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Application for Permit Variation

Permit N° 53997 (New Tip)

Document NTPV 01 (C2)

Pre-application discussions with the Environment Agency

Section J

- Method Statement for the restoration of the 'New Tip' area December 2014 Rev F (for completeness)

- Schedule 5 Notice revised submission information:

  - *Method Statement for the restoration of the 'New & Old Tip' areas 'Supplemental Information' June 2015 Rev I (August 2018)*

  - *Proposal for compliance testing on cement-stabilised 'New Tip' waste sludge v6*

  - *Review of testing on cement-stabilised 'New Tip' waste sludge (R1635-L08/afs)*

  - *Further risk assessment for cement-stabilised 'New Tip' waste sludge, Springside Mills, Belmont (R1635-L09/afs)*

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Restoration of the existing "New Tip"

(EA Environmental Permit No. 53997)

at the
former

Springside Mills Site

BELMONT

METHOD STATEMENT FOR THE RESTORATION OF THE "NEW TIP" AREA

December 2014
Rev F

Prepared by John Bamforth

Printed:- 19-Dec-14

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1.0 Introduction & Background

Urbanspringside Ltd having acquired the site (known locally as Kruger Paper Tissue) is to complete the restoration of the new tip area to facilitate a wider residential development of the former Springside Works brownfield site.

The proposed restoration works to the "New Tip" area has been subject to a formal planning application (N^{O} 10/12/1110) which was approved on 21st February 2013 although subject to a number of pre-commencement conditions (N^{O} 2 and 5 – 11). An application to discharge conditions 5 – 11 was submitted to the Blackburn with Darwen Borough Council Planning (LPA) department on 20th December 2013 and is currently pending consideration, with additional information being submitted to the LPA on 4th December 2014. This additional information could not be provided until condition 2 had been formally discharged and although submitted on 8th April 2014 was not approved until 19th November 2014.

A further hybrid planning application (N^{O} 10/14/0440 ~ submitted 9th May 2014) for the redevelopment of Springside Works, seeking:

a) *Full planning permission for engineering works to remodel the landform and for the implementation of a structural landscaping scheme:*
b) *Outline planning permission for the erection of up to 110 N^{O} dwellings (all matters reserved other than access).*

This application was taken to Planning Committee on 20th November 2014 where the recommendation to Members was for the application to be approved subject to conditions and a section 106 Agreement. Members followed that recommendation and subsequently Urbanspringside are now in the process of negotiating the wording of the 106 Agreement and once finalised and signed the decision notice will be issued.

In the years since Kruger vacated the site it has been left essentially unmaintained with complicated issues associated with existing contamination, dereliction, erosion, serious slope instabilities, and invasive plants alongside general health and safety concerns. The proposed restoration of the "New Tip" is the first phase of works to resolve these issues returning the brownfield site and its surroundings to a more beneficial use whilst enhancing the local ecology.

This work is essential as the tip currently poses an environmental threat and there is a need to re-engineer the steep grossly unstable slopes above the river to stable gradients and the badly eroded footpaths through this area require remedial action.

The restored slopes will be planted in a manner that extends the ecologically important riverside habitats under the guidance of ecological and landscape experts to ensure the area is restored as quickly as possible, in keeping with the natural form of the Eagley Valley and is considered as being of benefit to the wider community.

The purpose of this method statement is to detail the requirements, arrangements and methodology for the removal of the encumbering paper pulp currently within the tip and the infilling back up to levels sympathetic with the surrounding topography.

Urbanspringside personnel routinely undertake the design and management of remediation earthworks operations involving both natural and anthropogenic materials with most schemes involving the recovery and re-use of suitable materials to maximise cost-effectiveness and sustainability.

It is anticipated that these restoration works will be commenced during the spring 2015 and will continue through to the spring of 2016 and we have allowed a period of approximately 50 weeks to complete the works.

For the duration of these works Urbanspringside will be maintaining the integrity of the existing palisade fencing surrounding the works to prevent unauthorised access and ensure that the safety of our operations is not compromised.

A high-tech security camera system has been installed at the site which enables the site to be remotely monitored 24/7 and should there be any unauthorised intruders the alarm is automatically raised and they are given a verbal warned by Tannoy followed by police notification and an independent security company despatched to intercept with all such activations being recorded and reported.

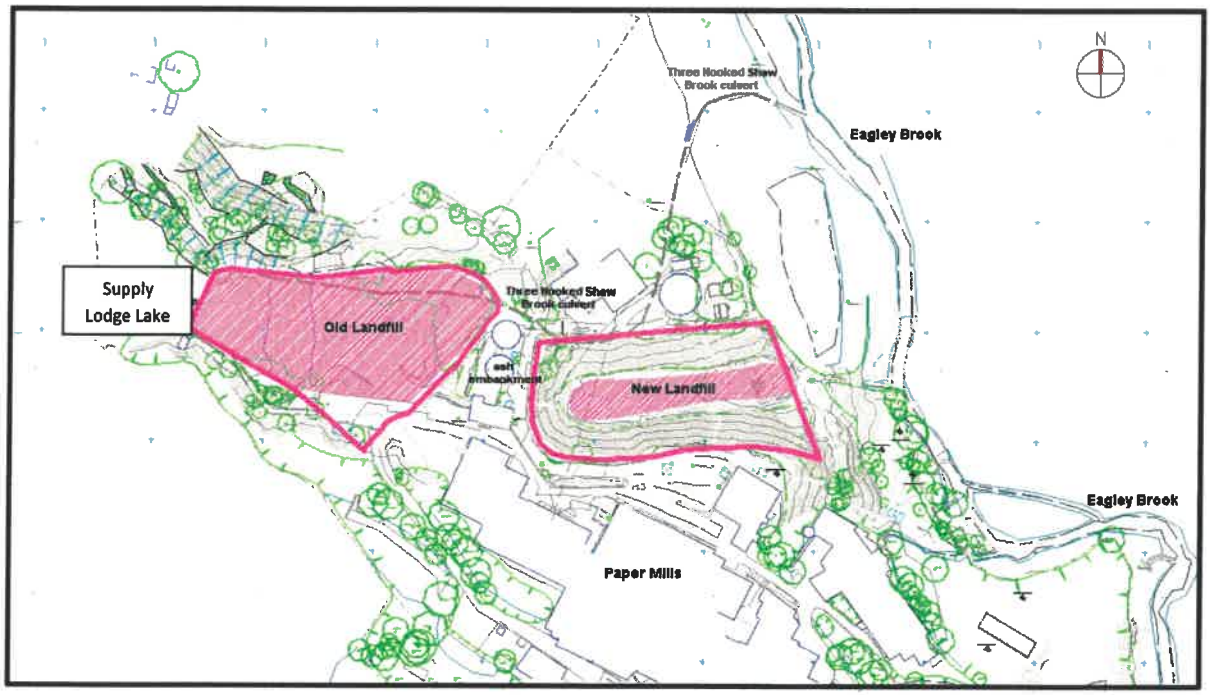


Figure 1.1 Permit boundaries, with extent of paper pulp filling hatched

This initial stage in the restoration of the New Tip has been determined, because of the relatively small volume of controlled wastes placed by Kruger in the New Tip, as the most feasible method of securing the long-term beneficial use and management of the site will be by removing the existing paper waste and replacing with engineered fills. This will stabilise the slopes surrounding the New Tip (including the bank buttressing the Old Tip), and create a landscaped slope down to Longworth Clough which is designed to merge with the slopes elsewhere in the valley and remove the artificially steep and unstable ash slopes that are currently present.

This work is essential as the tip currently poses an environmental threat and there is a need to re-engineer the steep grossly unstable slopes above the river to stable gradients and the badly eroded footpaths through this area also require remedial action.

During and on completion of the restoration works all the western slopes will be maintained in a stable condition and reinstated sympathetically, to a condition satisfactory to the authorities.

* references to paper pulp waste in this document actually describe the effluent treatment plant solid wastes which essentially comprise mineral matter (fine limestone and china clay particulate) with cellulose fibre and water; the Paper Industry refers to such materials as fibreclay when they are used for the amelioration of agricultural soils; these materials were placed in the landfills as a temporary expedient when land-spreading outlets were not available, or when the water content was too high to facilitate off-site transport.

2.0 General Health & Safety

This Method Statement for the restoration works has been prepared in line with CDM Regulations 2007 with Urbanspringside undertaking the duties and requirements of the Principal Contractor role for the works.

Upon arrival at site all operatives, visitors and delivery drivers shall report to the Urbanspringside site office located in the former gate house of the works for induction into the Site Health & Safety procedures and systems. This induction will include specific environmental and water body sections (Sections 3, 7 and 8) where attention will be focussed on the need to control vehicle movements and prevent any unauthorised discharge into the Eagley brook. All visitors shall be required to sign in and out on arrival and departure from site.

Urbanspringside's Project Manager is aware of the need to protect the environments of the site overall, adjacent properties and local residents. All operatives will comply as a minimum with the restrictions and specifications detailed in this plan and any other deemed necessary by the authorities but also other task specific details communicated during site induction and the regular tool box talks that will be given as works progress or change.

Competency certificates will be provided by all operatives prior to commencing work on site. All machines used on site will be tested and certified as necessary in accordance with PUWER Regs 1998 with copies of certificates being kept in the Site Health & Safety File.

Beyond the standard Urbanspringside PPE of safety helmet, safety boots and fluorescent waist coat, any additional task specific mandatory PPE shall be supplied to operatives when and where required.

No smoking shall be allowed on site, and may only be permitted in the areas designated by Urbanspringside.

Emergency Procedures:

Signage will be positioned on the boundaries with an out of hours Urbanspringside telephone number.

3.0 Environmental Considerations

Urbanspringside's Project Manager and personnel are aware of the need to protect the environments of the site overall, adjacent properties and local residents and routinely undertake the design and management of remediation earthworks operations involving both natural and anthropogenic materials on a variety of sites, with most schemes involving the recovery and re-use of suitable materials to maximise cost-effectiveness and sustainability. We regularly work adjacent to watercourses and in sensitive and populated areas and company policy is to always keep local residents informed (by letter drops and consultation) and to encourage contact with site management to thwart potential problems.

There may be a requirement for an Ecologist to attend the site during the initial works for preservation of the existing flora, fauna and wildlife habitats and for the presence of bats in the existing old stone tunnel/culvert. Urbanspringside's Project Manager will ensure that the Ecologists are present at the appropriate times.

At all times, surface and ground water run-off will be controlled to mitigate the risk of polluting Eagley Brook.

3.1 Topography

The New Tip is constructed within the base of the Three Nooked Shaw Brook (TNSB) valley downstream of the Old Tip which is protected from the TNSB upstream by a concrete dam impounding the Supply Lodge lake. The water level in the Supply Lodge lake is controlled by an outlet into a culverted section of TNSB which diverts the stream below the northern side of the Old Landfill before heading northeast away from the TNSB valley to discharge to Eagley Brook upstream of both landfills. The New Tip is enclosed within slopes tipped with boiler ash from a pre-gas post-waterpower generator at the Paper Mills. A large ash embankment crosses the TNSB valley and separates the two landfills.

The New Tip waste is contained within a butyl liner placed over an ash base drainage layer. The waste paper mill effluent sludge comprises cellulose fibre and clay fillers. The landfill is uncapped and un-restored, and the waste surface has been partly colonised by weeds and scrub vegetation. The surface area is approximately 1600m^2 and maximum depth of waste is 3.8m. Waste disposal in the New Landfill ceased several years before the closure of the works in June 2006.

3.2 Hydrology

The TNSB, which carries catchment water and provides a route for discharging water from the United Utilities controlled Springs Reservoir was diverted away from its original route in order to construct the old and new tips, and now runs in culvert (42" diameter pre-cast spun concrete pipes) from the Supply Lodge lake to a spillway discharge into Eagley Brook some 130m upstream of the tips and the original discharge point of TNSB into Eagley Brooks.

Prior to the construction of the New Tip, the TNSB culvert discharged via a spillway into the lower TNSB valley immediately downstream of the ash embankment via a stone-lined tunnel below a further embankment carrying a track across the valley at its lower end, to a confluence with Eagley Brook. In 1969, following a release from Springs Reservoir, the retaining wall to the Supply Lodge lake was overtopped which resulted in the subsequent raising of the retaining wall to the Supply Lodge lake.

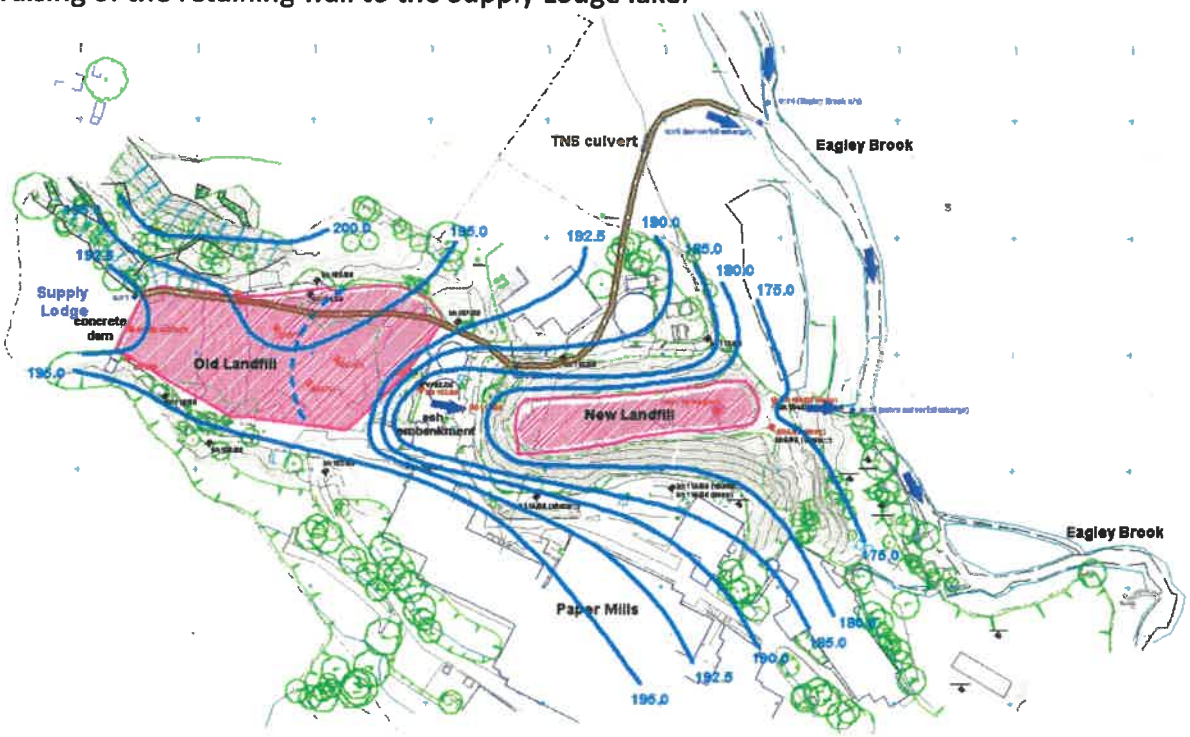


Fig 3.2.1 Interpolated groundwater contours and stream flows (contours in m AOD)

When the New Tip was constructed, the ash tipped along the sides of the valley was re-graded to form a smooth base to receive the landfill liner. No specific basal drainage was constructed, although the stone-arched tunnel that originally carried the TNSB through the lower embankment was retained, with ash being piled against its upstream end; this tunnel though collapsed at a point about 20m from the downstream portal, continues to issue a moderately ferruginous flow of water which runs via a short length of open channel into Eagley Brook. The observed wet weather flows are estimated to range from about 1 to 3 ls^{-1}. The Ochre (iron oxyhydroxide) sediment in the channel bed downstream of the tunnel does not extend into Eagley Brook to any significant extent.

