Installation Details & Process Description for Envision AESC UK Ltd Giga 1 Car Battery Manufacturing Facility, Sunderland

Report ref: 300168590-ES-001

Version ref: 1

Issue date: 26/09/2023

Ref. No:	300168590-ES-001
Version:	1
Issue date:	26/09/2023

Report prepared for: Envision AESC UK Ltd

IAMP
Washington road
Sunderland
Tyne and Wear
SR5 3HY

Report prepared by: Gemma Lucas

Telephone: 07784 361734

Email: Jacob.owen@tuv.com

TÜV Rheinland Industrial Services Limited

Technical Engineering Consultancy

Pavilion 9, Byland Way

Belasis Business Park

Billingham

TS23 4EB

Revision History

Version	Date	Purpose
1	26/09/23	Issue

Approval

Version	Date	Name	Role
1	26/09/23	Jacob Owen	Process Engineer

Contents

1 Introduction

Envision AESC UK Ltd are applying for a Part A(2) Environmental Permit (EP) from Sunderland District Council under the Local Authority Integrated Pollution Prevention and Control (LAIPPC) regulations, for their new Giga 1 Lion-ion car battery manufacturing factory in Washington, Sunderland.

The Installation is located in Sunderland, Tyne and Wear, situated between the Concord and Castletown areas. The Installation is part of the IAMP (International Advanced Manufacturing Park) designated for industrial/commercial use. It is to the west of the A19, and to the south of the River Don. A location plan is included in **Appendix 1**.

The Installation consists of a single, three-storey industrial unit (main factory building) that is to house a capacity electrode and battery manufacturing facility with a maximum capacity of up to 9 GWh / annum, split across two battery manufacturing plants separated by a central spine of offices. This is where the bulk of the chemical processing takes place. Processes within the main factory building utilise production line type machinery and robots and are predominantly automated. Surrounding the main factory building are various storage and utility areas.

The proposed Installation will form a part of the wider IAMP area. The facility will employ circa 1,000 staff consisting of circa 850 shift-based staff and circa 150 day-based (office) staff. Access to the Installation will be from the A1290 via International Drive and an 800-space staff carpark will be created to the immediate north of the unit.

The Installation will be securely fenced, and the only vehicle access point is via the security gatehouse. There is a security presence 24 hours a day with regular site patrols. In addition, the Installation is covered by CCTV linked to the gatehouse.

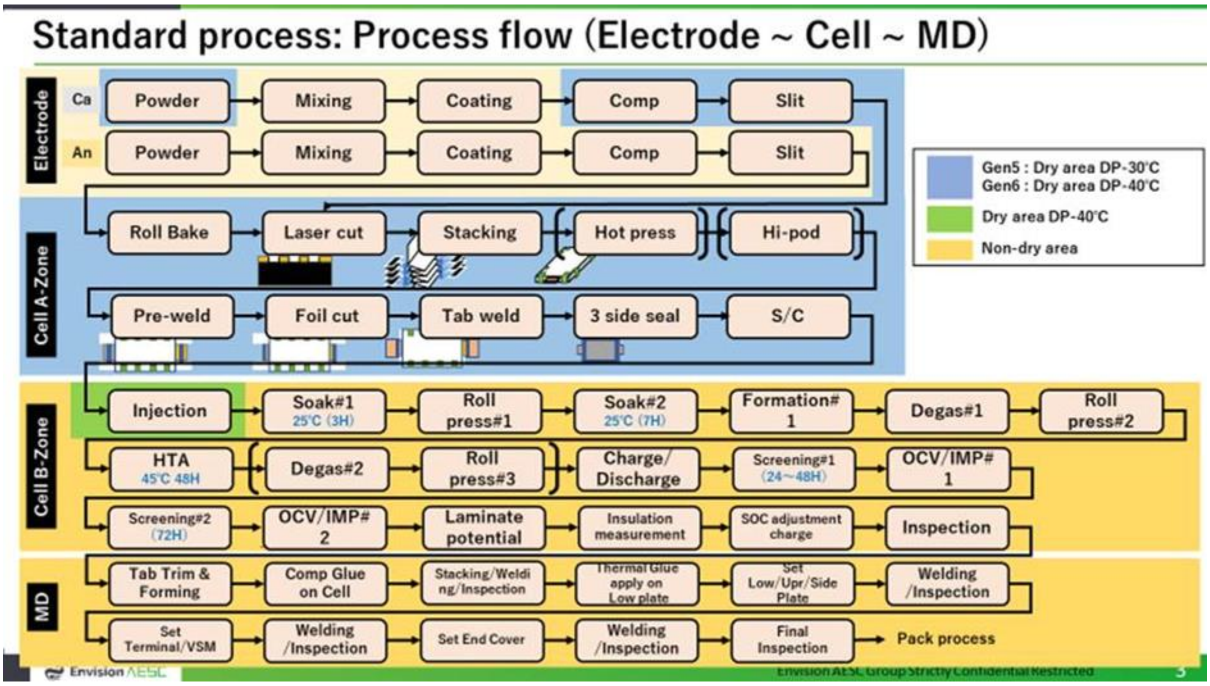
The Installation will produce electric vehicle batteries starting with the raw anode and cathode constituent parts and solvent, along with electrolyte used to fill the batteries. Most of the constituent parts are stored in powder form, while the solvent will be in a tank and electrolyte stored in refrigerated, trailer-mounted iso tanks. The process has a high level of automation with personnel only being present in hazardous areas when and where they are required for Quality Assurance and maintenance purposes.

A plan showing the layout of the Installation is included in **Appendix 1**, along with plans showing the factory layout, factory roof, surface water and foul water drainage plans.

2 Process Description

2.1 Process Overview

A process flow block diagram is shown below to demonstrate a basic overview of the process.



2.2 Management Systems

Envision AESC UK Ltd are certified to ISO 14001 and a copy of the certificate is included in **Appendix 2**.

As the facility and associated equipment are installed, all processes, procedures and risk assessments will be developed and in place prior to operation.

2.3 Detailed Process Description

2.3.1 Electrode Area

Various powders are used during the manufacture of cathode and anode electrodes and represent one of the main feedstocks on the Installation. Powder bags and FIBCs are stored on pallets and shipped to the Main Warehouse Area, also known as the Goods In Area, located on the west side of the site. Following shipment, the pallets are transported to the Powder Warehouse at the west side of the Factory Building and stored until they are required for processing. Transportation of the pallets is achieved via an Automated Storage and Retrieval System (ASRS). The ASRS consists of an Automated Guide System (AGS) which directs robots to materials for collection and transportation. Transportation from the Powder Warehouse to the Powder Discharge Station on the 3rd floor of the factory is achieved via a goods lift with adequate containment to prevent falls.

Once collected from the Powder Warehouse and transported to the Powder Discharge Station, the FIBC is lifted using a manually operated crane and positioned above one of four loading stations. Each loading station consists of a hopper, weighing system, and 2 mixers which are used to process the powder. The equipment items operate at or near to atmospheric pressure and ambient temperature. Smaller bags are loaded into the powder system at small bag discharge stations.

There are 4 hoppers within the Powder Discharge Station which are used to load cathode materials (NMC, Carbon Black and PVDF Grade A) and anode materials (graphite, CMC, and Carbon Black). The powders are loaded directly from FIBCs or bags via a manual crane or small bag dischargers. Once the powder is loaded into the hopper, it is discharged via gravity to the weighing system on the second floor. The second floor contains the weighing systems for each of the loading stations and is generally unmanned. Each hopper has its own weighing station, load scales are used to achieve specific weights. Once the powder is at the correct weight, it is then transferred to the central hopper.

Once the powder is loaded into the central hopper, it is discharged to the mixers on the first floor. In both cases, the powders are transferred via gravity to one of 2 mixers. Once the powder is loaded into the mixer, cathode solvent (NMP as well as CNT conductive paste) or anode solvent (deionised water) is added and mixed under vacuum. The mixers use a high shear and planetary type mixer to effectively mix the powder with the solvent. The mixing process takes approximately 4 to 5 hours per batch and the mixture emerges as a slurry and is transferred to the coating machines in preparation for coating and drying.

Machinery is used to unwind a roll of aluminium foil and then a slot die is used to spread the active slurry on to the top of the foil. The coated foil then passes through an oven 60 m in length to dry the slurry and set it to the foil. The ovens have a variable temperature range between 60 and 150 °C. Once through the oven, quality inspection checks take place and then the second side of the foil roll is coated. The coated foil then passes through another 60 m oven which is located on top of the first stage oven. Further inspection checks are made once the second side of the foil roll has passed through the oven. Following the drying process, the coated rolls are then split into two smaller width rolls using slitting machines. The cycle time for one roll is approximately 60 minutes.

The rolls which leave the coating and drying process are fed through a series of press rollers, before being slit and fed into Area A (west side of the Factory Building). The purpose of this process is to remove any loose contamination, before compressing the coating and making the thickness uniform. The cathode rolls are heated to approximately 100 °C for this process, requiring additional heating and cooling rollers. However, the anode rolls do not require this. The pressing and slitting process takes an estimated 40 minutes for each cathode roll and 30 minutes for each anode roll.

2.3.2 Cathode Material: N-Methyl-Prrolidone (NMP)

NMP is the liquid material utilised within the manufacture of the Cathode electrode. The purpose of NMP is to dissolve the PVdF (Polyvinylidene difluoride) and act as the binding agent of the active materials to the metallic foil.

NMP CAS NO (872-50-4) is listed within REACH and was placed on the candidate list as a SVHC. GHS records the material with a Hazard Phrase of H360D (May cause damage to the unborn child), therefore significant Health, Safety and Environmental restrictions have been placed on suppliers and downstream users.

Article 5 of the Solvents Emissions Directive identifies substances with the Hazard Phrase of H360D (formally R61) with a mass flow of greater or equal to 10g/h, an emission limit value of 2mg/Nm3 is to be complied with. Each Tandem Cathode Coater has a re-circulatory volumetric flow rate of 71,000 times 3 which equals 213,000 nm3/hr. Of this 10% will go up the stack. Therefore 213,000*0.1*2/1000 =42.6 g/hr =1022.4g/day = 373176 g/year =376 kg/year.

There are currently no alternatives or substitutes that are commercially available.

In relation to the environmental impact *1-Methyl-2-pyrrolidone* has on the environment, NMP is expected to be readily decomposed by bacteria or other living organisms and therefore is not expected to accumulate in the environment.

2.3.3 NMP Recovery

There are 4 fresh NMP storage tanks each with a maximum capacity of 25 m3. The tanks are located within the NMP canopy within a shared bunded area with the Waste NMP tanks. NMP is discharged into the Fresh NMP tanks from road tankers at a flowrate of 480 lpm and a maximum temperature of 30 °C

As part of the cathode electrode manufacture, fresh NMP is introduced to the process in the wet mixing tanks where it is mixed with NMC, SP and PVDF Grade A. In addition to cathode manufacture, the NMP is used as part of the insulation layer process, where it is mixed with Boehmite and PVDF Grade B in a mixing tank. These two slurries are applied to an aluminium foil which is then passed through a hot air-drying oven where the NMP is evaporated and removed.

Vapours (NMP for cathode, steam for anode) from the drying process are exhausted from the dryers at 100 to 130 °C and are sent to a heat exchanger. The vapours are cooled to approximately 60 °C using air at room temperature. The air is heated to temperatures of 70 °C or higher and is recirculated back to the ovens. Once cooled, the vapour exhaust from the ovens is sent to the condensers which utilise room temperature cooling water. The NMP/deionised water is cooled to 30 to 40 °C and a large amount of condensed NMP/deionised water is produced. Any uncondensed vapour flows to a cryocooler where it is condensed further until the NMP vapour content is less than 250 ppm.

Any condensed NMP/deionised water is transported through pipework to Waste NMP/deionised water tanks. A specifically designed VOC zeolite purification unit is then utilised to separate the residual NMP vapour from the air. Approximately 90% of the treated gas is passed through a heat exchanger and then returned to the dryers to supply air for the drying process, while the other 10% passes through the VOC zeolite purification unit and is discharged to the atmosphere.

2.3.4 Area A – Cell Assembly

Anode rolls are passed through roll-to-roll drying machines to remove any residual moisture before they are processed into cells. The anode rolls have a maximum diameter of 800 mm and weigh up to 600 kg. Machinery unwinds the anode material and feeds it through an electrically heated oven which operates under vacuum and an operating temperature of 300 °C. The anode material then passes through a cooling chamber before being rewound onto another roll. The process takes an estimated 40 minutes to dry one anode roll. Note cathode rolls do not require this process following roll pressing at elevated temperature. Cathode rolls have a maximum diameter of 800 mm and weigh up to 1100 kg.

The anode and cathode rolls are again unwound and fed into a laser cutting chamber where the terminal profile is cut along one edge of the material. A small 'V' shaped notch is also cut into the anode and cathode material. The machines carry out a cleaning operation to remove dust particles before feeding into the final stage which rewinds the electrode materials back onto a roll. These machines contain ATEX zones due to the potential for build-up of aluminium dust during the laser cutting process. The estimated process time is 40 minutes per roll. The material is then cut into single sheets in this process by cutting blades, then cut is performed where the notch is located. Each individual sheet has one foil terminal. The individual sheets are stacked and transferred to the next process in magazines. Separate cutting facilities exist for anode and cathode materials. Approximately 272 sheets are produced every minute.

Machinery then takes anode, cathode, and separator sheets and stacks them vertically with each stack consisting of a repeating configuration of individual anode and cathode sheets separated by separator sheets. The stacks are taped and transferred to the next process on pallets, each pallet contains 2 cell stacks. Stacks on the pallets are then transferred into the hot press machine which compresses the stacks and heats them to approximately 80 °C. Stacks are then automatically transferred from the hot press to a cooling conveyor.

The cell stack is transferred onto internal pallets and any excess terminal foil is trimmed off. Then terminal tabs, patch material, and the foils of the stack are ultrasonically welded together. This process occurs on the anode and cathode terminals, such that both terminals now have rigid tabs attached. Following welding, the welded areas of the tabs are pressed, to remove shape distortion following welding and then insulation tape is applied to the upper and lower weld regions. The stack is then placed inside a preformed laminate pouch. The laminate material is formed with a die and cut to shape. The laminate pouch is then heat sealed on three sides. The cell is then tested for short circuits that could have formed due to the processing. Following short circuit check, a unique cell ID is printed directly to the laminate pouch and the pouch is loaded into a magazine and transferred to the next process.

Each cell pouch is then weighed on an electric scale. Cell pouches are then stored in magazines which each hold 36 cell pouches. The magazines are transferred to an electrolyte injection chamber where electrolyte is injected into each of the laminate pouches using injection machines under vacuum. On completion of electrolyte injection, the cell pouches are weighed and held in a vacuum buffer. Cell pouches then progress to the temporary seal chamber. In the temporary seal chamber, the open side of the cell will be heat sealed under vacuum. On completion, the seal thickness is checked followed by a final weight check of the cell. The cell pouches are then returned to a magazine. The electrolyte injection process includes ATEX zones due to the flammability of the electrolyte.

2.3.5 Electrolyte Storage and Supply

Electrolyte is a key component within the battery cells and is responsible for transporting positively charged ions between the cathode and anode sheets. The electrolyte is delivered to site in 25 m3 isotankers which are stored at the Storage Bay. The ground beneath the Electrolyte Isotanker is sloped such that electrolyte would flow to a sump located at the back of the Storage Bay canopy, preventing electrolyte from pooling directly under the Electrolyte Isotanker. There are 4 electrolyte isotankers on site at any one time, 2 duty and 2 standbys, with swap over and subsequent removal of empty isotankers occurring approximately every 1 to 2 days (depending on site production). The isotankers are cleaned by the supplier following each delivery to Envision using diethyl carbonate solvent to remove any traces of contamination prior to refilling with electrolyte.

The electrolyte is transferred from the isotankers by nitrogen at 3 barg through a discharge hose and stainless-steel pipework rated for 10 barg. The electrolyte then passes through a heat exchanger and multiple filters (PTFE and PP) before filling the electrolyte day tanks in the injection machine rooms. To maintain raw material quality, by reducing the precipitation of lithium salts, the electrolyte isotankers operate at a temperature of 0 °C using an onboard cooling system and a pressure of 3 barg. The electrolyte day tanks are kept in injection machine rooms within the main clean room. Within the main clean room there are four electrolyte injection machines with their own individual rooms. The main clean room and injection rooms are Class 10000 with a ventilation rate of 30 ACH, the ventilation system is in the main clean room. Each injection machine room contains 4 electrolyte day tanks each capable of storing 20 L of electrolyte. The filling rate for the electrolyte day tanks is 20 lpm at 3 barg transfer pressure. Each electrolyte day tank has its own 750 x 880 x 30 mm bunded area.

Waste electrolyte is collected from intermittent venting and purging activities in the injection machines and is pumped to the 10 te electrolyte waste tank. This is periodically collected, typically six monthly during normal operation and more frequently during maintenance/inspection, by road tanker for disposal offsite.

