

EDEN DEEP GEOTHERMAL PLANT

CONSTRUCTION ENVIRONMENTAL
MANAGEMENT PLAN

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List of abbreviations used within Report

AIA	Arboricultural Implications Assessment
AMS	Arboricultural Method Statement
BRE	Building Research Establishment
CC	Cornwall Council
CEMP	Construction Environmental Management Plan
COSHH	Control of substances hazardous to health
CTMP	Construction Transport Management Plan
dB(A)	Decibel (A-weighted)
EA	Environment Agency
EGSE	EGS Energy Ltd
ha	Hectare
HA	Highways Agency
L _{Aeq}	A-weighted equivalent continuous sound level over the duration of an event
mph	Miles per hour
PB	Parsons Brinckerhoff Ltd
PPE	Personal Protective Equipment
QUENSH	Quality, Environment, Safety & Health
SuDS	Sustainable Drainage System
SWMP	Site Waste Management Plan
TPO	Tree Protection Order
WAC	Waste Acceptance Criteria

1 INTRODUCTION

1.1 Background

1.1.1 Parsons Brinckerhoff (PB) have been appointed by EGS Energy Limited (EGSE) to prepare a Construction Environmental Management Plan (CEMP) for the delivery of the proposed Eden Deep Geothermal Plant. This document provides information in relation to the planning and implementation of construction activities in accordance with environmental commitments identified within the Environmental Statement and the planning conditions. The purpose is to reduce the risk of adverse impact of construction on sensitive environmental resources and to minimise disturbance to local residents. The objective of this report is to demonstrate that appropriate checking, monitoring and audit processes will be implemented to ensure works are undertaken in an appropriate manner, together with measures to ensure that appropriate corrective actions or mitigation measures are taken.

1.1.2 The CEMP is a live document and should be updated as the construction phase of the works progresses with any additional information as required.

1.1.3 The *principle contractor* will establish working practices and procedures to further augment and support the CEMP.

1.1.4 This report specifically addresses the following:

- a Planning of Works
- b Site specific & environmental control measures
- c Control of construction processes

1.2 Construction Method Statement

The Scheme

1.2.1 The construction of the proposed Eden Deep Geothermal Plant will comprise two phases:

- Phase 1: Drilling, stimulation and testing of the wells;
- Phase 2: operation of the geothermal plant.

1.2.2 This document pertains to the construction of the site, within Phase 1.

1.2.3 Phase 1 will principally involve drilling two wells to a depth of approximately 4.5 km. Both wells will be cased to a depth of

approximately 4 km, leaving approximately 500 to 800 m of open-hole at the base. Each well will commence vertical and at a suitable depth will start to be deviated until achieving a maximum inclination of 30° at a depth of 4 km.

- 1.2.4 The first activity will be to prepare the site at Eden for the drilling operations). The first well will be drilled and completed to total depth. The creation of the underground reservoir will involve injecting a large volume of water (up to 30,000 m³) at relatively high flow rates (up to 100 l/s) into the open-hole section of the well to open natural fractures within the granite. The growth of this reservoir will be monitored using a network of sensitive seismometers placed both at surface and at shallow depth (100 m) at distances of up to 5 km around the site. Once the reservoir has been created to sufficient size, the second well will be drilled to intersect it on a similar trajectory to the first well. The precise design of this will be dependent on in-situ conditions.
- 1.2.5 The reservoir will form the closed-loop system through which water pumped down the injection well will be circulated to collect heat before returning to surface via the production well. At surface, the heated water will pass through a heat exchanger, supplying the power plant, before it is re-injected as cooled water down the injection well.
- 1.2.6 It is estimated that the drilling rig will be on site for approximately 10 months. Once both wells have been completed the drilling rig will be de-commissioned. The reservoir will then be circulated to ascertain its characteristics and based on this the specifications for the power plant can be identified. The plant will be designed and built by a specialist company and its components will be delivered on-site for construction.

Land Required

- 1.2.7 The facility is to be located within the northern extreme of the Eden Project estate, adjacent to the main public entrance. The Eden Project estate is itself located at Bodelva, near Par in Cornwall.
- 1.2.8 The site area covers an area of approximately 3.0 ha.
- 1.2.9 The site is surrounded by Cornish hedgerows. Much of the site has been overlaid with inert spoil and is overgrown with marshy grassland and scrub. A central part of the site hosts a wet broadleaf woodland and a pond.
- 1.2.10 The site is currently unused.

1.3 People

Contract Site Manager

1.3.1 The Contract Site Manager is the construction specialist and an individual working for the Main Contractor having day-to-day responsibility for Health and Safety, Environmental and Quality performance throughout the construction period. This person will ensure that appropriate resources are made available, and any necessary environmental controls or mitigation measures are implemented. The Contract Manager report to the Main Contractor's Board of Directors and the Project Manager.

Environmental Clerk of Works

1.3.2 The Environmental Clerk shall have experience of the environmental aspects of construction for major highways projects together with good communication skills.

1.3.3 The key responsibilities include:

- a Help develop and review the CEMP.
- b Review and approve method statements for environmental aspects prior to work starting.
- c Monitor construction activities and performance to ensure that identified and appropriate control measures are being effective and ensure compliance with the CEMP.
- d Act as a main point of contact between the regulatory authorities and the Project on environmental issues.
- e In conjunction with the environmental specialists, overall monitoring of the programme for environmental works, and provision of status reports as necessary.
- f Provision of advice and liaison with the construction teams to ensure that environmental risks are identified and appropriate controls are developed and included within method statements and risk assessments.
- g Management of the environmental monitoring programme and review the routine reports.
- h Environmental audit of subcontractors and suppliers.

Site Waste Co-ordinator

1.3.4 The Site Waste Manager reports to the Contract Manager and is responsible for overall waste management issues arising from the

project. The Site Waste Co-ordinator is responsible for engendering a culture of waste minimisation throughout the contract.

1.3.5 CC wish to maintain high waste management performance levels on site and targets have been set for the construction period. These are discussed further in the Site Waste Management Plan (SWMP). Separate waste monitoring will be required and this should be undertaken weekly. This will involve the following:

- a Visual inspection of waste storage areas to ensure they are contained and managed properly;
- b Visual inspection of material recycling areas to ensure they are contained and managed properly;
- c Check workforce recycling bins and replace when required;
- d Check all waste containers for leaks;
- e Ensure the SWMP is updated and all waste transfer notes are complete;
- f Ensure checks are undertaken to ensure waste is being transported to the correct waste disposal facilities

1.3.6 The completed waste monitoring sheets should be attached to the SWMP.

Environmental Specialists

1.3.7 Environmental specialists will support the project as required to provide the mitigation measures described either in the CEMP or in response to particular construction activities that may otherwise present an environmental risk. Their role is to undertake the detailed mitigation design within their specialist field, oversee its implementation, maintenance and monitoring throughout the construction period up to the end of the maintenance period.

2 PLANNING OF WORKS

2.1 Introduction

2.1.1 Specific proposals for the operation, phasing, timing and sequencing of the works are currently being developed by the principle contractor, working closely with the Design Manager.

2.2 Register of Environmental Impact

2.2.1 The various risks identified in the surveys and reporting statements together with any subsequent risks resulting from design development, the contractors selected methods of working, changing site conditions etc. have been identified. Risks have been highlighted under the following headings:

- a External Traffic Routing
- b Internal Vehicle Routes
- c Construction Operation and Delivery Times
- d Construction Lighting
- e Dust Suppression and Mud Control
- f Noise Controls
- g Site Compound Locations
- h Car Parking Arrangements
- i Construction Vehicle Movements
- j Landscape Character, Visual Amenity & Ecology
- k Archaeology
- l Geology, soils and water
- m Waste

2.2.2 The site specific and environmental controls associated with the areas of potential impact are discussed further in Chapter 3: Site Specific Environmental Control.

2.3 Risk Assessments

2.3.1 All activities undertaken on site will be subject to a risk assessment. Risk assessments will be undertaken by trained staff following an approved procedure which will:

- a Identify the significant environmental and Health & Safety impacts that can be anticipated;

- b Assess the risks from these impacts;
- c Identify the control measures to be taken and re-calculate the risk;
- d Report where an inappropriate level of residual risk is identified so that action can be taken through design changes, re-scheduling of work or alternative methods of working in order to reduce the risk to an acceptable level;
- e The results of risk assessments, and their residual risks are only considered acceptable if; the severity of outcome is reduced to the lowest practical level; the number of risk exposures are minimised; all reasonably practical mitigating measures have been taken and the residual risk rating is reduced to a minimum;
- f The findings of the risk assessment and in particular the necessary controls will be explained to all operatives before the commencement of the relevant tasks using an agreed instruction format.

2.4 Method Statements

- 2.4.1 Implementation method statements will be completed by the *principle contractor* and/or *sub-contractor* by trained engineers or other appropriate experienced personnel, in consultation with specialists. Their production will include a review of the environmental / Health & Safety risks and commitments, so that appropriate control measures are developed and included within the construction process.
- 2.4.2 Method statements will be reviewed by the *principle contractor's* Environmental Manager and, where necessary, by an appropriate environmental specialist. Where appropriate, method statements will be submitted to the regulatory authorities (Environment Agency, Highways Agency, English Nature, Environmental Health Officer etc.) as required.
- 2.4.3 Method statements will contain as a minimum:
 - a Location of the activity and access / egress arrangements;
 - b Work to be undertaken and methods of construction;
 - c Plant and materials to be used;
 - d Labour and supervision requirements;
 - e Health, safety and environmental considerations;
 - f Permit or consent requirements.

2.5 Site Environmental Standards

2.5.1 These will be agreed with the Clients Environmental Manager and detail the minimum measures that will be achieved for general operations that fall outside the risk assessment / method statement procedure designed to cover the majority of construction activities.

2.6 Environmental and Social Targets

2.6.1 To help achieve and maintain high levels environmental and social performance for the construction, specific targets have been set and are listed below in order of priority.

- a Ensure no pollution incidences occur;
- b Ensure no enforcement actions;
- c Divert as much waste from landfill as possible;
- d Ensure all environmental mitigation is implemented and monitored where appropriate.

2.6.2 The achievement of these targets should be reported in the Contractor's Report and be monitored through the Environmental Site Monitoring process outlined in the section above.

2.7 Training, Awareness and Competence

2.7.1 The raising of environmental awareness is viewed as a crucial element in the appreciation and implementation of the CEMP. All staff will undergo environmental awareness training, initially by way of the pre-start induction process. A project specific training plan that identifies the competency requirements for all personnel allocated with environmental responsibilities would be produced and would be contained within the CEMP.

2.7.2 Training for all personnel identified in the training plan will be completed before commencement of the associated construction activities. Line managers and supervisors will ensure that all personnel engaged in activities that may have an impact on the environment are competent to carry out their duties or, where necessary, arrange for suitable training to be undertaken.

2.8 Supervision of Construction Activities

2.8.1 All construction and installation activities including those carried out by subcontractors and suppliers will be supervised, or regularly checked through the completion of site inspections by the *principle contractor's* Environmental Manager, to ensure that requirements identified in risk assessments or method statements are implemented.

2.8.2 The frequency and extent of this supervision will vary according to the degree of competence displayed by the workforce and the level of risk.

2.9 Environmental Inspection and Reporting

2.9.1 The *principle contractor's* Manager will carry out an assessment of the project's environmental performance, based on reports from the environmental specialists and site environmental monitoring sheets. This will be carried out at a frequency no less often than at monthly intervals but could be held more regularly depending on the nature of the construction activity. An assessment of the performance over the month would be made and quantified. A monthly *contractor's* report detailing performance for the period will be provided to the project manager and will include a summary of environmental inspections completed, audits undertaken, complaints and incidents.

2.9.2 Cornwall Council (CC) will be informed of any significant environmental occurrences on site together with any complaints reported to the contractor by members of the public.

2.9.3 All environmental complaints received will be reported to the Environmental Manager and logged in a Complaints Register, which shall be available for review by the Contract Manager. These will be investigated in the following manner:

- a Contact with contractor/consultant or Environmental Manager for report on activity;
- b Site visit to determine whether the source of complaint can be identified;
- c Corrective action where relevant;
- d Subsequent reporting of source of complaint where appropriate;
- e Follow-up with complainant as necessary.

2.9.4 The Environmental Manager will, as necessary, provide details to project delivery team and also to the relevant statutory environmental agencies or local authorities if required.

2.10 Communication and Co-ordination

2.10.1 Project communications will be assisted by way of regular team meetings as follows:

- a **Weekly team meetings**
Weekly meetings chaired by the *Contractor's* Environmental Manager will be held to review performance and co-ordinate short-term planning of forthcoming activities. Environmental

management representatives will use these meetings to report on the findings of their inspections together with any systematic or recurring issues.

b Monthly review

Environmental issues will be discussed at monthly project meetings chaired by the *Contract Manager* and attended by the *Contractor's* Environmental Manager, the *Client's* Environmental Manager and when necessary, environment specialists and representatives from statutory consultees.

2.10.2 The Project Environmental Review will:

- a Consider past performance from inspections, audit reports and monitoring data;
- b Plan actions required to mitigate forthcoming risks;
- c Disseminate best practice.

2.10.3 A Project Community Liaison Plan will be established by the *principle contractor* to provide a framework for managing communications with local residents. This will include details of how residents will be informed of significant construction processes by a letter drop and how residents can raise concerns.

2.11 Site Inductions

2.11.1 Everyone intending to work on site must first attend the *principle contractor's* induction.

2.11.2 At the induction, details of the site rules and other related items (e.g. project outline, the main site hazards, organisational arrangements, emergency and evacuation procedures etc.) will be discussed. At the induction, all personnel will be asked to provide evidence of appropriate competence.

2.11.3 Any site visitors or sub-contractors must undertake the *principle contractor's* Site Induction.

2.11.4 All those who have attended the Induction Course must sign a Quality, Environmental and Safety & Health (QUENSH) Induction Training Attendance Form.

2.12 Biodiversity Impact Assessment

2.12.1 A Biodiversity Impact Assessment has been undertaken for the scheme. The CEMP has used and incorporated the environmental mitigation measures stated within it; these are identified in the individual Environmental Control Plans.

3 SITE SPECIFIC ENVIRONMENTAL CONTROL

3.1 Introduction

3.1.1 The following section explains the Environmental Control Plans which will be implemented on-site. Potential environmental and social constraints are discussed and mitigation stipulated. The workforce should be made aware of these measures through the site induction process and their progress monitored.

3.2 Air Quality

Introduction and Background

- 3.2.1 The works have the potential to affect air quality as a result of:
- a Dust from construction activities;
 - b Exhaust emissions from plant, and on and off site construction vehicle movements.
- 3.2.2 The operational stage of the scheme is expected to improve air quality levels by reducing congestion levels, however, construction dust and emissions from site plant will need to be monitored closely throughout the construction period.
- 3.2.3 The best practice techniques should be implemented on-site to ensure no negative air quality impacts occur during the construction period.
- 3.2.4 Dust from construction activities has been identified as the primary concern.
- 3.2.5 Appropriate site specific mitigation measures should reduce any adverse air quality risks.
- 3.2.6 The principal sources of dust were identified as haulage activities, materials handling and storage, plant emissions, earthworks, demolition, and construction and fabrication processes.
- 3.2.7 With prevailing winds from the south west, properties to the north-east of the proposed scheme and specifically those within 100m of construction works were considered to be at greatest risk of impacts.

