

Oxford Flood Alleviation Scheme



Materials Management Plan

November 2021

Prepared by Jacobs on behalf of the Environment Agency

Document History

This document has been issued and amended as follows:

Version	Date	Description	Created by	Checked by	Approved by	Document Number
1.0	04-07-16	Technical Summary Report	HF		DRAFT	
2.0	15-07-16	Planning information added	HF	PJM	DRAFT	
3.0	22-07-16	Minor corrections	HF	PJM	DRAFT	
4.0	12-09-16	Updated with comments from EA	HF	PJM	PJM	
5.0	26-06-17	Initial detailed design updates	ZO	PJM	DRAFT	
6.0	11-09-17	Updated with EA Comments	ZO	PJM	DRAFT	
7.0	24-01-18	Updated for planning	ZO	PJM	DRAFT	
8.0	06-02-18	Updated with EA Comments	ZO	PJM	DRAFT	
9.0	28-02-18	MMA section updated	ZO	PJM	DRAFT	RE-C-000111
10.0	07-03-18	For Planning Application	ZO	PJM	PJM	RE-C-000111
11.0	22-02-21	Update for revised planning	PJM		DRAFT	
12.0	16-10-21	Minor updates	PJM	MB-A	DRAFT	RE-C-000111
13.0	01-11-21	For Planning	PJM	MB-A	PJM	RE-C-000111
14.0	19-11-21	For Planning	PJM	MB-A	PJM	RE-C-000111

Contents

Section	Page
Acronyms and Abbreviations	v
Introduction	1
1.1 Background and Purpose of this Plan.....	1
1.2 Scope of Plan.....	1
Materials.....	2
2.1 Introduction	2
2.2 Materials Arising	3
2.2.1 Top Soil.....	3
2.2.2 Made Ground (including the Kennington Road landfill sites)	3
2.2.3 Alluvium	4
2.2.4 River Terrace Deposits	4
2.2.5 Oxford Clay.....	5
2.3 Materials Quantities.....	5
2.3.1 General.....	5
2.4 Excavation Methods	6
2.4.1 General.....	6
2.4.2 Traditional Excavation.....	6
2.4.3 Dredging.....	6
2.4.4 Suction or Vacuum Excavation	7
Material Management Options.....	8
3.1 General	8
3.2 Landfill Disposal	8
3.3 Sale of Materials.....	8
3.4 Re-use Within the Scheme.....	8
3.4.1 Topsoil.....	8
3.4.2 Alluvium	9
3.4.3 River Terrace Deposits	10
3.4.4 General.....	10
3.4.5 Environment Agency Schemes	11
3.4.6 High Speed 2.....	11
3.4.7 Local Authority and Local Infrastructure Schemes	12
3.4.8 Private Developments.....	12
3.4.9 Re-use Schemes.....	12
3.4.10 Other Wider Schemes	13
3.5 Re-use Locally.....	13
3.5.1 Agricultural Benefit.....	13
3.5.2 Golf Course	13
3.5.3 Permanent Placement to Land to the South of Hinksey Heights	13
3.5.4 Other Areas	16
Transport Options	17
4.1 General	17
4.2 Road.....	17
4.3 Rail.....	18
4.4 Barge.....	19

Section	Page
4.5 Pumping.....	19
4.6 Conveyor.....	20
Summary and Recommendations.....	21
5.1 General.....	21
5.2 Management Solutions.....	21
5.3 Transport Solutions	21
5.4 Next Steps	22
Appendix A – Materials Management Matrix.....	23

Figures

Figure 2-1 - Site Location Plan

Figure 2-2 – Channel formation using dredging

Figure 3-6 – Potential Locations for Permanent Storage

Acronyms and Abbreviations

RTD	River Terrace Deposits
ALV	Alluvium
ORG-ALV	Organic Alluvium
m ³	Cubic metres
ha	Hectares
GPS	Global Positioning System (Satellite systems)
LiDAR	Light Detection and Ranging (Laser scanning)

Introduction

1.1 Background and Purpose of this Plan

This plan was initially produced to support the planning submission for the Oxford submitted in 2018 and subsequently withdrawn in 2020. The document has been updated in 2021 to reflect the changes to the scheme and support the resubmission of the planning application.

The Oxford Flood Alleviation Scheme aims to protect a significant number of houses by rerouting some of the flood water around the city and away from the residential areas. The main aspect of the scheme is the construction of a two-stage flood channel to the west of central Oxford.

This solution will require the excavation of large quantities of material. The purpose of this plan is to document the decision-making process for the proposals for dealing with this excavated material, whether it is re-used on site or removed for other purposes, as well as identifying the safest and most cost-efficient method of excavation to support the planning submission to Oxfordshire County Council.

The area surrounding the proposed flood management channel is low lying and falls within the designated floodplain. Raising or development of areas of the floodplain is contrary to planning guidance as it reduces the natural space to accommodate flood water, the result of this is typically raising of flood levels locally which can increase flood risk. The purpose and aims of the Oxford Flood Alleviation Scheme is to reduce flood risk to residential and commercial properties along with key transport routes including the railway.

The location of the proposed scheme, in close proximity to these previously developed areas, means that any local raising of the floodplain will have a direct negative impact on flood levels and goes against the aims of the scheme. As such any excavated material from the construction cannot be re-used around the immediate area of the proposed works without impacting on the flood capacity afforded by the area. The focus of the design is to ensure that materials are re-used within the permanent works wherever possible to avoid the need for removal from site. Where surplus materials are not able to be re-used then material will have to be removed from the immediate vicinity of the proposed works.

The water table throughout the floodplain to the West of Oxford and the area of the proposed Oxford Flood Alleviation Scheme flood management channel is consistently high. During ground investigation works the water table was located at the interface between the sand and gravel layer and the overlying alluvium overburden. In several locations, the water table rose slightly when exposed in trial pits indicating it may be constrained by the impermeable alluvium layer.

1.2 Scope of Plan

This materials management plan was initially produced at the Outline Design stage and then regularly updated to reflect the development of the detailed design process for the scheme.

The options reviewed and discussed in this plan are based on the best available information from the materials management market at the time of writing. This market is constantly changing as other schemes are taken forward or stopped. This plan will need further development and finalisation as exact locations of sites receiving the materials are confirmed at the commencement of the construction stage. This will ensure that the routes for dealing with materials arising from the scheme are dealt with in the most cost effective and sustainable manner available at the time of construction of the scheme.

Materials

2.1 Introduction

The scheme has been split into four areas. These are shown on Figure 2-1. These areas are shown in more detail in the figure below.

