
Appendix: Loss of Landbank Enhancement Case

YKY-PR24-DDR-40- Loss of Landbank Enhancement Case



YorkshireWater

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1. Enhancement Case: Loss of Land bank

1.1 Drivers:

Mitigating the risk of being unable to recycle biosolids to agriculture.

1.1.1 Requested Investment:

Table 1.1 AMP8 Expenditure

	BP submission (£m)	Ofwat DD (£m)	DDR (£m)	Variance (£m)	Table Line Ref.
Enhancement Expenditure Capex	0	0	7.822	7.822	CWW3.183
Enhancement Expenditure Opex	0	0	2.178	2.178	CWW3.184
Base Expenditure Capex	0	0	0	0	n/a
DPC value	0	0	0	0	n/a
Total	0	0	10.00	10.00	

1.1.2 Associated Reporting lines in Data Table:

Table 1.2 Reporting Lines

Line Number	Line Description
CWW3.183	Destruction technology for Sludge to Land capex (AMP8)
CWW3.184	Destruction technology for Sludge to Land opex (AMP8)

1.2 High level driver description:

The risk that Yorkshire Water (and other WASCs) will no longer be able to recycle sludge for agriculture purposes has now become highly likely. Therefore, it is necessary to begin investing and planning for alternative sludge destruction solutions.

The expected duration for which recycling sludge to agriculture will remain a viable option is now less than the time required to convert our existing facilities to accommodate the destruction of sludge through options such as incineration. There are alternative solutions, such as advanced thermal conversion, but these will require significant investment to prove their viability at scale. Therefore, it is necessary that we begin investing into alternatives to minimise the duration in which we may not have a viable route for the recycling or disposal of sludge.

1.3 Need for investment

Currently Yorkshire Water recycles over 98% of its sludge to agriculture each year; in 2023, this was over 73,500 tonnes of dry solids (tds) which is approximately 300,000 wet tonnes of material. Of this, typically c.75% is incorporated into the land by farmers in the autumn as part of

their normal cultivation operations. This is standard practice for the disposal of sludge in the UK, with over 80% of the 3.5m tonnes of sludge produced annually disposed in this way.

The water industry has no direct control over the continuing practice as it relies on third-party farmers, who are not obligated to recycle the sludge on their land. Currently there are numerous threats to this practice, including potential regulatory changes, media campaigns and changes to public perception.

Landbank modelling work carried out recently on behalf of Water UK¹ indicated that in the best-case scenario if recycling to agriculture was lost as an outlet that alternative outlets, predominantly landfill, would be exhausted by 2032. The expected timescales to obtain the necessary permits, planning consents, land purchase and construction phase for an incineration plant is thought to be c.10 years² meaning it is imperative that action is taken in AMP8 to prepare for this outcome.

1.3.1 The Need for the proposed investment

Most recently, the High Court judgement in River Action UK v Environment Agency on 24th May 2024 has altered the legal status of the practice of recycling sludge to agriculture in the autumn, making it highly likely that the practice may not be permitted to continue. Therefore, requiring us to identify new ways of disposal.

The court decided that regulation 4(1)(a)(i), which provided that an application of organic manure or manufactured fertiliser to agricultural land should be planned so that it did not “exceed the needs of the soil and crop on that land”, should be interpreted as referring to needs at the time of application, rather than over an annual crop cycle or a crop rotation. The National Farmers’ Union (NFU) had intervened in the proceedings to (unsuccessfully) argue the latter interpretation.³

The water industry, including Yorkshire Water, relies on the latter interpretation to recycle sludge to agriculture, with c. 80% recycled in the autumn. The practice can continue under Defra’s Statutory guidance, ‘Applying the farming rules for water’, updated 16 June 2022.⁴

River Action UK have publicly stated that they intend to challenge Defra’s guidance given the High Court ruling in respect of application of organic manures. It is not yet known how Defra will respond to the High Court ruling, but if they remove their guidance to align with the Court ruling or River Action UK’s challenge, it would bring about an almost immediate end to the practice of recycling sludge to agriculture, with insufficient land available to accommodate the sludges at other times of year.

It is with this new threat in mind, due to the High Court ruling on 24 May 2024, that Yorkshire Water is proposing this modest but critical investment need to begin work:

- Identifying alternative technologies at scale.
- Land selection.
- Planning permission.
- Environmental permitting.
- Technology selection.
- Detailed design.

