

Variation to Permit BT2831IA

May 2022

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1. Introduction

This document supplements the application made to vary environmental permit BT2831IA, as granted to and operated by Chemviron Carbon Ltd.

It includes a non-technical summary of the site's process, details of the H1 assessment conducted to support the application, a site plan and elements of the application form that had to be extended beyond the capacity of the form templates.

Proposed changes to site operation are as follows:

- Two horizontal furnaces included in the previous permit variation (EPR/BT2831IA/V005, current version EPR/BT2831IA/V006) are being decommissioned and removed.
- A new vertical furnace is being installed.
- A new air emission abatement system is being installed including a thermal oxidiser.
- Changes to site emission points.
- Relocation of the effluent treatment plant to facilitate the new gas abatement plant.

Abatement of the exhaust gasses from the new equipment will be achieved via at least a two-stage treatment process; i) water based quench system which will remove airborne particulate and ii) exhaust gas scrubbing in a sodium hydroxide liquor before discharge to atmosphere. Also under consideration is the installation of a thermal oxidizer which will deal specifically with carbon monoxide emissions from the facility.

It is also proposed that exhaust gases from existing carbonisers (A1 & A2) and the new furnace will be merged into one pipe-run and run through one scrubber system, then out through a single release point. These two existing release points are included to address previous exceedances for hydrochloric acid fume and reduce unplanned downtime from the process.

The new furnace will be based in the area vacated by the decommissioning of the existing horizontal furnaces. The main abatement plant will be in the area currently occupied by the existing effluent plant.

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A history of previous applications is included for reference and clarity.

Date Duly Made	Reference	Description	Date Determined
27/02/03	BT2831IA	Permit application.	15/08/03
	EPR/BT2831IA/V002	Variation BX1349IK	15/12/03
	EPR/BT2831IA/V003	Variation QP3839SM	22/11/04
	EPR/BT2831IA/V004	Variation HP330XD Covers several issues including facilitating the future use of new furnace technologies. Provision for the purchase and installation of a new carbonization furnace. Resulted in a permitted release points A15 and A16.	05/08/08
19/03/15	EPR/BT2831IA/V005	Application to include new plant items, a new carbonizer <i>and</i> a new activator. Aamendment of emission points to air. New furnace technologies referred to in HP330XD purchased but are slightly different to those described in that application. This variation is to accommodate these minor differences, specifically the change in source emissions for release points A15 and A16, and the relocation of A15 itself. Minor technical variation to allow for changes after installation of two new horizontal furnaces described in the previous variation.	05/05/15
13/01/17	EPR/BT2831IA/V006	Change of registered office address to Bean Road Industrial Estate, Bean Road, Tipton, West Midlands, DY4 9AQ.	18/01/17
Current Application 2021	EPR/BT2831IA/xxx	Current variation submission. Decommissioning and removal of two horizontal furnaces covered by previous variations. Installation of single new vertical furnace. Installation of new air abatement plant. Installation of thermal oxidiser. Installation of new trade effluent treatment plant.	Current Application

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2. Non Technical Summary

Chemviron Carbon Ltd is the European operation of Calgon Carbon Corporation USA. As of 2018 both companies are owned by Kuraray, a company based in Japan. The division of Chemviron based at Rainton Bridge Industrial Estate, Houghton-le-Spring produces Activated Carbon Cloth (ACC).

ACC was developed by the Ministry of Defence at Porton Down UK after identifying the need for an adsorptive material for inclusion into Nuclear, Chemical and Biological (NCB) warfare suits. The development work neared completion in the late 1970s and in subsequent years the license to manufacture was transferred to what was then known as Charcoal Cloth International (now Chemviron).

ACC has an extremely large surface area for adsorption (100-1200m²/g) and, with the cloth being predominantly porous, is highly efficient at removing odour particles from the air. The unique, slit-shaped micro-pore structure has been demonstrated to perform extremely well at low levels of contamination. The finished products are currently used in medical, industrial, domestic and military applications. The flexible nature and unique enhanced wound healing characteristics provide several advantages over existing technologies.

The main processes that are operated on site involve the conversion of viscose rayon fabrics into activated carbon textiles. This requires several distinct processes. The first of these is the treatment of the raw material with a proprietary impregnation solution which lends the rayon several properties necessary for the next two stages: carbonisation and activation.