2.3.6 Area B – Cell Processing

Once the cells have been assembled and transferred to magazines, they are then transferred to Area B which is to the east of Area A in the Factory Building. Area B consists of various lanes which are used to further process the cells. Transport of cell magazines within Area B is fully automated. Each of the lanes and their purpose is summarised below:

- Soak Lane – Allows the cells to soak in the electrolyte for 18 hours at room temperature.
- Formation Lane – Charges each of the cells to 100%.
- High Temperature Ageing Lane – Heats the cells to 45 °C for 60 hours.
- Charge/Discharge Lane – Charges each of the cells to 100% and then discharges the cells.
- Screening Lane – Stores the cells at room temperature for 90.5 hours.
- OCV Lanes – Open circuit voltage measurement of each cell whilst it is in the magazine.
- Inspection Lane – Automated checking and inspection process for each of the cells. Includes sealing inspection, open circuit voltage and impedance check, cell leak check, automated appearance inspection etc.

Once the cells have been processed and have passed their inspection, they are then transferred to Area C.

2.3.7 Area C – Module Production

Area C is to the east of Area B in the Factory Building and is used for creating cell modules from cell magazines. Cell magazines are handled by personnel within the Factory Building at this stage. Cells are removed from the cell magazines and individually inspected by personnel. Once inspected, machines are used to flatten the tabs around the edges of each cell. The tabs are then trimmed, and any dust is vented to a dust extraction system.

Following the tab tramming, protection tape is applied to the laminate edge. The tab shape is then checked, and each cell is cleaned by an air blower. Compression glue is then applied to each cell and cells are stacked on top of each other. Pressure is then applied to the cell stack to make the cells paste together. Welding of a module container then takes place on site. The module container is used to contain stacked cells. Once the stacked cells are suitably stored within the module container, the module passes through a series of checks and inspections to ensure the module meets product requirements.

2.4 Best Available Techniques

A BAT assessment has been completed for the Installation and this is presented in **Appendix 3**. This has considered the best available techniques set out in Sector Guidance Note 6 (surface treatment using solvents) and the European Commission BAT reference document (BREF) for surface treatment using organic solvents.

3 Emissions

3.1 Point Source Emissions to Air

Emissions to air from the proposed Installation will be from the following sources:

- Six stacks associated with on-site boilers.
- Twenty-one stacks associated with possible N-Methyl-2-Pyrrolidone (NMP) emissions.
- Ten stacks associated with possible Ethyl Carbonate (EC) emissions.
- Five stacks associated with possible Diethyl Carbonate Solvent Vapour (DEC) emissions.

Full details of these point source emissions to air are presented the following report:

- Envision AESC-Air Quality Report (Ref.300168590-ES-004)

The location of the point source emissions is shown on the following drawing which is included in **Appendix 1**:

- 107-P03-Proposed Factory Rood Plan

Information on the proposed technology and other techniques for preventing or, where that is not practicable reducing the emissions is provided in the BAT assessment in **Appendix 3**.

A Solvent Management Plan has been prepared for the Installation (Ref. 300168590-ES-006). As the Installation is currently under construction and operations have yet to begin, not all information about the solvent emissions is known. Envision AESC UK LTD will monitor the outputs from their activity annually over the course of their operation and will update the monitoring plan to fill in the gaps in information within the first 12 months of commission.

3.2 Point Source Emissions to Water

There will be no intentional process wastewater emissions to the nearby surface water body.

All de-ionised recovery water from the process will be collected and remove from site via a licensed waste management contractor. This is likely to comprise the removal of 2 x 25000l via tanker per day at full volume production.

The remaining process water (e.g. condensate) and domestic sewage from the Installation will be discharged to public sewer. Envision AESC are currently in discussions with Northumbrian Water regarding the requirement for a discharge consent for this.

Drawings showing the proposed surface water drainage layout and the proposed foul water drainage layout are included in **Appendix 1**.

3.3 Point Source Emissions to Land

There are no intentional emissions to land anticipated.

3.4 Fugitive Emissions

There is no expected to be any fugitive emissions to air, water or land associated with the Installation. However, procedures will be implemented to ensure that fugitive emissions from the processes will be kept to a minimum and where there is potential release to exist, measures will be taken to suppress.

3.5 Noise and Vibration

A noise assessment has been completed for the Environmental Impact Assessment as part of the Planning application with the Local Authority for impact on the neighboring environments, no issues were identified associated with noise impacts.

All equipment will be UKCA compliant. All areas where noise limit thresholds are exceeded will require mitigative measures to be adopted during installation phase.

Noise assessments will be carried out during initial plant design by the general contractor's design team.

4 Raw Materials, Water, Energy & Waste

4.1 Raw Materials

Information on the raw material inventory for the Installation is provided in **Appendix 4** and it is also considered in the Site Conditions and Baseline Report which has been prepared for the Installation (Ref. 300168590-ES-002).

Information on storage arrangements, containment measurements, deliveries and handling can be found in the Site Condition Report and also the BAT assessment.

4.2 Water Use

The water usage at the Installation is predicted to be 29.6 l/s.

Best practice will be used in the design of all systems to ensure that water usage is kept to a minimum. An initial water efficiency audit will be carried out. Monthly water usage will be monitored and comparison year on year will be made to look for any significant usage. Further information is provided within the BAT assessment.

4.3 Energy Use

The maximum annual electricity consumption for the installation is forecasted to be 289,238,287kWh.

A monthly and annual forecasted electricity consumption is presented in **Appendix 5**.

Proposed measures for energy efficiency can be found in the BAT assessment.

4.4 Waste

Information on the types of waste streams that will be produced at the Installation is provided in **Appendix 4.**

All waste will be stored in appropriate containers in accordance with best practice in the designated waste compound area. Waste will be collected on a regular basis by licensed waste management companies.

5 Monitoring

Monitoring of emissions has not yet been undertaken, as the Installation is currently being constructed.

To validate air emissions from the Installation, monitoring of emissions to atmosphere of will be undertaken on a periodic basis during the first two years of operation of the plant. The frequency and type of testing will be agreed with the regulator prior to implementation. The monitoring is likely to be completed by a suitably qualified third party to MCERTs standards where appliable. The results of the testing will be shared with the regulator to determine the requirement and frequency of any ongoing monitoring.

A Solvent Management Plan has been prepared for the Installation (Ref. 300168590-ES-006). As the Installation is currently under construction and operations have yet to begin, not all information about the solvent emissions is known. Envision AESC UK LTD will monitor the outputs from their activity annually over the course of their operation and will update the monitoring plan to fill in the gaps in information within the first 12 months of commission.

6 Emergency Response

A COMAH Safety report has been prepared for the Installation and this identifies the major accident scenarios for the site along with the proposed preventative and mitigation measures.

There will be a site-wide emergency response procedure to cater for the identified abnormal events that are foreseeable.

Procedures will include:

- Emergency action in the event of a Fire event
- Emergency action to be taken in the event of a personal accident
- Emergency action to be taken in the event of a Chemical Spill
- Action for vehicle fuel spillage
- Escalation process in the event of an emergency situation

It is the intention of Envision AESC to ensure suitable measures are employed to prevent any release or escape of any pollutant that may or will cause harm to the environment.

The management system will incorporate necessary policies and procedures to ensure personnel practices are carried out in a safe and effective manner. Typically, in the area of emergency response, any foreseeable detrimental event will be detailed into a written procedure and trained out to ensure the competency for all authorised staff.

Appendix 1 – Site Plans

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5. © Crown copyright and database rights 2022 Ordnance Survey 0100031673

N

Rev	Description	By	Ckd	Date
P03	Planning Submission	HH	JAT	12/05/23

MAKING COMPLEX EASY

A TETRA TECH COMPANY

Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E: rpsnewark@rpsgroup.com

Client

Project: Envision AESC Giga Factory

Title: Existing Site Layout and Site Location Plan

RPS Project Number	Scale @ A0	Date Created
NK020439-P	1:1250	14/07/21
Task Team Manager	Information Author	Task Information Manager
TH	TSR	TSR

Status
S4 (Suitable For Approval)

Document Number: 100
Revision: P03

Project Code - Originator - Function - Space - Type - Role - Number

rpsgroup.com

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5. © Crown copyright and database rights 2022 Ordnance Survey 0100031673

Key:

Planning Boundary

P06	Planning Consultant's comments incorporated	HH	JAT	19/06/23
Rev	Description	By	Ckd	Date

MAKING COMPLEX EASY
A TETRA TECH COMPANY

Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T 01636 605 700 E rpsnewark@rpsgroup.com

Client

Envision AESC Wates

Project Envision AESC Giga Factory

Title Proposed Site Plan

RPS Project Number	Scale @ A0	Date Created
NK020439P	1:1250	14/07/21
Task Team Manager	Information Author	Task Information Manager
TH	TSR	TSR

Status
S4 (Suitable for Approval)

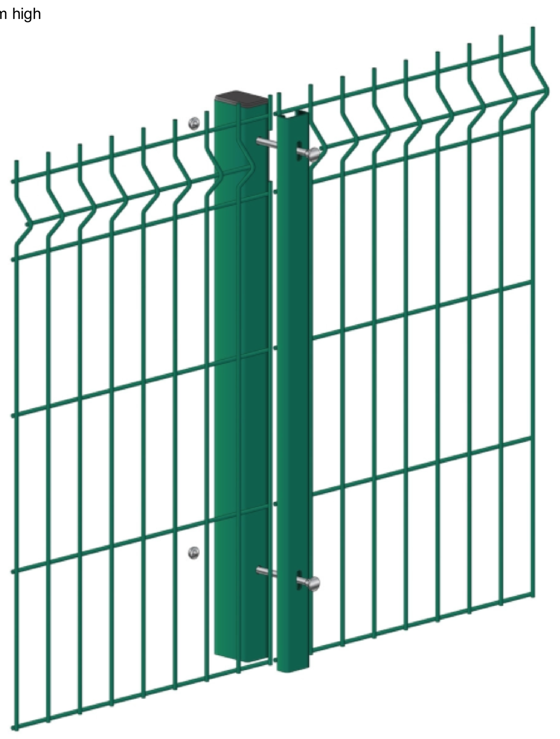
Document Number	Revision
101	P06

Project Code – Originator – Function – Space – Type – Role – Number

rpsgroup.com

Timber Post and Wire Mesh Fencing
1.2m high

Timber Post and Rail Fence
1.1m high



Wire Mesh Fence (RAL 6005 Green)
2.4m high

Site Layout
1 : 1250

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5. © Crown copyright and database rights 2022 Ordnance Survey 0100031673

25m SCALE 1:1250

Rev	Description	By	Ckd	Date
P04	Planning Submission	HH	JAT	12/05/23

MAKING COMPLEX EASY
A TETRA TECH COMPANY
Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E:rpsnewark@rpsgroup.com

Client: Envision AESC, Wates

Project: Envision AESC Giga Factory

Title: Proposed Site Layout

RPS Project Number	Scale @A0	Date Created
NK020439P	1 : 1250	14/07/21

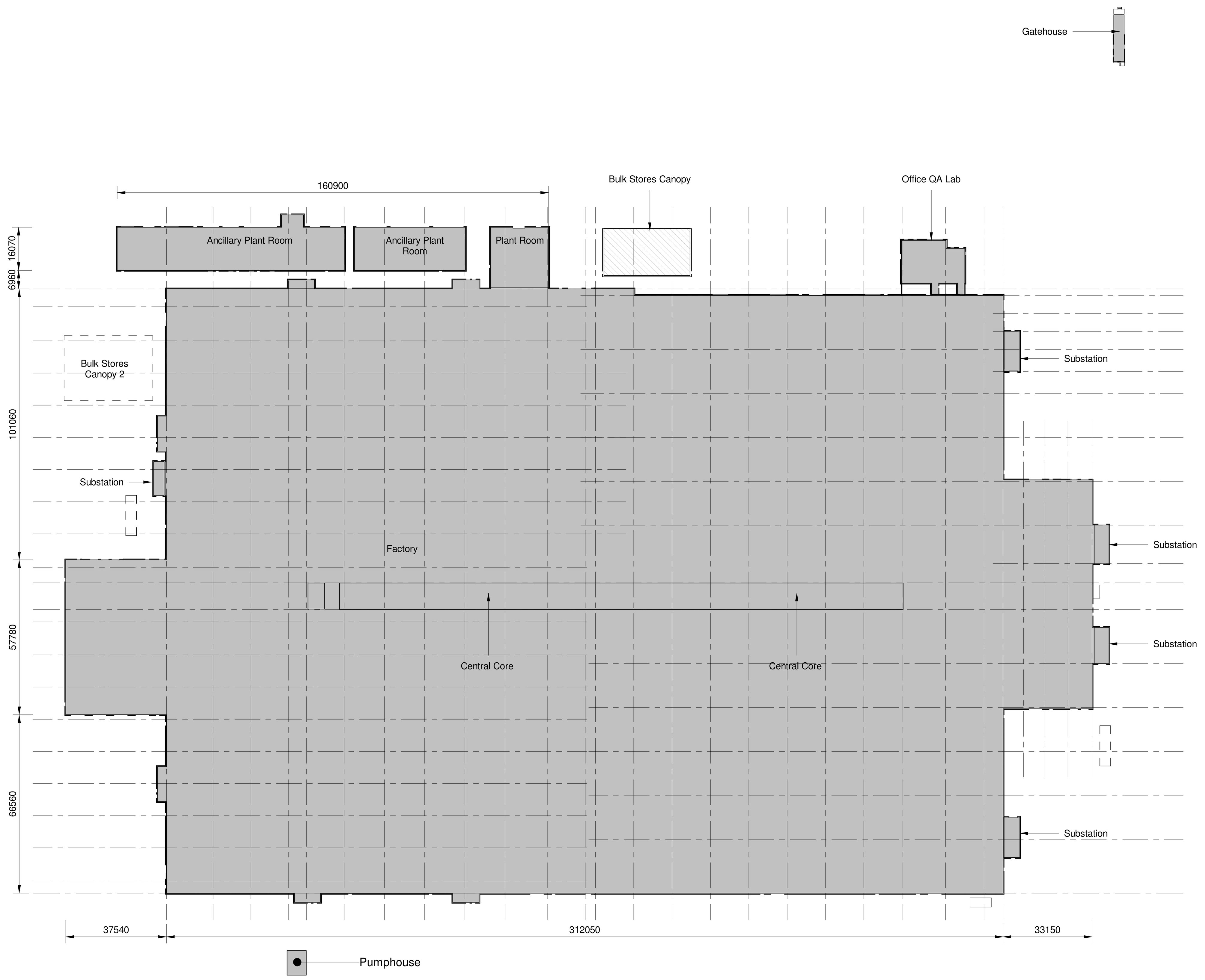
Task Team Manager	Information Author	Task Information Manager
TH	TSR	TSR

Status: S4 (Suitable for Approval)