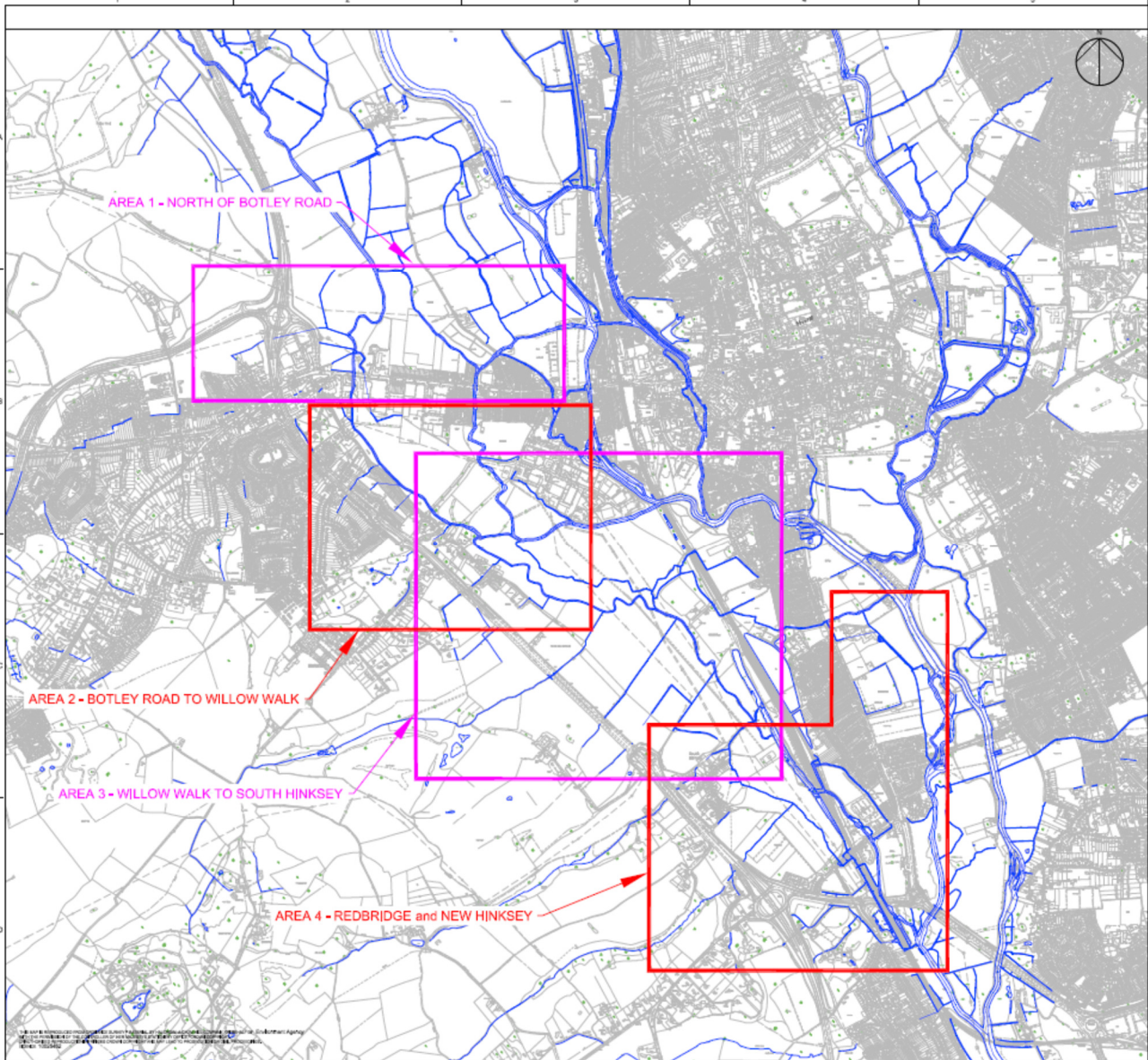


Figure 2-1 - Site Location Plan

This map is reproduced from Ordnance Survey material with the permission of Her Majesty's Stationary Office ©Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Environment Agency, 100026380, 2021.

The site is subdivided into the following areas:

- Area 1 – North of Botley
- Area 2 – Botley Road to Willow Walk
- Area 3 – Willow Walk to the Devil's Backbone
- Area 4 – Devil's Backbone to Confluence with the River Thames

The bulk of the route through the western floodplain consists of open land with farmland grazing, but it also comprises some developed land associated most notably with former landfills and is intersected by the road embankment for the A423 Southern Bypass Road, Old Abingdon Road and the railway.

As part of the development of the scheme a number of data gathering exercises have been undertaken to determine the types of materials likely to be encountered in the excavation of the scheme as follows;

- Desk based geotechnical information to gather existing ground data for the area undertaken in 2015.
- Ground investigation across the whole of the proposed site was undertaken by WYG in September 2015. This consisted of 87 trial pits, 15 window samples and 10 boreholes.
- Targeted ground investigation focused on key structure locations and to supplement the 2015 investigations to obtain design parameters undertaken by WYG in April 2017. This consisted of 59 trial pits, 25 window samples and 57 boreholes.
- Archaeological trial trenching across the site area undertaken by WYG and Oxford Archaeology in October 2017 – this was targeted on archaeological features but soils information from 200 trenches were also recorded and included into the overall geotechnical data for the area.
- A further smaller ground investigation was undertaken in 2020 by Socotec Ltd, this was targeted in the Kennington Road landfill sites (Kendall Copse) area to obtain further information to inform temporary works designs and changes to the alignment of the flood channel through this area. The findings of this investigation have been summarised in an Addendum to the Contamination Report which forms part of the planning submission.

Based on the information obtained from the above investigations the following geological sequence was typically encountered:

- Topsoil
- Alluvium: Soft slightly silty clay, sometimes organic
- River Terrace Deposits (RTD): generally comprising of sand gravel, sometimes slightly silty and with occasional bands of clay. Gravel is of limestone and sandstone.
- Oxford Clay: slightly silty dark grey clay.

Within Area 4, made ground deposits were also encountered in connection with the former landfill sites on Kennington Road. Made Ground comprising reworked alluvium was also encountered in previously developed parts of the site.

2.2 Materials Arising

2.2.1 Top Soil

Topsoil was found to be on average between 0.1m and 0.3m deep from the top surface level for each area.

2.2.2 Made Ground (including the Kennington Road landfill sites)

Deposits of Made Ground were encountered in localised pockets near the ground surface around the site, predominantly in the vicinity of Old Abingdon Road (the most heavily developed section of the site). Generally, these deposits were very thin and comprised of reworked alluvial deposits. Though variable in composition, the Made Ground was typically described as:

“Brown slightly sandy slightly gravelly silt/clay. Gravel is sub-angular to sub-rounded, fine to coarse brick, concrete, flint and occasionally shells.”

Within the former landfill site at Kennington Road, now known as Kendall Copse, the Made Ground was very variable in nature. However, these deposits could be very broadly described as:

“Brown / yellowish brown slightly clayey sandy gravel. Sand is fine to coarse. Gravel is very angular to sub-rounded, fine to coarse flint, plastic, rubber, glass, metal and timber.”

The landfill material has been classified as non-hazardous for the purposes of waste management and will need to be taken to a licenced landfill when it is removed from the site.

During the 2017 ground investigation, local pockets of asbestos fibres were identified in two trial pits. The first was close to the A423 road embankment and the second in the southern end of the Botley Road nature reserve area. These were isolated findings but do indicate that other contamination may be present in local areas which will dictate the disposal route of material arising from these locations. By its random nature this contamination is impossible to predict and will need excavations to be monitored and tested to ensure that appropriate disposal routes are utilised for any specific contamination found.

The additional limited 2020 ground investigation confirmed the depths and type of materials in the landfill areas to help inform the possible disposal routes along with design parameters for the realigned channel connecting to the replacement A423 bridge and the lining for the channel to separate the landfill material from the new watercourse. An addendum to the Contamination Report for the scheme has been produced to cover the additional information obtained during the 2020 investigations.

2.2.3 Alluvium

Alluvium was found to underlie much of the site and was typically described as:

“Soft to firm orange brown, mottled grey, slightly sandy CLAY, occasionally slightly silty and slightly gravelly in nature. Occasional lenses and bands of dark brown to black soft pseudofibrous peat and decomposing organic matter, with occasional white shells.”

For the purpose of the geotechnical assessment, the alluvium was subdivided into the following units based on either laboratory test results of organic content, or field descriptions:

- Alluvium (ALV): organic content <2% and/ or field descriptions do not reference organic matter/peat layers.
- Organic alluvium (ORG-ALV): organic content >2% and/or field descriptions note organic matter/peat layers.

Although a distinct boundary occurs between the alluvium / organic alluvium and the underlying River Terrace Deposits, there is no obvious stratigraphic relationship between the alluvium and organic alluvium across the site.

The alluvium thickness varies from less than 1m thick to up to 2.5m thick in different areas of the site.

Typically the alluvium is 1 to 1.2m thick in most areas where the second stage channel is located. This means the lower portion of the first stage channel will be located in the river terrace deposits layer.

2.2.4 River Terrace Deposits

River Terrace Deposits (RTD) were found to underlie the alluvium, and occasionally be near or at the ground surface. The RTD were typically described as:

“Medium dense to dense grey sandy subangular to subrounded limestone, quartz and sandstone gravel, becoming orange brown with depth. Sand is fine to coarse, sometimes silty in nature.”

For the purpose of the geotechnical assessment, the River Terrace Deposits were subdivided based on the proportion of material passing the 0.06mm sieve in the laboratory particle size density test, which provided an indication of the clay and silt sized (fines) content of the samples. The following categories were adopted:

- RTD-C: < 5% material passes 0.06mm sieve
- RTD-F: > 5% material passes 0.06mm sieve

This distinction between the categories was made to assist the assessment of potential reusability of the RTD in the minerals industry. Based on guidance from a mineral extraction expert, RTD-F material would require washing and/or further treatment in order to become acceptable for use within the aggregates industry, reducing the commercial value of such deposits.

The RTD-F were generally still described as a sandy gravel, but with clay and / or silt present. Sporadic thin bands and localised pockets of cohesive material were also encountered in a small number of locations within the RTD-F. These deposits were generally described as a sandy clayey silt, sometimes with the presence of gravelly material. A review of the ground investigation data indicates that the RTD-F described as a SILT appear to occur in discontinuous lenses distributed across the entire site. Although these silt deposits have been classified as RTD-F, it should be noted that their engineering behaviour may be slightly different to the more granular RTD-F strata. For the purposes of material management plan both RTD-C and RTD-F have been considered as a single entity as both would be managed via the same routes.

As outlined in the introduction to this report (Section 1.1) the consistent stage of the water table means that the gravels are saturated. Extraction of sands and gravels from below water is feasible. Once removed from the ground they will drain quickly and can be excavated using a perforated bucket to allow them to drain back into the working area. This helps to avoid the need to deal with the groundwater.

