Environmental Statement

Carbon Plantations Ltd. B J Rutterford.

NON TECHNICAL SUMMARY

Project Purpose

The Carbon Plantations Ltd (CPL) proposed project will establish 53 hectares of new woodland on the B J Rutterford site to the west of Hockwold Cum Wilton, within the administrative boundary of Kings Lynn and West Norfolk District Council. The project will consist of plantations of a fast-growing non-native hardwood tree alongside new native woodland creation. The plantation tree will produce hardwood for the massively undersupplied UK hardwood market and sequester large quantities of carbon, contributing to the fight against climate change. The native woodland and associated open areas will deliver a significant biodiversity gain as well as increasing habitat connectivity and the quality of existing woodland features. The project will deliver a managed woodland project that secures an income stream through the sale of hardwood and carbon sequestered. The project displaces intensive agricultural cropping. The basis upon which this land use change is possible is entirely down to the economics of return that the project can generate for landowners. This is only possible as a result of the quantity of hardwood timber and carbon sequestered by Phoenix One. No other tree has, to date, been identified that can deliver to this level.

The non-native tree, Paulownia Phoenix One (a hybrid of *fortunei* and *elongata*), has been approved to be grown at scale in some European countries (Spain, Italy, Germany). The UK Forestry Commission (FC) Environmental Impact Assessment (EIA) screening process and associated opinion advised that the project required consent based on its nature and size. This requires the production of an Environmental Statement (ES).

The project will establish woodland on agricultural land. To conform to the UK Forestry Standard (the UK governments' approach to sustainable forestry) this mix will consist of 68% Phoenix One, 13.5% native woodland, 1.5% other non-native (Scots Pine) and 17% open areas. The native woodland will remain as a permanent feature. The open areas, Phoenix One understory, hedgerow boundaries and buffers will be managed to maximise biodiversity gain and this gain will be monitored. The Phoenix One will be grown as a plantation. It is established in year one and up to 10 years growth harvested in cycles. It then grows back from the root ball similar to a coppice. The intention will be to sell the wood into the UK hardwood timber market and used for construction, furniture, veneers, storage boxes and surf boards amongst other uses. It is light weight and structurally strong.

Management in the plantations includes pruning, targeted fertiliser placement and provision of water by drip irrigation in some years and harvesting. There will be a rigorous monitoring programme in place. Plantations have a life cycle of up to 85 years with the potential to remove after the 35 year lease period with the landowners finishes.

The project has successfully passed through the Forestry Commission Woodland Creation Planning Grant (WCPG) stage 1 and 2. It is also UK Forestry Standard (UKFS) compliant. The project is registered with the Woodland Carbon Code (WCC) and has secured UK Government Woodland Carbon Guarantee contacts to purchase carbon units produced.

Potential impacts

Through the process of the WCPG stage 2 some potential impacts were identified, this included thorough stakeholder consultation as per Forestry Commission guidance. Many potential issues were addressed or mitigated as part of that process resulting in UKFS compliance.

A scoping meeting was then convened with an agreed list of organisations and public bodies (many of whom had already been consulted with prior to this requirement). This resulted in an agreed issues log Annex 6.a "Scoping Meeting Issues Log" that would be considered as part of process.

There are 9 potential impacts that have been identified as a result of the WCPG stage 2 and scoping meeting processes. These have all been addressed within this ES.

- The invasiveness potential of Phoenix One to include competition with native flora and associated ecosystem change, Cost of control measures and the potential for introducing and hosting alien pathogens.
- Water reserves depletion affecting ground water and drinking water supplies.
- Landscape character change.
- Biodiversity changes on project sites and in the wider area.
- Degradation of soil carbon in peat soils.
- Damage to archaeological sites.
- Local residents' quality of life change.
- Carbon sequestration increases.
- Hardwood production increases.

Summary of impacts both positive and negative

There are 2 impacts identified that could have negative outcomes: invasiveness and landscape change. These have both the subject of mitigation of impact and their potential likelihood.

The potential of invasiveness could be a considerable impact, however the likelihood of this impact is very low. There is no evidence, to date, of invasiveness of this clone in any plantations under management, however the planned monitoring and control measures are rigorous. CPL accept that the precautionary principle approach (the unknown unknowns) remains. Alongside Forestry Research and the Forestry Commission, a mitigation, monitoring and control programme will be developed to counter any potential future eventuality, some of which have already been designed into each plantation block. An ongoing Risk Assessment process incorporating the NNSS (Non-Native Species Secretariat), DEFRA, Academia and all commercial operations will constantly evaluate the new plantations.

The impact of landscape change has been rigorously assessed through an Outline Visual & Landscape Appraisal, including Zones of Theoretical Visibility, concluding that landscape change will not affect overall landscape character. There may be local landscape impacts, these have been mitigated as much as possible through project design, however some remain but are considered localised and of low overall impact.

The impact on water (irrigation and water balance) and on local residents have been concluded as negligible. Natural England have also confirmed that the project site does not contain any fields with peat levels above the threshold of concern or where peat levels are capable of restoration.

The impacts on biodiversity, carbon capture and UK hardwood supply have been concluded as all very positive. The project brings significant positive impacts across all these areas.

Overall CPL conclude that the positive impacts are significant and near certain. These outweigh the low likelihood of any potential negative impacts.

ENVIRONMENTAL STATEMENT

1 Introduction

1.1 Reasons assessment were called

The Carbon Plantations Ltd (CPL) proposed project will establish new woodland consisting of plantations of a fast-growing non-native hardwood tree alongside new native woodland creation as well as new open ground areas. The plantation tree will produce hardwood for the massively undersupplied UK hardwood market and also sequester large quantities of carbon, contributing to the fight against climate change. The native woodland and associated open areas will deliver a significant biodiversity gain as well as increasing habitat connectivity and the quality of existing woodland features.

The non-native tree, Paulownia Phoenix One (a hybrid of *P.fortunei and P. elongata*), has been approved to be grown at scale in some European countries (Spain, Italy, Germany). It has not been subject to the traditional, but lengthy, 3 stage process for introduction of non-natives trees to the UK.

The opportunity this project represents requires the plantations to be planted in the short term. This would necessitate a change of land use and an assessment on the potential changes to local environments.

The Forestry Commission (FC) Environmental Impact Assessment (EIA) screening process and associated opinion advised that the project required consent based on its nature and size. This requires the production of this Environmental Statement (ES).

As advised by the FC, the project has followed a process of successfully completing Woodland Creation Planning Grants (WCPG) stage 1 and stage 2 and is now UK Forestry Standard (UKFS) compliant.

This **Environmental Impact Assessment (EIA) Environmental Statement** evidences the materials produced within WCPG stages1 & 2 as well as the outcomes from the EIA scoping meeting and engagements with the non-native risk assessment forum (NNRAF) process.

1.2 Scoping meeting conclusions

The scoping meeting was delivered on 7 June 2021. It included representatives from Natural England, The Environment Agency, Defra, NNRAF, Suffolk and Norfolk Country Councils, Forestry Research, the Forestry Commission and CPL. All participants are documented in Annex 6. b "CPL EIA Scoping Meeting Agenda and Participating Organisations".

The issues log has been accepted by all participants as a true and representative record of the meeting and is shown in Annex 6.a "Scoping Meeting Issues Log".

One participant reiterated some points already raised within the issues log as part of their response to agreeing the issues log. These have been noted as a foot note in the Annex.

The scoping points identified in the meeting to include or strengthen in the EIA statement were:

- Invasiveness.
- Flowering potential.
- The basis for Sterility.
- The lack of trial work in UK conditions on Phoenix One.
- The potential for neglect.
- Alternative species consideration.

- The monitoring framework and associated resources.
- Documenting mitigating actions.
- Water run off.
- Water supply.
- Landscape Visual Impact Assessment (LVIA).

The areas of biodiversity, archaeology, ground water and soils were not raised in the meeting. The extensive information supplied as part of the WCPG2 process covered these and will be referenced within this statement.

It was proposed that responses to the above bullets would be strengthened through:

- The engagement with NNRAF as part of an ongoing risk assessment process. This to address the issues on invasiveness, flowering, sterility.
- Forestry Research commissioned to produce a monitoring framework.
- Agreeing mitigating actions as part of the monitoring framework and or risk assessment and or risk log.
- Responses to the Environment Agency on water supply and run off.
- The commissioning of a landscape architect to produce an outline Landscape and Visual Appraisal (LVA).

In addition, to conform to the recently released England Peat Action Plan, the peat status of project sites would be confirmed with Natural England.

1.3 Summary of potential impacts (positive and negative)

The main potential impacts of the project are defined within:

- The invasiveness potential of the non-native tree. Potential impacts identified from invasiveness include
    - Competition with native flora and associated ecosystem change.
    - Cost of control measures.
    - Introducing and hosting alien pathogens.
- Water reserves depletion affecting ground water and drinking water supplies.
- Landscape character change.
- Biodiversity changes on project sites and in the wider area.
- Degradation of soil carbon in peat soils.
- Damage to archaeological sites.
- Local residents' quality of life changes.
- Carbon sequestration increases.
- Hardwood production increases.

2 Site Description

2.1 Project location

This project site, on land under the ownership of B J Rutterford in West Norfolk, consists of a single block totalling 52.75 hectares and made up of 3 adjoining field, located to the west of Hockwold Cum Wilton and the Cut-Off Channel.

2.2 Location Map

The site is detailed in Annex 1.a "B J Rutterford - Site Context Map".

2.3 Site context

The sites are gently undulating and made up of sandy clay loamy soils. Soil analysis are shown in Annex 2.a "B J Rutterford - Soil Analysis"

The landscape type that the site sits in corresponds to The Peat Fen area within The Fens. The Geology of which can be described as glacial deposits on Jurassic and Cretaceous bedrock overlain by diverse deposits of sands, silts, clays and peat. The underlying geology is a combination of post-glacial alluvium and freshwater clays and post-Roman marine clays.

No evidence has been found to suggest that the proposed woodland planting will have any material effect on the appreciation of geology. The elevation is 10 m above sea level.

Annual rainfall is approximately 750 mm.

Despite scale, flat, open landscape with extensive vistas to level horizons, the aspect is not strongly characterised, partly due to the presence of vegetation on the edge of the character area.

The site sits within and is part of a landscape supporting the functional land cover of intensive agriculture where arable cropping predominates. Arable cropping typically includes wheat, barley, Sugar beet, maize, potatoes, onions. The project fields are currently managed as intensive temporary grassland.

Fauna across the project site is characterised by a typical range of farmland birds.

There is a deer population across the project site comprising mainly of Roe & Muntjac with some Chinese Water Deer also present in the area..

The sites are land drained when in an arable rotation as per normal agricultural practice.

2.4 Land use

The entirety of the planted areas within the project will take place on grass fields which do however have a long history of intensive cropping of cereal and root crops requiring substantial annual soil disturbance, in organic fertiliser, agrochemicals and fossil fuel burning to power required machinery.

2.5 Site designations

The following designations or priority habitats have been identified and appraised as part of the planning grant process with the Forestry Commission. Annex 2.i "B J Rutterford - Designations List"

There are no designated areas situated directly on or adjacent to the proposed project area, however the Breckland Special Protection Area (SPA) and Breckland Farmland Site of Special Scientific Interest (SSSI) are situated approximately 742m to the northeast of the project site.

Other SSSIs in relative proximity of the proposed planting sites include:

- Stallode Wash, Lakenheath 1.4km to the south.
- Shippea Hill 4.3km to the south west.
- Pashford Poor's Fen, Lakenheath 5.3km to the south east.
- Breckland Forest 5.6km to the east.

There are three County Wildlife Sites situated within the surrounding landscape:

- Poors Ground (289), situated approximately 760m to the east.
- The Cut-off Channel (2188), situated approximately 847m to the east.
- The Cut-off Channel Feltwell (2165), approximately 1.8km to the northeast.

A small area of priority habitat Deciduous Woodland that runs adjacent to the project area, on the northern boundary.