Both processes involve heating the cloth in an oxygen free environment (using electrically heated, purpose-built furnaces). This thermal decomposition first creates the carbon cloth (the carbonisation stage) then burns out any impurities or contaminants from the micro-pores (the activation stage). Thereafter, the cloth is either sold on to customers, or subjected to further processing (for example secondary impregnation or processing into laminated discs for use in filtration devices).

The site currently operates to the requirements of ISO14001 and is recommended for ongoing certification by SGS Limited.

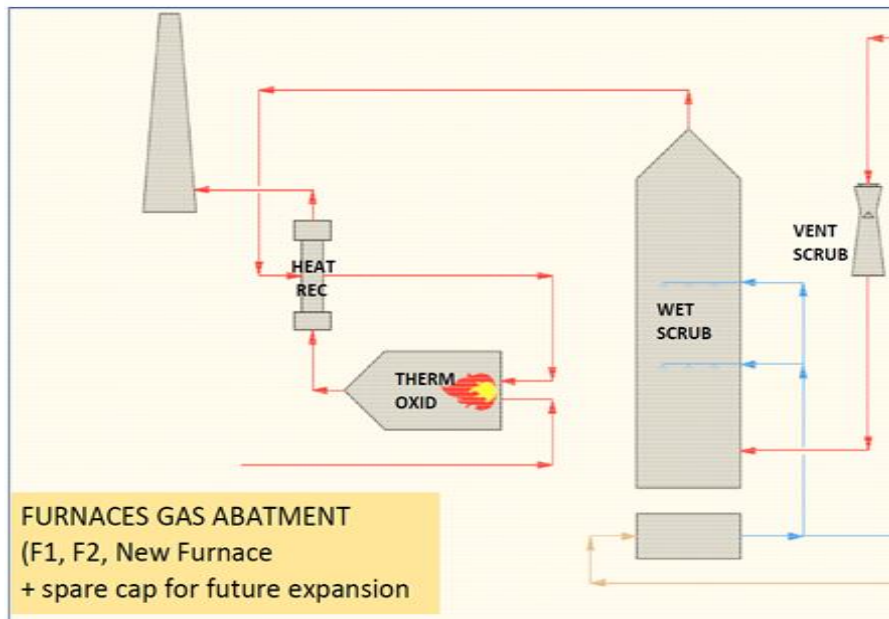
This variation application is made to facilitate the decommissioning and removal of existing horizontal furnaces and installation of a new vertical furnace, abatement equipment and relocated trade effluent plant. Refer to the above table for a summary of permit applications.

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Gas Abatement

The basic principle of the gas abatement system is the same as the existing equipment, which is based on quenching and scrubbing, however, with improved technology.

The current quench system is not effective and leads to frequent blockages of exhaust pipework leading to unplanned downtime and inefficient use of resource. The new quench incorporates two opposing water jets which causes the water to form a curtain across the body of the quench which has been proven to be much more effective at solids removal.



The treated exhaust downstream of the initial quench is then passed through a scrubber system comprising of two of these opposing spray systems based on a sodium hydroxide liquor to neutralize any residual acidic exhaust gas and further remove particulate.

The addition of a thermal oxidizer alongside a heat recovery system to reduce CO emissions is also being considered and the environmental impact and benefits will be assessed during the detailed engineering phase of the project.

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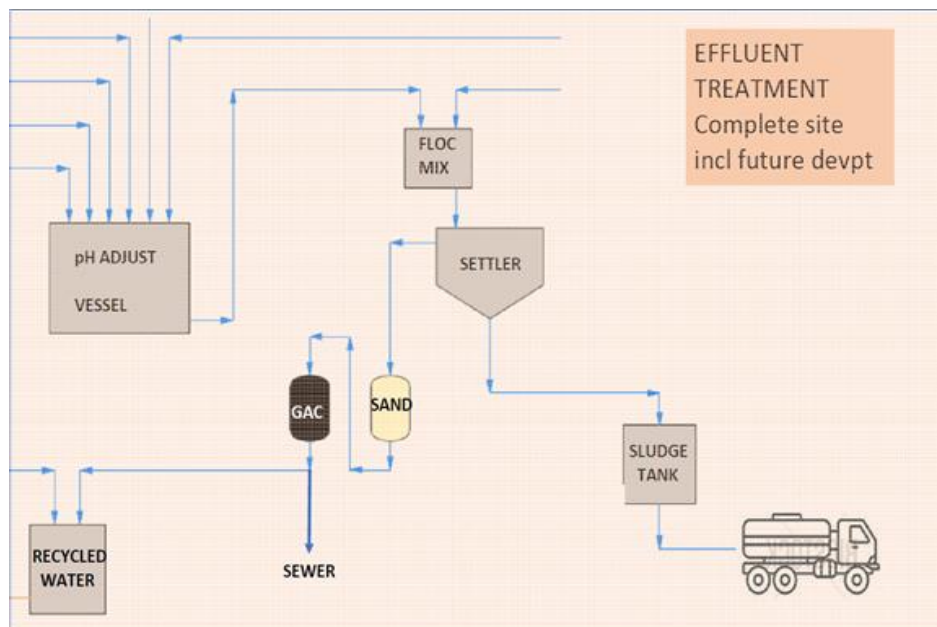
Effluent treatment Plant

