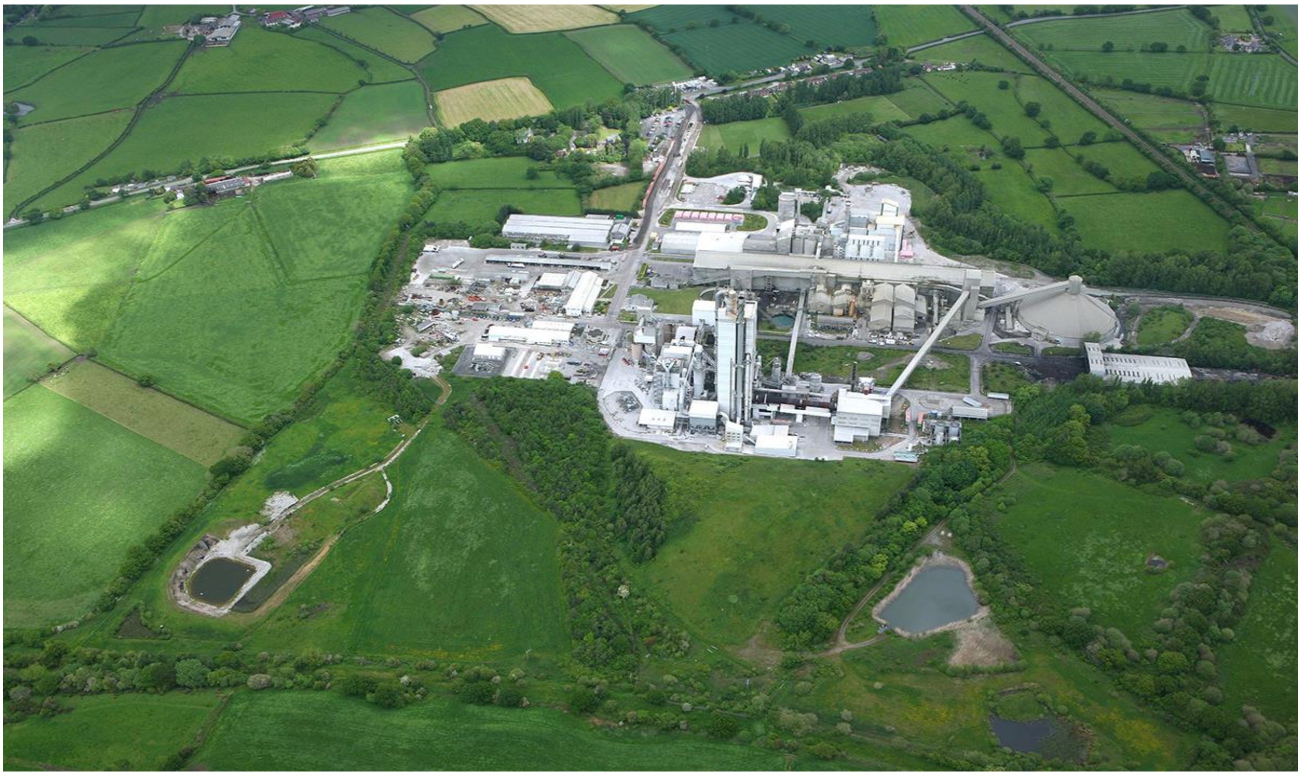
HEIDELBERG MATERIALS

Padeswood Carbon Capture Plant – FEED Phase

Drainage Philosophy

Document no. Rev 0: 215000-00190-000-PR-PHL-00004



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Rev	Description	Originator	Reviewer	Worley Approver	Revision Date
Rev A	Issued for Inter Discipline Check	A Kundu	C Viljoen	A Kundu	04 January 2024
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Revision History

Rev	Status	Section	Description of Change
A	IDC	All	Issued for Inter Discipline Check
B	IFR	All	Incorporate IDC comments.
0	IFD	All	Incorporate IFR comments, as well as alignment with Civil design.

Holds

No	Section	Description	Input From	Planned Date

Table of contents

Appendices

List of tables

List of figures

No table of figures entries found.

