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# Mulilo De Aar 2 South Wind Energy Facility: Stormwater Management Plan

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## 1. BACKGROUND

Mulilo De Aar 2 South (Pty) Ltd Wind Energy Facility (WEF) has identified a site ideal for the development of a Wind Energy Facility, located south of the Regional Route 48 (R48) between De Aar and Philipstown, northeast of De Aar in the Northern Cape, South Africa, as indicated in Figure 1. The site extends across 9 farm portions located on a plateau.



Figure 1. Mulilo De Aar 2 South Wind Energy Facility locality map

Activities associated with the development of a Wind Energy Facility can impact negatively on existing drainage systems. By recognizing natural hydrological patterns, it is possible to develop a stormwater water management system in a manner that reduces any negative impacts. The greatest risks associated with inappropriate stormwater management are increased erosion and potential flooding.

Because of the above risk, this Stormwater Management Plan and the Erosion Management Plan should be managed together.

## 2. STORMWATER MANAGEMENT

This Stormwater Management Plan addresses the management of stormwater runoff from the Wind Energy Facility and impacts such as soil erosion and downstream sedimentation. The main factors influencing the planning of storm water management measures and infrastructure are:

- Placing of infrastructure and infrastructure design;
- Topography and slope gradients;
- Average Annual rainfall; and
- Rainfall intensities

The purpose of the plan is therefore to provide measures to address runoff from disturbed portions of the site, such that they:

- Do not result in concentrated flows into natural watercourses i.e. provision should be made for temporary or permanent measures that allow for attenuation, control of velocities and capturing of sediment upstream of natural watercourses.
- Do not result in concrete or other lining of natural watercourses to protect them from concentrated flows off the development if not necessary.
- Do not divert flows out of their natural flow pathways, thus depriving downstream watercourses of water.

### 3. **STORMWATER MANAGEMENT**

#### 3.1. **DEVELOPMENT PHASE**

In the design phase, various stormwater management principles (including those referred to in the water use authorization and/or general authorization - which would take precedence in the case of any inconsistencies) should be considered, including:

- Ensure that development does not increase the rate of stormwater flow above that which the natural ground can safely accommodate at any point in the sub-catchments.
- Ensure that all stormwater control works are constructed in a safe and aesthetic manner in keeping with the overall development.
- Prevent concentration of stormwater flow at any point where the ground is susceptible to erosion.
- Reduce stormwater flows as far as possible by the effective use of attenuating devices (such as swales, berms, silt fences etc.) As construction progresses, the stormwater control measures (stipulated in any applicable risk assessment matrix) are to be monitored and adjusted to ensure complete erosion and pollution control at all times.
- Minimize the area of exposure of bare soils to minimize the erosive forces of wind, water and all forms of traffic.
- Design access roads to be positioned in such a way that no clearing within no go areas is required and definite drainage areas are avoided wherever possible
- Plan and construct stormwater management systems to remove contaminants before they pollute surface waters or groundwater resources. Implement the principle of separating clean and dirty runoff streams (typically from bunded areas or those areas associated with hydrocarbon storage or the facility substation).
- Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
- Avoid situations where natural or artificial slopes may become saturated and unstable, both during and after the construction process.
- Design and construct roads to avoid concentration of flow along and off the road. Where flow concentration is unavoidable, measures to incorporate the road into the pre-development stormwater flow should not exceed the capacity of the culvert. To assist with the stormwater run-off, gravel roads should typically be graded and shaped with a two to three percent crossfall back into the slope, allowing stormwater to be channeled in a controlled manner towards the natural drainage lines and

to assist with any sheet flow on the site.

- Design culvert inlet structures (where a water use authorisation has been obtained for applicable structures) to ensure that the capacity of the culvert does not exceed the pre-development stormwater flow at that point. Provide detention storage on the road and/or upstream of the stormwater culvert where permissible to do so.
- Design outlet culvert structures (where a water use authorisation has been obtained for applicable structures) to dissipate flow energy. Any unlined downstream channel must be adequately protected against soil erosion.
- Where the construction of a building causes a change in the vegetative cover of the site that might result in soil erosion the risk of soil erosion by stormwater must be minimized by the provision of appropriate artificial soil stabilization mechanisms or revegetation of the area. Any inlet to a piped system should be fitted with a screen, or grating to prevent debris and refuse from entering the stormwater system.
- Preferably all drainage channels on site and contained within the larger area of the property (i.e. including buffer zone) should remain in the natural state so that the existing hydrology is not disturbed.