Mitigation

- 3.2.8 The following mitigation measures should be implemented on site:

Site Planning

- a Consideration of weather conditions, dust generating potential of material to be excavated prior to commencement of works;
- b Plan site layout to maximise distance from plant/stockpiles etc. to sensitive receptors;
- c Dusty materials should be removed from site as soon as possible.

Construction Traffic

- d Loads entering and leaving the site with dust generating potential should be covered and wheel washing facilities made available;
- e No idling of vehicles;
- f Vehicles to comply with site speed limit of 10 mph;
- g Water assisted sweeping of local roads to be undertaken if material tracked out of site;
- h Install hard surfacing as soon as practicable on site and ensure that they are maintained in good condition.

Site Activities

- i Exposed soils should be re-vegetated as soon as practicable.
- j Minimise dust generating activities, particularly during prolonged dry, dusty weather unless damping / other suppressants are used;
- k Ensure an adequate water supply to site and use water as dust suppressant where applicable;
- l Ensure any site machinery is well maintained and in full working order;
- m Ensure equipment available for cleaning spills etc. available at all times;
- n Sand and aggregates should be stored away from sensitive receptors and screened/shielded.

3.3 Ecology WorksIntroduction and Background

- 3.3.1 Ecological survey work started on the scheme in September 2010, and protected species surveys were undertaken in 2011.

- 3.3.2 Impacts arising from construction activities of the proposed scheme are:
- a Habitat loss;
 - b Habitat fragmentation;
 - c Disturbance from visual, noise, dust and lighting impacts;
 - d Increased mortality for the species present during site clearance and construction;
 - e Pollution, principally in the form of increased dust and lighting, or possibly by the incidental release of chemicals, fuels or waste materials.

- 3.3.3 During construction, Jenny Stuart from Cornwall Environmental Consultant will provide the role of Ecological Clerk of Works

Habitat Surveys

- 3.3.4 Detailed species surveys have been undertaken for the following species and species groups:
- a Bats
 - b Dormice
 - c Breeding birds
 - d Reptiles
 - e Invertebrates

- 3.3.5 The following mitigation measures have been stipulated in the Environmental Statements and are site specific.

- 3.3.6 The full details of the mitigation, protection and enhancement measures will be contained in the individual ecological surveys and reports which may be found in the Appendices.

Generic Mitigation

- 3.3.7 For generic mitigation, the following hierarchy of measures should be followed:
- a Avoidance / prevention
measures taken to avoid or prevent adverse effects, for example, scheme layout or timing of site works;
 - b Reduction / mitigation
measures taken to reduce adverse effects, for example, retaining walls or pollution interceptors; and

- c Compensation / offsetting measures taken to offset significant residual adverse effects, i.e. those which cannot be entirely avoided or mitigated to the point that they become insignificant; for example, habitat creation or enhancement.

3.3.8 In accordance with the hierarchy of mitigation proposed above, the *principle contractor* will implement the following measures shown in Table 3.1.

Table 3.1 Generic Mitigation measures for Ecology

Ecology Issue / Category	Control Measures
Ecology Management Plan	<ul style="list-style-type: none"> • Implementation of the CEMP by the Principal Contractor(s); and a Works Method Statement(s) developed to illustrate how impacts on ecology and biodiversity would be managed throughout the construction process. • Good construction site management would be implemented to avoid / minimise generation of excessive litter, dust, noise and vibration. • Measures would be implemented to avoid / minimise potential for fuel and chemical spills. • There would be no storage of potentially contaminating materials in areas of hydrological sensitivity.
Work Compounds	<ul style="list-style-type: none"> • Work compounds and access tracks etc. would not be located in, or adjacent to, areas that maintain habitat value. • Establish site fencing by erecting to prevent access to areas outside working areas, particularly in areas adjacent to features of interest / value.
Materials Storage	<ul style="list-style-type: none"> • Procedures would be implemented to address site safety issues, including storage of potentially dangerous materials (see sections 3.9 and 3.10).
Biodiversity	<ul style="list-style-type: none"> • Briefings and instruction would be given to staff and contractors regarding the biodiversity issues associated with the site.
Best Practice / Site Management Procedures	<ul style="list-style-type: none"> • Workforce would be restricted to working areas through the erection of fencing, to prevent additional damage; • Cover trenches over night to prevent wildlife (for example, badgers) from falling in, and becoming trapped resulting in injury or death; • Best practice methods would be followed throughout; and • Protocols and contingency plans would be established to deal with incidents should they arise.
Landscaping	<ul style="list-style-type: none"> • All new landscape plantings are to be locally typical and/or species native to the south west region, to complement the semi-natural habitats of the local area in line with the proposed scheme design.

Flora

Wet Woodland

3.3.9 Approximately 0.38ha of woodland, just under 50% of the wet woodland, will be removed under the proposals. The loss of this

woodland will be mitigated in the long-term by the replanting of an equivalent area (0.46ha) within the site. The planting will link the woodland within the centre of the site with the western hedgerow boundary.

3.3.10 This planting can only be completed once construction of the new facility has been completed as part of the area will be required to provide a new haul route around the construction area. The species of tree selected for the new woodland will mirror that of the woodland being removed. Soils from within the existing woodland will be collected and re-spread in areas of new planting to ensure that the seed-bank within the woodland is also translocated.

3.3.11 In the short term the loss of woodland is considered to be a significant impact on this habitat of local value. In the long term the impacts will be to an extent mitigated by the new planting, although it is noted that it will take many years for the newly planted woodland to reach the maturity of the existing woodland.

Cornish Moneywort

3.3.12 Cornish Moneywort has been recorded within the south western section of the site. It is unlikely given the location of the plant that it will be possible to retain the plant in situ. A translocation of this species is therefore proposed. This will be done by cutting turfs within the areas in which Cornish Moneywort have been identified and transferring these cut turfs into an area in the north of the site, adjacent to the balancing pond where conditions will be considered suitable. This species requires damp ground that occasionally floods, therefore a location on the fringes of the attenuation pond (at or above the high water mark) will provide an ideal habitat.

3.3.13 The science team from the Eden project have also taken some cuttings from this plant and are propagating these within their greenhouses. During landscaping works an area of the site surrounding the attenuation pond will be prepared to receive the propagules.

3.3.14 This multifaceted approach to protecting the Cornish Moneywort should ensure that upon completion of construction the conservation status of this species has been protected and most probably enhanced by the proposals.

3.3.15 The physical translocation of Cornish Moneywort involved removing clumps of individuals by hand as large turfs and replanting in early Spring 2011 as described in the 'Ecology Mitigation Summary' report, which may be found within the appendices of this document.

Japanese Knotweed Strategy

- 3.3.16 A number of discrete stands of Japanese knotweed have been identified on the site and wherever possible these stands will be left undisturbed and protected by appropriate fencing during the construction period. This will enable continued herbicide treatment of the plant in situ. In the event that stands of Knotweed lie within construction zones the plant and soils for approximately 7m³ surrounding the plant will be excavated and stored on a geotextile membrane within the site. Treatment of the soils and vegetative material within this stock pile will continue to be treated.
- 3.3.17 Tests will be conducted on the Knotweed within each stand being treated with herbicides. Where tests confirm that Japanese knotweed is reproductively unviable, the dead vegetative material and soil which has been contaminated with herbicides can be used as infill material. The intention is to use this material to fill the very deepest excavations on site. Any material placed into the ground will be capped with a geotextile membrane as a precautionary measure to ensure that the plant cannot regrow.
- 3.3.18 The mitigation of the Japanese Knotweed commenced in January 2011 and was undertaken in-house by the Eden Project following accepted protocol and guidelines as described in the 'Ecology Mitigation Summary' report, which may be found within the appendices of this document.

General Flora

- 3.3.19 Any clearance of vegetation to be undertaken in the winter months shall be undertaken under a watching brief from the Ecological Clerk of Works.
- 3.3.20 All green waste will be separated and re-used on site where possible. Any remaining should be recycled.

Fauna*Dormice*

- 3.3.21 The development will result in the loss of approximately 0.43ha of woodland and scrub along the southern boundary of the woodland. Dormice tend to live at low densities, with the average population density, of around 2.2 dormice/ hectare¹. Based on this density, and the fact that the site is only 2.8 hectares in size, of which <50% contains suitable dormouse habitat, it can be assumed that the site currently only provides habitat for approximately 1-2 dormice, which

has been classified as a small population. Furthermore, given that dormice were only identified on the site on a single occasion it might also be assumed that the suboptimal nature of habitats on site means that the habitats are only used on an occasional basis by dormice. On this basis, the short-term unmitigated impacts would be considered to be of low magnitude and significance and following the implementation of the mitigation measures identified below the short-term mitigated impacts and long-term impacts would be considered neutral.

3.3.22 Mitigation will be required to ensure that the favourable conservation status of dormice is protected during the construction and operational phases of the development, and that offences under the Habitats Regulations (2010) and the Wildlife and Countryside Act (1981) are not committed.

3.3.23 The mitigation strategy for dormice is set out below.

a Site Clearance

Vegetation removal will follow the standard winter clearance methodology set out within the Dormouse Conservation Handbook (The Dormouse Conservation Handbook, English Nature (2006)). Following clearance of suitable habitats the site will be protected until Dormice emerge from hibernation and disperse into adjacent retained suitable habitat. Once dormice are known to have emerged from hibernation the tree stumps and roots of trees will be removed and the area would be considered clear of dormice.

b Protection of Retained Habitats

The hedgerows surrounding the site and the woodland within the centre of the site will continue to provide suitable habitat for dormice. Close boarded fencing will be erected adjacent to the hedgerows and surrounding the retained northern section of woodland. This will control artificial light spillage into the hedgerow, which has the potential if left uncontrolled to reduce the value of retained habitat.

c Minimising Fragmentation

Any dormice within the wet woodland within the centre of the site will be fragmented from other areas of suitable habitat and other populations of dormice once the southern section of the woodland is cleared. To address this, a new area of planting will be provided which will aim to connect the western boundary of the site with the woodland. This will be in the form of a hedgerow. Mature standard trees and willow whips will be used to ensure that the new hedgerow quickly develops as a feature which dormice will be able to disperse through. It is noted that a degree of fragmentation caused by a construction haul route around the

woodland will occur, however given the suboptimal nature of the habitat, low numbers of animals likely to be present within the woodland and relatively narrow haul route further mitigation, such as the provision of an arboreal linkage is not considered necessary.

d Enhancing Retained Habitats

30 permanent dormouse boxes will be erected within the mature hedgerows which surround the site and within the northern section of woodland. These will provide a permanent enhancement of these habitats for dormice, which will mitigate for the loss of other similar habitat removed through development. Furthermore, the management of the hedgerows around the site will be arranged to favour dormice. This will include in filling of gaps in the hedgerow with locally appropriate species of value to dormice, and the sensitive management of the hedgerows, such as cutting the hedgerows over the winter whilst dormice will not be nesting.

e Creation of New Habitat

Following completion of construction the access road west of the woodland will be removed and replanted to reconnect the retained woodland to the western hedge boundary. The total area of new planting (0.46ha) is equivalent to the area of woodland being removed. It is recommended that small woodland glades / rides are created within this area, with scalloped edges which constrict, where overhanging canopy trees meet, to act as arboreal crossing points.

- 3.3.24 Mitigation work for dormice habitat began in the winter of 2010/2011 as described in the 'Ecology Mitigation Summary' report, which may be found within the appendices of this document.

Bats

- 3.3.25 A wide range of bats species have been recorded on site during the surveys and therefore the impacts upon this highly protected species group needs to be carefully considered. The two key features identified on the site were the hedgerows along the southern and western boundaries. These will be retained and appropriately protected throughout construction. Close boarded fencing proposed to ensure the hedgerows continue to provide suitable habitat for dormice will also help to minimise light spillage, which would disrupt foraging and commuting bats.
- 3.3.26 The remainder of the site has shown occasional use by bats; however, the loss of the southern portion of the site will not be anticipated to have a significant adverse effect upon any of the species identified. In

the long term the mitigation measures, including the provision of new areas of woodland complete with woodland glades and rides will ensure that the value of the site for foraging bats is preserved.

- 3.3.27 The most significant impact resulting from the development on bats will be the use of artificial lighting on the site. Efforts will be made to limit the use of artificial lighting on site to areas where it is essential only. Where essential, directional lighting will be used and cowls/baffles will be fitted to lighting columns to minimise light spillage out of non-target areas. Particular care and attention will be paid to ensuring that the southern & western boundaries and the retained section of the woodland are subject to minimal artificial illumination. The close boarded fences recommended to limit impacts of artificial lighting on dormice will contribute towards limiting light spillage into areas of value to bats.

Birds

- 3.3.28 A number of bird species have been recorded, with suitable nesting habitat identified throughout the site. Although several species listed on UK Red and Amber lists have been recorded within the site the majority of bird species identified were relatively common. No species protected under Schedule 1 of the Wildlife and Countryside Act (1981) were recorded. A precautionary approach to nesting birds will be adopted during construction with clearance timed to avoid the nesting bird season (see Table 3.2).
- 3.3.29 Construction of the geothermal energy plant will remove suitable bird nesting habitat within the southern wet woodland and surrounding scrub. The loss of this habitat will be a short term negative effect, as new wet woodland will be planted within the east of the site, equivalent to the area of woodland being removed. Bird nesting opportunities within retained and newly created habitat will be enhanced through installation of a variety of bird nest boxes.

Reptiles

- 3.3.30 Grass snakes have been identified within the south-eastern corner and north-west of the wet woodland. It is assumed that grass snakes may use any of the habitats across the site on an occasional basis but that the site forms a very small part of a larger territory. The most valuable features for grass snakes identified on site are considered to be the attenuation pond at the north of the site and the area of wet woodland. The construction will result in much of the site being unsuitable for reptiles during the construction phase and therefore a loss of habitat for the grass snakes identified. Given the typical sizes of grass snake

territories the loss of habitat within the development site is not considered to be a significant impact.

- 3.3.31 In the long term a mosaic of grassland, scrub and woodland planting will be established which will incorporate features such as hibernacula, wood piles and basking sites. The area will be of value to grass snakes the area is considerably smaller than the area of suitable habitat currently available on site. However, any such reduction in overall suitable habitat is likely to be relatively insignificant given the typical size of a grass snake territory. It should also be noted that the most valued habitat for grass snakes, (i.e. the balancing pond and wet woodland) are largely being retained. Therefore the proposals are not considered to have a significant adverse impact upon this species group.
- 3.3.32 Given the protection of grass snakes under the Wildlife and Countryside Act (1981) it will be necessary to adopt measures to prevent the incidental mortality of grass snakes during site clearance and subsequent construction activities. Measures include a precautionary approach to site clearance conducted at an appropriate time of year and the provision of reptile proof fencing between the attenuation pond and the construction site to limit movement of grass snakes into the construction area from this habitat.

Invertebrates

- 3.3.33 Several individuals of the nationally scarce sap beetle *Epuraea distincta* have been identified which highlights the importance of retaining dead wood on the site. Dead wood piles should be created in various parts of the site including the retained woodland, at the bases of hedgerows and within the area of proposed new woodland.
- 3.3.34 In addition to wood piles longer trunks which have been felled should be retained as these are of specific value to invertebrates. These should be positioned within the wet woodland. The above measures will ensure that short-term and long-term adverse impacts upon invertebrate fauna will be adequately mitigated. It is not anticipated that the proposals will result in significant adverse impacts upon sap beetles or any other invertebrate species group.

