MEMO

EIMS

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Johannesburg, 2123. April 4, 2013

Attention: Nicus Durieux

Grootvlei PV Project No: 09280002

This memo focuses on the review of the three techniques proposed by ARUP for founding the PV cells at the proposed Grootvlei old ash dam site and specifically the relevance to surface and groundwater control and possible impacts in the area. It also looks at the specifications for adequate storm water control.

The following three foundation methodologies were proposed by ARUP and will be dealt with individually:

Method one – Screwed or rammed piles

This founding technique if used in the area will have to be piled deeper in the western section next to the ash dam and much shallower on the old ash dam. This method does not require major machinery and the diameter of soil/rock to be disturbed is minimal. It is unlikely that they will breech the groundwater table on the ash dam but depending on the soil characteristics and bedrock depth adjacent to the old ash dam area they could possibly breech the groundwater table as the level is shallow around 2 to 4 m in this area.

Possible impacts or issues:

- Although the area associated with the piling is small there will be a huge number of them and preferential pathways for groundwater recharge could be established;
- The material used could cause reaction with groundwater where breeching does occur and this could cause contamination;
- The disturbed soil around the pile could cause substantial weathering over the area during high volume rain storm events; and
- This method does not allow for capping of the surface at all and infiltration at the ash dam will still be as usual.

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Mitigation:

The rammed piles should be sealed with a form of grout or silicon that is water proof around the section where it enters the surface, this should be durable and UV resistant and should be done for all piles. The material used for the piles should be inert and non-reactive with water. Compaction of the area around the piled surface should be compacted to ensure that no weathering will take place during rain events over time.

Pre-drilled holes with backfilling or concrete

During this method holes are drilled with possibly an auger before the piles are established and then filled with material such as concrete or soil removed from the hole during drilling. This is the same method as above but with some localized improvement of the foundation of the pile.

Possible impacts or issues:

The possible impacts therefore are the same as above.

Mitigation:

However this method already applies some of the mitigation mentioned above in the form of surface stability and sealing the area next to the pile. It needs to be ensured though that water proof material is used as mentioned above. A small percentage of the surface is also capped with this method and surface runoff will increase so storm water design on the ash dam and elsewhere will have to be in place.

Caution must be applied as the areas not covered by concrete or compacted material will cave away or erode during storm events. The ideal would therefore be to apply a clay layer to the area once construction is complete and compact it in line with the constructed zones so that erosion would not occur around the cast blocks. This will also prevent ponding and infiltration but run off will increase significantly.

Ballast foundations

This method uses larger cast concrete blocks as support with mounting frames fixed onto them with bolts. Again very similar construction methods as above but there are no holes penetrating the surface to cause preferential pathways. Therefore this method is the least desirable cost wise for engineers but the best option for groundwater.

Other problems are the same again as with the other two methods. The capped area improves as more surface is covered thus quicker surface runoff and higher chances of erosion if not controlled. Also no material penetrates the surface and therefore groundwater should not be breeched and hence the requirement for inert material is no longer necessary.

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This is therefore the best founding method.

General Surface Water Control

No mention is made in the documentation from ARUP on how they intend to manage precipitation with the increased smooth surface coverage on the old ash dam area and adjacent areas.

Increase of runoff will be due to:

- The coverage by flat smooth solar pv cells over the area approximately more than 80 % of the total area; and
- Hard compacted soils with no vegetation below the pv cells and in the open areas.

If no capping on the olds ash dam is going to be constructed then due to the above two factors a network of collection channels / trenches will have to be installed between the pv cells to collect the precipitation from the panels during high precipitation events. This will still have to be collected in a down gradient trench / collector pond large enough to handle 1:50 and 1:100 storm events. As dust fallout will collect on the panels as well and mixed with precipitation the water quality discharged by the trenches should be monitored and comply with DWA discharge policy which is specific to the water catchment areas in the country. Water not suitable for discharge will have to be discharged into the closed dirty water system at Grootvlei, so a conduit system for this will also have to be allowed for.

Such a system should ideally conform to at least the 50 % scenario mentioned in the groundwater report but could ultimately conform to between 90 and 99 % of impermeability. Thus very little recharge to the old ash dam area.

Vegetation is also an important factor, the area adjacent to the old ash dam can be re-vegetated to decrease surface runoff and increase recharge (if the general water quality can be proven originating from the pv cells) and should be very similar to natural runoff conditions below the cells. This will negate the need for an intricate storm water system and only limited channels or perhaps a form of a gutter system that links with the ash dam system to control excess flow originating from the pv cells itself. The ash dam however will have to have a formal system as recharge should be kept to a minimum in this area and vegetation is not an option. A compacted clay layer would be the best with a storm water system on top of that.

The final ash dam surface drainage system will ultimately be approved by DWA engineers to ensure that the recharge to groundwater is reduced and hence the leaching of the old ash dam material to groundwater is minimized. This will improve the groundwater quality over time and basically remove the contaminant source effectively which would be the ultimate goal.

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