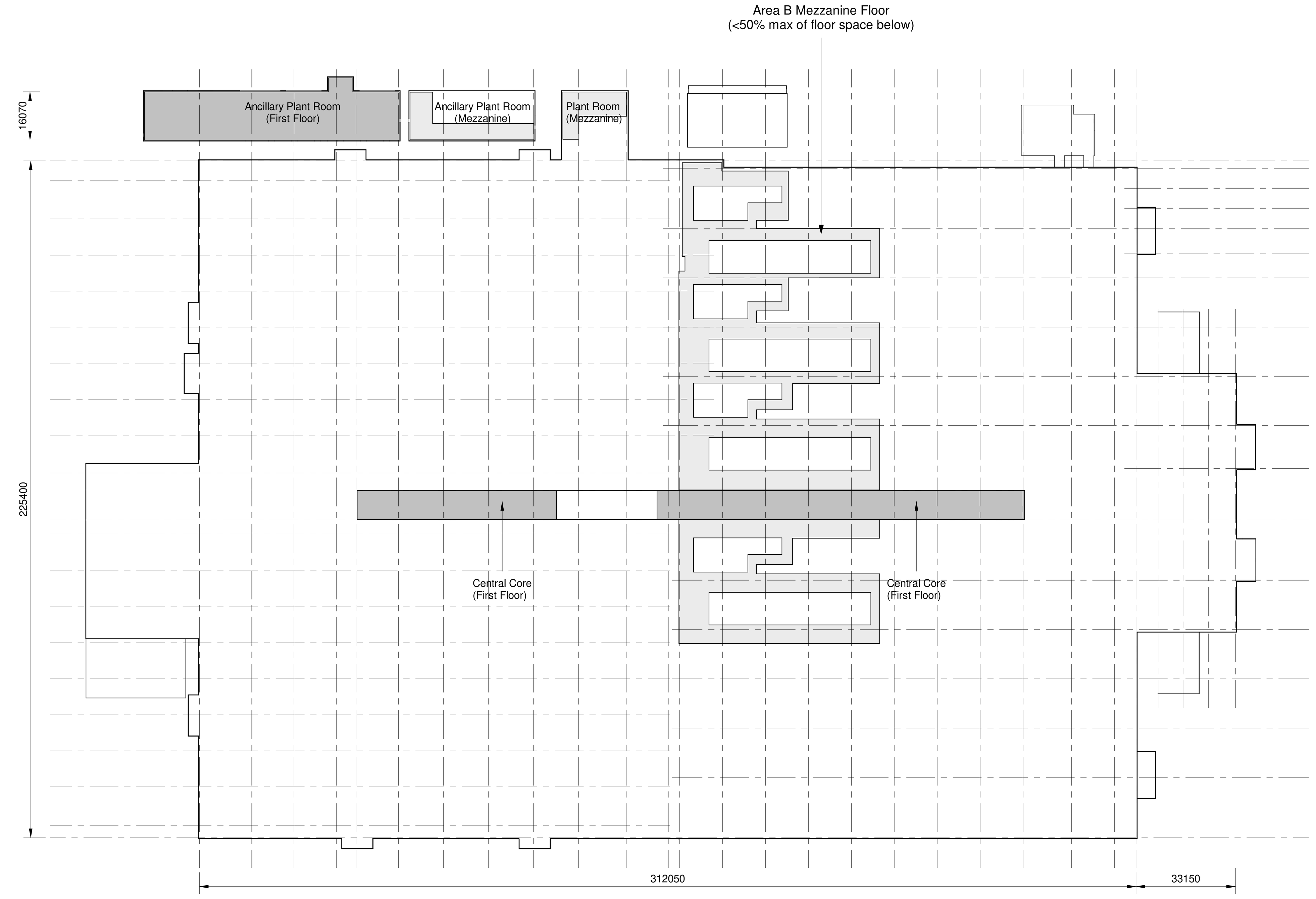
Document Number: 104
Revision: P04

Document Number

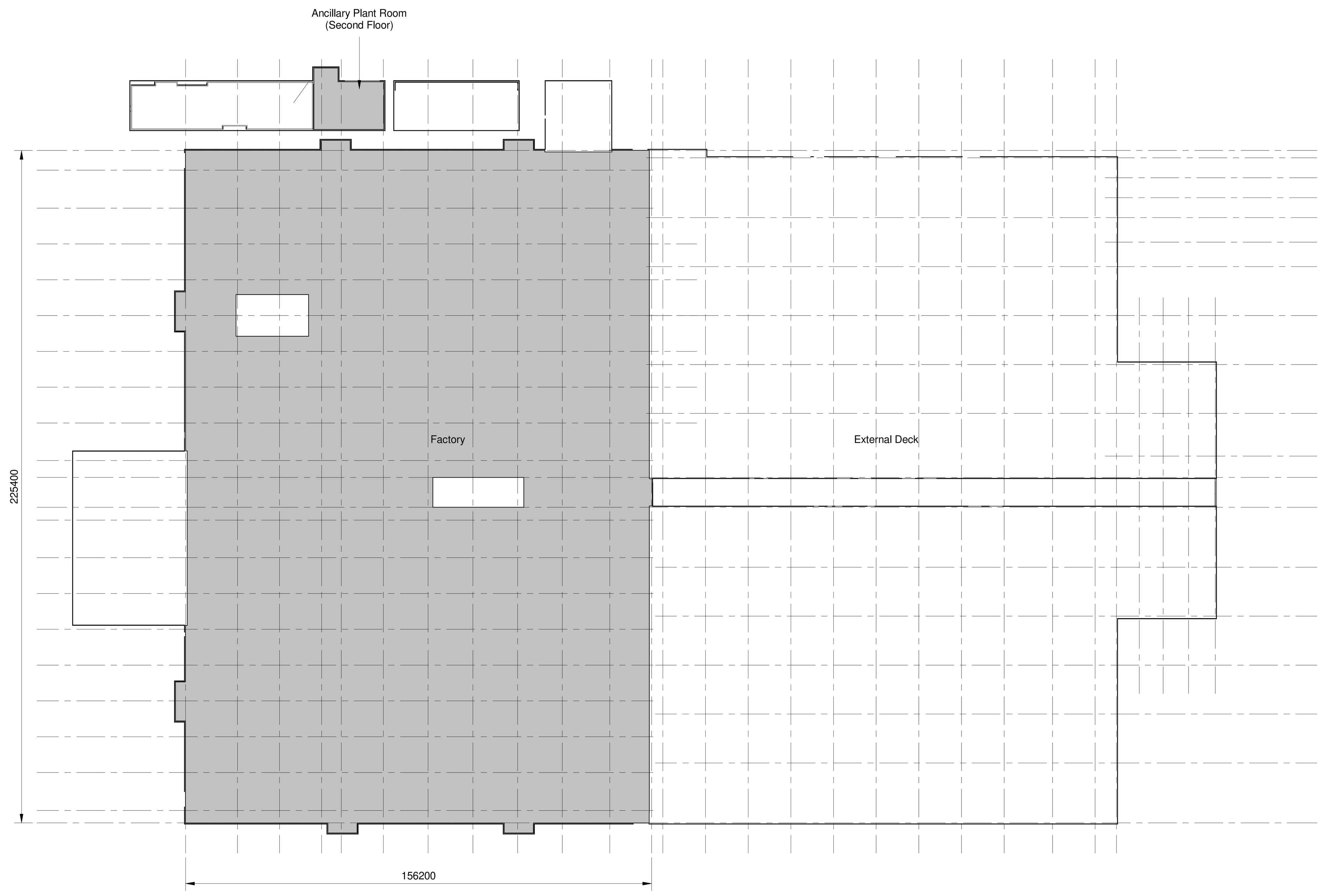
rpsgroup.com



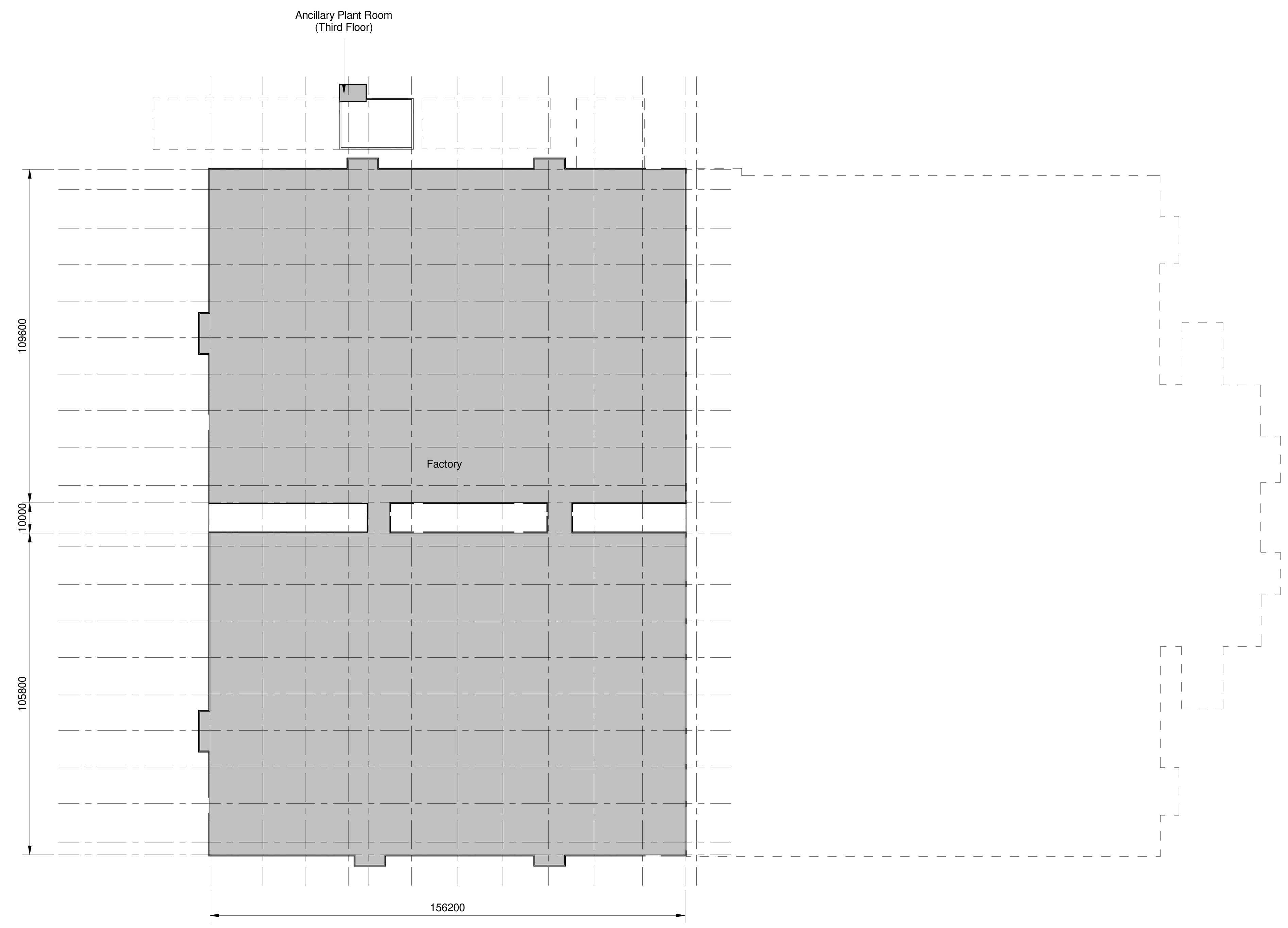
Ground Floor
1 : 1000



Mezzanine Level
1 : 1000



First Floor
1 : 1000



Second Floor
1 : 1000

Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5. © Crown copyright and database rights 2022 Ordnance Survey 0100031673

Schedule of Areas

Gross Internal Areas:

Main Building

• Ground Floor	76,126 m²
• First Floor	34,590 m²
• Second Floor	34,090 m²
• Central Core (First Floor)	1,832 m²

Ancillary MEP Plant Rooms

• Ground Floor	2,065 m²
• Mezzanine Floor	213 m²
• First Floor	1,400 m²
• Second Floor	413 m²
• Third Floor (Stair core)	48 m²
Office / QA Lab	375 m²
Gatehouse	70 m²
Pump House	65 m²
Total	**151,287 m²**

Excluded from GIA

• Area B Mezzanine	4,554 m²

(to be < max 50% of the total floor space)

Gross Internal Area (GIA) in accordance with RICS Code of Measuring Practice 6th Edition.

10m SCALE 1:1000

Rev	Description	By	Ckd	Date
P03	Planning Submission	HH	JAT	12/05/23

MAKING COMPLEX EASY
A TETRA TECH COMPANY

Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 **E:**rpsnewark@rpsgroup.com

Client: Envision AESC / Wates

Project: Envision AESC Giga Factory

Title: Proposed Factory Plans

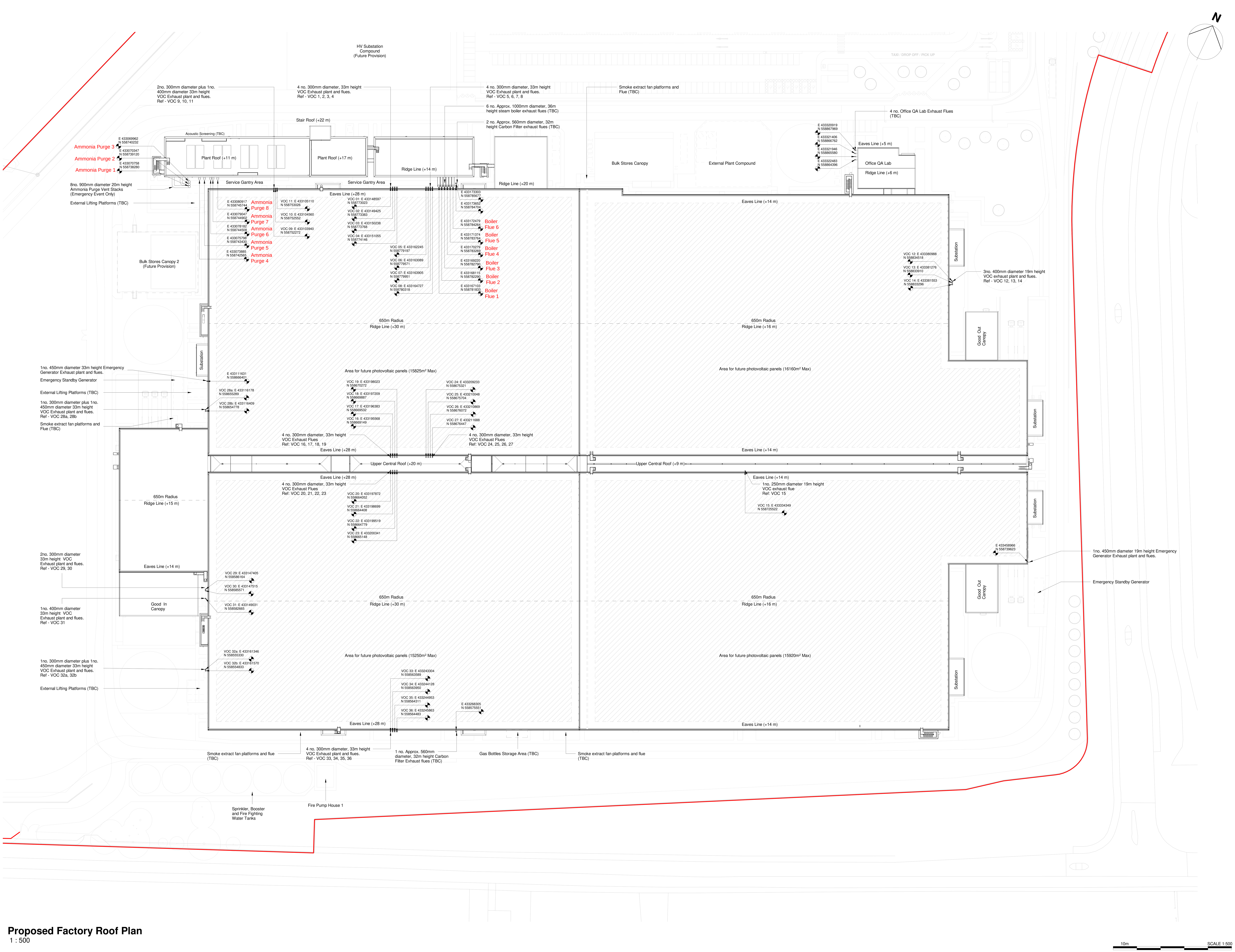
RPS Project Number	Scale @A0	Date Created
NK020439P	1 : 1000	14/07/21
Task Team Manager	**Information Author**	**Task Information Manager**
TH	TSR	TSR

Status: S4 (Suitable for Approval)

Document Number: 106
Revision: P03

Document Number

rpsgroup.com



Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5. © Crown copyright and database rights 2022 Ordnance Survey 0100031673

Rev	Description	By	Ckd	Date
P05	Planning Submission	AS	OP	22/06/23

MAKING COMPLEX EASY
A TETRA TECH COMPANY

Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E:rpsnewark@rpsgroup.com

Client

Project: Envision AESC Giga Factory

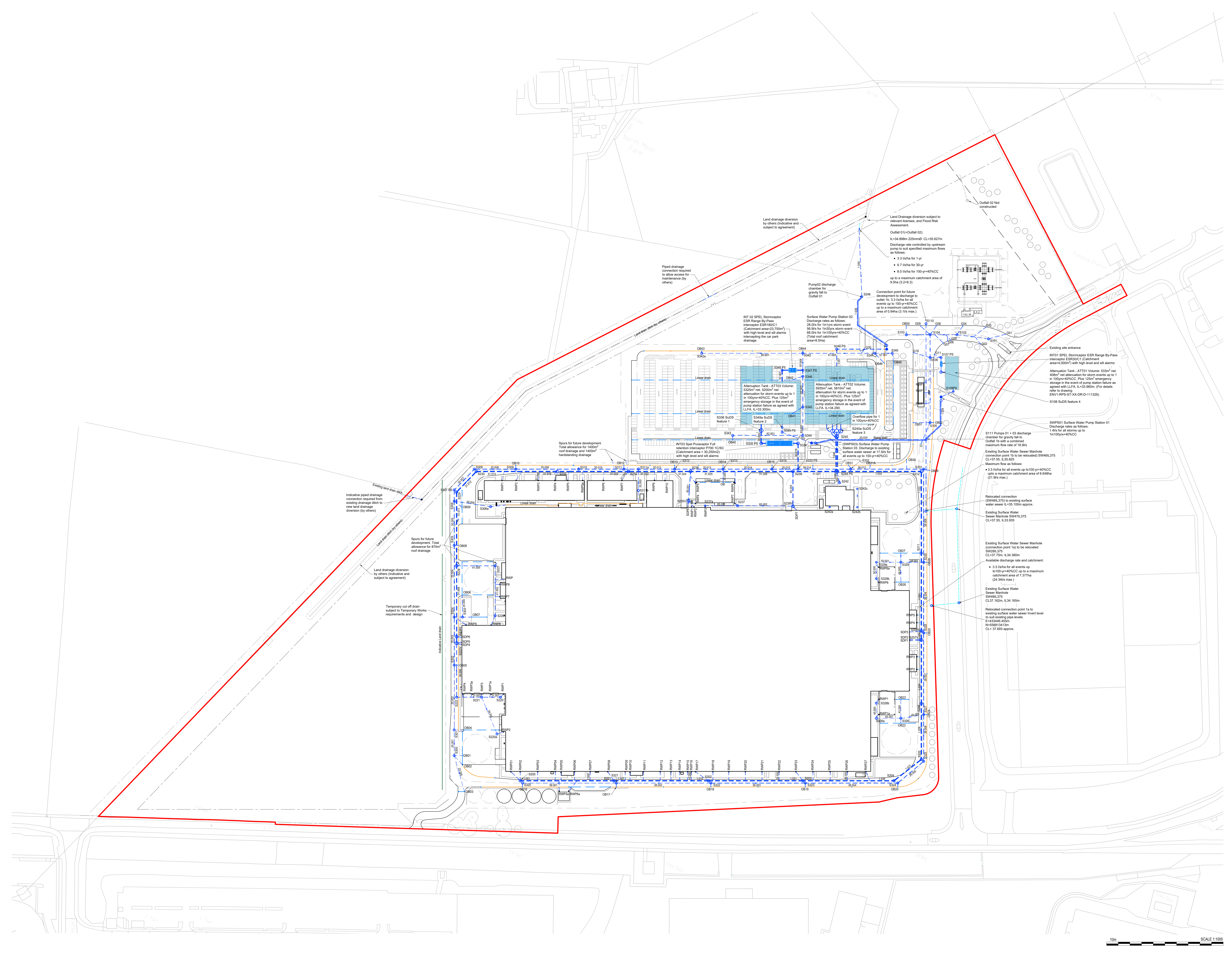
Title: Proposed Factory Roof Plan

RPS Project Number: NK020439P
Scale @A0: 1 : 500
Date Created: 14/07/21
Task Team Manager: TH
Information Author: TSR
Task Information Manager: TSR
Status: S4 (Suitable for Approval)
Document Number: 107
Revision: P05

rpsgroup.com

Proposed Factory Roof Plan

1 : 500



Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5.

