INCREASED REFUSE DERIVED FUEL ADDITION

PRE TRIAL REPORT

Birkenhead Works EPA (Licence 1126)

Private and Confidential

Contained in this document is a submission to trial increased Refused Derived Fuel addition to the Birkenhead kiln process. The current site operating licence permits the use of this material at up to 15t/h, as a partial replacement for the site's natural gas fuel. Adelaide Brighton Cement requests approval to conduct trials at up to 25t/h, which will increase the displacement of natural gas, beneficially re-use material currently being landfilled and support the national waste hierarchy.

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ENVIRONMENT PROTECTION AUTHORITY

THIS IS THE APPROVED RDF Rate Increase Pre-Trial Report

REFERRED TO IN CONDITION U-703

OF EPA AUTHORISATION NUMBER 1126

DELEGATE David Vaughan DATE 11 January 2019

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GLOSSARY

Term	Definition
g/h	grams per hour
m^3	cubic metres
ng	nanogram. (10^{-9} gram)
Nm^3	gas volume in dry cubic metres at NTP dry basis
ppm	parts per million
t/h	tonnes per hour
Abbreviations	**Definition**
Air EPP	Environment Protection (Air Quality) Policy 2016
CKD	Cement Kiln Dust
ITEQ	International Toxic Equivalent for PCDDs & PCDFs, (NATO 1989 basis)
NATA	National Association Of Testing Authorities, Australia
NEPM	National Environmental Protection Measure
PCDD's	Polychlorinated Dibenzo-p-Dioxins
PCDF's	Polychlorinated Dibenzofurans
RDF	Refuse Derived Fuel – processed fuel produced from waste materials generated by construction, demolition, commercial and industrial sources
RPP	Recovered Products Plan
SA EPA	South Australian Environment Protection Authority
SCADA	Supervisory Control and Data Acquisition (a control system that uses computers, networked data communications and graphical user interfaces for high-level process supervisory management)

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INTRODUCTION

Adelaide Brighton Cement Limited (ABC) is seeking approval from the SA Environment Protection Authority (SA EPA) to conduct further alternative fuel trials. The intent of the trials is to increase the maximum Refused Derived Fuel (RDF) input to the kiln process from the current approval level of 15 tonnes per hour, up to a maximum of 25t/h. The plastic content of the RDF will be maintained at the current licence level of 20%.

For the alternative fuel being proposed, "Refuse Derived Fuel" is a generic name used to describe various waste materials from construction, demolition, commercial and industrial sources. The major combustible components of the RDF are wood, paper, cardboard, textiles, plastic and rubber. Additionally, it contains approximately 15% ash, which is predominantly sand and clay. Historically the input materials have been landfilled but, when processed appropriately, ABC has been able to use the resultant RDF as a partial substitute for natural gas in its clinker-making process. Original trials were conducted in 2003, with ongoing burning commencing in 2004. To date ABC has consumed over 900,000 tonnes of RDF, which is a major contribution to the Government's zero waste philosophy and demonstrates support for the waste hierarchy. Currently the RDF is burnt at the licence limit of 15t/h, this represents in excess of 25% displacement of the kiln's natural gas requirement.

The company has an active consultation program established with the local community near the Birkenhead plant. Presentations have been made to the community liaison group, advising of ABC's intention to proceed with these trials. The company is committed to achieving best practice environmental management, maintaining a Quality Management System certified to ISO 9002 and an Environmental Management System certified to ISO 14001.

This submission has been prepared in accordance with the requirements of schedule W-1 of Birkenhead EPA licence 1126. In particular, it presents information to meet the requirements of section W1.1 "Pre-trial Report". Increasing the addition rate of RDF forms part of an ongoing ABC strategy to trial and implement alternative fuels and raw materials. The effects on the process of firing at an increased RDF rate have been predicted and trials are required to confirm these predictions. If the trials prove successful, ABC will then apply to the SA EPA to change the site licence to allow ongoing usage at a proven higher rate.

1.1 DEMONSTRATION OF BENEFICIAL PURPOSES

Increasing RDF usage will give environmental and raw material conservation benefits as follows:

- Beneficial re-use of a material with no other current viable use. The current maximum addition rate of RDF does not displace South Australia's total generation of construction, demolition, commercial and industrial waste, which means that there is still a significant surplus sent to landfill.

