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31 January 2017

Mr Gerard Hocking
Senior Marine Adviser
Environment Protection Authority
Regulation and Compliance Division
GPO Box 2607
Adelaide SA 5001

Dear Gerard

**January 2017 quarterly update
Adelaide Brighton Cement Ltd (ABC) Environmental Improvement Program (EIP):
01 January 2016 – 30 October 2017**

I refer to Adelaide Brighton Cement's Environmental Improvement Program. As required, I provide the January 2017 quarterly update report (attached).

Yours sincerely

Tu Bui

Operations Manager SA

Adelaide Brighton Cement Ltd (ABC) Environmental Improvement Program (EIP) 1 January 2016 – 30 October 2017
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Compliance Action	Description	Actions and outcomes
1	<p><i>By 30 September 2016, ABC will complete a 'Stack Emission Improvement Study' of all its 4A and 4B Stack emission control equipment - to be undertaken by FLS (global cement industry technical experts). The study will include a desk top study, industry benchmarking assessment of the best available emissions reduction techniques and a review of the current process both during operational and shutdown phases (planned shutdown March 2016).</i></p> <p><i>A final report which will table options to reduce stack emissions will be submitted to the EPA for assessment. The options contained in the report will include the following:</i></p> <p><i>a) The expected reduction in particulate emissions of each option;</i></p> <p><i>b) The annualised total mass emissions and short term variability projected using the different options; and</i></p> <p><i>c) The projected reduction in emissions under both stable and unstable operations for each option</i></p>	<p>On 30 September 2016, ABC completed a 'Stack Emission Improvement Study' of its 4A and 4B stack emission control equipment which was undertaken by FLSmidth (global cement industry technical experts).</p> <p>The study included a desk top study, industry benchmarking assessment of the best available emissions reduction techniques and a review of the current process both during operational and shutdown phases.</p> <p>A final report with options to reduce stack emissions was submitted to the EPA for assessment.</p> <p>The final report includes:</p> <ul style="list-style-type: none"> • The expected reduction in particulate emissions of each option; • The annualised total mass emissions and short term variability projected using the different options; and • The projected site reduction in emissions under both stable and unstable operations for each option <p>In mid-November 2016 a detailed presentation was given by ABC staff to the EPA on the methodology used for the selected options.</p> <p>On the 16th December 2016, at the request of the EPA (letter dated 25/11/16), ABC provided further details on the selected options and the practical benefits submitted in the original report and was followed up at a meeting at the EPA office on the 20th December 2016 in which ABC presented the additional information as requested by EPA.</p>
2	<p><i>By 31st December 2016, ABC will submit a revised EIP to the EPA that will include an action plan for implementing the agreed emission reduction actions approved by the EPA as detailed in the FLS study report. The revised EIP will include timeframes for completion of the works to be undertaken. Actions to be implemented will need to be reasonable and practical whilst ensuring the best possible outcomes for the adjacent community.</i></p>	<p>On the 21st December 2016, a meeting was held with the ABC Community Liaison Group and two EPA representatives (Site Licence Coordinator and Team Leader - Industry Branch) to communicate with the CLG members the Stack Emission Improvement Study (Compliance action 1) outcomes:</p> <ul style="list-style-type: none"> • Identified options to reduce emissions • Options identified by study that have been implemented (EIP compliance actions, 3, 4 & 6) • Options examined and not feasible • Methodology for selection of options for implementation • Details on selected options for implementation • Plant trials conducted to help validate the selected options <p>ABC subsequently submitted a revised action plan to the EPA on the 28 December 2016 that included the timeframes for completion of the works to be undertaken for the selected emissions reduction</p>

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		<p>projects.</p> <p>The revised action plan projects were approved by EPA and an updated EIP “Document number 1126 EIP version 2, dated 28 December was issued in late January 2017.</p> <p>The revised compliance actions include:</p> <p><u>Compliance Action 2A</u></p> <p>By 31 October 2017, ABC will have completed an upgrade of the 4A Bypass Gas Conditioning Tower (GCT) Spray System which is expected to lower particle emissions from 4A tower during both stable and unstable operation.</p> <p>Work involved includes:</p> <ul style="list-style-type: none"> • upgrading from single (water only) to dual phase (air/water) sprays; & • installing thermodynamic feed forward controls. <p>These improvements will facilitate conditions for smaller droplets resulting in greater surface area and faster more efficient evaporation and is expected to result in lower particle emissions from the 4A tower.</p> <p><u>Compliance Action 2B</u></p> <p>By 31 October 2017, ABC will have completed an upgrade of the 4A (GCT) Spray System which is also expected to lower particle emissions from 4A tower during both stable and unstable operation.</p> <p>The work and the improvements will be the same as that in compliance action 2A above.</p> <p><u>Actions completed for Compliance action 2A & 2B</u></p> <p>External Computational Fluid Dynamics (CFD) modelling has been completed on the 4A Bypass and the 4A conditioning towers. CFD modelling accurately determines the gas flows and heat transfers through the towers and subsequently ensures the correct number of sprays and placement throughout the tower are achieved. This in effect will provide for the most effective conditioning of the gases in the towers. Subsequently, the infrastructure required for the new sprays system can now occur during the planned March 2017 annual shutdown, allowing for the longer lead items to be installed and commissioned as they arrive.</p>

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		<p><u>Compliance Action 2C</u></p> <p>By 31 October 2017, ABC will have completed an upgrade of the 4A Clinker Cooler Baghouse Controller and Particulate Detection System which is expected to lower particle emissions from 4A tower.</p> <p>Work involved includes:</p> <ul style="list-style-type: none"> • upgrading the Differential Pressure Controller (dP); & • installing Particle Sensor to detect broken bags. <p>These improvements will enable broken bags to be immediately detected and isolated and allow pulsing to be adjusted to optimise cleaning and minimise wear on bags and is expected to lower particle emissions from the 4A tower.</p>
4	<p><i>By 3 March 2016, ABC will have completed a trial of new filter bag technology in the Cooler Bag filtering process. The intent is to optimise bag life and Cooler Bag performance associated with the 4A Stack gas stream by a noticeable percentage. An analysis report detailing the effectiveness of the trial actions (bag life performance) will be provided to the EPA for assessment.</i></p>	<p>During the March 2016 shutdown, a new type of filter bag was installed as a trial in the Cooler Bag house of Kiln 4 (280 bags were trialled in one of the six cells/chambers). The new bag type was chosen based on the findings of a 12-month investigation. The new bag features a heavier weave and a reinforced cuff that is predicted to greatly increase the lifespan of the bags and therefore the performance of the bag filter in reducing emissions.</p> <p>Assessment of the performance of the new bag type undertaken during recent unscheduled plant maintenance shutdowns have indicated significant improved performance as predicted. The wear rate has been far less than that of the previous type of bag used. As a result, a further 280 of the new bag type were installed in another chamber during quarter 3 2016 during a plant outage. There are plans in place to replace additional bags in other chambers during the annual plant shutdown in March 2017.</p>
6	<p><i>By 30 April 2016, Adelaide Brighton Cement Ltd will have optimised the performance of its Electrostatic Precipitators(ESP's). This action will reduce stack particulate emissions across variable plant operating conditions</i></p>	<p>Further to the actions undertaken and reported for quarter one in 2016, improvements made to the 4A Bypass gas conditioning system have had a marked effect on improving the performance of the Bypass Electrostatic Precipitator which forms part of the 4A stack stream. Subsequently, emission peaks for the 4A stream have sustained an average baseline emission reduction which has been maintained (Reference: Birkenhead Stack Monitoring Report – Quarter 3 2016).</p>
8 and 12	<p><i>By 30 June 2016, ABC will have a dedicated water truck/cart and will have commenced applying dust suppressant/sealing agents</i></p>	<p>Since January 2016 a dedicated water cart has been used to apply dust suppressant and sealing agents to all external raw material stockpiles and unsealed access areas whenever they are being worked or regularly used.</p>