### 3.1.1. ENGINEERING SPECIFICATIONS

The project's appointed Civil Engineers<sup>1</sup> shall create, during the detailed design stage, a complete Stormwater Management Plan based on the underlying concepts of this Stormwater Management Plan, with engineering specifications explaining and demonstrating the proposed stormwater control techniques. Where appropriate, this stormwater management plan must take into account control measures approved by the relevant water authority. Additionally, erosion control techniques should be included in this. Among the conditions for project design are:

- Before, during, and after construction, erosion control measures must be put into place, including the last stormwater control measures (post construction).
- The complete stormwater management plan must include all temporary and permanent water management structures and stabilization techniques.
- To ensure sufficient capacity for moving storm waters around and away from infrastructure, the site's drainage system should be designed to specifications that can successfully deal with a rainfall event with a 1:50 year intensity or greater.
- Procedures for stormwater flow through a project site need to take into consideration both normal operating practice and special circumstances. Special circumstances in this case typically include severe rainfall events.
- An on-site Engineer or Environmental Officer must be responsible for ensuring implementation of the erosion control measures on site during the construction period.
- The EPC Contractor holds ultimate responsibility for remedial action in the event that the approved stormwater plan is not correctly or appropriately implemented and damage to the environment is caused.

### 3.2. CONSTRUCTION PHASE

During the construction phase, in order to prevent soil erosion, the contractor must create a Stormwater Control Method Statement. They must also take the necessary precautions to ensure that the requirements

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<sup>1</sup> The engineers for the DA2S WEF are yet to be appointed at time of compilation of this SWMP.

of the complete Stormwater Management Plan are met before, during, and after construction, as well as in accordance with any applicable water use authorization. The person on site who is responsible for ensuring that the necessary stormwater control measures are in place before construction activity begins must be identified in the storm water control method statement. Potential construction phase interventions for the control of storm water (the details of which are to be confirmed in the complete Storm Water Management Plan) may include (but are not limited to) the following:

- Should any drainage pipes be required, a standard riprap lined ditch for erosion control is to be installed for the end-of-pipe energy dissipation.
- Degradation or erosion as a result of leaking pipes, spills, muddy conditions, or washaways shall be taken into account when designing any water abstraction points. Any leaks identified must be repaired immediately.
- Cleared areas and stockpiles of aggregates or soil is to be protected in such a way that erosion or sediment inputs to ecologically sensitive areas during rainfall is prevented.
- Access to wet areas after rainy periods is to be avoided until such a time as the soil has dried out.
- Water is to be recycled during the construction phase wherever possible
- Preserving natural drainage patterns including the use of natural ponding areas.
- Use of “Irish Bridges” where applicable, strategically at various points to allow continuity of natural flow and water passage.
- Surface runoff may be collected by a system of drainage swales, but additional drainage ditches may be required in locations where there are no proposed roadways to conduct flow to the Irish Bridge flow passages
- Use of side drains and v-drains.
- Correct rehabilitation of natural vegetation, where applicable in line with an erosion prevention plan and rehabilitation plan.
- Use of deflection berms to avoid erosion of a pipeline route.
- To assist with the storm water run-off, gravel roads should typically be graded and shaped with a 2% cross fall back into the slope, allowing storm water to be channeled in a controlled manner.
- Where any proposed roads intersect the natural, defined drainage lines, it is suggested that either suitably sized pipe culverts or drive through causeways are installed / constructed and should take into account the hydrology criteria for a selected major storm.

#### **4. CONCLUSION AND RECOMMENDATIONS**

If not previously addressed by the mitigations provided as part of construction, the complete Stormwater Management Plan should be created during the detailed design phase and be implemented during the operation phase with a view to limiting the passage of concentrated flows off hardened surfaces and onto natural areas.