1.0 INTRODUCTION

This technical memorandum has been prepared by Golder Associates (UK) Ltd (Golder) on behalf of REG Ling Hall Power Solar Ltd. Its purpose is to support the discharge of Condition 8 of Planning Permission RBC/14CM029 for Ling Hall Landfill Site, Coalpit Lane, Lawford Heath, Rugby, Warwickshire, CV23 9HH (the ‘Site’).

Condition 8 of Planning Permission RBC/14CM029 requires the following:

‘The development hereby permitted shall not be commenced until a method statement has been submitted and approved in writing by the County Planning Authority. This document shall identify and assess the risks to the following and provide appropriate mitigation measures. These are:

i. The cap and pollution control infrastructure from construction and operational activities;
ii. Slope stability;
iii. The landfill permit holders obligations for environmental monitoring;
iv. Waste settlement; and
v. Maintenance and ongoing replacement of gas and leachate management infrastructure.

Once approved, the development shall be carried out in full accordance with the approved method statement.

This document forms part of a suite of documents intended to support the discharge of the Planning Conditions attached to Planning Permission RBC/14CM029.

This document seeks to address the five elements of the Condition in a sequential process using the same numbering as defined above.

2.0 THE CAP AND POLLUTION CONTROL INFRASTRUCTURE FROM CONSTRUCTION AND OPERATIONAL ACTIVITIES

The proposed construction works have been designed to protect the integrity of both the landfill containment system and the associated extraction and monitoring infrastructure, as well as minimising the impact on the day-to-day landfilling operations.

Whilst the Site is operational, the areas chosen for the development of the Solar Project are fully restored and away from the active tipping phases of the Site. The development area covers the following parts of the Site:

- Northern section of the Site covering Cells 5A to 9B;
South west section of the Site covering Cells 1 and 5.

We understand that landfilling operations ceased in the southern section in the early 1990s; the northern cells received waste in the late 1990s and beyond. These have now been completed and restored in a phased manner in a west to east direction.

2.1 Maintaining the integrity of the capping system

In order to maintain the integrity of the landfill capping containment system, two methods of anchoring the solar arrays are proposed. The type to be used will be determined by the available depth of cover soils above the geomembrane capping liner.

- **Scenario:** Where the cover soils are in excess of 1000 mm thick, the solar panels will be attached to racking, which is supported by steel piles driven into the ground.

  **Approach:** A visual indicator will be painted at 800 mm from the foot of each pile. The anchor bars will be installed through holes in the piles to increase resistance to both upward and downward force. These holes will be drilled to achieve a 45 degree angle and a visual indicator will be painted at 1264 mm from the foot of each anchor bar so that no part of the foundation system is deeper than 800 mm.

  This approach has been approved for use by the Environment Agency (EA) at a similar development at Netley Landfill Site in Hampshire (refer Appendix A).

- **Scenario:** Where the cover soils are less than 1000 mm thick, the solar panels will be mounted on steel frames supported on concrete ‘shoes’ that are laid at existing ground levels.

  **Approach:** The concrete “shoes” are approximately 3300 mm long, 360 mm tall and 600 mm wide and provide for the attachment of the steel framework supporting the solar panels. Each “shoe” will weigh approximately 1800 kg. The size of these “shoes” provides the required support for the panels and anchors them to the ground providing for wind loading and other considerations. The “shoes” will be placed at approximately 3020 mm centres to provide the level of support required.

It is anticipated that due to the thickness of the cover soils determined from a trial pitting exercise at the Site, the shallow piling option will be the preferential choice. The details of both anchoring methods are shown on Drawing SO20045671 Cofely Netley – G [01-02] - 2016.02.18 (Appendix A). Appendix A also includes email correspondence from the EA supporting the proposed design.

**Risk:**

It is considered that neither of these methods will compromise the integrity of the containment barrier, which is formed of a geomembrane liner, as the piles will be terminated within the restoration capping soils. As a consequence, the proposal is considered to be relatively low risk.

**Mitigation:**

To mitigate against potential breaches in the containment layer, the depth to the geomembrane liner shall be determined prior to the commencement of any piling activities via a series of test/probe holes. This will provide confidence that the information provided and gained is reflective of the entire area.

In the event that the geomembrane capping liner is damaged during any part of the construction works, the developer will liaise with the Site operator (Veolia Ltd) to inform and agree the remediation approach.