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	<p><i>(typically green) in real-time, to all external raw material stockpiles and unsealed access areas whenever they are being worked or used. This action item will assist in reducing fugitive particulate emissions from these sources.</i></p> <p><i>Commencing 1 January 2016 Adelaide Brighton Cement Ltd will apply, using a dedicated water truck/cart, a road stabilisation agent to all unsealed surfaces around the site, as required, to ensure fugitive dust is minimised from these areas (this may be more frequently undertaken in warm and/or windy conditions).</i></p>	
9	<p><i>Commencing on 1 January 2016, ABC will have a preventative maintenance and cladding replacement program for the main Clinker Storage Gantry. Actions outlined in the maintenance and replacement program will be carried out continuously throughout this EIP. This action item will assist in reducing fugitive particulate emissions from this source.</i></p>	<p>A quarterly preventative maintenance program has been implemented for this Gantry building to ensure its cladding is maintained in a satisfactory condition. By design, this Gantry building is maintained under negative pressure by a large dust collector to ensure minimal escape of fugitive dust. Thus, adequate sealing of this building is vital to the effective operation of this dust collector.</p> <p>In quarter one of 2016, the sealing of the eaves and cladding on western side (Victoria Road) of the Gantry using a crane was completed after an inspection.</p> <p>In the second quarter of 2016 an inspection identified an opening on the north west side on the Gantry, directly adjacent the eaves and was subsequently sealed.</p> <p>In the third quarter of 2016 an inspection identified an opening in the eve on the east side of Gantry and was subsequently sealed.</p> <p>Inspections during Oct – Dec 2016 did not identify any issues with Gantry cladding.</p>
13	<p><i>From 31 January 2016, and to be continued throughout this EIP, ABC, will undertake a Noise Impact Mapping/ Modelling Program. The modelling program will be undertaken by</i></p>	<p>A comprehensive noise mapping and model was developed and submitted to EPA (ref: 50B-15-0069-TRP-472941-3). The model was based on sound pressure measurements and surveys of all primary noise emitting sources (mechanical plant and equipment) on-site. Noise prediction was carried out using the validated SoundPlan acoustic modelling software and assessed against the EPA 2007 Noise Policy.</p>

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	<p><i>acoustic consultants employed by ABC, who will manage and complete the modelling program in addition to the current noise monitoring program that has been in progress for the last four years. The Program will continue to inform noise abatement actions to be undertaken on site.</i></p> <p><i>Regular reports from monitoring and modelling undertaken will be provided to the EPA for assessment within one calendar month of any such report being received by ABC from the acoustic consultants. Noise abatement actions to be implemented will be agreed by the EPA, be reasonable and practical and ensure the best possible outcomes for the adjacent community.</i></p>	<p>The model is based on both worst case scenario meteorological conditions (5 m/s wind in the direction of the adjacent community) and under neutral (no wind) conditions to ensure maximum community impacts are captured. The model was calibrated/validated against actual readings taken late at night to ensure minimal traffic impacts on the measurements at a series of noise sensitive residential locations.</p> <p>The model can be used both as a predictive tool and will be updated as noise abatement projects are implemented.</p> <p>In the third quarter of 2016, a comprehensive night time noise study was conducted and completed by Vipac Engineering (ref: 50B-16-0068-DPR-799861-3) to identify the next phase of noise abatement projects for the site. The report was submitted to the EPA and subsequently approved.</p> <p>Key findings and recommendations include:</p> <ul style="list-style-type: none"> • Noise abatement of two dust collector fans on level 3 on the west side of the plant, adjacent Victoria Road • Refurbishment and harmonisation of the sites three largest plant fans is scheduled for the March 2017 major shutdown. <p>A summary of all noise report findings was sent to Community Liaison Group members prior to the 26 September 2016 quarterly meeting and discussed at the meeting.</p> <p>In the fourth quarter of 2016 the design and specifications of two new noise abatement silencers to fit the two fans on level 3 on the west side of the plant were completed. An order was subsequently placed to fabricate the silencers and upon arrival to site they will be fitted onto the fans.</p>
<p>15</p>	<p><i>By 31 October 2017, ABC will replace all required personal access (PA) doors site wide. PA doors are to be of a self-closing and self-sealing design. This action will assist in reducing fugitive particulate emissions from buildings and reduce noise in dust sensitive areas containing fire alarm sensors.</i></p>	<p>A comprehensive inspection, maintenance and replacement program is in place. In quarter 1 of 2016, 23 new doors were replaced. The new doors are self-closing and sealing, contain a rubber flange at bottom for high wear areas as required (prevents damage when opening and closing), prevent alarms going off from load centres (dust ingress) and fugitive dust escaping buildings. Additionally, all major site doors are locked and controlled under a Shift Supervisor's master key.</p> <p>Existing doors are regularly inspected and maintained by site personnel.</p>

