

**To: Skipulagsstofnun, the Icelandic National Planning Agency**

**RE: Sulur/Stapafell Grinding Mill Project**

**Dr. Mr. Jakob Gunnarsson,**

**Overview**

Greencraft has developed and patented an Alternative Cementitious Material (ACM) processed from Hyaloclastite found in Icelandic Moberg deposits (1). This material improves physical and chemical properties of concrete and any other Portland cement based materials. It reduces concrete carbon footprint by replacing Portland cement. Greencraft has processed and tested raw materials from deposits located in the Olfus, Grindavik and Reykjanes areas with promising results.

**Greencraft ACM Concrete Properties:**

- Reduced Portland cement use and water demand compared to Portland cement concrete (2)
- Greater compressive strength and physical properties when compared to Portland Cement (2)
- Greater chemical resistance and transport properties resulting in more durable concrete (2)
- ASR reduction greater than concrete using Portland Cement and other ACMs (3)
- Increased service life of concrete structures resulting in reduced carbon footprint and lower cost

**Iceland Carbon Footprint Reduction Benefits:**

- Portland Cement is among the highest CO<sub>2</sub> emissions contributor at approx. 800 kg/ton
- ACM materials will be processed using renewable electricity resulting in minimal CO<sub>2</sub> emissions
- A 20% ACM replacement of Portland Cement will eliminate over 32,000 tons CO<sub>2</sub> per year (4)
- A 20% OPC replacement will reduce CO<sub>2</sub> equivalent to planting 1,440,000 trees (5)
- A 30% ACM replacement of Portland Cement will eliminate over 48,000 tons CO<sub>2</sub> per year (4)
- A 30% OPC replacement will reduce CO<sub>2</sub> equivalent to planting 2,160,000 trees (5)
- Cost neutral to Iceland government, taxpayers, concrete producers, contractors, owners, etc.

**Stapafell, Sulur and Melur Mining operations:**

Stapafell and Sulur formation have been mined for aggregate for decades. The current mining operation is open pit. The raw material is processed in open air. The aggregate screening, crushing and piling activities do not require any special mitigation. They are approved and allowed under current land use for this area. These operations are in full compliance with all rules and regulations. The area designated to this activity is far off from public access with controlled private road access.

Greencraft proposed grinding mill operation is similar to the existing material crushing and processing operations. Moreover all ACM Greencraft operations will take place in an enclosed structure which will further reduce any possible dust or noise concerns.

### **Greencraft ACM Raw material source:**

After two years of pilot plant processing and material testing Greencraft has selected the Sulur Hyaloclastite material as raw feed for processing into the ACM material. Greencraft has been working closely with and has received commitments from IAV to supply at least 50,000 ton/year of raw material. IAV is a trusted and well known entity to Reykjanesbaer and Iceland community. In January 2019 IAV has received a 10 year renewal on the Stapafell/Sulur mineral mining lease.

Greencraft and IAV are currently working with Marvin Ívarsson at the Ríkiseignir office to determine the best location for the plant and secure a land lease. Two options are being considered, one inside the current lease perimeter and another outside the current lease perimeter in front of the Sulur formation. See Figs. 1 and 2. The Ríkiseignir office has expressed agreement with either option. Marvin Ívarsson has indicated that a letter from Reykjanesbaer stating that the community is not opposed to the project will be necessary to initiate the land lease agreement.

### **Grinding Mill Overview:**

Greencraft has retained ANIVI to design a mill for grinding the raw material into a fine powder. ANIVI is a highly reputable and experienced firm in the manufacture of specialty grinding mills for highly abrasive and hard minerals. ANIVI has been in business since 1939. The READY MILL 1500 is configured as a modular system manufactured in a plug and play type set up. Modules will be delivered to the site prebuilt and ready to set up and assemble in a short period of time. These modules can also be easily disassembled and moved. As such this type of grinding mill is portable and not permanently fixed to a particular building or location. The grinding mill plant is 100% EU made.

### **Raw material properties:**

The grinding mill requires raw feed material to be at 1% moisture. The natural state of the material is wet with a likely moisture content of over 10%. A two stage drying process will be employed to dry the raw material from the wet state to the 1% moisture required by the mill.