The works shall be independently supervised to provide compliance with the agreed design and a Construction Quality Assurance (CQA) Report produced for submission to the Environment Agency.

2.2 Interaction with the pollution control infrastructure

To maintain compliance with the Environmental Permit, it is imperative that the development of the Solar Project does not interfere with the existing pollution control infrastructure at the Site. Such infrastructure will include the following:
Gas extraction wells;
- Gas extraction transmission and main pipe lines (which comprise a combination of buried and surface laid pipes);
- Manifolds and condensation knock-out pots; and
- Leachate extraction wells and pipework.

**Approach:**

The layout of the proposed solar arrays and associated infrastructure has been designed to avoid conflict with the existing infrastructure and to maintain safe access to operatives and monitoring technicians.

**Risk:**

The location of Site infrastructure is surveyed recorded; therefore, the risks of impacts on this from the construction are considered to be relatively low. There may be some circumstances where surveyed records and as-built drawings do not correspond with ground conditions, and in the unlikely situation that this arises, mitigation described below will be employed.

**Mitigation:**

Prior to construction the following activities will be undertaken.

- The existing landfill infrastructure in the development area will be identified by the contractor, in collaboration with the Site operator. All such identified infrastructure will be protected by exclusion fencing or flutter tape to ensure that all operatives on Site are aware of the presence of the existing infrastructure.
- The developer and the Site operator will undertake an audit of the pollution control infrastructure to assess the pre-works condition. This will be recorded for review during and after works.

During construction, should the works impact any of the pollution control infrastructure, at any point, the Site operator will be immediately informed in order to agree and undertake the required actions, the timescales for completion and who will be responsible for the action.

Post construction, a second audit will be carried out to determine the location and extent of any damage to the infrastructure caused by the construction works. Such works will be rectified.

Where any new access tracks or other infrastructure needs to cross lines of gas collection pipework or other elements, the construction will “bridge over” the existing infrastructure in such a way that the existing infrastructure is not affected.

Any on-site cabling above the landfill areas will either be on cable trays attached to the galvanised metal racking systems or installed within semi-buried concrete cable troughs to avoid any potential conflict with existing pipework and prevent penetrating the capping layer. Cabling in areas where there is no landfill will be buried underground at a typical depth of between 600 and 800 mm.

**3.0 SLOPE STABILITY**

The additional loading on the landfill may give rise to slopes stability issues and compromise the long term performance of the containment system and infrastructure.

**Approach:**

The location of the solar panels has been chosen to avoid any steep slopes. The topography in the areas chosen is relatively shallow and can be summarised as follows:

- Northern area: Maximum slope gradient 1(v) in 12(h);
- South west area: Maximum slope gradient 1(v) in 10(h); and
- South east area: Maximum slope gradient 1(v) in 7(h).
Risk:

The potential impact of the panels on the slope stability is through the application of an additional load on the slope, which will reduce the factor of safety against slippage. Slope stability analyses have been carried out to assess the impact of the additional loading from installation of the solar panels.

The results of the stability analyses suggest that the factors of safety against slippage of the restoration soils will decrease after the installation of the solar panels; however the reduced factors of safety are still at an acceptable level. This is considered satisfactory.

Mitigation:

No additional mitigation required but note the following:

The level of loading included in the analyses has been based on choosing concrete pads as the foundation style for the solar panels. Should pile foundation be chosen for the solar panel, the additional loading will be less due to lighter weight of the pile foundation; hence, the reduction of the factors of safety caused by additional loading will be less than the concrete pad foundation. This is therefore considered satisfactory.

4.0 THE LANDFILL PERMIT HOLDERS OBLIGATIONS FOR ENVIRONMENTAL MONITORING

The Site operator will require regular access to all the pollution control infrastructure in order to carry out the required routine monitoring and also for balancing the gas extraction system to maintain optimum efficiency.

Approach

The consented development is reliant on the collaboration of both parties and the design is such that access to monitoring points will be provided throughout the project.

Risk:

The risk of the Site operator not being able to achieve their obligations under the Permit is considered to be low.

Mitigation:

During construction the developer and Site operator will collaborate throughout the works so that a full understanding of the need and timings of operational activities are understood and managed as part of the programme.

Post construction the arrays will be within a security fencing; therefore necessary arrangements will be made for operational and monitoring staff to be given unrestricted access to all areas of the development.

5.0 WASTE SETTLEMENT

There will be a degree of waste settlement over time in the consented development area, as there may be in other areas at the Site. However, there is insufficient information to be able to quantify the magnitude of any settlement.

The older southern areas are likely to have undergone the majority of their expected settlement as a result of the cessation of landfilling operations in the early 1990s. However, differential settlement may still occur in the northern areas due in part to the nature and type of waste deposited, and its more recent restoration.

Approach:

Observations will be made through routine inspections by the Site operator and during/following the development by the developer’s staff.

Risk:

Any settlement across the developed areas may result in an increased risk of condensate build up within the gas transmission pipework.
The risk of settlement is considered to be low to medium as there is some uncertainty on the extent of settlement that may occur. In applying the mitigation below, the risk will be low.

**Mitigation:**

Where settlement is identified by the Site operator through routine inspections, then the Site operator will be allowed full access to the affected areas to remediate the issue e.g. through the filling of depressions in ground surface or raising of leachate/gas pipework.

**During construction,** the developer’s staff will identify to the Site operator any areas where settlement is observed in order that corrective action can be taken at the earliest opportunity.

**Post construction,** the developer’s staff will identify to the Site operator any areas where settlement is observed in order that corrective action can be taken at the earliest opportunity.

Throughout the project lifecycle, in order to manage the effect of settlement on the solar arrays, the racking onto which the panels are attached will allow some adjustability to maintain the correct orientation of the panels.

**6.0 MAINTENCE AND ONGOING REPLACEMENT OF GAS AND LEACHATE MANAGEMENT INFRASTRUCTURE.**

The Site operator will require regular access to all the infrastructure in the consented development area in order to carry out both regular and emergency maintenance on the gas and leachate extraction network

**Approach**

The consented development is reliant on the collaboration of both parties and the design is such that access to monitoring points will be provided throughout the project.

**Risk:**

The risk of the Site operator not being able to achieve their obligations under the Permit is considered to be low.

**Mitigation:**

**During construction** the developer and Site operator will collaborate throughout the works so that a full understanding of the need and timings of routine operational activities e.g. replacing valves are understood and managed as part of the programme.

**Post construction** the arrays will be within a security fencing; therefore necessary arrangements will be made for operational and monitoring staff to be given unrestricted access to all areas of the development.

Should the Site operator identify the requirement for any larger scale maintenance i.e. re-drilling of an extraction well or replacing/laying pipework, then the works and potential impacts on both the Site and the solar project, will be determined and planned between both parties.

We trust this meets your requirements, but please contact either of the undersigned should you need further information.

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Paul Hopper  
Engineering Geologist

David Hybert  
Reviewer

PH/DH/es
APPENDIX A
This structure is valid for the following tolerances of the modules Trina Solar:
- tolerances on the length and width are ± 2mm
- tolerance on the thickness is ± 0.5mm

NORTH

This structure is valid for maximal terrain slope in E-W / N-S direction:
In case of higher terrain slope, the customer has to do necessary earth movement in order to respect the given slope limits.

- This plan cannot be used for the final building site layout of piles, frames or tables. Only the specific SADEF "Structural drawing" may be used to prepare or realize the montage of the SADEF-frame.
- It is the entire responsibility of the SADEF customer to verify the validity and the completeness of the attached data sheet relating to the supplied solar panel.

Production of the SADEF steel frame will only be launched after approval by the SADEF customer on the content of these plans and attached documents.

The layout of the solar tables on the terrain should be done in such a way that there is always a minimal distance of 10 cm between the steel structures of adjacent tables.

In case of a terrain with more than 10% slope, the minimal distance (in cm) should be equal to the slope of the terrain (in %).

E.g. 20% terrain slope → 20cm minimal distance between tables.

The chosen surface treatment of the steel frame is supposing no significant water accumulation on the terrain surface. It is considered that the ground will absorb all rain water.

In case of higher terrain slope, the customer has to do necessary earth movement in order to respect the given slope limits.

Grounding of the installation is the responsibility of the SADEF customer.

Every table should be built in E-W direction in one straight line.

- Concrete blocks and anchors has to be designed and delivered by SADEF customer and his qualified engineer.

**Concrete blocks and anchors has to be designed and delivered by SADEF customer and his qualified engineer.**

The content of the documents "Design data", and "Special conditions for components in solar frames (incl. A)" in enclosure is to be fully taken into account!

Please note that this document is a representation of the structure and does not include all the details and annotations that are present in the original drawing. The original drawing must be referred to for precise measurements and specifications.
This structure is valid for the following tolerances of the modules Trina solar:
- tolerances on the length and width are ± 2mm
- tolerance on the thickness is ± 0.5mm

This structure is valid for maximal terrain slope in E-W / N-S direction:
In case of higher terrain slope, the customer has to do necessary earth movement in order to respect the given slope limits.

In case of terrain irregularity, extra pile length could be needed.

**Section View**

- The ramming machine head (preferably a rectangular shape) should consider the pile section tolerances up to ±4mm!
- The chosen surface treatment of the steel frame is supposing no significant water accumulation on the terrain surface. It is considered that the ground will absorb all rain water.
- Minimal depth of studs and possible need of pre-drilling has to be defined by SADEF customer and his qualified geologist.
- In case of terrain irregularity, extra pile length could be needed.

**Concept Drawing**

- Production of the SADEF steel frame will only be launched after approval by the SADEF customer on the content of these plans and attached documents.
- The layout of the solar tables on the terrain should be done in such a way that there is always a minimal distance of 10 cm between the steel structures of adjacent tables.
- The chosen surface treatment of the steel frame is supposing no significant water accumulation on the terrain surface. It is considered that the ground will absorb all rain water.
- eventual consequences on the steel structure due to water accumulation or underground water will be the full responsibility of the SADEF customer.

**Top View with PV-Modules**

- The ramming machine head (preferably a rectangular shape) should consider the pile section tolerances up to ±4mm!
- The chosen surface treatment of the steel frame is supposing no significant water accumulation on the terrain surface. It is considered that the ground will absorb all rain water.
- eventual consequences on the steel structure due to water accumulation or underground water will be the full responsibility of the SADEF customer.

**Frame with PV-Modules**

- This structure is valid for the following tolerances of the modules Trina solar:
  - tolerances on the length and width are ± 2mm
  - tolerance on the thickness is ± 0.5mm

**Frame without PV-Modules**

- The chosen surface treatment of the steel frame is supposing no significant water accumulation on the terrain surface. It is considered that the ground will absorb all rain water.
- eventual consequences on the steel structure due to water accumulation or underground water will be the full responsibility of the SADEF customer.

**General Notes**

- The content of the documents “Design data”, and “Special conditions for components in solar frames (incl. A)” in enclosure is to be fully taken into account!
From: Smith, Anita [mailto:anita.smith@environment-agency.gov.uk]
Sent: 20 May 2016 14:52
To: Matt Partridge; Deacon, Simon; Maskell, Jon
Cc: Simon Holt; David Goodwin; Simon Pipkin; Shaw, Steve; Adrian Foster
Subject: RE: Netley Solar Farm: piled foundation discussions

Dear Matt,

We have reviewed the Method Statement and Geophysical report and have the following comments to make:

The Method Statement states the following:

The site is divided into zones where the surface soil (the material above the capping layer) exceeds a thickness of 1,000mm or more and other zones where there is less depth to the capping layer. In zones where there is less than 1,000mm of material above the capping layer, and in the area within 2 metres (horizontal) of the perimeter of such zones, either the soil will not be penetrated and a concrete foundation will be used (see section 3) or no panels will be installed. In the zones where a minimum depth of 1,000mm is found (approximately 85% of the site area according to the APEX Report), the design will allow for a maximum soil penetration of 800mm.

Based on these preliminary design criteria, the engineered cap will not be penetrated and therefore there is minimal risk to the integrity of the landfill, landfill integrity and infrastructure. Therefore we would find the details of the proposals acceptable.

For any further correspondence, including design proposals or information relating to the installation/management of the Solar Park, please can you contact Veolia direct, as they are the Operators of Netley Landfill Site and have responsibility and control for any activities carried out on the site.

Kind regards
Anita

From: Matt Partridge [mailto:MattPartridge@regpower.co.uk]
Sent: 18 May 2016 17:15
To: Smith, Anita; Deacon, Simon
Cc: Simon Holt; David Goodwin; Simon Pipkin; Shaw, Steve; Adrian Foster
Subject: RE: Netley Solar Farm: piled foundation discussions

Dear Simon/Anita

Further to our meeting in late January and the attached detailed advice request and associated purchase order, I would be grateful if you could review the attached method statement. The supporting geophysical report (15MB) is available to download here:

If you have any queries, please not hesitate to contact me.

In the meantime, I look forward to hearing from you in early course.
Thanks in advance.
Best regards
Matt

From: Matt Partridge
Sent: 17 February 2016 10:47
To: PlanningSSD <PlanningSSD@environment-agency.gov.uk>
Cc: Simon Holt <simonholt@regpower.co.uk>; David Goodwin <david.goodwin@veolia.com>; Smith, Anita <anita.smith@environment-agency.gov.uk>; Deacon, Simon <simon.deacon@environment-agency.gov.uk>; Simon Pipkin <simonpipkin@regpower.co.uk>
Subject: RE: Netley Solar Farm: piled foundation discussions

Dear Sir/Madam

Further to our conversation yesterday, please find attached the Detailed Advice Request Form to accompany the purchase order. Perhaps unusually, the EA officers we met on 29 January have already indicated that one hour of pre-application advice will suffice in this case.

Best regards
Matt

From: Matt Partridge
Sent: 16 February 2016 12:12
To: ‘PlanningSSD’
Cc: Simon Holt; David Goodwin; Smith, Anita; Deacon, Simon
Subject: RE: Netley Solar Farm: piled foundation discussions

Dear Sir/Madam

Please see the attached PO relating to the 1 hour of pre-application advice on this matter. The documents for reviewed will be sent in the near future to Simon Deacon and Anita Smith.

Best regards
Matt

From: PlanningSSD [mailto:PlanningSSD@environment-agency.gov.uk]
Sent: 29 January 2016 15:18
To: Matt Partridge
Cc: Simon Holt; David Goodwin; Smith, Anita; Deacon, Simon
Subject: RE: Netley Solar Farm: piled foundation discussions

Dear Mr Partridge,

As per your conversations with my colleague Mr Simon Deacon regarding the above site, please find attached our Detailed Advice Request Form for you to complete and return to us.

The Environment Agency now charges for our detailed planning advice in response to planning enquiries that we receive from our customers. As part of this service, a dedicated project manager will coordinate the advice from different teams within the Environment Agency. Our service will include bespoke technical and planning advice if you request this. This will allow the developer/applicant to have greater clarity on the assessments needed to accompany the planning application and certainty about whether the development is acceptable before a formal application is submitted.
Currently our rates are £202 per person.

Please return this form to the Sustainable Places team at: PlanningSSD@environment-agency.gov.uk

Kind Regards

Kind Regards
Sustainable Places
Environment Agency
PlanningSSD@environment-agency.gov.uk

Flood Risk Standing Advice was updated on 15 April 2015. For more information please follow the links below:

For developers: FRSA developers page
For councils: FRSA council’s page

From: Matt Partridge [mailto:MattPartridge@regpower.co.uk]
Sent: 29 January 2016 14:42
To: Smith, Anita; Deacon, Simon
Cc: Simon Holt; David Goodwin
Subject: Netley Solar Farm: piled foundation discussions

Dear Simon and Anita

Many thanks for making time for this morning’s meeting to discuss the issue of piled foundations at the Netley Solar Farm. It was very useful to discuss the results of our investigations to date and how they can be used to propose a scheme and methodology for using piled foundations over a significant part of the Netley Solar Farm, with the attendant carbon, environmental and operational benefits.

Simon Holt and I will now prepare a further document which will set out a proposal for using piled foundations and buried cables with a method statement to govern the safe implementation of the agreed scheme. Given the need to ensure that the cap is not compromised, notwithstanding our growing confidence in the ground profiling results from a combination of geophysical investigations and trial pits, our proposal will build in a 200mm, above-cap buffer as discussed.

In the meantime, I would be grateful if you could send details of the proposed 1 hour of pre-application (variation) advice that will be needed so that we can raise a purchase order.

Either Simon or I will be in touch soon.

Best regards

Matt

Matt Partridge
Development Director

NEW ADDRESS:
First Floor
Unit 3, Damery Works