The current effluent treatment process deals with the pH correction of the effluent stream from all site activities and precipitation and settlement of zinc hydroxide. A granular activated carbon (GAC) polishing filter completes the treatment process. This treatment plant has been in operation since approximately 2001.

The existing effluent plant includes an auto sampling facility which collects sample of effluent prior to discharge and is testing periodically. In addition, active sampling of the discharge to sewer for residual zinc content is also in place and will continue after the relocation of the effluent plant.

The installation of the new gas abatement plant requires the relocation of the existing effluent treatment plant effluent to create the space required for the new equipment.

The increase in volume would be from the current 120m³ to up to 240m³ per day and is being addressed with an application for a new discharge consent from Northumbrian Water Limited.



It is intended that improved separation of suspended solids through the installation of a larger settlement tank will be achieved. Also being considered is the installation of sand filters to remove the carryover of any solids which may transfer over to the carbon polishing filters. Any particulate carryover leads to filter plugging and reduced GAC lifetime. This has the potential to reduce our waste volume of spent GAC from the process.

Furthermore, the increased footprint of the effluent plant bund will allow the installation of complimentary technology at a future date, for example, laminar settler or polyelectrolyte dosing. It is proposed that efficacy of these systems will be reviewed after the installation of the new plant.

It is also proposed that following installation, we will consider opportunities to recycle water from the effluent treatment plant to distribute to areas such as the quenches or gas scrubbing.

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Utilities

The planned installation of the new furnace, drying equipment and installation of downstream equipment not directly associated with the permitted activity will require an upgrade of the existing electrical transformer based at the site. This work will be performed by NEDL at their facility located adjacent to the site. Utility usage estimates per unit of product will be determined during commissioning, however, initial estimates indicate that these will not be higher than the existing process.

It is mandated by Kuraray that each production facility must reduce their carbon footprint, as such the intention is that, whilst the new furnace will have the facility utilize the use of carbon dioxide for the activation process, the furnace will also have a facility to use a small amount of steam in its place. We see multiple environmental benefits from the use of steam in place of carbon dioxide.

Emission Points

The following table gives an overview of the proposed changes to the release points at the facility. The location of the emissions points are detailed on the site plans located in the Appendix at the end of document.

Release Point	Equipment	Comment
A1	Furnace 1	Remove and merge into new release point
A2	Furnace 2	Remove and merge into new release point
A3	Furnace 3	No change
A4	Furnace 4	No change
A12	Dryer	No change
A13	Dryer	No change
A14	Drying plant	Relocating release point/ equipment
A15	Furnace 5 & 6	Not in use. To be removed.
A16	Furnace 5 & 6	Not in use. To be removed.
New (A0)	Furnace 1, 2 & X	New release point

Following installation and commissioning it is proposed that stack testing is performed to provide the Environment Agency with the full emissions profile from the new release point to demonstrate compliance with any prescribed site limits.

3. Environmental Assessment (H1)

An H1 assessment for the release points A3, A4 and A0 which is the new combined release point, has been completed. The summary of the assessment is included below (figure 2, extracted directly from the H1 software tool). It is important to note the following;

The VOC emissions have been speciated previously, were not all available as options in the H1 software, therefore Benzene has been used to represent all VOCs, as per the H1 guidance.