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<p>16</p>	<p><i>By 30 November 2016, ABC will ensure a vibration study/impact assessment is undertaken in the adjacent community to determine affected areas and any associated impacts. The outcome of the study will be an action plan to determine vibration impacts associated with plant operations. The action plan will be submitted to the EPA for assessment by 31 December 2016.</i></p>	<p>Leading independent external consultant firm, Resonate, has been engaged to initiate and manage this program. During the March 2016 plant shutdown and post shutdown, three ground vibration monitors were placed along the ABC boundary on Victoria Road and in the plant to determine activities/vibration with plant off and on.</p> <p>The report identified “vibrations from traffic on nearby roads and other activities are generally higher than the vibrations likely attributable to ABC. Vibration levels of these transient events, such as traffic etc. are likely to have a higher impact when they occur than the baseline vibration levels which are attributable to ABC plant.”. However further residential measurements were recommended. The report was submitted to the EPA for consideration (ref: A15623RP3).</p> <p>The second phase of the project included an independent community survey of the adjacent neighbourhood and technical assessment to identify the subsequent residential properties to be tested for ground vibrations. The Community Liaison Group resident members, in conjunction with ABC and the consultants, developed the scope of the survey questionnaires and subsequent information that was provided to local residents. The report was submitted to the EPA and the Community Liaison Group (ref: A15623RP4) for assessment.</p> <p>The third and final phase of the study was to undertake internal vibration monitoring of six cross sectional residences directly adjacent the main plant. The survey and residential locations tested were conducted and chosen by the independent consultants to ensure full confidentiality and impartiality.</p> <p>The final report (ref: A15623RP5) was submitted to the EPA for assessment on the 30th November 2016. The report identified that vibration levels at the selected residences was significantly less than the “not uncomfortable” perception level based the Australian and International standard 2631.2 2014 and that the short term higher vibration measured were caused due to localised activity adjacent the vibration monitors or due to vehicle movements on the adjacent Victoria Road.</p> <p>On the 5th December 2016 independent consultants, Resonate Acoustics, presented the findings of the study at the ABC Community Liaison Group open meeting.</p> <p>Residents on whose properties the vibration testing has been conducted as part of the vibration study have also been provided with a copy of the consultant’s report.</p>