- The proposed additional 10t/h usage of RDF in the Birkenhead kiln will consume approximately a further 70,000 tonnes per annum of waste produced from construction, demolition, commercial and industrial sources. SA landfill will correspondingly reduce by this amount.

- The RDF contains up to 15% ash, which is primarily sand and clay. These are useful raw materials in cement manufacture, so the ash will substitute for a further 12,000 tonnes per annum of mined clay.

- The additional RDF will displace up to a further [redacted]% of the kiln's natural gas usage.

- The site's carbon footprint will reduce, as the fuel component of the RDF comes primarily from renewable sources.

1.2 DEMONSTRATED SUPPORT FOR THE WASTE HIERARCHY

The increase in RDF proposed is an extension of the existing approval for use in the Birkenhead kiln. The RDF has a useful calorific value, and so displaces a portion of the natural gas fuel currently used for cement clinker production.

Therefore, combustion of the RDF is primarily an energy recovery activity. According to the waste hierarchy, this is preferable to disposal. Currently the material is disposed of in landfill and, if ABC was not to use the RDF, this disposal route would continue. In this way waste is diverted from landfill to a more sustainable option. As mentioned above, ABC's RDF program has to date resulted in 900,000 tonnes of material being diverted from landfill.

ABC believes that extending the use of RDF in this manner demonstrates support for the waste hierarchy.

1.3 PURPOSE OF THE TRIAL

In April 2016, ABC installed extra storage and firing equipment on the Birkenhead site. This was done primarily to increase the operating uptime of RDF firing. However, it has also given the capacity to increase the maximum RDF firing rate beyond 15t/h. The mechanical equipment installed now has the capacity to transport up to 25t/h of RDF. Process calculations indicate the kiln process has the capacity to burn this rate of RDF, but trials are required to prove what is actually achievable and sustainable. In discussions with external RDF processing companies it is clear that there is more than enough capacity in the SA waste market to supply this higher volume continuously.

As a result, ABC is seeking approval to carry out a series of trials according to the trial management protocol described in schedule W-1 of the Birkenhead site EPA licence. The trials involve combusting RDF at up to 25t/h in the kiln used for the clinker making process. The RDF will displace natural gas and the ash will be incorporated usefully into the kin product, thus reducing fuel and raw material consumption.

The trials will allow ABC to prove the operation of the process, test the stack emissions and confirm product quality. In particular, the trials will:

- demonstrate the capacity of the receival and firing equipment to handle the increased volumes of RDF. Sufficient time is required to ensure a steady, reliable feed rate

- demonstrate the capacity of the kiln process to burn increased volumes of RDF. Process tuning will be required to ensure appropriate kiln operating parameters are determined, set and proven to be sustainable
- allow for an extended period of operation at a steady RDF addition rate. This ensures that the volatile alkali cycle is fully developed and stable, that appropriate quantities of product can be collected for quality testing and that adequate time is available for the stack testing needed
- assess the capacity of the RDF supplier to maintain a delivery rate of 25t/h. As part of this assessment, ABC will instruct the supplier to maximise the plastic content of the fuel up to the current licence limit of 20%. ABC believes it is appropriate to complete the stack testing at the highest plastic content currently permitted, in order to fully assess the impact of plastic on the process and the emission outcomes

1.4 PHYSICAL AND CHEMICAL SPECIFICATIONS OF THE RDF

In this circumstance, “Refuse Derived Fuel” is a generic name used to describe a processed fuel produced from various waste materials generated by construction, demolition, commercial and industrial sources. The major combustible components of the RDF are wood, paper, cardboard, textiles, plastic and rubber. Additionally, it contains approximately 15% ash, which is predominantly sand and clay. To be suitable as a fuel the materials are blended to ensure consistency and shredded to produce an appropriate particle size. When processed appropriately, ABC has been able to use the material as a partial substitute for natural gas in its clinker-making process.

ABC has an SA EPA approved Recovered Product Plan for the RDF that confirms the composition, supply and use of this material complies with the SA EPA Refuse Derived Fuel Standard, February 2010.