Table 3.2 Ecology Calendar

Issues	Timing
Reptiles	All year: October to March is the hibernation period so care would be taken to avoid hibernacula, including hedgerow roots. They are active between April to September
Amphibians	All year:

	February to July is the breeding season so they are present in waterbodies. August to January they are predominantly found in terrestrial habitat
Nesting Birds	Nesting season – March to August inclusive
Bats	All year depending on what is affected e.g. trees and buildings
Water voles	All year – main activity March to October
Badgers	All year

3.3.35 Specialist ecologists will provide expertise to the Contractor throughout the construction period in respect of the indicated periods of the year indicated in Table 3.2.

3.4 **Landscape and Visual**

Introduction

3.4.1 This section considers mitigation of impacts on both landscape resources and visual receptors. A clear distinction is drawn between such impacts:

- a Landscape resources relate to the physical characteristics or components of the urban environment, which together form the character of that landscape, e.g. built form, vegetation and water areas;
- b Visual receptors are individuals whose views of that landscape may change as a result of the Scheme, e.g. local residents or transport users passing through the area.

3.4.2 Potential impacts predicted to arise during the construction phase are:

- a Site clearance and removal of vegetation to accommodate the temporary construction areas;
- b General construction activities including: movement of construction machinery and large scale construction equipment; soil stripping; cutting excavations; presence of construction workers; presence of site compounds and parking on site; batching plants; material stockpiles; presence of hoardings and protective fencing; presence of temporary lighting and signage; installation of new infrastructure; installation of lighting; and planting; and
- c Vehicles moving materials to and from the site.

Trees

3.4.3 A number of trees will be removed to allow construction of the proposed scheme.

3.4.4 A survey in accordance with 'BS 5837:2005 Trees In Relation To Construction – Recommendations' was undertaken, whereby the following was included:

- a An assessment of the quality of the existing trees on site;
- b An Arboricultural Implications Assessment (AIA); and
- c An Outline Arboricultural Method Statement (AMS).

3.4.5 The site has a tree protection order (TPO) covering those trees that were present when the order was made in 1989. The species listed in the order covers "Oak, Ash, Birch, Willow and Sycamore trees"

Mitigation

3.4.6 Proposed mitigation measures are:

- a Use of hoardings should be considered to provide screening along road frontages and from any residences in close proximity;
- b Materials and plant should be stored in less visually intrusive areas of the site;
- c Any temporary lighting used should be targeted away from sensitive receptors;
- d Public roads should be kept clean and a water bowser kept on site;
- e Site compounds should be positioned on existing hard standing out of sight of the of sensitive receptors where possible;
- f Any visual intrusive material storage piles should be covered; and
- g Site waste storage areas should be positioned in less visually intrusive areas of the site.

3.5 **Soils and Earthworks**

Introduction

3.5.1 Land use associated with the wider Trethurgy / Bodelva area reflects a history rooted in mining & quarrying, which no longer sustains the local economy, and late C20th redevelopment of smaller scale leisure / tourist development.

Contamination on Site

3.5.2 Contaminant concentrations (including metals, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons) were recorded below commercial industrial screening criteria in Made Ground and natural material.

3.5.3 With the exception of arsenic and benzo(a)pyrene, all contaminant concentrations were recorded below residential (without plant uptake) screening criteria in Made Ground. The conservative average value (US95) for arsenic was above the residential screening criteria. Only one sample of Made Ground recorded elevated benzo(a)pyrene (4020mg/kg). The Made Ground at this location contained a large proportion of dark coloured branches and wood suggesting partial burning. It was considered that the presence of benzo(a)pyrene was related to the residue of this partially burnt wood and hence this sample was not included in the calculation of the US95. The resultant US95 for benzo(a)pyrene was therefore below residential screening criteria.

3.5.4 Phytotoxic metal (copper and zinc) concentrations were recorded below the relevant screening criteria.

Off-site material disposal

3.5.5 Where off-site material disposal is required, waste acceptance criteria (WAC) testing will be carried out within areas of made ground to formally determine the waste classification of the material.

Mitigation

Direct contact with contaminants in the Made Ground during site development

3.5.6 Appropriate use of personal protective equipment (PPE) and safe working practices. PPE should, as a minimum, include the use of dust-proof overalls, dust/vapour masks (where appropriate), eye protection and nitrile gloves etc. as required. Construction workers should remain vigilant of ground conditions at all times and should report any suspect areas of potential contamination.

Health impacts from inhalation and ingestion of contaminated dust particles

3.5.7 During construction phases of work, dust suppression measures should be employed by the contractor as necessary to prevent the potential generation of contaminated dust particles and migration off site. This should include the use of water sprays during dry spells, cleaning up of spills from site vehicles, the use of wheel washes for site vehicles and sheeting of loads for off-site disposal.

Degradation of Granite Aquifer and surface water via increased leaching and mobilisation of contaminants

- 3.5.8 Where excavation of grossly contaminated soils (if encountered) is required, stockpiling of this material will be avoided if possible. Stockpiles (where necessary) will be covered when not in use and placed on impermeable sheeting/hardstanding to prevent migration of contaminants into the underlying soils.
- 3.5.9 Pollution control measures will be implemented by the contractor where required and spillage containment will be present on site at all times.
- 3.5.10 Drilling arisings and mud will be temporarily stored in concrete lined lagoons, before being removed for disposal offsite at an appropriately licensed facility.

Degradation of Granite Aquifer via creation of temporary preferential pathway or driving of solid contaminants into the underlying aquifer during piling and drilling

- 3.5.11 A Drilling Method Statement is required from the drilling contractors to ensure appropriate casing and grouting is undertaken.
- 3.5.12 The likely piling method will be driven pre-cast. Contaminant concentrations within the surface material are not highly elevated and therefore a Foundations Work Risk Assessment is not required.

Degradation of Granite Aquifer and surface water via fuel and chemical spills.

- 3.5.13 All fuels and chemicals used during construction/drilling will be stored and used in accordance with current regulatory and industry guidance. For example, all fuels will be stored within 110% bunded areas, all chemicals will be stored on appropriately sized drip trays located on hardstanding within dedicated chemical storage areas as a minimum and safe working procedures will be adopted to minimise accidental spillage etc.
- 3.5.14 An oil/water interceptor and surface water drainage system in accordance with current regulatory and industry guidance to be installed between the site generator and fuels storage/dispensing area hardstanding, and also where surface water drainage from the drilling platform discharges into the attenuation pond.
- 3.5.15 Control measures will be implemented by the contractor on refuelling activities, storage of fuels and chemicals and vehicle movements and parking.

- 3.5.16 A spill response plan should be incorporated into the CEMP outlining the measures to be implemented by the contractor should an unintentional release of a potentially contaminating substance, this should include methods for containment (such as drain blockers etc.), removal (such as absorbents etc.), reporting and corrective measures to avoid a repeat occurrence etc.

3.6 **Site Management**

Introduction

- 3.6.1 The site management plan addresses specific arrangements which will need implementing to ensure efficient construction and management of the highway improvements.
- 3.6.2 The *principle contractor's* Site Manager will ensure that a detailed Site Layout Drawing is produced, periodically reviewed to reflect the project programme, maintained as described in the construction management plan, and displayed on the Site's Quality, Environmental and Safety & Health (QUENSH) Notice Board(s) throughout the project.

Construction compounds

- 3.6.3 Site compounds will be positioned in areas to help reduce the negative environmental impacts of the construction stage. Compounds should be located on existing areas of hardstanding to reduce pollution risk and should be positioned in less visually intrusive areas. If possible, compounds should be positioned in areas which reduce travel across the site.

Transport and Pedestrian Safety Management

- 3.6.4 The *principle contractor* and its subcontractors will organise the site in such a way that pedestrians and vehicles can move safely and without risk to their health and safety.
- 3.6.5 The Construction Site Traffic Plan details the anticipated number and type of plant / vehicles on site and identifying authorised access and exit points and traffic routes around site. The Site Layout Drawing, mentioned in paragraph 3.6.2, will form part of this Plan. A copy of the CTMP is appended to the CEMP.
- 3.6.6 Once on the site, all personnel, delivery drivers and visitors must comply with the designated vehicle and pedestrian routes as marked on site and on the Site Layout Drawing.
- 3.6.7 Drivers should observe normal Highway Code requirements and the Site's mandatory speed limit of 10 mph. They also need to take

additional precautions when in the vicinity of pedestrians, operating plant and areas remaining in common use.

- 3.6.8 All suppliers will be issued with a copy of the project specific Delivery Driver Site Rules for issue to their drivers delivering materials to site. These will be verified by banksman and through the established auditing process.

Site Rules

- 3.6.9 The Site Manager will produce a set of project specific Site Rules. The QUENSH Coordinator will ensure that they are included in the induction and a copy is maintained on the QUENSH Notice Board(s).

- 3.6.10 If any employee, contractor or visitor is in breach of any of the Site Rules, or is observed carrying out an unsafe action / condition or an environmental nonconformity, the *principle contractor* will take appropriate action to make the site safe and notify both the individual and their company in writing of the breach. Our Site Unsafe Action / Condition Notification form AMPS/PD/SF713 will be used for this purpose.

- 3.6.11 The *principle contractor* will require that those personnel involved are disciplined appropriately and in the case of a serious breach, removed from site.

Induction

- 3.6.12 Everyone intending to work on site must first attend an induction given by the *principle contractor*.

- 3.6.13 At the induction, details of the Site Rules and other related items e.g. project outline, the main site hazards, organisational arrangements, emergency and evacuation procedures etc. will be discussed. At the induction, all personnel will be asked to provide evidence of appropriate competence.

- 3.6.14 On projects where the Employer's own direct employees and contractors need access on to our site, the Employer's representative must ensure that they receive a site induction from the *principle contractor* before starting work.

- 3.6.15 All those who have attended the Induction Course must sign a QUENSH Induction Training Attendance Form AMPS/PD/SF402.

Visitors

- 3.6.16 All visitors must sign in before they enter site, they will only be allowed on to site if they have read, understood and signed to confirm their understanding of the Site Rules and are accompanied by a fully inducted person, otherwise, and they must attend the site induction. It is the host's responsibility to ensure that the visitor is accompanied at all times and complies with the site rules.

Exclusion of Unauthorised People

- 3.6.17 The *principle contractor* and its subcontractors will ensure that access/egress to the office compound and site is via the designated access point as marked on the Site Layout Drawing. Anyone requiring access to site, including delivery drivers, must report to a member of the *principle contractor's* staff or the site office and must sign in and out of site. At each access point, signs will be posted warning of site hazards, requirements and prohibitions.
- 3.6.18 There are no public rights of way crossing the site. Public rights of ways adjacent to the Site will remain open and must be clearly signed warning the public of plant movements and site personnel of members' of the public proximity to the site.
- 3.6.19 The *principle contractor's* Project Management will ensure that all existing fences are maintained around the perimeter of the site to exclude members of the public. Where fences do not exist or are inadequate, the *principle contractor* will ensure that the site boundary is adequately demarcated and unauthorised access is prohibited. In addition, any individual areas which present a high risk e.g. storage areas, excavations etc. will be individually fenced off using "heras" type fencing, before the end of the shift / working day. Netlon type fencing is not considered suitable for use as protection; it is only to be used for demarcation purposes.

Security

- 3.6.20 A common cause of pollution from construction sites is through vandalism. Therefore, the site shall be adequately protected from intruders, and plant and equipment shall be locked and immobilised overnight.
- 3.6.21 The site will be constantly manned (24 hours a day, 7 days a week) throughout the drilling phase. Security measures shall be maintained on a 24 hour basis so as to prevent unauthorised entry to, or exit from, the work sites. Site gates shall be closed and locked to prevent trespassing and vandalism when there is no site activity. Any alarms

shall meet health and safety requirements and the requirements of the Code of Practice on Noise from Audible Intruder Alarms, 1982.

Site Lighting

- 3.6.22 Lighting to site boundaries adjacent to public highways, footways, cycleways or Rights of Way shall be provided with illuminations sufficient for the safety of the passing public, including mobility impaired people. In particular, precautions shall be taken to avoid shadows cast by the site hoarding on surrounding footpaths and roads.
- 3.6.23 Site lighting shall be kept to a minimum brightness for adequate security and safety. Construction buildings, equipment and lighting shall be sited so as to minimise visual intrusion and light spillage offsite, consistent with the efficient operation of each work site.
- 3.6.24 Site lighting shall also be positioned and directed so as to minimise distractions or confusion to passing drivers on adjoining public highways. This provision will apply particularly when night working will be carried out and the appropriate lighting shall be provided for these sites.
- 3.6.25 Arrangements for site lighting shall be subject to the approval of the Project Team.

Housekeeping

- 3.6.26 A 'good housekeeping' policy shall be followed at all times. This shall include, but not necessarily be limited to, the following requirements:
- a Smoking areas shall be provided at suitable locations at ground level as far as practicable;
 - b Open fires are prohibited at all times;
 - c Rubbish shall be removed at frequent intervals and at least weekly, and the site kept clean and tidy;
 - d Adequate toilet facilities shall be provided for all staff. Toilet facilities shall be kept clean;
 - e Food waste shall be contained and removed at least weekly;
 - f The wheel washing facilities area shall be brushed clean at frequent intervals;
 - g Hoardings shall be frequently inspected, repaired and re-painted as necessary.

3.7 Noise Control Plan

Introduction

- 3.7.1 The planned construction works will be undertaken in proximity to residential properties and other sensitive receptors. Noisy aspects will include piling and drilling.

Sensitive Receptors

The closest noise receptors are residential properties to the East and North East; the nearest being Carne Cross Lodge. There are also properties in the village of Trethurgy, to the west of the site.

Mitigation

Drilling rig

- 3.7.2 The procurement of a drilling rig limited to 102dB(A) is required if possible. Otherwise, measures dictates in section 3.7.3 must be followed.
- 3.7.3 Where section 3.7.2 cannot be satisfied, the enhancement of sound insulation performance of affected facades at sensitive noise receptors should be undertaken. For example, double glazing and acoustically attenuated ventilators.
In order to meet BS8233, noise should not exceed 30dB L_{Aeq} inside the dwelling at night time.

Ground works

- 3.7.4 The quietest possible plant that can practicably be obtained will be used for each construction task. Percussive plant will be avoided where alternative non-percussive plant is available for a given task.
- 3.7.5 All vehicles and mechanical plant to be fitted with effective exhaust silencers and maintained in good working order
- 3.7.6 Working hours of works *other than drilling*, general site activities and deliveries / uplifts which are audible outside the site boundary limited to 07:00 – 19:00 weekdays, 07:00 – 13:00 on Saturdays.
- 3.7.7 A noise barrier should be constructed along the east / northeast boundary of the site.
- 3.7.8 It should be noted that the existing trees between the site and Carne Cross Lodge are not expected to provide any noise reduction.