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		<p>In view of the final report findings and the community consultation that has been undertaken the requirement to prepare an action plan to determine vibration impacts associated with plant operations was deemed as not warranted at this point in time. This was communicated to the EPA in a letter dated 23rd December 2016.</p> <p>In a letter dated 10 January 2017, the EPA accepted that the report findings have achieved compliance with the EIP requirements and notes that there is no further work required on this action.</p> <p>A final action will include a communications letter to all residents who participated in the survey.</p>
<p>17</p>	<p><i>From 31 January 2016 and continuing through to 31 October 2017 ABC, will implement and undertake a site greening/earth-care program. Plantings of native trees and shrubs will be undertaken in the following areas:</i></p> <ul style="list-style-type: none"> • <i>Southern area of the site adjacent to Cement Mill 1 Gantry and on the river side of railway line;</i> • <i>Schroder Park extension area (most southern end of plant);</i> • <i>Victoria Road, adjacent to the Limestone Reclaimer Shed; and</i> • <i>Along the western boundary of the main limestone stockpile at north end of site.</i> 	<p>In quarter two of 2016, greening/earth-care work has commenced at the southern end of Victoria Road, adjacent to the reclaimer shed. The works have included:</p> <ul style="list-style-type: none"> • Removal and mulching of approximately 15 large dead or diseased trees, including stumps; and • Planting/irrigating of approximately 450 trees and scrubs, including about 80 mature trees. <p>In quarter three of 2016, greening/earth-care work was implemented along the western boundary of the main limestone stockpile area, along Elder road.</p> <p>The works have included:</p> <ul style="list-style-type: none"> • Planting of approximately 50 mature trees and 100 large scrubs; • The installation of approximately 150 metres of green shade cloth on the fencing – wind break/fugitive dust suppressant; and • Repair of fencing along Elder Road
<p>18</p>	<p><i>By 28 February 2016, ABC will implement a particle deposition tray program in the adjacent community to analyse the nature and extent of the deposition of particulate material Potentially/that may originate originating from the plant.</i></p>	<p>A cross functional ABC team was assigned to the project. Commencing in February 2016, 14 deposition trays were placed in the following locations:</p> <ul style="list-style-type: none"> • 9 X trays in the adjacent community; • 3 X trays on-site along the ABC boundary on Victoria Road (EPA trial monitors); and • 2 X neutrals (Sellicks Hill and Largs North) <p>The positioning of the trays was based on community feedback, wind direction assessments and air modelling/assessments from our two community ambient air monitors.</p>

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	<p><i>By 31 March 2017, ABC will provide a detailed report to the EPA outlining the findings of the deposition tray program.</i></p>	<p>At the March 2016 Community Liaison Group Meeting, Tony Bazeley, a long term Community Liaison Group member, joined the program. With Tony's assistance and contacts, the University of Adelaide Innovation Centre, CSIRO and Lindsay Hope (see below) were all commissioned to be part of the program.</p> <p>Note: The University of Adelaide Innovation Centre and CSIRO will be undertaking advanced scanning electron microscopy, light diffraction and x-ray diffraction analysis of the deposition material.</p> <p>In May 2016, Lindsay Hope of SA Environment Pollution Monitoring Services was engaged to independently manage, update and coordinate the entire program. Lindsay has over 40 years' experience in air pollution monitoring/quality with 30 of those years with the EPA. His management will provide independence to the program. Lindsay, in consultation with ABC and Tony Bazeley have agreed on an enhanced program including:</p> <ul style="list-style-type: none"> • Retention of the original 9 based community locations and the Largs North neutral. • 9 X monthly fallout trays to measure fallout rate (mg/day) – customised tray with elevated sides and grids to ensure material retained in trays. • 6 X day sampling events when wind is in direction of residential locations and when dry weather is forecast to ensure no hydration of any cementitious material (all 9 locations). • Customised larger trays for day sampling to ensure enough material is captured for analysis. <p>Lindsay has worked with CSIRO and University of Adelaide testing services to ensure that the optimum medium for particulate capturing and effective analysis (minimise interferences as much as possible) is achieved.</p> <p>To date three lots of day sampling events were completed as metrological conditions allowed for optimum weather conditions as mentioned above. The samples have been delivered to CSIRO and the University of Adelaide Innovation Centre for analysis.</p> <p>On the 19 January 2017 a meeting was held at the Adelaide University Innovation Centre that included ABC personnel, Lindsay Hope and Tony Bazeley to discuss and review preliminary investigation analysis conducted on samples.</p> <p>A subsequent meeting was held on the 27 January with CSIRO personnel and included the above</p>

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		personnel and the Adelaide University Innovation Centre representative. The meeting focus was to obtain possible synergies between the testing parties, optimum testing methodologies and progress of the program.