1.4.1 COMPOSITION OF THE RDF – MAJOR INORGANIC COMPOUNDS

Since burning of RDF commenced, ABC has collected and tested daily samples to ensure supplier quality specifications are achieved. As a result, very comprehensive data is available showing how the fuel varies over time. In recent years, significant work has been successfully completed with the RDF supplier to reduce ash and moisture content, thus increasing the combustible fraction. Over the last 12 months the average ash content has been 13%, with a standard deviation of 2%. The ash is predominantly naturally occurring minerals such as sand, clay and limestone. The average chemistry of the ash over the last 12 months is shown below. As no further changes are planned with the fuel preparation equipment, this is predicted to be representative of the future RDF that will be used in the process.

Table 1: RDF Ash Chemistry - Major Components

Major Components	Current Year Average (%)
Silica (SiO_2)	58.2
Alumina (Al_2O_3)	7.5
Iron Oxide (Fe_2O_3)	2.7
Calcium Oxide (CaO)	17.7
Magnesia (MgO)	1.7
Sodium Oxide (Na_2O)	1.3
Potassium Oxide (K_2O)	1.6
Chloride (Cl)	1.3
Sulphuric Anhydride (SO_3)	7.7

1.4.2 COMPOSITION OF THE RDF – OTHER SCHEDULE Y ELEMENTS

The RDF samples collected daily for chemical analysis are combined to produce weekly composites, which are then tested for elements specified in schedule Y-1 of the Birkenhead site licence. Lead has also been included as it is an element of significance in NEPM reporting. Average results in the ash for these elements are shown below.

Table 2: RDF Ash - Minor Elements

Schedule Y-1 Element	Average (ppm)
Arsenic	110
Barium	980
Beryllium	6
Cadmium	20
Chromium	450
Copper	4000
Fluorine	400
Mercury (total)	0.1
Manganese	630
Nickel	80
Lead	1300
Antimony	130
Zinc	1700

1.4.3 OTHER PHYSICAL AND CHEMICAL PROPERTIES

To ensure a suitable calorific value, the product specification includes a maximum moisture content. ABC collects and tests daily samples to ensure this specification is achieved. The average moisture content is quite acceptable at 20%.

To ensure rapid and complete burnout, particle size limits are also defined in the product specification. ABC collects and test samples for percentage retained on specific sieve sizes. If particle size parameters are not achieved, the supplier is instructed to take corrective action.

1.5 RISK ASSESSMENT AND MITIGATION MEASURES

RDF conforming to the same specification has been burned by ABC at its Birkenhead site since 2003. Since 2007, burn rate has been up to 15t/h in line with the current site licence. Under this proposal the burn rate would increase up to a maximum of 25t/h. No negative impact on stack emission levels is expected as a result of the increased RDF burn rate. This expectation is discussed in detail below.

1.5.1 PREDICTED MASS BALANCE AND EMISSIONS

Table 3 below shows the change in the kiln feed composition as a result of the replacement of a portion of the current raw materials with RDF ash. The calculations have been completed assuming a base case RDF addition rate of 15t/h (approximately 2.3t/h of ash into the kiln mix), compared with the trial case which is a maximum 25t/h (approximately 3.8t/h of ash into the kiln mix). Tables 4 and 5 show the actual mass balances for heavy metal inputs and outputs for both cases.

Iron, manganese, magnesium, chlorine and fluorine are included on schedule Y-1 of the site licence. However, as with all previous alternative fuel trials, these elements have not been included in the mass balance, as they are either added purposely to the process, or occur in large percentages in the existing raw material streams. For instance, iron is an essential element for the clinker-making process, and is purposely added for its fluxing capacity. During the trials the stacks will be tested for all schedule Y-1 substances, including any not included in the mass balance.

The only other schedule Y-1 element of concern not included in the mass balance is chromium (6) (Cr^{6+}). Total chromium addition has been included, but this is a summary of all oxidation states. ABC believes it is misleading to calculate input and output levels of Cr^{6+}, as the oxidation state will inevitably be changed by the kiln burning process. During the trial process the stacks will be tested for Cr^{6+}.