The removal of the gravels would leave an open excavation full of groundwater to the level of the surrounding ground water table, in the area in question this is likely to be within 1m of the surrounding ground surface depending on the time of year.

2.2.5 Oxford Clay

Oxford Clay was proven across the site in a number of the cable percussion boreholes, and occasionally in hollow stem auger holes or trial pits. The Oxford Clay was typically described as:

“Firm, becoming stiff to very stiff with depth, dark grey to bluish grey slightly silty clay, occasionally with small lenses of fine white sand.”

The channel works proposed as part of the scheme will not extend deep enough to encounter this material. It is also unlikely that structure foundations will generate significant quantities of this material therefore Oxford clay is not considered further in this management plan.

2.3 Materials Quantities

2.3.1 General

The channel profile from the fluvial modelling has been directly transferred to the 3D digital ground model to enable the excavation quantities to be derived directly from the model based on the ground levels from the topographic survey of the area. The channel profile has been taken from the Flood Modeller georeferenced model. This has been supplemented with hand calculations for smaller areas.

A separate allowance has also been included to cover excavation associated with new structures to be built as part of the scheme and for the inclusion of additional excavation of scrapes to provide ecological enhancements.

The overall quantities of materials which need to be removed from site are estimated as follows;

Table 2-1 – Estimated materials quantities

	Material Type	Volume to be removed from site (m ³)
1	Topsoil	27,585
2	Made Ground (incl landfill material)	30,088
3	Alluvium	293,255
4	River Terrace Deposits	8,200
5	Oxford Clay	0
	Totals	359,128

The above table outlines the volumes of each material type to be removed from site and takes into account the re-use of topsoil, river terrace deposits and alluvium within the works where possible, see Section 3.4 for further details.

Further details of the estimated quantities for each type of material for each of the site areas is included in the matrix in Appendix A.

2.4 Excavation Methods

2.4.1 General

Traditionally earthworks contracts are run over the driest parts of the year, typically April to end of October. This avoids the winter period when material can be too wet or frozen to be handled easily and plant can become bogged down on the site. Whilst wet periods outside of this winter period do occur they tend to be relatively short periods as the ground dries much more quickly due higher temperatures and typically a lower water table.

2.4.2 Traditional Excavation

Traditional open excavation is carried out using plant set on surrounding ground. For a project of this scale it is expected that large scale GPS controlled machinery would be utilised to increase the speed and accuracy of the process.

For material movement of this kind traditional back acting excavators are routinely used and are available in a range of sizes and reaches including those suitable for working on soft ground and are able to excavate material from below the water table. The use of GPS controls means an accurate channel profile could be excavated below the water table and minimise any over excavation.

Scrapers and bulldozers can normally remove up to 300mm of material with each pass however this kind of excavation methodology requires dry conditions which precludes them from use in the majority of areas on this scheme.

Moving material around the site from excavators would usually be carried out using off road 40t dumper trucks for re-use elsewhere on the site or for onward transfer to the chosen method of removal from site.

It is proposed to utilise off road dumpers to transfer material to a compound area for temporary storage and sorting before being removed from site but in some areas access for road going vehicles will be possible via a suitable temporary haul road and any material to leave site via road could be loaded directly into road going trucks to avoid double handling in these areas.

2.4.3 Dredging

In areas of high water table dredging has been used to form new channels. The dredger effectively digs its way along forming the new channel as it goes as shown in Figure 2-2 below.



Figure 2-2 – Channel formation using dredging

Whilst the water table in the Oxford area is relatively high the size of the lower section of the channel is not sufficiently large to accommodate a floating work barge and the second stage, upper section of the channel is above the water table. Therefore, dredging type excavation has been discounted for this scheme.

2.4.4 Suction or Vacuum Excavation

Suction or vacuum excavation technology has developed rapidly over the last few years and it is now routinely used for excavations around services and in other areas where traditional excavation is not possible due to access or space constraints. Materials can be transferred directly to vehicles for moving off site. Whilst this can be effective for small scale excavations, its use for large scale excavation of alluvium is unproven and would not be cost effective. It is therefore not considered further in relation to this project.

Material Management Options

3.1 General

For each type of material various management options have been identified and investigated. These options were initially assessed without consideration of cost or environmental constraints. These were then refined as described below.

3.2 Landfill Disposal

Landfill sites have the advantage of being able to deal with a large quantity of material over a short period of time however they are environmentally damaging and expensive for disposal of primarily inert material. As such they are only to be considered as a last resort and sustainable re-use of the material should be a key objective of materials management. Materials arising from the existing historic landfill areas along the scheme will need to be taken to a licenced waste management facility for appropriate disposal. However, the works have been designed to minimise the excavation in areas of known historic landfill.

3.3 Sale of Materials

Consultation with various minerals companies has taken place to understand whether or not there is likely to be a demand for any minerals. Although initial indications were that some minerals companies would be willing to purchase the minerals. As the design developed it became clear that the volumes of sands and gravels generated by the scheme are low, the best scenario is that they would offer to take it from site at no cost due to the amount of processing of the gravel that would be required prior to resale. This would need to be undertaken away from the flood alleviation scheme site at established facilities, processing on site for the limited volumes of gravel arising because of the scheme would not be cost effective. The opportunities for wider gravel extraction as part of the scheme has been considered but discounted for a range of technical and planning reasons. The final design of the scheme re-uses the sands and gravels within the permanent works, see Section 3.4.3, with the surplus being removed from site to be re-used in other environmental schemes.

There is generally a market for good quality topsoil, for commercial sale it typically needs to be screened and sterilised to prevent transfer of disease. However, whilst there may be a market for agricultural use of any surplus topsoil the volumes are relatively small. It may be possible to transfer topsoil to local fields or allotments for agricultural benefit in agreement with landowners at no cost to the project. If this is not possible then surplus topsoil will be removed from site to a processing facility for re-use.

It should be noted that due to the timing of the construction of this scheme could be running concurrently with High Speed 2 rail project (HS2), some materials management companies have raised concerns that HS2 are likely to be require a large volume of materials to be processed in the same period which may affect the market and costs for managing materials.

3.4 Re-use Within the Scheme

3.4.1 Topsoil

Re distribution of the topsoil material within the site is considered to be achievable however it is proposed for some areas have topsoil reinstated to support meadow grass as currently exists and in others a low nutrient sub-strate is left to support more varied species, this will involve replacing topsoil to a depth of 50 to 100mm. At present the thickness of topsoil varies but is typically 100 to 300mm deep. It is estimated that two thirds of the overall volume of topsoil is reinstated and the remainder is removed from site or re-used locally in conjunction with landowners.

Topsoil can be placed in surrounding areas to where it has been removed with the exception of Area 2 (Hinksey Meadow) which contains MG4a status grassland. The turves, topsoil and green hay from this area will be used, without mixing with materials from other areas, to populate a similar area just south of the Bulstake Stream and recreate a similar standard of grassland. We are working with the Floodplain Meadow Partnership to confirm the best way to recreate MG4a grassland elsewhere on the scheme.

3.4.2 Alluvium

Two main options for re-use of materials on site were considered and are outlined below.

The first option is for the utilisation of the alluvium in the construction of a series of flood embankments required as part of the scheme.

There are four locations within the site boundary suitable for the re-use of the alluvium:

- The new South Hinksey embankment;
- The New Hinksey embankment parallel to Abingdon Road;
- The new Botley Road embankments; and
- Osney Mead embankment in Oatlands Recreation ground.

This will help reduce the number of vehicles taking material off site on the wider road network although it will still require transporting to the raised defence site from the material source. Some of the alluvium in locations such as north of Botley Road is either too soft or has a too high organic content to be suitable for use in flood defences. Therefore, there will need to be a coarse sorting process on site to identify areas of suitable material and ensure it is used as efficiently as possible. For some areas additional on-site processing to mix with gravels will need to be undertaken to provide a suitable material for the flood defences. For the South Hinksey defences it is anticipated the material can be moved within the site using off road plant to increase efficiency. For the Botley Road defences, Osney Mead and the New Hinksey defences the material will need to be imported to these areas from the main works in Area 3, where suitable material is located. This will necessitate transport via the local road network.

It should be noted that the quantities of Alluvium that are expected to be removed will exceed the volumes required for the construction of these defences and a significant amount will still need to be removed from site. See table 2-1 for information on the quantity of the alluvium to be removed from site.

Further uses off-site for Alluvium are outlined in Section 3.5 of this report.

An option was reviewed, but then discounted, to replace areas of over excavated gravel with alluvium. As the gravels can potentially be removed from site at a lower cost than alluvium, by over excavating the gravels alluvium can be laid in its place to avoid disposal off site. However, this will still result in the same number of vehicle movements out of the site as part of the scheme.