- 3.7.9 Further mitigation measures include:
- a Undertaking of a letter drop to local residents detailing the duration and type of works to be undertaken. A contact telephone number should also be provided in the event of complaints;
 - b Maintenance of plant to minimise the noise produced by operations on site and acoustic enclosure of static plant where appropriate;
 - c Machinery that is used intermittently would be shut down or throttled back to a minimum during periods when not in use;
 - d Static plant known to generate significant vibration levels to be fitted with acoustic dampening;
 - e Plant, such as generators or pumps that are required to operate before 08:00, after 18:00 or at the weekend are surrounded by an acoustic enclosure or portable screen where appropriate.
 - f Care will be taken when loading or unloading vehicles or dismantling scaffolding or moving materials etc. to reduce impact noise.
 - g Plan storage areas in locations removed from sensitive receptors. This should also be applied to crushing and screening operations. Where this is not possible consideration shall be given to using materials, earth, and waste material in a manner that will function as a noise barrier.
 - h The sequencing and scheduling of construction operations is equally important in addressing and mitigating construction related noise.
It may be possible to schedule several noisy operations concurrently to take advantage of the fact that the combined noise levels produced may not be significantly greater than the level produced if the operations were performed separately.

3.8 Water Control and Pollution

Introduction

- 3.8.1 Two potential construction phase environmental effects have been identified relating to hydrogeology and hydrology. These mechanisms are as follows:
- a **Direct and indirect contamination of surface water** due to mobilisation of soils, existing contamination and spillage of oils and the like from construction plant.

b **Direct and indirect flooding and changes to baseline drainage hydrology** due to disturbance of the ground during construction works.

- 3.8.2 Construction activities may result in both direct and indirect impacts on the water quality, flooding, drainage and the hydrogeology of the site. There are no surface watercourses on the site and so drainage is likely to be via infiltration to groundwater. Impacts which extend beyond the site include indirect effects upon the wider catchment, particularly with regard to flood risk.
- 3.8.3 The use of water for dust suppression may also increase runoff quantities during construction and any excavation of potentially contaminated soil could have an impact on both surface and groundwater quality.
- 3.8.4 Most pollution incidents are avoidable. Careful planning of operations, responsible waste management and suitable anti-pollution measures reduce the risk of spillage, along with simple precautions to deal with any potential spillages. The costs of cleaning up a pollution incident can be very high, and the consequences of a prosecution for environmental offences serious. This plan should be used to ensure best practice techniques are implemented throughout the construction period to protect ground and surface water sources.
- 3.8.5 The Contractor should aim to reduce the amount of water being used throughout the construction phase and where possible use water from sustainable sources. The water control measures listed in this section should be implemented on-site to help conserve water.

Local Catchment

- 3.8.6 The proposed site is situated close to the watershed of the Par River catchment. The Par River catchment lies east of St Austell and includes the towns of St Blazey and Par. The land-use within the remaining catchment is predominantly agricultural / farmland. Sites designated as Bathing Waters are situated at Par and Charlestown, to the east of the Par catchment.

- 3.8.7 Desktop surveys indicate that nearby springs to the north and west of the site at OS grid references SX041561, SX042560, SX043559, SX044560 and SX045557 combine to flow in a northerly direction across Starrick Moor to the village of Luxulyan, where it meets the Par River at OS grid reference SX045581. From here, the Par River flows in a south-westerly direction through the town of St Blazey to St Austell Bay on the English Channel at Par beach (OS grid reference SX082529), approximately 3.0km from the project site. The overall Par River catchment encompasses an area of approximately 71.5km².

Flooding

- 3.8.8 The site is not highlighted on the Environment Agency's online Flood Warning map. Land either side of the watercourse from Starrick Moor to Luxulyan and the Par River from Luxulyan to Par is highlighted as "Flooding from rivers or sea without defences".

Mitigation

- 3.8.9 Mitigation measures during construction comprise measures to prevent runoff carrying sedimentation or construction materials into ditches (and potentially local watercourses) via the use of bunds and interceptors where necessary. Surface water shall be prevented from entering excavations, e.g. by the use of cut off ditches. Temporary site compounds where located at/near to any potential sources of contamination shall be provided with anti-pollution measures such as bunded trays for standing pumps and chemical storage containers.
- 3.8.10 Construction vehicles shall be maintained to reduce the risk of hydrocarbon contamination (defined for the CEMP as petrol, diesel and oils). Other construction materials shall be managed in such a way as to effectively minimise the risk posed to the aquatic environment.
- 3.8.11 The EA and other appropriate bodies shall be consulted by the Contractor prior to the commencement of site activity. All documentation such as discharge consents shall be in place prior to any site activities.
- 3.8.12 Nothing shall be permitted to enter the surface water drains which could cause pollution, including silty water.
- 3.8.13 No foul drainage or contaminated surface water run-off (including any silty water) shall be discharged into any borehole, well, spring, soak away or watercourse (including dry ditches having a connection with a watercourse).

- 3.8.14 Any water that has come into contact with contaminated materials shall be disposed of in accordance with the Water Resources Act 1991 and the Water Industry Act 1991 (if disposed to public sewer) to the satisfaction of the EA, sewerage provider and local authority as applicable.
- 3.8.15 Good housekeeping shall be practiced including:
- a Carrying out regular inspections of discharges, drainage systems, collection ditches, swales, interceptors and ditches to ensure that they are in good order;
 - b Where possible, the installation of SuDS at the beginning of the project to assist in dealing with the construction site run-off;
 - c Providing and maintaining spill clean-up kits on site at all times and training staff in their use; and
 - d Stabilising surfaces and/or re-vegetating as soon as possible.
- 3.8.16 General risks to the water environment and control measures are set out in Table 3.3 below:

Table 3.3 General Risks

Issue	Requirements
Earthworks, excavation and digging	<ul style="list-style-type: none"> • Run-off from earthworks, excavation and digging activities shall be appropriately managed.
Completed earthworks	<ul style="list-style-type: none"> • Stabilise surfaces and/or re-vegetate as soon as possible.
Storage mounds	<ul style="list-style-type: none"> • Cover with correctly secured tarpaulins.
Transitory soil mounds	<ul style="list-style-type: none"> • Soil mounds shall be treated with surface binding agents to reduce wind erosion. • Re-seed any exposed ground and stockpiles to stabilise the ground and reduce erosion. • Consultation with the EA is necessary before employing any binding agent.
Mixing and granular materials	<ul style="list-style-type: none"> • The use of pre-mixed plasters and masonry compounds is recommended. • The mixing of concrete or bentonite slurries shall take place in designated and approved areas.
Non-compliance with permits; sub-standard treatment facilities	<ul style="list-style-type: none"> • Maintain a full record of inspections, maintenance and measures required to ensure compliance with consents and permits. Treatment facilities to be regularly inspected and properly maintained.
Vandalism resulting in a pollution incident	<ul style="list-style-type: none"> • Work sites to be adequately protected from intruders.
Suspended solids reaching water bodies	<ul style="list-style-type: none"> • Where appropriate cut-off ditches shall be used at the edge of the work site.
Completion of Construction Activities - The completion of construction activities and site demobilisation carry significant risk of causing water pollution.	

Issue	Requirements
Laying of surface courses on hardstandings will effectively mean that drainage systems become operational	<ul style="list-style-type: none"> Ensure that pollutants do not become mobilised via operational drains.
Paints and treatment products	<ul style="list-style-type: none"> Ensure pollutants do not become mobilised via operational drains.
Topsoil dumped on finished hardstandings	<ul style="list-style-type: none"> Other sites for such activities or control measures to be put in place.
Washing of finished surfaces	<ul style="list-style-type: none"> Conducted in such a manner that pollution does not reach surface water outfalls.
Demobilisation	
Removal of storage facilities and plant	<ul style="list-style-type: none"> Measures to ensure that open ground is not exposed to erosion and formation of gullies.
Contaminants liberated from plant wash down	<ul style="list-style-type: none"> Appropriate control measures such as the management of waste water and other arisings.
Decommissioning fuel storage areas, septic tanks, decontamination units and mess facilities	<ul style="list-style-type: none"> To follow pollution prevention measures.

3.8.17 Table 3.4 details management procedures for concrete and cement.

Table 3.4 Managing Concrete and Cement

Potential Pollution Source	Control Measures
Washing out and cleaning of concrete batching plant or ready mix lorries	<ul style="list-style-type: none"> Carried out in a contained area as far from the watercourse as practical – referred to as the wash-down area. All wash-down areas to be signed. All plants contaminated with concrete to be clean in designated wash-down areas. Washout shall not be allowed to flow into any drain or watercourse.
Concrete spills during site transportation	<ul style="list-style-type: none"> Loads managed to avoid spillages – load dependant on vehicle, slump of concrete and prevalent ground conditions.
COSHH	<ul style="list-style-type: none"> All materials used must be subject to a COSHH Assessment.

Waste Water and Drainage

3.8.18 Without EA permission no abstraction shall be made from any water body.

3.8.19 Liquid wastes, including runoff from material storage areas and from wet methods of preparation, shall never be released directly into

ditches/surface waters or surface water drains without prior approval from the EA.

- 3.8.20 Foul water and sewage effluents produced by the construction workforce shall be contained by temporary foul drainage facilities to be installed (e.g. Portaloo's). A suitably licensed subcontractor shall dispose of all foul water and sewage effluents off-site. Table 3.5 details associated risks and management of wastewater.

Table 3.5 Risk Associated with Wastewater and Control Measures

Potential Pollution Source	Control Measures
Surface washing	<ul style="list-style-type: none"> The most efficient method of containing waters generated is by a vacuum attached to the spray nozzle.
Wastewater used for pressure washing	<ul style="list-style-type: none"> To be contained and the resultant waste managed.
Dewatered from ducts may be contaminated with silt, oil, or other substances	<ul style="list-style-type: none"> To be contained and the resultant waste managed.

- 3.8.21 In addition to the generic mitigation specified above, specific mitigation is detailed in Table 3.6.
- 3.8.22 Construction impacts can be mitigated through the successful implementation of the measures detailed within the CEMP. Impacts during the operational phase have been mitigated through appropriate engineering design.
- 3.8.23 The greatest impacts on the water environment are with respect to surface water runoff.
- 3.8.24 SUDS and vegetative drainage systems will be used, which will also reduce pollution risks by treating the surface water runoff before it outfalls to a receiving watercourse or before reaching the aquifer.
- 3.8.25 No other significant effects to the water environment have been identified during either the construction phase.

Table 3.6 Specific Mitigation for the Water Environment

Category	Specific Mitigation
CEMP	<ul style="list-style-type: none"> The CEMP is a requirement of the EA and recommended in good practice guidance (such as the EA Pollution Prevention notes). See each respective section for best practice.

Category	Specific Mitigation
General	<ul style="list-style-type: none"> All waste produced during the works must be stored in designated areas and isolated from surface drains; All oil storage tanks and drums must be stored on an impervious base within an oil tight bund; Use of banded pallets for storage of plant; Concrete and equipment washings must not be released into surface waters and mixing must take place as far from surface waters as practicable; Measures to control runoff from stockpiles of waste material as per good practice guidance; Control and discharge of waste water shall be controlled via the control measures within the CEMP, as well as obtaining any necessary discharge or trade effluent consents.
Groundwater Quality	<p>Mitigation measures shall be specified prior to the commencement of the works, and shall include, but not be limited to:</p> <ul style="list-style-type: none"> Any restriction on the use of List I and List II substances during construction; Measures required ensuring List I and List II substances are not released to the water table during construction activities.

3.9 **Materials**

Mitigation

Materials Handling

3.9.1 During the construction phase of the proposed scheme, it is likely that waste arisings would result from the works. In the event of potentially contaminated material being encountered on-site, their handling, storage and removal would be subject to current waste management legislation and guidance (A Site Waste Management Plan (SWMP) would be implemented by the contractor to this effect.

Materials Reuse

3.9.2 Appropriate disposal or reuse / recycling of excavation materials, including the need for pre-treatment, should be considered as part of the detailed design. Such material may need to be processed to comply with the requirements for imported fill. Reuse criteria will require to be agreed with the local authority.

Concrete Classification

3.9.3 In accordance with the procedures outlined in BRE Special Digest 1 and the results of the laboratory testing undertaken during the intrusive site investigation, the required concrete class for the proposed scheme site is DS-1 (assuming an aggressive chemical environment for concrete classification of AC-1). Relevant measures should be

adopted for building foundations and services constructed in the ground. It is recommended that the results be submitted to the utility suppliers to determine suitable materials for services to be placed in the ground.

Hardstanding Provision

3.9.4 During the operational phase of the proposed scheme, the site would comprise hardstanding in its entirety. This is expected to sever the potential pollutant linkage to future site users from contaminant exceedances.

3.9.5 Appropriate mitigation measures should be adopted in windows of soft landscaping (e.g. using a capping layer of clean, suitable soil from an approved source).

Cornish Hedges

3.9.6 Stone removed from hedges should be retained on site for re-use in the provision of new hedges.

3.10 **Construction Traffic Management Plan**

Introduction

3.10.1 The Construction Traffic Management Plan is to be found in the appendices.

3.10.2 The traffic arising from the proposed scheme will affect the local area on a daily basis. However, the impacts of the construction traffic generated by the scheme during the peak hours when the highway network is at its busiest, are not of sufficient magnitude to be considered a material impact.

3.10.3 Receptors that may be affected by the traffic and transport impacts include:

- a Road users – including vehicle operators and occupants;
- b Public Transport users;
- c Vulnerable road users (e.g. Pedestrians and Cyclists).

Mitigation

3.10.4 The following measures should be implanted by the Principal Contractor(s):

- a Haul routes should be chosen to minimise disruption to traffic along both trunk and local roads;

- b The principal contractor should agree the principles and routes for material haulage to and from the proposed scheme with the Local Highways Authority;
- c Temporary signals at site entrance and exit should be considered where construction vehicle movements cause congestion and there is potential for accidents due to site constraints;
- d All loading and unloading of vehicles shall take place off the public highway wherever this is practicable;
- e Vehicles arriving or leaving the site shall do so during the normal working hours unless otherwise agreed with the Local Highways Authority. Access and egress points shall be as agreed with the Local Highways Authority and local Police;
- f All reasonable measures shall be taken to ensure that delivery vehicles do not park on the highway prior to entering the site. In exceptional circumstances, it may be necessary to have the potential for a limited number of vehicles to park on the highway, but only with the agreement of the Local Highways Authority and the local Police;
- g Construction vehicles will be limited to non-peak hour periods where practicable, to reduce disruption on the local highway network;
- h The principal contractor will also be expected to produce freight management strategies that will control the movements of HGVs;
- i All abnormal (incl. wide loads) movements are to be planned in advance in accordance with appropriate risk assessments. It is envisaged that wide loads associated with the drilling rig are to be escorted.

Car Parking Arrangements

- 3.10.5 The areas of car parking, which will be required to support the site compound and to cater for construction employees on site, will be surfaced with granular fill to minimise dust emissions and will be located adjacent to the site compounds. Public and non-motorised transport is recommended where practicable to reduce demand for parking.
- 3.10.6 The public highway is not to be used for parking by construction related vehicles.

Construction Operating and Delivery Hours

- 3.10.7 The proposed working hours will be restricted to the hours indicated below to ensure that key construction processes are not prejudiced,

however critical construction works may occur outside these periods to ensure construction processes on site are not prejudiced:

- 07:00 – 19:00 Monday to Friday
- 07:00 – 13:00 Saturday
- Occasional working on Sundays and Bank Holidays (for essential works only) is proposed
- A period of approximately 10 months is expected in which drilling will be conducted 24 hours per day, 7 days per week.