Table 3: Predicted Change to Kiln Feed using RDF

	Reporting Exit Stream	Composition of RDF Ash (ppm)	Kiln Feed	
			15t/h RDF Base Case, 2.3t/h ash (ppm)	25t/h RDF Trial Case, 3.8t/h ash (ppm)
Antimony	Clinker	130	1.7	2.3
Barium	Clinker	980	102	106
Chromium	Clinker	450	40	42
Copper	Clinker	4000	49	68
Mercury	Stack	0.1	0.02	0.02
Zinc	Clinker	1700	261	269
Arsenic	Clinker	110	10	11
Beryllium	Clinker	6	0.6	0.7
Cadmium	Clinker	20	0.7	0.8
Nickel	Clinker	80	15	16

Table 4: Mass Balance of Schedule Y-1 Elements: 15t/h Base Case

Element	Kiln Feed (g/h)	Clinker (g/h)	CKD (g/h)	Stack Emission		
				4A (g/h)	4B (g/h)	Coefficient
Antimony	476	463	12	0.04	0.03	0.99993
Barium	28,083	27,524	557	0.81	0.62	0.99997
Chromium	10,926	10,718	207	0.00	0.70	0.99997
Copper	13,519	13,324	193	1.28	0.67	0.99993
Mercury	5	2	0	1.57	1.46	0.60911
Zinc	71,859	68,865	2,982	8.16	4.51	0.99991
Arsenic	2,831	2,747	85	0.07	0.09	0.99997
Beryllium	175	171	3	0.05	0.08	0.99963
Cadmium	200	53	147	0.04	0.01	0.99986
Lead	6,454	3,834	2,619	0.98	0.33	0.99990
Nickel	4,209	4,128	80	0.49	0.53	0.99988

Table 5: Mass Balance of Schedule Y-1 Elements: 25t/h Trial Case

Element	Kiln Feed (g/h)	Clinker (g/h)	CKD (g/h)	Stack Emission		
				4A (g/h)	4B (g/h)	Coefficient
Antimony	643	626	17	0.05	0.04	0.99993
Barium	29,074	28,496	577	0.84	0.64	0.99997
Chromium	11,421	11,204	217	0.00	0.73	0.99997
Copper	18,669	18,400	266	1.76	0.92	0.99993
Mercury	5	2	0	1.58	1.48	0.60911
Zinc	74,093	71,006	3,074	8.42	4.65	0.99991
Arsenic	2,966	2,877	89	0.07	0.10	0.99997
Beryllium	180	176	4	0.06	0.08	0.99963
Cadmium	226	60	166	0.05	0.01	0.99986
Lead	8,133	4,831	3,301	1.24	0.42	0.99990
Nickel	4,282	4,199	82	0.50	0.54	0.99988

The coefficients presented in tables 4 and 5 above define the proportion of the analytes of interest partitioning into the clinker and cement kiln dust (CKD). For instance, 99.993% of the antimony that enters the process is predicted to leave in the clinker and CKD streams. The remaining 0.007% will leave via the two stacks. These partitioning coefficients were calculated using data obtained from samples taken from all process feed and exit streams during previous trials. Sampling was conducted at steady plant operation and testing was done in NATA registered laboratories.

Emission predictions are based on the total elemental concentration in the off gases, whether sourced as a fume or in particulate matter. Schedule Y-1 in some cases references substances from a health perspective, such as copper fume and magnesium oxide fume. However, due to the extremely low level of the elements in the off gases, the total elemental analysis has been referenced as the comparative value to Schedule Y-1. The analysis therefore includes traces of the element as both a fume and in the particulates being emitted, giving a cautious position for predicted emissions.

1.5.2 RESULTS OF PREVIOUS STACK EMISSIONS TESTING

RDF conforming to the same specification has been burned by ABC at its Birkenhead site since 2003. Since 2007, the RDF burn rate has been up to 15t/h in line with the current site licence. Under this approval regime twice yearly stack emission testing has been completed and reported to the SA EPA. All stack emission test reports consistently show that all schedule Y pollutants, with the exception of NOx which is discussed further below, are more than an order of magnitude lower than the SA EPA Environment Protection (Air Quality) Policy 2016 ground level concentration limits. No negative impact on stack emission levels is expected as a result of the proposed increase in use of RDF.