1. Project Introduction

Heidelberg Materials (HM) has become a partner in the HyNet Northwest consortium, which aims to create the world's first low-carbon industrial cluster in the region of Northwest England. The proposed hydrogen and carbon capture and storage (CCS) industrial cluster will play a critical role in the UK's transition to net zero greenhouse gas emissions and the fight against climate change. As part of 'Making Net Zero Possible', Asset Improvement programme options to decarbonise COMPANY cement plant are being considered. Carbon Capture (CC) is one of the key technologies being developed as a route to decarbonisation. COMPANY cement plant located at Padeswood which currently produces about 110 ton per hour (tph) of clinker, has been selected by DESNZ as a track 1 phase 2 carbon capture project. The PROJECT will enable carbon capture from the existing cement kiln 4 and from a new Combined Heat and Power (CHP) plant designed to provide the heat and electricity required to operate the Carbon Capture and Compression (CCC) plant. Captured CO2 will be transported by pipeline to the HyNet CO2 main pipeline at Northop Hall AGI for onward transportation to storage offshore in depleted gas fields operated by Eni UK. The PROJECT will enable the production of net zero cement for use in the UK construction industry.

Ahead of this CONTRACTOR has been engaged by COMPANY to undertake a pre-FEED study for the carbon capture development. The pre-FEED study was completed in March 2023. Based on the pre-FEED study, an amine-based post combustion CO2 capture technology has been selected as a suitable technology for capturing 95% of the CO2 emissions from cement plant.

A consortium between Mitsubishi Heavy Industries (MHI) and Worley as the selected FEED contractor for the Heidelberg Material (HM) Padeswood CCS Project shall deliver an overall FEED package utilizing MHI's Carbon capture technology.

The capture plant can be considered a green field development, but some elements of the integration with the cement plant will be considered brown field. Green field elements will be developed by MHI and Worley, while brownfield elements will be developed by both HM and MHI/Worley.

2. Document Purpose

This document presents the Drainage Philosophy for the Heidelberg Materials FEED Project. This philosophy shall apply to process and utility systems including packaged equipment. This document is primarily focused on process drainage, including drainage and spillage of process fluids and surface water drainage from process areas. Surface water drainage from non-process areas and from the existing site are covered by this philosophy to the extent required to describe the interactions and interconnections with the process drainage. Foul water / sewers and effluent treatment are outside the scope of this document.

This document should be used in conjunction with project specifications, including:

- Process Basis of Design (Reference 1)
- Process Design Criteria (Reference 2)
- Isolation Philosophy (Reference 3)

3. Abbreviations, Definitions & References

3.1 Abbreviations

Acronym	Definition
AMS	Alarm Management System
B.L.	Battery Limit
BOD	Basis of Design
CCP	Carbon Capture Plant (CCU + CO_2 Compression Conditioning + Utilities)
CCS	Carbon Capture and Storage
CCU	Carbon Capture unit
CHP	Combined Heat and Power
CO_2	Carbon Dioxide
CS	Carbon Steel
DCC	Direct Contact Cooler
EP	Electrostatic Precipitator
EPC	Engineering, Procurement and Construction
FEED	Front End Engineering Design
HM	Heidelberg Materials
HHV	Higher Heating Value
HTF	Heat Transfer Fluid
LHV	Lower Heating Value
MCC	Motor Control Centre
MCM	Machine Monitoring System
MJ	Mega Joule
MHI	Mitsubishi Heavy Industries
MOP	Maximum Operating Pressure
MW	Mega Watt
MWth	Mega Watt Thermal
NaOH	Sodium Hydroxide
OWS	Oily Water Sewer
PE	Polyethylene
PFD	Process Flow Diagram
PHT	Pre-Heating Tower
SCR	Selective Catalytic reduction
STP	Standard Temperature and Pressure
T&S	Transport and Storage
UCP	Package Unit Control Panels
UFD	Utility Flow Diagram
WHRU	Waste Heat Recovery Unit

Table 3-1 - List of Abbreviations

3.2 Definitions

Term	Definition
COMPANY	Heidelberg Materials
CONTRACTOR	Worley Europe Limited
LICENSOR	A party entering a Licensing Agreement with the CLIENT
PROJECT	Padeswood Carbon Capture Plant
SUPPLIER/VENDOR	Company / organisation suppling equipment, materials or services.
SUB-SUPPLIER	The organisation selected by the SUPPLIER/VENDOR to supply the part of equipment and services.
WORK	Shall mean all and any of the WORKs and / or services and / or materials required to be provided under the Contract with CLIENT.
shall and must	Indicates mandatory requirements
Should	Indicates that a provision is not mandatory but recommended as good practice.
May	Used to indicate that optional action is available

Table 3-2 - List of Definitions

3.3 References

Document Number	Title
215000-00190-000-PR-BOD-00001	Process Basis of Design
215000-00190-000-PR-CRT-00001	Process Design Criteria
215000-00190-000-PR-PHL-00001	Isolation Philosophy

Table 3-3 - List of References

4. Drainage Philosophy

This philosophy assumes that the new Heidelberg Materials Project ISBL and OSBL facilities are provided with a new drainage system. The overall storm water drainage strategy for the site must be integrated with the process drainage and both streams considered together to ensure pipes and catchment/treatment facilities are suitably sized.