2.6 New woodland creation category

The Forestry Commission "Low risk areas for woodland creation" maps https://www.forestergis.com/Apps/MapBrowser/ do not indicate these sites to be low-risk woodland creation areas because this category omits Agricultural Land Classifications of 3a and better.

2.7 Archaeology and the Historic Environment

The following features have been identified and appraised as part of the planning grant process with the Forestry Commission. Annex 5.q "B J Rutterford – NCCHE Consultation"

Norfolk County Council Historic Environment Record (NCCHER) identified Neolithic artefacts on the northeast edge of the project site. The only significant archaeological remains identifiable are HER5320 and HER19818.

The site is in an area categorised as Enclosed Agriculture, typically Pre-Modern Form, something taken into account as part of the project design layout.

2.8 Landscape

The initial landscape analysis for the site is included in Annex 2.b "B J Rutterford Landscape Analysis"

The project sits within an area characterised as an open landscape of systematically drained and enclosed fen, with linear tree belts and blocks of poplar which still exist within the landscape, most of which is employed for intensive combinable and root crop production.

The site falls within the local authorities Landscape Character Assessment (LCA) 9. Planned Fenlands.

The project area contains intersecting ditches/dykes, with no small in-field ponds or individual in-field trees. The southern field parcel adjoins a small strip of existing woodland.

The landscape is largely dominated by enclosure pattern, created from the network of ditches. Enclosure within the landscape has resulted in rectilinear field parcels and highly regular pattern of drainage ditches.

2.9 Water

There are no rivers or natural water bodies of scale within the project site areas. However, the river Little Ouse flows to the west and south of the proposed project area, in addition the Cut-off Channel, which flows northwards and intersects the River Wissey, is situated 840m to the east of the proposed site.

Two Main Drains are located adjacent to the proposed project area, these are situated to southeast side of the proposed site, and to the northwest. These are controlled by the Internal Drainage Board (IDB).

The project area lies within the catchment of the South Level and Cut-Off Channel. The waterbody within this catchment is the Ely Ouse (South Level). The Ely Ouse has a 'moderate' ecological status and a 'fail' chemical status, with the overall waterbody classified as 'moderate' in 2019. The project area is underlain by the Cam & Ely Ouse Chalk groundwater body, indicated to have classifications of "poor" for both quantity and quality

The EA confirmed that the area is underlain by the Cam and Ely Ouse Chalk WFD groundwater body which is classified as having poor quantitative status and is not located on a primary aquifer.

There are no public or private drinking water supplies within 2km of the site and the majority of licences nearby are for agricultural use. In addition, the nearest public water supply abstractions are boreholes which are situated 8.8km away, to the northeast of the site

2.10 Settlement and Local stakeholders

The area surrounding the planting sites is highly isolated with a very low population.

Local stakeholders have been identified and included in the consultation process.

3 Description of the proposals

3.1 Location

The location of project site is shown in Annex 1.a "B J Rutterford - Site context Map".

3.2 Area statement

The site planting design conforms to UKFS with the Paulownia One constituting (68%) of total areas and the remaining being split between native woodland (13.5%), Scots Pine (1.5%) and open areas (17%).

B J Rutterford: (based on 11% Scots Pine on 100% of the native planting)

		Open Area	***Native Planting***	***Other non-native***	***Natural Regen***	***Paulownia***	***Total***
Rutterford	(Ha)	8.95	7.12	0.79	0.00	35.89	**52.75**
	(%)	16.96	13.50	1.50	0.00	68.04	**100.00**

3.3 Purpose and ambition of the project

The overall purpose of the project is to deliver a managed woodland project that secures an income stream through sale of hardwood and carbon sequestered.

In delivering this project ambition objectives across key areas are detailed as the following:-

Biodiversity:

- Maximise biodiversity net gain above the current base line being delivered through intensive agricultural practices.
- Increase the diversity of habitat within the local environment.
- Protect watercourses in close proximity to the project site.

Archaeology and the Historic Environment:

- Ensure the protection of known significant archaeological features through appropriate mitigation.

Landscape and visual:

- Minimise any visual impact of non-native tree species through effective project design.
- Mimic existing woodland species mixes to ensure the areas character profile is maintained and enhanced.
- Promote connectivity between woodlands where appropriate and possible to do so.

Water:

- Increase water use efficiency and sustainability above current practices.
- Reduce long-term water use below current rates associated with intensive agricultural practices.

Stakeholders:

- Encourage stakeholder engagement throughout the project design process.
- Minimise any negative impact by the project.

Timber:

- Maximise sustainable, consistent, and regular hard wood timber production from non-native tree species.

Carbon:

- Meet predicted carbon sequestration rates to generate income through the sale of carbon units.

3.4 Alternative site use

The alternative for the site is to remain in intensive agriculture, with irrigated cropping included in the rotation to utilise the opportunity of available water.

The project displaces intensive agricultural practices. The basis upon which this land use change is possible is entirely down to the economics of return that the project can generate for landowners. This is only possible as a result of the quantity of hardwood timber and carbon sequestered by Phoenix One. No other tree has, to date, been identified that can deliver to this level.

3.5 Project design

The design of the project has been informed by detailed Site Appraisal Plans. These have mapped on site features and surrounding features and landscapes. These are shown in Annex 1.b "B J Rutterford - Site Appraisal Plans"

Design Concept Plans have been produced that accommodate existing features, use the opportunity of the native and open areas to buffer and enhance existing features and include operational feature such as wood loading areas and water hydrants. These are shown in Annex 1.c "B J Rutterford - Design Concept Plans"

The final design plans for the project sites have been produced, building upon the initial Design Concept Plans, following incorporation of stakeholder and FC comments. These are shown in Annex 1.d "B J Rutterford - Final Woodland Creation Design Plans".

3.6 Project lifecycle

The overall programme will plant fast growing Hardwood trees alongside native trees and species rich open areas. A Carbon Mapping process will take place just prior to planting to act as a base for future calculations.

An optimum tree harvest cycle is anticipated every 9-10 years, however for the project to work, half of the plantation will be harvested after around year 5-6, effectively 'thinning' the woodlands in order that every subsequent 5 years optimum growth is achieved on half of the plantation cyclically. The Hardwood is essentially coppiced and regrows around 8 times before it exhausts itself and essentially fails after around 75-80 years. The management of the plantation would be classed as semi-intensive including some pruning, weed-suppression, irrigation, 2 to 3 fertiliser applications and up to 2 organic insecticide applications annually from May-September depending on the conditions. The Grass under sown will require some cutting too as well as other aspects of woodland management. All activities will be overseen and dictated to the contractor (or farmer) by CPL under direction from their technical partners and agronomist. CPL will work under contract with a UK based Agronomist with intimate knowledge of local soils to evaluate the plantations at various key stages throughout the year. In a harvest year, harvesting could begin anytime from November to March. Trees would be felled and stacked by the access gateway ready for collection after a period of 'air drying', usually lasting a few months. Standard Term Woodland Insurance covering public liability and woodland destruction by fire will also be in place for the duration of the project.

A grass mix (see "site preparation" below) is sown in the first Spring at the same time as the Trees are, or soon after tree planting, to attract insects and birdlife. Apart from some irrigation in the first 3 years to assist establishment and 2 to 3 fertiliser applications, the plantations are left alone to grow and just be monitored.

Phoenix One is a fast growing non-native hybrid that delivers high wood and carbon sequestration yields. It is a deciduous hardwood that in 8 years of German trials has not produced flowers or pollen and is sterile. It grows from a root stock and is "coppiced" every 9-10 years. The tree will be grown in managed plantations, not dissimilar to poplars and will be secured within deer fencing.

The plantation cycle and associated landowner lease with CPL is for 35 years. After this period the trees could potentially be removed (subject to the regulatory requirements at the time), or the project lifecycle could be extended under landowner management conforming to the same regulatory requirements as under CPL management.

3.61 Site Preparation:

Detailed within Annex 3.a "B J Rutterford - Silviculture; Ground Preparation, Species Mix & Planting Design".

Ground preparation prior to planting will be assessed on a field-by-field basis with consideration of soil state and weather conditions. The below operational plan sets out the maximum extent of soil cultivations and has been planned with consideration of the UKFS aim around minimising short-term soil carbon loss whilst promoting early tree establishment and growth.

Prior to tree planting, a series of inspection pits will be dug across each block to assess the depth of plough pans and consequently the depth of any required sub soiling operations.

Detailed analysis work will then be undertaken to assess cation-exchange capacity, soil nutrients, soil carbon content in order to tailor site specific nutrient management and accompanying understory mixes.

Where necessary, a low disturbance sub-soiler and cultivation will be implemented shortly before planting. Sub-soiling to a depth no greater than that of routine cultivation operations associated with the sites former agricultural land use.

Much of the soil across this project has been degraded through years of modern agricultural production and has therefore lost integrity at depth, many of them creating a 'sedimented' layer rather than a true plough pan. The long-term ceasing of any cultivations as a consequence of the project will allow the soils to settle and re-generate, and this layer will not form and will be broken up as soils re-structure themselves. Paulownia is able to recover degraded soils through their long, dense root system avoiding erosion and the high nitrogen content of the leaf Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia" Page 11.

3.62 Planting Technique & Tree Protection:

Notch planting method will be applied when planting the native element of the project, to provide effective soil root contact promoting root development. This efficient and speedy planting technique will allow the maximum number of whips to be planted in optimum conditions, encouraging a higher survival rate, and reducing replacement costs.

Native bare root stock will be planted when dormant, preferably in November to allow root establishment before the arrival of winter, making the tree more likely to survive any hot dry spells the following summer and reduce the impact of potential spring droughts.

Young Paulownia plants will be planted as plugs between April and June, this operation will be carried out by hand and involve planting individual plugs at set spacing in line with dripline irrigation runs. Irrigation will be used to wet the soil and assist planting where necessary. A combination of mulching and mulch mats will be used depending on location.

Where applicable trees will be planted offset from the rip lines, preventing the cracks created by subsoiling opening in dry weather and potentially exposing the roots.

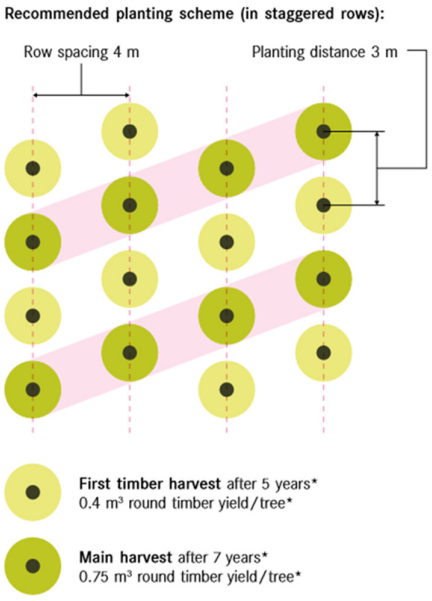
Within this project, deer fencing will be erected around the perimeter of the entire planting block, protecting both the Paulownia and native tree species from a relatively high local deer pressure. This tree protection strategy will substantially reduce the projects plastic use, with native species fitted with only a wooden stake and spiral, and Paulownia requiring no individual guard.

Native planting areas will be protected against weed pressure through use of appropriate spot spray herbicide applications during the initial few years of growth, whereas Paulownia, the bark of which is more sensitive to chemicals, will have mulch mats placed around the plug during planting which will suppress weeds until tree height exceeds the threat.

Weed competition will be further reduced through use of an understory with mixes including Birdsfoot trefoil, White clover, Alsike clover, Knapweed, Kidney vetch, Timothy (low percentage for tussock formation), Slender Red fescue and Smooth stalked meadow grass. This understory is also intended to reduce potential soil run off. The intensive weed control schedule outlined in the WeGrow Plantation Maintenance & Growth Report will not be fully employed in these projects in order to achieve the biodiversity gains intended by the understory species mix Annex 3.e "WeGrow Plantation Maintenance & Growth Report" page 2.

