable. 5. Where you are discharging to drain, consider whether there should be an intermediate holding or "guard" tank to protect against accidental losses from the organics phase.	1.Processing techniques will be used which maximise physical separation of the phases and also minimise mutual solubility. 2.Use of phase separation processes will minimise the breakthrough of any organic phases into the waste-water streams which go to the existing VRP. These effluents undergo further treatment in the existing VRP which effectively remove any organic phase from the final effluent prior to discharge to trade effluent or disposal to third party effluent treatment plant via tanker. 3.Phase separation operations will not be done by hand in the 3CR process under normal circumstances. 4.Automatic detection is not practicable. 5. There is no direct discharging to drain from 3CR liquid-liquid separation processes.
BAT 2.5C Solid-Liquid Separations	1.JM have considered techniques to re-use the waste water from washing however due to the high purity requirement of the product, this is limited to

BAT Requirement	Specific Measures
Indicative BAT You should where appropriate: 1. Use techniques to minimise, re-use and/or recycle rinse water, and to prevent breakthrough of solids. 2. Install instrumentation or other means of detecting malfunction as all of the techniques are vulnerable to solids breakthrough 3. Consider installing "guard" filters of smaller capacity downstream which, in the event of breakthrough, rapidly 'clog' and prevent further losses. 4. Have good management procedures to minimise loss of solids, escape of volatiles to air and excessive production of waste water.	process steps where purity is not compromised. All filters are selected to eliminate breakthrough of solids. 2.Pressure indicator alarms for in-line filter systems will be installed to detect malfunctions. Visual checks of product filtration will also be performed regularly. 3.Previous experience indicates the installation of “guard” filters of smaller capacity to prevent further losses is unnecessary due to the reliability of upstream filter systems. Any solids breakthrough which does occur will be captured in existing downstream recovery processes. 4. Due to the presence of precious metals in the product there will be a robust management system to reduce escape of solids. Waste water passes through an existing values recovery system to recover precious metals before it is pumped either to the on-site effluent treatment plant or tanker for third party effluent treatment. Emissions of volatiles to air will be minimised through the abatement systems and the use of enclosed containment systems. The products filtered in solid-liquid separation steps within 3CR have a low volatility. Any volatile reagents and wastes will be stored out of sunlight to minimise any vapour.
BAT 2.7 Chemical Process Controls Indicative BAT You should where appropriate: 1. Monitor the relevant process controls and set with alarms to ensure they do not go out of the required range.	All vessels will be fitted with control instrumentation to monitor process temperatures and liquid levels.
BAT 2.8 Analysis Indicative BAT You should where appropriate:	Analysis of process streams at key stages in the refining steps will be used to determine operating conditions and to approve further processing at the 3CR.

BAT Requirement	Specific Measures
1. Analyse the components and concentrations of by products and waste streams to ensure correct decisions are made regarding onward treatment or disposal. Keep detailed records of decisions based on this analysis in accordance with management systems.	Prior to discharge all effluent streams will be separately analysed to ensure suitability for discharge. This will include any discharge of floor well sumps following wash down or spill. SOPs will be written to ensure non-conforming effluents are quarantined and processed correctly.
BAT 3.1 Point Source Emissions to Air Indicative BAT You should where appropriate: 1. Formally consider the information and recommendations in the BREF on Common Waste Water and Waste Gas Treatment/ Management Systems in the Chemical Sector (see Reference 1, Annex 2) as part of the assessment of BAT for point-source releases to air, in addition to the information in this note. 2. The benchmark values for point source emissions to air listed in Annex 1 should be achieved unless we have agreed alternative values. 3. Identify the main chemical constituents of the emissions, including VOC speciation where practicable. 4. Assess vent and chimney heights for dispersion capability and assess the fate of the substances emitted to the environment.	1. Refer Appendix 0 Table 3.1 for the assessment against the WGC BRef. 2. The specification of the wet scrubbers selected indicates that they will meet the current limit for the existing plant. JM will work within the specific timelines issued when the UK WGC BRef is issued to ensure that applicable UK BRef BAT AEL's are met. 3.JM have defined the speciation for VOCs emitted from the 3CR process. VOCs will predominantly include pentane-2-one and n-hexane. 4. Refer to 416.065394.00001_AERA for an assessment of potential impacts to offsite receptors from emissions to air released as part of the 3CR process.
3.2 Point Source Emissions to Water Indicative BAT You should where appropriate: 1. Control all emissions to avoid a breach of water quality standards as a minimum. Where another technique can deliver better results at reasonable cost it will be considered BAT and should be used. 2. Use the following measures to minimise water use and emissions to water:	1.As with the current PGMR plant there will be no releases to groundwater or other controlled waters. All releases to the water environment will be made via the existing values recovery process (VRP) which recovers precious metals; the site effluent treatment plant (SETP); and Anglian Water Services sewage treatment works 2.Heat exchangers using cooling water are designed for optimum heat transfer between process streams. • Heat recovery opportunities include return of steam condensate to the CHP. Where possible heat exchangers will be used to preheat

BAT Requirement	Specific Measures
• Where water is needed for cooling, minimize its use by maximising heat transfer between process streams. • Use water in recirculating systems with indirect heat exchangers and a cooling tower rather than a once through system. (A water make-up treatment plant and a concentrated purge stream from the system to avoid the build-up of contaminants are likely to be necessary.) • Leaks of process fluids into cooling water in heat exchangers are a frequent source of contamination. Monitoring of the cooling water at relevant points should be appropriate to the nature of the process fluids. In a recirculatory cooling system, leaks can be identified before significant emission to the environment has occurred. The potential for environmental impact is likely to be greater from a once through system. Planned maintenance can help to avoid such occurrences. • Reduce water used for cleaning. • Strip process liquor and treat, if necessary, then recycle/reuse. • Use wet air oxidation for low volumes of aqueous effluent with high levels of organic content, such as waste streams from condensers and scrubbers • Neutralise waste streams containing acids or alkalis to achieve the required pH for the receiving water. • Strip chlorinated hydrocarbons in waste streams with air or steam and recycle by returning to process where possible. • Recover co-products for re-use or sale. • Periodically regenerate ion exchange columns. • Pass waste water containing solids through settling tanks, prior to disposal. • Treat waste waters containing chlorinated hydrocarbons separately where possible to ensure proper control and treatment of the chlorinated compounds. Contain released volatile chlorinated hydrocarbons and vent to suitably designed incineration equipment.	feeds with waste heat energy, however these opportunities are limited due to scale of operation and relatively low temperature gradients across processes; • Waste heat will be recovered from the steam condensate recirculation system; • The cooling water system design will ensure that process fluids will not contaminate the cooling water, leaks will cause a shut-off of cooling water to affected areas. This is because the cooling water is always at a higher pressure than the process fluids. Planned maintenance will be implemented to avoid process failure. • Bespoke lines for each production step are used, eliminating the need for cleaning between batches; • Where a complete clean is necessary cleaning methods that minimise the use of cleaning agents will be used, specifically a high pressure (2 bar) water spray-ball cleaning. Water will be warmed to increase the efficiency of the cleaning of certain processes. These systems will be automated to ensure efficient use. • Effluent is sent to the VRP to recover precious metals where possible. • Effluent is also run through the SETP prior to discharge. • Prior to discharge to the existing VRP all effluent streams will be separately analysed to ensure suitability for discharge. This will include any discharge of floor well sumps following wash down or spill. SOPs will be written to ensure non-conforming effluents are quarantined and processed correctly. If effluent is not suitable for discharge to sewer it will be tankered offsite to a suitably licensed treatment facility. • Thermal incineration will not be undertaken at 3CR.