The drainage system design should support the HSE regulations, operability and maintainability of the plant. The supporting principles to achieve this objective are to:

- Ensure compliance to environmental and regulatory standards.
- Segregate hazardous and non-hazardous effluent.
- Identify the required drain system types.
- Contain leaks and accidental spills via carefully designed collection systems.
- Establish requirement to segregate collection and to eliminate cross contamination prior to recovery and disposal.
- Identify recovery and recycle interfaces for the drained fluids.
- Ensure safe design with access for maintenance and inspection.
- Account for normal operations, maintenance draining and drainage during an emergency.

Drainage and surface liquid containment are not supplemental process systems but must be integrated into the overall process design. This is especially true for facilities handling hazardous and/or toxic liquids where spilled liquids can present a danger to the surrounding environment if released. If process drainage systems are handling hazardous materials it is essential the risks are mitigated through the implementation of appropriate design measures. The principal aim is to segregate the hazardous effluents from non-hazardous effluent where possible.

Drainage at the site is primarily classified into:

- Process Drains System which collects drainage directly from equipment or piping.
- Storm Water Drain System which collects rain/storm water. Accidental spillages from process areas or maintenance water such as Jet Wash Effluent can also be routed to storm water systems after passing the control measures put in place to ensure acceptable quality. Drainage can originate from kerbed areas and gullies. Any systems which can collect fire suppression/fire fighting water and/or surface water (rainfall) must be suitably sized for concurrent realistic scenarios. This realistic concurrent scenario shall be defined in the relevant Civil Engineering Discipline deliverable.

Both systems can contain either hazardous or non-hazardous fluids which will be reviewed in further detail in sections 5 and 6.

Please note that at this early stage of the project, chemicals used in the plant are not fully specified. Various chemicals are used in the ISBL and OSBL systems which may require a dedicated drainage system. During FEED as design becomes more mature and safety datasheets for various chemicals become available, the drainage philosophy should be kept under review and updated according to the latest available information.

Process drains include routine draining of equipment and pipework for maintenance operations. As far as practical, drained fluid will be retained and returned to the appropriate system. Where this is undesirable, fluids will be discharged to suitable containment, treated and, if necessary, sent to off-site disposal.

Surface water run-off may contain storm water, fire water and/or maintenance water from process areas and it is assumed the concentrations of process materials will be relatively low. It can be assumed that surface water run-off from non-process areas (such as building roofs) will not contain any process materials and hence will not be part of the process design scope. However, it is anticipated that storm water from non-process areas can still contain other elements that need basic treatment before re-use, such as solids removal and/or removal of traces of oil (e.g. from vehicles). Appropriate facilities for treatment of this water for re-use will be part of the Project scope.

Spill containment is focused on containing accidental releases of process fluids. Under these circumstances the concentrations of process materials will be relatively high. Loading and storage operation of chemicals is a typical scenario which could result in spills and major leaks. All chemicals should be evaluated for their effects, including flammability, toxicity, corrosion, reactivity and quantity. This is to determine whether collected spills are to be treated (e.g. neutralisation) and/or disposed.

The specifics of the drainage systems will depend on the site topography. Whilst gravity flow is to be utilised wherever possible, additional pumping stations may be required to boost flows to the waste collection points.

This philosophy does not cover specific process waste streams which will be pumped directly to treatment facilities, such as the Flue Gas Condensate from the Quench units.

5. Process Drain System

Process Drains are required to collect liquid maintenance drains from equipment and piping which can contain both non-hazardous and hazardous/toxic fluids and safely dispose and degas the liquid (if required). The Process Drain header will be below grade.

On the Heidelberg Materials Project there are no significant quantities of flammable hydrocarbons that need to be handled by drain systems. Where flammable fluids are handled in drain systems these must be designed to ensure no oxygen can enter the system and create a flammable mixture and that any flashing of hydrocarbon vapours is sent to an appropriate disposal system such as a flare. Currently no such systems are envisaged to be required on the Heidelberg Materials Project.

The main process fluids that require a dedicated hard piped process drain are the hazardous fluids (such as amine solvent used in the carbon capture process and the heat transfer fluid for WHRU).

Where eye wash stations and emergency showers (with connection to site alarm with visible beacons) are provided, the drainage route shall be decided based on the potential contamination and best available route depending on layout.

5.1 ISBL Process Drainage

Chemicals, including amine, shall not be discharged to any open drain systems or water treatment facilities and must be contained. Where possible it should be recovered and recycled for use within the process

Table 5-1 - Summary of ISBL Drainage philosophy

Type	Source	Fluid	Normal Operation	Drain Philosophy
Slurry	Quencher (720TW001) Bottom section and surrounding equipment, piping.	DeSOx circulation fluid (pH approx. 6.5 acidic slurry aqueous solution)	Send to the buffer tank in OSBL	① The internal liquid at the system include with piping is drained by gravity into the sump tank (newly additional). The collected liquid in the sump tank is transferred to the Quencher FGD Section Drain Tank, (ISBL, newly additional) CCP Effluent Tank (OSBL). ② The liquid collected in the CCP Effluent Tank is transferred to the existing cement plant at the following location, if necessary: • Raw Mill-3 • Raw Mill-5 • Gas Conditioning Tower
Flue Gas Condensate	Quencher (720TW001) Top include Wet-ESP section and surrounding equipment, piping.	Flue gas condensate	Send to FG Condensate Storage of WWT (OSBL)	① The internal liquid at the system is transferred to FG condensate storage of WWT (OSBL) as much as possible. ② The remaining liquid in the system, including within piping is drained by gravity into the sump tank (newly additional). The liquid collected in the sump tank is transferred to the CCP Effluent Tank (OSBL), if necessary.
Amine	Absorber	Amine Solvent	-	① The internal solvent at the system is transferred to

	(720TW002A) Regenerator (720TW003) and surrounding equipment, piping.			Solvent Tank (720TK001)(*1) at ISBL as much as possible. ② The remaining liquid into the system include with piping is drained by gravity into Solvent Sump Tank (720TK002). Additional solvent drain sumps might be required depending on the plot layout. ③ If it is necessary to empty the tanks, the internal solvent in the tanks is transferred to the temporary buffer tank and it will be outsourced as chemical wastewater. (*1) The capacity of Solvent Tank (720TK001) does not take into account the simultaneous maintenance of Absorber(720TW002A) and Regenerator(720TW0003). The capacity of 720TK001 is designed to accommodate only 720TW002A, which has a larger solvent holding volume than 720TW003.
Amine contaminated water	1st and 2nd Washing Section of Treated Gas Wash Tower (720TW002B) and diluted solvent users	Diluted Amine Solvent	Send to the cement plant	① The internal solvent at the system is transferred to Wash Water Tank (720TK005) and Dilute Wash Water Tank (720TK006) at ISBL as much as possible. ② The remaining liquid into the system include with piping is drained by gravity into Solvent Sump Tank (720TK002). The collected solvent in the sump tank is transferred to Wash Water Tank (720TK005) or Dilute Wash Water Tank (720TK006), if necessary. ③ If it is necessary to empty the tanks, the internal solvent at the tanks is transferred to a temporary buffer tank and it will be outsourced as chemical wastewater. Maintenance: Rinse water from Water Wash, Absorber and Regenerator will be routed to 720TK006
Acid wash water	3rd Washing Section of Treated Gas Wash Tower (720TW002B) and diluted solvent users	Acid wash water	Send to the cement plant	① The internal solvent at the system is transferred to Acid Wash Water Tank (720TK009) at ISBL as much as possible. ② The remaining liquid into the system include with piping is drained by gravity into the sump tank (newly additional). The collected solvent in the sump tank is transferred to Acid Wash Water Tank (720TK009), if necessary. ③ If it is necessary to empty the tanks, the internal solvent at the tanks is transferred to a temporary buffer tank and it will be outsourced as chemical wastewater. Maintenance: Rinse water of the acid wash section will contain almost no amine and will be drained to the storm water system for re-use as raw water.
Reclaimed waste	Reclaimer Heater (720HE007A/B) Reclaimed Solvent Drum (720VZ003A/B)and surrounding equipment, piping.	Reclaimed waste	Send to the cement plant	① The internal liquid at the system is transferred to Reclaimed Waste Tank (720TK004) as much as possible. ② The remaining liquid into the system include with piping is drained by gravity into Reclaimed Waste Sump Tank (newly additional, ISBL). The collected liquid in the sump tank is transferred to Reclaimed Waste Tank (720TK004), if necessary.③ If it is necessary to empty the tanks, the internal liquid in the tanks is sent to the cement plant, If transport to the cement plant is not possible, it is transferred to the temporary buffer tank and it will be outsourced as chemical wastewater.

CO2 compressor condensate water	CO2 compressor drain	Amine contaminated water	-	① The process condensate water from CO2 compressor is transferred to Reflux Drum (720VZ001) and the CO2 Compressor suction drum liquid is transferred to 720TK002 during normal operating condition. ② In low-pressure system or pressure vessel after depressurization, the internal liquid at the system is drained by gravity into Solvent Sump Tank (720TK002). The collected liquid in the sump tank is transferred to Wash Water Tank (720TK005) or Dilute Wash Water Tank (720TK006), if necessary. ③ If it is necessary to empty the tanks, the internal liquid at the tanks is transferred to a temporary buffer tank and it will be outsourced as chemical wastewater.
Acid	Sulphuric Acid Tank (720TK010) and surrounding equipment, piping.	Sulphuric Acid	-	Chemical drain is rarely generated during normal operation, but a remaining chemical in the chemical hose or piping may be generated as a small amount of drain during the chemical loading operation from the tank truck. This very small amount of drain can be applied to a temporary bucket to minimize contamination. Even if this very small amount of chemical spills onto the floor, it is collected in the sump pit or tank and transferred to OSBL WWT.
Caustic soda	Caustic Soda Tank (720TK003) and surrounding equipment, piping.	Caustic Soda	-	Chemical draining is rarely required during normal operation, but remaining chemicals in the chemical hose or piping may be generated as a small amount of drain during the chemical loading operation from the tank truck. This very small amount of drain can be applied to a temporary bucket to minimize contamination. If some of this very small amount of chemical spills onto the floor, it is collected in the kerbed/bunded area sump pit and transferred to OSBL WWT.
Pre-coat filter wet cake	Pre-coat filter	Water with cellulose	Sent to the Calciner	If it is necessary to empty the tank, the internal liquid at the tank is transferred to a temporary buffer vessel, i.e. IBC.

5.1.1 Amine Drains

The rich and lean amine drain system shall be hard piped to specific funnels connected to the amine drain header. These funnels will have covers to prevent spillage due to splashing.

Dedicated hard piped process drains are not considered for other drain systems, as specified above.

Where only parts of the system are to be drained down, as much amine inventory as possible shall be transferred to other parts of the system or to the storage area prior to draining to the drain drum/sump. The Solvent Tank should have sufficient volume to contain the liquid from the single largest equipment/segment containing amine. If drainage to an atmospheric drain tank is considered, it shall be emphasised in operating procedures that equipment must be fully depressurised and degassed before opening of drain isolation valves / spectacle blind. The amine drain system shall be designed for easy collection and removal of solid particles, for example by including filters downstream of the pumps at the exit of the drain sumps. If any solids are expected to remain in the drainage that cannot be removed by such a filter, facilities shall be provided to remove these residual solids without impacting on plant operation.

The design temperature of the drain headers, drain tank and drain pump should be made to allow drainage of equipment within reasonable time. If the design temperature for the drain system is made lower than for the overall amine system, cool-down requirements shall be clearly described in operating procedures. If any scenarios are identified where immediate drainage of hot process fluid into the drain system is necessary in an emergency scenario, the drain system shall be designed to accommodate this requirement.

5.2 Closed Drains for HTF

The HTF Closed Drain Systems should collect liquid maintenance drains from equipment and piping, containing heat transfer fluid (HTF), and safely dispose and degas the liquid if needed.

Liquid levels in the equipment to be maintained shall be lowered to the minimum practical level using the normal process connections to downstream system. All the remaining liquid in the equipment in HTF system will be drained to the Closed Drain Drum using N_2 pressure. Closed drain drum for HTF will be above ground and sufficient volume to hold all the HTF liquid from the system.

5.3 Open Drains

Surface water run-off from potentially oil contaminated areas will drain to the storm water sewer drain system. Also, potentially oil contaminated liquids, e.g. accidental overflow from pump drip trays, will drain to the drain system. Liquid from drip trays with potential risk of amine contamination to be released manually only after inspection if there is a risk of amine contamination by opening a valve.

If there is a risk of amine contamination, the storm water will be held in a kerbed area. It will only be released to the drain system if confirmed that it is not contaminated with amines. Refer to section 6 for more detail.

Lube oil from pumps and compressors will be manually drained by Maintenance into a suitable container as per maintenance procedures.

Steam traps are only used for draining condensate from steam headers and steam piping. The steam trap outlets will be routed to funnels connected to the drain system. A small section of metal pipe will be required to cool the condensate before joining the PE drain system.

6. Storm Water Drain System

The surface water strategy for this project is to collect, treat and reuse the surface water at the site in the Water System. The reuse of this water will reduce the raw water extraction. The surface water will be pumped to the Raw Water tank for use if it is not contaminated.