The New Tip is contained within an intact artificial liner, which appears to be water-tight, with inflows to the New Tip being either via rainfall or due to a long-standing leak from the TNSB culvert in the vicinity of the former spillway. Outflows have previously been either via over-topping of the liner at its lowest, eastern end, close to Eagley Brook, or via pumped discharge to the TNSB culvert (under Environmental Permit ~ NPSWQD006635).

These discharges are monitored at three monthly intervals by Smith Grant LLP (SGP are the project's Environmental Consultant), with recent test results confirming that said waters remain sufficiently clean to be discharged directly into Eagley Brook.

Although the site lies close to designated and protected conservation sites, these are hydrologically isolated from the site and not considered at risk from any potential release of pollutants.

3.3 Pollution and Contamination

The New Tip's leachate formed by the infiltration of rainwater or leakage from the TNSB culvert accumulates within the fully lined landfill, and the landfill has been monitored over several years and has shown negligible concentrations of pollutants within the leachate discharge. Although iron-staining is evident in the bed of the former TNSB culvert between the old tunnel and Eagley Brook, the concentrations of dissolved iron in the culvert water and leachate discharge both meet the 1mg l-1 environmental 'good' standard for rivers (WFD England & Wales 2010).

Previous investigations by Edge Consultants in 2006 of the New Tip contents included the hand-auguring of boreholes and collection of sludge samples for chemical analysis demonstrated typically low concentrations of organic substances, with the only leachable compounds found above detection limits being hexachlorohexane, chloroform and bromodichloromethane probably as a result of biocide use or chlorination in the water treatment system.

Analyses of the New Tip contents were also carried out in 2008 for the purpose of assessing the potential for recovery of the waste as a soil improver, and also by Smith Grant in December 2012 to address local authority questions. These again showed low contamination levels, low organic content and a substantial content (>20%) of lime (calcium carbonate) from paper fillers, indicating a significant liming value for the waste if applied to agricultural land. The residue is made up of other inert mineral matter, in particular china clay (kaolin) filler. The carbon-nitrogen ratio was in the order of about 25:1 indicating that the organic content would be slowly biodegradable, and could release nitrogen over time.

Investigations by SGP and Urbanspringside in 2012 by trial-pitting and probing indicate that only "paper pulp" (actually paper effluent treatment sludge) has been deposited within the New Tip liner with the volume of waste estimated to be circa 3,000m3. The materials appear to be physically similar to the more recent paper sludge's on the northern and western parts of the Old Landfill. Whilst further analysis of the solid wastes has not been carried out to date, the continuing monitoring of leachate in the New Tip has not indicated the presence of priority or hazardous substances as defined in the Water Framework Directive (WFD) and Groundwater Daughter Directive (GWDD).

At all times, surface and ground water run-off will be controlled to mitigate the risk of polluting Eagley Brook.

The risk of odour annoyance during the short time frame that paper pulp is actually being moved is considered unlikely as the prevailing wind is generally from the west and the nearest property Lower Fold Farm is situated some 200m to the west of the proposed works.

The following additional environmental rules MUST also be applied on a site wide basis:-

- Fuel shall be stored in bunded fuel tanks in the designated areas, which will be sited well away from any watercourse.
- All static plant shall be positioned over drip trays
- Spill kits to be available at all times at work areas and at re-fuelling points
- All plant shall be regularly inspected for leaks. Any leaks shall be reported immediately and the plant parked up until repairs can be rectified.
- All plant will be parked in a position well away from adjacent properties as far as practicable overnight to negate noise nuisance.
- No water shall be discharged from site to sewer without appropriate consent.
- Site working hours are proposed (subject to planning conditions) as follows:-
  0730 to 1800 Monday to Friday
  Saturdays up to 1300
  No Sunday or Bank Holiday working
- Deliveries shall only be permitted during site working hours.
- All plant shall be switched off when not in use.
- All plant shall be silenced where possible.
- Over-revving of plant to be avoided at all times.
- Wagon movements to and from site shall be organised such that a road sweeper is in attendance as necessary to keep the surrounding roads clean, where required.
- Workers vehicles will be parked within the site in designated areas.

4.0 Compound/Welfare Arrangements

Urbanspringside will be responsible for the provision and maintenance of welfare facilities on site, including the supply of clean water and the removal of waste water.

In this instance Urbanspringside propose to utilise the existing gatehouse with its integral toilet and messing facilities located near to the front entrance. Further temporary facilities may be employed at times during the works as required.

Picture 1: Works entrance.

Signed off-road parking for staff/visitors shall be available during the works, with segregated pedestrian access from the gate house/entrance to the new tip work area and will be established on site as part of Urbanspringside traffic management arrangements.

All refuelling as necessary shall take place from a bunded fuel tank which will be sited in designated areas well away from the adjacent properties and water courses.

5.0 Programme

It is anticipated that these restoration works will be commenced during the spring 2015 and will continue through to the spring of 2016 and we have allowed a period of approximately 50 weeks to complete these works.

6.0 Site Management, Plant and Labour

All works will be managed and supervised by an appropriately qualified Site Manager.

Plant and Labour to be used:-

1 x D6 bulldozer + towed BW6 roller plus operator
1 x Excavator (long reach) plus operator
1 x Excavator (25t) plus operator
1 x Articulated dump truck (25t) plus operator
1 x Excavator (10t) plus operator
1 x Tractor and trailer with additional vacuum tank
1 x General Operative (others as necessary)

Various water pumps and hoses as necessary.

All operatives will be authorised, competent, trained and certified for any plant item that they operate on the site, with proof of training/qualifications being provided to Urbanspringside prior to any work commencement.

All plant and equipment that is used on site shall have the appropriate certification of conformity for its type, copies of which shall be kept in the Site Health & Safety File. Regular operator inspection shall be recorded in accordance with PUWER and in line with Urbanspringside standard procedures.

Any operatives or plant/equipment that fails to comply with the above will be removed from site immediately.

All portable tools and equipment used on site shall be in good condition and safe for use. Electrical equipment will be 110 volts and PAT tested.

Urbanspringside's Projects Manager is aware of the need to protect the environments of the site overall, adjacent properties and local residents. All operatives will comply with the restrictions and specifications detailed in this method statement and any other deemed necessary by the authorities.

There may be a requirement for an Ecologist to attend the site during the initial works for preservation of the existing flora, fauna and wildlife habitats and for the presence of bats in the existing old stone tunnel/culvert. Urbanspringside's Projects Manager will ensure that the Ecologists are present at the appropriate times.

7.0 PPE

PPE shall be provided to suit the element of work being carried out and the level of risk exposure as determined in the risk assessments. Examples of equipment types and uses are listed below, although this list is not exhaustive.

- Hard Hats
- Safety Boots (with steel safety cap and mid-sole)
- Hi-vis reflective vest/jacket
- Gloves (when involved in manual handling)
- Eye protection
- Dust masks

8.0 Communication of Health & Safety Risks

All personnel on arrival to site will be given an initial site safety induction and brief on site working procedures as appropriate. All new operatives will be informed of the site rules, which will be displayed on the site Safety Notice Board.

Tool-box Talks will be held prior to each change of activity. The Projects Manager will inform all site personnel about the potential risks and measures to be used to eliminate or reduce those risks to an acceptable level.

No work will be commenced on site until a safe method of working has been established and approved by the Company.

9.0 General Methodology of Tip Restoration

These proposed restoration works will be designed by a suitably qualified and experienced engineer and this general methodology should be read in conjunction with the Curtins Springside Mill Proposed Drainage Layout rev C03 drawing.

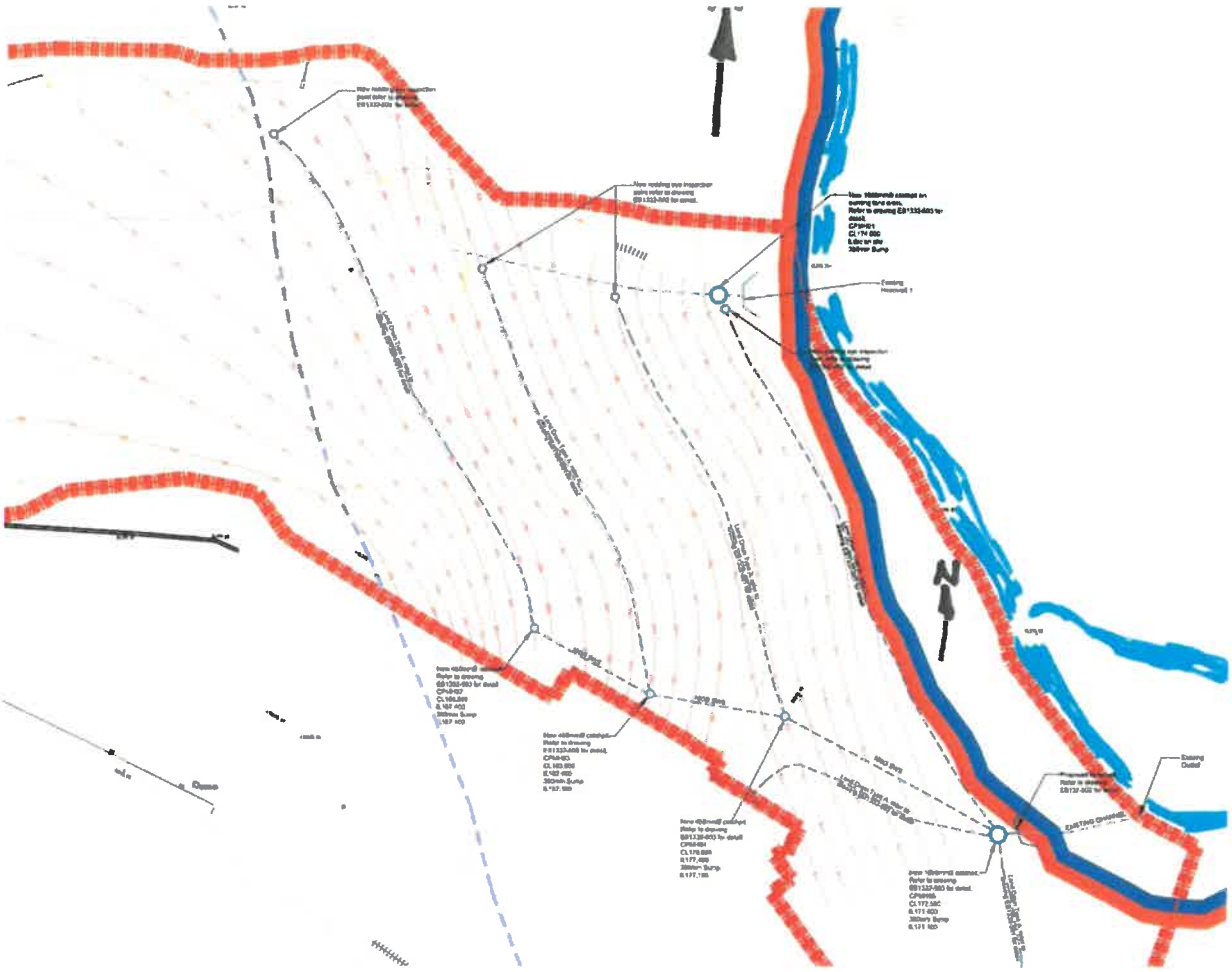
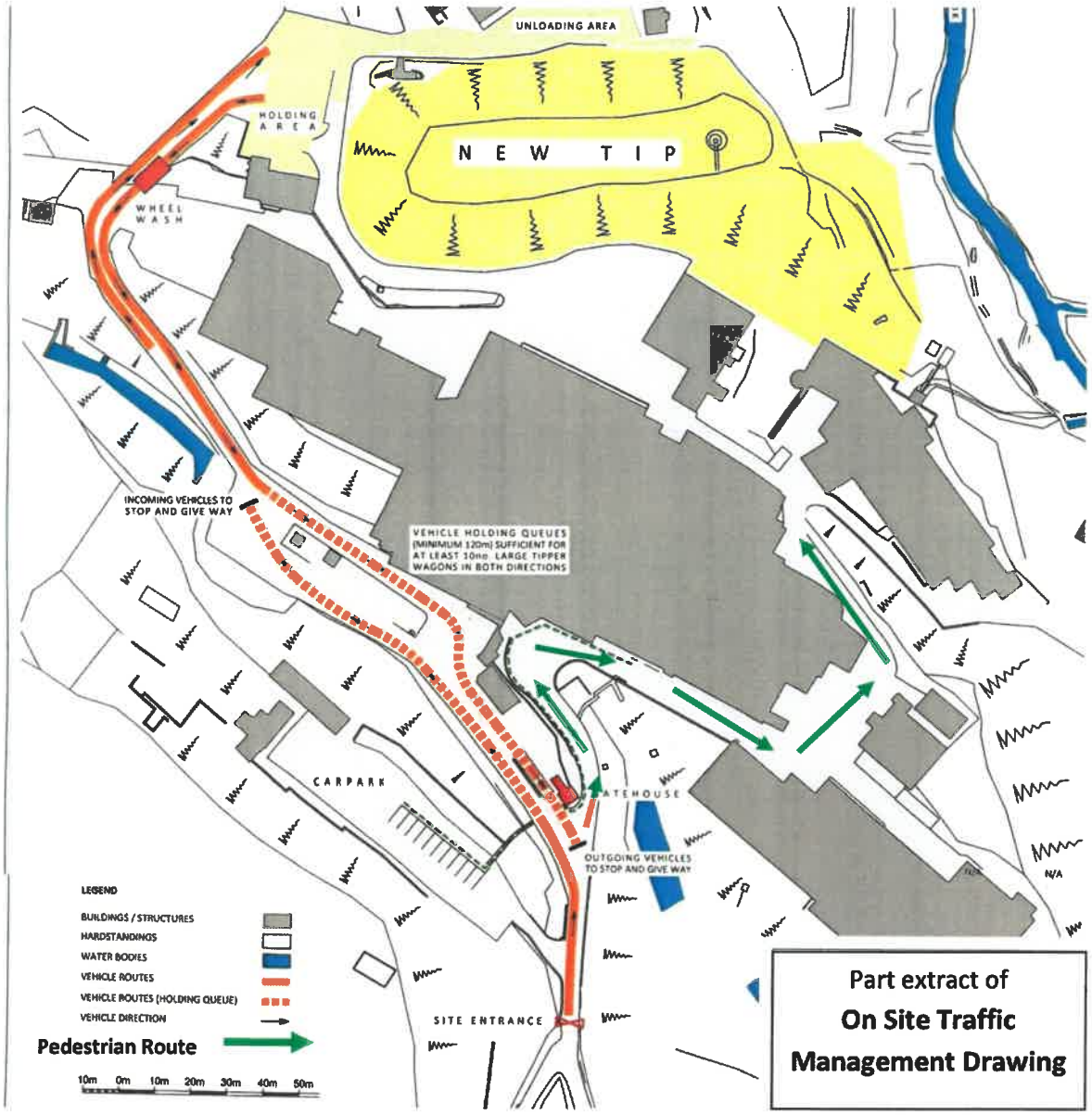


Fig 9.0.1 Part Extract of Curtins Proposed drainage Layout rev C03

The proposed works are generally contained within the bowl of the existing new tip and off-road parking will be signed for all staff and visitors, which will restrict all vehicle movements on site to construction traffic only. This site traffic will be controlled by site induction, signage, roadside barriers where necessary and localised task fencing all of which will be continuously maintained. The restricted route as detailed on the "On Site Traffic Management" drawing will prevent accidental vehicle damage to the land and habitat areas surrounding the remediation site. Similarly the drawing details a segregated pedestrian

access from the gate house/entrance to the new tip work area which will be policed by Urbanspringside's Project Manager to ensure that personnel do not stray into sensitive areas.