Green Travel Plan

3.10.8 Sustainable travel is any form of transport that keeps damage to the environment at a minimum, and normally has the advantage of being a healthier alternative for the user. This includes walking, cycling, public transport and car sharing, or using vehicles which minimise carbon emissions.

a Health Benefits

- Improved health, motivation and well being
- Lower levels of stress
- A better quality of life
- Can offer you the opportunity of fitting exercise into a tight daily schedule

b Environmental and Community Benefits

- Less traffic and congestion
- No parking problems or costs
- Improved public transport services
- Reduction in local level pollution

Site Measures

3.10.9 The contractor should provide suitable access and parking/storage for cyclists, consider staff working times to permit use of local public transport and promote car sharing.

4 SUMMARY

- 4.1.1 This framework CEMP provides information in relation to the planning and implementation of the construction activities to reduce the risk of adverse impact of construction on sensitive environmental resources and to minimise disturbance to local residents.
- 4.1.2 Ahead of construction, the CEMP will be further developed by the *principle contractor* to identify the site specific measures and controls that are necessary.
- 4.1.3 The conclusions and recommendations contained herein are limited to those given the general availability of background information and the development proposals.
- 4.1.4 Third party information has been used in the preparation of this report, which Parsons Brinckerhoff Ltd, by necessity assumes is correct at the time of writing. While all reasonable checks have been made on data sources and the accuracy of data, Parsons Brinckerhoff Ltd accepts no liability for same.
- 4.1.5 The benefits of this report are provided solely to EGS Energy Ltd.
- 4.1.6 Parsons Brinckerhoff Ltd excludes third party rights for the information contained herein.

5 APPENDICES

5.1 Ecology Mitigation Summary

5.2 Construction Traffic Management Plan

5.3 Site Waste Management Plan

1 INTRODUCTION

1.1 Background

1.1.1 Parsons Brinckerhoff Ltd (PB) have been appointed by EGS Energy limited (EGS) to prepare a Construction Traffic Management Plan (CTMP) for the delivery of the Eden Geothermal power plant.

1.1.2 The objective of the CTMP is to minimise the effects of construction traffic to the local community and environment.

1.2 Concerns of local community and stakeholders; Limiting Traffic movements

1.2.1 Parsons Brinckerhoff Ltd recognise that a key concern is the effect of construction traffic on access to and from the Eden Project. With this in mind, the CTMP has been developed to:

- a minimise generation of traffic
- b use the preferred route from the A391 at Penwithick
- c safely manage pedestrians & cyclists crossing site entrance
- d endeavour to ensure that materials delivered by road travel as short a distance as possible

1.3 Socio-economic factors and impacts on the local area

1.3.1 The construction phase of the project should employ local companies where practicable. This will have the following effects, not limited to:

- a reducing traffic burden on trunk and local road network
- b reducing carbon emissions and other pollutants associated with vehicle movements
- c create a positive impact on local economy

1.4 Environmental impact on the area

1.4.1 The impact on the local environment will be minimised by limiting the movement of traffic. Emissions will be minimised by using local contractors / suppliers where possible.

1.4.2 Dust associated with construction traffic on site is to be minimised through dust suppression measures. In very dry conditions, these may require dampening with water.

2 DESIGN

2.1 Design measures

2.1.1 Measures include the use of extracted material as fill on site.

3 CONSTRUCTION

3.1 Planning and Procurement

3.1.1 All planning and procurement relating to the large items of plant required during the construction phase is to keep these items on site for the duration of an activity. It is not envisaged that such plant would require regular movement to and from site.

3.2 Transport of personnel to Site

3.2.1 Parsons Brinckerhoff recommends that personnel use public transport, non-motorised transport, or a combination of the two where practicable.

- a The nearest railway stations are situated at:
 - i St Austell 3.0 miles (Penzance mainline)
 - ii Par 3.1 miles (Penzance mainline)
 - iii Luxulyan 1.8 miles (Par to Newquay branch line)
 - iv Bugle 2.9 miles (Par to Newquay branch line)
- b The site is situated on or near to the following bus routes:
 - i Travel Cornwall bus route no. 423
 - ii First bus route no. 101
 - iii Western Greyhound bus route no. 527
- c The site is situated adjacent to a traffic-free cycle path.
<http://www.sustrans.org.uk/ncn/map/route/clay-trails-to-eden-project>

3.2.2 Limited parking facilities will be made available on-site. Those choosing to use this option will be required to avoid arriving and leaving around busy times.

The contractor is to liaise with The Eden Project for guidance with regards to busy times.

3.2.3 Where vehicular travel is essential, all employees, subcontractors and supply chain members are to be advised at induction of the requirement to obey speed limits and to use the dedicated route to and from site.

3.2.4 All motorised vehicles to use the route prescribed in Section 4.

3.3 Transport of Materials, Plant and Equipment to Site

3.3.1 Road deliveries are to be scheduled to avoid busy periods associated with The Eden Project wherever practicable.

The contractor is to liaise with The Eden Project for guidance with regards to busy times.

3.3.2 As part of the establishment of the site, a number of deliveries will be required. These should be scheduled in such a manner as to eliminate delivery vehicles waiting near the site. Table 3-1 provides an indication of the types of delivery required.

3.3.3 All deliveries to use the route prescribed in Section 4.

Table 3-1: Schedule of Planned Principle Road Deliveries

Materials	Use on Project	Expected Frequency
Contractors' Accommodation: Enabling Works: 7 cabins 1 storage container Drilling Works: 8 cabins 1 storage container 1 Generator		
Aggregates	Construction of temporary road	
Ready Mixed Concrete	Construction of platform	
Fuel Deliveries	Construction vehicles, Drilling equipment,	
General Building Materials		
Large Plant and Equipment Excavators Drill Temporary pumps Roadwork equipment Fences / Barriers	Earthworks Drilling Road construction	
Removal of material		
Waste Disposal	Sewage from the WCs and accommodation units to be collected in buried 50m ³ tank. This tank to be emptied by waste disposal contractor as required.	

4 ROUTE TO SITE

4.1.1 An authorised route is to be agreed upon in advance in collaboration with the Highways Agency. Provisionally, access to the site is to be as follows:

4.2 Construction vehicles travelling southbound along A391

- a At double-roundabout at Carluddon (OS grid ref: SX024556), take the second exit (right) followed by the first exit (left) signposted Luxulyan and Eden Project.
- b Continue in an easterly direction. Follow the road for approx. 2 miles to roundabout (OS grid ref: SX043559).
- c Take the second exit (straight on), signposted Eden Project (for cars).
- d The site entrance is immediately on right side of road.

4.3 Construction vehicles travelling northbound along A391

- a At double-roundabout at Carluddon (OS grid ref: SX024556), take the 2nd exit (right) signposted Luxulyan and Eden Project.
- b Continue in an easterly direction. Follow the road for approx. 2 miles to roundabout (OS grid ref: SX043559).
- c Take the second exit (straight on), signposted Eden Project (for cars).
- d The site entrance is immediately on right side of road.

4.4 Additional information

4.4.1 The routes described above are shown in Appendix A.

4.4.2 All abnormal (wide load) movements are to be planned in advance in accordance with appropriate risk assessments. It is envisaged that wide loads associated with drilling equipment are to be escorted. Where such vehicles are brought onto site, a banksman is to be used at all times.

4.4.3 Alterations to the public road layout at the roundabout adjacent to the site entrance will be required in order to enable access for the drilling equipment. See Section 5 for details.

5 ALTERATION TO EXISTING HIGHWAYS

5.1 Roundabout adjacent to Site Entrance

5.1.1 It has been noted that the road layout at the roundabout adjacent to the site entrance will require temporary alteration to enable access for the wide load(s) associated with the drill rig.

5.1.2 The proposed amendment to the road layout is shown in Appendix B. The proposal is not yet approved by the Highways Agency / Cornwall Council and may require revision following discussion.

5.2 Site Entrance

5.2.1 The site entrance will require widening to allow access construction traffic.

- 5.2.2 The proposed amendment to the road layout is shown in Appendix C. The proposal is not yet approved by the Highways Agency / Cornwall Council and may require revision following discussion.

6 TEMPORARY TRAFFIC MANAGEMENT SCHEME

6.1 Principle Contractor's responsibilities

- 6.1.1 The appointed Principle Contractor will be responsible for (but not limited to) developing, implementing and maintaining temporary traffic management measures (e.g. signage, lining, guarding etc.) to minimise delays and ensure the safe movement of the travelling public along all routes likely to be affected by construction works associated with the proposed development site.

6.2 Interface between on-site and off-site road movements

- 6.2.1 Wheel wash facilities are to be made available when necessary to mitigate the spread of material from the site onto public highways. In addition, site roads are to be cleaned regularly.

6.3 Interface with Pedestrians / Cyclists

- 6.3.1 A cycle path lies along the eastern boundary of the site, ending adjacent to the site entrance. Access to the cycle path must be maintained at all times.
- 6.3.2 A gateman is to be placed on duty during working hours to control pedestrian, cycle and vehicular movements.
- 6.3.3 Pedestrian barriers are to be erected at the entrance.
- 6.3.4 Appropriate signage is to be displayed upon exiting site warning of pedestrians and cyclists.
- 6.3.5 Appropriate signage is to be displayed on highway, footway and cycle path warning of site entrance.

7 MONITORING AND MANAGEMENT OF THE TRAFFIC MANAGEMENT PLAN

7.1 Principle Contractor's responsibilities

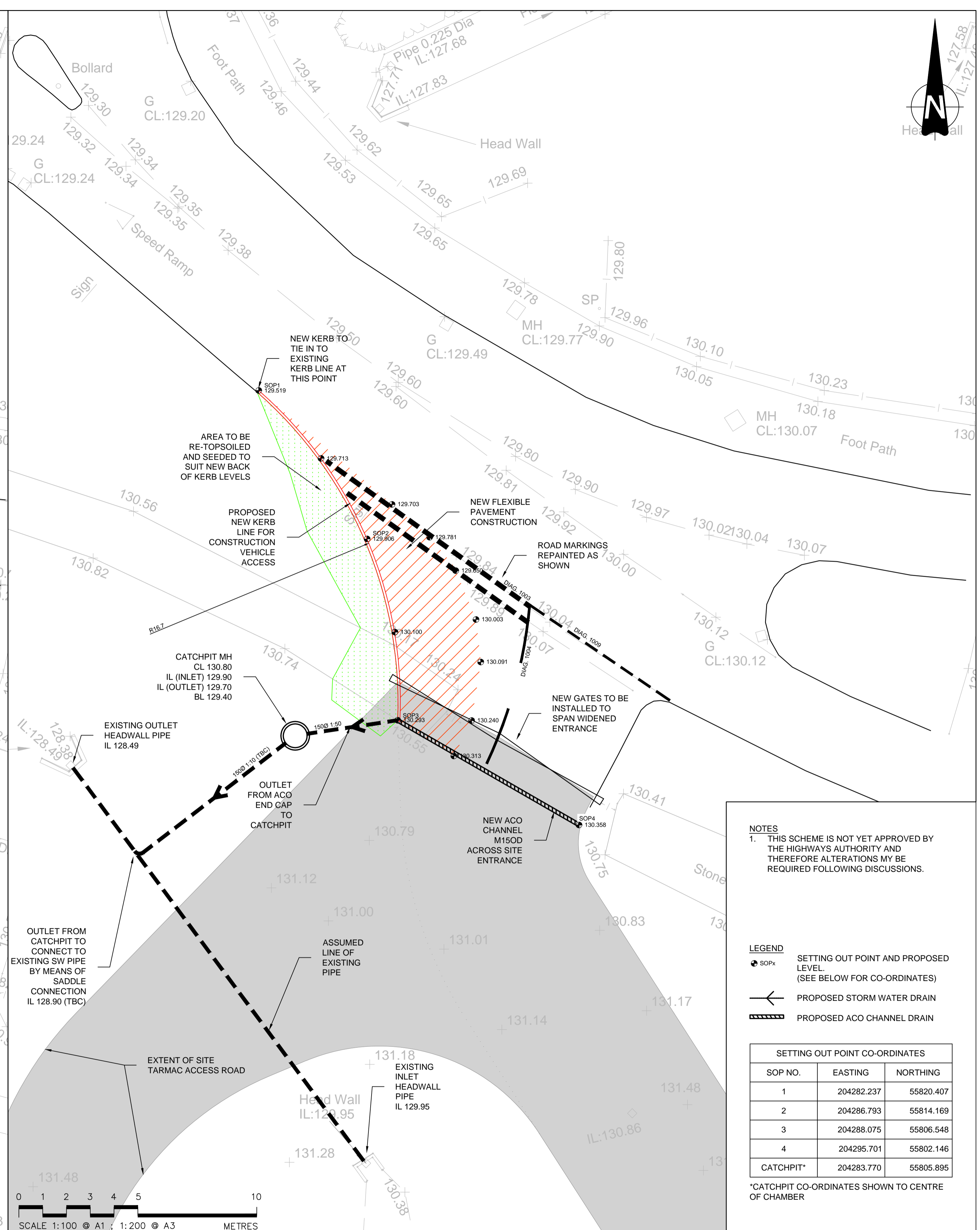
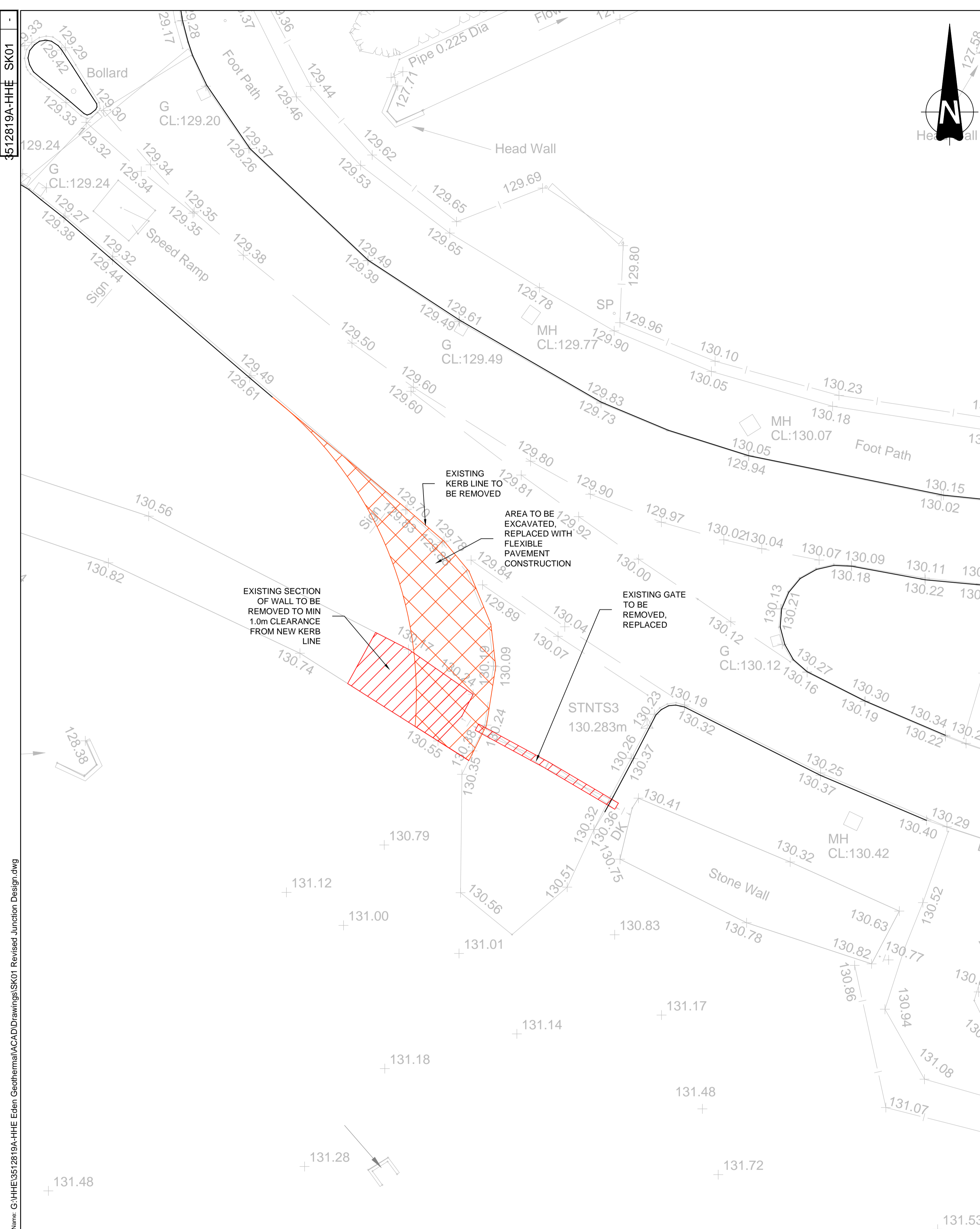
- 7.1.1 The Principle Contractor is to ensure that their employees adhere to this Management Plan.
- 7.1.2 A record of all materials and transportation, including location of origin of materials, is to be kept and made available to the Client upon request.
- 7.1.3 A monthly report is to be produced displaying the number and description of deliveries.