It could be possible to overdig the gravels along the route of the channel and replace with alluvium, this would effectively create a lined channel which is not in direct contact with groundwater. This would be contrary to one of the aims of the project which is to provide a natural channel and would limit the environmental opportunities within the channel corridor which are achievable.

Excavation over a larger area would also create additional quantities of alluvium to get to the gravels which would need to be managed on site. If the gravel was extracted to its full depth there would be an opportunity to dispose of material from other areas to reinstate the excavation back up to natural ground levels but costs for double handling of the additional alluvium would have to be considered. It would also have significant additional environmental impacts across the area.

It should also be noted that whilst it is possible to extract gravel from underwater it is not practical to place alluvium as backfill underwater, this would apply to both wider excavation and over digging the channel. To avoid future settlement or ground stability issues the alluvium needs to be placed in layers and compacted with a mechanical roller. The alluvium would need to be at a suitable moisture content to allow this to be effective and this would have to be undertaken in a dry excavated area with no groundwater present.

To facilitate this any excavation to be filled would need to be dewatered using a well point system. This would significantly increase costs and there are limited areas in which to manage the groundwater pumped out of the excavation and avoid it passing directly into nearby watercourses or impacting on additional land areas.

The gravel is highly permeable and groundwater flows through this area relatively unhindered. Backfilling this area with impermeable alluvium would prevent this and groundwater would have to flow around the filled area. This is likely to have an adverse impact on the groundwater regime in an area already sensitive to groundwater flooding. It may be possible to engineer flow paths through any impermeable areas but this would reduce the capacity for groundwater flows, material disposal and create a potential long-term maintenance liability.

Given the logistical problems with dealing with groundwater the options for over digging of gravels to facilitate backfilling with alluvium have been dismissed as part of the project.

Land raising of other areas around the site above existing ground levels has also been dismissed for the reasons explained in Section 1.1.

3.4.3 River Terrace Deposits

The limited volume of sands and gravels generated will be re-used in the scheme wherever possible, these will be utilised for gravel filter drains and creating environmental enhancements. These will be in the form of gravel beds to some streams which are not currently within the gravel layer and provide environmental enhancements such as riffles in new and existing streams. As noted in the previous section, some will also be used for mixing with alluvium to create materials suitable for use in the raised flood defences. The surplus amount of sands and gravels arising from the scheme will be taken off site and re-used in other local environmental schemes including other Environment Agency schemes.

3.4.4 General

Ideally all surplus materials arising from the works which cannot be re-used locally within the site should be re-used in other schemes. The closer to the works that the site of re-use is located will result in shorter vehicle trips and hence less disruption, environmental impact and a lower overall carbon footprint.

The construction programme for the scheme requires the removal of approximately 900m³ of material from the site each day excavation is being undertaken. This is considered to be the maximum number of vehicle movements which could be realistically achieved, this is equivalent to 111 vehicle movements per day. This will require working on multiple excavation areas during the periods earthworks are taking place. It is expected that earthworks will be restricted to the drier months of the year typically, April through to October.

As an indication of the distance that vehicles can transport materials and hence how many vehicles would be required to transport 900m³ of material per day see Table 3-1 overleaf. It has been assumed that each vehicle travels at an average speed of 40mph and 0.5 hours is required each end for loading and unloading. This gives an indication of the likely viability of reusing material on other schemes.

It should be noted that many developments that require materials will only be able to receive the materials at the rate they can be used and are unlikely to be able to stockpile significant quantities of materials. Therefore, to allow the production rates to be achieved to meet the delivery programme for the Oxford scheme it is likely that a number of disposal routes, ideally to the north and south of Oxford, will be required to reduce risk of delays and avoid reliance on any one single receipt site. The precise location of sites will need to be confirmed just before construction commences as receptor sites will not commit to any agreements before there is confirmation that the scheme will be going ahead to give themselves certainty of receipt of materials.

Table 3-1 – Indicative vehicle numbers required for transportation

Trips per day	Loading/unloading time (hours)	Transport time (hours)	Distance (miles)		Vehicles required to achieve 900m ³ /day
			One way	Round trip	
1	1	7	140	280	120
2	2	6	60	120	60
3	3	5	33.5	67	40
4	4	4	20	40	30
5	5	3	12	24	24
6	6	2	6.5	13	20

3.4.5 Environment Agency Schemes

3.4.5.1 Alluvium

As outlined in Section 3.4.2 alluvium is considered suitable for re-use in flood embankments.

A review of the Environment Agency’s current six-year plan for the local area has failed to identify any schemes with a local requirement for large quantities of materials. A number of schemes with a demand for cohesive material are under development within the programme and will continue to be monitored to determine if they can be brought online to coincide with the Oxford scheme and whether it is cost effective to transport the surplus material from Oxford to other flood risk management sites for re-use. The Environment Agency manages flood defences in the Thames Estuary through a programme called TEAM2100. There are a series of embankment improvement works that will be carried out on the River Thames from Teddington to the river mouth. The sites range from 60 miles to 120 miles from the South Hinksey junction on the A34 requiring 60 to 120 vehicles to achieve 900m³/day. Although large quantities of materials are likely to be required it is expected that it would be more economically viable for these schemes to acquire this material from HS2 which is understood may be delivering to sites for free locally within the London area at the same time as the Oxford scheme will be generating materials. It is therefore highly unlikely that sourcing material from Oxford will be the most cost-effective option for the Team 2100 project.

Whilst none of the potential Environment Agency schemes are likely to create a complete solution to the materials management issues on the Oxford scheme it may be a number of small schemes within the Thames area could make use of the materials as a partial solution and reduce materials import costs on these schemes.

3.4.5.2 River Terrace Deposits

As outlined in Section 3.4.3 surplus quantities of sands and gravels arising from the scheme will be taken off site and re-used for ecological and environmental benefits in other local environmental improvement schemes possibly including other Environment Agency schemes. There are potential Environment Agency and partner projects working to a similar timescale to this scheme in the local area which may require gravels. These include enhancements planned for the River Evenlode, a fish bypass channel at Wolvercote, and collaborative river restoration projects on the River Thame, where cost effective, gravels may be re-used in these or other schemes which coincide with the implementation of the Oxford scheme.

3.4.6 High Speed 2

A number of initial discussions have been held with the High Speed 2 project (HS2) in relation to the possibility of collaborative working. HS2 are likely to have a large quantity of cohesive material arising that they too will be looking to remove from their sites, they will however require quantities of gravels at the same time the Oxford scheme will be under construction.

HS2 initially indicated they may be able to accept unprocessed gravels by train however given the relatively small quantities being generated as part of the scheme this option has now been ruled out.

3.4.7 Local Authority and Local Infrastructure Schemes

National Highways and Oxfordshire County Council have a number of projects planned on the road network between the M4 and M40 plus further infrastructure improvements along the network.

At present, it is understood that funding has not been fully allocated to these projects and the likely timescales are not fixed. This potential route for disposal would provide a viable method of local materials management given the proximity to the site however given the funding uncertainties it cannot form part of any firm plans at this stage.

Liaison with National Highways and local highway authorities will continue to identify any new schemes which come up locally which could help with the re-use of materials.

3.4.8 Private Developments

At present there are no known large scale housing developments in Oxford likely to go ahead within the timescales of the scheme. However, it is possible that a number of schemes could come to implementation before the scheme is planning to commence. A number of significant developments have been identified in surrounding areas with a possible need for bulk fill material but these are at early stages of planning and implementation. The opportunities identified to date include;

- Didcot Power Station, located to the south of Oxford there is a planned re-development of the Didcot power station site for a new data centre, it is understood cohesive material may be required for a capping layer across the site. There are also proposals for 1200 new houses in the North East Didcot development and over 10,000 new houses in total in the Didcot area with a resolution to grant or full planning permission. These sites are located approximately 16 miles away and would require 30 vehicles to make 4 trips per day to achieve 900m³/day, however timescales and material requirements for these developments are currently unknown but will be monitored as potential opportunity to take forward.
- Symmetry Business Park and the Eastern Villages Development, Swindon, this is a major housing and industrial development of the eastern side of Swindon. It is part of the adopted Swindon Borough Local Plan for the level of housing, employment and other development needs up to 2026 and includes over 7,500 new homes. The construction of the business park is currently underway with the housing development expected to commence in soon and run for a number of years. The site is located 29 miles from the site and would require 40 vehicles making 3 trips per day to achieve 900m³/day. However, the route to this site would utilise the A420 road which can be heavily trafficked and suffers regular delays which could increase the number of vehicles required to meet production rates.

Whilst neither of these developments listed are currently in a position to commit to receiving materials, liaison with all local planning authorities and relevant developers will continue over the next year to ensure that these or other smaller local developments are reviewed.