The proposed restoration works will be as follows :-

9.1 Preliminary Enabling Works

- The invasive weeds will be treated insitu and/or removed and set aside for on-going treatment on site in accordance with Agency guidelines.

- The vegetative cover to the paper pulp will be removed with the use of a long reach excavator and set aside for potential future re-use on site.

- The trees to the valley sides have been removed and chipped for future use within the site. The remaining root balls will be extracted and set aside for future shredding and similarly potentially for re-use as soil improvers.

Picture 2: General work area looking east down the New Tip valley.

- The badly deteriorated footpath in the north east corner has been realigned back to its original location and the existing 2.4m high palisade fencing moved out to accommodate all of the proposed work activities and thus ensuring the security of the site is not compromised during the restoration works.

- The existing discharge channel from the old tunnel was bunded close to the Eagley Brook by a series of weirs in order to construct a new stone headwall to support the realigned footpath and to enable continuity of the current groundwater flows. This pipework will be extended (as the collapsed culvert is removed) until it extends to beneath the existing liner to maintain this groundwater flow.

Picture 3: New headwall with realigned footpath and fencing.

- Samples of paper pulp from the New Tip were taken on 19th May 2014 from two locations at depth (from 2m to 3m) and transported by dumper to a location adjacent to the Old Tip where they were placed into 2 skips and their respective "fresh and agitated" leachate's collected for chemical comparison with the quarterly monitoring findings.

Picture 4: Pulp sample locations.

The results from the above "skip Leachate tests" established that the initial leachate produced from freshly agitated and lightly re-compacted pulp contained high levels of chemical oxygen demand (COD probably due to suspended cellulose fibre which will be settled out within the liner or water treatment facility) and slightly elevated concentrations of aromatic volatile organic compounds. These results are suggestive of intermediate breakdown products from the natural anaerobic hydrolysis of the pulp and though not previously identified in pumped leachate or groundwater, this temporarily "higher strength" leachate will need to be managed and monitored to take account of this. See section 9.5 for details.

- The existing old filter beds will be refurbished and totally cleared of deleterious materials in anticipation of receiving both the runoff from the whole restoration area and the Leachate from within the new tip liner. This refurbishment will now include the installation of a monarflex liner to ensure there are no accidental discharges or leaks.

Picture 5: Existing filter beds.

- A temporary connection will be made to the refurbished filter beds / water treatment facility and laid along the south western side of the tip such that any water (rain or emerging springs) collecting behind (west of) the proposed filling works can be gravity fed (or pumped if necessary) to these beds so that they provide a settling function to ensure suspended solids are kept to acceptable limits. It has been calculated using national average rainfall that the tanks minimum 175m3 capacity will allow for 1 day's residency for the anticipated maximum likely volume of runoff and we would test the tanks' water quality on a weekly basis (or as necessary) when in use. During pulp removal works the contents will be tested and managed as per details in section 9.5.

- A toe of batter drain (to the engineer's detail and incorporating a Terram wrap) will be installed just inside of the palisade fence culminating in a catch pit at the southern end prior to discharging into the existing mill discharge channel. This will have the purpose of collecting any surface run off from the lower 1/3rd of the embankment with the upper 2/3rds being caught in terram wrapped berm drains (every 5m height).

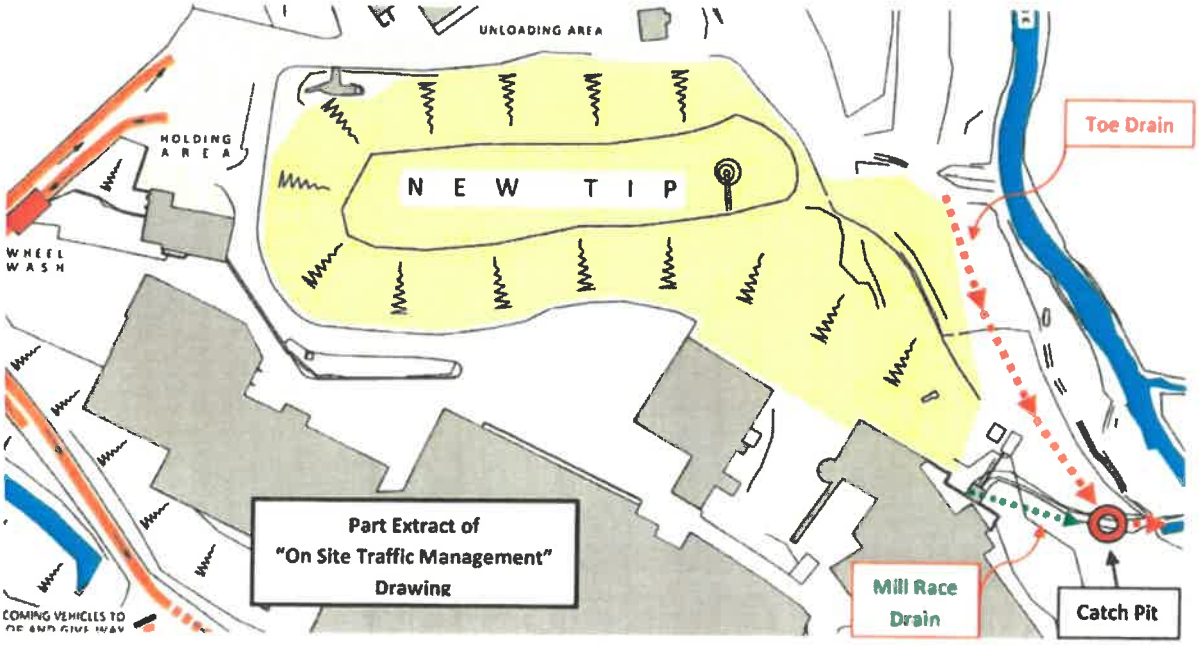


Fig 9.1.1 Alignment of Toe of Batter drain.

- The original existing millrace discharge will also be piped and connected into the catch pit of the toe of batter land drain to prevent erosion or de-stabilisation of the embankment construction. This connection will become superfluous during the demolition and remediation process as the entire works drainage will be picked up and incorporated within the proposed development.

9.2 Eastern Embankment Construction

- The footprint of the lower embankment (see Fig 9.2.1) which is outside of the licensed boundary of the "New Tip" will be geotechnically checked for suitability for the foundation of the whole embankment and ultimate infilling behind by Curtins the projects structural engineer. This approval will involve the removal of any geotechnically unsuitable materials and the introduction of an initial founding drainage layer as per the engineer's design.

The discharges from the whole Springside Mill site have been monitored for many years (as required by the Environment Agency's permit) and Smith Grant LLP the project's Environmental Consultant will continue to monitor at three monthly intervals and consider that as the proposed works are substantively above the water table that there will be no deterioration in current discharges from the proposed earthwork operations as water flows through existing materials will diminish as filling progresses.

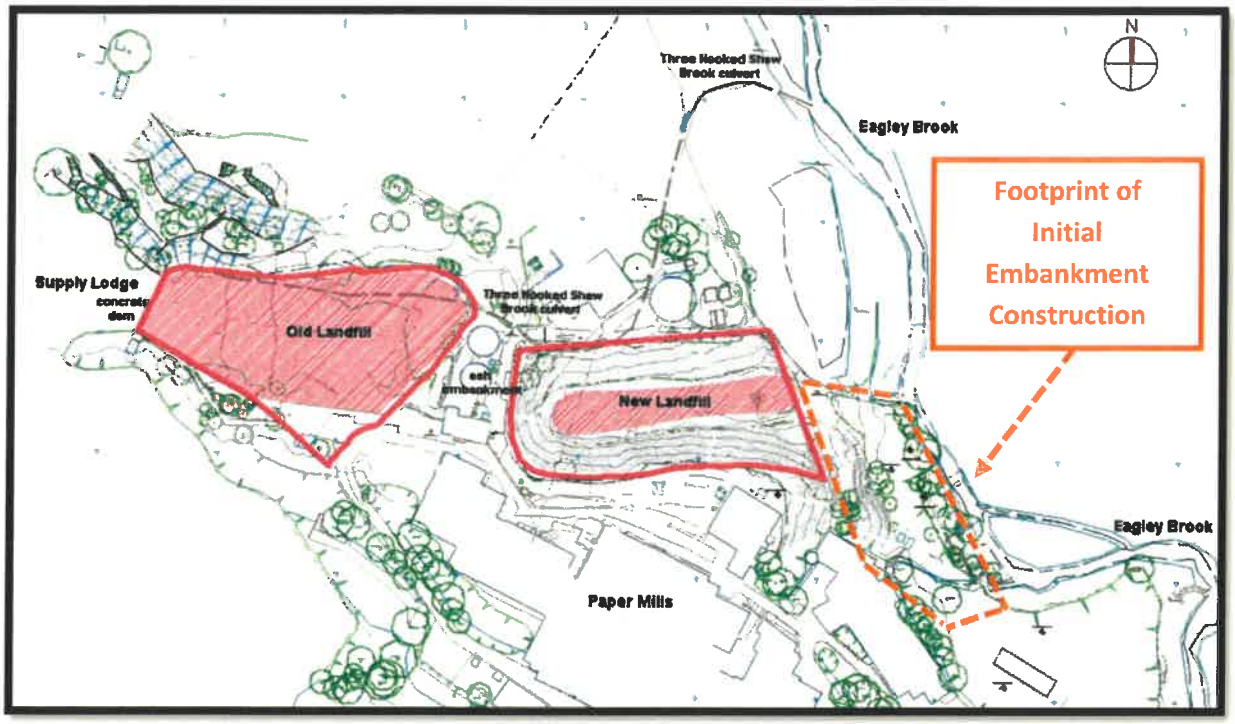


Fig 9.2.1 Area of initial embankment construction.

- During the construction of the basal drainage layer and removal of soft spots, some additional "Wavin" type under drainage might be installed as necessary to the engineer's specification with connections to the proposed land drainage system.

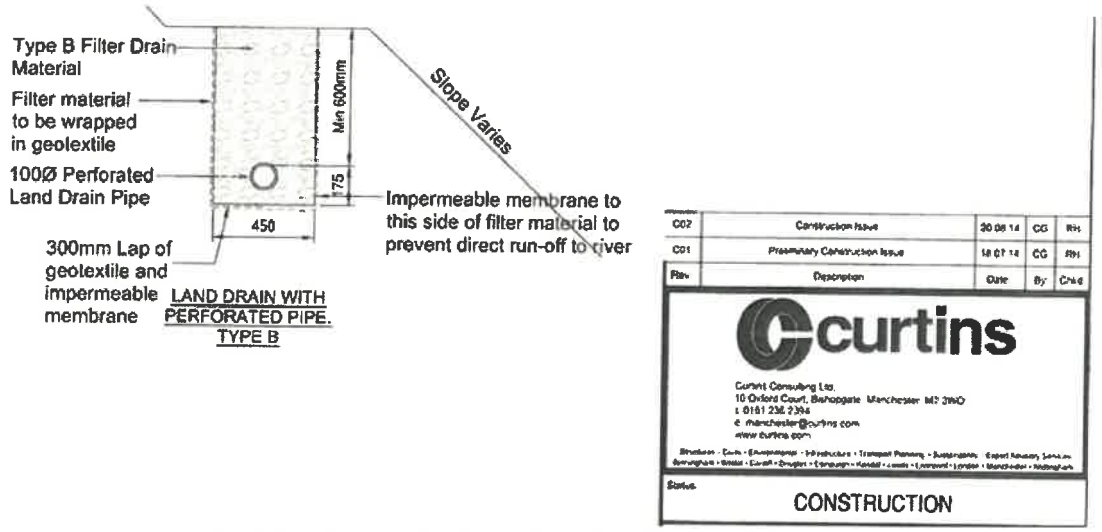


Fig 9.2.2 Part of Drainage drawing 501 rev C02.

- Settlement plates will be embedded within the basal drainage layer and extended as necessary as filling progresses to enable thorough continuous monitoring of levels, settlements or lateral movement both during the works and post completion. It is anticipated that these monitoring plates will be positioned to coincide with the proposed berms to the Eastern Embankment.

The construction of the lower first five meters height will be carried out utilising suitable site won materials which may be supplemented with imported natural materials in accordance with CL:AIRE The Definition of Waste: Development Industry Code of Practice March 2011.

A detailed record will be maintained on site of all material imports and movements within the stockpile record file and on daily movement sheets and will be provided in validation / verification reporting for the site.

As the embankment is raised any water (precipitation or emerging springs) trapped behind the embankment (west of) will be transferred via a gravity drainage pipe (or pumped as necessary) to the "water treatment facility" where it will be tested for suitability prior to discharge to Eagley Brook. All previous investigations and testing have not indicated the presence of any priority or hazardous substances and due to the settling function we do not envisage any problems with discharging to the brook.
However should testing reveal any unacceptable results (chemically or suspended solids) then the water will remain impounded and advice sort from our environmental consultant.
Should there be no practical solution then the liquid contents of the "water treatment facility" will be properly categorised (with details being provided to the accepting facility) and tankered off site as required pending amendments to the treatment facility.

During this initial filling phase the existing old collapsed tunnel to the north will be further removed and replaced with new pipework extended westwards from the catchpit. Currently, the water flowing in this channel is monitored and tested every three months as a condition of the discharge license and we would propose to independently carry out similar tests monthly or as necessary during these early stages of restoration to prove that the

procedures adopted are appropriate. Urbanspringside's Project Manager would also perform specific daily visual checks (during the restoration works) for increased flow rates, oily or carboniferous films or any obvious odours or discoloration.

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Discharge @ Old Tunnel / Ochre Culvert

Project Managers Daily Inspection Records

Date:	Time:	Observation:	Initials:

Should any abnormality in the flows become apparent then the outlet to the catchpit will be stopped up and the incoming flow investigated and advice sort from our environmental consultant. If necessary the inflow will be diverted or pumped to the "water treatment facility" for quarantine, treatment or onward disposal.

The following environmental rules will be applied and regularly monitored by Urbanspringside's Project Manager particularly during these "waterside" works, but will be adopted on a site wide basis for the duration of all the restoration works :-

- All refuelling as necessary shall take place from a bunded fuel tank which will be sited in designated areas well away from any water courses or properties.
- All static plant shall be positioned over drip trays.
- Spill kits to be available at all times at work areas and at re-fuelling points
- All plant shall be regularly inspected for leaks. Any leaks shall be reported immediately and the plant parked up until repairs can be rectified.
- All plant will be parked in a position well away from adjacent properties as far as practicable overnight to negate noise nuisance.
- All plant shall be switched off when not in use.
- All plant shall be silenced where possible.

When the filling reaches sufficient height (approx. 5m vertically) and dependant on the time of year, the sloping face of the embankment will be soiled as necessary and hydra-seeded with an appropriate seed mixture to stabilise the surface and improve the vista from the adjacent footpath . The lower slope will then be planted through the grass as soon as practicable with a native woodland mix which may be cell grown but actual timing of this item will be dependent on the prevalent weather conditions and advice of the project's Environmental Consultants the Appleton Group.

9.3 Inspection of Restoration Works

Urbanspringside's geo-environmental consultant, Smith Grant will attend site regularly during the restoration works to inspect, test, validate and record that the works are undertaken in accordance with this method statement and the regulator approved restoration design.

Similarly Urbanspringside have appointed Curtins as a structural engineer to assist in developing an engineering methodology and specification for the embankment construction (including any necessary drainage) and the subsequent infilling of the new tip. They will also be regularly attending site to inspect, sample, test and monitor the works and provide an engineering completion report.

Upon completion of all the restoration work an inspection by the relevant authorities will be invited to demonstrate that all areas have been adequately restored and secured.

Smith Grant will also submit a completion report to the EA validating that the restoration works have been completed in accordance with the approved methodology.

9.4 Control of Amenity Issues of Odour and Dust

9.4.1 Odour

The duration of works directly associated with the potential bulking (to the west end of the New Tip) and removal of pulp are anticipated to be completed within 4 to 6 weeks with an additional few days whilst the eastern end is cleared for access to extend the eastern embankment. The recent "Pulp Skip Tests" (19th May 2014 and Leachate monitoring on 28th May, both supervised by Smith Grant) were carried out with fresh agitated samples from depth in the New Tip and transported to the Old Tip, to replicate our proposed operation for pulp removal and though an odour was apparent next to the excavation and immediately adjacent to the skips it was only just noticeable at 5m and by 20m not discernible at all. We were advised by Smith Grant that on the "Hedonic Scale" the odours would probably register as moderately offensive, but were of low emission rate and rapidly dispersed and should not cause nuisance or annoyance at the site's boundaries.

It should also be noted that the prevailing winds are expected to be influenced by the local topography to give a strong north or northeast heading, and the nearest properties at Lower Fold Farm are situated some 200m to the northwest, Springside Cottages 270m to the south of the proposed works and Hampson's Gate House at 430m to the south, away from the prevailing winds.

In view of our onsite observations and assessments, and the absence of close residences we consider that the likelihood of odour becoming an annoyance beyond the boundary as remote. However during the actual works the Urbanspringside's Project Manager will monitor the situation and should any increased odour be observed then works causing the

odour emission will be stopped and advice will be sort from Smith Grant and if necessary a propriety odour "Mobile Atomiser" spray (40 micron) will be brought to site to neutralise and break down the smells.

Picture 6: Typical Mobile Atomiser

9.4.2 Dust

Should any of these works produce the potential for dust generation then damping down measures will ensue by means of a tractor and vacuum tank which will spread water onto the affected areas. An all-weather supply of water for dust suppression is readily available at the site.

Picture 7: Tractor and vacuum tank.

9.5 Paper Pulp Removal from the New Tip

Following obtaining appropriate approvals and licensing the vegetative cover to the paper pulp within the New Tip will be removed with the use of a long reach excavator and set aside for future use on site.

Picture 8: Vegetation treatment building.

The vegetative materials will be placed in windrows inside the building shown which has been chosen due to its internal dimensions, smooth (dense & impermeable) concrete floor and lack of internal drainage gullies or channels.

Picture 9: Inside vegetation treatment building.

This building has been successfully used previously in 2012 for small scale pulp and wood chip mixing trials utilising a 15t excavator and remains in good condition.

The intention is to turn the windrows over on a regular basis (weekly then bi-weekly though maturation) to ensure good aeration to encourage aerobic composting and the production of an organic soil additive for reuse in the restoration. Urbanspringside will obtain the appropriate licenses and permits to facilitate this waste recovery operation which benefits the sites sustainability by limiting disposals off site and reducing the amount of soils import. There is a requirement for a large quantity of soil cover for the restoration of the site whereas site wide there are very limited resources in this respect due to its former industrial heritage.

Findings from the recent "Pulp Skip Tests" (19th May 2014 see Picture 4 on p16) it appears that the pulp at the eastern end contained less water and presented as firmer allowing vertical sided excavation down to 2.7m, (though only for a limited time period) whereas that pulp to the western end kept slumping to around 45° sides. Taking these observations into account we will try to bulk the wetter materials up at the western end and allow more Leachate to fall out onto the liner.

The results of leachate testing (photos above) of these freshly disturbed pulp samples (see 9.1 and Smith Grant R1635-R08-v3 Closure Plan) exceed the existing permitted leachate discharge consent limits and it is intended that this temporarily "higher strength" leachate will be pumped to the "water treatment facility". This will be lined (monarflex or similar) and sub divided (similar to an interceptor) such that any necessary treatment can be monitored and tested on reduced and separated volumes.

It is anticipated that there will also be a natural influx of water albeit rainfall or springs though the valley sides which will add naturally to the leachate which may reduce the oxidation treatment necessary to reduce the high levels of chemical oxygen demand (COD). This treatment will consist of spray bars / jets and or pumping air via a diffuser or submerged perforated tubes until satisfactory test results are achieved. Should acceptable COD levels or other discharge criteria (suspended solids) not be attained the liquor will be tankered off site as required pending amendments to the treatment facility.

We propose to commence excavations in the New Tip around the existing Leachate pump and sump as this will be the lowest point within the tip liner and from there we will be able to deal with any Leachate or surface water runoff. We would carefully excavate using a smooth bucket (long reach machine as used successfully for obtaining samples for the Leachate skip tests) and intend to empty the area to the eastern end whilst retaining the integrity of the liner around the sump to collect leachate.

Picture 10: Smooth edged bucket.

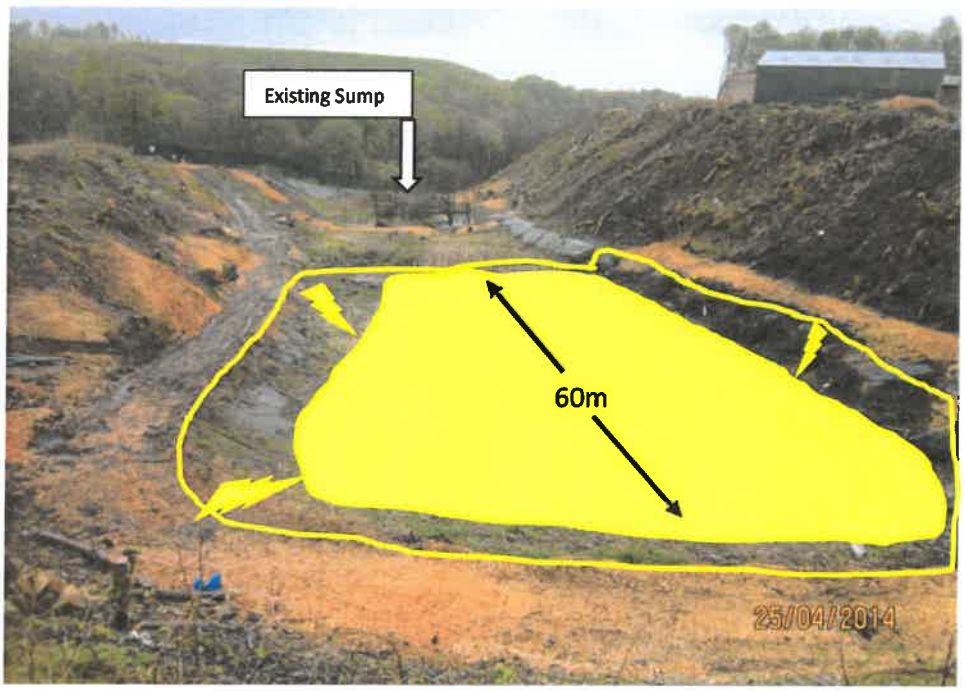
Should the liner become damaged during these works (or existing damage be exposed) Urbanspringside will have available a suitably wide double-sided adhesive tape to initiate a temporary repair using patches cut from an area of liner currently above the current pulp level as shown below.

Picture 11: Potential source for repair patches.

The pulp excavated from the eastern end would be relocated to the western end and further material to the immediate west of the sump would also be transferred up to the western end.

We anticipate that the temporary pulp stockpiling to the western end (still within the confines of the existing liner) will allow for further release of Leachate and make all of the remaining pulp material much more manageable for removal onto the Old Tip with traditional dump trucks. The remaining pulp will be generally removed in a westerly direction and utilising the existing sump for leachate extraction to the water treatment facility where it will be monitored and tested in order for the appropriate disposal route to be maintained. The visual monitoring of leachate production in these initial stages of work, or during / soon after heavy rainfall, will generate knowledge and experience for dealing with the leachate.

This proposed opening up of the east end (beyond the sump) releases a significant amount (total of 40% including the embankment footprint ~ circa 25,000m^3) of filling opportunities which will be carried out initially within an MMP (for the area outside of the current landfill permit boundary) and latterly on a "Recovery" basis once amended permitting is in place.
The early construction of this embankment (see Fig 9.1.2) will provide additional bund protection to Eagley Brook from potential storm runoff or sludge mobilisation within the New Tip with the added benefit of effectively reducing the actual volume of pulp though leachate loss (current water content measured at 53% and 64% or 114% and 175% of dry weight). We have site measured and calculated that there is circa 2,000 m^3 of containment available in the western half (60m) without any allowance or necessity to exceed the height of the existing liner.



Picture 12: Possible containment area.

To summarise, the advantages of the above proposals are that a larger catchment volume is achieved within the existing liner whilst maximising leachate release and increased protection of Eagley Brook (enhanced also by the increasing height of the eastern bund with its inbuilt drainage). This would also reduce the actual volume of pulp requiring translocation to the temporary storage on the old tip and with reduced leachate quantities (expected to be similar to the normal constituents and not "higher strength").

However to prevent any possibility of leachate percolating into the body of the "Old Tip" from the temporarily stockpiled pulp we would ensure that a suitable impermeable liner was installed beneath. This situation would be further enhanced by the construction of bunds and a small sump to enable collection of all the leachate produced which would be either transferred via the "New Tip" collection or direct to the water treatment area where it will be monitored and tested in order for the appropriate disposal route to be maintained.

We also expect the remaining "New Tip" pulp material to be much more manageable following the initial heaping up to enable relocation onto the Old Tip with traditional dump trucks and by utilising the existing sump for leachate extraction will simplify the regular monitoring and testing in order for the appropriate disposal route to be maintained. The frequency of visual monitoring will depend upon the rate of leachate production, but is expected to be hourly in the initial stages of work, or during / soon after heavy rainfall, perhaps reducing to twice daily as knowledge and experience of leachate generation rates accrues.

The above strategy will allow for a close inspection by our consultant Smith Grant (following use of hand tools such as spade and squeegee as necessary) of the liner for damage and leaks and enable a targeted sampling strategy to be undertaken in any areas found to be damaged. The ash from areas of the tip sides above the liner will be used to characterise contamination levels with that being exposed below the liner. Smith Grant believe that the potential for residual leachate within the landfill basal drainage (assumed ash layer)or natural strata appears to be negligible given the absence of any detectable pollutants in down gradient monitoring wells and no significant impact of pollutants has been recorded within the surface watercourses over the last 7 years of monitoring.

Once these pulp removal operations commence (and for the duration) the inspections at the acknowledged primary groundwater discharge point at the "ochre" culvert will be increased to daily by the Urbanspringside's Project Manager for any visual changes (flow rate or discoloration). Smith Grant will initially carry out weekly chemical testing as per its regular quarterly procedures. The observed wet weather flows have been estimated to range between 1 to 3 ls^{-1}. Should anything untoward be observed then the discharge pipe could be stoppered (within the catchpit) and the contents / flow be diverted by pumping to the "water treatment facility" for further treatment (as advised by Smith Grant) or tankered off site as required pending amendments to the treatment facility.

Should it be necessary to remove the existing Leachate sump prior to all the pulp being removed then the liner will be peeled back and a small bund constructed across the tip width (North to South) to maintain the integrity of the Leachate catchment.

The Environment Agency has expressed a technical interest in the performance and integrity of the landfill liner, which is believed to have been an early example of an installation using welding techniques. Officers will be invited to attend the site following pulp removal to carry out an examination.

9.6 New Tip Preparation for Infilling Works

Following the removal of all the pulp the liner will be removed for later disposal and a detailed survey will be carried out of the tip base for compilation of an as-built drawing.

A series of trial pits will be excavated under supervision of the Environmental Consultant into the underlying ash sub-base to the level of the natural valley floor / water table to allow visual inspection for evidence of paper pulp or leachate contamination and the collection of samples for chemical analysis. It is envisaged that entries will be spaced on a nominal 20m grid across the New Tip footprint, with additional targeted entries at any locations where contamination is indicated or where relict drainage structures may be present.

The extended replacement pipework from the collapsed and replaced ochre culvert will be further extended on the advice of our appointed structural engineer Curtins with discussions to date indicating that some sort of single sized sump/ collection point wrapped in Terram would be an appropriate termination (should no existing actual pipe be located). The precise detail cannot be pre-determined as there are no contemporary records of the original tip construction or details of how the original valley bottoms natural groundwater flow connected into the old stone culvert.

Pictures 13 & 14: Unstable corners to North & South

The anticipated existing ash sub base that was beneath the liner will be augmented as necessary to form a basal drainage layer (depth of free draining material in accordance with

current best practice and the engineers specification) to carry the existing natural groundwater eastwards through the former valley over the bottom of the tip using locally recovered ash from the unstable ash corner slopes to the north and south.

The tip base (and sides as the filling works progress) will be surveyed and an as-built/constructed drawing will include any land drainage installed during construction.

During the construction of the basal drainage layer any soft spots or organic material encountered during inspection or proof rolling of the formation will be removed and replaced with suitable fill. Wavin type construction underdrainage will be installed with connections to the proposed land drainage system as necessary or as prescribed by the engineer to take account of any springs encountered.

Settlement plates will be embedded within the basal drainage layer and extended as necessary as filling progresses to enable thorough continuous monitoring of settlements.

Upon completion of the pulp removal operation Urbanspringside will seek to surrender the New Tip Permit and to ensure a satisfactory surrender is achieved Urbanspringside will invite the Environment Agency to a "Surrender Pre-App Meeting" where the proposed reporting and supporting documentation that is necessary can be established.

9.7 General Infill Engineering & Restoration Works

Urbanspringside personnel routinely undertake the design and management of remediation earthworks operations involving both natural and anthropogenic materials with most schemes involving the recovery and re-use of suitable materials to maximise cost-effectiveness and sustainability. All such operations involving the import of recovered materials require careful scrutiny and chemical testing to ensure that the placed fills are fit for purpose and do not give rise to pollution. Typically this will involve prior inspection of materials to be received and testing to the engineers (Curtins) pre-determined specification to facilitate the engineering and geotechnical validation strategies which will be furthered with onsite testing procedures.

Urbanspringside propose that their engineering consultant Curtins will be responsible for the design of:-

- The "Eastern Embankment" which lies outside of the Environment Agency's permitted boundary.
- The land drainage design and installation which includes the replacement of the collapsed culvert and dealing with existing land drains and springs.
- Progressive infilling up to design levels (potential max of 14m) and developing a suitable strategy.
- Production of an Engineering Completion report.

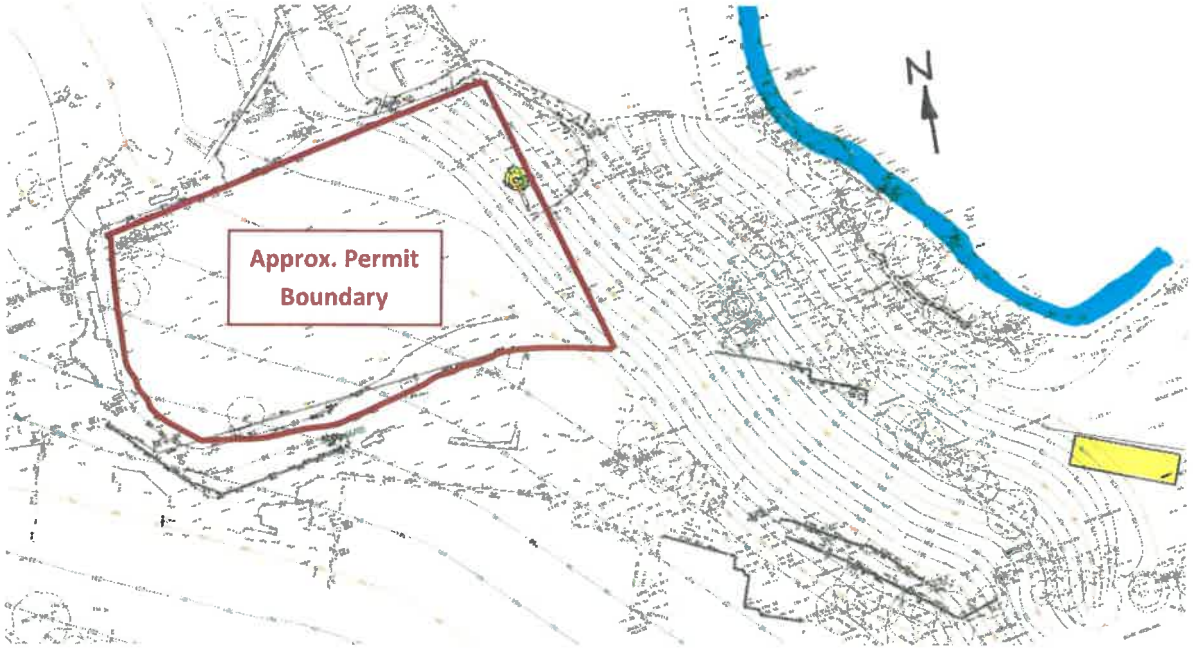


Fig 9.7.1 Part of MCK Proposed Contour Plan 0003.