First, wet material will be stock piled inside a large enclosure to let the water drain naturally over time and pre-dry to around 5% moisture content. Second, the 5% moisture pre-dried raw material will be placed in a drier to reduce the moisture to 1%.

### **Grinding Mill overview:**

The grinding mill plant is 90% pre-built and pre-mounted with limited onsite erection. It includes the following modules (Fig. 3):

- Raw material reception and dosing
- Ball Mill system
- Product classification and storage
- Finished product packing and delivery
- Control rooms, automation and electrical rooms
- Steel structure, sheet metal and piping work

Equipment performance:

- The grinding plant has a total installed power of 1950 kw
- The grinding mill can process and produce up to 10 tph of ultrafine hyaloclastite based ACM.
- The mill will be operated 24 hours per day for 5 days with shut down for maintenance on the weekend.

Emissions: Fully compliant with the local norms in terms of emissions and waste products.

- Dust emissions will be <30 mg/Nm<sup>3</sup> at stack. Nevertheless, as the system will be inside a storage hall, emissions will be further minimized
- Process water: Water is not used in the process. Therefore, there will be no process water to collect and process
- Sound emissions: 85db in open air. The storage hall will reduce sound emissions to below 85db.

**Raw Material drier:**

Greencraft will use a gas powered drier to reduce the raw feed moisture to 1%. The fuel will be a renewable biogas from Reykjavik land fill methane gas production. Methane gas is one the most potent greenhouse gases. Its environmental impact is 20 times more harmful than CO<sub>2</sub>. At this time SORPA is burning at the landfill more than twice the amount of biogas than the drier will require. In order to reduce the methane gas emission SORPA has a new organic digester plant under construction that will produce even more biogas starting in the next year. Without new users, this biogas will have to be burned onsite without any benefit.

Greencraft has met with SORPA and is in discussions to purchase up to 1.000.000 Nm<sup>3</sup> per year of methane (CH<sub>4</sub>) from the Alfnaes site. The use of biogas from the methane landfill will eliminate additional greenhouse emissions and further the project's sustainability commitment.

**Housing for Raw material and Grinding Mill:**

A 130 m long by 40 m wide by 17 m tall housing structure of temporary tent type construction with steel trusses and a Teflon/PVC skin and a concrete footing will be erected on or near the Stapafell/Sulur mineral mining lease (Fig 4). The interior floor area will remain the natural lava that forms the surrounding area. A portion of the structure will be used for the stockpile and the loading of the raw material into hoppers; the other portion will house the drier, grinding mill and associated storage and distribution silos and/or bagging equipment. The area between the stockpile and the grinding mill will be separated by a full height barrier.

The material stockpile will contain around 20,000 tons of material. A stacking conveyer will be used to create the pile. The dust, if any, resulting from this material handling will be contained inside the housing structure.

**Civil Works requirement:**

The housing structure will require a concrete perimeter foundation of approximately 300 mm wide and 1 m tall. The steel trusses will be bolted to the foundation to resist wind loads (Fig.5).

The grinding mill modules require concrete slabs of different thicknesses depending on the different types of modules (Fig.6). Modules are bolted down to the respective slabs and can be easily removed.

Both the housing structure perimeter foundation and the grinding mill slabs are of temporary nature and can be removed at the end of the project life.

**Electrical Power Source:**

Greencraft has met with HS ORKA and HS VEITUR and discussed the 2 mwh power need.

HS VEITUR confirmed available distribution capacity to the specific location and is formulating a proposal for the project.

HS ORKA stated that there is more than sufficient electric capacity and will provide a bid for the electrical power for the project. The electrical power is being produced from renewable sources.

**Economic Opportunities:**

- Initial investment in the local economy of approx. 10 million euros to build a processing plant
- Creation of new jobs in the Reykjanesbaer area
- Reduced import of Portland cement to Iceland by partial replacement with a local material
- Potential Export of excess ACM to EU resulting in potential CO<sub>2</sub> credits to Iceland
- Potential export of ACM to EU will result in new revenue stream to Reykjanes Port Authority

**Governmental feedback:**

Greencraft has met with various government agencies to discuss this project. Every agency has reacted positively. We have met with various officials at the Ministry of Industry, Ministry of the Environment and Natural Resources, Ministry of Transportation and Office of the Prime Minister. For the past year and half we have met several times with Reykjanesbaer officials and received positive feedback.