3.4.9 Re-use Schemes

There are a number of ongoing minerals sites to the north and west of Oxford which are coming to the stage where they have areas being reinstated upon completion of the mineral extraction. Several of these sites have indicated that they will be in a position to receive inert alluvium material during the period that the Oxford scheme will be generating material and have existing planning permissions with agreed restoration schemes. These sites are to restore the gravel workings to create wetland and ecologically diverse sites which is a positive re-use of material for the Oxford scheme.

Smiths and Sons Bletchingdon operate the ongoing Gill Mill Quarry, which lies just south of Witney within the Lower Windrush Valley near Ducklington, parts of this site have already been reinstated to a high standard forming reed beds and other ecologically beneficial features. This site is located 14 miles from the flood alleviation scheme site, based on 4 or 5 trips per day this would require 30 vehicles to achieve the 900m³/day production rate. However, based on discussions this is a long-term restoration project spread over a number of years and unlikely be able to receive the material at the required rate. At present the operator is not willing to commit to receiving materials until the flood scheme has confirmation of

going ahead following the planning process. It is likely that the use of a number of sites will be required to achieve the full production rate required.

Hansons have also indicated that they have similar restoration schemes in the local area at Cassington and Yarnton which are closer to the scheme than the Ducklington site.

Grundons operate the at New Barn Farm, Cholsey which is to the south of Oxford and the restoration proposes importing 2.1 million tonnes of inert restoration materials for use to restore to agriculture whilst providing biodiversity enhancements.

Many of the sites are located to the north of Oxford in the Witney and Standlake areas which will require vehicles using the A34 and A40 roads, both of which have serious congestion problems during rush hour periods. Ideally a combination of sites to both the north and south will be utilised to give flexibility in transport routes and spread construction traffic.

Contact will be maintained with all mineral companies in the local area to ensure the maximum amount of material can be taken to nearby restoration schemes to help create environmental improvements.

3.4.10 Other Wider Schemes

There are a number of major developments going on across the county and surrounding areas which require significant quantities of inert material to raise sites and also cap off and seal brownfield sites.

One such development is a Scottish and Southern power station site in Gloucestershire near Avonmouth which requires the importation of 1.1 million cubic metres of clays, subsoils and hard core, over a 50 month period, for the purposes of the remediation of the site.

Major projects will continue to be monitored over the next 12 months however it is likely that these sites are too far from Oxford when the carbon emission impacts and costs are considered to be an-effective disposal route.

3.5 Re-use Locally

3.5.1 Agricultural Benefit

The possibility of creating agricultural benefits with surplus materials has been reviewed both technically and in discussions with landowners and members of the local farming community. The use of ground raising to help deal with the alluvium arising from the site will not bring justifiable agricultural benefits. However, the possibility of relocating excess topsoil to fields with limited topsoil coverage could bring agricultural improvements.

Two areas for improving the depth of topsoil have been identified following discussions with landowners. These are on land opposite Redbridge Park and Ride and in the Sandford area. The Bulstake Close allotments site off Botley Road has also indicated a willingness to receive some topsoil, however this is located in the floodplain and care will need to be taken to avoid any detrimental impacts if this option is progressed. Given the general demand for topsoil it is likely other sites for re-use will be available closer to the date when the material becomes available.

3.5.2 Golf Course

The owners of South Hinksey Golf Course at Hinksey Heights on the opposite side of the A34 have indicated they would accept some material. A valid planning permission would be required to enable any filling or raising on this site. However, following a visit to the site and a meeting with the owners the volume required is very small in comparison of the volumes being generated and is not considered to be worth pursuing further.

3.5.3 Permanent Placement to Land to the South of Hinksey Heights

Several locations for permanent raising of land were identified in the area south of Hinksey Heights and have been investigated to see if they would provide a suitable alternative to removing material off site via the road network. The benefits of using this area include helping to reduce congestion on local roads along with a reduction in associated vehicle emissions. This would also reduce costs and provide a buffer to

allow excavation to continue during any periods when traffic is at a standstill on the A34. A number of areas were identified as shown on Figure 3-6 overleaf.

Areas to East of the A34, MMA(1) and MMA(2)

It was initially considered that a low noise bund could be constructed within MMA(1) and MMA(2) to shield the area from the A34 road noise. However the northern field, MMA(1), contains a water main and a gas main running along the western edge which would preclude the construction of a bund in this field. The current intention is to use MMA(2) as a materials laydown area and for temporary storage during the construction process so the installation of the bund would need to be planned around site activities to avoid creating logistical problems and the need for double handling of materials. Given the limited volumes of material involved, and the likelihood of a short section of bund to prevent noise in this area being ineffective, these locations have been discounted for any permanent landraising.

Areas to West of the A34, South of Hinksey Heights, MMA(3) and MMA(4)

A wider area of the land on the west side of the A34 than marked on Figure 3-6 was reviewed initially but discounted due to environmental and visual impacts, accessibility and proximity to residential areas. Following meetings with landowners and a site visit the potential areas for raising were reduced down to the areas outlined in red and labelled as MMA(3) and MMA(4) in Figure 3-6.

MMA(3), is at the end of an escarpment and land raising in this area would have a limited impact on the landform. The site is also shielded from view from the east by the interchange and other viewpoints from Boars Hill towards Oxford look over the top of this site. These fields are currently used for livestock grazing and once reinstated could continue to be used for this purpose.

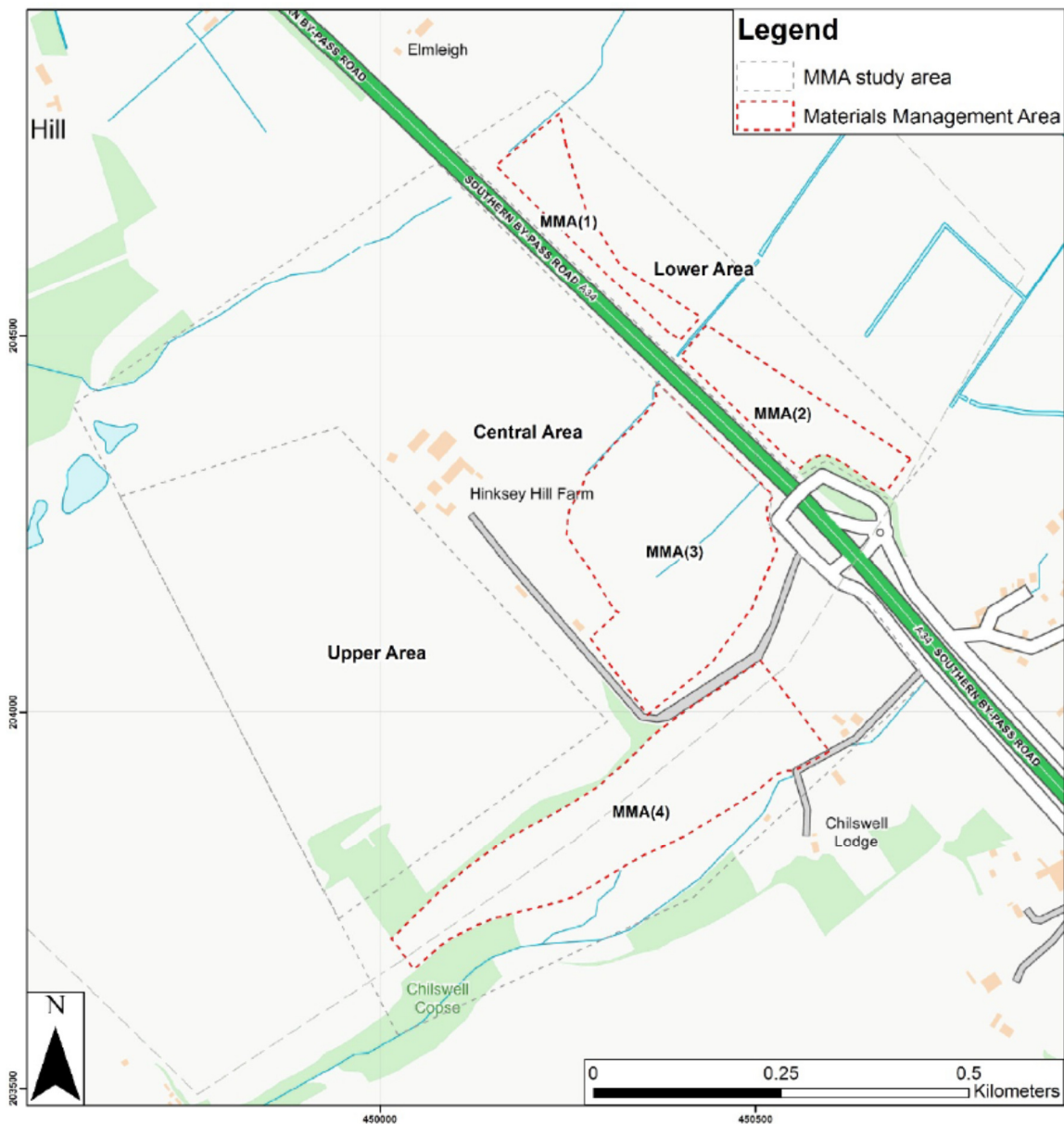


Figure 3-6 – Potential Locations for Permanent Storage

It is understood that the landowner has now leased the lower half of MMA(3) to a market gardening operation which would reduce the volume of material that could be used here. By raising the land here by 1.0m to 1.5m approximately 35,000m³ of surplus inert material could be used without impacting on the landowner's business.