N

Key:

Planning Boundary

Surface Water Drainage Requirements

1. Outfall rates limited during all events and surcharged during 1in100+40%cc event as per ITT Appendix S - IAMP Site 1 2 - Discharge limits.
2. Pump Stations:
   2.1. Duty and standby pump arrangements in pump stations.
   2.2. Variable pump rates where required (i.e. duty, standby and assist).
   2.3. Pumps linked to BMS/Gatehouse for remote shut down in emergencies.
   2.4. Back up power supply to be provided for pump stations/ provision for standby generators to be brought to site in event of power outage.
3. Fire Fighting Water
   3.1. The volume of firefighting water required to be attenuated is subject to agreement with local fire authority
   No allowance is made for a dedicated spent fire water tank.

SuDS feature schedule

1. **SuDS feature 1 (S367) -**
   1No. vortex separator 182l/s treatment flow 739 max. flow (3.0m FP McCann - StormCleanser)
2. **SuDS feature 2 (S349a) -**
   1No. vortex separator 15l/s treatment flow 31l/s max flow (1.2m FP McCann - StormCleanser)
3. **SuDS feature 3 (S245a) -**
   3No. vortex separators 564l/s treatment flow 2423l/s max flow (3No. 3.0mØ FP McCann - StormCleansers (max flow =2250l/s or equal approved)
4. **SuDS feature 4 (S108) -**
   1No. vortex separator 54l/s treatment flow 180l/s max. flow (1.8m FP McCann - StormCleanser)

Drainage Key:

1.000	SW Sewer (Pipe reference)
S100	SW Manhole
	Existing drainage to be removed
	Pump station
	Pressure main
	Existing SW sewer
	Linear drain
	Kerb drain
OB	Outlet Box
RWP	Rainwater Pipe (c/w RE)
G	Gully
SDG	Sprinkler Discharge Gully
PS	Penstock valve
	Surface Water Attenuation tank

10m SCALE 1:1000

Rev	Description	By	Ckd	Date
P01	Planning Submission	LMA	MM	12/05/23

RPS MAKING COMPLEX EASY
A TETRA TECH COMPANY
Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 E: rpsnewark@rpsgroup.com

Client
Envision AESC Wates

Project Envision AESC Giga Factory

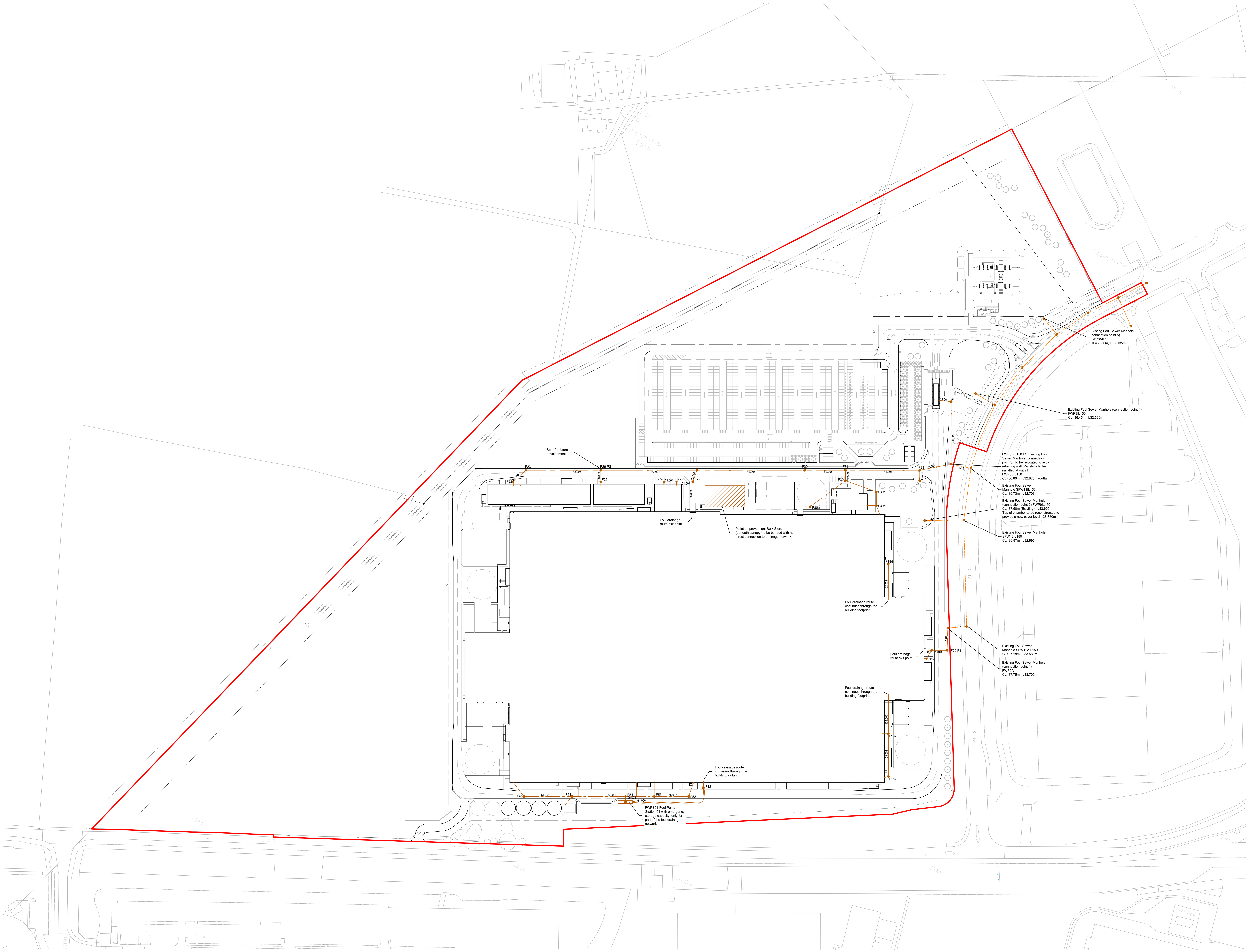
Title Proposed Surface Water Drainage Layout

RPS Project Number	Scale @ A0	Date Created
NK020439P	1:1000	12/05/23
Task Team Manager	Information Author	Task Information Manager
TH	LMA	MM

Status
S4 (Suitable for Approval)

Document Number: 160
Revision: P01
Project Code - Originator - Function - Space - Type - Role - Number

rpsgroup.com



Notes

1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
3. This drawing should be read in conjunction with all other relevant drawings and specifications.
4. The scheme is subject to statutory approvals, surveys and design development.
5.

N

Key:

Planning Boundary

Foul Drainage Requirements

1. Internal manholes to be double sealed with internal plates.
2. Pump Stations:
   - 2.1. Duty and standby pump arrangements in pump stations.
   - 2.2. Variable pump rates where required (i.e. duty and standby).
   - 2.3. Pumps to be linked to BMS/Gatehouse for remote shut down in emergencies.
   - 2.4. Back up power supply to be provided for pumpstations/ provision for standby generators to be brought to site in event of power outage.
3. Domestic Foul Water Design Baseline:
   - 3.1. Project maximum discharge rates: Allowable DWF = 0.14l/s/ha Allowable peak = 0.92l/s/ha.

     Developed site area 16ha. Allowable DWF = 2.24l/s max Allowable peak = 14.72/s
   - 3.2. No. of Staff per day

     Office staff (1 shift/day) = 102

     Factory staff (2 shifts/day) = 231 /shift
   - 3.3. Daily Flow per person = 100 l/person/day
   - 3.4. Peak Flow based on shift change = 564 staff changeover in 30 minutes.
4. Fire Fighting Water
   - 4.1. The volume of firefighting water required to be attenuated is subject to agreement with local fire authority

     No allowance is made for a dedicated spent fire water tank.

Drainage Key:

5.000	FW Sewer (Pipe reference)
F1	FW Manhole
	Existing drainage to be removed
	Pump station
	Pressure main
	Existing FW sewer
OB	Outlet Box
G	Gully / Pop up
PS	Penstock valve

Rev	Description	By	Ckd	Date
P01	Planning Submission	LMA	MM	12/05/23

MAKING COMPLEX EASY
A TETRA TECH COMPANY

Sherwood House, Sherwood Avenue,
Newark, Nottinghamshire, NG24 1QQ
T:01636 605 700 **E**: rpsnewark@rpsgroup.com

Client

.\161\Related data\Logos\Envision AESC.jpg .\161\Related data\Logos\Wates_2020.jpg

Project: Envision AESC Giga Factory

Title: Proposed Foul Drainage Layout

RPS Project Number	Scale @ A0	Date Created
NK020439P	1:1000	10/05/23
Task Team Manager	Information Author	Task Information Manager
TH	LMA	MM

Status
S4 (Suitable for Approval)