- All emissions are predicted rates based on the existing furnace technology and results of the monitoring performed on it.
- The emissions for all furnace release points have been assumed to be operating at full capacity

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Figure 2 – H1 Air Assessment Summary Table

Air Summary Tables

(Substances screened as insignificant are not shown)

Option 1 - Base-Case

Release Points

Number	Description	Location	Effective Height	E flux Velocity	Total Flow
			metres	m/s	m3/hr
1	A3	North East corner	12	33	6500
2	A4	North East corner	12	30	5800
3	A0	North East corner	12	15	8588

Long Term Impact

Substance Assessed	Background Contribution	EAL	PC	PEC	% PC of EAL	% PEC of EAL	EQ
	µg/l	µg/m3	µg/m3	µg/m3			
Benzene	0.18	5	1.31294	1.49	26.26	29.86	0.26
Carbon monoxide	220		128.48144	0.00			
Hydrogen chloride			0.13849	0.00			
Particulates (PM 10) (24 hr Mean)	11.28		2.20036	0.00			
Total:							0.26

Short Term Impact

Substance Assessed	Background Contribution	EAL	PC	PEC	% PC of EAL	% PEC of EAL	EQ
	µg/l	µg/m3	µg/m3	µg/m3			
Benzene	0.36	195	27.29514	27.66	14.00	14.18	0.14
Carbon monoxide	440	10000	#####	3,111.04	26.71	31.11	0.27
Hydrogen chloride		750	2.87906	0.00	0.38	0.00	0.00
Particulates (PM 10) (24 hr Mean)	22.56	50	45.74413	68.30	91.49	136.61	0.91
Total:							1.33

Option Summary

Long Term Option Summary

Substance Assessed	Option	% PC of EAL	% PEC of EAL	EQ
Benzene	1	26.26	29.86	0.26

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4. Site Plan

The site plan is in the Appendix of this document and provides detail of the main changes dealt in the application for variation of the permit. In summary these are detailed below.

Item	Comments
Removal of two horizontal furnaces	These furnaces installed and permitted under the current variation did not prove successful. They will be decommissioned and removed from site by an approved waste contractor. These furnaces have two release points associated with them; A15 & A16. The two release points assumed that A16 would be used with no thermal oxidizer and A15 would be used if we required this equipment.
Removal of A1 & A2	These two release points relate directly to furnace 1 and furnace 2. These emission sources are generally rich in heavy organics which cause frequent blockages leading to unplanned downtime. The intention is to merge these two release points into one larger packed column scrubber following quenching.
Inclusion of new vertical furnace (Fx) and abatement equipment	A new vertical furnace based on the existing furnace technology (that is, furnaces 1 – 4) will be installed at the facility.
Installation of new release point	A new quench system to collect heavy organics will be installed on F1, F2 and Fx. The exhaust gas will then be treated to remove acid gasses and in a sodium hydroxide based scrubber. A provision has been made for the installation of a thermal oxidizer which would serve to oxidize any carbon monoxide to carbon dioxide.
Effluent Plant Relocation	The existing effluent plant will be relocated into a new purpose built bunded area capable of holding 110% of the volume of the largest tank. It may be necessary to change some of these tanks as required. A new discharge consent is being sought from Northumbrian Water Limited as we anticipate an increase in trade effluent volume from the facility. The technology will remain the same as the existing treatment process.
Relocation of A14	The drying equipment associated with A14 will be relocated to create the space required for the new furnace. No other changes to this equipment.

No changes to the scope of the installation are planned at this stage.

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5. Emissions (Form C3)

Installation name		Chemviron Carbon Ltd		
Point Source Emissions to Air				
Emission Point and Location	Source	Parameter	Quantity	Unit
A3 (East Side of Factory)	Furnace 3 (Activator 1)	Total Class B VOC	2	kg/hr
		HCl	10	mg/m ³
		Particulates	20	mg/m ³
		Oxides of Nitrogen	-	-
		Carbon Monoxide	-	-
A4 (East Side Corner of Factory)	(Furnace 4) Activator 2	Total Class B VOC	2	kg/hr
		HCl	10	mg/m ³
		Particulates	20	mg/m ³
		Oxides of Nitrogen	-	-
		Carbon Monoxide	-	-
A0 (North East Corner of Factory)	New Furnaces	Total Class B VOC	2	kg/hr
		HCl	10	mg/m ³
		Particulates	20	mg/m ³
		Oxides of Nitrogen	-	-
		Carbon Monoxide	-	-

Monitoring

A1 - A4 are currently monitored annually via sampling points on the stacks, as per the conditions of the existing permit, by an MCERTS accredited contractor. The results of the monitoring are communicated in the annual reporting requirements before January 31st each year.