Currently the permit holder (Permit EAWML 53997) to the above indicated area is Charles Turner which is an owned subsidiary of Kruger Tissue Industrial Limited and although Urbanspringside have formal authority to carry out all activities actions and works necessary (to comply with the terms of the Licences and to submit any applications, reports and or notifications that are necessary) for the proposed development they will arrange the formal permit transfer to Urbanspringside prior to varying or the ultimate surrender of said license.

The Claire code of practice does not cover deposits in permitted areas and Urbanspringside have been discussing for some time the proposed licence transfer (similarly for the "Old Tip" Permit EAWML 53658) and the steps needed to vary the permit to accommodate the proposals detailed in this method statement.

During the meeting on 27th March 2014 with the Environment Agency (6 N^{O} officers) the general philosophy of excavating the pulp and infilling with inert materials was discussed and there was general agreement that the license should be transferred and then varied for the waste removal and to then surrender the permit. Following this there were two methods for infilling permits, Recovery vs Disposal. There was a general consensus that "Recovery" would be the preferred method as the waste is being used for construction as the infill is integral to supporting the proposed residential development. It was also suggested that it might be possible to vary the removal permit to cover the "Recovery" process rather than surrender and reapply.

Urbanspringside's proposals will therefor consist of initially constructing the "Eastern Embankment" as described in Section 9.2 (page 18) in accordance with CL:AIRE The Definition of Waste: Development Industry Code of Practice March 2011 with the subsequent general infilling of the former "New Tip" not proceeding until the appropriate "Recovery" permit has been issued.

During the filling of the eastern embankment the temporary drain connection to the water treatment area (former filter beds) will be extended to behind the embankment fills to ensure that any waters now trapped behind will be subject to a settlement process and tested prior to discharge.

The construction of the lower first five meters height of the eastern embankment will be carried out utilising suitable site won materials which may be supplemented with imported natural materials in accordance with CL:AIRE The Definition of Waste: Development Industry Code of Practice March 2011.

A detailed record will be maintained on site of any material imports and all movements on site within the stockpile record file and on daily movement sheets in order to provide a suitable part of the validation / verification report for the site.

For the duration of the site works a traffic management system will be introduced detailing the Working Area Access Arrangements. A holding area will be established (see Fig 9.1.1 on page 18) to the west of the "New Tip" which will be integrated with the recommendations of the Waterman's Transport Statement concerning the "Traffic Management on Site Access Road" from the A675 Belmont Road.

As the embankment is raised any water (precipitation or emerging springs) trapped behind the embankment (west of) will be transferred via a gravity drainage pipe (or pumped as necessary) to the "water treatment facility" where it will be tested for suitability prior to discharge to Eagley Brook.

The filling will continue with the eastern embankment construction widening its base (up to 45m width to remain outside of the permitted area) to allow for the increasing overall height with the land drainage also being extended to suit. When the filling reaches sufficient height (approx. 5m vertically) and dependant on the time of year, the sloping face of the embankment will be soiled as necessary and hydra-seeded with an appropriate seed mixture to stabilise the surface and improve the vista from the adjacent footpath . The lower slope will then be planted through the grass as soon as practicable with a native woodland mix which may be cell grown but actual timing of this item will be dependent on the prevalent weather conditions and advice of the project's Environmental Consultants the Appleton Group.

When the filling reaches the height of the middle berm (approx. 10m height) then the design items of berm drain, hydra-seeding and planting as appropriate will be repeated dependant on the time of year as explained above.

The filling will further continue with the eastern embankment construction widening its base until the licensed "New Tip" boundary is reached whereupon filling will cease until the appropriate license (assumed "Recovery") is issued to the allow for the completion of the eastern embankment to it full height (approx. 15m height). The uppermost berm drain will then be installed with the hydraseeding and planting again being repeated with the land drainage also being extended as necessary.

The remaining space within the "New Tip" will be infilled in a westerly direction (assuming all the pulp has been removed) with the temporary drainage from behind the fill and the connection to the filter bed will being closed off and sealed to the engineers satisfaction.

9.8 Working Area Re-Instatement & De-Mobilisation

The general finish to the completed earthworks will be to reintroduce the ancient woodland character by soiling as necessary and hydraseeding with an appropriate seed mixture in keeping with the local natural flora and fauna environment of the Eagley Valley to mitigate soil erosion. Urbanspringside will continue to liaise and take advice from our neighbouring land owner and partner consultee the Lancashire Wildlife Trust (LWT) in this regard.

There will be an aftercare period in the landscape management plan which will include for the maintenance of the surfaces and vegetation cover, weeding and replacement of dead or diseased stock.

The refurbished filter beds may well be retained for potential future use as a settlement function for mitigation of suspended solids for the future development works with a provision that ultimately they will be de-commissioned and then be landscaped in accordance with the approved scheme. It has been suggested that they might be remediated and enhanced as a new wetland wildlife resource within the Longworth Clough corridor and included within the 25 year habitat management plan.

The gatehouse will be retained for on-going site security and monitoring due to its location and own individual electrical supply.

9.9 Inspection of Restoration and Completion Reporting

Urbanspringside's geo-environmental consultant, Smith Grant will attend site regularly during the restoration works to validate and record that the works are undertaken in accordance with the regulator approved restoration design. Similarly Curtins the structural engineer will visit, record and validate the engineering works.

Upon completion of all the restoration work an inspection by the relevant authorities will be invited to ensure the area has been adequately restored and secured.

Smith Grant will also submit a completion report to the Environment Agency validating that the restoration works have been completed in accordance with the approved design.

10.0 Supplemental Detailed Reporting

This general method statement should be read in conjunction with all the other detailed supplemental reporting associated with the tip restoration as scheduled below:

Sedgwick Associates	Supporting Planning Statement Design & Access Statement
Waterman	Transport Statement
Smith Grant LLP	Environmental Review and Mitigation Proposals Contamination Desk Study, SI & Remedial Strategy Closure Plan
The Appleton Group	Tree Survey, Tree Impact Assessment & Landscape Proposals
Mike Lambert Associates	Flood Risk Assessment
ERAP Ltd	Ecological Survey & Assessment

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Restoration of the existing 'New & Old Tips'

(EA Environmental Permit N^{os} 53997 & 53658)

at the former

Springside Mills Site

BELMONT

METHOD STATEMENT FOR THE RESTORATION OF THE 'NEW & OLD TIP' AREAS

'Supplemental Information'

June 2015

Rev I
(August 2018)

Prepared by John Bamforth / Darrell Woodrow

Printed: - 28-Mar-19

urbanspringside

INDEX

1.0 Introduction & Background

Urban Springside Ltd. have acquired the Springside Mills brownfield site (known locally as Kruger Paper Tissues). As part of the remediation works it is to carry out the restoration of the 'New Tip' to facilitate a wider residential development.

The Applications for the transfer of the relevant Permits (N^{os} 53658 and 53997) were submitted 16th December 2014 (via Bruce Westwood (01772 714363) of the Environment Agency - East Lancashire Waste Team) and contained the following enclosures:

1. Document N° 1 - Resume of Urban Springside
2. Document N° 2 - Pre-Application Meeting Minutes

   Note: Items 1 and 2 are common to both permits
3. Parts D2, F1 and A for Permit N° 53658 (Old Tip)
4. Parts D2, F1 and A for Permit N° 53997 (New Tip)
5. 2 x CD's Ref 53658 (Old Tip) full application

   Note: Contains items 1, 2, 3 and various additional backup information
6. 2 x CD's Ref 53997 (New Tip) full application

   Note: Contains items 1, 2, 4 and various additional backup information

Further to the above Applications and subsequent meetings with Bruce Westwood (19th May and 8th December 2015) regarding the proposed removal of the paper pulp* from the 'New Tip'; it was decided to prepare a 'Supplemental Information' document (to be read in conjunction with the previously submitted ***'Method Statement for the Restoration of the 'New Tip' Area (Rev F)* - Section 9.0 General Methodology of Tip Restoration'**) detailing the specific removal of the paper pulp from the 'New Tip'. This document was further revised to include the EA's approved method for the stabilisation of the paper pulp and subsequent placement within the capping of the 'Old Tip'.

Currently the 'New Tip' presents serious deficiencies with regards to the management of leachates. There is no internal drainage to the cell with the paper pulp placed directly on the impermeable liner. Consequently, there is minimal natural drainage (the majority being from surface run-off) and the drainage stone surrounding the leachate sump has become clogged.

Due to the excessive moistures access to the cell is not possible and thus inhibits maintenance works.

** References to paper pulp waste in this document actually describe the effluent treatment plant solid wastes which essentially comprise mineral matter (fine limestone and china clay particulate) with cellulose fibre and water; the Paper Industry refers to such materials as fibreclay when they are used for the amelioration of agricultural soils; these materials were placed in the landfills as a temporary expedient when land-spreading outlets were not available, or when the water content was too high to facilitate off-site transport.*

2.0 Detailed Methodology of Tip Restoration

This ***'Supplemental Information'*** document details the methodology to be implemented to enable the removal and treatment of approximately 3,000m^3 of paper pulp located within the 'New Tip' (see Figure 2.0.1) and the decommissioning of the 'New Tip' cell to enable the subsequent infilling of the resultant void to restoration levels as detailed in the approved ***'Planning Application 10/12/1110'*** granted by Blackburn with Darwen Borough Council.

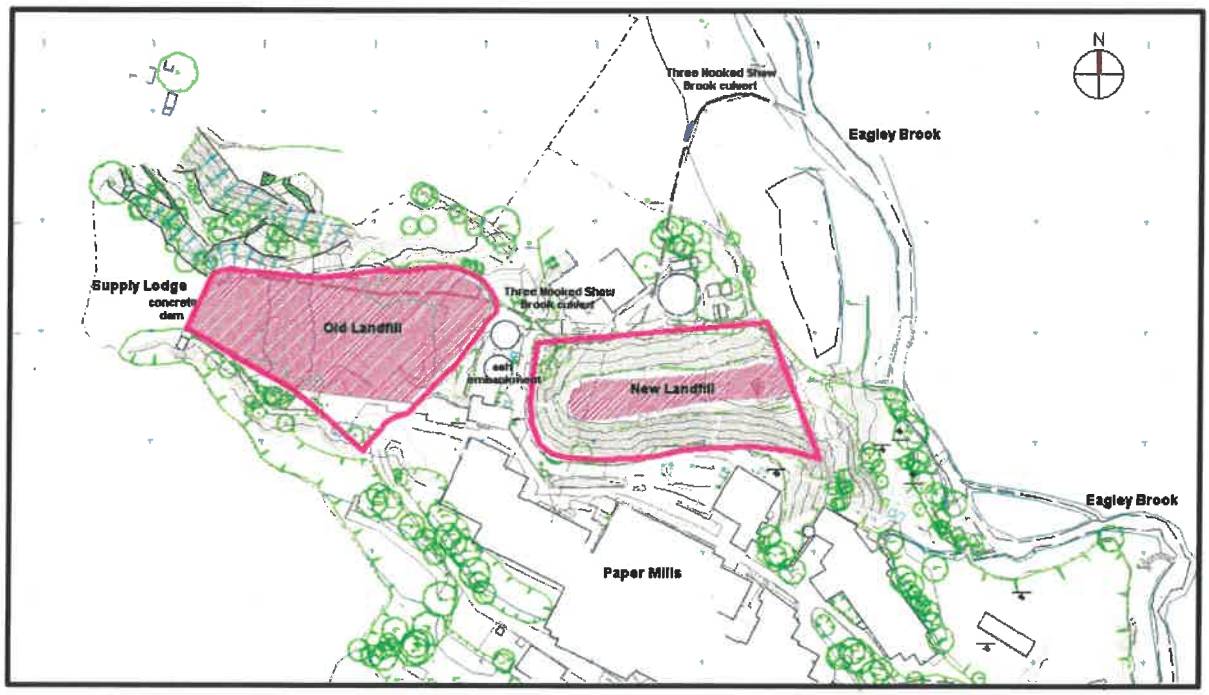


Figure 2.0.1 – Permit boundaries (extent of paper pulp hatched pink).

2.1 Moisture content reduction

The paper pulp contained within the 'New Tip' has a moisture content in excess of 60% (170% of dry weight). It is intended that this excessive moisture content be reduced by enabling natural self-imposed compaction and the drainage / discharge of the resultant leachates.

To achieve this, it is necessary to improve / install haul routes and drainage within the existing 'New Tip'. This will facilitate the management of the paper pulp and allow the leachate control sump to be serviced. It is intended that the haul routes are formed utilising the existing ash located adjacent to the 'New Tip' (for which there is anecdotal evidence that it was used beneath the existing 'New Tip' liner).

This initial restoration phase has been determined to be the most practicable method of achieving a satisfactory consistency of the encumbering paper pulp.

In May 2015, a new leachate chamber was installed using concrete ringed sections. A drainage surround was constructed around this chamber using a combination of a 150mm dia' perforated 'Wavin Coil' (wrapped around the chamber to increase the collection volume and functioning leachate surface area) and 60mm single size clean stone enclosed by a porous Terram membrane. This was then surrounded with coarse ash recovered from adjacent to the 'New Tip' (see Figure 2.1.1). This structure replaced the existing leachate chamber and surrounding 75-100mm stone which had become clogged.

To enable the new leachate chamber to be constructed an ash partition was installed to the west of the existing chamber. A 360° excavator systematically removed the paper pulp (casting it to the west) along the alignment of the partition and replaced the material with site derived ash. This operation continued in a southerly direction until the partition extended across the full width of the 'New Tip' truncating the eastern 15m (see Figure 2.1.3).
With the partition installed the remaining paper pulp located to the east was relocated to the west end of the 'New Tip'. This was carried out by 2 no 360° excavators casting the paper pulp

along the length of the 'New Tip' as well as a 25T dump truck travelling along the ash bund located on the outer north side of the 'New Tip'.

Figure 2.1.1 – Lower section of the new leachate chamber.

To facilitate the paper pulp movement westwards it was found beneficial to install additional ash partitions / fingers (see Figure 2.1.2). This enabled the paper pulp to be stockpiled higher (to the top of the existing liner) increasing the natural self-imposed compaction of the material and maximising the leachate release. Consequentially this improved the physical condition of the paper pulp by reducing the moisture content and consolidating the material.

Following the removal of the paper pulp from the truncated eastern end of the 'New Tip' it was observed that the initial ash partition was 'creeping' eastwards. This was halted by backfilling the resultant void with additional ash. This also improved the accessibility to the new leachate chamber and the general management of leachates as prescribed previously in the ***'Method Statement for the Restoration of the 'New Tip' Area (Rev F)*** **- Section 9.5;** utilising the 'water treatment facility' as appropriate.