**Requests:**

Greencraft is requesting approval for the Stapafell/Sulur grinding mill project under the current land use of the mining and aggregate processing operations of IAV.

Greencraft is looking forward to receiving any advice or guidance necessary to move this project forward.

Sincerely,



Romeo Ciuperca, C.E.O.

**References:**

1. U.S. Patents that cover this subject matter: 9,822,037; 9,828,289; 10,047,005; 10,047,006 and 10,065,886 with more pending in the U.S. and EPO regarding the “Hyaloclastite, Sideromelane or Tachylite Pozzolan, Cement and Concrete Using Same and Method of Making and Using Same”
2. Tourney Consulting preliminary test report dated March 6, 2018
3. Tourney Consulting ASR test results report dated February 26, 2018
4. CO<sub>2</sub> reduction estimate calculated based on estimated Iceland cement use of 200,000 tons/year
5. Based on an average tree absorption of 22 kg per year of CO<sub>2</sub> Iceland tree absorption may vary.

Fig. 1:



Fig. 2:







Fig. 4:

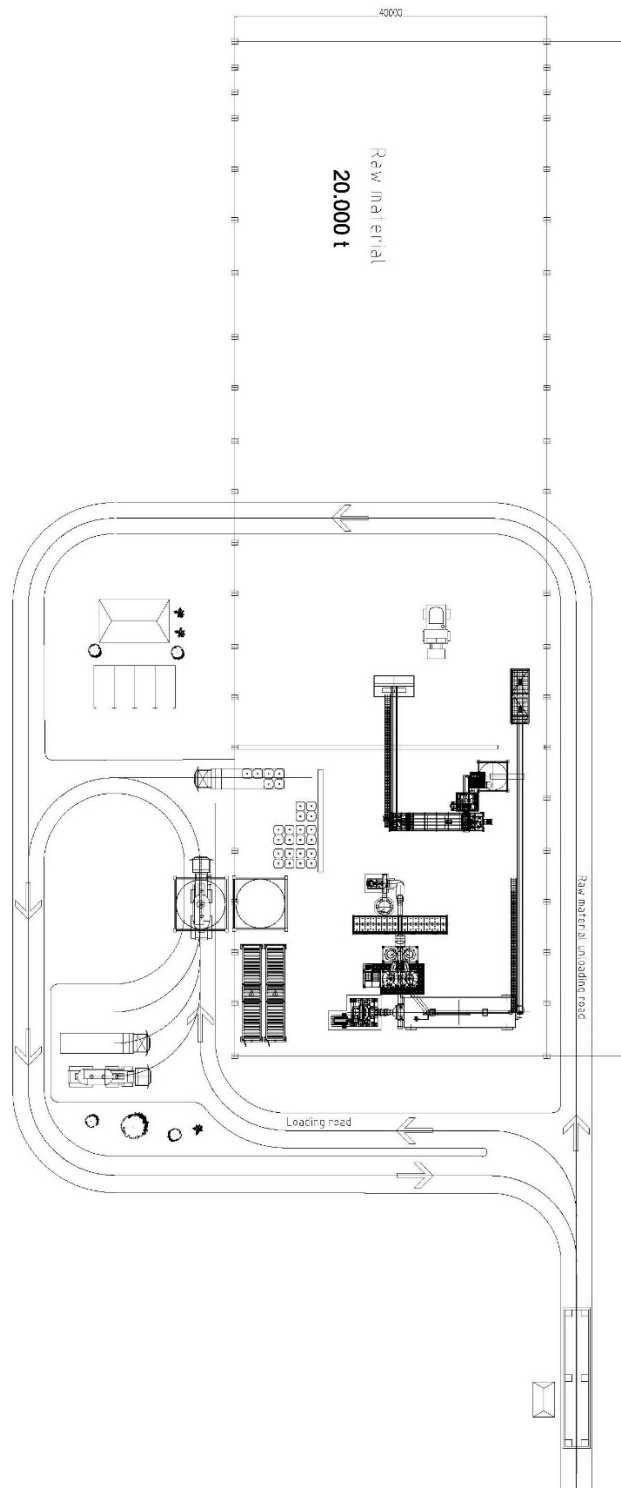




Fig. 5:

