

# **Maendy Quarry Submission of Improvement Condition 1 Initial Restoration Scheme for Maendy Quarry**

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# Maendy Quarry

## 1. Introduction

On the 18<sup>th</sup> January 2018 an application was submitted to National Resource Wales (NRW) to vary and consolidate the water discharge Environmental Permits for Maendy Quarry. The application was submitted in order to vary the permit to consolidate the existing environmental permits AN0236801 (East Quarry) and AN236802 (West Quarry), update and vary the discharge consent limits and revise the monitoring frequencies. The permit variation was determined on 19<sup>th</sup> July 2018 (Permit Number: AN236801)

The Permit as issued regulates the discharge of rainfall related site drainage arising from the Maendy West Quarry and site drainage from Maendy East Quarry. Four improvement conditions have been included in the Permit to ensure an appropriate scheme for the restoration of the site with the intention to encourage a general improvement of the discharges, noting they are currently compliant with the Permit limits, further detail are set out in the document.

This document has been prepared in order to discharge Improvement Condition 1 (IC1) set out in the above mentioned Permit (Permit Number: AN236801). This is required for submission within six months of the determination of the permit - before 19<sup>th</sup> January 2019.

## **2. Background**

Maendy Quarry is located approximately 2km north of the centre of Church Village near Pontypridd in South Wales.

Maendy Quarry comprises of two discrete areas known as the Western and Eastern Quarries, separated by a single track rural lane (Maindy Road). The location is centered at NGR ST075 876.

The Western Quarry was landfilled between 1966 and closed in 1970. Run-off water from the restored and vegetated landfill in the Western Quarry drains westwards and seepages from the Western Quarry flow eastwards towards the Eastern Quarry.

The western runoff flows to the western boundary which drains into a weir box and discharges to a local surface watercourse at the quarry perimeter. This discharge point is referenced MAE002 – A2.

Water in the Eastern Quarry flows across the exposed rock head before entering a marshy area, before it then passes into a weir box prior to discharging to the local surface water network. This discharge point is referenced MAE001 – A1.

Drawing CE-MQ1458-DW01 shows the existing situation at the site and the two discharge points (MAE001 – A1) and (MAE002 – A2).

### 3. Improvement and Permit Conditions

Following several years of discussion regarding an appropriate approach to permitting the site, NRW confirmed that the regulatory framework for managing the site discharges should continue to be via the existing Permit which allows discharges to the water environment, as the discharges are not considered to be a waste.

During these discussions NRW noted that the surface water catchment of the Nant Clun, in which MAE001 and MAE002 discharge into, has been identified at its lower reaches as failing to meet its desired water quality status. This reflects potentially numerous inputs into the catchment from legacy industrial land uses.

No discernible impact on surface water quality in the receiving tributary has been attributed to Maendy Quarry from the extensive monitoring undertaken. As part of the catchment area review, NRW have indicated that they wish to see a general improvement in the drainage from Maendy Quarry as part of the catchment improvement.

The Permit Variation determined on 19<sup>th</sup> July 2018 will continue to allow the discharge of rainfall related site drainage arising from the Western and Eastern Quarry areas.

In order to encourage a general improvement in the site drainage an improvement programme was included in the Permit variation, which will take the form of a restoration scheme which will be developed and installed over the next five years.

This is listed in Table S1.3 of the Permit. See Table 1 below.

Table 1. Improvement Programme Requirements

Table S1.3 Improvement programme requirements		
Reference	Requirement	Date
A1 Maendy East Quarry and	<b>IC1</b> - Initial restoration scheme designs submitted to NRW for review 6 months from date permit issued	IC1 - From date of permit issue.
A2 Maendy West Quarry	<b>IC2</b> - Final designs for restoration scheme and an outline construction programme to be completed and approved by NRW 6 months following NRW review/finalising of IC1  <b>IC3</b> - Restoration scheme to be built and commissioned in accordance with outline construction programme agreed in IC2 and no later than 21 months from final approval of IC2, unless otherwise agreed with NRW.  <b>IC4</b> - Operator to submit report to NRW reviewing monitoring data and make recommendations for improvement works if required. The report shall also review the compliance limits, parameters and monitoring frequencies, 2 years from completion of the commissioning of the works carried out in accordance with IC3.	IC2, IC3, IC4 from time frames as stated in requirements

Table S3.1 of the Permit sets out the point source emission limits to water for MAE001 and MAE002. This includes limits for Chemical Oxygen Demand (COD), monohydric Phenol and Toluene, using an average value collected over twelve consecutive samples taken on a monthly period, a minimum and maximum pH range and for no visible oil and grease to be present.

Throughout the period of the Improvement Programme there will be a requirement to comply with the current limits set out in Table S3.1. The final IC (IC4) requires a review of the compliance limits parameters and monitoring frequencies following the restoration of the site.

Recent data shows concentrations for COD, Mono-Phenol and Toluene at both discharge points are below the limits set out in Table S3.1.

#### **4. Restoration Scheme**

Throughout the discussion leading up to the Permit Variation application NRW has indicated it would like the restoration scheme design to consider improvements in both discharges at the site, rather than a sole or primary focus on the discharge from the Eastern Quarry. The scale of restoration will be confined by the extent of the existing quarry footprints, as set out on drawing (Ref: CE-MQ1458-DW01).

The restoration scheme will aim to compliment the local surroundings, using materials which aim to minimise the need for any hard engineering. The basis of this approach is that there is an observed natural improvement in the water discharged through the existing marshy wetland area to the south of the Eastern Quarry. The scheme will seek to replicate, as far as practical, the conditions already on site with a view to provide a further natural improvement in the water discharged.

The scheme will focus particularly on the restoration of the Eastern Quarry where presently there is an area of exposed rock surface, following removal of soil and vegetation from this location some years ago. The Western Quarry will also be subject to additional works to manage the surface runoff and routing of the flows to encourage improvements. This will be done where it is practical noting the limitations of both the areas available in the Western and Eastern Quarries.

Despite the drainage from the site meeting its respective discharge limits, the benefits of restoring the site and replicating marshy wetland areas aligns with the aspiration to deliver improvements in the discharges. Whilst the site specific conditions are relatively unique there are examples of passive restoration schemes working to make drainage improvements.

In order to develop this approach and deliver the restoration proposal we have appointed Keith Knox from Knox Associates and Crestwood Environmental to support in delivering the scheme. Both are familiar with land restoration and passive wetland type approaches, and their input and advice has shaped the initial scheme outlined in this document.

We have also reviewed data collected from passive systems incorporated at other sites operated by our business, where transitional areas are incorporated into an overall passive management system and act as a type of wetland in order to improve the nature of water managed at the site.

In particular we have examples where transitional areas have been created in order to slow the flow of the water at shallow or saturated water depths, provide prolonged contact times between water and media surfaces within these areas and encourage a diverse community of micro-organisms to build up which are capable of breaking down or transforming a wide variety of substances.

By adopting a similar design approach by incorporating the basic principles of a semi passive wetland area at Maendy this should support an improvement in the discharge water quality.

Drawing CE-MQ1458-DW02 sets out the areas in the west and east quarry which are to be restored in line with the improvement programme set out in Table S1.3.

Whilst recognising the limitations on space and variability in the flow rates, the initial design seeks, where possible, to achieve improvements in both discharges at the site.

The receiving water environment is likely to benefit most from the restoration scheme's ability to deal with lower flow conditions at the site. It is apparent there may be relatively higher potential impacts to the water environment at lower flow conditions compared to the higher flow conditions, where it appears that rainfall events of varying intensities generate significant flashy runoff as a response. In reviewing the recorded flow data, peak flow rates occur at both discharge points very quickly in response to rainfall events.

During low to medium flow conditions the rainfall related site drainage from the Western Quarry will be directed through the western restoration area and then intercepted before reaching discharge point MAE002. It will then be pumped to the Eastern quarry where it will then pass through a wetland area and the existing marsh wetland area prior to discharge via MAE001.

## **5. Western Quarry Restoration Proposal**

The Western Quarry was previously restored in the 1970's and is well vegetated. Therefore the area identified in the Western Quarry for further restoration is a smaller overall area than that identified in the Eastern Quarry.

Rainfall related site drainage in the Western Quarry currently sheds to the western boundary which drains via a weir box and discharges to the local surface watercourse at the quarry perimeter at MAE002. There are periods when there are no flows through Maendy MAE002.

Drawing CE-MQ1458-DW03 sets out the proposed restoration scheme for the Western Quarry surface. The following points below sets out the aims of the restoration scheme:

- Drainage flowing down towards MAE002 will be shed to the west where the western restoration area will incorporate some additional material and shallow re-profiling of the area to assist in attenuating flows.
- A mixture of restoration materials such as organic matter and/or wood bark will be used. The restoration material depth will generally be relatively shallow given the topography of the area. This should also allow the water to have access to oxygen and allow contact with the material and microorganisms.
- It is envisaged that during low to medium flow conditions (which are anticipated to be in the range of 0m<sup>3</sup> to 50m<sup>3</sup>/day) site drainage collected will be pumped to the restoration area in the Eastern Quarry.
- During higher flow rainfall events (volumes above 50m<sup>3</sup>/day) site drainage will be allowed to discharge to the local surface watercourse at the quarry perimeter at MAE002. At these higher flow rates only limited benefit will be obtained from passive wetland systems.

## 6. Eastern Quarry Restoration Proposal

Water in the Eastern Quarry flows across the exposed rock head before entering a marshy area to the south of the quarry and then flows via a weir box prior to discharging to the local surface water network. This discharge point is referenced MAE001.

The area proposed for restoration in the Eastern Quarry covers the existing exposed quarry rock head and an area to the north east of the Eastern Quarry footprint. Drawing Ref: CE-MQ1458-DW03 sets out the proposed restoration scheme and is as described below:

- The aim of the restoration scheme here is to replicate the marsh wetland area located to the south of this quarry area.
- It is envisaged that during low to medium flow conditions, which are anticipated to be in the range of  $0\text{m}^3$  to  $150\text{m}^3/\text{day}$  site drainage passively flow through the Eastern Quarry restoration area.
- During higher flow rainfall events, volumes above  $150\text{m}^3/\text{day}$  will be allowed to flow into the exiting southern marsh wetland area, which in turn discharges into MAE001. At these higher flow rates only limited benefit will be obtained from passive wetland systems.
- The area identified for restoration is approximately  $9,000\text{m}^2$ , with the area of the exposed rock head in the quarry base being approximately  $4,100\text{m}^2$ .
- The proposed design would aim to optimise the attenuation time and maximise flows paths through the quarry area. Given the limitations of the area available and noting the flow paths set out on Drawing CE-MQ1458-DW03 a flow length of approximately 330m may be possible through the restoration area.
- The restoration area will seek to ensure both sub-surface and above ground flow paths, by incorporating passive flow control. This should assist in encouraging an improvement in quality in line with the approach set out in Section 4 above.
- The depth of the wetland media will be no greater than 0.9m, noting that greater depths may not achieve as effective improvement, as oxygen penetration is less likely in the lower areas of the restored surface.
- The restoration area will be designed to allow a steady flow in order to assist in mixing, allow the site drainage to have access to oxygen and for maximum contact with the media. The area will be restored with an elongated flow path to provide these conditions, as set out on Drawing CE-MQ1458-DW03.
- Taking into account the area of restoration, the retention time in the wetland could range between 3 and 8 days depending on flows.



- As with the Western Quarry, the restoration material will be a mixture of organic matter / wood bark and also gravel beds. The performance of any material will be reviewed over time in accordance Improvement Condition 4.
- Stone beds maybe included across the width of the wetland at two locations to assist with:
  - passive level control
  - normalisation of flow to ensure that the site drainage is in contact with the activated growth / micro-organisms on the media
  - Allows access across the wetland for monitoring and maintenance

## **7. Summary**

An initial scheme has been developed based on both the historic data and current site performance and is set out in this document and associated drawings.

The scheme proposes an approach to passively improve the quality of water discharged through the permitted discharge points by incorporating restoration measures to attenuate and route flows using a mixture of material such as organic matter / wood bark.

This will assist in encouraging extended contact times between site drainage and media surfaces within these areas and encourage a diverse community of micro-organisms to build up in the restored surface. The micro-organisms are capable of breaking down or transforming a wide variety of substances, which will assist in improving the nature of the discharges.

Whilst it may not be possible to accurately predict the extent of the improvement in performance, a review of restoration scheme will be undertaken in accordance with Improvement Condition 4.

Subject to approval of this outline scheme, the final design for restoration and an outline construction programme will be prepared and submitted to NRW.

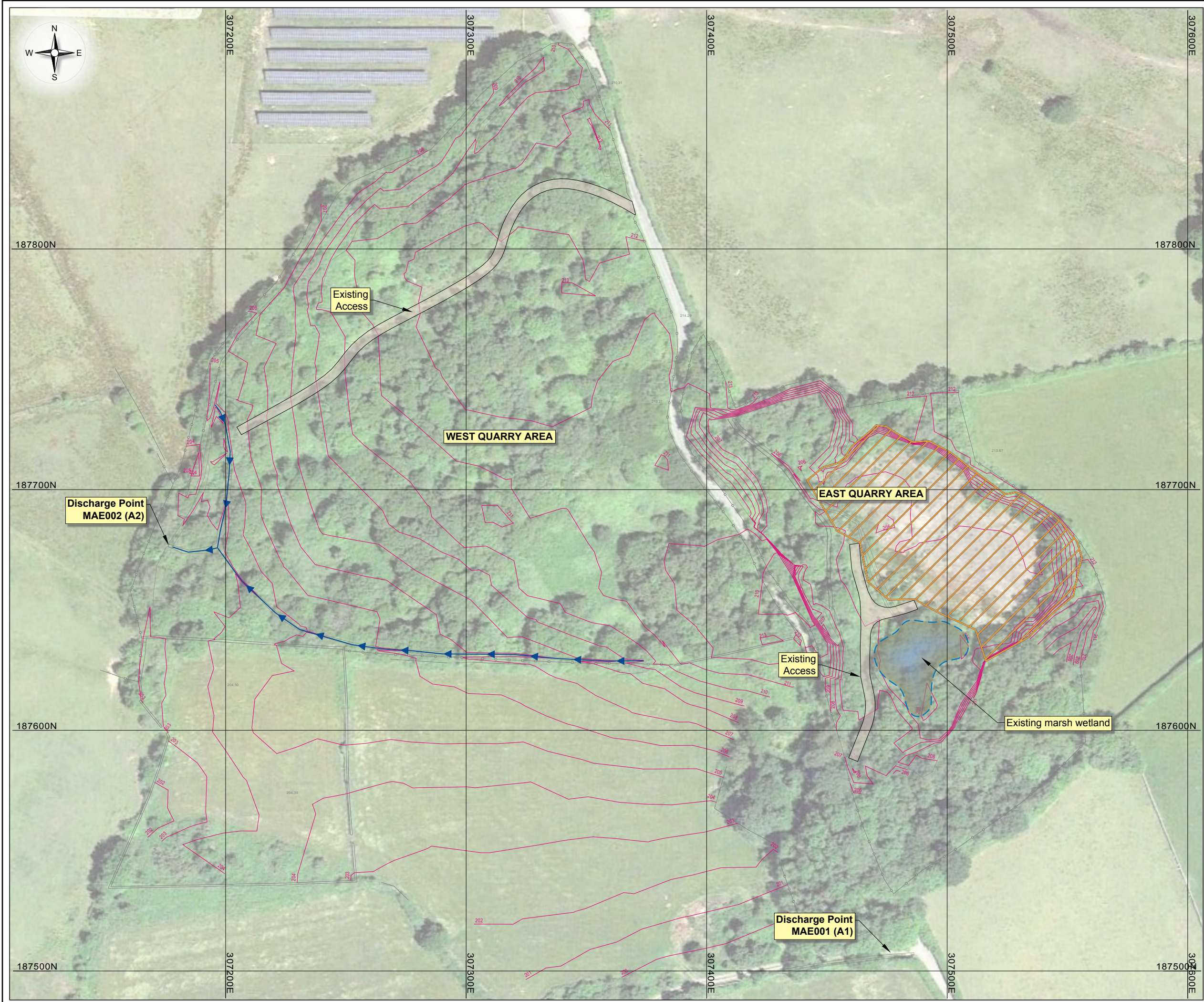
## Appendix A Site Drawing

**CE-MQ1458-DW01**

**CE-MQ1458-DW02**

**CE-MQ1458-DW03**





Legend:

- Existing rockhead area in East Quarry
- Access tracks
- Existing Site (Survey) Contours
- Existing ditch

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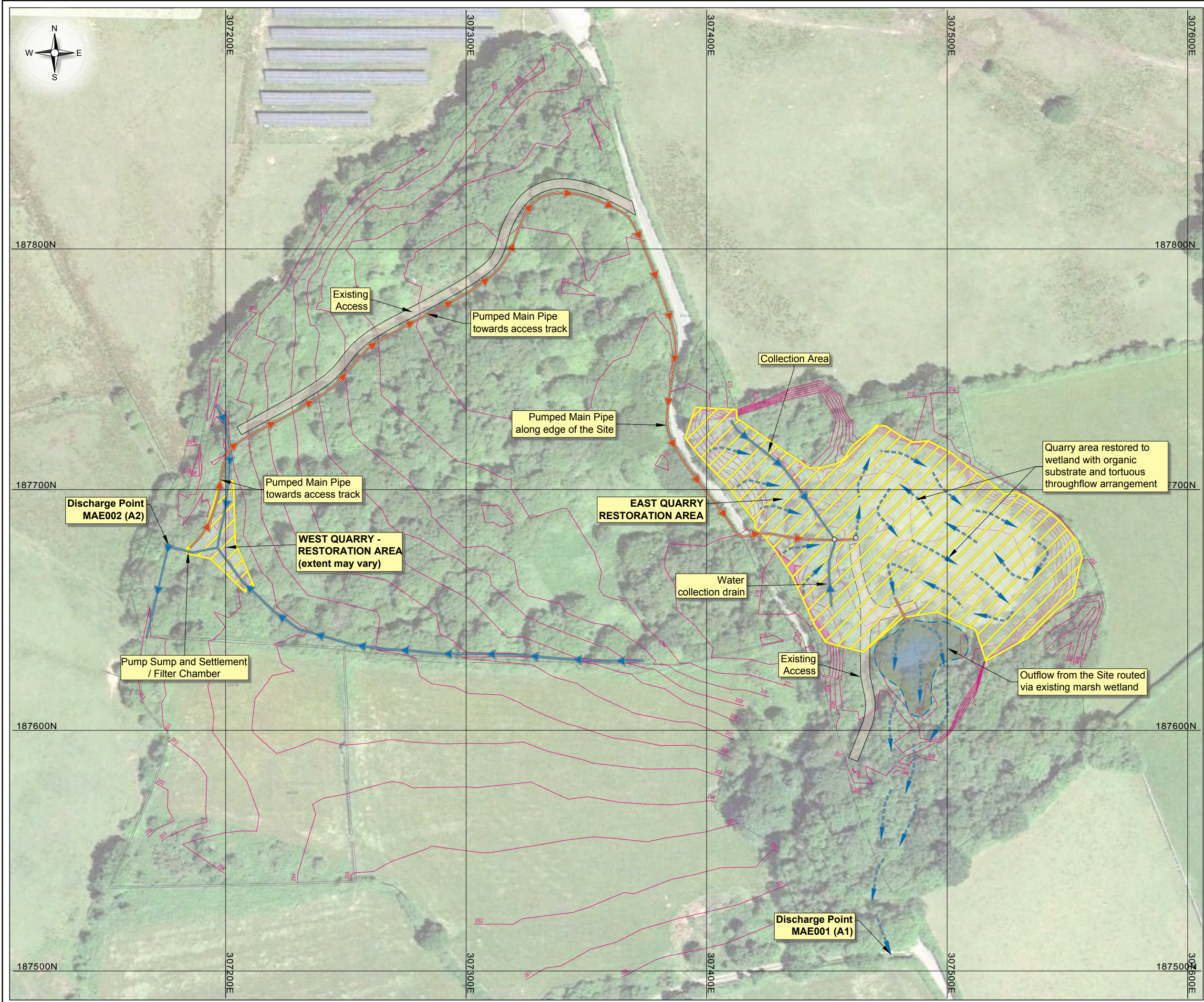
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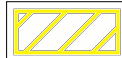
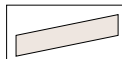
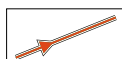