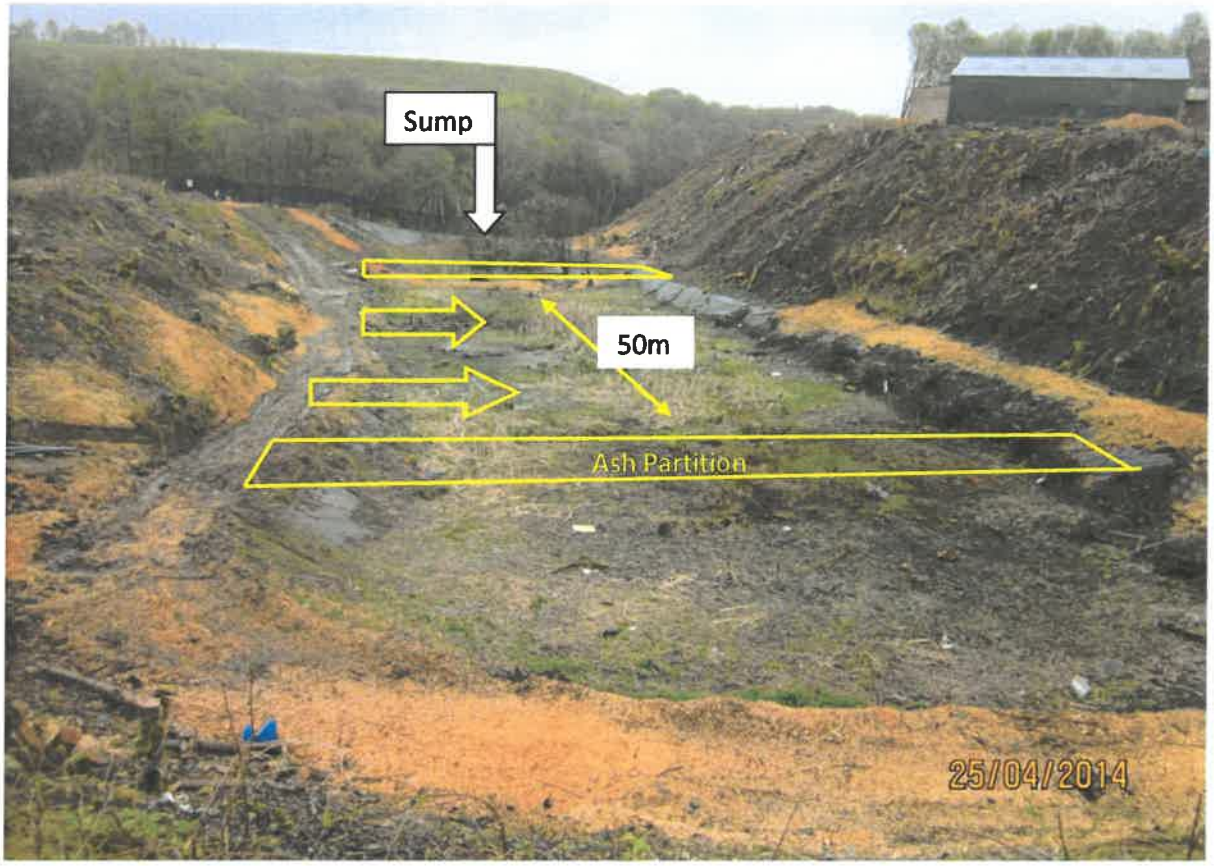


Figure 2.1.2 – Indicative ash partitions / fingers.

All excavations of the paper pulp were carried out using a smooth-edged ditching bucket on a 360° excavator, with care taken to avoid puncturing the impermeable liner.

In the event that damage was caused to the liner excavation works were to cease and the damaged area cleaned. A repair would then be affected by utilising a section of liner salvaged from above the fill line at the extreme eastern end of the 'New Tip' (see Figure 2.1.3). All excavation works were supervised, and records kept by the Urban Springside Ltd. Project Manager.

To protect Eagley Brook, additional drainage infrastructure was installed to the eastern boundary of the site prior to works commencing in the 'New Tip'. These included the installation of an additional catch pit located immediately upstream of the 'ochre' culvert headwall. This was positioned inside of the site palisade perimeter fence and provides the facility, if necessary, to temporarily stop off any discharge and allow consultants Smith Grant

Partnership LLP (SGP) the opportunity to test and advise on an alternative / appropriate disposal route. (see Figures 2.1.4 & 2.1.5).

Figure 2.1.3 – Initial ash partition installation and paper pulp removal works.

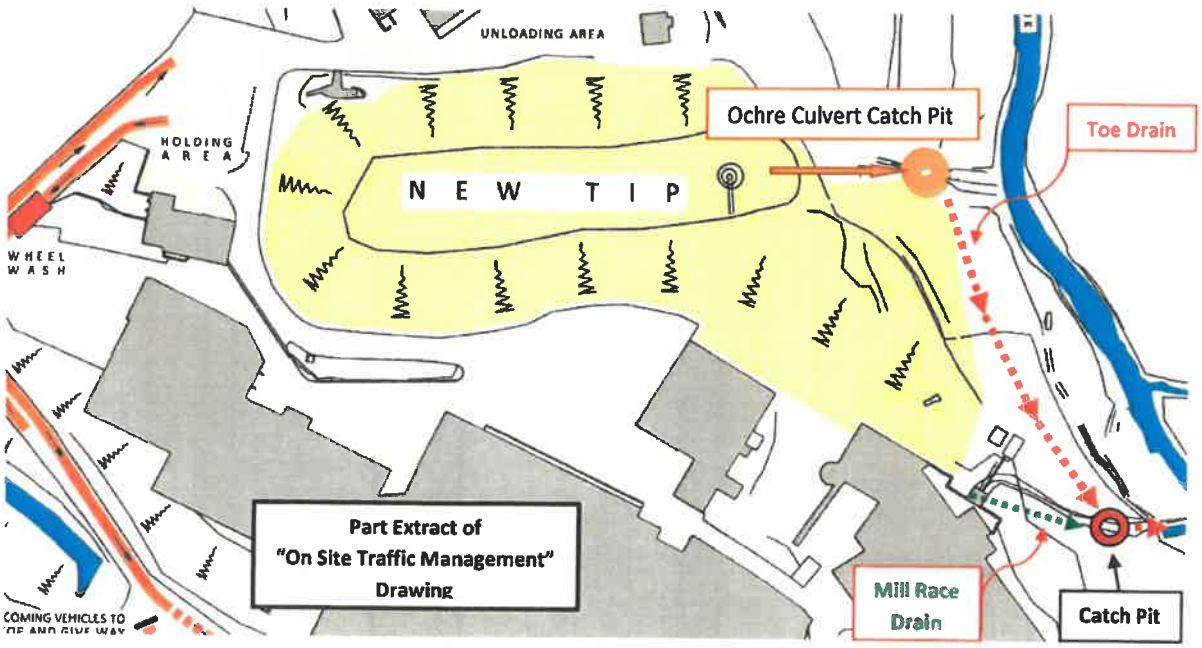


Figure 2.1.4 – Layout of additional drainage infrastructure.

A toe of batter drain was also installed along the inside line of the palisade perimeter fence to control any surface water run-off in this area. This was connected to a new catch-pit which was constructed on the exiting Mill Race drain which discharges directly into Eagley Brook (see Figures 2.1.4 & 2.1.5).

Fig 2.1.5 'Ochre' culvert Catch-pit ...with Replacement Pipe .....and Toe of Batter drain.

During these initial restoration works all inspections at the acknowledged primary groundwater discharge point (the 'ochre' culvert) were increased and surface / ground water run-off was controlled to mitigate the risk of pollution.

2.2 Treatment, testing and excavation of the 'New Tip' paper pulp

The rate of leachate production / extraction was closely monitored following the initial stockpiling within the western portion of the 'New Tip'. When the leachate production had sufficiently diminished the consistency of the paper pulp was investigated (22nd September 2015). Samples were taken by SGP using a hand auger and the resultant moisture contents established. These results mirrored the December 2012 findings in so much as the density of the material appeared to increase (decrease in moisture content) towards the east (downhill part of the landfill). Characteristically the material was significantly firmer. The western end of the 'New Tip' (which is most affected by surface water runoff) improved to a 55% moisture content whereas the paper pulp to the east, closest to the new sump, achieved 19% and in the central area 37%. The leachate and surface water runoff pumping has continued up to the present day on a regular basis to prevent uncontrolled discharges to Eagley Brook.

During the period of 'moisture content reduction' Urban Regen Ltd. and SGP carried out small scale trials on the paper pulp utilising different additives (e.g. boiler ash, crushed brick / dust and soda ash) and varying concentrations of cement and lime (calcium oxide / slaked lime) with the intent of establishing a procedure to produce a paper pulp blend which was

geotechnically stable and non-polluting for use as a restoration material on the 'Old Tip'. On evaluation of these bench scale site trials, it was considered that 4 of 19 no tests produced satisfactory results in terms of improved handling performance following initial curing and were therefore submitted for multi stage leachate testing (commonly known as 'Tank Tests').

Following these site trials SGP concluded (***R1635-N04 14/10/2015 ~ Waste Treatment Review***) that the potential for generation of polluting leachate from stabilised paper pulp appears to be insignificant following curing whilst displaying improved handling and stability rendering it suitable for use in the restoration of the site.

Subsequently, in February 2016 Environmental Recovery Ltd. (now Urban Soil Solutions Ltd.) were retained to review the results from the bench scale site trials undertaken by Urban Regen and SGP. The review was to determine the feasibility of utilising their "Retek Process" to modify the paper pulp so that it could be rendered environmentally safe and form a suitable engineering fill for re-use on the 'Old Tip' as part of the landfill cover system (following regulatory approval / permitting).

Following the review by Environmental Recovery Ltd., SGP updated their Closure Plan (***R1635-R08v5 June 2016)*** to incorporate the "Retek Process" Treatability Report which was duly issued to the Environment Agency.

Following discussions and a subsequent meeting with the Environment Agency (Bruce Westwood and Jordan Gibson 20/9/16) it was concluded that further testing was required. The Environment Agency stated that as part of a Waste Recovery Plan (WRP) it was appropriate to augment the previous 'Tank Tests' with a specific (for granular materials) 'Up flow Percolation Test' to authenticate an 'End of Waste Decision' and the suitability of re-using the treated 'New Tip' paper pulp as part of the landfill cover system of the 'Old Tip'.

Fig 2.2.1 Treated 'New Tip' paper pulp sample

Suitable samples were prepared (see Figure 2.2.1) and tested accordingly with the results compared against a potential substitute 'non-waste' material by SGP. Subsequently SGP compiled ***'Review of Testing on Cement Stabilised New Tip Waste Sludge'*** (R1635-L08/afs dated 17/01/25). This was duly issued to the Environment Agency for information and comment (17-01-26).

On review the Environment Agency concluded that they were satisfied that the treated paper pulp material produced was suitable for its intended use as a gas drainage layer within the capping system of the 'Old Tip'. However, the Environment Agency considered that if it was to be deposited as an inert (WAC) waste engineering material for site restoration then a satisfactory assessment of any derived leachate would be required to show there would be no risk to controlled waters beneath the site.

SGP subsequently produced an assessment ***'Further risk assessment for cement-stabilised New Tip Waste sludge, Springside Mills, Belmont'*** (R1635-L09/afs) which was submitted to the Environment Agency. Upon review it was deemed satisfactory by Jordan Gibson which enabled Bruce Westwood to formally accede to the proposal (17-3-16) to treat the encumbering paper pulp in the 'New Tip' and then incorporate this treated material into the capping system of the 'Old Tip'. This operation was to be carried out under the sole auspices of an approved Deployment Form under the Urban Soil Solutions Ltd **EPR/EB3704LN** permit (Operation of Waste Mobile Plant).

Subsequently, all relevant reports were updated and revised to reflect the agreed strategy and submitted to the Environment Agency for approval.

A deployment application was duly submitted by USSL on 20th April 2017 with formal approval notification being issued on 27th July 2017 to carry out the proposed treatment activities associated with the mobile plant permitting regime only. In accordance with earlier discussions and tacit approvals from the Environment Agency (Bruce Westwood & Jordon Gibson) Urban Springside Ltd. applied for a minor variation to the Old Tip EAWML 53658 license to allow the use of the treated 'New Tip' paper pulp within the 'Old Tip' restoration.

The Permit Variation application was submitted to the EA in December 2017 with the updated Final Closure Report RO8 v6 appended. Following further discussions with Jordan Gibson he confirmed (9th March 2018) that the application would be "Duly Made" and that prior to determination Urban Springside Ltd. could commence the treatment operations and subsequently move the treated material in cementitious aggregate form onto the Old Tip for temporary storage pending its use in the final capping and restoration work of the 'Old Tip'.

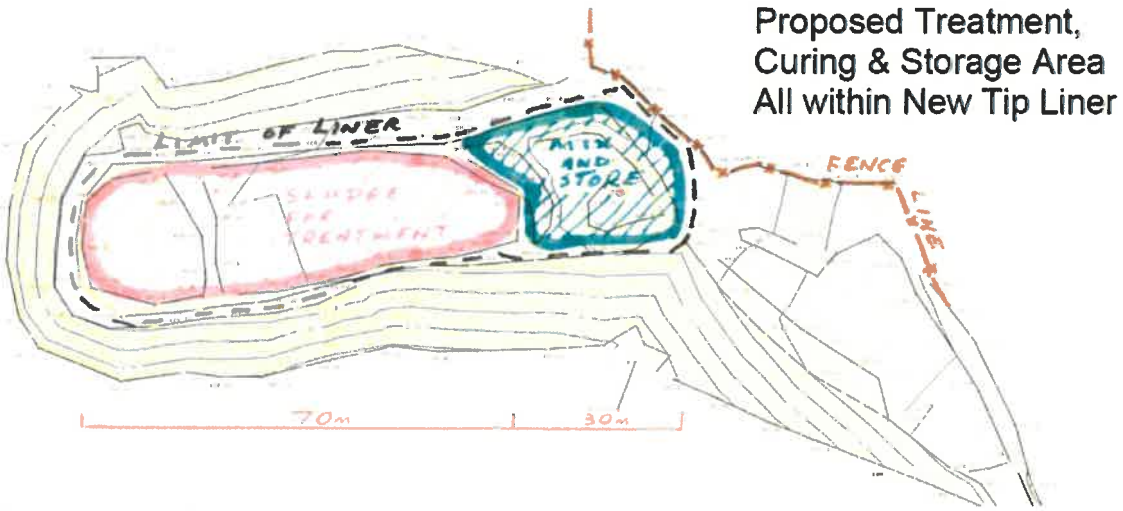


Fig 2.2.2 Location of Proposed Mixing & Storage Area.

Paper pulp treatment is to be carried out within the confines of the liner at the eastern end of the 'New Tip' on the area already backfilled with ash (see Fig 2.2.2) utilising an excavator with a toothless bucket (see Fig 2.2.3)

Figure 2.2.3 Smooth edged bucket.

The mixing is to be carried out in accordance with the approved Deployment Form, under the supervision of a WAMITAB technically competent manager provided by Urban Soil Solutions Ltd. (USSL). Working within the confines of the impermeable liner of the 'New Tip' at all times, Urban Regen Ltd. are to work in a westerly direction recovering the paper pulp using a 360° excavator and mixing it with cement (delivered in 1.5t super sacks) in the designated area to replicate the bench trials and ensure a homogeneous mixture.