INCREASED REFUSE DERIVED FUEL ADDITION

PRE TRIAL REPORT

Birkenhead Works EPA (Licence 1126)

International industry experience has shown that the emission of analytes of environmental concern from kilns burning alternative fuels is not statistically different to the emissions from kilns burning only fossil fuels. ABC has confirmed this in previous trials reported to the EPA. This observation indicates that the partitioning coefficients used to predict pollutant emission levels are conservative, and the predicted stack concentrations are expected to be higher than will than will occur in reality. Nonetheless, by using these conservative partitioning coefficients, a good indication is given of the maximum emission levels that could occur when using RDF as an alternative fuel.

Impact of Increased RDF Burn Rate – NO_X Emissions

It is quite clear that the use of alternative fuels has reduced NOx emissions from the Birkenhead clinker manufacturing process. Before 2004, the only fuel used was natural gas and the NOx emissions were typically 90% of the SA EPA GLC limit. With the commencement of alternative fuel burning, the NOx emissions immediately dropped. The reduction is a result of a lower flame temperature, which reduces the production of thermal NOx.

Results for recent stack tests show NOx emission levels at an average of 60% of the GLC limit. ABC is very confident that increasing the level of RDF burning will not increase NOx emissions, and may actually lead to a further reduction.

Impact of Increased RDF Burn Rate– Heavy Metal Emissions

Table 3 above shows that there are increases in the input of the various heavy metals of concern. This increase is reflected in the mass balances, summarised by tables 4 and 5, where it can be seen that increases in stack emission levels are predicted to follow. However, in all cases the emission of these heavy metals of interest are extremely low. Results from the last 8 stack tests, completed since October 2013, shows a range of very low results. To indicate the worst-case scenario, the highest results measured in these tests are shown, alongside the averages, in table 6 below. ABC predicts there will not be a measurable change in the emission of these pollutants.

Table 6: Maximum Heavy Metal Results Measured

Pollutant	Results observed in last 8 stack emission tests (as % of GLC limit)	
	Average	Maximum
Antimony	<0.001	0.002
Barium	<0.01	0.1
Chromium (3)	<0.1	0.1
Chromium (6)	<1	1.9
Copper oxide	<1	1.2
Mercury (total)	<1	1.2
Zinc Oxide	<0.1	0.5
Arsenic	<1	0.9
Beryllium	3	9
Cadmium	<1	0.6
Lead	<0.1	0.3
Nickel	1	5

Impact of Increased RDF Burn Rate – Products of Incomplete Combustion

Schedule Y-1 of the site licence specifies limits on the emission of carbon monoxide, benzene and poly-aromatic hydrocarbons. In all cases the emission levels of these pollutants from the kiln process are extremely low. Review of the last 8 stack emission tests shows average:

- Carbon monoxide (1 hour average) results less than 2% of the SA EPA GLC limit
- Benzene (3 minute average) results less than 1% of the GLC limit
- PAH (3 minute average) results less than 0.1% of the GLC limit

Emission of these pollutants is so low because ABC must carefully control its burning conditions to maximise fuel efficiency and ensure product quality. No change in the emission of these schedule Y-1 pollutants is expected by increasing RDF usage.

Impact of Increased RDF Burn Rate – Dioxins and Furans

Although testing for dioxins and furans has not previously been required under schedule Y-1 of the site licence, ABC has checked the levels of these pollutants whenever a change to the process fuel mix is trialled. Under the new site EPA licence, testing for these pollutants is now required. Review of past stack testing results for dioxins and furans shows no relationship between RDF burn rate and the emission of dioxins and furans. In all cases the emission of dioxins and furans has been lower than the SA EPA guideline of 0.1 ng/Nm^3 (ITEQ). Previous results seen are shown in table 7 below.

Plastic content of the RDF will remain at a maximum of 20%. Therefore the addition rate of plastic components will increase from 3t/h to 5t/h. However, based on previous results, ABC predicts there will be no change in the emission levels of dioxins and furans as a result of increasing RDF burn rate.