6. Action Plan

Section	Action	Target Completion Date
-	Following the decommission of the horizontal furnaces	
-	Perform work to determine environmental impact of operating with thermal oxidizer	Q3 2023
-	Confirm emission profile from new combined release point	Within 90 days of commissioning the new furnace
-	Perform energy audit of the new furnace	Within 90 days of commissioning the new furnace

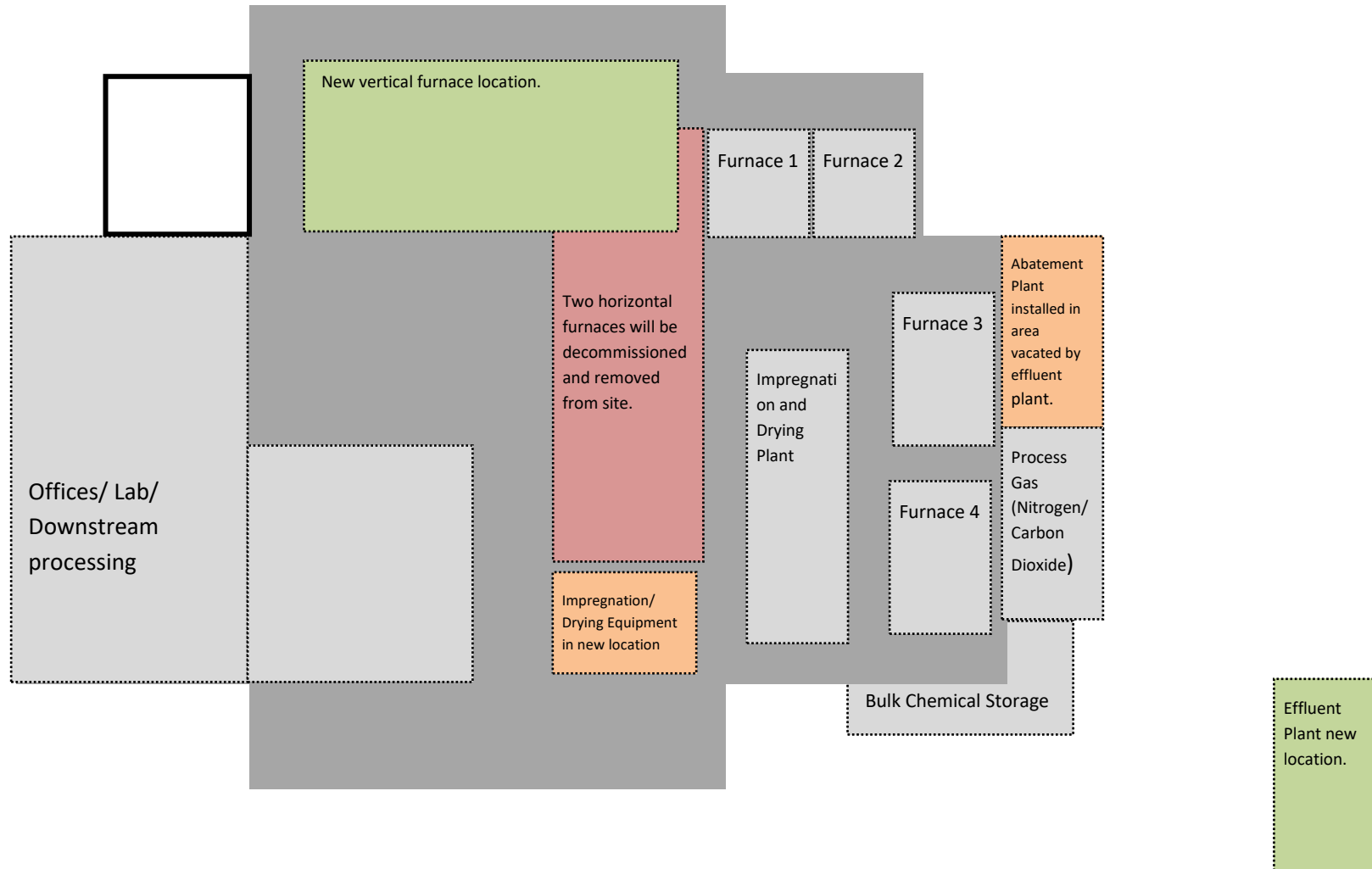
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Appendix