8 APPENDICES

8.1 Route to site

8.2 Proposed alteration to roundabout

8.3 Proposed alteration to site entrance



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 Logon: Weekes, Chris
 Plot Date: 04-Oct-2013 15:06:46

SITE CLEARANCE REQUIRED

PROPOSED NEW ACCESS ARRANGEMENT

NOTES
 1. THIS SCHEME IS NOT YET APPROVED BY THE HIGHWAYS AUTHORITY AND THEREFORE ALTERATIONS MY BE REQUIRED FOLLOWING DISCUSSIONS.

LEGEND
 ● SOPx SETTING OUT POINT AND PROPOSED LEVEL. (SEE BELOW FOR CO-ORDINATES)
 ← PROPOSED STORM WATER DRAIN
 ▬▬▬▬ PROPOSED ACO CHANNEL DRAIN

SETTING OUT POINT CO-ORDINATES		
SOP NO.	EASTING	NORTHING
1	204282.237	55820.407
2	204286.793	55814.169
3	204288.075	55806.548
4	204295.701	55802.146
CATCHPIT*	204283.770	55805.895

*CATCHPIT CO-ORDINATES SHOWN TO CENTRE OF CHAMBER

Rev	Date	Description	By	Chk	App

Notes:



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Client: **EDS ENERGY**

Site/Project: **EDEN GEOTHERMAL**

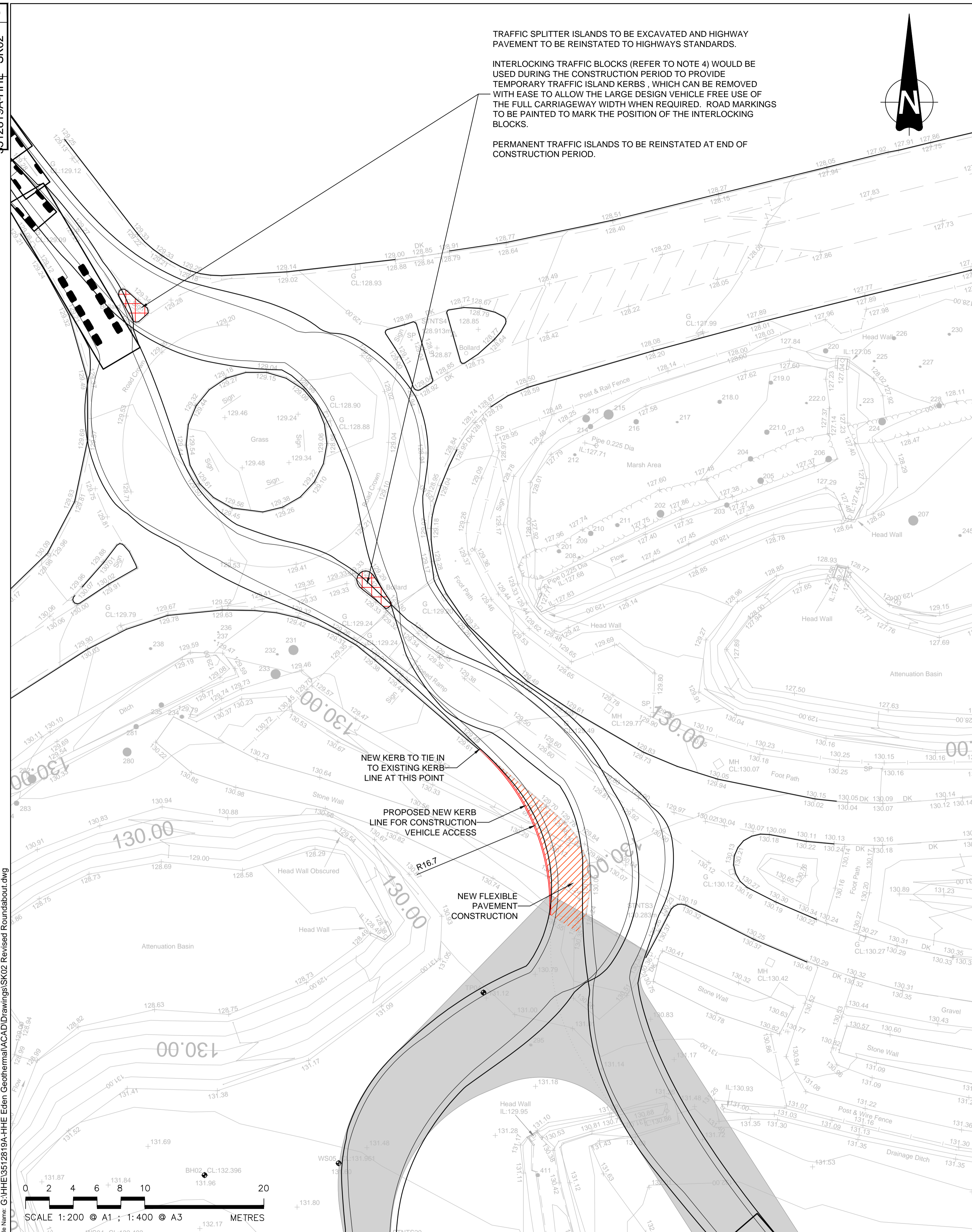
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Designed: CJW	Approved: TO
Date: 19/06/2013	Scale: 1:100 A1 Sheet: 1 OF 1
Project Number: 3512819A-HHE	Drawing Number: SK01
© Copyright Parsons Brinckerhoff	

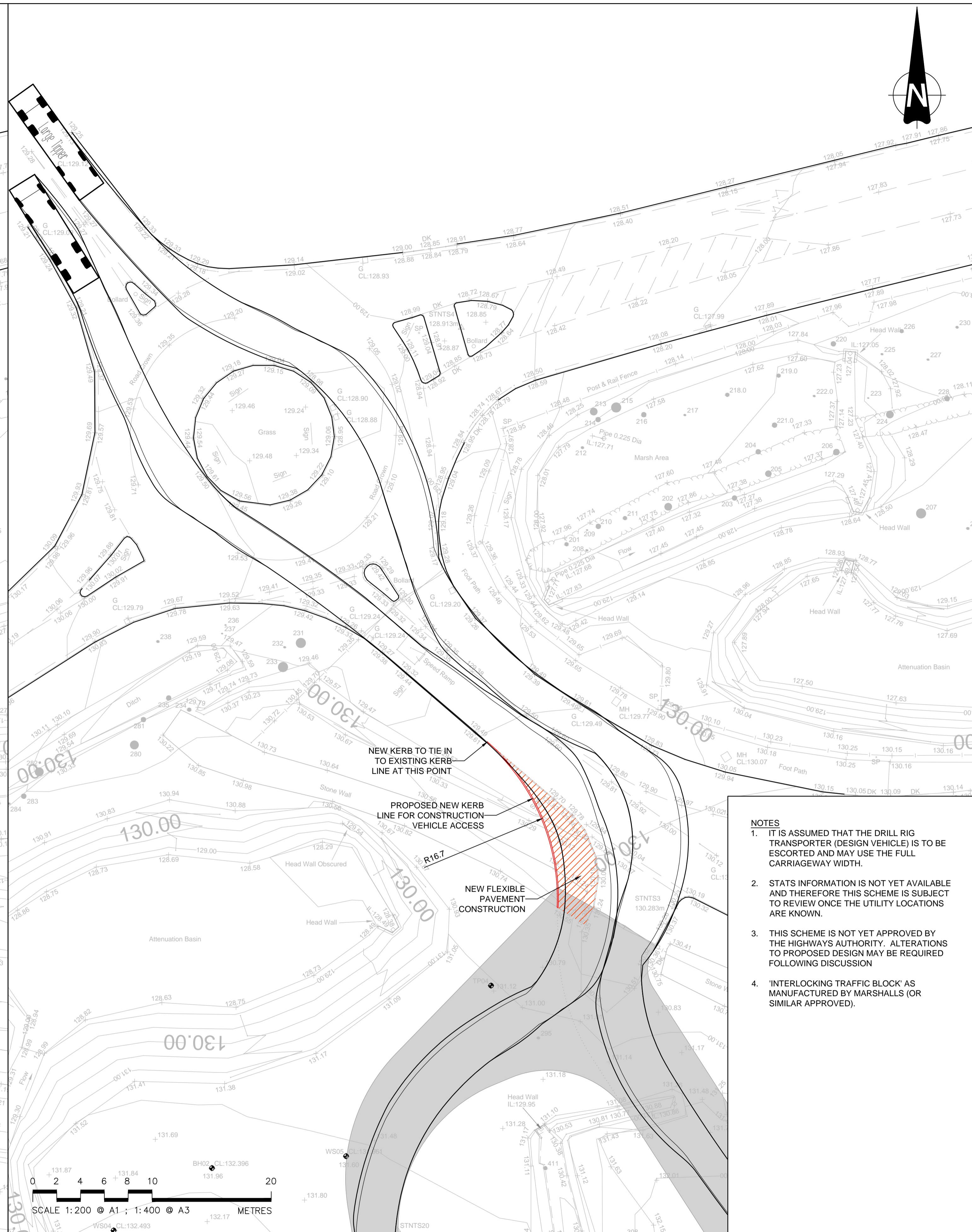
TRAFFIC SPLITTER ISLANDS TO BE EXCAVATED AND HIGHWAY PAVEMENT TO BE REINSTATED TO HIGHWAYS STANDARDS.

INTERLOCKING TRAFFIC BLOCKS (REFER TO NOTE 4) WOULD BE USED DURING THE CONSTRUCTION PERIOD TO PROVIDE TEMPORARY TRAFFIC ISLAND KERBS, WHICH CAN BE REMOVED WITH EASE TO ALLOW THE LARGE DESIGN VEHICLE FREE USE OF THE FULL CARRIAGEWAY WIDTH WHEN REQUIRED. ROAD MARKINGS TO BE PAINTED TO MARK THE POSITION OF THE INTERLOCKING BLOCKS.

PERMANENT TRAFFIC ISLANDS TO BE REINSTATED AT END OF CONSTRUCTION PERIOD.



DESIGN VEHICLE TRACKING, ONE WAY TRAFFIC REQUIREMENT



LARGE TIPPER TRACKING, TWO WAY TRAFFIC REQUIREMENT

- NOTES**
- IT IS ASSUMED THAT THE DRILL RIG TRANSPORTER (DESIGN VEHICLE) IS TO BE ESCORTED AND MAY USE THE FULL CARRIAGEWAY WIDTH.
 - STATS INFORMATION IS NOT YET AVAILABLE AND THEREFORE THIS SCHEME IS SUBJECT TO REVIEW ONCE THE UTILITY LOCATIONS ARE KNOWN.
 - THIS SCHEME IS NOT YET APPROVED BY THE HIGHWAYS AUTHORITY. ALTERATIONS TO PROPOSED DESIGN MAY BE REQUIRED FOLLOWING DISCUSSION
 - 'INTERLOCKING TRAFFIC BLOCK' AS MANUFACTURED BY MARSHALLS (OR SIMILAR APPROVED).

Rev	Date	Description	By	Chk	App
1	19/06/2013	15.37.29	CJW	TO	TO

Notes:



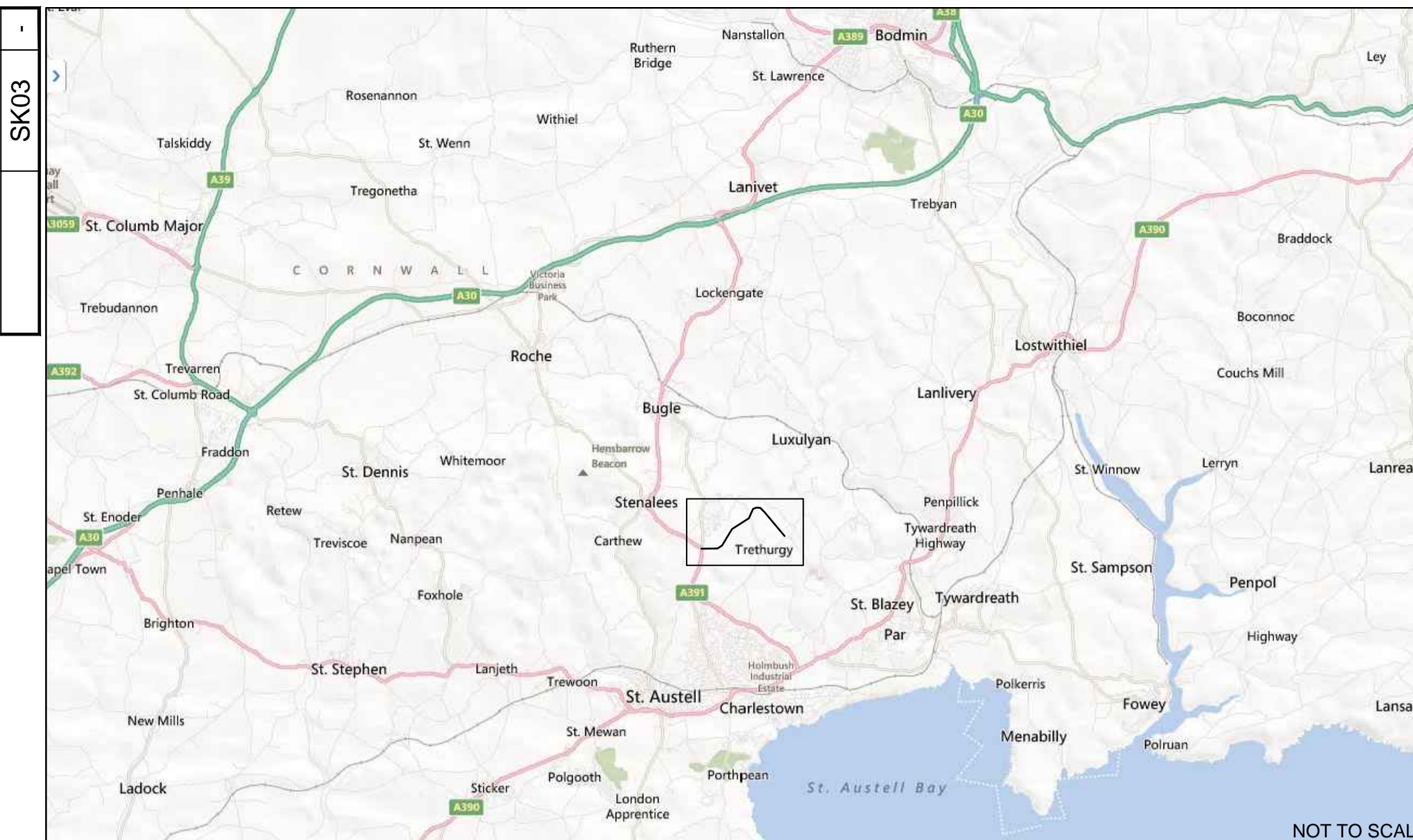
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Client: EDS ENERGY