Table 7: Historical Dioxin and Furan Emission Levels

Case	RDF Burn Rate (t/h)	Test Date	4A STACK (ng/Nm^3 ITEQ)	4B STACK (ng/Nm^3 ITEQ)	SA EPA Guideline (ng/Nm^3 ITEQ)
100% Natural Gas	0	30/07/1999	0.04	0.07	0.1
		24/02/2000	0.03	0.05	
		28/08/2001	0.02	0.01	
RDF trial – 5 tonnes/hour+ 10% plastics	5	14/02/2003	0.02	0.02	0.1

RDF trial – 10 tonnes/hour + 10% plastics	10	27/02/2003	0.05	0.05	0.1
RDF trial 15 tonnes/hour + 10% plastics	15	26/05/2005	0.03	0.02	0.1
RDF trial 15 tonnes/hour+ 20% plastics	15	23/10/2014	0.01	0.01	0.1

1.5.3 ON-SITE STORAGE, HANDLING AND FEED

RDF is transported from the supplier's site at Wingfield to ABC's Birkenhead site in fully enclosed walking floor trailers. No change to this operation will occur, except that truck movements will increase from 18 per day to 30 per day.

Unloading of the delivery trailers occurs in a fully-enclosed, dedicated drive-through facility. This facility is equipped with dedusting equipment, and operation is electrically linked with the access doors. In this way unloading cannot occur unless the doors are closed and the dedusting equipment is operating. There will be no change to this operation as a result of the trial. In particular, there will be no change to fire risk or the risk of fugitive dust generation.

From the unloading station the RDF is transported by fully-enclosed screw conveyors and an elevator to one of two fully enclosed storage bunkers. As on-site storage capacity is defined by the size of these bunkers, there will be no change to on-site storage volume or storage method.

From the two storage bunkers, RDF will be fed to the kiln process. RDF will be extracted from the two bunkers at similar rates, around 12 to 13t/h, and then transported pneumatically via two pipelines into the lower section of the calciner. The feed rates from each RDF bunker will be controlled automatically and held constant. Small automatic adjustments will be made to the burn rate of the remaining natural gas, to ensure the calciner burning temperature is kept at the required setpoint. This process is exactly the same as the current operation, except that the RDF extraction and feed rates are higher. Assessment of the sustainable capacity of this firing equipment is a major part of the trial.

The ash content of the RDF reduces on-site clay usage by 12,000 tonnes per annum. As this is only 10% of the total site clay usage, no change to on-site clay storage is expected.

1.5.4 RISK MITIGATION DURING TRIALS

From the above discussion, ABC does not expect that the increased RDF addition will have any adverse impact on stack emission. However, as an extra precaution the process will be monitored and actions taken during the trials as follows:

INCREASED REFUSE DERIVED FUEL ADDITION

PRE TRIAL REPORT

Birkenhead Works EPA (Licence 1126)

1. Combustion Conditions

Currently, at two positions downstream of the RDF feed point into the calciner, the process is continuously measured for carbon monoxide as a measure of combustion efficiency. These measurements provide an ongoing indication to the plant operators that combustion is proceeding satisfactorily. Ensuring this has economic, safety, environmental and quality implications for ABC. There are automatic actions and alarms built into the burner management system if carbon monoxide rises to unacceptable levels due to some process upset or mechanical failure.

During the proposed trials, the levels of carbon monoxide will be monitored as a surrogate variable indicating RDF burn efficiency. If the levels rise unacceptably, it will be clear that there is a combustion problem. If this occurs, either the RDF feed rate will be reduced to a previously determined acceptable level, or the trial will be terminated while the issue is assessed. This preventive action will be taken before carbon monoxide levels reach the existing burner management system action limits.

2. Emission Levels

Both exhaust stacks are equipped with continuous monitoring for particulate emissions. As discussed previously, ABC does not expect that increasing RDF burn rate will have any impact on emission levels. However, if there is an unanticipated effect this will be seen, either through the stack monitor or visually in the field. If particulate emission rises above normal operating levels, either RDF burn rate will be reduced or the trial terminated. Emission levels will not be allowed to rise to reportable levels, instead action will be taken before emission levels become serious.

3. Trial Control Strategy

To minimise the impact on the process, the RDF burn rate will be gradually increased from the current approved level of 15t/h, rather than introducing a drastic change. In this way it can be proven that the process can operate steadily and sustainably at any particular new feed rate. This method will allow the full process to be assessed and eventual bottlenecks identified, before reaching a point where the process becomes unstable. As a result, this will ensure satisfactory combustion and prevention of any environmental harm through the trial process.