Document Number: 161
Revision: P01

Project Code - Originator - Function - Space - Type - Role - Number

rpsgroup.com

Appendix 2 – ISO 14001 Certificate

Appendix 3 – BAT Assessment

Indicative BAT for Surface Treatment using Solvents	Envision AESC UK BAT Compliance Status
Delivery, Storage and Handling of Raw Materials	
The operator should ensure that deliveries are carried out in such a way so as to minimize noise, spillage, leaks and dusty emissions.	Factory is built away from neighbours. All areas where leaks are likely are bunded. Powders delivered in sealed bags with dust extraction in processes and areas of direct use.
Storage areas should be under cover and protected from the elements to avoid or minimize environmental impact, except where stored materials are in suitable weatherproof containers.	All waste/raw materials are stored inside or undercover.
Storage areas should be hard surfaced	All storage areas are hard surfaced (Concrete hard standing external / Resin covered internal).
Bulk storage tanks for solvents and solvent-containing liquids should wherever practicable be back vented to the delivery tank during filling. Where this is impracticable, for example: due to long pipe runs, back pressure, or contractual agreements over deliveries, then, displaced air vents should be sited in such a way as to prevent the arising of offensive odour beyond the site boundary	Displaced air vents are sited to prevent offensive odour beyond the site boundary
Bulk storage tanks for solvent storage should normally be light coloured, in order to reduce thermal increase as a resulting from sunlight. (planning restrictions may apply	All solvent storage tanks shall be stainless steel,
All new static bulk solvent storage tanks containing solvent with a composite vapour pressure that is likely to exceed 0.4kPa at 20oC (293K) should be fitted with pressure vacuum relief valves. Pressure vacuum relief valves should be examined at a minimum of at least once every six months for signs of corrosion, contamination, incorrect seating and be cleaned and/or corrected as required	Pressure vacuum relief valves are examined at a minimum of at least once every six months for signs of corrosion, contamination, incorrect seating and be cleaned and/or corrected as required - this is recorded on the relief valve register
Delivery connections to bulk storage tanks should be located within a bunded/contained area, fixed and locked when not in use	All delivery connections to bulk storage tanks are located within a bunded/contained area, in accordance with HSG 176 The hose will be inaccessible when not in use due to drive away prevention,
All fixed storage tanks should be fitted with audible and/ or visual high-level alarms or volume indicators to warn of overfilling. Where practicable in relation to the viscosity of the material being handled or pumping system used, the filling systems should be interlocked to the alarm system to prevent overfilling.	All fixed storage tanks should will be fitted with audible and/ or visual high-level alarms or volume indicators to warn of overfilling and will be interlocked to prevent an overfill.
Dusty or potentially dusty materials should be stored in silos, or in confined storage areas within buildings, or in fully enclosed containers / packaging.	Dusty materials are delivered in fully sealed packaging. They are opened in glove boxes or areas with LEV. All powders are mixed in fully enclosed hoppers.
Deliveries to bulk storage tanks should be supervised by trained personnel to avoid potential accidents and spillage	All bulk storage deliveries are received by production staff who are fully trained in the facility and the task.
Deliveries to silos should be supervised by trained personnel to avoid materials being blown into silos at a rate which is likely to result in pressurisation of the silo, especially towards the end of the delivery when the quantity of material entering the ducting is reduced.	N/A - No Silos
Air displaced during delivery to a silo should be vented to suitable abatement plant (for example cartridge/bag filters) in order to minimise emissions. Abatement plant fitted to silos should be of sufficient size (and kept clean) to avoid pressurisation during delivery.	N/A - No Silos
Silos and bulk storage tanks containing dry materials should be equipped with audible and/ or visual high-level alarms, or volume indicator, to warn of overfilling. The correct operation of such alarms should be checked before a delivery takes place	N/A - No dry storage
If emissions of particulate matter are visible from ducting, pipework, the pressure relief valve, dust abatement plant or any other part of the plant during silo filling, the operation should cease and the cause of the problem rectified prior to further deliveries taking place. Transport of dusty materials should be carried out so as to prevent or minimise airborne particulate matter emissions. e.g. vacuum transfer system, enclosed conveyors, enclosed Archimedes screw, pneumatic.	Powder delivery via gravity Dust extraction system is under vacuum & dust collected in waste hopper with HEPA filtration
Double handling of dusty materials should be avoided.	All powders are transferred in the process in a sealed system
Solvent containing materials should be stored in closed storage containers.	Solvent containing materials will be stored in closed storage containers (closed system).
The storage, handling and use of flammable materials should be in accordance with HSE requirements, in order to prevent accidents that may have environmental consequences	HSG176/51 guidance followed
Emissions control	
All releases to air	
Ensure that all operations which generate emissions to air are contained and adequately extracted to suitable abatement plant, where this is necessary to meet specified emission limit values.	Confirmed. All VOC/ LEV will be extracted and if required Abated.
Ensure that potential emissions are recovered and reused where possible, e.g. returning collected particulate material to feedstock.	Evaporated NMP is recovered for recycling by a condensing plant. Only clean air is returned to atmosphere.
Ensure that emissions from combustion processes in normal operation are free from visible smoke and in any case do not exceed the equivalent of Ringelmann Shade 1 as described in British Standard BS 2742:2009.	All combustion equipment will us natural gas. Emergency generators and fire pumps will be Deisel and exhaust emissions will be visual checks during routine test running.
Ensure that emissions take place from the minimum practicable number of chimneys. This is particularly important when new plants are being designed or when changes are being made to existing processes. If practicable a multi-flue stack should be used.	Minimum number of Chimney stacks will be designed for. Multi Flue stacks will not be used
Ensure that vent and chimney heights are sufficient to ensure adequate dispersion under all normal operating conditions.	Stack heights have been designed for sufficient height and dispersion requirements.
Ensure that the minimum vent height is 3 metres above roof ridge height of any building within a distance of 5 times the uncorrected vent height and in no circumstances should it be less than 8 metres above ground level. (Note: workplace dust extraction units do not need to meet these requirements)	Confirmed
Be able to demonstrate to the regulator that all reasonably practicable steps are taken during start-up and shutdown, and changes of fuel or combustion load in order to minimise emissions.	All emissions are from natural gas combustion, we have not got the electrical capacity on site to move to electrical heating so we do not change between fuel sources.
Investigate the cause and nature of any persistent visible emissions and provide a report to the regulator.	All emissions will be from combustion of natural gas. No visible emissions are expected however stacks will be checked on a daily basis as part of the maintenance daily checks
Ensure that emissions of water vapour are free from droplet fallout.	Evaporative condensers will be fitted with drift eliminators to reduce droplet emissions form the towers.
Ensure that liquid entrainment in the duct of wet abatement, leading to droplet fallout, does not occur as a result of the linear flow rate within the duct exceeding 9 m/s.	Confirmed. Efflux velocity designed correctly for process. No wet abatement on site
Ensure that flues and ductwork are cleaned to prevent accumulation of materials, as part of the routine maintenance programme.	Confirmed
Normally the discharge of exhaust gases through a stack takes place at constant volume. When this occurs stacks should achieve a minimum efflux velocity of between 10 - 15 m/sec unless dispersion modelling allows a lower velocity to achieve air quality standards. Where the discharge volume varies then the design of the stack should be optimised around the most frequent emission rate.	Stack emission data will be gathered during commissioning to ensure that the necessary efflux velocity is achieved.
Ensure that stacks are not fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.	Confirmed
Where possible, ductwork should be sufficiently lagged to prevent condensation of liquids within the duct in particular solvents.	Confirmed.
Combustion processes should use low NOx burners.	Confirmed . Low NOx burners are being used.
Point Source Emissions to Surface Water and Sewer	
All emissions are controlled, as a minimum, to avoid a breach of water quality standards (Calculations and/or modelling to demonstrate this may be required by the regulator).	Penstock valve are located at strategic points around the site to enable the drainage system to be isolated to prevent emissions from site in the event of a leak of release.
Run-off from the installation should be controlled and managed and where necessary (given the nature of the run-off) treated before discharge in a suitable effluent treatment plant	Penstock valve are fitted to allow containment within the site boundaries should a large spill be released
All interceptors:	
• are impermeable.	Initial fill and level drop tests will be carried out to ensure that the sumps are impermeable, annual retests will be carried out.
• are subject to visual inspection and any contamination removed at a frequency agreed with the regulator.	PPM/Daily Checks (CMMS)
• have an annual maintenance inspection; prior to inspection all contents should be removed.	Annual clean out and drop test to be carried out
Procedures for dealing with the discharges from bunds should be in place.	Bunds will be pumped into IBC's these will be sampled to determine disposal requirements.
Process effluent is kept separate from surface drainage unless agreed with the regulator.	Separate foul and surface water drain systems are being installed.
Point Source Emissions to Groundwater	
There should be no intentional point source emissions of List I and List II substances to groundwater.	There will be no point source emissions to groundwater
Fugitive Emissions to Air	
Operations should be controlled to minimize fugitive emissions	Emission will be controlled to meet guidelines
Where dusty materials are handled, dust should normally be controlled by covering of skips and vessels, using enclosed conveyors, spraying water on sand conveyors, minimizing drops and by avoiding outdoor or uncovered stockpiles	All powders will be contained in a purpose built powder store until required for production in sealed bags. The bags are then unloaded into missing vessels with LEV.
For VOC where the operator uses the Emission and Fugitive limits or the Total Emission Limit Value for compliance the Fugitive VOC Emissions must be determined in accordance with the Solvent Management Plan (Appendix 2). Once completed, it need not be done again until the equipment is modified in such a way as to affect the potential fugitive release of VOCs.	Stack emission data will be gathered during commissioning to ensure that the solvent emission are below the Total Emission Limit Value.
When transferring volatile liquids, one or more of the following techniques should be employed - subsurface filling via filling pipes extended to the bottom of the container, the use of vapour balance lines that transfer the vapour from the container being filled to the one being emptied, or an enclosed system with extraction to suitable abatement plant where abatement is necessary to meet the emission limits.	All tanks are subsurface filled and all tanks are connected to an extraction system to allow materials to be vented when filling
Vent systems should be chosen to minimise breathing emissions (e.g. pressure/vacuum valves) and, where relevant, should be fitted with knock-out pots and appropriate abatement equipment.	All vent systems are designed and installed to ensure that operators are exposed to levels below the WEL (Workplace exposure limits) for all substances used in accordance with EH40 (HSE guidance on workplace exposure limits for chemicals)
Where possible the application of the coating should be carried out in contained conditions.	Electrode coating carried out in booth fitted with extraction.
Where pre impregnated wipes are used they should be held within a closed container prior to use.	All wipes are kept in closed containers
Prior to removal from site used wipes and other items contaminated with organic solvent should be placed in a suitably labelled metal bin fitted with a self-closing lid.	All waste containing solvents are stored in metal bins with self closing lids and removed from site by a licensed waste carrier
Bins should be emptied at least daily, as the contents not only present a fire hazard, but may also undergo spontaneous combustion (especially if contaminated with certain types of coating residues).	All bins are emptied at least daily by contracted on site waste handler
For materials that may undergo spontaneous combustion special bins that allow air to circulate beneath and around them to aid cooling should be used.	No material can undergo spontaneous combustion
Application of cleaning organic solvents should be from a contained device or automatic dispensing system when applied directly.	All application of solvent is carried out with plunger can and a cloth
Closed cleaning systems should be used wherever possible.	Tanks and pipework are cleaned using a closed system, some tanks are sent offsite for cleaning
Oven units and ductwork should be enclosed and sealed to prevent fugitive loss of VOCs.	All ovens and ductwork are sealed
All drying ovens should be operated under balanced or negative pressure to reduce VOC emissions at entry and exit points. All other apertures within the oven must be sealed sufficiently.	Ovens are under negative pressure to prevent fugitive emissions
Drying systems should operate to maximise the drying efficiency. Complete drying reduces the fugitive emission level of organic solvents from products.	99 - 100% recovery of solvent from the electrode is achieved
Fugitive emissions to surface water, sewer and groundwater	
The operator should have a clear diagrammatic record of the routing of all installation drains, subsurface pipework, sumps and storage vessels including the type and broad location of the receiving environment.	Drainage layout drawing will be displayed in prominent display cabinets/frames near the reception area.
The operator should identify the potential risk to the environment from drainage systems recorded by the above and should devise an inspection and maintenance programme having regard to the nature and volume of waste waters, groundwater vulnerability and proximity of drainage systems to surface waters.	Confirmed. Maintenance and inspection systems will be implemented. Recovered water will be recovered in a static tank and tankered off site.
The operator should ensure that all operational and storage areas are equipped with an impervious surface, spill containment kerbs, sealed construction joints, and connected to a sealed drainage system or such alternative requirements as approved by the regulator.	All operational storage areas are designed and built to prevent contamination of the soil below, i.e. impermeable hardstanding. Will be designed to required British Standards.
Oil and solid interceptors should be used if necessary for the drainage of open storage areas.	No open storage areas, all storage areas are enclosed and bunded. However, oil interceptors are present on site.
All sumps should be impermeable and resistant to stored materials.	The sumps are designed to not be affected by the materials stored on site.
All liquid storage tanks should be located within bunds that are designed, constructed and located following to appropriate standards and ensuring that the volume is more than 110% of the largest tank.	All liquid storage and bunding will be done in accordance with HSG176
Storage tanks should be fitted with high-level alarms or volume indicators to warn of overfilling and where practicable the filling system should be interlocked to the alarm system to prevent overfilling. Delivery connections should be located within a bunded area, fixed and locked when not in use.	All storage tanks will be fitted with level indication and alarm points will be set to indicate maximum fill level has been reached this will interlock fill equipment to prevent possible overfilling.
All tanks bunds and sumps should be subject to regular visual inspection, as agreed with the regulator, and placed on a preventative maintenance programme. The contents of bunds and sumps should be pumped out or otherwise removed as soon as is practicable after checking for contamination.	Pre Preventative Maintenance/Daily Checks (CMMS)
The operator should assess the pollution risks posed by the storage of solvents and devise control measures to minimise the pollution risk.	Environmental risk assessment carried out and COMAH Safety report. Considered in Environmental Aspects register.
For VOC where the operator uses the Emission and Fugitive limits or the Total Emission Limit Value for compliance the Fugitive VOC Emissions must be determined in accordance with the Solvent Management Plan. Once completed, it need not be done again until the equipment is modified in such a way as to effect the potential fugitive release of VOCs	Confirmed. Solvent management plan to be implemented. Total emission limit will be adhered to.
Odour	
Operators should conduct odour assessments to determine whether emissions result in offensive odours at or beyond the installation boundary.	Odour not expected to be an issue, however, upon commission, olfactory assessments/checks will be undertaken and dealt with accordingly.
If operations are identified as resulting in offensive odour, operators should devise an odour control programme of improvements and maintain an odour management plan.	There are no offensive odours expected to be present.
Management	
Environmental Management System	
Operators should use an effective Environmental Management System with policies and procedures for environmental compliance and improvements. Audits should be carried out against those procedures at regular intervals.	The site is an ISO 14001 certified plant
Operations and maintenance	
Effective operational and maintenance systems should be employed on all aspects of the installation whose failure could impact on the environment. Such systems should be reviewed and updated annually.	Significant Aspects/Zone Instructions - Operational Status Reports/ PPM/Daily Checks (CMMS)
Environmentally critical process and abatement equipment (whose failure could impact on the environment) should be identified and listed. The regulator should be provided with a list of such equipment.	Equipment listed in COMAH report. Register will be set up upon commission and will be reviewed on a periodic basis to ensure applicable. Environmental Aspect Register which will be reviewed periodically as part of EMS audits.
For equipment referred to above:	

Indicative BAT for Surface Treatment using Solvents	Envision AESC UK BAT Compliance Status
- Alarms or other warning systems should be provided, which indicate equipment malfunction or breakdown.	Building Management System will monitor and flag up alarms for equipment malfunctions.
• Such warning systems should be maintained and checked to ensure continued correct operation, in accordance with the manufacturer's recommendations.	Condition Based Maintenance/Central Control Room/Building Management System /Planned Presentation Maintenance / Daily Checks / Computerised Maintenance Management System)
• Essential spares and consumables for such equipment should be held on site or be available at short notice from suppliers, so that plant breakdown can be rectified rapidly.	Yes critical spares will be present in event of any breakdowns. Risk Priority Number /Critical Spares (CMMS)
Records of breakdowns should be kept and analysed by the operator in order to eliminate common failure modes.	Yes records will be kept on the CMMS/MBD (major breakdown reports) / Chronic Loss Report.
Competence and training	
A competent person(s) should be appointed to liaise with the regulator and the public with regard to complaints. The regulator should be informed of the designated individual(s).	A senior manager within the SHEQ dept is appointed as the competent person to deal liaise with the regulator
A formal structure shall be provided to clarify the extent of each level of employee's responsibility with regard to the control of the process and its environmental impacts. This structure shall be prominently displayed on the company within the process building at all times. Alternatively, there must be a prominent notice referring all relevant employees to where the information can be found.	Maintenance Training System (Maintenance members) Induction/onboarding programme along with zone specific Production management system used which holds training and compliance. Some specific items are baked into standard operations/check sheets
Personnel at all levels shall be given training and instruction sufficient to fulfil their designated duties under the above structure. Details of such training and instruction shall be entered into an appropriate record and be made available for inspection by the regulator.	Maintenance Training System (Maintenance members) Induction/onboarding programme along with zone specific Production management system used which holds training and compliance. Some specific items are baked into standard operations/check sheets
The potential environmental risks posed by the work of contractors should be assessed and instructions provided to contractors about protecting the environment while working on site.	All contractor are given an induction and this includes a section on environments requirements and considerations. RAMS
Accidents/Incidents/Non-conformance	
There should be written procedures for investigating incidents, (and near misses) which may affect the environment, including identifying suitable corrective action and following up.	Online system will be used to manage incidents and near misses - My Compliance. Authorised at management level to ensure implementation.
Raw Materials	
The operator should adopt procedures to control the specification of those types of raw materials with the main potential for environmental impact, such as the inks and coatings used in the process in order to minimize any such impact. An annual review of alternative raw materials should be carried out with regard to environmental impact.	The materials with the least environmental impact are chosen where reasonably practicable. Continuous improvement activities are undertaken to reduce the risk to ALARP.
Substances or mixtures which, because of their VOC content are assigned or need to carry risk phrases / hazard statements R45, R46, R49, R60 or R61 shall be replaced, as far as possible by less harmful substances and mixtures within the shortest possible time.	The materials with the least impact on health are chosen where reasonably practicable. Continuous improvement activities are undertaken to reduce the risk to ALARP.
A programme to monitor and record the consumption of inks/coatings/organic solvent against product produced should be used to optimise the amount of organic solvent/ink used	SAP system will monitor product consumption by applying production usage vs inventory using BOM level data. SAP will calculate required future ordering to maintain safety stock level
Waste Minimisation	
The operator should record materials usage and waste generation in order to establish internal benchmarks. Assessments should be made against internal benchmarks to maintain and improve resource efficiency.	KPI's tracked via TQM. OK Rate/Attn and waste. Managed daily by production via DMD evaluation and Waste audits (audits etc) Scrap Officer hired FY23
The operator should carry out a waste minimisation audit at least as frequently as the permit review period.	Waste minimisation is classed as a continuous improvement activity and is therefore always under review and it is currently reviewed on a monthly basis as part HSE committal meeting. Also an annual objective. Information will be provided to regulator in accordance with permit requirements. Managed daily by production via DMD evaluation and Waste audits (audits etc)
If an audit has not been carried out in the 2 years prior to submission of the application, it should be completed within 18 months of the issue of the first PPC permit. The methodology used and an action plan for optimising the use of raw materials should be submitted to the regulator within 2 months of completion of the audit.	We will comply with this. Covered by EMS. internal and external audits completed for EMS purposes.
Specific improvements resulting from the recommendations of audits should be carried out within a timescale approved by the regulator.	We will comply with this if required.
Consumption of organic solvents should be reduced and minimised where practicable through good process control and the application of the appropriate techniques for the system as described in Guidance Note GG429 Cost Effective Solvent Management.	NMP is contained within the NMP system and total recycling is carried out using the NMP recovery system. All solvents are used within closed systems to minimise waste
Water Use	
The operator should carry out a regular review of water use (water efficiency audit) at least as frequently as the permit review period. If an audit has not been carried out in the 2 years prior to submission of the application it should be completed within 24 months of the issue of the first PPC permit.	An initial water efficiency audit will be carried out. Monthly water meter readings will be checked and any unexpected increase will be investigated.
Using information from the water efficiency audit, opportunities for reduction in water use should be assessed and, where appropriate, should be carried out in accordance with a timescale approved by the regulator.	Best practice will be used in the design of all systems to ensure that water usage is kept to a minimum.
Information from audits should be used to establish benchmarks. Operators should keep records of such benchmarks and make measurement against them to reveal whether the process is being maintained "in control" or to track improvements.	Monthly water usage will be monitored and comparison year on year will be made to look for any significant usage increases.
The volume of mains and abstracted water used in the activities should be directly measured when the installation is operating under normal production conditions for a sufficient period to determine the base use of the activity. Thereafter, an annual exercise should be done to confirm the measurement. All measurements should be recorded, and the records held on site.	Water meter readings will be taken and store to allow a base line range to be determined, ambient conditions will have a large impact on monthly consumption due to the use of evaporative condensers for the chilled water systems.
When parts are removed for cleaning a two-bath system should be used to minimise the use of cleaning water. The water from the second bath can then be used to replenish the first bath when this water is so soiled it must be disposed of.	n/a
When cleaning tanks and fixed vessels cleaning water should be minimised by using rotary spray nozzle heads and reused where possible.	Electrolyte tanks are cleaned off site by the supplier using rotary spray nozzles. NMP tanks are flushed with NMP only.
Waste handling	
The operator should produce an inventory of the quantity, nature, origin and where relevant, the destination, frequency of collection, mode of transport and treatment method of any waste which is disposed of or recovered.	SCM team keep a master log of waste streams with information required
Operators should segregate the main waste types described in paragraph 3.249 of SG6.	All waste streams are segregated in accordance with AESC's waste management guide.
Operators should ensure that waste stored in containers that are durable for the substances stored and that incompatible waste types are kept separate.	Waste is stored in dedicated storage areas and incompatible waste types are segregated. All waste is stored in suitable containers for that waste type.
Ensure that waste storage areas are clearly marked and signed, and that containers are clearly labelled	All dedicated waste areas are in place with clear signage. All waste containers are marked with 'Red label' waste indication specifying the nature of the waste in the container. Duty of care checks are carried out on waste carriers to ensure the waste is going through the correct waste stream.
Ensure that appropriate storage facilities are provided for substances that are flammable, sensitive to heat or light etc, and that incompatible waste types are kept separate.	All flammable liquids are stored in suitable systems or containers. DSEAR assessments are carried out for all areas where flammable atmospheres could be present. Suitable zoning and Atex equipment is installed where necessary. All other flammable waste is stored in flame resistant metal containers with closed lids.
Ensure that containers are stored with lids, caps and valves secured and in place. (This also applies to emptied containers.)	All containers are stored with secure lids to prevent contamination and spillage
Ensure that procedures are in place to deal with damaged or leaking containers.	Any damaged or leaking containers are placed in bunded areas and placed into larger vessels or decanted into another vessel
Segregate waste wherever practicable.	All waste is segregated into waste streams in accordance with AESC waste management guide
Identify the disposal route for all waste. This should be as close to the point of production as possible.	Waste is segregated at the Production lineside and is handled by a waste contractor before waste disposal.
Ensure that dust from abatement plant is collected in robust bags that can be disposed of directly, or in fully enclosed skips to avoid the release of fugitive dusts during transfer.	Extracted dust is collected in a robust bag which is contained inside the metal drum of the dust collection system. Bags are then removed and tied off to prevent release of dusts before disposal in the correct waste stream.
All reasonably practicable efforts should be made to minimise the amount of residual organic solvent bearing material left in drums and other containers after use. All organic solvent contaminated waste should be stored within closed containers.	All organic solvents are stored in bulk sealed systems rather than drums. Any waste contaminated with flammable solvents is stored in flame resistant metal containers with closed lids.
Prior to removal from site used wipes and other items contaminated with organic solvent should be placed in a suitably labelled metal bin fitted with a self-closing lid.	All waste contaminated with flammable liquids are disposed of in suitably labelled metal bins with self closing lids.
Bins should be emptied at least daily, as they not only present a fire hazard, they may also undergo spontaneous combustion.	Bins are continuously emptied by onsite waste contractors. Operators empty bins shiftly
For materials that may undergo spontaneous combustion special bins that allow air to circulate beneath and around them to aid cooling should be used. Dusty wastes should be stored in closed containers and handled in a manner that avoids emissions.	There are no materials which can spontaneously combust Dusts are handled in a closed system
Waste Re-use, Recovery, Recycling or Disposal	
The operator should carry out an annual review to demonstrate that the best environmental options are being used for dealing with the waste streams listed in Table 12 of SG6.	AESC are an ISO14001 accredited site and are audited annually by an external auditor.
At a minimum of every two years, the operator should investigate potential markets for the recovery/re-use of wastes that are currently disposed of to landfill.	All materials are recycled where practicable as this provides revenue to the company. We have a zero landfill policy. This is reviewed monthly in the EHS meeting.
Energy	
Basic energy efficiency requirements	
The operator should produce a report annually on the energy consumption of the installation.	Energy consumption is to be monitored on a monthly basis and an annual report will be generated.
The operator should monitor energy flows and target areas for reduction which should be updated annually. ("Sankey" diagrams and energy balances would be useful as aids.)	This is a new factory and best practice will be used during the design process to minimise energy consumption.
In order to optimise combustion, the operator should, where practicable, monitor waste gases. The scope of this monitoring will depend on the size of the combustion plant and, where relevant, should be determined by consulting the appropriate Statutory Process Guidance Note.	Significant Aspects/Zone Instructions - OSR/PPM/Daily Checks (CMMS). CBM/CCR/BMS
The operator should ensure that all plant is operated and maintained to optimise the use and minimise the loss of energy.	PPM/Daily Checks (CMMS) burner efficiency checks to be carried out on an annual basis
The operator should ensure that all appropriate containment methods, (e.g. seals and self-closing doors) are employed and maintained to minimise energy loss.	General maintenance activity
For new oxidation plant, where thermal oxidation is used, heat recovery should be maximised. Where heat recovery is not practicable, catalytic oxidation should be used wherever technically possible.	n/a
Additional Energy Efficiency Requirements	
Energy Efficiency Techniques	
The following techniques should be considered:	
Heat recovery from different parts of the processes	Dehumidification plant use heat recovery from regeneration to pre heat incoming fresh regeneration air. Heat Recovery from coater driers being used to reheat the ovens.
Minimisation of water use and closed circulating water systems	LTHW and Chilled water systems will be closed systems
Good insulation	Insulation will be applied to meet BS standards
Plant layout to reduce pumping distances	Plant has been designed to ensure pump distances will be kept to a minimum
Phase optimisation of electronic control motors and fans	Motors will use VSD control or will be high efficiency CE motors
Optimised efficiency measures for combustion plant	PPM/Daily Checks (CMMS) burner efficiency checks to be carried out on an annual basis
Preventative maintenance programme targeting energy drops	PPM/Daily Checks (CMMS)
Energy Supply Techniques	
The following techniques should be considered:	
Use of Combined Heat and Power (CHP)	n/a
Generation of energy from waste	n/a
Use of less polluting fuels	Plant will use CH4 (Natural Gas) gas as a source of fuel for the boilers
Accidents	
Accidents/incidents/non-conformance	
There should be written procedures for investigating incidents and near misses, including identifying suitable corrective action and following up.	An electronic database is used to record and track all incidents and near misses. Corrective actions progress is tracked in the monthly EHS meeting.
The operator should maintain an accident management plan covering the matters listed in paragraphs 3.260 to 262 of SG6 and to the satisfaction of the regulator. The plan should be available for inspection by the regulator.	A major accident prevention plan is in place due to the site being an upper tier COMAH site and an emergency response plan to respond to incidents is in place
In the case of abnormal emissions arising from an accident, such as a spillage for example, the operator should:	x
Investigate immediately and undertake remedial action as soon as practicable	CMMS/EOS/MBD/ Chronic Loss Countermeasures required for all n/miss or accidents - very well documented
promptly record the events and actions taken	All incidents reported into incident database - MyCompliance
ensure the regulator is made aware without delay.	Where required all incidents shall be reported to the regulator
Specific conditions:	
Specific conditions may need to be included within permits to prevent accidents.	A permit to work system is in place
Suitable solvent containment and spillage equipment should be readily available in all solvent handling areas.	All solvents are controlled and spill kits are available Solvents are managed in accordance with HSG51 - Storage of flammable liquids in containers HSG140 - Safe use and handling of flammable liquids HSG 176 - The storage of flammable liquids in tanks
Adequate provision to contain potential liquid and solid spillage should be provided.	All flammable liquids are stored in bunded areas with a capacity of 110% or more of largest container or greater than 25% of total as per HSG176 and HSG51. Solid materials are contained within a sealed system (Dust etc)
Appropriate precautions should be taken to prevent ignition of flammable materials.	See above
All spillages should be cleared as soon as possible; solids by vacuum cleaning, wet methods, or other appropriate techniques may be used, however, dry sweeping of dusty spillages should not be permitted.	Spillages are dealt with by the emergency response team who are trained in containment of spillages an emergency response
The handling and use of flammable and explosive materials should be carried out in accordance with the requirements of the Dangerous Substances and Explosive Atmosphere Regulations SI2776 2002 (Ref 14b in SG6).	DSEAR risk assessments are carried out by a consultant and any Atex zones identified are installed with suitably rated equipment.