It is envisaged that as the paper pulp is excavated from its eastern end that the remaining bulk material will slump back naturally into the resultant void due to the natural down valley gradient of the 'New Tip' (as during earlier moisture reduction works). This will ensure that the paper pulp remains within reach of the 360° excavator at all times.

The supply of paper pulp may be supplemented as necessary by relocating paper pulp from the western end of the 'New Tip' by means of a 25T dump truck travelling along the ash bund located on the outer north side of the 'New Tip'.

There is a necessity for the treated mixture to be allowed to cure and it is anticipated that upwards of 300m^3 could be treated weekly whilst remaining stored (space for approx. 700 to 800m^3 currently) within the extents of the 'New Tip'.

If necessary, a secondary mixing area could be prepared to the western end of the 'New Tip' or the eastern mixing area extended dependent upon whether all the paper pulp is to be treated prior to it being relocated to the 'Old Tip'

Once the treated paper pulp has cured and satisfactory confirmatory testing carried out, the stabilised material will be transferred by 25T dump truck to a temporary stocking area adjacent to the 'Old Tip' in preparation for re-use as part of the proposed cover system.

It is proposed that up-flow percolation tests (UPT) are used for confirmatory testing to determine the leachable fraction of pollutants of concern from the treated paper pulp to demonstrate compliance (as detailed in ***'Proposal for compliance testing on cement-stabilised New Tip Waste sludge – v6'***).

All confirmatory testing samples are to be collected by suitably competent persons (SGP). Representative bulk samples (circa 10kg) of the treated paper pulp are to be collected immediately following treatment using the multi-point composite sampling method (as detailed in Appendix D of WM3).

Initially, 1 no sample is to be obtained per 500m^3 of treated material for the first 1,000m^3. If the results are constant and confirm an appropriate degree of homogeneity and no exceedances of criteria are reported, the subsequent sampling will be reduced to 1 no sample per 1,000m^3.

The bulk sample is to be split and sub-sampled to provide the mass required for the UPT's and allowed to cure with a duplicate prepared and stored in the event further assessment or repeat testing is required. Chain of custody documentation shall be retained.

Up-flow percolation tests (CEN/TS 14405:2004) and analysis of elutes is to be carried out by a suitably accredited laboratory.

Elute concentrations are to be compared to either the discharge consent limits for the 'Old Tip' (inc' EQS for substances not given a site-specific value), or the previous average values obtained by up flow percolation testing carried out during the treatment trials (which were assessed as not likely to cause any significant impacts on the surrounding controlled waters receptors). These values are detailed in Table 2.2.1 (unshaded cells).

Substance	Surface water quality standard	Average leachable value from UF percolation tests (assessed as no risk)	Old Tip discharge limit (NPSWQD006635)
Arsenic	50	2.25	No exceedance EQS in watercourse
Cadmium	5	0.02	No exceedance EQS in watercourse
Chromium VI	5	<3	No exceedance EQS in watercourse
Copper	22	5.2	No exceedance EQS in watercourse
Nickel	100	1.0	No exceedance EQS in watercourse
Lead	10	0.55	No exceedance EQS in watercourse
Zinc	200	3.5	No exceedance EQS in watercourse
Ammoniacal nitrogen	1,000	50	5,000
Chloride	250,000	2,000	No exceedance EQS in watercourse
Nitrate	-	500	No exceedance EQS in watercourse
Sulphate	400,000	69,500	No exceedance EQS in watercourse
Total Organic Carbon	-	7,500	No exceedance EQS in watercourse
BoD	-	-	20,000
pH	-	7.4	5-9

Table 2.2.1 Elutes testing criteria (All figures other than pH are µg/l)

Any exceedances will undergo further assessment by SGP.

For the duration of the 'New Tip' treatment works SGP will carry out their risk-based monitoring plan (as set out in ***Closure Plan R1635-R08-v6 Appendix C***) for surface water and groundwater which has an increased frequency of leachate monitoring. Similarly, the Urban Springside Ltd. Project Manager will carry out daily (minimum) inspections at the acknowledged primary groundwater discharge point (the 'ochre' culvert). If any changes are observed (i.e. flow rate, odour or discoloration) the discharge pipe to Eagley Brook located within the new catch pit (see Fig 2.1.4) may be stoppered to enable temporary containment

of leachates prior to assessment by SGP. In this situation the leachates could be diverted, by pumping, to the onsite "water treatment facility" or tankered off site as necessary.

The proposed strategy allows for close monitoring and inspection by SGP of both the treated paper pulp and the existing liner in addition to their regular reporting and any additional items identified within the permitting requirements. The 'New Tip' leachate sump will continue to be utilised until the paper pulp removals / treatment are complete.

When the bulk of the paper pulp has been removed and treated any remnants remaining on the impermeable liner will be removed with an improvised squeegee fitted to a rotating grab attachment on the 360° excavator. This will allow SGP to carry out an inspection of the liner for damage / leaks and enable a thorough targeted sampling strategy to be prepared for the future closure of the 'New Tip'

NOTE: It is recognised and acknowledged by both the Environment Agency and Urban Springside Ltd. that the current Old Tip EAWML 53658 license will require a minor variation to enable its restoration and closure to be completed but that this should not delay any of the proposed works to either the 'New Tip' or 'Old Tip' but will be necessary to achieve the actual Closure of the 'Old Tip'.

2.3 'New Tip' closure

When the paper pulp has been treated and removed from the 'New Tip' the Environment Agency has insisted that the impermeable liner be completely removed. To mitigate the disposal of the liner it is understood (following discussions with disposal facilities) that further intensive cleaning of the liner by hand will be required. It will then need to be cut into 'manageable' pieces prior to being processed by a slow speed shredder. The resultant product will then be removed in skips to a suitably licensed facility.

When the liner has been removed the exposed sub-strata is to be inspected / tested in accordance with the approved Closure Plan for any localised contamination that may be present.

Upon satisfactory completion of the liner removal and testing, Urban Springside Ltd. will apply to surrender the permit EAWML 53997 associated with the 'New Tip'.

2.4 Enabling works to the 'Old Tip'

Currently the 'Old Tip' has an unsatisfactory profile with no capping and steep slopes of up to 1 in 5 that do not facilitate satisfactory restoration or gas management by the agreed methane bio-oxidation methodology. It is therefore necessary to re-grade the current surface topography.

Generally, the re-grade of the 'Old Tip' involves the cutting of soil and inert wastes located at the eastern end of the tip and infilling the landform to the west, particularly towards the concrete dam associated with the Lodge. The area in front of the concrete dam wall contains softer materials where ongoing consolidation continues; this area is expected to settle more than the higher main tip body to the east. This low area routinely floods during periods of heavy rainfall and as a part of the sites general maintenance it is periodically over pumped into the lodge overflow culvert (in accordance with the Environment Agency ***'Consent to Discharge' Permit Number NPSWQD006635/01***; the discharges of which are monitored on a regular basis). During the re-grade operation this area will require special treatment which will involve the utilisation of the 'Consent to Discharge' (up to $10m^3$/day) to remove rainfall / runoff from the encumbering paper pulp and allow it to air dry prior to placement of the restoration cap. In the event that the liquid being discharged becomes visually milky or fails any of the 'Consent to Discharge' criteria, then discharge via the culvert will cease and the liquids will be re-circulated onto the central mass of the 'Old Tip'.

Due to the high moisture content associated with the paper pulp located within the 'Old Tip' (especially to the west) it will be necessary to install temporary accesses utilising site derived ash (possibly reinforced with woven geotextile) as detailed previously for access to the paper

pulp in the 'New Tip' (see 2.1 Moisture Content Reduction). It is anticipated that a main spine road will be established east / west with additional north / south spurs extending from the spine road as necessary to enable the necessary re-grade to accommodate the prescribed cover system.

Predominately the cover system consists of coarse ash or hardcore (as a gas permeable / open textured / bio-oxidation layer) and the treated paper pulp from the 'New Tip' (as part of the cover layer used to raise levels to facilitate run off drainage) as prescribed in the Smith Grant LLP ***Closure Plan (R1635-R08-v6 Nov 2017)***. This being supplemented (following completion of the 2015 site trials) as described by their File Note R1635-N04 (14th Oct 2015).

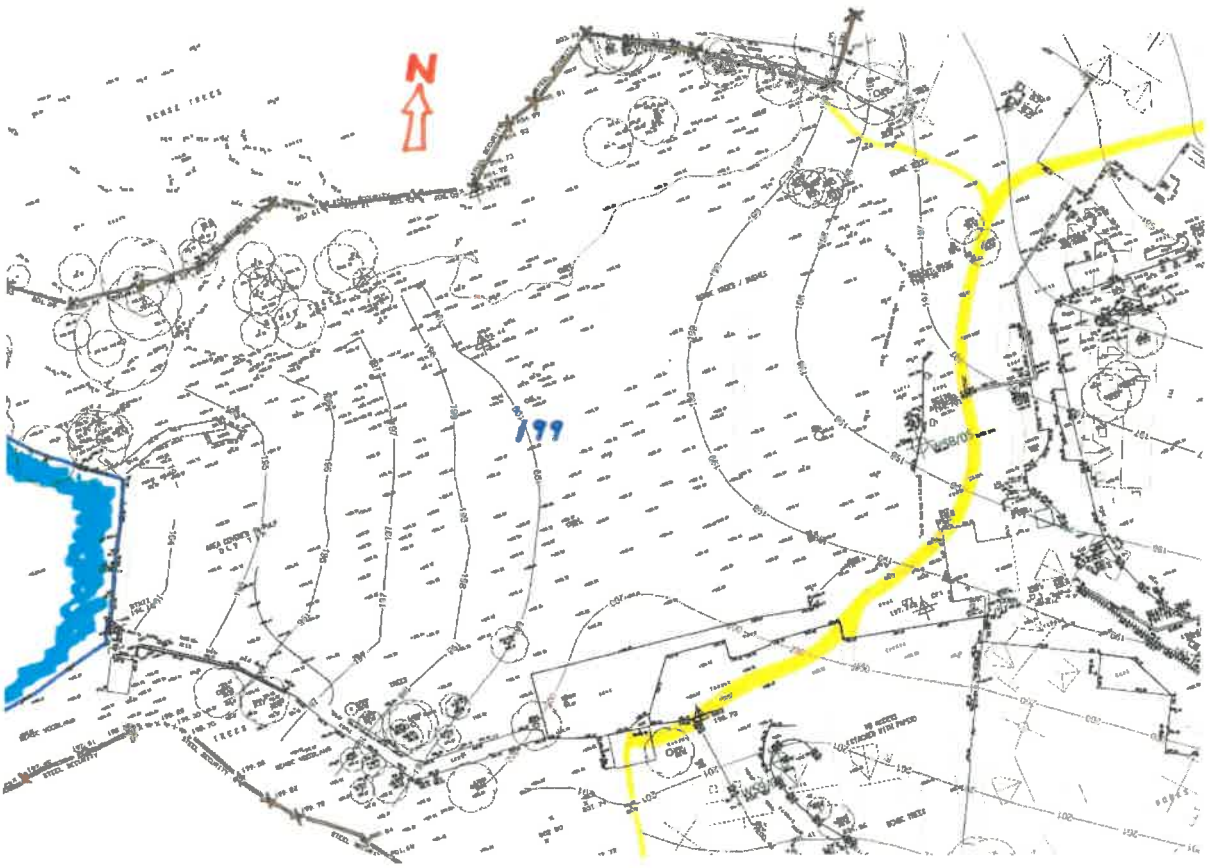


Figure 2.4.1 POS / Old Tip Remediation Area. *It should be noted that the area shown bounded by the western dam (blue) and the yellow line (back of footpath to development access road) and the fence lines (brown to north and south) is all "Public Open Space" (as designated by Planning Permission) This area is considerably larger than the actual footprint of the licensed 'Old Tip' boundary and the area occupied by paper pulp.*

Following the reprofiling operation it is proposed to stockpile circa 4-5,000m^3 of site derived low fines ash (for use as the gas permeable bio-oxidation layer) at the eastern end of the 'Old Tip'.

2.5 'Old Tip' peripheral drainage

The 'Old Tip' is bounded to the north and south by natural drainage gullies which are constantly charged with water (see Figure 2.5.1). The northern gully collects spring water from the adjacent natural sand embankment. The southern gully appears to collect natural spring water from the embankment to the south as well as a flow from the abandoned former mill race which is situated higher up the embankment just outside of the sites palisade boundary fence. Both gullies lie outside of the 'Old Tip' boundary but are the main sources of the water trapped against the concrete dam associated with the Lodge.

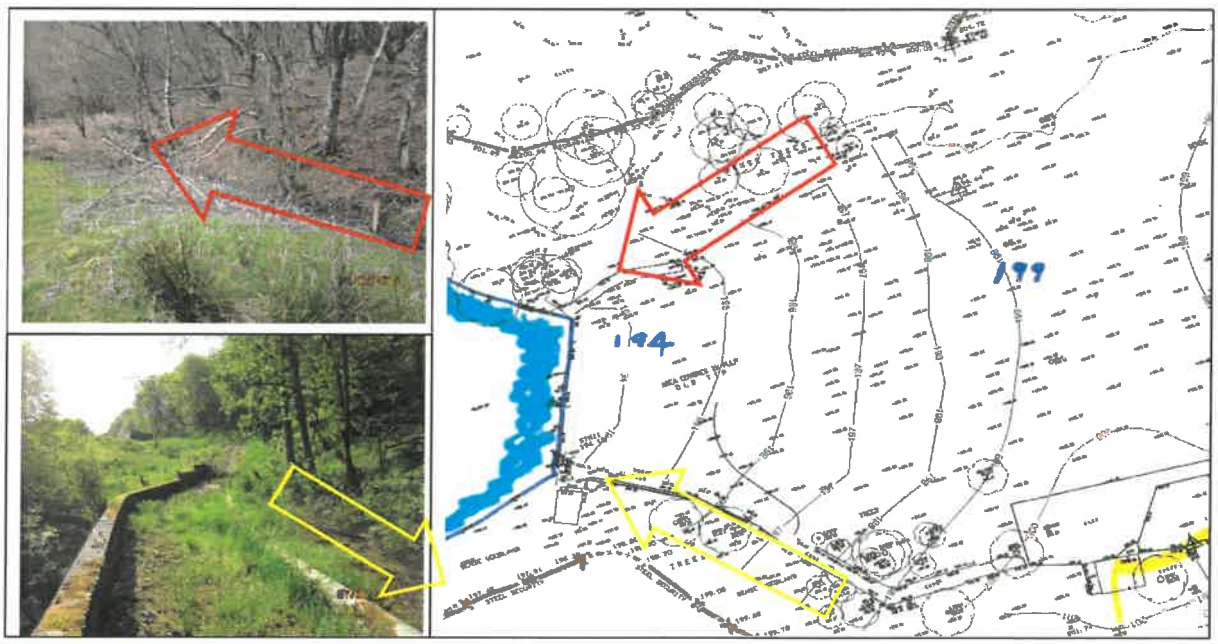


Figure 2.5.1 Natural drainage gullies within the POS Area ('Old Tip').

To mitigate the continuous inflow of water to the 'Old Tip' it is proposed to install Terram wrapped land drains along the gullies which will discharge directly into the existing Lodge. This is to be carried out prior to the re-grade works commencing. As the restoration works progress these drains can be extended / lifted to ensure surface waters are continually controlled and any recharge of the 'Old Tip' is minimised.

2.6 Concrete dam remediation details

The existing concrete dam (see Figure 2.6.1). has been inspected by a structural engineer (Reid Jones Partnership) who concluded that it was generally in a good overall condition, being plum and level along its length with no visible signs of distress or movement. However, it was recorded that there was a degree of seepage from the 'Old Tip' through the upper brickwork which was bedded on top of the lower concrete structure. It was recommended that the vegetation be removed, the brickwork re-pointed, and the hand rails replaced. It should be noted that the top of the concrete normally remains approximately 300mm above the normal dry weather water level.