3.63 Paulownia Planting Layout

The Paulownia element of the project will be planted at a very low stocking density as depicted in the illustration below. This spacing use equates to 825 trees/hectare. Harvesting will occur in alternating rows every 6 – 7 years, meaning established Paulownia is always present and evenly distributed across the site. This has biodiversity and visual landscape benefits.



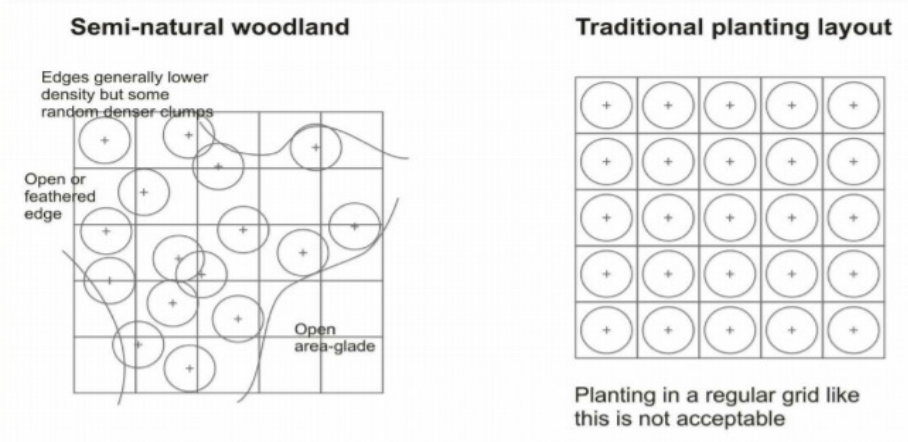
3.64 Native Planting Layout

Where appropriate, elements of 'clump planting' will be employed to prevent slower growing species becoming out competed and promote habitat diversity. Single species clumps and clumps comprising of complementary species of various form and size will be incorporated into the woodland design.

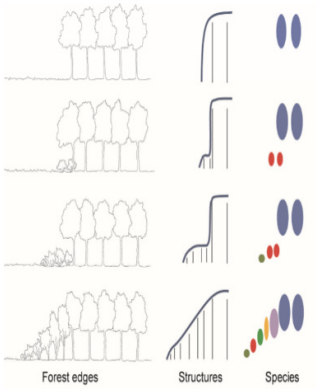
Tree spacing within clumps and in adjacent clumps will be varied to avoid the appearance of rows and grids as well as to provide a range of light infiltration in order to increase wildlife diversity. Clump definition will phase out and tree spacing become more regular in areas closer to Paulownia growth to prevent a strong visual distinction between woodland types.

The sketch highlights the use of clumping.

The below diagram illustrates the use of feathered edging and varied spatial distribution in comparison to conventional tree planting.



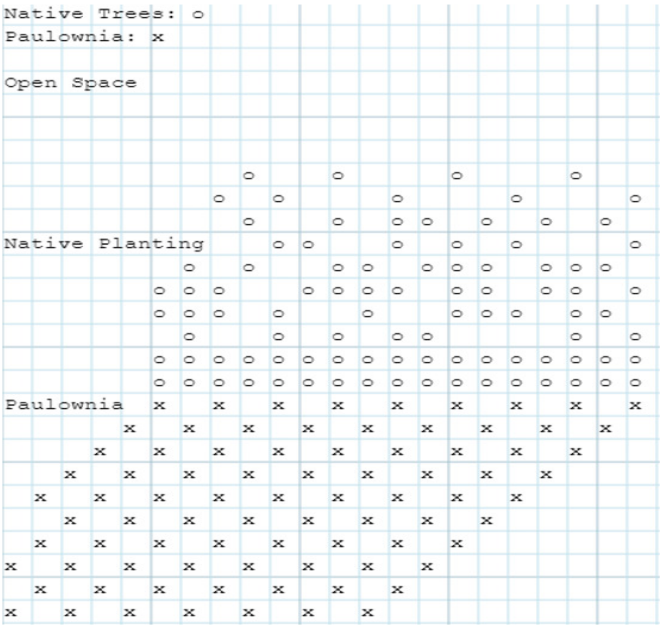
Native woodland edges will comprise of an evenly graded structure, as demonstrated in the lowest forest edge design option of the below diagram. This will be achieved through appropriate distribution of lower growing species on the woodland periphery with species hight gradually increasing to the interior of the woodland, providing a feathered edge effect.



As well as promoting visual qualities of the woodland due to increased space available for flowering, fruits/berries and foliage colours, this design feature will provide shelter functions and support a greater range of biodiversity.

3.65 Spatial Distribution:

In specific project areas where larger areas of open ground meet new native woodland planting, trees will be planted in a dispersed configuration, with stocking densities gradually increasing and becoming more unified before transitioning into the Paulownia planted areas. This will help to promote harmony between the new woodlands and surrounding landscape. The below diagram demonstrates the considered transition from open space through to native planting and the more regimented by sparse Paulownia.



3.66 Sourcing Stock

Paulownia Phoenix One plugs will be sourced from WeGrow – European market leader in supply of Paulownia stock and the developer of the Phoenix One variety suitable for sustainable growth in East Anglia and to ensure the highest quality of planting materials. All stock will be sourced in conformance with phytosanitary health legislation. Further information around WeGrow can be found on Page 46 of Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia"

3.67 Native Planting

An appropriate species mix, and origin/provenance of stock will be used to ensure the woodlands future suitability to East Anglia. The diversity of the native species mix has been maximised to maximise biodiversity gain and as a mitigation to expected changes in climate.

Efforts will be made to source a portion of the native stock from origins up to 2 degrees south of the project site, particularly those species identified to be vulnerable in the Forest Research 2080 Ecological Site Classification (ESC) output. This should not only limit risk but enhance growth rates and result in woodland more adaptable to climate changes. Due to earlier flushing of southerly stock and increased risk from frost damage, a significant proportion of the species mix will be sourced more locally.

The project will aim to source no more than a third of native stock from a single region, maximising the long term prospects of the woodland as far as possible.

The native woodland mix has been selected using ESC (Ecological site classification) predictions across a baseline, 2050 and 2080 scenarios. These are shown in detail within Annex 2.c "B J Rutterford ESC Output inc. DAMS Scores (2050 & 2080 AWC)"

3.68 Native Woodland Planting Species Mix

Species	Native Status	Species Code	Yield Class (ESC)	% of Area
Pedunculate Oak	Native	POK	8	39
Silver Birch	Native	SBI	5	5.6
Hazel	Native	HAZ		5.6
Hornbeam	Native	HBM	8	11
Field Maple	Native	FM		5.6
Wild Cherry	Native	WCH	8	5.6
Hawthorn	Native	HAW		5.6
Wild Crab Apple	Native	CAP		5.6
Dogwood	Native	DOG		2.7
Small Leaved Lime	Native	SLI	7	2.7
Beech	Native	BE	3	2.7
Black Poplar	Native	BPO	16	8.3

In addition to the above, the non native Scots Pine is also included representing 11% of total native planting.

3.7 Project operational activities

The Paulownia will be irrigated by a drip irrigation system. This highly efficient system allows for placement of water at the tree roots.

The native element of the project will not be harvested, aside from thinning, and instead managed to maximise biodiversity gain.

Harvesting of the Paulownia elements of the project will be dictated by ground conditions and minimising damage to the understory. Mechanical harvesting will be favoured where plantations grown in a uniformed manor, however hand harvesting carried out by skilled in-house teams is possible and will be carried out where required.

Brash from Paulownia harvesting will be chipped onsite and use as a mulch/humus. Depending on the quality and value, any excess chip may go into the composite wood industry. The level of chipping required at harvest is however relatively low in comparison to traditional conifer timber harvesting.

Hand pruning of Paulownia trees will take place several times a year for the first 3 years of growth. This will be timed in order for de-budding to be left on the floor, whilst larger branches will be chipped onsite and again used as a mulch Annex 3.e “WeGrow Plantation Maintenance & Growth Report” page 2.

Each Paulownia tree will be geo located in year one, and any failed stock will be replaced with the new tree being incorporated into the next applicable harvest cycle, a maximum of 6 years away.

Paulownia leaf drop occurs at first frost, where they will be left on site as humus for their high protein value. With a low C:N ratio they will break down swiftly with the understory will reduce any potential leaching of N & P. The captured nutrient will be utilised for early growth the following season Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia" Page 35.

These aspects of maintenance of plantations are covered in Annex 3.e "WeGrow Plantation Maintenance & Growth Report" page 2.

3.8 Materials residues and emissions

The construction phase of the project will be characterised by site preparation and then plantation establishment.

Sites, as existing agricultural fields, will require no change to existing base line i.e., no clearance or invasive practices aside from a potential soil cultivation (using an agricultural tractor) in line with exiting agricultural practice.

Startup activities including site fencing will be delivered using mechanical and manual labour with standard agricultural machinery and planting of the tree plugs will be via manual labour supported by agricultural equipment for transport.

Emissions from the above will relate to diesel engine combustion and in line or less than for previous cropping regimes.

Access tracks around and within the plantations will be unsealed dirt tracks. They will have relatively limited traffic and most will be of a light vehicle in nature. Any water run-off would be absorbed within the surrounding planted understory or open areas.

Loading areas will be substantiated with hard core where appropriate and required.

Water will be precisely delivered through drip irrigation aligned with crop needs and uptake. This will not result in any excess residues.

All leaf biomass and wood chippings from harvest operations will remain on site to break down and contribute to organic matter build up to levels as appropriate for each tree.

3.9 Associated works

Irrigation piping will be enabled to project sites from existing farm infrastructure.

Around the site perimeter a 1.8m high deer fence will be erected to the specification provided in the Forestry Commission Technical Guidance 'Forest Fencing'. Wooden, creosote treated fence posts will be used, without planned use of a strutted stake assembly since the sites are not in particularly exposed locations, do not experience heavy deer pressure or sit on soft soils. Single width netting is planned, with use of spiral wire preformed fence connectors. Small river gates hinged on a wooden pole are planned where fence lines cross small water courses. A lack of PROWs and public access to the sites negates the need for stiles, ladders and dog latches anywhere along fence lines. The line of the fence shall be cleared of debris and be smooth enough to allow the bottom of the fence to seat with the ground and avoid gaps through which deer could enter underneath the fence.

The project sites are self-contained.

4 Prediction of impacts

4.1 Impact 1: Invasiveness

4.11 Change from existing or baseline

Paulownia Phoenix one is not currently grown commercially in the UK.

As a non-native tree, evidencing and information collation is required to demonstrate appropriateness and gain approval to grow in the UK. This information also informs any predicted change from baseline.

The focus of this exercise is in in collating evidence in the following areas in order that a balanced view can be formed on any invasiveness risk associated with growing Phoenix One in managed plantations:

- The sterility of the Phoenix One cultivar.
- The potential for Phoenix One to establish in UK managed and unmanaged conditions.
- Plantation management requirements to demonstrate agronomic and operational control. and plantation design to ensure adequate thresholds for buffering and monitoring.
- The potential for Phoenix One as a food source, host, symbiont or vector for other damaging organisms (insect, fungal, viral).
- Phytosanitary certification to ensure sterility of plant materials entering the UK.
- Adoption of a Forestry Commission approved monitoring framework.

Evidence across these areas was summarised in WCPG2 paper Annex 3.f "Phoenix One Sterility and Invasiveness Summary".

This paper set out the evidence to support the complete lack of flower or seed production in Phoenix One in 8 years of trial work, supporting sterility. It describes the highly controlled and exacting planting breeding process and the rigor of the phytosanitary controls. The paper summarises how plantations would be managed to reduce suckering and how the trees are harvested every 6-7 years, a number of years before any reproductive stimuli would normally be triggered. Integral to plantations design would be extensive buffering and sucker monitoring zones to ensure that there was isolation from external features minimising vegetative propagation risks. The basis of suggested monitoring parameters are also stated.

This document references the supporting papers:-

Annex 4.a "Paulownia Elongata Risk Assessment - Hawai Import".
Annex 4.b "Paulownia Fortunei Risk Assessment - Hawai Import".
Annex 4.c "Phytosanitary Certificate".
Annex 4.d "Portuguese Risk Analysis on the Introduction of Paulownia - Ecological Characterisation".
Annex 4.e "Portuguese Risk Analysis on the Introduction of Paulownia".
Annex 4.f "Portuguese Risk Assessment for Phoenix One".
Annex 4.g "Prof. Dr. Ralf Pude, University of Bonn - Phoenix One Sterility Statement".
Annex 4.h "University of Bonn Phoenix One Sterility Report".

The "Annex 3.f "Phoenix One Sterility and Invasiveness Summary" set out the status of information at the time of WCPG2 (March 2021).

This information was based on 7 years of scientific evidence (this is now 8 years) and feedback from European plantations that demonstrates Phoenix One performance in European climatic and growing conditions. CPL appreciates evidence from the UK is absent but given that this is not

available have evidenced data from Europe aligning as closely as possible climatic and agronomic conditions.

After WCPG2 and UKFS compliance the process has further evolved.

The scoping consultation meeting raised questions on invasiveness (encapsulating sterility, neglect), lack of UK trial work and monitoring. Captured in Annex 6.a "Scoping Meeting Issues Log".

The approved issues log from the scoping meeting indicates that the invasiveness aspects would be addressed through the Defra GB Non-native Risk Analysis Forum (NNRAF) risk assessment process.

It is proposed that the monitoring aspects are addressed through a monitoring framework based on a draft framework authored by Forest Research Annex 7.a "SRF Monitoring Framework".

Trial work for new forestry species normally takes many years (20 or 30). This timescale for Phoenix One would not allow this project to proceed and the opportunity for delivering to carbon and UK hardwood requirements (see section 4.8 and 4.9) would be lost. CPL propose that the data from European plantations in addition to the detailed monitoring and mitigation plans would serve to negate the requirement for many years of traditional forestry trial work. CPL does accept that this does not align with the preferences of one scoping meeting consultee who responded as such in the issues log sign off process.

A risk register has been compiled, with expert input from the John Innes Centre. Version one submitted to the Non-Native Risk Assessment Forum (NNRAF) process for review. Comments were received, considered and incorporated into a version 2.

The risk assessment process now focuses on the hybrid Phoenix One (as opposed to other Paulownia varieties) and a managed plantation approach. It aligns identified potential risks with CPL mitigating actions as to be agreed.

This risk assessment is included in Annex 4.j "GB Non-Native Species Risk Analysis Phoenix One Vs 2".

NNRAF have provided the following comments in relation to this second draft of the Risk Assessment:

- The risk assessment is draft and not yet considered fit-for-purpose by the NNRAF. The NNRAF understand that the FC still wish to consider the draft assessment – in which case they advise that their comments should be taken into account whenever it is used.
- The NNRAF have provided their comments in two parts. The first provides their comments for the FC (and anyone else reading the risk assessment) to take into account when considering the risk assessment. The second provides more detailed comments on the updated assessment for the risk assessor to consider and to respond to. These more detailed comments may also be of interest to the FC and other readers of the risk assessment. These are included as Annex 4.p "Paulownia Phoenix One - RAv2 NNRAF Comments on Draft Risk Assessment" and Annex 4.q "Paulownia Phoenix One - RAv2 Draft Risk Assessment"
- The NNRAF's comments should remain and be considered with the draft risk assessment whenever it is being used.

The Forestry Commission have indicated, being conversant and aware of the NNRAF process, that the ES should be prepared and submitted on the understanding that the risk assessment process will be an ongoing activity. CPL remain committed to work with this ongoing process.

Additional supporting papers have been researched that strengthen the evidence that, to date, there are no reports of Phoenix One exhibiting invasiveness traits. These papers include:
Annex 4.k" A case for the Non-Invasiveness of Paulownia".
Annex 4.l "Paulownia in China – Zhu et al".
Annex 4.m "Comparison of Influrescence and Infructescence Within Different Paulownia Genotype Lines".
Annex 4.n "Paulownia Invasive or Not (Gillard)".
Annex 4.o "Berg et al 2019 - Survivorship attained diameter height and volume of three Paulownia Species USA".

In summary the evidence provided sets out the case that managed plantations of Phoenix One present a very low risk of becoming invasive, that management actions will be designed to further minimise risks and that a rigorous, Forestry Commission approved, monitoring plan with mitigating actions would be implemented.

In this case CPL believe that the change from baseline would be negligible.

4.12 Nature of the change

The change from baseline would be negligible.

4.13 Confidence level of prediction

CPL is confident given the alignment of information sources supporting the non-invasiveness position. CPL does recognise that concerns have been raised over the limit of this information being 8 years and that 12 years of information would be required for greater confidence.

4.14 Relationship to standards/policies

The plantation design is UKFS compliant.

A draft monitoring framework has been designed by UK Forest Research will be implemented to a standard acceptable to the FC

The NNRAF process has been followed resulting in the production of a draft 2 risk assessment report, version 3 is currently underway.

4.15 Basis for predictions

Predictions are drawn from the scientific publications, researched papers and risk assessments contained within the annexes. The technical experience of the plant breeder, WeGrow, is also evidential.

4.16 Method of impact identification

CPL will commit to carry out monitoring of the plantation sites and will ensure that adequate resources are in place to deliver this obligation. These have been included in the financial model and further Resources are to be invested for this purpose exclusively.

CPL proposes to use the draft framework from Forest Research as the basis for production of a monitoring plan with some further discussion around how a more stratified approach focusing on monitoring the heterogeneity within project sites could be adopted. The intention being to reduce sampling frequency whilst maintaining monitoring integrity.

A copy of the draft monitoring framework produced by Forest Research is include in Annex 7.a "SRF Monitoring Framework.

4.17 Uncertainties and unknowns

There is uncertainty over Phoenix One flower or seed production attributes beyond the 8 years of published trials data as discussed in earlier sections.

There is uncertainty of Phoenix One adaption to UK conditions as discussed in earlier sections.

The plantation designs, plantation buffering and plantation monitoring all contribute towards minimising impacts of the uncertainties described.

4.2 Impact 2: Water

4.21 Change from existing or baseline

The impact of water usage by the project has been assessed across irrigation demand, on water resource balances and effects on private water supplies as identified in the WCPG2 scoping work.

Irrigation

Plantations in Spain indicate that commercially grown Paulownia trees require between 7 and 10 litres of water each per day during the initial establishment stage. Once established, water demand in the first three years drops to an average of between 4l and 6l per day during the growing season. In much of the UK there is insufficient rainfall to meet this demand and supplementary irrigation is required at key times using SMD meters (Soil Moisture Deficit).

The residual estimated irrigation demand on light soils in the east of England is 451m3/ha in year 1 rising to 715m3/ha in year 3. This compares favourably with the irrigation demand of vegetable crops in similar conditions. Peak, year 3, Paulownia irrigation demand is about 30% that of main-crop potatoes grown in similar conditions and average annual demand over a 10 year cropping cycle is about 40% that of a typical commercial carrot/potato rotation.

The above is included within an irrigation report produced by Paul Bradford MCIWEM C.WEM in Annex 3.b “CPL Report - Paulownia Irrigation Demand” specifically for this project. This report concludes water requirements to be considerably under that of conventional root crops creating a positive position to the existing baseline of agricultural cropping. This is a positive impact.

This water is supplied via an efficient trickle irrigation system and subject to existing abstraction licencing with the Environment Agency.

Water resource balance

The Environment Agency, Forestry Commission and academia have carried research into the impact of forestry on water resources. This is important because much of East Anglia is in water resources deficit as a result of historic over abstraction. The research shows that all types of woodland significantly increase infiltration rates, by between 17% and 60%, but that this benefit can be offset by increased rainfall interception and evapotranspiration (ET) from the canopy. Interception and ET is broadly determined by tree type, canopy size and planting density. Mature coniferous forestry with its dense canopy and long growing season has a significant adverse impact on water resources whereas broadleaved woodlands have a more nuanced effect. Studies show that beech and ash can increase groundwater recharge, in comparison to grassland, by between 17% to 25%, but mature oak, which is better adapted to scavenging water during prolonged periods of drought can reduce recharge in dry conditions by between 16% and 45%.

On balance, the evidence suggests that Paulownia may have a benefit on the overall water resource balance. This is articulated in a paper by Paul Bradford in Annex 3.g "High Level Water Balances".

The trees are grown at a low density and are maintained in an immature state, only reaching full canopy cover for a 2 year period before they are cut. Recharge rates under juvenile deciduous trees have been found to be 3 to 4 times greater than for mature trees and separate research concludes that 'groundwater recharge can be enhanced under moderate planting densities'. Paulownia has a short growing season and because it is native to high rainfall regions, is not adapted to scavenge deep groundwater.

With summer rainfall predicted to drop by up to 57% in the summer and increase by 33% in the winter, by the 2070's (UKCIP high emissions scenario), landscape scale, flood attenuation and water retention features we become increasingly important. Paulownia plantations reduce flood flows by increasing infiltration rates and soil water storage capacity. Soil carbon storage under Paulownia can increase by up to 5%. As well as reducing atmospheric carbon, this improves the health, structure and water holding capacity of the soil. An increase in the amount of organic matter in the soil of 1%, one can increase the quantity of water held per Ha by 222m3/ha. Given that the project is expected to increase the percentage of organic matter in the soil by up to 5%, we could potentially store an additional 1110m3 of water per Ha. Much of this water is prone to run-off in conventional agricultural systems, so the plantations reduce the risk of both flood and drought and topsoil erosion. Monitoring to assess the changes to environmental water fluxes, carbon sequestration and habitat improvement as a result of the plantations will be incorporated into the project design.

A further water report contained in Annex 3.c "Paulownia Water Use Report" adds to this logic by assessing the balances between infiltration, soil water storage, transpiration and interception and concludes that we do not see the plantations making significant losses to the re charge systems rather by making the rainfall 'effective' we will change the nature of the re charge and eventually hopefully store water for later use, rather than drawing on valuable aquifer reserves.

We believe that the analysis articulates that the change from existing baseline is negligible, most probably positive.

Private water supplies

The nearest public water supply abstractions identified by the Environment Agency are boreholes situated 8.8km away, to the northeast of the site and a borehole at Brandon over 10km away. Both of these abstraction licences are held by Anglian water services Ltd Annex 5.a "B J Rutterford – Environment Agency Response".

In addition to this, consultation with Kings Lynn and West Norfolk District Council Food & Health & Safety Department identified no private water supplies within 1km of the proposed project site Annex 5.p "B J Rutterford – West Norfolk District Council – Private Water Supplies".

Other

The acidification of surface water is not an issue for this site as demonstrated by the FC Land Information Search undertaken as part of Woodland Creation Planning Grant Stage 2. This is documented in Annex 1 "Forestry Commission Approved Woodland Creation Planning Grant Stage 2"

The Internal Drainage Board (IDB) were consulted early on in the WCPG process regarding the potential impact the project could have on routine management of IDB drain on the southeast

boundary of the site. Based on IDB advice, 9-metre open area buffers were added to project areas adjoining relevant IDB drains Annex 5.t "B J Rutterford - Internal Drainage Board Response".

The Environment Agency expressed no concern over local water dependent protected sites Annex 5.a "B J Rutterford - Environment Agency Response". Natural England highlighted potential sensitivities of local water dependent protected sites to certain activities involving the drainage or modification of watercourses, none of which the project intend to engage in.

The scoping meeting issues log raised two points on water:

The Environment Agency raised a question on prevention and mitigation for water run-off. CPL responded with a description that management of the woodland planting would include an understorey, this to be established at the beginning of the woodland creation process, providing a solid environment to manage run off and will ensure bare ground is not left thus minimising the risk. A key point of the project is soil stabilisation and improving degraded soils over the existing industrial agricultural use currently practiced on the field parcels. This response was included in the accepted issues log from the meeting.