Site/Project: EDEN GEOTHERMAL

Title: PROPOSED ALTERATIONS TO SITE ENTRANCE

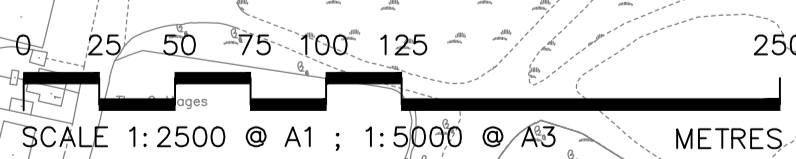
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Drawing Number: SK02	Revision: -



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Rev	Date	Description	By	Chk	App

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Site/Project: **EDEN GEOTHERMAL**

Title: **ROUTE TO SITE**

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Designed: CJW	Approved: TO
Date: 19/06/2013	Scale: 1:2500 A1
Project Number:	Sheet: 1 TO 1
Drawing Number:	Revision:
SK03	-

SITE WASTE MANAGEMENT PLAN

1 INTRODUCTION

1.1.1 The Site Waste Management Plan (SWMP) applies to all activities throughout the contract.

1.1.2 The following methods were adopted during the conception, design and specification phases to reduce the amount of waste arising during construction

Method	Resource Saving
Excavated material to be used on site where possible	Approximate excavation required: Class 1 (Granular Fill) 4 000 m ³ Class 2 (Cohesive Fill) 6 400 m ³ Class 5 (Topsoil) 1 200 m ³ Class U1 (Unacceptable Material) 9 000 m ³ Total 20 600 m ³

1.1.3 All personnel are to be made aware of the relevant requirements in this Plan at the initial site induction and in subsequent toolbox talks. The SWMP will be available in the site office for inspection at any time.

1.1.4 The *principle contractor* is to ensure that:

- a A Waste Co-ordinator is appointed, whose responsibility will be to drive engender a culture of waste minimisation throughout the contract;
- b Each waste stream is identified. For each waste stream, suitable storage and disposal measures are provided in line with duty of care;
- c Compliance with the 'waste hierarchy' is adhered to: reduce, re-use, recover, recycle, and disposal as the least preferred option;
- d Only when all other options have been rejected, waste will be sent to landfill. In such occurrence, waste must be accompanied by a 'Pre-Treatment Confirmation' form;
- e Targets for re-use and recycling are recorded at the start of the contract on the Waste Targets and Monitoring Form. Progress towards such targets is monitored monthly;
- f The site registers with the Environment Agency as a producer of Hazardous Waste and obtains a Premises Code for use on all Consignment Notes;
- g All waste is segregated, secured, labelled and disposed of safely and completely;
- h Waste Transfer Notes are correctly completed for each consignment of inert or non-hazardous waste;
- i Hazardous Waste Consignment Notes are correctly completed for each consignment of hazardous waste;
- j Waste contractors' carrier's licences and permits are verified with the Environment Agency. Copies are to be placed in the contract file;
- k The procedures detailed in the SWMP are brought to the notice of all employees and subcontractors' employees;

- I All waste data including that re-used on site shall be recorded on the *principle contractor's* KPI system

1.1.5 A summary of the duty of care information required by the *principle contractor's* environmental system is contained in the Waste Predictions and Summary Table (Appendix 3). This is to be completed for each waste material leaving or entering the site. All supporting documentation is to be retained in the Contract Filing System.

1.1.6 Appendix 2 contains a checklist of actions that should be completed at the appropriate time in the contract.

2 LEGISLATION / GUIDANCE

- a Control of Pollution (Amendment) Act;
- b Waste (England and Wales) Regulations;
- c Environmental Protection Act;
- d The Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations;
- e Environmental Protection (Duty of Care) Regulations;
- f Environment Act;
- g Landfill (England and Wales) Regulations;
- h Hazardous Waste Regulations;
- i Environmental Permitting Regulations;
- j Site Waste Management Plans Regulations;
- k Waste Minimisation in Construction – Site Guide, CIRIA Special Publication 133;
- l Waste Management – the Duty of Care, Code of Practice, HMSO;
- m Carriage of Dangerous Goods and Use of Transportable Pressure Equipment;

3 DEFINITION OF WASTE

3.1.1 Waste is defined in Article 1 (1) (a) of the Waste Framework Directive (2006/12/EC) and means...“any substance or object ...which the holder discards or intends or is required to discard”. All waste that falls within the scope of this definition will be recorded in this SWMP. “Holder” means “the producer of the waste or the natural or legal person who is in possession of it”. It rests, in the first place, with the producer or holder of a substance or object to decide whether it is being discarded and is waste.

3.1.2 Waste is widely defined and includes excess unwanted materials, effluents, unwanted surplus substances arising from the application of any process and any substance or article which is broken, worn out, contaminated or otherwise damaged. Waste becomes controlled by legislation when it is discarded by the holder. Materials being returned to the company stores or supplier for credit are not considered as waste. Materials sold for re-use or re-cycling are still classified as waste and subject to all the statutory controls, including Duty of Care.

3.1.3 Waste ceases to be waste once it has achieved ‘Final Recovery’. This is when the waste material (in the view of the Regulator) has been incorporated into a final product.

4 STORAGE AND TRANSPORTATION

- 4.1.1 Under the Controlled Waste (Registration of Carriers and Seizure of Vehicles) Regulations, it is a criminal offence for anyone who is not registered as a waste carrier to transport controlled waste. The *principle contractor* is to be registered as a waste carrier.
- 4.1.2 All waste carriers to be used on the Contract (including the *principle contractor*) will be listed in the Waste Summary Table (Annex 4). Confirmation will be obtained from the Environment Agency that all carriers' registrations are currently valid, and the evidence filed in the Contract Filing System.
- 4.1.3 At the site compound the waste will be stored in an appropriate, clearly labelled container. The Waste Co-ordinator will maximise the recycling opportunities and ensure that waste streams are separated to facilitate this.
- 4.1.4 Hazardous waste will be sufficiently described to waste contractors to enable them to comply with any labelling etc. requirements under the 'Carriage of Dangerous Goods and Use of Transportable Pressure Equipment' regulations.
- 4.1.5 All materials brought to site will be stored and handled appropriately to minimise unnecessary wastage. Any site welfare facilities will be equipped with sufficient waste disposal containers for their needs, including recycling containers for plastic and cans.
- 4.1.6 If sewage from welfare facilities and site toilets is stored on site; it will be collected and disposed of by a sub-contractor approved by the *principle contractor*.

5 DISPOSAL OF WASTE

- 5.1.1 Any waste which cannot be used on site will be recycled or disposed of off site, via a registered carrier to:
- a A licensed landfill site; or
 - b A licensed transfer station; or
 - c A licensed recycling facility; or
 - d An exempt site.
- 5.1.2 Any waste disposed of to landfill must be pre-treated first. This is most easily achieved by segregating waste streams into different containers or sending waste to a recycling centre. This information needs to be recorded on the Pre Treatment form (see Appendix 4). Licensed landfill sites will not accept waste unless accompanied by a declaration of pre-treatment.
- 5.1.3 Every proposed destination site will be checked to ensure that a valid permit or waste exemption has been issued by the Environment Agency for the type of waste to be received. Copies of the relevant licences shall be obtained and filed in the Contract Filing System.
- 5.1.4 To further comply with the *principle contractor's* Duty of Care, if there are any suspicions regarding the waste contractor, the Contract Team will confirm that the waste is being taken to the site agreed with the Carrier. This may be done by:
- a Telephoning the destination site to confirm arrival;
 - b Receiving written confirmation of receipt from the destination site;

- c Timing the carrier's return trips;
- d Following a load and taking photographs as necessary.

Any actions from the above list will be recorded in the Contract Filing System.

- 5.1.5 Any illegal activities will be dealt with immediately by notification to the Environment Agency.
- 5.1.6 In addition, the *principle contractor* is to be act as a registered broker for waste generated by their sub-contractors.
- 5.1.7 The disposal of non-hazardous and inert waste will be covered by a fully completed Waste Transfer Note.
- 5.1.8 Disposal of hazardous waste is strictly controlled by separate legislation in England and Wales. The Hazardous Waste Regulations contain a revised definition of what constitutes Hazardous Waste. The site is to register with the Environment Agency as a producer of hazardous waste and the premises code issued shall be noted in the Waste Summary Table (Annex 4) and used on all Hazardous Waste Consignment Notes.
- 5.1.9 Every movement of waste must be accompanied by a Transfer Note, or, in the case of Hazardous Waste, a Consignment Note. These will be retained, filed and held at the site office. Waste Transfer Notes will be retained for at least two years and Consignment Notes for three years as required by the legislation. Completed Waste Transfer Notes and Consignment Notes will be filed in the Contract Filing System
- 5.1.10 All Transfer and Consignment Notes should show that the waste hierarchy has been considered prior to the disposal of waste.
- 5.1.11 The Waste Co-ordinator will be responsible for ensuring the skips are checked regularly and the contents disposed of correctly, and for keeping all relevant Hazardous Waste Consignment Notes and Waste Transfer Notes for filing.

6 POTENTIAL WASTES AND MANAGEMENT OPTIONS AT THE EDEN GEOTHERMAL SITE

- 6.1.1 At the start of the contract, the Contract team will anticipate the different waste streams and estimate the quantities to be re-used, recycled or disposed of. This data will be recorded in the Waste Predictions and Summary Form.
- 6.1.2 Containing the initial targets set for re-using and recycling the different waste streams, is to be printed and filed in paper form as Annex 3 to this Plan. The rest of the form is updated every month with the actual waste figures achieved. This is kept as an electronic document in the Contract Filing System.

7 COMPLETION OF WORK

- 7.1.1 Within 3 months of the contract completion the project team shall:-
 - a Review actual waste vs predicted quantities
 - b Identify any deviations away from the plan with explanation
- 7.1.2 The Declaration of Conformity Appendix 5 is to be signed by the Project Manager.

APPENDIX 1 COPY OF WASTE CARRIER'S / BROKER'S LICENCE

<<To be added by the *principle contractor*>>

APPENDIX 2 SITE WASTE MANAGEMENT PLAN CHECKLIST

This Checklist should be completed by the person responsible for producing the Site Waste Co-ordinator. If waste is being managed to sufficient standards, the Waste Co-ordinator should be able to answer 'yes' to all questions.

Questions to consider	Tick if 'Yes'	Comment: If 'yes', what action have you taken / do you propose to take? If 'no', why not?
Questions 1-21 to be completed before work on site begins		
1. Have you read and understood the company Policies?		
2. Have relevant sub-contractors producing significant waste streams been identified and their competence verified?		
3. Has a careful evaluation of materials been made so that over-ordering and site wastage is reduced?		
4. Have areas suitable for all components and materials been identified to prevent damage during storage?		
5. Has full consideration been given to the use of secondary and recycled materials?		
6. Is unwanted packaging to be returned to the supplier for recycling or re-use?		
7. Can unused materials be returned to purchaser or used on another job?		
8. Has a 'Waste Co-Ordinator' with responsibility for waste management planning and compliance with environmental legislation been assigned?		
9. Has a contract programme been developed to include likely waste arisings?		
10. Has an area of the site been designated for waste management, including segregation of waste?		
11. Have targets been set for the different types of waste likely to arise from the contract? Giving due consideration to the waste hierarchy		
12. Have measures been put in place to deal with expected (and unexpected) hazardous waste? (<i>Site registered as a hazardous waste producer?</i>).		

Questions to consider	Tick if 'Yes'	Comment: If 'yes', what action have you taken / do you propose to take? If 'no', why not?
13. Has disposal of liquid wastes such as wash-down water and sewage been considered?		
14. Have opportunities been considered for re-use of materials on-site?		
15. Have opportunities been considered for re-use of materials off-site?		
16. Have opportunities been considered for on-site processing and re-use of materials?		
17. Have opportunities been considered for reprocessing materials off-site?		
18. Have you identified the most appropriate sites for disposal of residual waste (non-hazardous and hazardous) from the contract?		
19. Do any of the planned waste activities require an environmental permit or an exemption to be registered?		
20. Have copies of all relevant duty of care documentation and other waste related legal documents been obtained and referenced on the Waste Summary Table		
21. Have toolbox talks been planned for all site personnel about waste management on-site?		
Questions 22-29 to be completed during the delivery of the contract on site		
22. Are selected waste materials segregated to allow best value to be obtained from good waste management practices?		
23. Are containers/skips clearly labelled to avoid confusion?		
24. Is the waste being stored securely to prevent any losses, in particular of hazardous substances?		
25. Are Duty of Care procedures complied with, including provision of transfer/consignment notes and checking authorisation of registered carriers, registered exempt sites and licensed waste management facilities?		
26. Are any checks made that waste is received at the intended site?		

Questions to consider	Tick if 'Yes'	Comment: If 'yes', what action have you taken / do you propose to take? If 'no', why not?
27. Is implementation of agreed waste management procedures monitored?		
28. Are reports regularly produced regarding waste quantities and treatment/disposal routes, and on costs incurred?		
29. During site operations, are barriers to good waste management practice considered and noted for incorporation into the post-completion review?		
Question 30 to be completed once operational activity on site is complete		
30. Has a final report of the use of recycled and secondary materials, waste reduction, segregation, recovery and disposal, with costs and savings identified, been completed?		