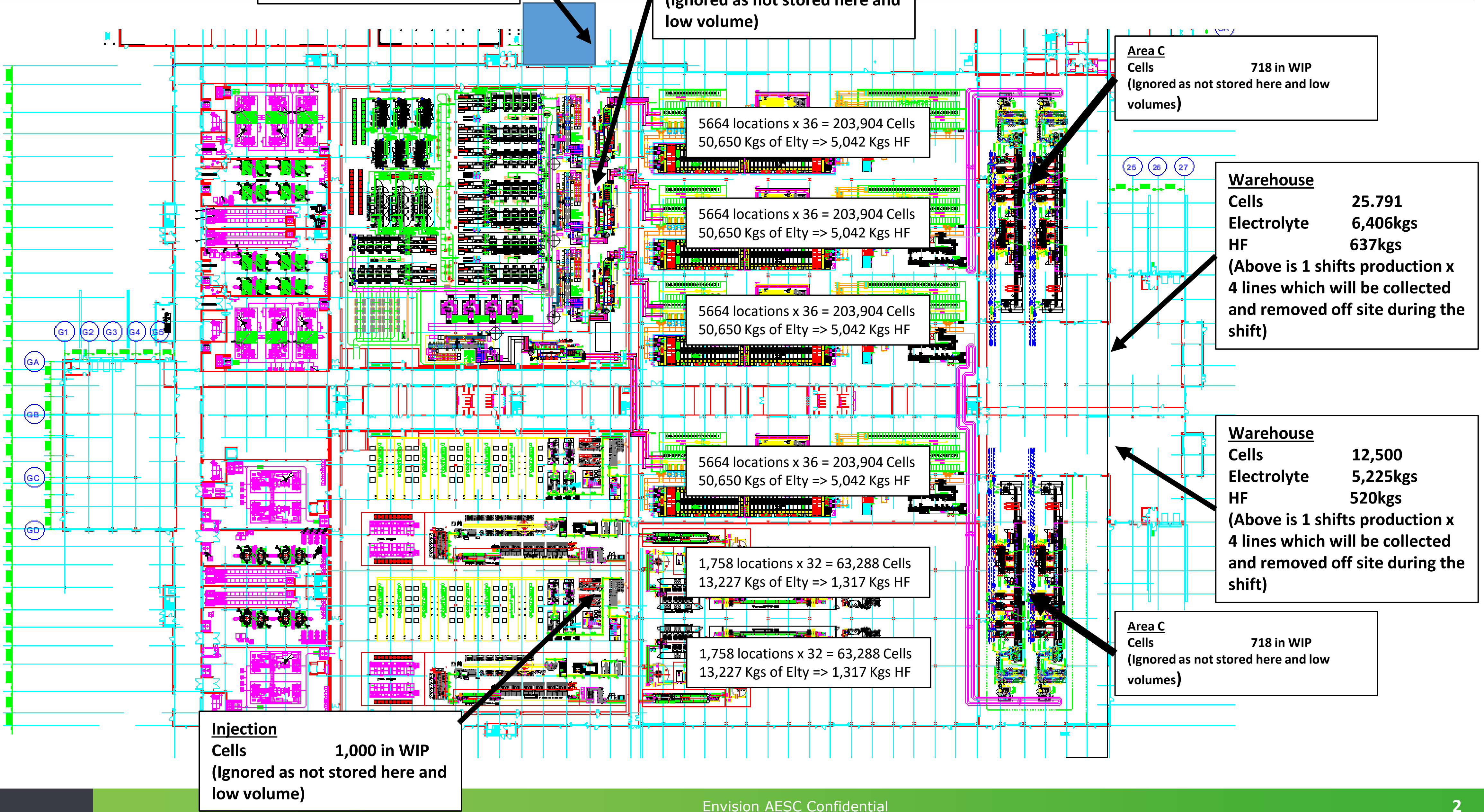
300168590-ES-005:BAT Assessment for Envision AESC Ltd - Giga 1 Car Battery Manufacturing Factory, Sunderland

Indicative BAT for Surface Treatment using Solvents	Envision AESC UK BAT Compliance Status
Areas where flammable organic solvents and organic solvent containing materials are handled or used should be suitably contained to minimise the potential spread for fire.	All solvents are contained within sealed systems with minimal risk of leakage. All areas are bunded and where necessary fitted with leak detection and fire suppression systems.
Operations working at above 25% of the organic solvent LEL must be controlled using suitable monitoring and control devices.	No areas of the plant operate where the organic solvent levels are above 25% of LEL. However where solvents are heated we have calibrated detection systems to monitor the LEL levels which shutdown the process if high LEL levels are detected.
The auto-ignition temperature should not be exceeded in any organic solvent containing section of the process, with the exception of the combustion chamber of any thermal abatement plant.	Electrolyte is used at ambient temperature and the auto ignition temp is approx. 450 degrees. NMP is heated to approx. 150 degrees but the auto ignition temp is approx. 252 degrees. Neither process uses the solvent close to it's auto ignition temp.
Electrical zoning and static protection should be provided in all areas where flammable organic solvents are stored used or handled.	DSEAR risk assessments are carried out by a consultant and any Atex zones identified are installed with suitably rated equipment. Static protection is used where required - Static checks on personnel, earth bonding of pipework etc.
Controlled shutdown procedures should be in place for dealing with an emergency such as organic solvent levels entering the combustion plant at greater than the limit as calculated using the relevant standards. (This figure will normally be 25%).	Calibrated detection systems on various parts of the process are used to monitor the LEL levels which shutdown the process if high LEL levels are detected.
The handling and storage of flammable materials should be carried out in accordance with the HSE requirements REF HS(G)140 and HS(G)176 (Ref 14 in SG6)).	All flammable materials are stored in suitable containers or tanks with adequate bunding, containment and leak detection where required. DSEAR assessments are carried out to identify and zone requirements Separation measures are in place for flammable substances from other materials All handling and storage measures are as per the guidance detailed in HSG176, HSG51 and HSG 140.
Noise and Vibration	
The operator should identify key plant and equipment (or operations) with the potential to give rise to significant noise and take such measures as are necessary by way of mitigation and maintenance of existing plant and equipment in order to minimise noise having regard to paragraph 3.265 and Table 13 in SG6.	Noise assessments will be carried out during initial plant design by the general contractor's design team A noise assessment has been completed for the EIA as part of the Planning application with the Local Authority for impact on the neighbouring environments, no issues were identified associated with noise impacts. All equipment will be UKCA compliant. All areas where noise limit thresholds are exceeded will require mitigative measures to be adopted during installation phase.
Monitoring	
Indicative BAT from SG6 235 - 266 may all apply	Monitoring and reporting will be undertaken in accordance with requirements of the environmental permit and inline with BAT. Monitoring of emissions to air and water will be completed where required by environmental permit and in accordance with BAT. A solvent management plan has been prepared and will be updated upon commission to monitor VOCs.

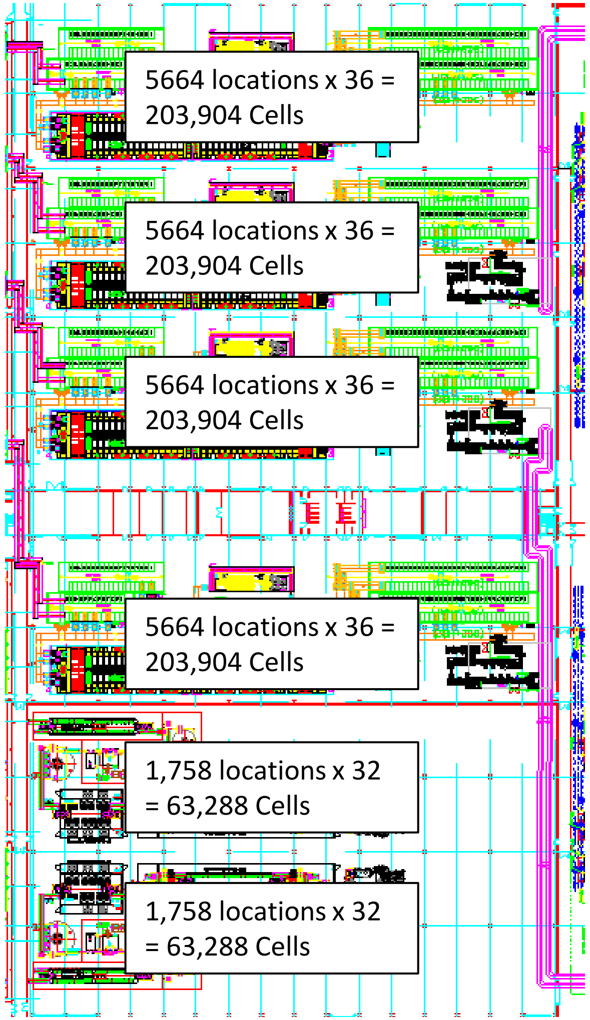
Appendix 4 – Raw Materials & Waste Inventory

Envision AESC
Material Report
1/12/22

Electrolyte Storage Locations & HF Produced If Converted



Electrolyte Storage Locations & HF Produced If Converted



Area	Locations	Cells	Elty (Kgs)	HF (Kgs)
Soak 1 Soak 2	592	21,312	5,294	527
Formation	128	4,608	1,145	114
HTA	1,220	43,920	10,910	1,086
CDC	128	4,608	1,145	114
Screen 1 +HB	1,828	65,808	16,347	1,627
Screen 2 +HB	1,768	63,648	15,810	1,574
Total	5,664	203,904	50,650	5,042