1.6 TESTS TO BE UNDERTAKEN DURING THE TRIAL

When sustainable operating conditions have been determined, stack testing will be completed to assess the level of all pollutants listed in schedule Y-1 of the Birkenhead site licence. This testing will be performed in duplicate in line with EPA testing requirements “Emissions Testing Methodology for Air Pollution, version 2, August 2012”.

In addition, three separate stack tests will be completed during the trial to determine the levels of dioxins and furans.

As NOx levels are expected to improve, no extra testing for this pollutant is warranted.

1.7 RECORDS TO BE KEPT AND RETENTION DURATION

All plant operating data is automatically retained in the Citect SCADA historian system for five years. This system retains several thousand operating parameters, and these include critical data relating to RDF operation such as, but by no means limited to, operating times, temperatures, pressures, gas flows and feed rates. It also includes records of combustion data such as levels of oxygen, carbon monoxide and methane. Logistics information, trial reports and laboratory results are also retained as described in table 8 below.

Table 8: Record Type and Retention Duration

Record Type	Retention Duration and Commentary
Plant Operating Data	Citect SCADA Historian automatically retains operating data for 5 years. This includes all plant operating data, which is time-stamped for ease of reference. This data includes all operating parameters relating to both kiln performance and supply and combustion of RDF
Logistics Information	All information relating to RDF delivered volume and dates of delivery, together with supplier and transporter details, is retained for 10 years
Trial Reports	All documentation relating to this proposal, including stack emission reports and EPA communications, is retained in the company electronic database for no less than 10 years
Material Analyses	All quality data relating to raw material inputs and kiln outputs, including RDF quality, is retained in the ABC laboratory electronic database (LIMS) for no less than 10 years

1.8 PROPOSED DATES FOR TRIAL COMMENCEMENT AND COMPLETION

It is anticipated that the trials would commence within one month of receiving EPA approval. Based on previous experience it is expected that a number of short-term, 1 to 3 day trials would be undertaken to assess maximum sustainable burn rate and stabilise the process.

An addition rate of up to 25t/h of RDF is proposed for the trials. However, initial feed rates will be lower than this while the addition system is tuned, kiln operation is stabilised and impact on quality is assessed. It is possible that the process cannot sustain a 25t/h burn rate and a lower maximum sustainable burn rate will be necessary. Once this maximum sustainable burn rate has been determined, the kiln will be operated for up to 5 days to stabilise burning conditions and the volatile alkali cycle within the process. Once stability has been achieved, stack testing will be completed.

It is anticipated that all trial work would be completed according to the predicted timeline below. The only delays anticipated would be if:

- the trial period coincides with the planned annual kiln shutdown in January 2019, or
- a major equipment modification is required to achieve a sustained increase in RDF burn rate

An outline of the predicted timeline is presented in table 9 below:

Table 9: Predicted Trials and Timeline

Trials	Duration and Commentary
Short-term equipment proving trials	Up to three trials, each lasting for two days, are proposed to assess machinery capacity. The time between each trial is anticipated to be up to one month, as minor modifications to equipment may be required to ensure operation at a higher RDF firing rate **Maximum time elapsed: up to 3 months from first trial**
Long-term kiln tuning trials	Up to three trials, each of up to five days duration, are proposed to tune addition of RDF at the chosen sustainable rate and assess the impact on kiln performance. It is anticipated that this stage could be completed in one month, as required modifications will only be operational. During these trials, all quality assessment samples will be collected. **Maximum time elapsed: up to 4 months from first trial**
Stack test trial	With operating parameters now confirmed, a further three day trial would be arranged and conducted, during which all stack testing would be completed **Maximum time elapsed: up to 5 months from first trial**
Stack test results	Delivery of stack test results and the accompanying ground level concentration assessment is anticipated to take up to two months **Maximum time elapsed: up to 7 months from first trial**
Submission of post-trial report to SA EPA	Upon receipt of stack results, preparation and submission of the results of the trial can proceed, according to the requirements of EPA licence Schedule W-1 **Maximum time elapsed: up to 8 months from first trial**