BAT Requirement	Specific Measures
• Non-biodegradable organic material can be treated by thermal incineration. However, the thermal destruction of mixed liquids can be highly inefficient, and the waste should be dewatered prior to incineration.	
BAT 3.3 Point Source Emissions to Land Indicative BAT You should where appropriate: 1. Use the following measures to minimise emissions to land: • Use settling ponds to separate out sludge (Note: Sludge can be disposed of to incinerator, encapsulation, land or lagoon depending upon its make up.); • Chlorinated residues should be incinerated and not released to land. (Chlorinated hydrocarbons are not to be released to the environment due to their high global warming and ozone depletion potentials.); • Either recycle off specification product into the process or blend to make lower grade products where possible; and • Many catalysts are based on precious metals, and these should be recovered, usually by return to the supplier.	Not applicable – there will be no point source emissions to land from 3CR.
BAT 3.4a Fugitive Emissions Indicative BAT You should where appropriate: 1. Identify all potential sources and develop and maintain procedures for monitoring and eliminating or minimising leaks. 2. Choose vent systems to minimise breathing emissions (for example pressure/ vacuum valves) and, where relevant, should be fitted with knock-out pots and appropriate abatement equipment. 3. Use the following techniques (together or in any combination) to reduce losses from storage tanks at atmospheric pressure:	Refer to Appendix 02 Table 3.1 WGC Bref assessment for how JM intend to manage fugitive emissions.

BAT Requirement	Specific Measures
• Maintenance of bulk storage temperatures as low as practicable, taking into account changes due to solar heating etc; • Tank paint with low solar absorbency; • Temperature control; • Tank insulation; • Inventory management; • Floating roof tanks; • Bladder roof tanks; • Pressure/vacuum valves, where tanks are designed to withstand pressure fluctuations; and • Specific release treatment (such as adsorption condensation).	
BAT 3.4b Fugitive Emissions to Surface Water, Sewer and Groundwater Indicative BAT You should where appropriate: 1. Provide hard surfacing in areas where accidental spillage or leakage may occur, e.g. beneath prime movers, pumps, in storage areas, and in handling, loading and unloading areas. The surfacing should be impermeable to process liquors. 2. Drain hard surfacing of areas subject to potential contamination so that potentially contaminated surface run-off does not discharge to ground. 3. Hold stocks of suitable absorbents at appropriate locations for use in mopping up minor leaks and spills and dispose of to leak-proof containers. 4. Take particular care in areas of inherent sensitivity to groundwater pollution. Poorly maintained drainage systems are known to be the main cause of groundwater contamination and surface/above-ground drains are preferred to facilitate leak detection (and to reduce explosion risks).	3CR will contain impermeable hardstanding in offloading / loading areas; chemical storage and waste storage areas. In the case of a spill, surface water drains in these areas will run to the SETP and held in buffer tanks giving the opportunity for analysis prior to treatment and / or disposal. Chemicals and waste will be stored in bunds or on bunded stillages. Chemicals will be stored predominantly indoors. A sealed drainage system leading to a sump that can be over pumped to the SETP will be installed within 3CR. Spill kits will be kept in key chemical / waste handling areas. JM will add the drainage at 3CR to the site's PPM, which includes regular monitoring of the drainage system. Refer to 416.065394.00001_ERA which indicates the risk to groundwater from the SCR process is considered to be low. 3CR will be managed under a PPM system.

BAT Requirement	Specific Measures
5. Additional measures could be justified in locations of particular environmental sensitivity. Decisions on the measures to be taken should take account of the risk to groundwater. 6. Surveys of plant that may continue to contribute to leakage should also be considered, as part of an overall environmental management system. In particular, you should consider undertaking leakage tests and/or integrity surveys to confirm the containment of underground drains and tanks.	
BAT 3.5 Fugitive Emissions – Odour Indicative BAT You should where appropriate: 1. Manage the operations to prevent release of odour at all times. 2. Where odour releases are expected to be acknowledged in the permit, (i.e. contained and treated prior to discharge or discharged for atmospheric dispersion): • For existing installations, the releases should be modelled to demonstrate the odour impact at sensitive receptors. The target should be to minimise the frequency of exposure to ground level concentrations that are likely to cause annoyance • For new installations, or for significant changes, the releases should be modelled, and it is expected that you will achieve the highest level of protection that is achievable with BAT from the outset • Where there is no history of odour problems then modelling may not be required although it should be remembered that there can still be an underlying level of annoyance without complaints being made • Where, despite all reasonable steps in the design of the plant, extreme weather or other incidents are liable, in our view, to increase the odour impact at receptors, you should take appropriate and timely action, as agreed with us, to prevent further annoyance (these agreed	The raw materials used in the 3CR process have low odour potential. All process vessels will be suitably draughted and ducted to the scrubbed draught systems. The plant is designed to ensure that no odours are detectable outside of the building. The raw materials will be stored in an existing permitted facility. The 3CR building will be situated remotely from site boundaries. For assurance purposes there is a Duty Fume Officer system on site that ensures any personnel who detects an odour can contact the fume officer on duty, in the event of suspected odour issues from 3CR, this will then be reported to the R&CE EHS department for further investigation.