1. Site overview
2. Existing release points
3. Proposed changes to release points

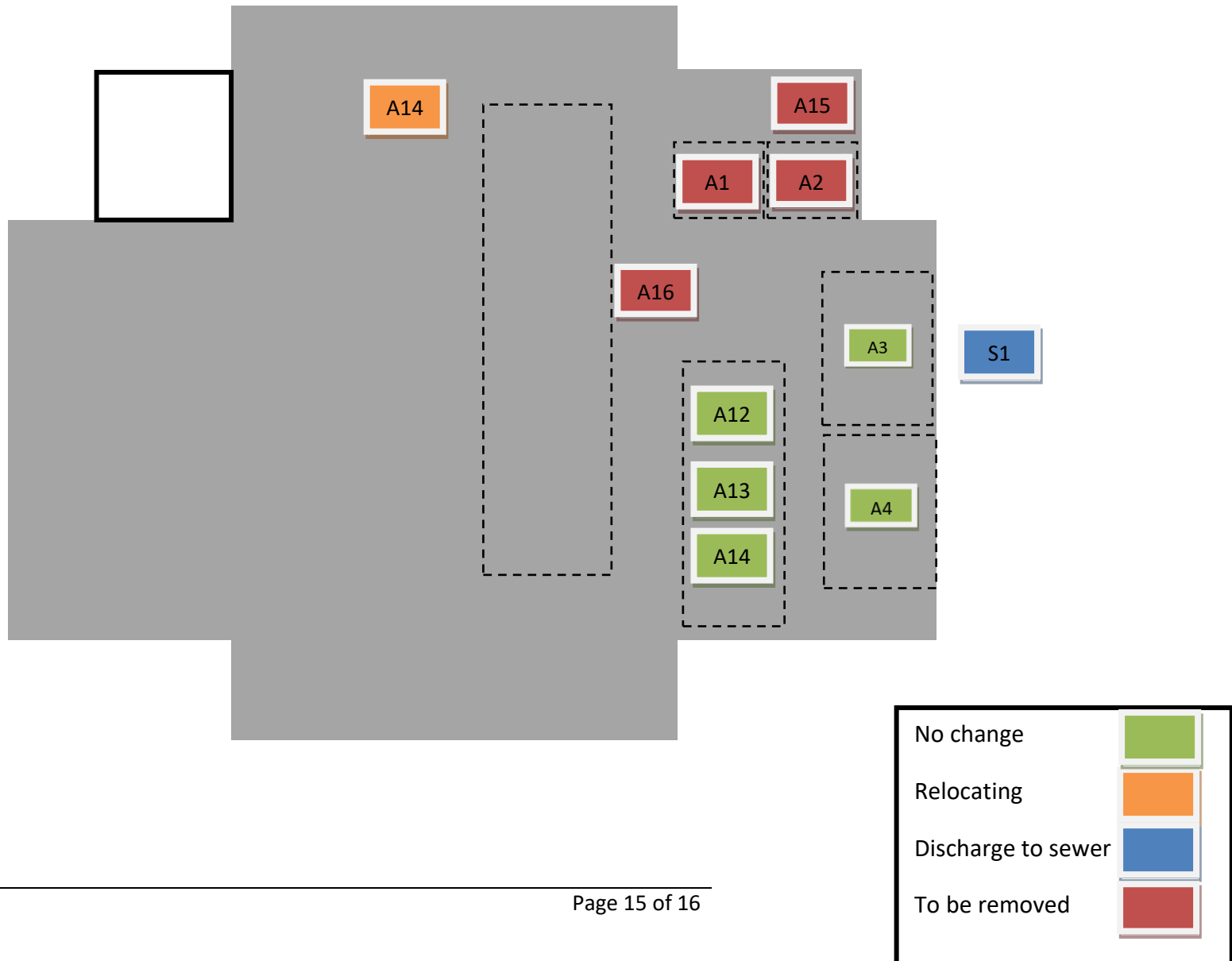
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Figure 1 : Site layout showing existing layout and planned changes



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Figure 2 : Existing release points and proposed changes



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Figure 3 : Future site layout showing new combined release point (A0) for F1, F2 and new vertical furnace