¹ ‘National Plan B – A review of the resilience of Biosolids outlets in England, Wales and Scotland’ AtkinsRealis 14th June 2024

² This estimate was provided to us by a 3rd party (Mott Macdonald).

³ ‘Environment Agency’s enforcement of Farming Rules for Water not unlawful (High Court)’, Practical Law Environment. Case report, published 30th May 2024

⁴ <https://www.gov.uk/government/publications/applying-the-farming-rules-for-water/applying-the-farming-rules-for-water>

This work is required to create a feasible plan for construction of destruction technology prior to the exhaustion of outlets for sludge disposal.

There was no driver available to Yorkshire Water within the PR24 WINEP to make investments of this nature. The EA stated to Yorkshire Water: “the sludge driver has a presumption for there to not be support in principle for options involving thermal destruction technologies”.⁵

The PR24 WINEP does not cover wholesale changes to landbank availability triggered by changes in the implementation and enforcement of sludge regulations such as Farming Rules for Water, which means changes to recycling practices and ensuing loss of landbank availability were not included in Yorkshire Water’s plans for PR24 as it was not recognised as a requirement.

We are including them now, in recognition of the change in circumstances since the High Court judgement and likely change in enforcement position in relation to the practice of recycling sludge to agriculture in the autumn.

1.3.2 The scale and timing of the investment

Work to review the capacity of non-agricultural recycling outlets for sludge disposal indicate that in the best-case scenario (60% loss of landbank), assuming landfilling of sludge is allowed, that modelled capacity would be exhausted by 2032⁶ nationally.

This indicates that the window to construct alternate destruction solutions is small, and in the case of incineration, already less than the 10 years considered necessary to deploy the solution at scale.

Given the severity of impact if no outlet for recycling or disposal of sludge were available, and the long lead time and high cost of alternatives, it is imperative that planning work begins as early as possible to try and ensure a viable alternative to recycling can be put in place.

The investment proposed by this case, seeks to prove an advanced thermal conversion technology that can operate at scale, as well as allow for the planning, permitting and design of destruction technology solutions. The full-scale deployment of which is proposed to be supported by a Bioresources Landbank notified item⁷ within PR24.

1.3.3 Interactions with base or previous funding

The required investment is only necessary owing to a change in circumstances following a High Court judgement in May 2024, therefore the enhancement was not funded via any previous funding request. Yorkshire Water made a similar funding request to the Environment Agency (EA) as part of the PR24 WINEP which was rejected as there was no driver available to fund this activity. Yorkshire Water believes the recent High Court judgement is likely to require a change to the Defra statutory guidance that therefore necessitates this need for new enhancement funding.

1.3.4 Long-term delivery strategy alignment

The need to incinerate sludge was identified as an alternative pathway within our long-term delivery strategy (LTDS), LS6 alternative pathway 4. The investment has not been moved to a core adaptive pathway, because we are not requesting the full investment needed to deploy

⁵ Letter from the EA to Yorkshire Water dated 22 June 2023, subject ‘Yorkshire Water WINEP Options Assessment decision challenge on two Sludge Driver WINEP rows Action ID:8YW100081a Provide standby UV and 08YW100084a Future planning of destruction technology, AMP8 planning and design investment for AMP9’.

⁶ ‘National Plan B – A review of the resilience of Biosolids outlets in England, Wales and Scotland’ AtkinsRealis 14th June 2024

⁷ Section 4.3 of YKY-PR24-DDR-05 – Cost Assessment cross-cutting Issues
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incineration or other destruction technologies. The investment requested by this case is required to enable planning to deliver the alternative pathway which now appears likely to occur.

1.3.5 Factors outside management control

The required investment is the result of the high likelihood of the restriction or complete removal of recycling sludge to agriculture as an outlet. This will ultimately necessitate a complete treatment solution change for the whole water industry with multi-billion-pound investments in new destruction technologies required nationally.

Owing to the high potential expense, Yorkshire Water and the wider industry remain engaged in efforts to postpone or remove this risk, working collaboratively with Water UK to demonstrate the high impact such a change will have on industry costs alongside the detrimental environmental impact of destroying a valuable nutrient route.

However, factors outside of Yorkshire Water's control, in this case River Action UK's legal challenge, brought in respect of poultry farming practices in the River Wye catchment, now means an accelerated path to the effective banning of recycling sludge to land appears inevitable.

It is therefore prudent that Yorkshire Water seeks investment to prepare for this eventuality.