Suffolk CC raised a question on the source of irrigation water. The CPL response was that Irrigation will be provided by existing abstraction licenses, currently undergoing trickle irrigation variations. No further source irrigation water would be required. This response was included in the accepted issues log from the meeting.

4.22 Nature of the change

The requirement for irrigation water will be around 60% less than for existing agricultural cropping. This driven by less consumption and greater efficiency in application.

Water resource balance will remain in a similar position as for the current agricultural cropping.

4.23 Confidence level of prediction

The confidence level for irrigation water is high and within CPL project control.

The confidence level for water resource balance is high but subject to greater variability and will be the subject of ongoing monitoring.

4.24 Relationship to standards/policies

Irrigation is subject to abstraction licensing by the Environment Agency that align with the EU water framework directive. Trickle license variations will be in place.

4.25 Basis for predictions

This report provides a synthesis of known baseline irrigation requirements and UK specific agro-climate and soil type factors. It uses the methodology set out in the Environment Agency's 'Optimum Use of Water' Guide as a template for estimating the 'design dry year' Paulownia irrigation requirements for any given agro-climatic zone and soil type in England and Wales.

4.26 Method of impact identification

The project intends to utilise the EAs new groundwater modelling initiative, involving the monitoring of specific boreholes close to the planting sites and early detection of any adverse impacts to groundwater.

4.27 Uncertainties and unknowns

The changing nature of ground water baselines as wider water usage and the climate changes will be a consistent unknown.

4.3 Impact 3: Landscape character change

4.31 Change from existing or baseline

The landscape character analysis was originally set out in the WCPG2 papers Annex 1.a "B J Rutterford - Site Context Map", Annex 1.b "B J Rutterford - Site Appraisal Plans" and Annex 2.b "B J Rutterford Landscape Analysis".

The scoping meeting generated an action to carry out landscape analysis work covering all proposed planting blocks in addition to that carried out as part of Stage 2 of the WCPG. The project is not located within any nationally designated landscapes or areas categorised as having a sensitive landscape by the local authority, and aside from the novel species use the proposals are not particularly complex. The Forestry Commission did not therefore request the completion of a full Landscape Visual Impact Assessment (LVIA), but did ask that for any reasonable gaps in the materials already undertaken that are essential for the Forestry Commission to assess compliance with the UK Forestry Standard to be filled. These included:

- Analysis of impacts by Local Authority Character Areas.
- Analysis of zones of theoretical visibility and identification of sensitive receptors.
- Visual impact depictions of the sensitive receptor views.

The above was delivered in the form of an Outline Landscape & Visual Appraisal, included in Annex 2.f "Outline Landscape & Visual Appraisal", which concluded that the project would have limited influence on landscape character, with only marginal, localised impacts, many of which have been mitigated as part of project design.

The subsequent Outline LVA has had no influence on project design, as the finalised UKFS compliant Stage 2 proposal balanced the requirements of many stakeholders whilst working within the parameters of the financial timber model. In summary, the conclusions drawn from the Outline LVA were not significant enough to displace existing design justification from consultee responses and previous landscape analysis work.

This has been completed and is included on Annex 2.f "Outline Landscape & Visual Appraisal". This further informs this impact assessment

The conclusion of the assessment is that there will not be a landscape character impact but that there will be some local impacts, many of which have been mitigated as part of project design.

Description of Baseline & Wider Landscape Context:

The proposed site consists of 3 adjoining field parcels intercepted by a network of ditches. The area is situated adjacent to Blackdike Plantation to the northwest, with a small deciduous spinney situated to the east of the most southern field parcel. The Block is bound by arable land to the north, south and west, whilst the eastern side is bound by permanent pasture. The proposed planting site is currently permanent pasture, however, has historically been cultivated for crops.

The project areas fall within several landscape assessments on National & District level. On a National level, the project is spread across the National Character Area (NCA) profile (formerly Joint Character Areas (JCA)) 46: The Fens and 85: The Brecks. The NCA 46 is characterised by its large-

scale, flat, open landscape with extensive vistas to level horizons The NCA 85, also known as Breckland, consists of a low, gently undulating plateau, largely covered with sandy soils of glacial origin.

Norfolk do not have a county-wide character assessment, but instead have the Breckland Landscape Character Assessment, published by Breckland District Council, and the King's Lynn and West Norfolk LCA (2007) covering the adjacent district area. Of the landscape types identified within the districts, the Rutterford site has potential links to aspects of E10: Feltwell, a landscape character area within The Fens – Open Inland Marshes character type, which corresponds to The Peat Fen area within The Fens.

The planting sites shares key characteristics with E10: Feltwell, in particular the strong geometric and linear landscape patterning defined by large scale intensive arable farming with extensive field units divided by a regular network of drainage ditches and dykes, long straight roads, large straight rivers and cut off channels.

The site also encompasses the large scale landscape with extensive vistas and wide open skies characterised by E10: Feltwell, as well as the Drainage channels and dykes flanked with golden rushes and bright green grass banks.

The project also falls within the local authorities Landscape Character Assessment (LCA) 9. Planned Fenlands, described as a vast open landscape of systematically drained and enclosed fen with individual farmsteads. Historically extensive areas of north Lakenheath were planted with poplars, many of which have been removed, but linear tree belts on the banks and blocks of trees still exist within the landscape.

Minimising Change from Baseline:

Landscape sensitivity has been a crucial factor throughout the planning and design process, with key targets around minimising adverse visual impacts, maintaining existing landscape character profiles and promoting landscape scale woodland connectivity. This has been achieved through early identification of more localised landscape character and enclosure patterns, a considered approach to LCA identity and an understanding of how the project can contribute to NCA objectives where possible and appropriate.

Landscape analysis was undertaken to identify localised sensitivities and explore options for the NCA to be maintained through specific aspects of design and landscape enhancement. This analysis also identified Public Rights of Way for most appropriately placing native planting belts to provide a visual buffer from the potentially regimented appearance of the plantations, most notable from the two PROW that pass east-west to the north and the south of the site. In other areas of the project, native boundary belts have been incorporated to reinforce the existing level of enclosure and promote a sense of connectivity between landscape features whilst increasing the species and age class diversity of woodland.

Field boundaries within and around the planting sites mainly consist of dykes and ditches. The large field sizes and lack of hedges make for a relatively weak pattern of enclosure. The condensed planting site make for a relatively low impact to the wider landscape enclosure. Open ground buffers of 6 metres either side of internal and external historic boundaries will help to preserve the current landscape pattern.

An outline Landscape and Visual Appraisal (LVA) has been used to further assess and develope a landscape baseline for the site, bringing in elements of visual appraisal with additional consideration of landscape-related designations and how the setting of these may be impacted by the project.

The project would have no material effect on the appreciation of geology, soils or watercourses on the site. The proposed sites are all currently in grass but have previously been in used for arable or vegetable production, and the proposed woodland would have little direct effect on the character of any of The Fens Landscape Character Assessments.

In reference to 85: The Brecks, agricultural intensification and improvement have in some places resulted in the loss and damage to landscape features, including traditional infield coppices and shelter belts, something the project design aims to improve through the incorporation of field boundary native woodland planting.

Most of the open, panoramic views across The Fens character area, e.g. to the north of the site, would be unaffected; similarly, the noted views to Wissington sugar beet factory would not be compromised by the proposed planting.

It is unlikely that the proposed woodland would be visible from neighbouring landscape character areas due to the presence of vegetation on the edge of the Feltwell character area – i.e. the Planned Fenlands to the south (as identified in the Suffolk Landscape Character Assessment) and Settled Farmlands with Plantations – Northwold on the higher grounds to the east – and so no effect on the appreciation of their landscape setting.

The landscape is largely dominated by enclosure pattern, created from the network of ditches. Enclosure within the landscape has resulted in rectilinear field parcels and highly regular pattern of drainage ditches. The overall shapes of forest and woodland plantations within the landscape are frequently geometric which has been reflected in the proposed woodland planting.

A significant emphasis of the native planting silvicultural elements has been put on landscape character, in particular softening the visual appearance of both Paulownia and new native planting. This has been achieved in a number of ways detailed in Annex 3.a “B J Rutterford - Silviculture; Ground Preparation, Species Mix & Planting Design” including graded edge structure, achieved through appropriate distribution of lower growing species on the woodland periphery. As well as dispersed planting configuration, with stocking densities gradually increasing and becoming more unified before transitioning into the Paulownia planted areas. This is intended to promote harmony between the new woodlands and surrounding landscape.

Positive Change Contributions:

NCA 85: The Brecks 3rd Statement of Environmental Opportunity (SEO) hinges around the management of forest plantations for climate change adaptation and regulation, with a noted example to achieve this being to “*Explore the potential for new woodland types, including species more resilient to potential challenges of climate change and new tree diseases”*.

The management regimes associated with coppiced woodland, as compared to pasture farming, would be less intense and result in reduced movements. As such, there would likely be a beneficial effect on the sense of tranquillity and isolation within the character area.

The preservation of existing natural and archaeological features aims to maintain the spirit of the place. Open space within woodland has provided an appropriate setting for specific archaeological features. Although the landscape comprises of flat farmland with limited hedgerow or hedgerow

tree cover resulting in an open, exposed character, the non-native planting will be screened effectively by utilising native species, in a naturalised planting pattern, around the perimeter.

4.32 Nature of the change

The nature of both the project and the landform that it's situated within make the potential effect on the landscape character baseline established in 4.31 above more likely to be direct, in the form of impacts to the local landscape, as opposed to indirect and related to character changes beyond the boundary of a character area/landscape type. Furthermore, due to the intricacies associated with landscape character assessments, and the variety of competing stakeholder interests in the project design, the project will have both positive and negative impacts on landscape character, contributing to certain elements and detracting from others.

Taking into consideration all elements that form landscape character, including natural, physical and cultural features, the net effect of this proposal on the landscape character profiles outlined above would be positive and long lasting.

4.33 Confidence level of prediction

The confidence level of these predictions is considered high, partly due to the highly analysed and documented nature of landscape character profiles allowing for a comprehensive baseline to be established, as well as the emphasis put on landscape character preservation during project design. The outsourcing of additional Landscape and Visual Appraisal work enabled potential effects to be considered in context to the wider landscape.

4.34 Relationship to standards/policies

The project design process has complied with the National Planning Policy Framework (NPPF)[1] para 174 which recognises the importance of understanding the local landscape character.

As part of the initial landscape analysis and subsequent Outline Landscape and Visual Appraisal, NCA profiles were heavily utilised, documents amended from JCAs as required under Natural Environment White Paper 2011, Biodiversity 2020, and the European Landscape Convention 2007.

In addition to this, the project meets the UK Forestry Standard requirements around sensitive woodland design in relation to landscape character types.

4.35 Basis for predictions

The LVA utilises key landscape and visual receptor as a method for analysing effects and determining predictions on specific local landscape points. Visual influence, indicative zones of theoretical visibility (ZTVs) were also generated and used as a tool for predicting likely extent of changes against the landscape character. Visualisation software has been used to demonstrate the visual effect of the project from specific viewpoints at various ages.

National and District level landscape character assessments, encompassing natural, physical and cultural features were used as a baseline for measuring scope of predictions against.

4.36 Method of impact identification

Ongoing monitoring of native elements of project to ensure predicted tree heights are met and associated screening delivered. Initially, any failed native stock will be replaced to ensure native belts provide full extent of intended visual buffering.

4.37 Uncertainties and unknowns

Whilst Paulownia Phoenix One has many similarities with existing local woodland and trees, their form and foliage colour hasn't before been seen in The Fens NCA, the visual contrast of which presents a level of uncertainty, particularly during summer months. This impact will be limited to an extent by the present lack of woodland cover.

Though yield class, planting density and location provide an indication of tree height at particular ages, an exact height cannot be guaranteed. An average height of 5m at 10 years was used as a basis for native planting height in visualisation models, a reduction from predictions to reduce risk around this uncertainty.

The visual change associated with the Paulownia coppicing regime employed is predicted to have a lower impact than that of traditional clear-fell regimes, however, the scope of landscape variation that coppicing will create is not fully known.

4.4 Impact 4: Biodiversity changes on project and surrounding sites

4.41 Change from existing or baseline

This project, to establish high carbon sequestration woodland, has been designed throughout to ensure an overall biodiversity gain. The planting areas replace intensively managed farmland with associated agrochemical inputs, with crops having been grown as a monoculture with very little diversity being allowed to flourish. This is generally reflected through declining soil health, low invertebrate levels (particularly insects), seed and pollination sources and associated farmland fauna and flora.

Project sites have been carefully selected to ensure that no existing biodiverse habitat (priority habitat) have been included within the project.

This project will deliver biodiversity benefit through a range of habitat creation zones including native woodland creation (13.5% of project area, 7 ha), other non-native (Scots Pine) (1.5% of project area, 0.8ha), open space (17% of project area, 9 ha), Paulownia and associated understory (68% project area, 36 ha).

The project adheres to the Lawton review principles of positive biodiversity change through creating a bigger better and more connected landscape.

Open areas have been used to create large habitat corridors across the project site whilst preserving all historic boundaries (hedges, ditches). This builds on and enhances the size of these existing features and promotes habitat connectivity.

The open area buffers around water courses will be established using a proportion of tussocky grasses to minimise water run off as suggested by environment agency consultee feedback. This will also generate an additional habitat type for invertebrates and ground feeding birds.

The creation of woodland will reduce risk to adjoining water courses through a number of means. Nitrate as a diffuse pollutant associated with arable agricultural practices will cease, and improved soil structure and organic matter will in time increase soil stability and water holding capacity. The effect of this being reduced run off leading to a reduction in dissolved nutrients which can

potentially pollute water courses. Soil run-off will be reduced via the grass/clover sward established across the project site.

The project will create new habitats and target maximising the quality of these. Native woodland – planting mixes will mirror local context as well as building in future resilience. To achieve this, tree mixes will normally include: Sessile/Pedunculate oak 39%, silver birch 5.6% and mixed native broadleaved species with some Scots pine 55.4% (to include in the mix hazel, hornbeam, field maple, wild cherry, hawthorn, wild crab apple, dogwood, small leaved lime, beech and black poplar). In open areas and Paulownia understory. The low shading of the Paulownia trees will allow for the establishment of a biodiverse understory alongside the other, sunny aspect, open areas across the project sites. The principle across these areas will be to establish and manage a diverse flora that delivers food sources to insects and birds (pollination and seeds). Mixes will include: Birdsfoot trefoil, White clover, Alsike clover, Knapweed, Kidney vetch, Timothy (low percentage for tussock formation), Slender Red fescue, Smooth stalked meadow grass.

Existing features, primarily hedges and woodland will receive open area buffers to improve the quality of these features and prevent encroachment by farming operations.

The project design has focused on joining up existing features and creating new wildlife corridors between habitats. The external perimeters to the project totals 3.4 km of biodiversity interface with the surrounding farmland. The addition of internal connectivity features increases this further to 4.8 km. In total 9 ha of pollination and seed rich buffers will be created and managed. The native woodland has been used to link existing woodland.

Overall, the change from existing baseline will be very positive.

A number of specific biodiversity areas were assessed around features on and adjoining this project site.

- Natural Englands initial response to WCPG Stage 1 consultation Annex 5.s "B J Rutterford - Natural England Response to WCPG Stage 1 Consultation" highlighted the potential impact that drainage, the modification of watercourses including banks and beds, realignment, damming or dredging, drainage operations and alterations to water levels as well as the infilling or digging of ditches, dykes, drains, marshes and ponds could have on Shippea Hill (SSSI) and Stallode Wash, Lakenheath (SSSI). No such activities are planned as part of project establishment or ongoing management.

- The Breckland Farmland SSSI was identified during screening and subsequently raised by Natural England during initial consultation (WCPG Stage 1) Annex 5.s "B J Rutterford - Natural England Response to WCPG Stage 1 Consultation" for the projects potential for impacting on the functionality of the SPA in supporting Stone Curlew. The proposed planting site is located 0.75km from the SSSI, further to this no Stone Curlew nesting sites are recorded on the land holding or within 1km of the proposed planting sites by the RSPB. The farm staff at B J Rutterford also confirm that they have not observed any Stone Curlew activity on or in close proximity to the proposed planting site.

- Consultation with Norfolk Wildlife Trust confirmed the proposed woodland planting will not have a significant impact on any County Wildlife Sites (CWS) situated nearby to the planting site Annex 5.e "Norfolk Wildlife Trust Response".

Across the above specific biodiversity areas identified we believe that there will be no impact on biodiversity.

The potential for impact on wider biodiversity priority sites has been assessed by a habitat risk assessment delivered by the Forestry Commission in conjunction with Natural England. This looks at threats to European protected sites.

4.42 Nature of the change

A specific target for this site will be the opportunity to increase the size, resilience and connectivity of existing woodland. New woodland belts will connect the existing woodland area adjoining the project.

The project area is close to the cut off channel, a key habitat for turtle doves. The project will target habitat creation for this declining species. The hawthorn feathering around woodland edges will target achieving the 4m wide 3m minimum criteria for turtle dove nesting habitat. In addition to this, the bare area blocks will be in part cultivated (and augmented if necessary with fumitory) to encourage annual arable plants, an important feed source for turtle doves.

Where project areas are in the vicinity of butterfly rich habitats the pollinator mixtures will be enhanced to offer butterfly feedstock to align with the fly times of local species.

4.43 Confidence level of prediction

The confidence level is high given the degree of positive land use change and the low existing baseline.

4.44 Relationship to standards/policies

The opportunity this project presents to achieve a big biodiversity gain is significant and supports the direction of travel as set out by UK Government net zero commitment by 2050 and biodiversity gain targets.

4.45 Basis for predictions

Predictions are based on a range of research and documented evidence that records and demonstrates an increase in biodiversity as a result of soil organic matter improvement, enhancing floral diversity and scale, protecting and enhancing existing features, The project delivers across all these aspects.

4.46 Method of impact identification

These are set out in detail in Annex 3.d “B J Rutterford - Biodiversity Report Summary”.

The project will measure

- Invertebrates through pit fall trapping.
- Floral diversity through quadrat sampling.
- Soil biodiversity through fumigation extraction of soil microbial biomass.
- Soil carbon through isotope techniques.
- Hedgerow biodiversity using the Defra hedgerow survey handbook.
- Pond biodiversity using the Norfolk biodiversity information service pond survey.
- Birds biodiversity using a common bid survey methodology as proposed by the RSPB.

4.47 Uncertainties and unknowns

The ability to establish a biodiverse understory in the Paulownia plantation may require some experimentation with floral species mixes to determine the most effective and sustaining understory. The project will look at understories in European plantation as well as those that thrive in UK woodland as part of determining the most appropriate site-specific mix.

4.5 Impact 5: Degradation of soil carbon in peat soils

4.51 Change from existing or baseline

The potential for peat soils to lose their carbon stocks through drying out, or the opportunity for them to be restored and sequester increased atmospheric carbon is recognised in the England peat action plan https://www.gov.uk/government/publications/england-peat-action-plan

Planting trees on peat may cause peat soils to dry out.

The site falls within the Natural England peat map as "Deep Peaty Soils", however correspondence with Natural England has confirmed that the project site does not contain any fields with peat levels above the threshold of concern or where peat levels are capable of restoration.

This impact is not therefore relevant.

4.52 Nature of the change

N/A

4.53 Confidence level of prediction

N/A.

4.54 Relationship to standards/policies

The England peat action plan https://www.gov.uk/government/publications/england-peat-action-plan.

4.55 Basis for predictions

Natural England assessment

4.56 Method of impact identification

N/A.

4.57 Uncertainties and unknowns

N/A.

4.6 Impact 6: Damage to archaeological and historic sites

4.61 Change from existing or baseline

An archaeology report produced by Norfolk County Council Historic Environment Record (NCCHE) identified several records around the proposed planting site, most notably HER5435 – East Harling Drove, Part of a possible prehistoric trackway running from east as well as various finds from an Early Neolithic occupation site (HER5320). Two archaeological features on the site were significant enough to influence planting layout, HER5320 and HER19818, NCCHE where 3.5ha of open space was allocated to mitigate any potential damage from tree roots. Annex 5.u "B J Rutterford - Forestry Commission Supported Archaeology Mitigation" sets out the final mitigation measure as agreed with Forestry Commission archaeology advisers in agreement with NCCHE.

Consideration has been given to the protection of historic boundaries including ditches/dykes and the lines of parish boundaries. All boundaries including those internal to the planting blocks have had a 6-metre open ground buffer incorporated into the project design. The planting sites sit entirely within the HLC Enclosed Agriculture (Typically Pre-Modern Form), described as gradually enclosed predominantly for agricultural use. Maintaining field boundaries will preserve field shape and form.

The lack of historical features in the vicinity of the planting site negated the need for a site specific Historic England report, a position taken based on research and analysis during Stage 1 of the WCPG. Despite this, insight was taken from Historic England reports prepared for similar Pioneer project and applied to the design principled for this site.

Given the accommodation of consultee concerns as part for the initial design the project represents no significant change to the existing baseline position.

4.62 Nature of the change
N/A.

4.63 Confidence level of prediction
High confidence.

4.64 Relationship to standards/policies
Norfolk Local Authority Historic Environment Team policy.

4.65 Basis for predictions
Mitigation as part of project design.

4.66 Method of impact identification
N/A.

4.67 Uncertainties and unknowns
None.

4.7 Impact 7: Local residents' quality of life changes

4.71 Change from existing or baseline
The change to baseline will be as a result of land use change on the fields in the vicinity of local residents. Agriculture production and associated management regimes will be replaced by woodland and associated management regimes.

Effects on local residents could fall under visual effects, healthy environment, road congestion and noise pollution.

The visual landscape will change.

Biodiversity levels will change.

The plantations, aside from at the harvest period every 6-7 years, are self-contained. The harvest cycle will involve the transport of wood from the site. This is unlikely to very different from usual traffic from agricultural machinery. There is likely to be no change from a road traffic/congestion perspective.

The management practices that can generate noise, disturbance and residues will change.

4.72 Nature of the change

The visual aspect will change from agricultural cropping to a mix of Paulownia plantation, native woodland an open space.

The landscape architect report Annex 2.f "Outline Landscape & Visual Appraisal" predicts these changes.

The biodiversity of the local area will increase as described in the biodiversity section of the report. There is much evidence that connections and interactions with nature improve human wellbeing. This is a positive impact.

The level of agrochemical inputs, fossil fuels, noise pollution and congestion from agricultural machinery will reduce as agricultural activity is replaced by extensive woodland management. This is likely to have positive effects on air quality, reduce run off from fields and reduce disturbance for local residents.

4.73 Confidence level of prediction

The confidence in the physical nature of change is high. The site is highly isolated with a complete lack of dwellings within 1km.

4.74 Relationship to standards/policies

The design of the project conforms to UKFS. Integral to achieving this standard and within the methodology is a requirement to understand and address where possible local stakeholder views.

4.75 Basis for predictions

The LVA provides a pictorial representation of landscape change.

The woodland design plans depict the design of the plantations, native woodland and open areas. They also capture mitigating actions resulting in design change as a result of stakeholder feedback.

Local stakeholder feedback record annotates potential impacts, there was no local resident feedback due to the absence of dwellings as a result of site isolation.

4.76 Method of impact identification

Any future impacts (positive and negative) channeled through feedback to landowner or CPL will be understood and if required addressed where possible.

4.77 Uncertainties and unknowns

The timeline for any impact (positive or negative) to manifest itself is not certain and should be managed through the mechanism for impact identification.

4.8 Impact 8: Carbon sequestration increases

4.81 Change from existing or baseline

The UK is committed to net zero carbon emissions by 2050. This is a front-line Government policy.

Achieving this ambition will be through a reduction in greenhouse gas emissions, clean technologies being adopted, carbon capture techniques and an increase in carbon sequestration.

Carbon sequestration, within the Rutterford land area context, could be driven through new woodland creation, peat land restoration and better soil management.

Trees store carbon because they use CO2 in the process of photosynthesis to feed their growth (produce wood), woodland soil is also rich in organic materials and therefore carbon stocks.

All this means that UK forestry is a net carbon sink, currently estimated at around 18MtCO2e.

However, even today tree cover in the UK is far lower than its closest neighbours – just 13% compared to the European average of 38%.

The Government has set itself a target of establishing 30,000 ha of new woodland in England by 2025 as outlined in the 2020 budget statement. The figures are associated with the Government's commitment to the Committee on Climate Change's net zero projections https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/ advocating the need for 30,000 ha of new trees being established in the UK every year to 2050, to take woodland cover in the UK from 13-17%.

June 2021 statistics on new woodland creation from Forest Research indicate that targets are not being achieved.

https://www.forestresearch.gov.uk/tools-and-resources/statistics/statistics-by-topic/woodland-statistics/

The Committee on Climate Change (CCC) 2021 progress report to Parliament indicated that the Forestry Commission's target for increasing the area of forest under active management had been missed

https://www.theccc.org.uk/wp-content/uploads/2021/06/Progress-in-adapting-to-climate-change-2021-Report-to-Parliament.pdf

There is a pressing need to harness the benefits that woodland can deliver and pressingly within a short-term timescale as the world faces dramatic climate change inpats. Traditional and historical forestry models are being realigned to deliver to the challenge.

Yield class (YC) is a measure used in UK forestry to gauge the productivity of trees and it can, therefore, also be used, as the CCC does, as an indicator of how much carbon they are absorbing. As yield class is based on the annual volume of timber being added by a tree on a particular site under specific conditions. The faster the tree grows, the higher the yield class and the higher the carbon storage.

Agricultural soil management has not be widely focused on practices that build soil carbon by ensuring winter green covers, incorporation of crop residues and non-inversion tillage techniques. These are outlined in the soil association article "Seven ways to save our soils" https://www.soilassociation.org/media/7458/7_ways_soils_final.pdf.

Even with these practices soil carbon sequestration is estimated to deliver around 0.5t/ha per year of addition carbon captured and stored. In most situations agricultural practice will not contribute to carbon sequestration and thus climate targets.

Woodland carbon capture is much more positive. Traditional native woodland can deliver 8 – 12 t per ha averaged over a 35-year period. Paulownia, in a managed plantation, is predicted to deliver 7 x the carbon capture rates of native woodland at over 65t/ha/year. This project across B J Rutterford and the mix of 68% Paulownia, 15% native woodland (including Scots Pine) and 17% open area is predicted to deliver approximately 70,000 Tonnes of captured carbon over the 35-year lifecycle.

This is a huge change from a baseline that, given continuation of current agricultural cropping practice, would be predicted to deliver between 0 and 1500 Tonnes over the same period.

4.82 Nature of the change

The change would be through a capture of atmospheric carbon. Predicted as 70,000 Tonnes. This carbon would be stored in the soils that the project manages and the timber from the commercially managed woodland.

4.83 Confidence level of prediction

Highly confident. The carbon sequestration predictions have been researched and evidenced, subject to commercial due diligence and form a significant basis for the investment case and business model.

4.84 Relationship to standards/policies

- The UK is committed to net zero carbon emissions by 2050. This is a front-line Government policy.
- The UK Forestry standard (UKFS) determines the species mix in the woodland areas. This project is UKFS compliant. https://www.gov.uk/government/publications/the-uk-forestry-standard
- The UK Woodland carbon code (WCC) determines the framework for carbon sequestration predictions and carbon yield. This project is registered with the WCC. https://woodlandcarboncode.org.uk/
- The Woodland Carbon Guarantee (WCaG) is the UK government reverse auction process that contracts to purchase sequestered carbon units that are compliant with WCC and received offers in the auction processes. https://www.gov.uk/guidance/woodland-carbon-guarantee. All of the project area on B J Rutterford has achieved a contract offer in this process.

4.85 Basis for predictions

The carbon predictions have been produced using the Forestry Commission Woodland Carbon calculation spreadsheet as required to register the project with the WCC. This spreadsheet was modified, in consultation with the FC, to accommodate Paulownia that does not a present have a yield class assigned.

Although ESC does not provide an assessment for Paulownia, UK trials and research carried out by the producer WeGrow support species suitability. Carbon calculations used for the Woodland Carbon Guarantee scheme demonstrate the high yield class (& timber production) potential of the tree.

The site has a DAMS score of 12 (sheltered) and therefore does not limit the intended species mix, all of which have a very high DAMS suitability score for the site. As demonstrated in the ecological site classification (ESC) outputs Annex 2.c “B J Rutterford ESC Output inc. DAMS Scores (2050 & 2080 AWC)”

4.86 Method of impact identification

The WCC process subject to validation, by a FC approved verifier, to ensure that the project sites are established as per the agreed plans. After every 5 years the carbon capture is calculated by a verification visit by the FC approved verifiers. The Soil Association and the Organic farmers and Growers are the current approved verifiers.

CPL will also me measuring the soil carbon impacts by using an isotope-based methodology (https://www.omniaprecision.co.uk/terramap/ This will baseline active soil carbon. CPL will revisit and ground truth geo located sites every 4 years to assess the increasing levels. C:N ratio will be tracked inn a similar way to the above analysis showing the changes in soil ratios as the system begins to 'settle' from modern arable production

4.87 Uncertainties and unknowns

The plantation growth of the Paulownia element will be subject to UK climate and growing conditions that have been untested to date. Carbon modelling has however been based on similar climatic and management conditions in Europe and is expected to yield similar results.

4.9 Impact 9: UK Hardwood production increases

4.91 Change from existing or baseline

The UK is one of the largest net importers of forest products by value in the world, second only to China. In total, 80% of the nation's wood is imported.

The UK timber sector is predominated by softwoods. There are also issues with the uses that wood products are being put to. From a carbon accounting perspective, there is a considerable difference between wood used in construction, which may last a century or more, and wood used in fencing, which may last 15 years. Evidence also suggests that at least half of UK-grown wood was being used in relatively short-term applications, such as paneling, fencing and pulp. A further quarter was being burned for energy. These short-term end uses release the carbon captured on wood negating some of the benefits of woodland as a carbon mitigation strategy. This is a complex area are discussed within a RSPB report on Woodlands for Climate and Nature http://ww2.rspb.org.uk/Images/Forestry%20and%20climate%20change%20report%20Feb%202020_tcm9-478449.pdf

The commercial production of Paulownia offers a different opportunity. Paulownia is a hardwood with a very high tensile strength to weight ratio. It is generally used as a plywood, a veneer, for making furniture, storage crates, musical instruments, surf boards and in the construction industry. These in general are long term applications for the wood produced.

This project will produce approximately 31,100 Tonnes of Paulownia timber over the 35 years. This is a very positive impact.

4.92 Nature of the change

The present land use agricultural cropping produces no timber.

4.93 Confidence level of prediction

The confidence level is high. The timber production models has been researched and evidenced, subject to commercial due diligence and form a significant basis for the investment case and business model.

4.94 Relationship to standards/policies

The UK Forestry standard (UKFS) determines the species mix in the woodland areas. This project is UKFS compliant. https://www.gov.uk/government/publications/the-uk-forestry-standard

4.95 Basis for predictions

Although ESC does not provide an assessment for Paulownia, UK trials and research carried out by the producer WeGrow support species suitability. Carbon calculations used for the Woodland Carbon Guarantee scheme demonstrate the high yield class (& timber production) potential of the tree.

The site has a DAMS score of 12 (sheltered) and therefore does not limit the intended species mix, all of which have a very high DAMS suitability score for the site. As demonstrated in the ecological site classification (ESC) outputs Annex 2.c "B J Rutterford ESC Output inc. DAMS Scores (2050 & 2080 AWC)"

The timber production models has been researched and evidenced, subject to commercial due diligence and form a significant basis for the investment case and business model. Due to Paulownias' versatility and light strength to weight ratio coupled with its fast growing nature, it lends itself for the most suitable timber for future markets in mostly non-decorative hardwood, including all sustainable uses.

The harvest cycle is based on 8 harvests within the 35-year project timeline. Each harvest will be of 50% of the plantation. This means that any individual tree is harvested every 9 years.

The native plantings will remain indefinitely.

4.96 Method of impact identification.

The sale of the Paulownia timber is underwritten by a floor price for 10 years. The quantity of sale will be recorded as a measure of output and impact.

4.97 Uncertainties and unknowns

The plantation growth of the Paulownia element will be subject to UK climate and growing conditions that have been untested to date. Timber modelling has however been based on similar climatic and management conditions in Europe and is expected to yield similar results.

The price of hardwood timber is underwritten by a floor price for the first 10 years and likely to increase.

5 Significant impacts and mitigation

5.1 Impact 1: Invasiveness

5.11 Approach to evaluation

CPL has consulted and worked with the Forestry Commission throughout the WCPG1 & WCPG2 process to ensure a project design that allows for invasiveness risks to be minimised.

The Non-Native Risk Assessment Forum (NNRAF) process, introduced at a later stage in project formulation, has also been embraced to accommodate a wider perspective on the parameters to evaluate.

The above dialogue together with the feedback from the scoping meeting puts CPL in a strong position to understand all perspectives and collaborate on evaluation design and deliver ongoing evaluation of project sites.

The draft monitoring framework, designed by Forest Research, will form the basis for that evaluation of any impacts.

5.12 Thresholds of concern

These will be clarified and documented within the monitoring framework

5.13 Avoidance/reduction/remediation/compensation

Project designs and plantation management, described earlier in this statement, have been formulated and will be delivered to ensure avoidance and reduction measures are an integral part of design and ongoing plantation management. These include site selection framed within avoidance of sensitive features, buffers and sucker monitoring zones, operation practice to minimize apical dominance suppressing suckering and physical destruction of any identified potential invasiveness features.

If a threshold of concern was crossed appropriate and proportional actions would be taken such as destroying problem trees. These to be agreed within the monitoring framework.

5.14 Expected effectiveness of mitigating proposals

These are expected to be highly effective.

5.15 Residual impacts

CPL recognise some residual concerns that cannot be addressed at this point in time (and without several further years of trial work in UK conditions). CPL is committed to long term transparent monitoring and will indemnify any mitigation that may become necessary.

5.2 Impact 2: Water

5.21 Approach to evaluation

CPL will agree with the Environment Agency key monitoring parameters.

An initial suggested set of monitoring parameters would be:

- Rainfall – Open and below canopy.
- Baseline evapotranspiration (ET) demand – Penman Monteith (ETo) (wind speed, solar radiation, humidity, barometric pressure).
- Plant actual ET estimate (ETc).
- Irrigation application rates.
- Soil water content at different depths (5, 10, 20, 30, 50 and 100 cm).
- Runoff/infiltration estimates –baseline and under forestry.

To enable comparison with the baseline of agricultural production these parameters would be monitored within plantation and then in a suitable local location outside. This would need to be across a number of years to accommodate annual climatic variance.

The range of parameters, methodology of approach would be finalised and agreed with the Environment agency.

5.22 Thresholds of concern

The thresholds of change from the baseline would be agreed with the Environment Agency.

5.23 Avoidance/reduction/remediation

Please see the Ecological Site Classification output in Annex 2.c "B J Rutterford ESC Output inc. DAMS Scores (2050 & 2080 AWC)" the highlighted native species mix have been chosen based on their

overall suitability, including water use and drought tolerance. They therefore have no additional water demand through irrigation

5.24 Expected effectiveness of mitigating proposals

The information collated across all water areas has outlined a high likelihood that there will be no change or a positive change against baseline.

Irrigation and associated abstraction licensing is subject to Environment Agency control and the "hands off" mechanism that would be brought into play in extreme circumstances to manage abstraction quantities.

Water resource balance change would be determined over an extended timescale to accommodate annual fluctuations. It would also need to be against the background of groundwater baseline change as the climate changes. The timescale for meaningful evidence is likely to be 10 plus years.

Ultimate mitigate would be a reduction in plantation size/density or in plantation management. This would affect the economic returns and business model that underpins the project and all alternatives for mitigation would be explored if and when this point was reached.

5.25 Residual impacts

None likely.

5.3 Impact 3: Landscape character change

5.31 Approach to evaluation

Prior to more detailed site-specific design options, screening and consultation took place to identify and finalise suitable planting sites and areas. Landscape formed an integral part of this stage, with potential sites chosen away from statutory and local authority landscape designations.

The first step in the design process involved the development of Site Context Map Annex 1.a "B J Rutterford – Site Context Map" to highlight any significant environmental features, settlements, roads and other infrastructure. This was followed by a more detailed Site Appraisal Plan Annex 1.b "B J Rutterford - Site Appraisal Plans", involving the evaluation of landscape survey information, and representation in a map-based format with more detailed features depicted on the site. Consideration of the 7 forestry design principles was also taken at this stage.

Following a more detailed synthesis exercise pulling together various sources of information and survey data, a Design Concept Plan Annex 1.c "B J Rutterford - Design Concept Plans" was produced to demonstrate a viable woodland design option, and an Outline Landscape & Visual Appraisal then carried out on that design.

5.32 Thresholds of concern

The thresholds of change from the landscape character profile baselines have been established through landscape analysis carried out as part of Stage 2 of the WCPG, which concluded the level of change as being UK Forestry Standard compliant, and subsequently through the Outline Landscape & Visual Appraisal, which also identified limited concern around change from baseline.

5.33 Avoidance/reduction/remediation/compensation

Mitigatory factors associated with preserving landscape character are focused around planting location, layout, species mix and design, all of which are implemented at the outset and are to an extent irreversible. Consequently, all efforts regarding landscape character have been invested into the avoidance of adverse impacts, with little scope for remedial action or successive compensation.

5.34 Expected effectiveness of mitigating proposals

A combination of CAD visualisations, comprehensive evaluation of project design against landscape character profiles, as well as the level of informed mitigatory design built into project layout and silviculture elements provides a high expected effectiveness of mitigating proposals.

5.35 Residual impacts

Despite the requirement to produce a UKFS compliant woodland proposal whilst meeting the hardwood timber output necessary for the projects financial structure and fulfilling the conditions of various statutory and non-statutory consultees, the final project design accommodates the majority of landscape character requirements. Residual impacts associated with landscape character which haven't been addressed in the project design to some extent are minimal.

5.4 Impact 4: Biodiversity changes on project sites

5.41 Approach to evaluation

Consultation feedback from the Environment Agency Fisheries, Biodiversity and Geomorphology Team response (NE have not provided feedback on this matter) supports our intention to monitor across 4 project biodiversity areas:

a) Plantation understorey.
b) Native woodland plantings.
c) Bare areas/Buffer strips.
d) Hedgerows.

Across these ecosystems we will evaluate invertebrates, floral diversity, soil microbial biomass, soil carbon, birdlife.

A more detailed description is set out in Annex 3.d "B J Rutterford - Biodiversity Report Summary"

5.42 Thresholds of concern

None identified

5.43 Avoidance/reduction/remediation/compensation

Natural Englands points raised during consultation around Drainage, Modification of watercourses, Alterations to water levels & tables, Management of aquatic & bank vegetation for drainage and Infilling or digging of ditches, dykes have all been incorporated to project design and ongoing management, with no such activities taking place throughout the project lifecycle.

The conversion or agricultural land into woodland will reduce risk to adjoining water courses through a number of means. Nitrate as a diffuse pollutant associated with arable cropping practices will cease, and improved soil structure and organic matter will in time increase soil stability and water holding capacity. The effect of this being reduced run off leading to a reduction in dissolved nutrients which can potentially pollute water courses.

Consultation response from Norfolk Wildlife Trust confirmed the proposed woodland planting will not have a significant impact on any County Wildlife Sites (CWS), therefore no further mitigation measures have been implemented in relation to CWS.

Identified during scoping and also raised by Natural England is risk associated with the potential invasiveness of the non-native tree species and its potential impact on the local environment. The project has integrated more localised mitigatory measures in the form of 4- 6 metre open ground

buffers around all Paulownia planting areas which will be routinely inspected for any suckering and managed accordingly.

5.44 Expected effectiveness of mitigating proposals

The mitigations are expected to be very positive and effective in maintaining biodiversity. Connectivity of habitats will be increased and resilience improved.

5.45 Residual impacts

None identified.

5.5 Impact 5: Degradation of soil carbon in peat soils

5.51 Approach to evaluation

Consultation with Natural England and reference to the Natural England peat map of "Deep Peaty Soils".

5.52 Thresholds of concern

Natural England confirmed that the project site does not contain any fields with peat levels above the threshold of concern or where peat levels are capable of restoration.

5.53 Avoidance/reduction/remediation

N/A

5.54 Expected effectiveness of mitigating proposals

N/A

5.55 Residual impacts

N/A

5.6 Impact 6: Damage to archaeological and historic sites

5.61 Approach to evaluation

Consultation with NCCHE with subsequent reports produced and analysed in collaboration with Forestry Commission archaeology advisors steered mitigation measures.

5.62 Thresholds of concern

Thresholds of concern agreed with internal Forestry Commission archaeology advisers in consultation with NCCHE

5.63 Avoidance/reduction/remediation

Avoidance though mitigation measures employed.

5.64 Expected effectiveness of mitigating proposals

Mitigations are expected to be effective based on the extent of expert input, research and advice.

5.65 Residual impacts

None expected

5.7 Impact 7: Local residents quality of life changes

5.71 Approach to evaluation

The design and planning process undertaken as part of WCPG2 set out to identify local residents who may be impacted by the project. Due to the remote location of the site no local residents were identified as being directly impacted.

5.72 Thresholds of concern

The main threshold identified related to potential long distance (1+km) views of the project. Concerns over the change in view from properties is not a threshold that is easily quantifiable and a more subjective measure, especially given the negligible potential impact in the case.

5.73 Avoidance/reduction/remediation/compensation

Planting of native buffers around site perimeters is intended to mitigate against the potentially regimented view of the Paulownia planting. Increased native planting and open areas are intended to improve visual aspect.

5.74 Expected effectiveness of mitigating proposals

The mitigating proposals will help maintain views across the wider landscape character profile.

5.75 Residual impacts

The views for some will be changed at a negligible level.

Biodiversity in the vicinity will increase.

6 Summary statement of the significant impacts

There are 2 impacts identified that could have negative outcomes: invasiveness and landscape change. These have both the subject of mitigation of impact and their potential likelihood.

The potential of invasiveness could be a considerable impact, however the likelihood of this impact is very low. There is no evidence, to date, of invasiveness of this clone in any plantations under management, however the planned monitoring and control measures are rigorous. CPL accept that the precautionary principle approach (the unknown unknowns) remains. Alongside Forestry Research and the Forestry Commission, a mitigation, monitoring and control programme will be developed to counter any potential future eventuality, some of which have already been designed into each plantation block. An ongoing Risk Assessment process incorporating the NNSS (Non-Native Species Secretariat), DEFRA, Academia and all commercial operations will constantly evaluate the new plantations.

The impact of landscape change has been rigorously assessed through an Outline Visual & Landscape Appraisal, including Zones of Theoretical Visibility, concluding that landscape change will not affect overall landscape character. There may be local landscape impacts, these have been mitigated as much as possible through project design, however some remain but are considered localised and of low overall impact.

The impact on water (irrigation and water balance) and on local residents have been concluded as negligible. Natural England have also confirmed that the project site does not contain any fields with peat levels above the threshold of concern or where peat levels are capable of restoration.

The impacts on biodiversity, carbon capture and UK hardwood supply have been concluded as all very positive. The project brings significant positive impacts across all these areas.

Overall CPL conclude that the positive impacts are significant and near certain. These outweigh the low likelihood of any potential negative impacts.

7 Consultees

Consultees as part of WCPG2 consisted of 9 organisations. Responses are listed in Annex 5.r "B J Rutterford - Stakeholder Consultation Log Summary".

Additional organisations participated in the scoping meeting as recorded in Annex 6.b "CPL EIA Scoping Meeting Agenda and Participating Organisations".

8 Annex List

		Annex
Primary Outputs	Forestry Commission Approved Woodland Creation Planning Grant Stage 2	1
1. Visual Outputs	B J Rutterford - Site Context Map	1.a
	B J Rutterford - Site Appraisal Plans	1.b
	B J Rutterford - Design Concept Plans	1.c
	B J Rutterford - Final Woodland Creation Design Plans	1.d
2. Survey/Analysis Outputs	B J Rutterford - Soil Analysis	2.a
	B J Rutterford - Landscape Analysis	2.b
	B J Rutterford ESC Output inc. DAMS Scores (2050 & 2080 AWC)	2.c
	B J Rutterford - RSPB Stone Curlew Nest Records	2.d
	Outline Landscape & Visual Appraisal	2.f
	LVA Zones of Theoretical Visibility	2.g
	LVA Visuals	2.h
	B J Rutterford - Designations list	2.i
	B J Rutterford - NCCHE Archaeology Report	2.j
3. Key Supporting Documents	B J Rutterford - Silviculture; Ground Preparation, Species Mix & Planting Design	3.a
	CPL Report - Paulownia Irrigation Demand	3.b
	Paulownia Water Use Report	3.c
	B J Rutterford - Biodiversity Report Summary	3.d
	WeGrow Plantation Maintenance & Growth Report	3.e
	Phoenix One Sterility and Invasiveness summary	3.f
	High Level Water Balances	3.g
4. Invasiveness/Sterility Material	Paulownia Elongata Risk Assessment - Hawai Import	4.a
	Paulownia Fortunei Risk Assessment - Hawai Import	4.b
	Phytosanitary Certificate	4.c
	Portuguese Risk Analysis on the Introduction of Paulownia - Ecological Characterisation	4.d
	Portuguese Risk Analysis on the Introduction of Paulownia	4.e
	Portuguese Risk Assessment for Phoenix One	4.f
	Prof. Dr. Ralf Pude, University of Bonn - Phoenix One Sterility Statement	4.g
	University of Bonn Phoenix One Sterility Report	4.h
	GB Non-Native Species Risk Analysis Phoenix One Vs 2	4.j
	A Case for the Non-Invasiveness of Paulownia	4.k

	Paulownia in China – Zhu et al	4.l
	Comparison of Influrescence and Infructescence Within Different Paulownia Genotype Lines	4.m
	Paulownia - Invasive or Not (Gillard)	4.n
	Berg et al 2019 - Survivorship attained diameter height and volume of three Paulownia Species USA	4.o
	Paulownia Phoenix One - RAv2 NNRAF Comments on Draft Risk Assessment	4.p
	Paulownia Phoenix One - RAv2 Draft Risk Assessment	4.q
5. Consultee Responses	B J Rutterford - Environment Agency Response	5.a
	B J Rutterford - RSPB Response	5.b
	B J Rutterford - Norfolk Wildlife Trust Response	5.e
	B J Rutterford - West Norfolk District Council - Private Water Supplies	5.p
	B J Rutterford - NCCHE Consultation	5.q
	B J Rutterford - Stakeholder Consultation Log Summary	5.r
	B J Rutterford – Natural England Response to WCPG Stage 1 Consultation	5.s
	B J Rutterford - Internal Drainage Board Response	5.t
	B J Rutterford - Forestry Commission Supported Archaeology Mitigation	5.u
6. Scoping Meeting	Scoping Meeting Issues Log	6.a
	CPL EIA Scoping Meeting Agenda and Participating Organisations	6.b
7. Other	SRF Monitoring Framework	7.a