MMA(4) consists of an arable field owned by Oxford City Council, to the north of Chilswell Copse Local Wildlife Site. MMA(4) is accessible from the golf course access road, however possible conflict with golf course users means that any access would need to be from a new entrance formed at the eastern end of the field from the road off the A34 junction. This would also avoid the residential access track to the south.

The initial ground investigations undertaken in this area identified a number of historical geological slip planes in the area. A more detailed ground investigation was therefore carried out and a slope stability assessment undertaken which indicated raising with up to 1.5m height of material would not create further stability issues.

There are a number of other issues however with utilising both MMA(3) and MMA(4) as detailed below:

There are badger setts located on the boundary of the MMA(4) field. When considering the legal exclusion zone around the setts then approximately 44,000m³ of material could be placed into this area

assuming the field raised by 1m and designed to be returned to arable agricultural management. The combined areas of MMA(3) and MMA(4) would then accommodate a theoretical volume of 89,000m³.

The presence of Great Crested Newts (GCN) in the local area will also have a significant impact on this potential volume. The newts use the ponds in this area to breed and use the surrounding fields for foraging outside of the breeding season. GCN are a protected species and they would need to be excluded from any of the working areas.

This exclusion requirement would effectively remove the entire MMA(3) area of the field to the north of the golf course access track and also cut off the access to the next adjacent field to the north. Taking into account these exclusion zones the total landraising volume available for the area by using MMA(4) only is reduced to approximately 44,000m³.

A hydro-ecological review of the land in this area has been undertaken, which confirmed the views of local wildlife groups that the surface and groundwater regime in the area is sensitive and could have impacts on the Chilswell Copse Wildlife Site if not managed correctly. There is a formal drainage regime present in this field which would need to be maintained and any changes to run off and groundwater movements avoided.

A change in the management practice on this land, after it has been raised, could create an extension to the wildlife site and create a 'buffer' between the arable land and the springs which feed the reserve. This approach would allow a more varied landform to be created and allow more material to be placed into the area, up to 60,000m³, but would require the agreement of the landowner.

The site is located within the Green Belt. A pre-planning advice request for landraising was submitted to Oxfordshire County Council in 2017 separately from the main OFAS pre-planning request. The advice received indicated that the proposal for landraising would be contrary to national and local planning policy as it would be inappropriate development in the Green Belt and that the justification was not convincing. Any planning application for this site would need to demonstrate that the benefits of the landraising scheme would outweigh the harm to the Green Belt and any other harm of the proposal.

The proposal would also be contrary to waste planning policy as set out in the Oxfordshire County Council Minerals and Waste Core Strategy 2017. The proposal would be a waste disposal operation and there is clear policy for the movement of waste up the waste hierarchy with disposal to land as the last resort. Justification would be required demonstrating that there are no alternative options for disposal of the waste material. An environmental permit would also be required for the landraising along with the protected species licences.

The technical difficulties of bringing this site forward for landraising coupled with the clear indication that the proposal would be contrary to planning policy has led to the pursuit of this proposal for the management of materials being discontinued.

Other uses for using material in these areas has been considered rather than just land raising. Ideas such as creating formal parks, a sculpture park or form viewing and picnic areas have been reviewed however most are not in keeping with the area. Initial consultation on these ideas with landowners, stakeholders and the local authorities indicated no interest for such new features at this location and they have not been pursued.

3.5.4 Other Areas

A number of other areas have been reviewed for potential for permanent raising including areas further north along the A34 and to the south of Kennington. Access to these areas would need to be via local public roads. Being more remote from the work area also makes them inefficient to use due to increased travel times. The additional issues and risks associated with obtaining permissions for these sites means that the use of material in third party restoration schemes which are closer to the work area and already set up with permissions to receive material will be more cost effective. Therefore, sites other than those in the previous section have not been pursued.

Transport Options

4.1 General

The location of site is to the west of the city centre and close to road rail and water transports links therefore there are a number of possibilities for moving the materials both within the site and away from the site. These are reviewed in the following sections.

It should be noted that a temporary storage site for material will be established near to South Hinksey as a holding area, this would be suitable to hold in the order of 1,000 to 2,000m³ of material which would act as a buffer in case of either difficulties with excavation or transport away from site and avoid minor delays to the construction process. Normally materials would be transferred directly to the transport system to avoid double handling and the temporary storage only used to overcome problems. An area is proposed in the field to the north east of the South Hinksey A34 interchange, this would be located alongside the main site compound and is shown as MMA(2) in Figure 3-6.

4.2 Road

South Hinksey village is served by an existing interchange on the A34 road. Consultation with National Highways has taken place and no objections to the use of the A34 for removal of the materials have been raised. It is therefore proposed that vehicles will access the main area of the site from an existing field entrance off Parker Road just south of this interchange without the need to travel through South Hinksey village. By using a temporary haul road along the length of the channel this access could service all the materials movements for the areas between Botley Road and Old Abingdon Road.

For the area to the north of Botley Road vehicles would need to utilise a short section of Botley Road for part of the access route. It should be possible to minimise additional congestion on this road by accessing the area to the west of the Seacourt Stream via an existing field access off the slip road from Botley interchange on the A34 and using a temporary haul road within the site.

To access the works at the Seacourt Park and Ride site and to north of the houses along Botley Road vehicles will enter and leave the site using the existing traffic light junction at the entrance to the Seacourt Park and Ride which would only use a short section of Botley Road and the connecting road to and from the A34. A temporary haul road from the park and ride site to the north of the houses parallel to Botley Road will minimise the number of vehicles using the remainder of Botley Road. However, a limited number of vehicles will need to use a longer length of Botley Road to access the proposed flood gates and works to the Osney Ditch alongside Botley Park playing fields and the works at Oatlands recreation ground.

The channel works around Old Abingdon Road and to the south of this area will need to be accessed via the A423 Southern Bypass, Old Abingdon Road and the Hinksey Hill interchange to gain access to the A34.

An option to take some material from Area 2 off site via Botley Road has also been reviewed, this would potentially reduce the number of vehicle movements at the South Hinksey interchange. This option would be to remove material only and all vehicles would need to enter the site via South Hinksey interchange then travel through the site exiting onto Botley Road at Botley Bridge alongside the Seacourt Stream at the existing Seacourt Nature reserve entrance. However, Botley Road is already a heavily congested route into and out of Oxford. Initial discussions with the highway authority indicated using this route was unlikely to gain acceptance due to the additional impacts on both vehicle and pedestrian and cycle traffic along the Botley Road and it has therefore not been pursued further.

A number of other options to improve the operation and slip road lengths on the South Hinksey Junction have also been reviewed. These options included extending Parker Road south to the Hinksey Hill Interchange however this was considered to create other road safety problems with the connection at this junction and increase the traffic load on an already overloaded junction.

A second option to replace the north bound 'on' slip with a separate new longer slipway was considered. However, this would re-join the main carriageway close to a layby north of the existing junction which has been recently closed due to safety issue around vehicles re-joining the main traffic flow at this point. It also had significant land take, visual, cost and environmental impacts so was not pursued.

Similarly, an option for new 'off' southbound slip from a similar point on the A34 was also rejected due to safety reasons and creating a second slip in close proximity to the existing exit which could confuse drivers. Complete reconstruction of the junction was also considered but discounted as being economically unviable due to the scale of the work required.

Works to the New Hinksey embankment will need access via Abingdon Road and the track to the north of the Oxford Spires Hotel. This will require the entrance to this track upgrading to accept large vehicles. It may also need temporary traffic lights to be set up to allow safe access and egress of large vehicles into the flow of traffic on Abingdon Road. However, these works are relatively limited and it should be possible to keep this disruption to Abingdon Road to a short period.

It is known that the A34 and A40 roads can become congested at rush hour. Enquiries are being made to identify suitable receptor sites to both the north and south of Oxford. This will also allow vehicles to be routed out of the site in different directions to minimise/avoid disruption to production rates.

A traffic assessment has been carried out on the above routes which indicates minimal impacts to existing traffic flows during the construction period, a copy of this traffic assessment is available in the Environmental Statement which accompanies the planning submission for the scheme.

A fleet of vehicles would be required to meet production rates, the use of a number of vehicles would also minimise the risk of down time due to breakdowns compared to larger single transport methods such as rail. A single vehicle breakdown would have less impact on overall production rates compared to a missed train movement would impact on a whole day of production.