At the back of the new retaining wall between the exsiting plant and the CCP a filter drain will be installed to pick up surface water from the existing Cement Plant. A series of weep holes will be installed within the retaining wall for ground water back of wall drainage. Filter drain will be provided at the toe of the retaining wall to collect surface water run-off and water from weep holes.

Storm water from areas that have no potential significant contamination sources will be routed to the storm water system, upstream of the interceptor.

Typically, Polyethylene (PE) pipes are used for underground drains. However, different materials might be required for different services and material of construction will be developed and indicated on the Material Selection Diagrams.

The following prevention measures can be used to reduce/avoid contamination of storm water and should be further studied during detailed design.

- Daily patrol for chemicals and oil leakage to be included in operating guidelines
- Periodical sampling of storm water in each area before purge
- Installation of pans under pumps
- Installation of pans and shroud for plate heat exchangers

In addition to the above, automated detection shall be considered, for example the licensor has proposed the use of conductivity meters in some cases. However, to ensure the integrity of the system it is recommended that manual detection is the primary method for deciding whether storm water is clean and can be pumped to the common storm water system.

6.1 Potentially Solvent Contaminated Drains

There are process areas within the plant where surface water run-off will potentially be contaminated with oil, over and above other chemicals. This can happen if there are small leaks from the process which are washed into the drains by surface water and could also occur if maintenance activities require wash down of equipment into the local drains. These potentially contaminated systems are to be segregated within kerbed / bunded areas and shall not free flow into the storm water system. Each kerbed / bunded area within ISBL is divided independently to prevent any contamination of leaked fluids.

If the storm water collected in each area is determined not to be contaminated with chemicals, it is drained to the drain system upstream of the Interceptor. If chemical contamination is found, treatment at the onsite water treatment plant or disposal to the cement plant may be required. A similar approach will be adopted for OSBL facilities where the potential for contaminated storm water exists. Storm water will be released to the Oily Water system after testing for contamination. If the water is contaminated it will have to be removed by vacuum truck for use in the cement plant or external disposal.

It is noted however that it is expected that there will be a small continuous carryover of amines in the CO_2 gas leaving the compression area, which may appear in the condensate drain leaving the CO_2 compressors. This stream will need to be collected and transferred back to the ISBL area where there are facilities to handle the amine contaminated condensate by an above ground pipe.

6.2 Potentially Oil Contaminated Area

Plant areas where relatively large quantities of oil may be present (such as local to rotating mechanical equipment) will be kerbed to allow contaminated surface water to be contained and directed to the drain if it is not contaminated with process fluids. The discharge from the kerbed area will gravity flow via the storm water drains to an Interceptor where potential oil is separated for off-site disposal by tanker. The cleaned-up water will be routed to pond for re-use.

6.3 Potentially Chemical Contaminated Area

Plant areas where relatively large quantities of only chemicals, i.e. KS21@TM solvent or sulphuric acid, caustic, etc. may be present (such as tank areas) will be bunded to allow potentially contaminated surface water to be contained. Storm water will only be released to the Storm Water system after testing for contamination and it is confirmed not to be contaminated with chemicals. The cleaned-up water will be routed via the Interceptor to the pond for re-use.

6.4 No potential Contamination Area

Tanks containing only non-contaminated water water will not be bunded and any leakage will flow directly to storm water system.

The storm water from areas without specific chemicals present (i.e., areas other than those mentioned above) will still require some light treatment before it can be re-used in the raw water system.

Final details of the required treatment process will be defined during FEED, but are expected to include:

- a step to reduce solid content such as silt traps within manholes and sumps
- a step to remove light oil contamination that may be present in uncontaminated areas due to vehicles being present
- storm water pond capable of holding the largest credible coincident storm water / fire water run-off scenario. This realistic concurrent scenario shall be defined in the relevant Civil Engineering Discipline deliverable.
- facilities to take samples of storm water as required
- a system at the discharge of the facility to control the final destination of the stormwater using pumps, valves or a combination of both. This system shall control whether the stormwater is:

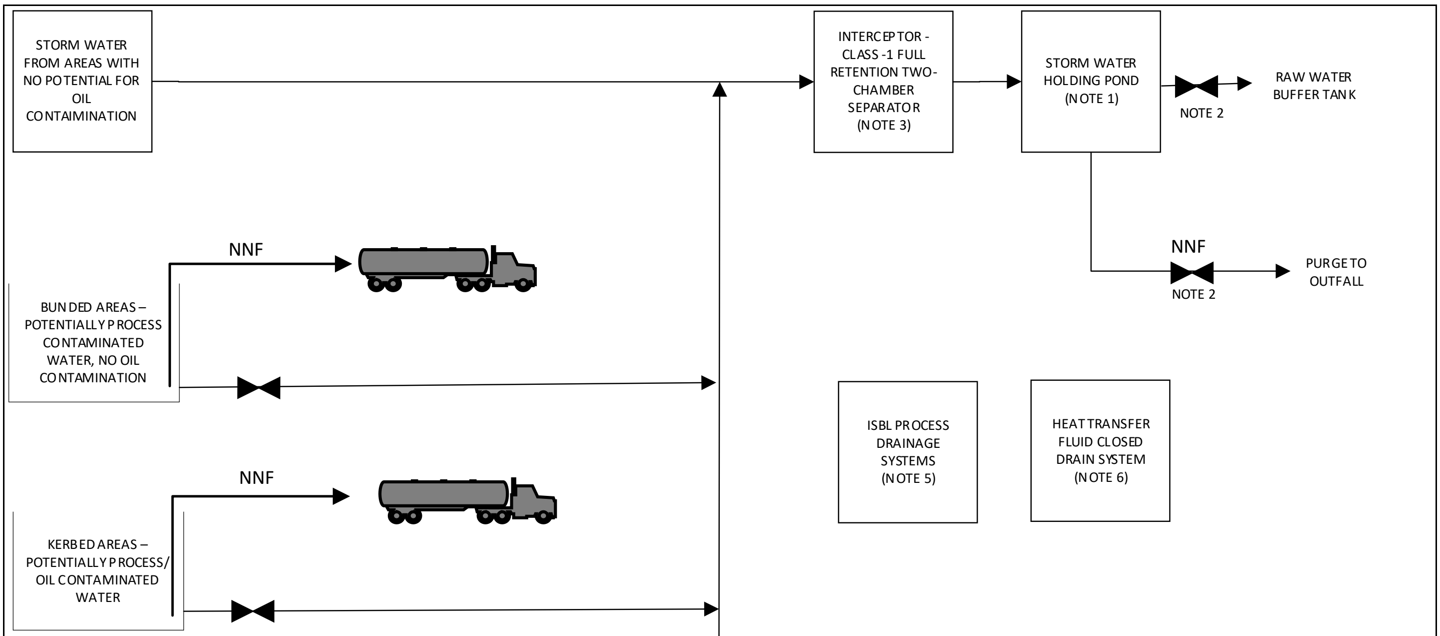
- purged from the site (if no demand)
- held in the storm water pond until quality checks can be completed (for example in the case of a fire event if the initial fire water load is not captured in the dedicated area sumps for any reason. Or if there is suspected contamination in the drain system for another reason).

Refer also to the sketch in Appendix A.

7. General Design Considerations

- The lateral sub-headers from the equipment to the nearest drains header will be designed to the same pressure class as the source equipment itself, up to the last isolation valve. This is to protect the laterals from overpressure in the event of blockages.
- The sub and main headers of the process drains system will have a minimum size of NB 100mm for headers and NB 80mm for sub-headers.
- As the main headers will have very low risk of blockage, they will be rated for a lower pressure rather than the rating of the highest-pressure source. The laterals will also include an enlarger before connecting to the header where required. The piping specification break point between the lateral and the header will be via a flanged joint to facilitate hydrotesting of the system to different pressure ratings. The flanged joints are to be positioned at the header (fitting to fitting).
- The atmospheric open drain lines should have no pockets and a minimum slope of 1:100 to maintain smooth flow of the fluid streams. Atmospheric drain lines will be vented at the head of runs.
- The process drains lines should be provided with a continuous slope with no pockets of 1:100 to the destination where it can be provided. If there are any horizontal sections of closed drains header piping, rodding out points need to be provided.
- Rodding points to prevent sand and solids blockages will be provided for all the drains headers.
- Where required, there should be valves in the drain headers and sub-headers collection systems to enable maintenance. The sub headers are to be designed to the equipment pressure to avoid overpressure of the sub header. Alternatively, valves shall be Locked Open (LO).
- All process drain connections from individual items of equipment will have isolation arrangement as detailed in Isolation Philosophy (Reference 3).
- The individual connections from vessel and piping sections should be sized to allow a reasonable time for the equipment to drain. For large vessels the time allowed is around 1 hour if required nozzle and drain line sizes are deemed to be reasonable.
- The maximum flowrate from manual draining of vessels should cater for drainage of 50% of the largest vessel inventory within 1 hour. This is to be used to size the drain line and the main header; however, the minimum lines size that should be used is 2 in.
- Requirement for chemical injection provision to be reviewed for the storm water drains to control bacterial growth.
- If pressurisation by nitrogen is needed to drain vessels, operating procedures should state requirements for depressurisation, safe hook-up of temporary nitrogen connections and safe operations in terms of nitrogen pressure and careful opening of globe valve for drainage.
- Drain system to be winterized to prevent from freezing, if above ground and not drained.