1.4 Best option for customers

1.4.1 Options considered

Given the short timescales since the High Court judgement in late May, there has been limited opportunity for in-depth analysis or optioneering. However, Yorkshire Water can call upon previous investigations, engineering experience, knowledge of market delivered solutions and cross sector knowledge to quickly consider the most appropriate investment options.

Options considered included direct investment to start delivery of incineration or advanced thermal conversion solutions which were both considered too expensive and may not represent the most efficient solution for customers as solutions. Both options could also lend themselves to Design, Build, Finance, Operate & Maintain (DBFOM) arrangements, so warrant detailed consideration of that funding approach versus capex investment alone.

Speed to deploy is an important consideration given the imminent expected onset of sludge recycling no longer being viable. Previous experience of large-scale incineration projects, two of which neighbour our largest site in Leeds, along with independent expert advice suggest that incineration would likely take 10 years to deploy from project inception. This timescale is challenging given the potential exhaustion of sludge disposal outlets by 2032 or earlier. However, incineration is currently widely considered as the only proven technology that can deal with Yorkshire Water's sludge volumes at scale.

Advanced Thermal Conversion (ATC) technologies, a term that collectively covers gasification, pyrolysis, super-critical water oxidation (SCWO) and hydrothermal carbonisation (HTC) processes, owing to their modular design are expected to be able to be deployed more quickly, in c.5yrs. However, ATC solutions are not yet proven at the necessary scale, and further work is required to consider the best solution and the most appropriate delivery model.

Environmental impact of any solution is also key, incineration has high process emissions which to an extent make it a solution of last resort when compared to ATC solutions which promise resource creation in Syngas or char that can be beneficially used.

Options considered are summarised as:

- Option 1: Capex investment in full scale incineration plants.

- Option 2: Capex investment in full scale ATC plants.
- Option 3: Capex investment to prove ATC is viable at the required scale.
- Option 4: Opex funding to plan appropriate delivery of destruction solutions.

1.4.1.1 Solution Development and Costing

As part of previous sludge strategy analysis⁸ Yorkshire Water received an indicative cost for the installation of incinerators capable of destroying approximately 75% of our sludge volumes. The total capex in 2022 for two facilities was estimated at £261m. Adjusting for inflation, this would likely exceed £287m in 2024.

It is difficult to estimate the cost to deploy ATC solutions, as limited information is available, and the market is not currently considered mature. However, information from previous trials and market sources suggests a possible capex cost of between £166-200m for capacity equivalent to 75% of our sludge volume.

Clearly the cost of deploying either capex option is prohibitively expensive so further testing of the market and analysis of delivery options such as DBFOM should be undertaken. Based on previous experience of market delivered solutions, we have estimated that delivery and development of planning, permitting, procurement, grid enquiries and technology assessments would cost c.£2m opex.

It is also evident that ATC options if feasible have considerable merit over incineration. Being potentially twice as fast to deploy, greater than 40% lower capex, and have significantly better environmental credentials.

Therefore, a simple analysis of the investment required to prove the viability of an ATC at scale was completed in relation to a gasification plant that is currently operational in Yorkshire, located adjacent to one of our existing works in Huddersfield. It was determined that a full-scale throughput trial capable of processing 8,000tds/yr of sludge could be realised with the addition of appropriately sized drying and pelletising equipment without the need for significant upgrades to the gasifier itself. The estimated cost of delivering this project is £7.822m capex, and as the drying is proven technology the lead time to deploy should be short. This is also considered low regret risk investment, as in the worst-case scenario whereby the ATC is not proven to be viable at scale, Yorkshire Water would still retain a dryer and pelletiser capable of throughput of 8,000tds/yr. This capability would likely be useful in the transition to other destruction technologies, or in mitigating the volume of sludge required to be recycled or disposed of if recycling ceased.

1.4.1.2 Preferred options

The preferred option is Option 3, which is to invest in proving ATC is viable at scale, by installing drying and pelletising equipment at an existing ATC facility, supplemented by opex investment to identify the optimum technology, as well as undertake the necessary planning works to allow the full-scale deployment destruction solutions.

1.4.2 Carbon impact and best value

There is not expected to be any carbon benefit from this work, there will be a yet undetermined increase in energy consumption to operate the sludge drying facility which is likely to have a negative carbon impact compared to the 'do nothing' baseline.