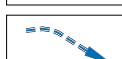

Client:

Site: <b>MAENDY QUARRY LANDFILL</b>			
Drawing Title: <b>Existing Situation</b>			
Date: 16 Jan 2019	Scale: 1:1,500	Paper Size: A3	
Drawn By: KJ	Checked By: CLIENT	Status: Final	Final Revision: -
CAD Ref: CE-MQ1458-DW01 - FINAL		Drawing No: <b>CE-MQ1458-DW01</b>	





Legend:

-  Overall Restoration Area
-  Access tracks
-  Proposed pipe routes (with flow direction)
-  Collection / transfer ditches
-  Surface / subsurface flow routes
-  Existing Site (Survey) Contours

© Google Earth aerial backdrop (2018)

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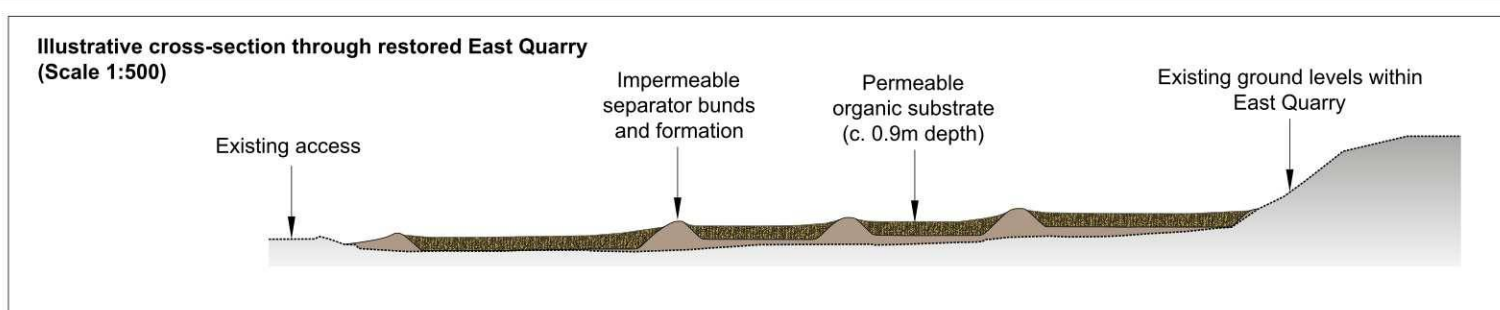
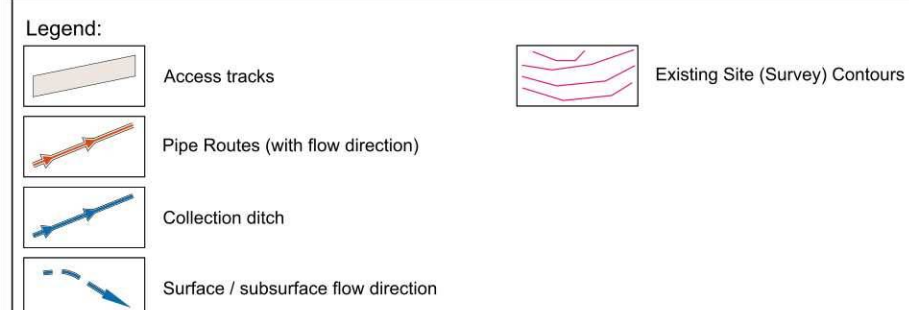
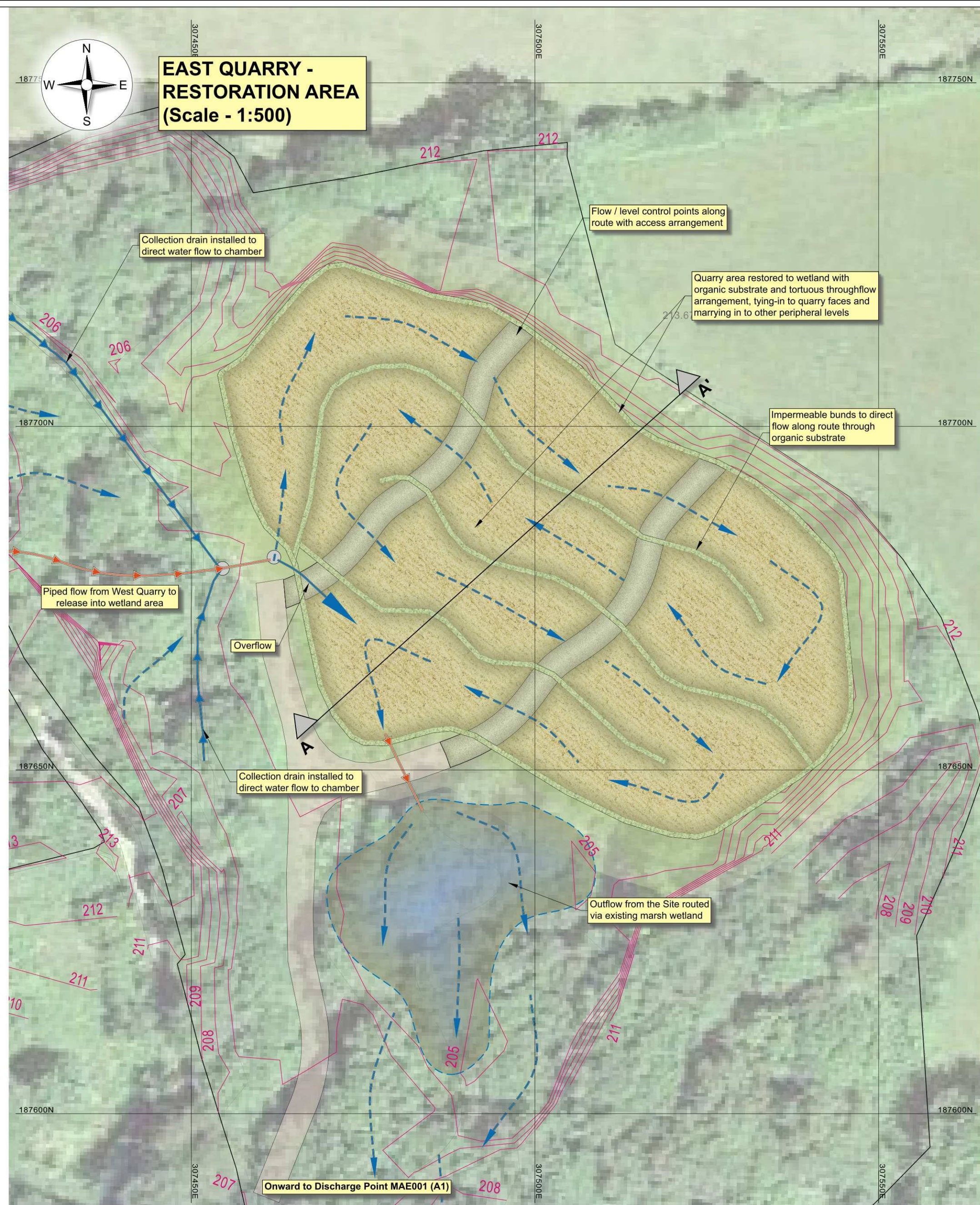


Client:



Site: <b>MAENDY QUARRY LANDFILL</b>			
Drawing Title: <b>Restoration Overview Plan</b>			
Date: 17 Jan 2019	Scale: 1:1,500	Paper Size: A3	
Drawn By: KJ	Checked By: CLIENT	Status: Final	Final Revision: -
CAD Ref: CE-MQ1458-DW02 - FINAL		Drawing No: <b>CE-MQ1458-DW02</b>	





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Final Revision: -  
Date: -  
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Site:  
**MAENDY QUARRY LANDFILL**

Drawing Title:  
**West and East Restoration Scheme**

Drawn By: KJ	Checked By: CLIENT	Date: 17 Jan 2019	Scale: As shown	Paper Size: A3 (594x420 mm)
Status: Final	Final Revision: -	CAD Ref: CE-MQ1458-DW03 - FINAL	Drawing No: <b>CE-MQ1458-DW03</b>	