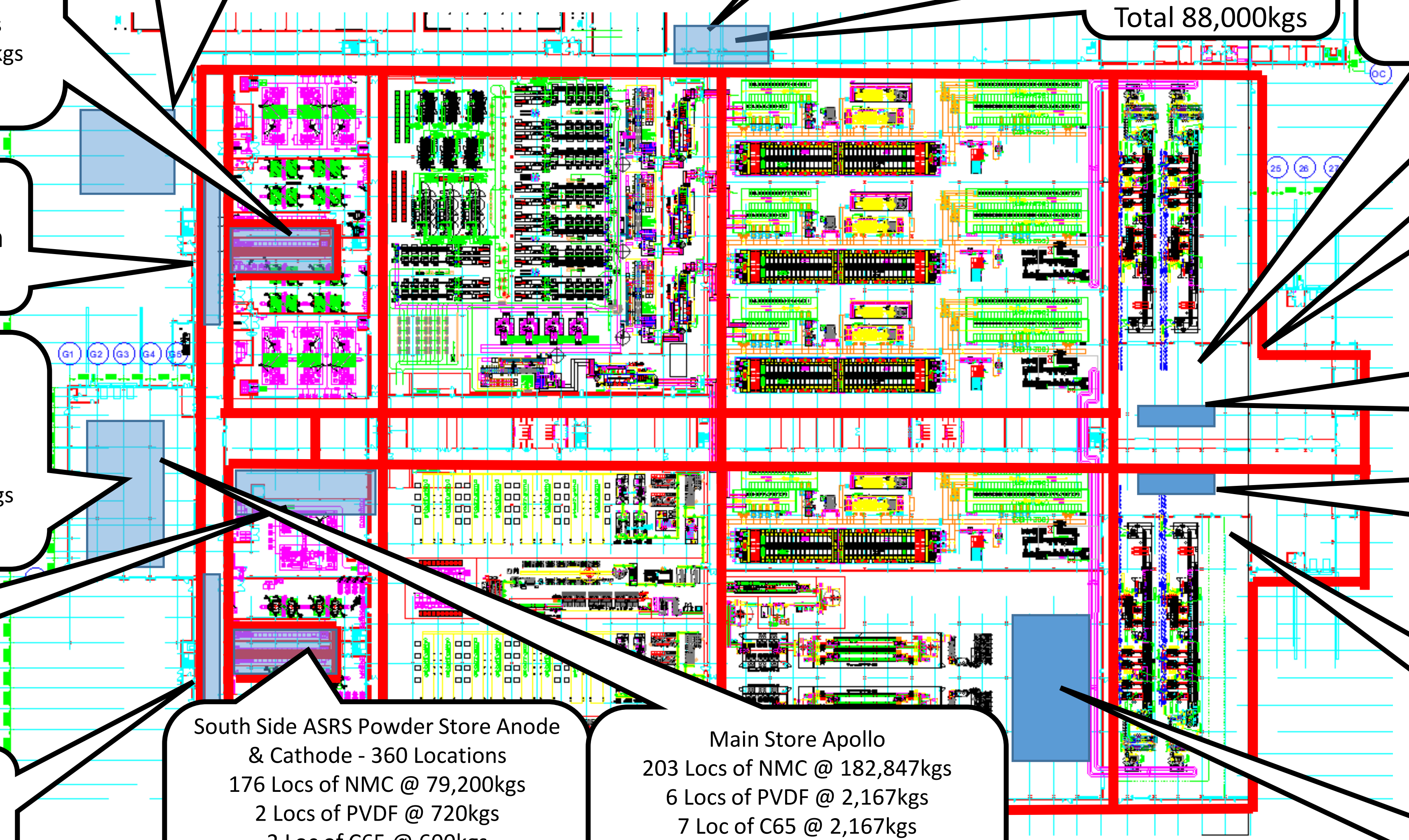
Area	Locations	Cells	Elty (Kgs)	HF (Kgs)
Formation	48	1,728	361	36
HTA	570	20,520	4,289	427
CDC	60	2,160	451	45
Normal Temp	1,080	38,880	8,126	809
Total	1,758	63,288	13,227	1,317

1,758 locations x 32 = 63,288 Cells
13,227 Kgs of Elty => 1,317 Kgs HF

Material Storage

Firewall

Envision AESC



North Side ASRS Powder Store
Anode & Cathode - 720 Locations
349 Locs of NMC @ 157,050kgs
5 Locs of PVDF @ 1,800kgs
6 Loc of C65 @ 1,800kgs
10 Loc of Bohemite @ 125kgs
354 Locs of Graphite @ 99,120kgs
3 Locs of CMC @ 1,200kgs
3 Loc of C65 @ 900kgs

NMP Supply & Recovery
4 x Supply Tanks 100,000kgs
2 x Recovery Tanks 100,000kgs

Waste Compound

DEC
3 x 1000kgs
Total 3,000kgs

Electrolyte Tankers
4 x 22,000kgs
Total 88,000kgs

North Side
CEMEDINE SX1505 Base Resin x TBC
CEMEDINE SX1505 Hardener x TBC
BF CB-2 ISOC x TBC
BF CB-2 POLC x TBC

CNT/SBR Store Location
107 x CNT@ 1,000kgs each
17 x SBR @ 1,000kgs each

North Side Finished Goods
1 Shift Stock

Main Store PZ1D
601 Locs of NMC @ 540,795kgs
15 Locs of PVDF @ 5,379kgs
18 Loc of C65 @ 5,379kgs
20 Loc of Bohemite @ 250kgs
643 Locs of Graphite @ 257,069kgs
11 Locs of CMC @ 3,243kgs
2 Loc of C65 @ 2,062kgs

North Side Module Part Store
3 Day Stock

South Side Module Part Store
3 Day Stock

Anode Foil, Cathode Foil & Separator Store

South Side Finished Goods
1 Shift Stock

CNT/SBR Store Location
26 x CNT @ 1,000kgs each
2 x SBR @ 1,000kgs each

South Side ASRS Powder Store Anode & Cathode - 360 Locations
176 Locs of NMC @ 79,200kgs
2 Locs of PVDF @ 720kgs
2 Loc of C65 @ 600kgs
129 Locs of Graphite @ 36,120kgs
2 Locs of CMC @ 800kgs
49 Loc of C65 @ 14,700kgs

Main Store Apollo
203 Locs of NMC @ 182,847kgs
6 Locs of PVDF @ 2,167kgs
7 Loc of C65 @ 2,167kgs
223 Locs of Graphite @ 125,157kgs
2 Locs of CMC @ 800kgs
156 Loc of C65 @ 46,495kgs

South Side Apollo Part Store
3 Day Stock

Material Storage – Direct Materials

Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
Lithium Nickel Manganese Cobalt Oxide	NMC	Main & ASRS Powder Store	450kg Frecon Bag	Generally Unmanned Area, Fire suppression & Internal location in set room	959,892 kg
Polyvinylidene Fluoride	PVDF	Main & ASRS Powder Store	20kg Container	Generally Unmanned Area, Fire suppression & Internal location in set room	10,066 kg
Carbon Black	C65	Main & ASRS Powder Store	7.5kg Bag	Generally Unmanned Area, Fire suppression & Internal location in set room	74,103 kg
Graphite	-	Main & ASRS Powder Store	280kg Frecon Bag	Generally Unmanned Area, Fire suppression & Internal location in set room	517,466 kg
Sodium Carboxymethyl Cellulose	CMC	Main & ASRS Powder Store	20kg Bag	Generally Unmanned Area, Fire suppression & Internal location in set room	6,043 kg
Boehmite	-	Main & ASRS Powder Store	12.5kg Bag	Generally Unmanned Area, Fire suppression & Internal location in set room	375 kg
Carbon Nano Tubes	CNT	Racking Outside Room	1000 Litre IBC	Fire suppression, Internal location & Bunded Racking	133,000 kg
Styrene-Butadiene Rubber	SBR	Racking Outside Room	1000 Litre IBC	Fire suppression, Internal location & Bunded Racking	2,000 kg
N-Methyl-2-Pyrrolidone	NMP	NMP Delivery & Waste Area	25,000 or 50,000 kgs supply/waste tanks	Fire suppression, Internal location & Bunded.	600,000 kg
Electrolyte	-	Electrolyte Delivery Area	22 Ton ISO Tankers	Foam enhanced sprinkler system, Leak detect & Bunded	88,000 kg
Diethyl Carbonate	DEC	IBC Room	1,000 Litre IBC	Fire suppression, Internal location & Bunded.	3,000 kg
Electrolyte (trial material)	-	IBC Room	1,000 Litre IBC	Fire suppression, Internal location & Bunded.	-

We ha

50,00
Max v

Material Storage – Direct Materials

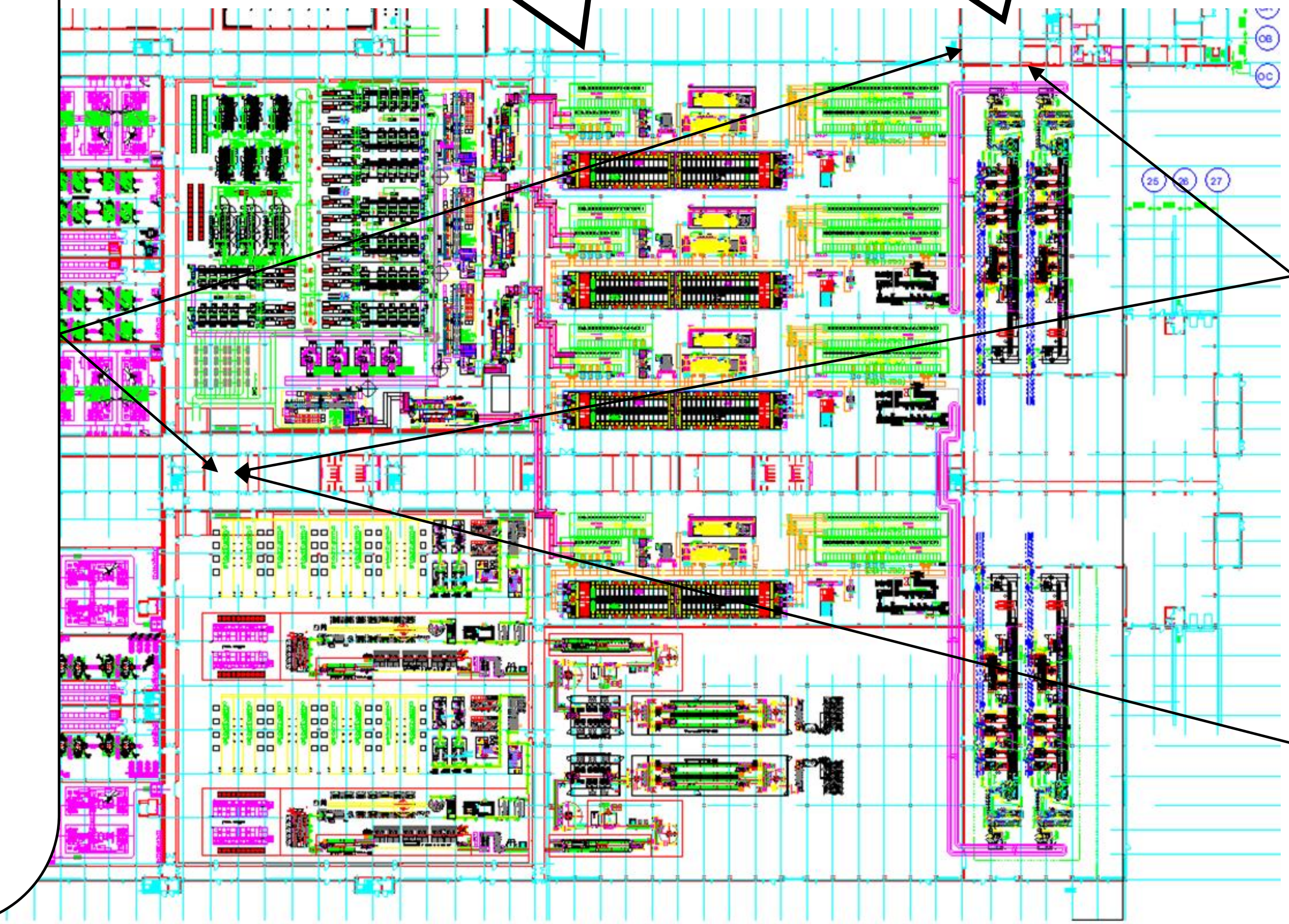
Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
CEMEDINE SX1505 Base Resin		North side Finished Goods	TBC		TBC
CEMEDINE SX1505 Hardener		North side Finished Goods	TBC		TBC
Experimental Modified BF CB-2 ISOC		North side Finished Goods	TBC		TBC
Experimental Modified BF CB-2 POLC	-	North side Finished Goods	TBC		TBC

QA Storage Locations

Gas Cage
Argon 3 x 200BAR L
Synthetic Air 3 x 200BAR L
Helium 3 x 300BAR XL
Hydrogen 3 x 200BAR L
O2 Calibration Gas 2 x 5L
5% Hydrogen/Argon 2 x 200BAR L

Labcold Refrigerator
Ethylene Carbonate 2 x 100g
MMDS 2 x bottles
Vinylene Carbonate 2 x 25g
Fluoroethylene Carbonate 2 x 25g

Chemical Cupboards/ ICP Items
Silica gel pellets 6 x bottles @ 2 locs
Phosphorous Pentoxide 5 x 500ml @ 2 locs
Sodium Hydroxide Pellets 2 x 1kg @2 locs
PH4 Buffer 2 x 500ml @ 2 locs
PH7 Buffer 2 x 1L @ 2 locs
PH9 Buffer 2 x 500ml @ 2 locs
Aquamicron Solid H2O 2 x 10g @ 2 locs
Sodium Hydroxide 2 x 2L @ 2 locs
Bromophenol Blue 2 x 25g @ 2 locs
Lithium Hexafluorophosphate 2 x 25g @ 2 locs
Lithium Nitrate Anhydrous 2 x 25g @ 2 locs
Copper Standard 2 x 100ml @ 2 locs
Aluminium Standard 2 x 100ml @ 2 locs
Beryllium Standard 2 x 100ml @ 2 locs
Chromium Standard 2 x 500ml @ 2 locs
Iron Standard 2 x 100ml @ 2 locs
Nickel Standard 2 x 100ml @ 2 locs
Zinc Standard 2 x 100ml @ 2 locs
Propylene Carbonate 2 x 100ml @ 2 locs
Potassium Disulphate 2 x 1kg @ 2 locs
Potassium Hydrogen Sulphate 2 x 1kg @2 locs
Decon 90 cleaner 2 x 5L @ 2 locs
Ethyl Acetate TBD
Lithium TBD



Flammables Cupboards
NMP 2 x 1L @ 2 locs
Acetone 15 x 1L @ 2 locs
DEC 15 x 500ml @ 2 locs
Methanol 15 x 1L @ 2 locs
Acetonitrile 10 x 2.5L @ 2 locs
IPA Wipes 2 x 40pack @ 2 locs
Aquamicron AKX 15 x 500ml @ 2 locs
Aquamicron AX 15 x 500ml @ 2 locs
Aquamicron CXU 10 x 5ml @ 2 locs
Ethyl Methyl Carbonate 2 x 25g @ 2 locs
Hydranal Coloumat AG TBD
Anhydrous Alcohol

Acid Cupboard
Sulphuric Acid 5 x 1L @ 2 locs
Nitric Acid 5 x 1L @ 2 locs
Hydrochloric 5 x 1L @ 2 locs

Material Storage – QA

Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
Silica Pellets		Lab Chemical Cupboard	Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	6 Bottles
Phosphorous Pentoxide		Lab Chemical Cupboard	500ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	2.5L
Sodium Hydroxide Pellets	NaOH	Lab Chemical Cupboard	1kg Container	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	2kg
Buffer solution PH4		Lab Chemical Cupboard	500ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	500ml
Buffer Solution PH7 Titrinorm		Lab Chemical Cupboard	1L Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	2L
Buffer Solution PH9		Lab Chemical Cupboard	500ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	500ml
Aquamicron Solid H2O		Lab Chemical Cupboard	10g container	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	20g
Sodium Hydroxide AVS Titrinorm	NaOH	Lab Chemical Cupboard	2L Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	4L
Bromophenol Blue Indicator Powder		Lab Chemical Cupboard	25g Container	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	50g
Lithium Hexafluorophosphate	LiPF6	Lab Chemical Cupboard	50ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	100ml

Material Storage – QA

Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
Lithium Nitrate Anhydrous	$LiNO_3$	Lab Chemical Cupboard	25g Container	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	50g
Copper Standard		Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
Aluminium Standard		Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
Berylium Standard [1000ppm]		Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
Chromium Standard		Lab Chemical Cupboard	500ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	1L
Iron Standard 100ml		Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
Nickel Standard solution		Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
Zinc Standard		Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
Propylene carbonate	PC	Lab Chemical Cupboard	100ml Bottle	Sealed marked containers, temperature controlled to 20 °C, ventilated area and segregated locked storage.	200ml
HYDRANAL™ -Coulomat AG		Lab Flammables Cupboard	TBD	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	TBD
Anhydrous Alcohol		Lab Flammables Cupboard	TBD	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	TBD

Material Storage – QA

Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
N-Methyl-2-Pyrrolidinone	NMP	Lab Flammables Cupboard	1L Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	2L
Acetone Normapur Analytical Reagent		Lab Flammables Cupboard	1L Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	15L
Diethyl Carbonate	DEC	Lab Flammables Cupboard	500ml Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	7.5L
Methanol Analar Norampor	MeOH	Lab Flammables Cupboard	1L Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	15L
Acetonitrile	AcN	Lab Flammables Cupboard	2.5L Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	25L
IPA Wipes		Lab Flammables Cupboard	40 pack	Segregated flammable materials storage, sprinkler system and temperature controlled to 20 °C.	80
Aquamicron Reagent AKX	AKX	Lab Flammables Cupboard	500ml Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	7.5L
Aquamicron AX Reagent	AX	Lab Flammables Cupboard	500ml Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	7.5L
Aquamicron CXU	CXU	Lab Flammables Cupboard	5ml Bottle	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	50ml
Ethyl Methyl Carbonate 99.9%	EMC	Lab Flammables Cupboard	25g Container	Segregated flammable materials storage, sealed marked containers, sprinkler system and temperature controlled to 20 °C.	50g
Potassium Disulphate		ICP Item	1KG Container	Sealed marked containers, segregated storage and controlled lab access.	1KG