⁸ 'PR24 Sludge to Land Strategy', Mott Macdonald, 22 September 2022
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1.4.3 Impact quantification

The driver for this investment is delivering statutory obligations there are no expected service benefits from this work, nor are any performance commitment deliverables affected.

The investment required to create a sludge drying facility and to plan for the move away from recycling sludge to agriculture to potential destruction technologies, does not improve sludge quality, or make our processes more efficient. The sole benefit of the investment is to reduce the risk of being unable to recycle sludge to agriculture.

1.4.4 Third-party funding

There is no planned third-party funding for this case.

1.4.5 Direct procurement for customers (DPC)

This case does not meet the DPC criteria.

1.5 Cost efficiency

1.5.1 Option costs

Capex works

Works required to achieve 8,000 tds/yr throughput at the Huddersfield ATC plant have been estimated using a combination of contractor budget quotes alongside engineering assessment of typical costs for projects of this scale.

In line with Yorkshire Water's standard capital expenditure forecasting, 21% was added to these figures as forecast on-costs to cover the cost of delivering the project. This is consistent with all other projects forecast utilising our Unit Cost Database (UCD) and is a forecast of the average recorded on-costs form previously delivered projects.

The table below summarises the estimated capex cost of delivering the upgrades necessary to achieve 8,000 tds/yr throughput at the Huddersfield ATC plant.

Table 1.3 Estimated capex cost of delivering necessary upgrades

Activities to be undertaken	£m including on costs
Front End Engineering Design (FEED) study	
Operating Philosophy	0.058
HAZOP-SIL Process safety	0.058
Specifications and standards	0.048
Final Plot plan	0.048
P&ID drawings	0.061
Planning assessment	0.036
Plant Install	
Drier	3.024
Boiler - thermal circuit	0.847
sludge reception	0.605
Pellet mill	0.605
Control system	0.242
Civils	0.605
Balance of plant	0.605
EPC	0.980
TOTAL capex	7.822

Opex works

Key activities required in the planning and delivery of the full-scale destruction solution have been estimated using industry expertise, and previous Kelda Group experience of delivering projects of this nature. Consistent with our approach to estimating the capex costs, as described above, a standard twenty-one percent overhead rate has been applied to cover Yorkshire Water costs for delivering the project.

The opex works anticipated to be required are:

- **Location identification** – finding land suitable for deployment of either ATC or incineration solutions.
- **Planning permission** – both early engagement and applications supported by expert advice.
- **Permitting** – preparing, submitting and related investigatory work required to obtain necessary environmental permits.
- **Procurement costs** – including market assessments and specialist commercial and legal support in proposing arrangements and preparing agreements.
- **Grid enquires & applications** – necessary to consider supply and export of electricity and gas.
- **Technology Assessments** – expert analysis and fact-finding on most appropriate technological solutions.

The table below summarises the estimated opex required for the planning for deployment of destruction technology solutions to meet our regional sludge throughput requirements.

Table 1.4 Estimated opex required

Activities to be undertaken	£m including on costs
Opex planning and delivery	
Location Identification	0.242
Planning	0.303
Permitting	0.303
Procurement	0.605
Grid enquiries & Applications	0.121
Technology Assessments x5	0.605
TOTAL opex	2.178

1.5.2 Efficient cost estimates

Where possible, budget quotations obtained from contractors have been used to inform capex cost estimates. Opex costs have been estimated based upon industry expertise and previous experience of similar projects delivered within the Kelda group.

1.5.3 Econometric or engineering evidence

Ofwat's approach to setting cost allowances to each driver, anticipating any model adjustment requirements, is challenging.

For this driver we anticipate that the range of interventions (wide ranging and company-specific) will make identification of appropriate cost drivers difficult. We therefore anticipate that Ofwat will not produce a cost model, and would assess this expenditure through a deep dive approach.

1.6 External assurance

We have followed our assurance plan, in line with the process described within our assurance appendix, published alongside our business plan in October 2023: YKY61_PR24 Assurance ([yky61_pr24-assurance-1.pdf \(yorkshirewater.com\)](#)). Due to the tight time constraints for the draft determination representation, our assurance has focussed on Level 2 and Level 2 assurance, with specific oversight provided at Level 2.

1.7 Customer protection

There is no applicable performance commitment, and the level of investment is below the Ofwat materiality threshold for a PCD.

1.7.1 Third Party Funding or Delivery Arrangements

There is no planned third-party funding for this case.