Air quality is known to be an issue in Oxford and particularly around the Botley area and the temporary effects of the scheme on air quality and traffic in the area are covered in detail in the Environmental Statement accompanying the planning application for the scheme.

4.3 Rail

Rail has been considered to reduce the volume of traffic on the roads. The nearest sidings to the site are at South Hinksey. This site is owned by Network Rail and operated by DB Cargo.

Positive consultation has been undertaken with DB Cargo and the following conditions have been applied to the use of the sidings;

- Each train has a payload of 1,500 tonnes of material. It is likely that up to 2 trains per day could be utilised during the main earth works periods.
- Initial discussions with DB Cargo have indicated that a number sites are available nationally which have the facility to receive material by rail.
- Would have to work around existing commercial activities at the sidings which could take precedence.

Initial discussions with the rail operator at the Hinksey sidings have indicated potential to remove a significant proportion of the material by rail from Areas 2, 3 and the northern section of Area 4. It should also be possible to remove material arising from Area 1 using rail although material would need to be transported, via the road network, to the main site compound and then onto the sidings. Due to construction programme constraints material from the area around the A423 will need to be removed by road vehicles. The contractor will still need to remove any contaminated material from the excavations by road vehicle to a suitable licenced waste facility.

There are several important issues with using this method to dispose of materials in this manner including access from the site. The existing road access to the sidings is not suitable for large volumes of traffic as it runs alongside operational rail lines with no barriers, Network Rail have indicated that using this route

would not be acceptable on rail safety grounds. The alternative is to construct an access ramp from the sidings into the construction site. This route would have to cross the Hinksey Stream, the Electric Road and impact on a small number of trees alongside the railway and the Pembroke College sports ground. The impacts of using this route are covered in Chapter 16 of the schemes Environmental Statement.

There is currently uncertainty around availability of sites for re-use of surplus material in the future when construction takes place. This along with the potential benefits of utilising rail for transport to reduce traffic on the area surrounding the site and the associated sustainability benefits means the Environment Agency and it's suppliers are continuing to develop this option until the final destinations for the re-use of material are confirmed.

The option for using rail is not included in the main scheme planning application but if taken forward would be covered by a separate planning application to cover the temporary creation of a haul route to the sidings.

Alternative sidings are available at Didcot to facilitate rail transport. These are only accessible by road from the site and hence would have no impact on the volume of traffic locally to the site. However, use of these sidings could facilitate access to other sites for re-use of material which are further away from the Oxford site than road transport would allow use of cost effectively.

4.4 Barge

The southern and eastern sections of Area 4 are close to navigable waterways. Barges were considered for the removal the material from site down the River Thames. Due to the size of the river in the Oxford area the maximum size of barge suitable would carry a maximum of 50-100 tonnes. A full survey of the route has not been undertaken but higher volume (near to 100 tonne) barges would have a draft in excess of normal pleasure craft which would be too great for the existing channel in some areas. To facilitate fully laden work barges dredging would be required along a significant section of the river to avoid grounding which is impractical due to costs and environmental impacts.

The removal of the material would also take a significant amount of time as the barges travel at an average of 4mph and would be slowed by the lock system in the area. The small sizes of the existing lock on the river in the area also limits the number of barges per tug.

There are limited wharf facilities within a 2 to 3 lock range of Oxford which could handle large volumes of materials, unloading would have to be by machine and material transferred to other forms of transport to continue its onward journey to the final destination which would increase costs by double handling materials and still result in road vehicle movements remote form the site.

Given the logistic issues above the use of waterbourne transport for bulk material movements has been dismissed, it may still be utilised in some local work areas such as the lower sections of the Hinksey Stream where overland vehicle access is difficult.

4.5 Pumping

One of the options for transferring materials considered was pumping to a nearby facility. This would only be practical over short distances such as for permanent re-use on land on the opposite side of the A34 south of Hinksey Heights.

Gravels are routinely pumped using high volumes of water and would have to be used in conjunction with suction or dredging style excavation from below the water table. This system could allow excavation to continue through the winter months when traditional excavation methods would be halted with wet ground conditions.

Whilst gravels will drain quickly to allow onward processing there is still a requirement for a large lagoon area to facilitate drainage and filtering water back into the groundwater system. However, gravels will also drain quickly if excavated with a perforated bucket on an excavator and as gravels are likely to be

taken off site for re-use then pumping does not provide any benefits and could result in double handling of material.

Pumping alluvium is estimated to need in the order of 2m³ of water for 1m³ of alluvium and would take much longer to drain and dry out than gravels so would need a larger series of lagoons. Given the limited land available for drying beds and difficulties with dealing with the volumes of water required this option has been discounted.

4.6 Conveyor

Conveyors consist of a constantly moving belt which transports material. These are routinely used in gravel extraction operations to transport materials to and from processing plants and avoid the need for running dumpers to transport materials. Conveyors have a limited range and can only be used to transport materials locally. However, it may be possible to utilise a conveyor system to transport material from the site to either the South Hinksey rail sidings to utilise rail transport or from the site to land on the west side of the A34. The conveyor could be set up on the existing South Hinksey interchange bridge by either narrowing the existing lanes or setting up single way traffic working. However, discussions with National Highways have indicated they have major concerns over this arrangement and would likely object to this proposal if put forward formally.

The materials would need to be double handled as there is an operation to load the conveyor and another to move the material to its final location from the end of the conveyor however these would be short distances and this system would remove a significant number of site vehicle movements. The use of conveyors to transport cohesive alluvium could be problematic as it may stick to the belts and not easily drop off at the end of the run.

Investigations have indicated that off the shelf conveyor systems are unlikely to be able to move the volumes of materials required within the project timetable. Therefore, this option has been discounted.

Summary and Recommendations

5.1 General

This management plan was initiated at the outline design stage of the scheme and updated throughout the detailed design process, using the best available data at this stage of the project.

5.2 Management Solutions

Disposal to landfill is considered to be a last resort for all inert materials. The modest volume of sands and gravels resulting from the excavation of the scheme will be reused on site as part of the scheme. This will include the creation of a gravel bed and rifles in both existing new and existing watercourses to improve the biodiversity of the river system. Gravels will also be utilised in filter drains to new embankments and for mixing with other materials arising on the site, such as alluvium, to create a suitable material for use as engineering fill to the proposed flood defence embankments. Surplus gravel arising will be removed from the site.

The main surplus material arising from the excavation of the new channel will be alluvium, as noted above this will be mixed with some of the gravels arising to create a suitable material for use in the proposed flood defence embankments. However, this will be a relatively small amount in relation the amount of material being generated. Other options for local raising and landscaping outside of the floodplain are limited due to existing greenbelt designation, infrastructure, protected species, local wildlife sites and geomorphological features. Therefore, the remainder of the surplus materials will need to be removed from the site.

Surplus inert materials will be re-used on other schemes in the Oxford area. Investigations have indicated that the most likely schemes which will be active during the construction period are likely to be gravel quarry restoration schemes with environmental outcomes however other development schemes may become available in the near future and opportunities need to be monitored as the scheme moves towards construction. There are several of these potential sites to the north and west of Oxford.

Any non-hazardous or material with a high organic content, such as dredgings from existing watercourses, will need to be dried and removed to a licenced waste management facility. Temporary working areas include space for some drying of material before removal from site. Materials from historic landfill sites in the Redbridge area which is encountered will be taken off site to a suitable licenced landfill site.

The ground investigation works encountered two small traces of asbestos across the whole of the proposed working areas, therefore it is not expected to encounter more than isolated pockets of hazardous material, if any is found this will need to be taken to a tip licenced to accept hazardous material.

Further details of the volumes are provided in Appendix A.

5.3 Transport Solutions

Based on the review and analysis undertaken for the for the various transport options available it is proposed that alluvium and topsoil will be excavated using traditional methods utilising GPS controlled 360 degree excavators and removed from site via road transport.

Suitable sites for re-use of the materials are being sought to both the north and south of Oxford to enable vehicles to be distributed across the trunk road network and minimise the risk of additional congestion as a result of our scheme. The temporary works layout has been designed to allow the majority of vehicles to directly access the A34 trunk road and minimise the impacts on local roads.

The option to utilise the rail sidings at South Hinksey will continue to be pursued in an effort to use rail transport to suitable re-use sites further afield and reduce the number of vehicles on the local road network.

Other forms of transport such as barges have limited capacity and still need road transport elsewhere for onward journeys to receiving sites.

The Environmental Statement which accompanies the planning submission this plan is part of contains a detailed traffic assessment. This reviews and comments on the possible impacts of the additional vehicles on the local networks along with an associated air quality review. It also includes a summary of the impacts of using the rail sidings should this be taken forward.