Material Storage – QA

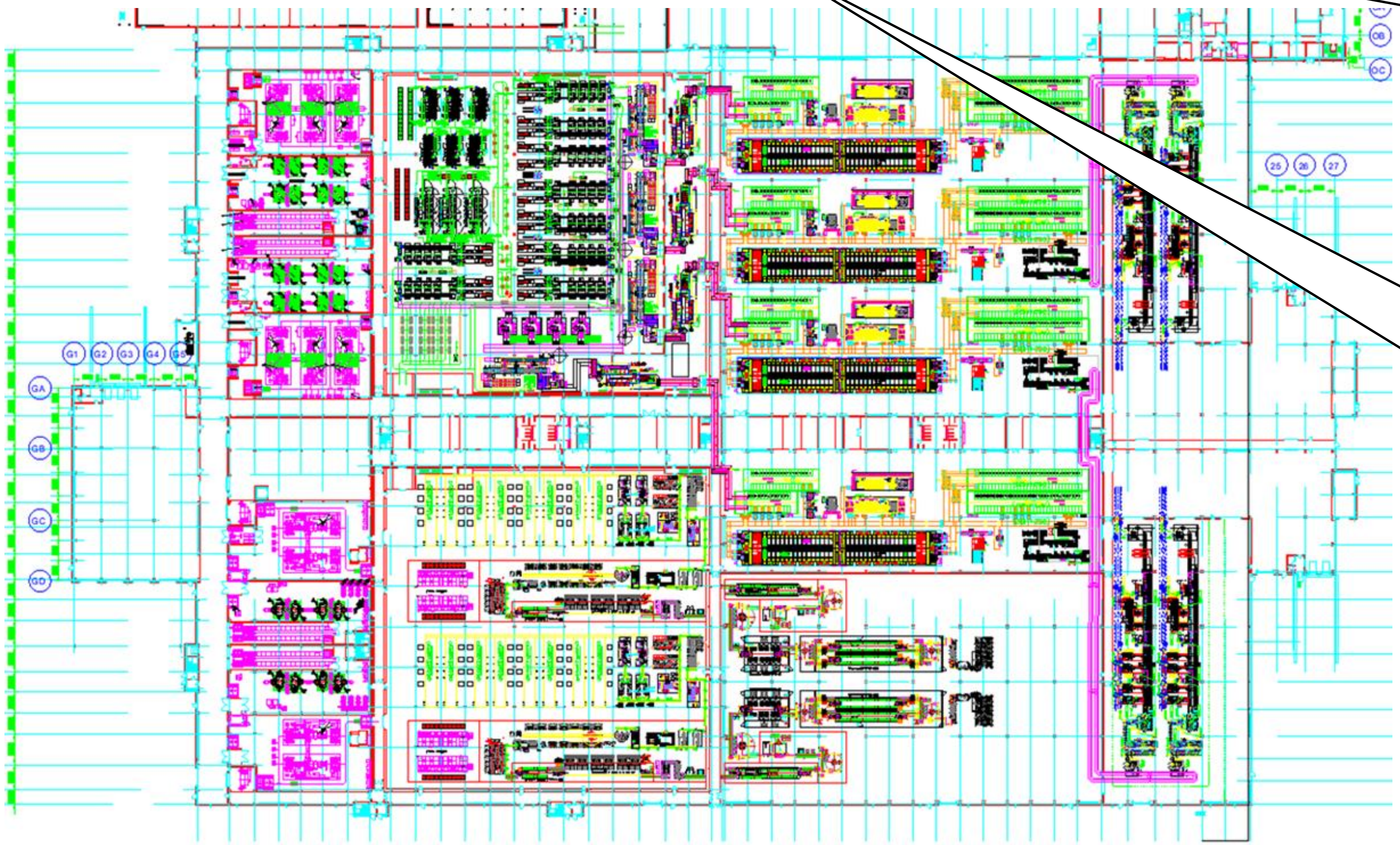
Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
Ethyl Methyl Carbonate		ICP Item	1KG Container	Sealed marked containers, segregated storage and controlled lab access.	2KG
Sulphuric Acid 98%	H2SO4	Lab Acid Cupboard	1L Bottle	Sealed marked containers, temperature controlled to 20 °C and controlled lab access.	5L
Perchloric Acid		Lab Acid Cupboard	1L Bottle	Sealed marked containers, temperature controlled to 20 °C and controlled lab access.	5L
Nitric Acid 69%	HNO3	Lab Acid Cupboard	1L Bottle	Sealed marked containers, temperature controlled to 20 °C and controlled lab access.	5L
Hydrochloric Acid 32%	HCl	Lab Acid Cupboard	1L Bottle	Sealed marked containers, temperature controlled to 20 °C and controlled lab access.	5L
Argon		Gas Cage	200BAR L Canister	Generally unmanned area, locked metal cage, chained down cannisters	3 x 200BAR L Canisters
Synthetic Air		Gas Cage	200BAR L Canister	Generally unmanned area, locked metal cage, chained down cannisters	3 x 200BAR L
Helium Grade A		Gas Cage	300BAR XL Canister	Generally unmanned area, locked metal cage, chained down cannisters	3 x 300BAR XL
Hydrogen CP Grade		Gas Cage	200BAR L Canister	Generally unmanned area, locked metal cage, chained down cannisters	3 x 200BAR L
O2 Calibration Gas		Gas Cage	5L Bottle	Generally unmanned area, locked metal cage, chained down cannisters	10 L
5% Hydrogen/Argon		Gas Cage	200BAR L Canister	Generally unmanned area, locked metal cage, chained down cannisters	2 x 200BAR L
Lithium		Lab Chemical Cupboard	TBD	Temperature controlled storage, sealed marked containers, ventilated area	TBD
Ethyl Acetate		Test Lab Chemical Cupboard	TBD	Sealed marked containers, ventilated area, locked segregated storage	TBD
MMDS	B0	Lab cold Refrigerator	Bottle	Sealed marked containers, segregated storage, controlled lab access and temperature controlled to 4 °C	2 Bottles
Vinylene Carbonate	VC	Lab cold Refrigerator	25g Container	Sealed marked containers, segregated storage, controlled lab access and temperature controlled to 4 °C	50g

Material Storage – QA

Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
Fluoroethylene Carbonate 99%	MFEC	Lab cold Refrigerator	25g Container	Sealed marked containers, segregated storage, controlled lab access and temperature controlled to 4 °C	50g
Ethylene Carbonate	EC	Lab cold Refrigerator	100g container	Sealed marked containers, segregated storage, controlled lab access and temperature controlled to 4 °C	200g
Decon 90 Cleaner		Sink Cupboard	5L Bottle	Sealed marked containers, segregated storage, controlled lab access.	10L

Waste Storage Location

Waste Compound



Waste Materials Storage

Wet Cell Waste – 26,160 kg

Waste Anode – 15,270 kg

Waste Cathode – 10,350 kg

Mixed Cell Waste – 25,680 kg

Waste Slurry – 25,000 kg

Powder Waste (An/Ca) – 25,000 kg

Powder packaging/PPE Waste – 15,000 kg

Glue Waste – 25,000 kg

Various Lab Waste -

Electrolyte Waste – 20,000 Kg

Waste Materials Storage – Waste Tank

Electrolyte Waste – 4,000 kg

Materials Storage - Waste

Material	Abbreviation	Store Location	Container	Area Controls/Containment	Total Quantity
Wet Cell Waste **(Cell filled with electrolyte)**		Waste Compound	220 L UN Barrel 144 @ 181kgs	Sealed marked containers, generally unmanned area and segregated locked storage. Bunded Area.	26,160 kg
Waste Anode		Waste Compound	0.85mx0.85mx0.85m dumpy bag with waste in plastic bags 36 @ 424kgs	Marked bags, generally unmanned area and segregated locked storage.	15,270 kg
Waste Cathode		Waste Compound	0.85mx0.85mx0.85m dumpy bag with waste in plastic bags 36 @ 300Kgs	Sealed marked containers, generally unmanned area and segregated locked storage.	10,800 kg
Waste Slurry (An & Ca)		Waste Compound	220L Blue UN Barrel 144 @ 174Kgs	Sealed marked containers, generally unmanned area and segregated locked storage. Bunded Area.	25,000 kg
Mixed Cell Waste		Waste Compound	220 L UN Barrel 144 @ 178kgs	Sealed marked containers, generally unmanned area and segregated locked storage. Bunded,	25,680 kg
Powder Waste (An & Ca)		Waste Compound	220L Blue UN Barrel 144 @ 174Kgs	Sealed marked containers, generally unmanned area and segregated locked storage.	25,000 kg
Powder packaging/PPE Waste		Waste Compound	220L Blue UN Barrel 144 @ 104Kgs	Sealed marked containers, generally unmanned area and segregated locked storage.	15,000 kg
Electrolyte Waste		Waste Compound	Steel Barrel 25L 40 @ 20Kgs	Sealed marked containers, generally unmanned area and segregated locked storage. Bunded	800kg
Electrolyte Waste		Waste Tank	Dedicated Waste Tank	Dedicated waste tank with self bunded.	4,000 kg
Misc Lab Waste		Waste Compound	220L Blue UN Barrel 144 @ 104Kgs	Sealed marked containers, generally unmanned area and segregated locked storage.	15,000 kg

Plant Equipment Storage

Material	Abbreviation	Store/Usage Location	Container	Container Amount (Kgs)	Area Controls/Containment	Total Qty (Kgs)
Ammonia Chiller		Based in Ammonia Chiller System	Chiller Machine & pipework	600Kg per line	Bund around chillers Gas sensors to detect and interlock system	4,800kgs
20% Glycol Cooled		All over plant	Pipework etc	TBC	Drip trays around process equipment	TBC
Water Treatment Acid		Di Water Machine & pipework	Di Water Machine & pipework	500ltr	Inside tank bunded area	500ltr
Water Treatment Alkali		Di Water Machine & pipework	Di Water Machine & pipework	500ltr	Inside tank bunded area	500ltr

Plant Equipment Storage

Firewall

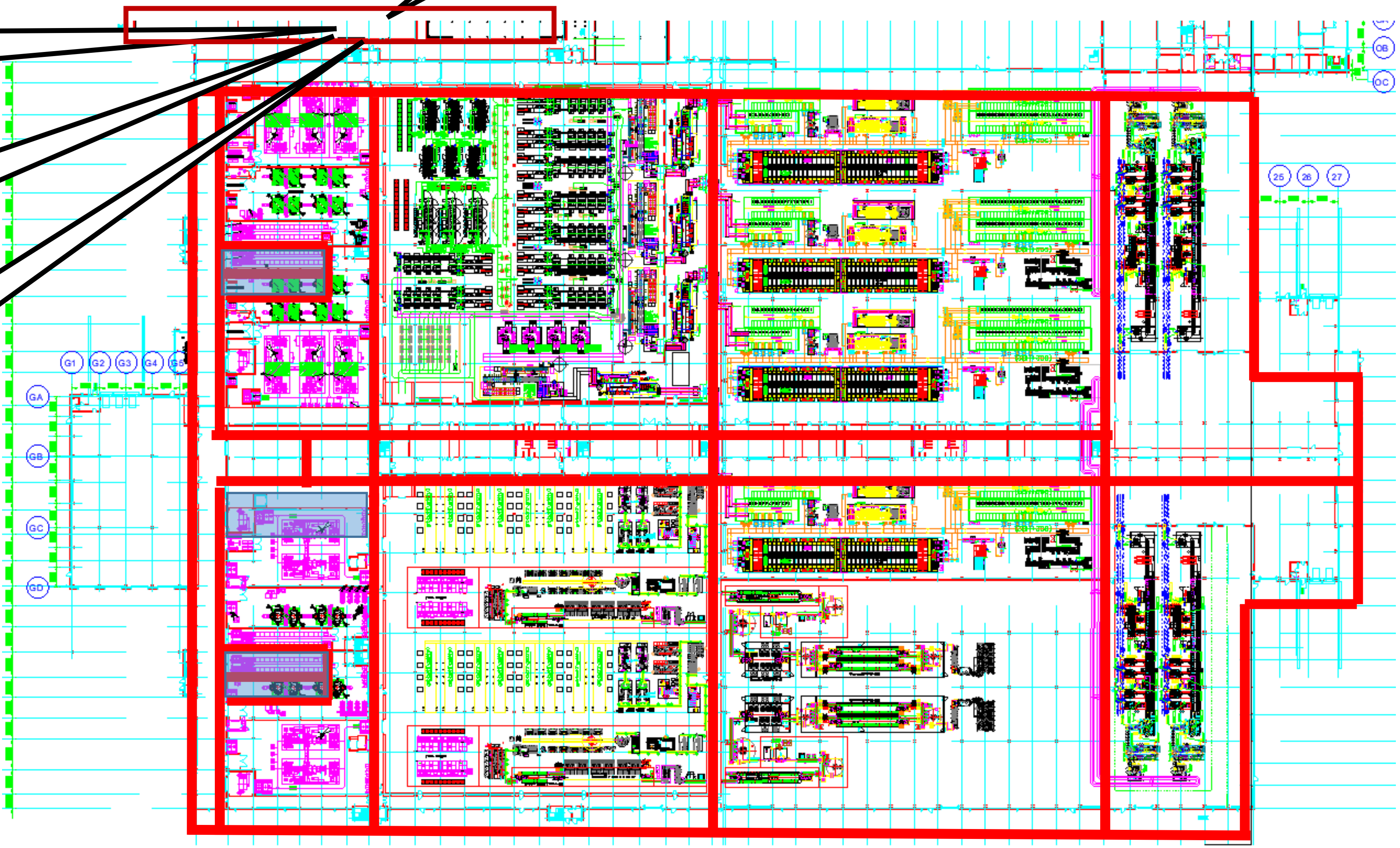
Envision AESC

Ammonia
8 Chillers with 600 Kg = 4800 Kg

Water treatment
Acid
Est 500lts

20% Glycol
Est TBC
all zones and areas in pipe work & chillers

Water treatment
Alkali
Est 500lts



Appendix 5 – Energy Usage Forecast

EAUK Giga 1 Plant - Grid Electricity Consumption Forecast

22/03/2023

			2023			
			Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	0	0.025	0.05	0.06
		Consumption F/Cast	0	377,215	754,430	905,316
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0	0	0	0
		Consumption F/Cast	0	0	0	0
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	0	**377,215**	**754,430**	**905,316**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	0.1	0.11	0.12	0.13
		Consumption F/Cast	1,508,860	1,659,746	1,810,632	1,961,518
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0	0	0	0
		Consumption F/Cast	0	0	0	0
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**1,508,860**	**1,659,746**	**1,810,632**	**1,961,518**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			2			
			Mar	Apr	May	Jun
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	0.15	0.33	0.33	0.39
		Consumption F/Cast	2,263,290	4,979,237	4,979,237	5,884,553
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0	0.025	0.05	0.06
		Consumption F/Cast	0	225,365	450,730	540,876
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**2,263,290**	**5,204,602**	**5,429,967**	**6,425,429**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			024 Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	0.45	0.55	0.56	0.59
		Consumption F/Cast	6,789,869	8,298,729	8,449,614	8,902,272
					PZ1D PT1	
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0.1	0.11	0.12	0.13
		Consumption F/Cast	901,459	991,605	1,081,751	1,171,897
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**7,691,328**	**9,290,334**	**9,531,366**	**10,074,170**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	0.64	0.74	0.88	0.88
		Consumption F/Cast	9,656,702	11,165,562	13,277,966	13,277,966
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0.15	0.2	0.25	0.3
		Consumption F/Cast	1,352,189	1,802,919	2,253,648	2,704,378
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**11,008,891**	**12,968,481**	**15,531,614**	**15,982,344**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			202			
			Mar	Apr	May	Jun
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	0.88	1	1	1
		Consumption F/Cast	13,277,966	15,088,597	15,088,597	15,088,597
				PZ1D SOP		
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0.45	0.55	0.56	0.59
		Consumption F/Cast	4,056,567	4,958,026	5,048,172	5,318,610
					APOLLO PV	
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**17,334,533**	**20,046,624**	**20,136,770**	**20,407,207**
Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**				

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			5			
			Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0.64	0.74	0.88	0.88
		Consumption F/Cast	5,769,340	6,670,799	7,932,842	7,932,842
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**20,857,937**	**21,759,396**	**23,021,439**	**23,021,439**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	0.88	1	1	1
		Consumption F/Cast	7,932,842	9,014,593	9,014,593	9,014,593
				APOLLO SOP		
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**23,021,439**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Mar	Apr	May	Jun
						2
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597

APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593

TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			026			
			Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			20			
			Mar	Apr	May	Jun
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			27			
			Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			20			
			Mar	Apr	May	Jun
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			28 Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			20			
			Mar	Apr	May	Jun
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

29

			Jul	Aug	Sep	Oct
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec	Jan	Feb
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			20			
			Mar	Apr	May	Jun
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Jul	Aug	Sep	Oct
			30			
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	15,088,597	15,088,597	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1	1	1
		Consumption F/Cast	9,014,593	9,014,593	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**

EAUK Giga 1 Plant - Grid Electricity Consumption I

22/03/2023

			Nov	Dec
PZ1D (incl Pack) (62.6%)	0.626	PZ1D % Util / Ramp	1	1
		Consumption F/Cast	15,088,597	15,088,597
APOLLO (37.4%)	0.374	PZ1D % Util / Ramp	1	1
		Consumption F/Cast	9,014,593	9,014,593
TOTAL PZ1D & APOLLO	**kWh**	**Consumption Forecast**	**24,103,191**	**24,103,191**

Giga 1 PZ1D & APOLLO - Max Annual Consumption	**kWh**	**289,238,287**