BAT Requirement	Specific Measures
actions will be defined either in the permit or in an odour management statement). 3. Where odour generating activities take place in the open, or potentially odorous materials are stored outside, a high level of management control and use of best practice will be expected. 4. Where an installation releases odours but has a low environmental impact by virtue of its remoteness from sensitive receptors, it is expected that you will work towards achieving the standards described in this guidance note, but the timescales allowed to achieve this might be adjusted according to the perceived risk. 5. Where further guidance is needed to meet local needs, refer to Horizontal Guidance Note H4 Odour (see GTBR, Annex 1).	
BAT 3.6 Noise and Vibration Indicative BAT You should where appropriate: 1. Install particularly noisy machines such as compactors and pelletisers in a noise control booth or encapsulate the noise source; 2. Where possible without compromising safety, fit suitable silencers on safety valves; and 3. Minimise the blow-off from boilers and air compressors, for example during start up, and provide silencers.	Refer to 416.065394.00001_NIA for the noise impact assessment of the 3CR facility. No significant adverse impacts are expected.
BAT 3.7a Monitoring Indicative BAT You should where appropriate: 1. Carry out an analysis covering a broad spectrum of substances to establish that all relevant substances have been taken into account when	Refer to Section 3.7 of the BATOT report for the monitoring that will be undertaken at applicable emission points. Monitoring has been selected to represent all relevant substances that may be present. Monitoring has been designed to meet relevant UK and EU guidance.

BAT Requirement	Specific Measures
setting the release limits. The need to repeat such a test will depend upon the potential variability in the process and, for example, the potential for contamination of raw materials. Where there is such potential, tests may be appropriate. 2. Monitor more regularly any substances found to be of concern, or any other individual substances to which the local environment may be susceptible and upon which the operations may impact. This would particularly apply to the common pesticides and heavy metals. Using composite samples is the technique most likely to be appropriate where the concentration does not vary excessively. 3. If there are releases of substances that are more difficult to measure and whose capacity for harm is uncertain, particularly when combined with other substances, then "whole effluent toxicity" monitoring techniques can be appropriate to provide direct measurements of harm, for example, direct toxicity assessment.	No chemicals released to air or sewer are difficult to measure or characterise in terms of risk.
BAT 3.7b Monitoring and Reporting of Waste Emissions Indicative BAT You should where appropriate: **1.** Monitor and record: • The physical and chemical composition of the waste; • Its hazard characteristics; and • Handling precautions and substances with which it cannot be mixed.	JM record waste transfers in line with Duty of Care guidance.
BAT 3.7c Environmental Monitoring (beyond installation) Indicative BAT You should where environmental monitoring is needed: **1.** Consider the following in drawing up proposals: • Determinands to be monitored, standard reference methods, sampling protocols;	Environment assessments within this application (416.065394.00001_ERA, 416.065394.00001_NIA, 416.065394.00001 – AERA) indicate that potential risks to offsite receptors is low and that environmental monitoring beyond the site boundary is not necessary.

BAT Requirement	Specific Measures
• Monitoring strategy, selection of monitoring points, optimisation of monitoring approach; • Determination of background levels contributed by other sources; • Uncertainty for the employed methodologies and the resultant overall uncertainty of measurement; • Quality assurance (QA) and quality control (QC) protocols, equipment calibration and maintenance, sample storage and chain of custody/audit trail; and • Reporting procedures, data storage, interpretation and review of results, reporting format for the provision of information.	
BAT 3.7d Process Variables Indicative BAT You should where appropriate: 1. Identify those process variables that may affect the environment and monitor as appropriate.	Through the EMS and PPM system, key process variables that may impact the environment are monitored (i.e., emission points to air, discharge to sewer, containment).