APPENDIX 3 WASTE PREDICTIONS AND SUMMARY TABLE

Site Hazardous Waste Registration Number: _____

If another party is arranging for the disposal of waste on the *principle contractor's* behalf, they are to be a registered Broker, Registration Number: _____

All of the following information must be completed for every type of waste produced on site:

Waste Details			Waste Prediction	Waste Carrier			Disposal Site			
							This may include more than one facility (e.g. transfer stations, treatment facilities, landfill sites etc.) for each type of waste. Details of each facility should be provided if available.			
Waste Type	European Waste Catalogue (EWC) Code	Source (i.e. process that produced it)	Predicted Amount (tonnes)	Name of Carrier and contact details	Registration Details (number, authorising EA/SEPA body and expiry date). Check on EA/SEPA website printed and filed?	Waste Transfer or Consignment Note used – single movement / annual (if annual, expires?)	Name of Site and contact details	Environmental Permit or Exemption Details (number, authorising EA/SEPA body)	Conditions of Permit Checked? (i.e. covers the type and quantity of waste involved). Copy filed?	Pre-Treatment Form completed? (Landfill only)

APPENDIX 4 WASTE PRE-TREATMENT FORM

Basic Characterisation & Pre-Treatment Confirmation Form									
Company Name:					Site Address:				
Waste Description:					Intended Disposal Site:				
Form		Smell		Colour					
Solid	<input type="checkbox"/>	Odourless	<input type="checkbox"/>						
Liquid	<input type="checkbox"/>	Odour <input type="checkbox"/> Specify:		EWC Code					
Process producing waste:				SIC Code:					
Waste type: (please tick)				Inert	<input type="checkbox"/>	hazardous	<input type="checkbox"/>	hazardous	<input type="checkbox"/>
Treatment of Waste									
Materials produced on site are: (tick all that apply)					Segregated?		Sent for re-use / recycling?		
Wood					<input type="checkbox"/>		<input type="checkbox"/>		
Paper					<input type="checkbox"/>		<input type="checkbox"/>		
Cardboard					<input type="checkbox"/>		<input type="checkbox"/>		
Glass					<input type="checkbox"/>		<input type="checkbox"/>		
Plastics					<input type="checkbox"/>		<input type="checkbox"/>		
Metals					<input type="checkbox"/>		<input type="checkbox"/>		
Green Waste					<input type="checkbox"/>		<input type="checkbox"/>		
Waste electrical & electronic equipment (WEEE)					<input type="checkbox"/>		<input type="checkbox"/>		
Topsoil					<input type="checkbox"/>		<input type="checkbox"/>		
Subsoil					<input type="checkbox"/>		<input type="checkbox"/>		
Stone					<input type="checkbox"/>		<input type="checkbox"/>		
Concrete					<input type="checkbox"/>		<input type="checkbox"/>		
Other (Specify):					<input type="checkbox"/>		<input type="checkbox"/>		
Have any other treatments been employed? (tick all that apply)									
Screening		<input type="checkbox"/>		Biological			<input type="checkbox"/>		
Thermal (e.g. incineration)		<input type="checkbox"/>		Other (specify):			<input type="checkbox"/>		
Approximately what percentage of the total waste is sent for recovery or recycling?					If treatment / segregation has not been carried out, please state why it is not considered necessary / feasible.				
Declaration: We confirm that the waste is delivered from the above named company and herein described has been treated as detailed above.									
Name:					Signature:				
Position in Company:					Date:				
Note: Treatment is a physical / chemical / thermal or biological process including sorting that also changes the characteristics of the waste and does so in order to: (i) reduce its volume; or (ii) reduce its hazardous nature; or (iii) facilitate its handling; or (iv) enhance its recovery.									

APPENDIX 5 DECLARATION OF CONFORMITY

This Declaration of Conformity must be completed within 3 months of contract completion.

Comparison to Predictions

The 'Predictions' and 'Totals' pages of the 'Waste Targets and Monitoring Form' should be filed in this section once completed to allow a comparison of the estimated quantities of each waste type against the actual quantities produced.

Deviation from the Plan

*(delete statement (a) or (b) as appropriate):

- a All measures documented within this Site Waste Management Plan (SWMP) have been adhered to throughout this contract*
- b If any of the measures within this Site Waste Management Plan (SWMP) have not been adhered to, provide an explanation as to why not here*:

Estimate of Cost Savings

Estimate any cost savings achieved by completing and implementing this Plan. For example, actual waste costs compared to predicted costs.

Waste Types	Tonnes	Cost	
		Predicted	Actual
Inert			
Non-Hazardous			
Hazardous			

Declaration

We confirm that this Plan has been monitored on a regular basis and revised and updated as necessary, in accordance with the Site Waste Management Plan Regulations.

Name:		Signature:		Date:	
Position:		Company:			

Summary of ecology mitigation at the deep geothermal energy site at the Eden Project

Following the receipt of planning consent on 16th December 2010 for the development phase of the deep geothermal energy plant at the Eden Project, work has been undertaken to meet the ecological mitigation (Figure 1). This has involved three main aspects:

1. Dormouse habitat mitigation and replanting
2. Japanese Knotweed control
3. Cornish Moneywort preservation

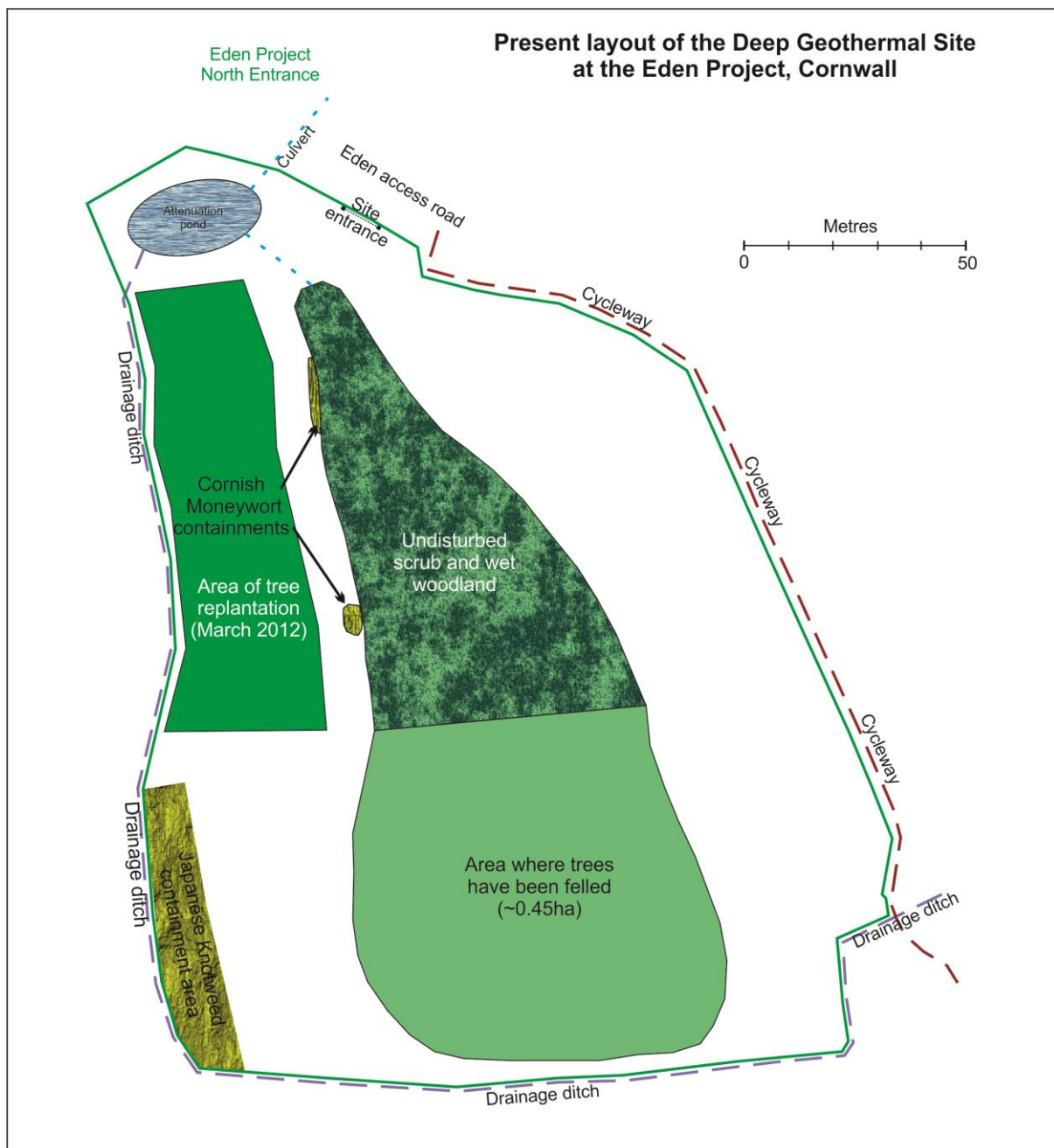


Figure 1 Ecology mitigation map of the proposed deep geothermal site at The Eden Project.

Dormouse habitat mitigation

A licence (Ref: EPSM2010-2687-B) under Regulation 53(1) of the Conservation of Habitats and Species Regulations 2010, was issued by Natural England on 4th February 2011 to permit the mitigation of the dormouse habitat on the site on the grounds of 'over-riding public interest'. Michael Woods Associates was commissioned by EGS Energy to carry out dormouse mitigation and monitoring works under the Natural England European Protected Species (EPS) Dormouse Mitigation Licence. The delivery of mitigation and compensation had been agreed under a Dormouse Licence Application Method Statement (issued by Michael Woods Associates, dated December 2010)

Construction of the geothermal energy facility and associated infrastructure required the removal of 0.43ha of woodland and scrub in the southern part of the site that had been found to provide sub-optimal habitat for a small population of dormice. In order to comply with protocol that had been agreed with English Nature the woodland and scrub was cleared by hand under the 'winter clearance method', during mid-February 2011. The trees were felled to a height of approximately 500mm above ground level. The work was carried out under the supervision of Michael Chanin, the nominated licence holder. Cut vegetation was chipped onto the paths which had been previously searched by the ecologists to ensure that there was no obstruction to any animals emerging from hibernation. All roots and stumps were left in place and care was taken during the vegetation removal to avoid disturbance of any animals which might be hibernating on the ground. No dormice or dormouse nests were encountered during vegetation clearance.

In mid-May 2011, once dormice had been confirmed as having emerged from hibernation, the large tree stumps and roots that had remained on site after felling were removed under the careful supervision of the licence holder (Figure 2).



Figure 2 The cleared southern end of the site - May 2011

In mid-February 2011 thirty dormouse boxes were installed at appropriate locations within the hedgerows/scrub along the southern and western boundaries and northern wet woodland. Monitoring of the installed dormouse boxes has taken place in May/June (pre-breeding) and September/October (post-breeding) each year (the results of this monitoring will be passed to Natural England, the Cornwall Biodiversity Records Centre and the National Dormouse Monitoring Programme (NDMP)/National Dormouse Database). These boxes have been monitored twice a year by an ecologist with a dormouse handling licence. One potential dormouse nest was found in a nest box during the monitoring inspection in May 2011; although no signs of occupation by dormice were found during the inspection in October 2011. This program of monitoring is planned for a period of five years after the habitat clearance.

A summary report, entitled '2011 Dormouse Monitoring Report' was produced by Michael Woods Associates in January 2012.

Tree planting

The Dormouse Licence Application Method Statement stated that the loss of the 0.43ha of scrub and wet woodland will be mitigated by the replanting of a total of 0.45ha of woodland and sensitive management of the retained hedgerows/scrub. The replanting was to be carried out in phases dependent on the program of site development. Phase 1 of the new planting had to occur between August 2011 and April 2012, when ground and weather conditions permitted. The objective was to plant new trees to mirror the existing woodland as replacement for the trees that had been felled in the southern end of the site. The new woodland planting would utilise species similar to those within the wet woodland that had been removed, as well as incorporating species known to benefit dormice such as hazel. It is accepted that it will take several years for the newly planted woodland to reach the maturity of the existing woodland. However, the installation of the thirty dormouse boxes would enhance existing habitat and would increase the number of breeding sites available to dormice whilst the new woodland becomes established. The replanting was confined to the western and northern ends of the site over an area covering approximately 0.15ha. The Phase 1 planting was carried out in March 2012 (Figure 3).



Figure 3 Tree replantation at along the western side of the site - March 2012

The tree replanting comprised a total of approximately 125 trees of the following species:

Goat willow	70 trees;	English Oak	15 trees;	Ash	10 trees;
Birch	10 trees;	Holly	4 trees;	Elder	4 trees;
Beech	2 trees;	Hazel	10 trees.		

Phase 2 will take place following completion of the construction of the geothermal plant. The access road west of the woodland will be removed and replanted to reconnect the retained woodland to the newly planted woodland and western hedge boundary. No long term fragmentation or isolation impacts are anticipated.

Japanese Knotweed Root Barrier Containment

Japanese Knotweed was found during the ecological assessment of the site that had been undertaken as part of the planning application. The chief area containing this plant lay along the southwest boundary of the site. The mitigation of the Japanese Knotweed commenced in January 2011 and was undertaken in-house by the Eden Project following accepted protocol and guidelines. The works comprised of three stages:

- Stage 1 – investigation to find the outer extent of the existing Japanese Knotweed sites;
- Stage 2 – construction of a single containment area for all the Japanese Knotweed;
- Stage 3 – monitoring and spraying of Japanese Knotweed within the containment area.

Stage 1

The investigation, by excavation of the extent of the Japanese Knotweed on the site was undertaken in January 2011. The main area of Knotweed was defined and a smaller secondary site was proven nearby.

Stage 2

In February 2011, the Japanese Knotweed from the small secondary area was transferred into the main area along the southwest boundary of the site. A trench 2.4 m deep and approximately 85 m long was dug to enclose the area containing Japanese Knotweed. As with the previous set of test pits, the sides of the trench were assessed, as digging progressed, for the presence of Japanese Knotweed roots and rhizomes. None were found. In the trench Peter Scott root barrier membrane was placed, supported 8'x4' sheets of 18 mm shuttering, the trench was then carefully backfilled. The ground on the 'clear' side of the barrier was then scraped to a depth of 15 cm and the removed material was placed on the JK side. Soil from the two isolated areas of Japanese Knotweed on the 'clear' side of the barrier was removed to a depth of 1 m (=11 excavator buckets) and placed on the Japanese Knotweed side; again, the hole sides were assessed for presence of roots/rhizomes and none were found. Finally a post and wire fence was erected along the east side of the root barrier containment area, approximately 0.5m from the barrier line.



Figure 4 Construction of the Japanese Knotweed containment area



Stage 3

The monitoring and spraying program commenced as soon as stage 2 had been completed and has been continued to the present date.

Cornish Moneywort preservation

Cornish Moneywort population was identified and located on the south western side of the site. The proposed mitigation measures and recommendations were designed to help minimize adverse impact on Cornish Moneywort pre-, during and post-construction.

Areas containing Cornish Moneywort that were not directly impacted upon by the development remained in-situ. Otherwise, translocation of plants, soil and turfs were to be moved to suitable areas within the same site, ideally within habitat that already supports Cornish Moneywort. Development of a Habitat Management Plan for Cornish Moneywort was required prior to translocation works. An assessment was made on both donor and possible receptor sites to confirm whether the translocation of the plants would be feasible. The physical translocation of Cornish Moneywort involved removing clumps of individuals by hand as large turfs (300mm in depth) and replanting in early Spring 2011. This enabled the topsoil containing the Cornish Moneywort seed bank to be successfully transferred to the receptor site. Two new sites of Cornish Moneywort were established adjacent to the western edge of the existing woodland, in an area that is unlikely to be disturbed by future development. These sites were delineated by fencing to ensure protection as 'no work' areas.

In addition, several sample clumps of Cornish Moneywort were propagated in a nursery at the Eden Project. This measure was critical to ensure that a viable population was maintained as a back-up should the on-site translocation fail. Monitoring of the Cornish Moneywort has been carried out since translocation of the plants and was based on best practice survey techniques undertaken by experienced specialists. Baseline information on Cornish Moneywort was collected prior to development. Monitoring of the trans-located and nursery grown individuals has provided valuable data on both the reproductive biology of the plant and the translocation process as a whole.