5.4 Next Steps

The previous two sections of this plan summarise the proposed methods of dealing with surplus materials arising from the work. However, the waste management market place is constantly changing and sites suitable for material re-use are changing with little notice. Some of the management routes identified in this plan may not be available in the future and others will come to the market place.

The CL:AIRE register tries to facilitate the management of materials across construction sites and the Oxford scheme will be registered on this system once planning consent has been achieved.

Positive action is being undertaken to identify suitable re-use routes and locations. We are continuing to monitor the market place to ensure the optimum management routes for re-use of materials are utilised. The Environment Agency's own delivery programmes will also be monitored to identify sites which could benefit from cohesive material from Oxford. This will ensure that costs are minimised and ensure materials are re-used in the most sustainable manner possible within the prevailing market conditions.

Appendix A – Materials Management Matrix

OXFORD FLOOD ALLEVIATION SCHEME
Appendix A - Materials Management Matrix

Version 4

Notes

1. It is intended that this plan will remain flexible right up to the implementation stage to enable the approach to be modified to suit market conditions prevailing at the time of construction and enable the best value opportunities to be exploited

Item	Material	Code	Excavated Quantity (m3)	Location / Area	Re-use opportunity within site	Management Type	Transport Route	Opportunities	Regulatory Requirements	Risk
Area 1 - North of Botley Road										
1.1	Topsoil	TOP	5,040	Across all areas	Reinstatement on embankments	Re-use / agricultural benefit	Site dumper / road	Surplus to allotments Possible re-use in bulk fill development schemes if suitable	May need waste licence	Fill to allotments would be in flood plain
1.2	Made Ground	MG	850	Around Botley Road	Limited	Off site	Road			
1.3	Landfill (non-hazardous)	LAND	0	Potential around Seacourt Park & Ride bottle dump	Raised embankments approx 3,400m3 required in Area 1 to come from other areas	Off site restoration schemes to north, Ducklington / Yarnton	Site dumper / road	Environmental restoration schemes Investigate spreading of fields for agricultural benefit	Landfill permit	Needs monitoring during excavation
1.4	Alluvium	ALV	14,192	Fields upstream of Botley Bridge						
1.5	Organic rich alluvium / peat	ALV-ORG	1,920	From existing channels	Limited	Dried and taken to tip	Road	Environmental enhancements to channels	To be reviewed	Traffic / capacity of receiving location Area for drying before transportation needed, double handling
1.6	Sands & gravels	RTD	350		Gravel sub-strate to channels, toe drains to embankments.	Off site to processing facility	Road			
1.7	Firm Oxford clay	CLAY	0	None expected						Traffic / charges for tipping material
			Area 1 sub-total	22,352						
Area 2 - Botley Road to Willow Walk										
2.1	Topsoil	TOP	19,400		Reinstatement on embankments / 2nd stage	Re-use / agricultural benefit	Site dumper / road	Surplus to agricultural benefit	May need waste licence	Majority still to landfill at high rate
2.2	Made Ground	MG	500	Nominal volume for area close to Botley Road	Limited	Off site	Road			
2.3	Landfill (non-hazardous)	LAND	0		Gravel sub-strate to channels, riffles to Bulstake Stream	Off site to processing facility	Road	Environmental enhancements to channels	Landfill permit	Traffic / charges for tipping material
2.4	Alluvium	ALV	21,987							
2.5	Organic rich alluvium / peat	ALV-ORG	0							
2.6	Sands & gravels	RTD	1,950	Willow Walk area						
2.7	Firm Oxford clay	CLAY	0	None expected						
			Area 2 sub-total	43,837						
Area 3 - Willow Walk to South Hinksey										
3.1	Topsoil	TOP	46,530		Reinstatement on embankments / 2nd stage	Re-use / agricultural benefit	Road	Surplus to agricultural benefit	May need waste licence	
3.2	Made Ground	MG	1,155		Limited	Off site				
3.3	Landfill (non-hazardous)	LAND	0	None expected	Use in South Hinksey embankments, approx 1000m3 required	Off site	Road	Investigate spreading of fields for agricultural benefit	To be reviewed	Area for drying before transportation needed, double handling
3.4	Alluvium	ALV	113,519							
3.5	Organic rich alluvium / peat	ALV-ORG	2,000		Limited	Dried and taken to tip	Road	Environmental enhancements to channels	To be reviewed	Traffic / charges for tipping material
3.6	Sands & gravels	RTD	9,370		Gravel sub-strate to channels, toe drains to embankments.	Off site to processing facility	Road			
3.7	Firm Oxford clay	CLAY	0	None expected						
			Area 3 sub-total	172,574						
Area 4 - Redbridge & New Hinksey										
Devil's Backbone to Old Abingdon Road										
4.1	Topsoil	TOP	11,545		Reinstatement of 2nd stage	Re-use / agricultural benefit	Site dumper / Road	Possible fill to agricultural field close to Redbridge and at Sandford	May need waste licence	Needs review with Waste Regs and discussion with landowners.
4.2	Made Ground	MG	1,263	Old Abingdon Road area	Limited	Off site	Road			
4.3	Landfill (non-hazardous)	LAND	4,000	Nominal volume due to known sites in area	Fill to New Hinksey Embankment, approx 8,000m3 required	Re-use / remove from site	Site dumper / road	Environmental restoration schemes	Waste permit at receiving site	Traffic / capacity of receiving location
4.4	Alluvium	ALV	17,917	North of Old Abingdon Road						
4.5	Organic rich alluvium / peat	ALV-ORG	0		Gravel sub-strate to channels, toe drains to embankments.	Off site to processing facility	Road	Environmental enhancements to channels	To be reviewed	Traffic / charges for tipping material
4.6	Sands & gravels	RTD	11,070							
4.7	Firm Oxford clay	CLAY	0	None expected						
Old Abingdon Road to Munday's Bridge										
4.1	Topsoil	TOP	240		Reinstatement of 2nd stage	Re-use / agricultural benefit	Road	Pursue possibility of leaving on site in sealed area of landfill	May need waste licence	
4.2	Made Ground	MG	1,000	Channel area around A423						
4.3	Landfill (non-hazardous)	LAND	14,320	Channel through historic landfill site	Re-locate within existing landfill	Re-locate or to tip	Road	Pursue possibility of leaving on site in sealed area of landfill	Landfill permit Waste permit at receiving site	Landfill charges
4.4	Alluvium	ALV	14,760		Possible additional capping to seal landfill areas	Re-use / remove from site	Site dumper / road			
4.5	Organic rich alluvium / peat	ALV-ORG	2,200	From existing channels	Limited	Dried and taken to tip	Road	Environmental restoration schemes Investigate spreading of fields for agricultural benefit	To be reviewed	Traffic / capacity of receiving location Area for drying before transportation needed, double handling
4.6	Sands & gravels	RTD	10,900		Gravel sub-strate to channels	Off site to processing facility	Road			
4.7	Firm Oxford clay	CLAY	0	None expected						Traffic / charges for tipping material
Works to Existing Channels										
4.1	Topsoil	TOP	0		Reinstatement of 2nd stage	Re-use / agricultural benefit	Road	Pursue possibility of leaving on site in sealed area of landfill	May need waste licence	
4.2	Made Ground	MG	2,500							
4.3	Landfill (non-hazardous)	LAND	4,500		Re-locate within existing landfill	Re-locate or to tip	Road	Pursue possibility of leaving on site in sealed area of landfill	Landfill permit Waste permit at receiving site	Landfill charges
4.4	Alluvium	ALV	4,450		Possible additional capping to seal landfill areas	Re-use / remove from site	Site dumper / road			
4.5	Organic rich alluvium / peat	ALV-ORG	8,400	High vegetation content from channels	Limited	Dried and taken to tip	Road	Environmental restoration schemes Investigate spreading of fields for agricultural benefit	To be reviewed	Traffic / capacity of receiving location Area for drying before transportation needed, double handling
4.6	Sands & gravels	RTD	3,000		Gravel sub-strate to channels	Off site to processing facility	Road			
4.7	Firm Oxford clay	CLAY	0	None expected						Traffic / charges for tipping material
			Area 4 sub-total	112,065						
Summary Excavation Totals										
Volumes										
	Topsoil	TOP	82,755							
	Made Ground	MG	7,268							
	Landfill (non-hazardous)	LAND	22,820							
	Alluvium	ALV	241,995							
	Organic rich alluvium / peat	ALV-ORG	14,520							
	Sands & gravels	RTD	36,640							
	Firm Oxford clay	CLAY	0							
	Allowance for environmental enhancements (ponds & scrapes)	ALV	49,140							
	Overall total - all materials		455,138							
	Topsoil to be reused on site	TOP	55,170							
	Sands and Gravels to be used on site	RTD	28,440							
	Alluvium fill to embankments	ALV	12,400							
	Total to be removed from site		359,128							