Appendix A. Drain System Sketch



NOTES:

1. DETAILS OF THIS SYSTEM TBC IN FEED, BUT REFER TO SECTION 4 OF THIS PHILOSOPHY FOR AN INDICATIVE OVERVIEW.

2. SYSTEM TO DIVERT CLEAN STORM WATER EITHER TO THE PURGE OUTFALL OR FOR RE-USE TO THE RAW WATER TANK. PREFERED LOCATION IS THE RAW WATER TANK.

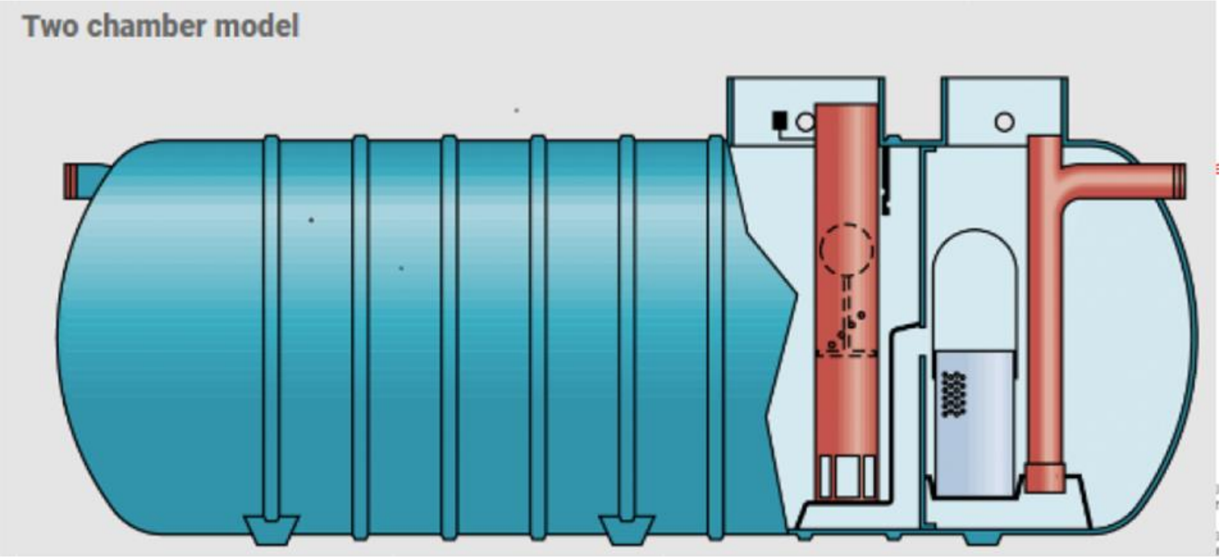
3. OUTLET OF INTERCEPTOR TO INCLUDE OIL LEVEL DETECTION AND AUTOMATED SHUT-OFF IF OIL LEVEL IS HIGH.

4. THE KERBED AREAS IN POTENTIALLY CONTAMINATED AREAS SHALL BE DESIGNED TO HOLD THE LARGEST CREDIBLE STORM/FIRE WATER COINCIDENT LOAD. SUMP CONTAINS A CONNECTION FOR DIRECT REMOVAL OF CONTAMINATED MATERIAL BY TANKER.

5. CHEMICALS, INCLUDING AMINE, SHALL NOT BE DISCHARGED TO ANY OPEN DRAIN SYSTEMS OR WATER TREATMENT FACILITIES AND MUST BE CONTAINED. WHERE POSSIBLE IT SHOULD BE RECOVERED AND RECYCLED FOR USE WITHIN THE PROCESS. REFER TO SECTION 5.1

6. THE HTF CLOSED DRAIN SYSTEMS SHOULD COLLECT LIQUID MAINTENANCE DRAINS FROM EQUIPMENT AND PIPING, CONTAINING HEAT TRANSFER FLUID (HTF), AND SAFELY DISPOSE AND DEGAS THE LIQUID IF NEEDED.

Appendix B. Example of 2-Chamber Interceptor



Example: https://spelproducts.co.uk/products/fuel-and-oil-separators/spel-puraceptor-class-1-full-retention-separators/