Figure 2.6.1 The concrete dam (the 'Old Tip' is located to the left).

The remedials advised by Reid Jones Partnership are superfluous to the current designs for the concrete dam as the intention is to remove all the brickwork and form a gently sloping edge into the lodge water (see Figure 2.6.2). Large rocks are to be placed either side of the concrete dam. These are to be topped off with 75-100mm clean rocks for erosion protection which will be extended 300mm above the flood level recorded during the extreme conditions experienced at the site on Boxing Day 2015 (see Figure 2.6.3).

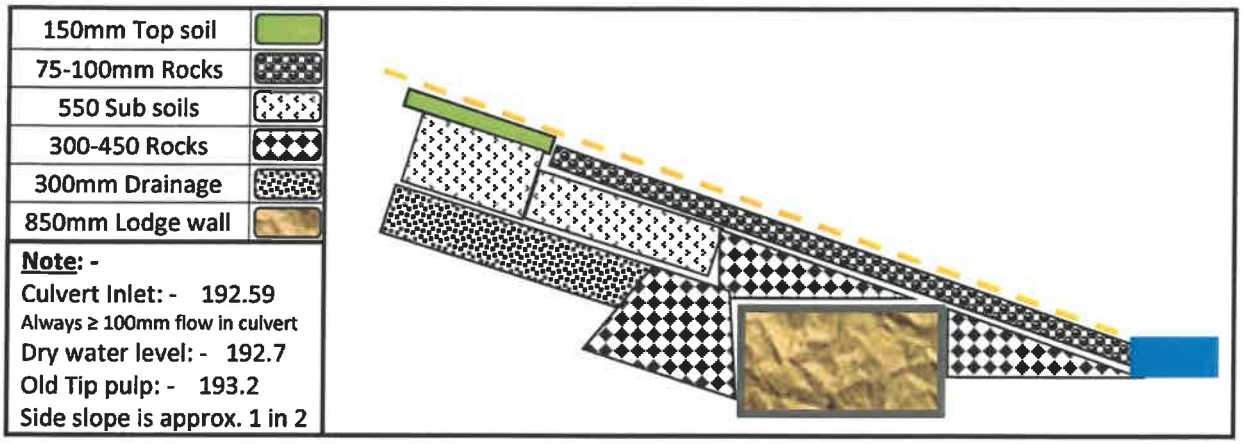


Figure 2.6.2 Proposed concrete dam cross section.

The existing culvert and overflow arrangements (see Figure 2.6.3) associated with the concrete dam are to remain, with the trash screen being refurbished in accordance with a flood risk engineer's comments. All drainage designs associated with the culvert including its discharge into Eagley Brook will be subject to approvals from the Local Authority Drainage Department.

Figure 2.6.3 Existing lodge overflow arrangement.

2.7 Installation of the engineered 'Old Tip' cap

Following the re-grading of the 'Old Tip' to the required landform, the installation of the approved landfill cap (as detailed in the Smith Grant LLP ***Closure Plan R1635-R08-v6***) can commence. It is intended to utilise geotextiles between the requisite layers to ensure separation and to improve stability for machine movements during placement works (see also 2.4 Enabling Works to the Old Tip).

2.8 Programme

It is anticipated that the restoration works to the 'New Tip' will be carried out spring to autumn 2018. A 20-week period has been allocated to complete the restoration works which are to include the treatment of the paper pulp, liner removal and inspection, and the closure / license surrender application.

2.9 Inspection of restoration works

Urban Springside Ltd. geo-environmental consultant Smith Grant Partnership LLP will be attending site regularly during the restoration works to inspect, test, validate and record that the works are being carried out in accordance with the associated method statement and the regulator approved restoration design.

The treatment of the paper sludges within the confines of the 'New Tip' will be overseen by Urban Soil Solutions Ltd. Ian Hadfield (WAMITAB cert Nº 14127) to ensure compliance with the requirements of the agreed ***Deployment Notice (EB3704LN/W0001)***.

The Environment Agency will be kept fully informed of the progress of these works in order for them to inspect the works as necessary.

Upon completion of all restoration works an inspection by the relevant authorities will be invited to demonstrate that all areas have been adequately restored and secured. SGP will

also submit a completion report to the Environment Agency validating that the 'New Tip' has been 'emptied' in accordance with the approved methodology.

Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT
Environmental Consultancy
LLP

Partnership No: OC 300776

Proposal for compliance testing on cement-stabilised New Tip Waste sludge -v6

1. Background & Rationale

Several test methods were employed during the 2016/2017 treatment trials including total and leachable concentrations, tank tests and Upflow Percolation Tests (UPT) to assess a variety of treatment and recovery scenarios.

Based on the objectives of the treatment: to provide a stable, low-density granular methane oxidation layer, the most representative test was considered to be UPT. This is because the test is designed to reflect conditions in the unsaturated zone, simulating rainfall infiltration through a granular medium.

The UPT is generally regarded as less aggressive than other leachate tests which tend to predict the maximum availability of leachate but more aggressive than tank test; the test was carried out at the request of the Environment Agency as part of the feasibility assessment for the scheme to produce realistic infiltration leachate concentrations for use in risk assessment.

The assessment of these results (R1635-L08 & R1635-L09) indicated that the maximum likely leachable fraction of the materials obtained under UPT was unlikely to cause any pollution.

It is therefore proposed that the UPT are used to determine the leachable fraction of pollutants of concern from the treated materials to demonstrate compliance.

2. Sample Collection & Preparation

Representative samples of the treated New Tip sludge (~ 10 kg) will be collected immediately following treatment. Multi-point composite sampling method at simple random locations within the material as set out in Appendix D of WM3 will be adopted for sample collection which will be carried out by a suitably competent person.

One sample will be obtained from the first 500m^3 treated and a second sample from the subsequent 500m^3: provided the results are relatively constant confirming an appropriate degree of homogeneity and no significant exceedances of criteria are reported the subsequent sampling will be 1 sample per 1,000m^3.

The bulk sample will be split & sub-sampled to provide the mass required for UPT tests and allowed to cure with a duplicate prepared and stored in case further assessment or repeat testing is required. Chain of custody documentation shall be retained.

3. Leachate Testing

Upflow percolation tests (CEN/TS 14405:2004) and analysis of elutes will be carried out by an accredited laboratory.

Analysis of the elute will be completed for arsenic, cadmium, hexavalent chromium, copper, nickel, lead, zinc, ammoniacal nitrogen, chloride, nitrate, sulphate, total organic carbon (i.e. total dissolved carbon), Biological Oxygen Demand, and pH.

Eluate concentration results will be compared to either the discharge consent limits for the Old tip, including EQS for substances not given a site-specific value, or the previous average values obtained by Up flow percolation testing during the treatment trials (which were assessed as not

likely to cause any significant impacts on the surrounding controlled waters receptors), as indicated below (unshaded cells):

substance	surface water quality standard	Average Leachable value from UF percolation tests (assessed as no risk)	Old Tip discharge limit (NPSWQD006635)
arsenic	50	2.25	No exceedance EQS in watercourse
cadmium	5	0.02	No exceedance EQS in watercourse
chromium VI	5	<3	No exceedance EQS in watercourse
copper	22	5.2	No exceedance EQS in watercourse
nickel	100	1.0	No exceedance EQS in watercourse
lead	10	0.55	No exceedance EQS in watercourse
zinc	200	3.5	No exceedance EQS in watercourse
ammoniacal nitrogen	1,000	50	5,000
chloride	250,000	2,000	No exceedance EQS in watercourse
nitrate	-	500	No exceedance EQS in watercourse
sulphate	400,000	69,500	No exceedance EQS in watercourse
total organic carbon	-	7,500	No exceedance EQS in watercourse
BoD	-	-	20,000
pH	-	7.4	5-9

All figures other than pH are µg/l

Exceedances will undergo further assessment as had been previously carried out: it is noted that the targets provided are for discharge from the tip into the surrounding watercourses, and attenuation of leaching materials from the treated material within the tip is not considered.

It is noted that compliance ground and surface water monitoring will be continued throughout the duration of the works and continue in order to provide data on the long-term trends and additional reassurance that the operations have not resulted in pollution.

Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT
Environmental
Consultancy
LLP

Partnership No: OC 300776

R1635-L08/afs

25th January 2017

John Bamforth
Urban Springside Ltd.

By e-mail: john.bamforth@urbanregen.co.uk

Dear John

Review of testing on cement-stabilised New Tip Waste sludge

1. Background

1.1. It is proposed to manufacture a bespoke product to be used as a gas-drainage / regulation layer within the proposed capping system in restoration of the Old Tip and Springside Mills. The technical requirements are that
(a) the layer be granular and permeable (to permit drainage of gas and infiltrating rain, and accommodate seasonal groundwater variations),
(b) have sufficient strength in conjunction with geotextile layers to be able to support topsoil cover and light construction and maintenance loadings (say <10kPa),
(c) have low density so as to avoid excessive and point loading of the underlying very soft waste deposit, minimising the risk of potential displacement of the cover, and
(d) the product must be chemically non-polluting.

1.2. Natural materials such as mineral sands and gravels are less than ideal in that they have relatively high density compared to the underlying wastes, and are not available at the site, therefore requiring import from a quarry source. New Tip waste sludge is available, and previous testing by Urban Springside has demonstrated the potential suitability of cement-stabilised sludge as a substitute material. However we understand that in order to be able to use treated waste material for restoration of a closed landfill under the terms of the Landfill Directive, it has to be shown that the material is recovered and therefore no longer legally defined as waste. For this, the treated material must be suitable for the intended purpose, its' use is beneficial and substitutes for an equivalent non-waste material or product, and such use has no worse effects than the equivalent material being substituted.

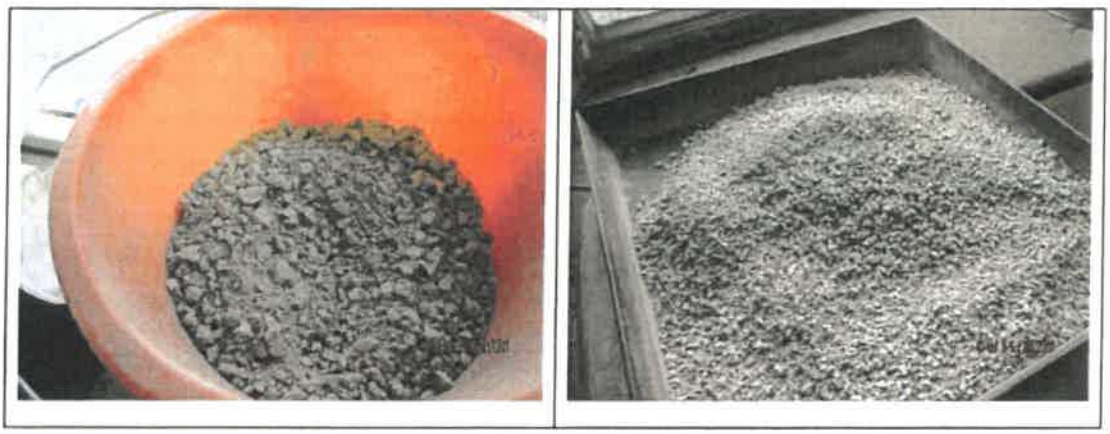
1.3. Evidence to support full recovery ("end-of-waste") of the cement-stabilisaed New Tip sludge may be obtained by comparing the performance of the material to the nearest available equivalent material that would have to be used as a gas drainage / regulation layer within the Old Tip restoration capping. The EA publishes supporting evidence for end-of-waste by use of material comparators (test data on equivalent non-waste products); the nearest analogous material is considered to be limestone aggregate that would be used in the event that recovered treated New Tip waste were not feasible (albeit with the disadvantage of increased density of the material). EA guidance is provided in publication "Material comparators for end-of-waste decisions: Construction materials: natural limestone aggregate", Report SC130040/R11 version 2, August 2016. In selecting limestone aggregate for the comparison, it is noted that the sludge

waste after treatment is formed into a stable aggregate with alkaline properties in which the predominant component is calcium carbonate and clay, as present within limestone.

1.4. Following initial discussions with the EA and submission of evidence concerning solid and leachate analyses of untreated and cement-stabilised New Tip sludges, the EA requested that an upflow percolation test (CEN/TS 14405:2004) be performed on the treated material to simulate the potential effects of rainfall infiltration and/or groundwater inundation within a cover layer. The testing undertaken by and on behalf of Urban Springside is described below.

2. Sample Preparation

2.1. A representative sample of fresh New Tip sludge (~ 5 kg) was collected by Urban Springside for cement stabilisation using cementing agent provided by treatment specialists United Retek. The sample was prepared by mixing in fresh state with additive at a ratio of 10 waste:1 cement and was allowed to air dry and cure for 1 week. The treated material formed a granular mass with particle size ranging from fine gravel to cobble size. The treated material was then ground to a fine gravel (maximum 4mm particle size) for testing purposes (see photos).



2.2. The sample was split and delivered to (i) Murray Rix for density and strength testing (geotechnical stability), and to (ii) Scientific Analysis Laboratories Ltd. (SAL) for up-flow percolation testing, ostensibly to CEN/TS 14405:2005 (chemical stability).

3. Geotechnical Properties

3.1. The Murray Rix test report is appended (ref: MRN 2305). The density of the sample following light compaction (2kg rammer) was determined to be 1.04 kg dm^{-3}. This result demonstrates low density for the treated product, at a similar value to wet sludge, and approximately 60% of quarry stone fine gravel.

3.2. The CBR value was 35% indicating strength equivalent to a non-plastic well-graded sand or sandy gravel.

3.3. The geotechnical test results indicate that the cement-stabilised waste meets the performance specification for the gas-drainage layer.

4. Upflow Percolation Testing

4.1. SAL carried out the testing in general accordance with the instructed method; the SAL analytical report is attached (ref: 612259-2). Testing involved placement of the sample within a column through which water was passed at a steady flow over a 20 day period. Eluate was collected at 48 hour intervals and was reported to be 1 litre in volume on each occasion. No reduction in permeability was noted over the test period. We are advised that the column diameter was 5 cm and the packed column length was approximately 30cm, giving a sample volume of 0.589 l. With a dry density of 1.04 kg/l, the sample mass would have been 0.61256 kg. This value has been used to determine the liquid:solid (L/S) ratio in calculating the concentration of leachable substances.

4.2. Analysis of the ten 48-hr eluate samples was carried out for arsenic, cadmium, hexavalent chromium, copper, nickel, lead, zinc, ammoniacal nitrogen, chloride, nitrate, sulphate, total organic carbon (i.e. total dissolved carbon) and pH.

4.3. Eluate concentration results are compared to surface water Environmental Quality Standards used in connection with the Springside Mills permitted landfills for assessing routine water monitoring results, as below:

substance	maximum	mean	median	surface water quality standard
arsenic	3.6	2.31	2.25	50
cadmium	0.10	0.041	0.02	5
chromium VI	<3	<3	<3	5
copper	13	6.3	5.2	22
nickel	4.0	1.7	1.0	100
lead	2.7	1.18	0.55	10
zinc	17	5.1	3.5	200
ammoniacal nitrogen	170	70	50	1,000
chloride	30,000	8,100	2,000	250,000
nitrate	26,000	7,800	500	-
sulphate	1000,000	218,700	69,500	400,000
total organic carbon	14,000	8,000	7,500	-
pH	10.5	7.93	7.4	-

All figures other than pH are µg/l

4.4. The eluate concentrations are all less than quality standards with the exception of sulphate which exceeded the standard in 3 out of 10 samples, although mean and median values are compliant. Sulphate concentrations declined as the testing progressed, and there is considered to be little environmental significance to the result. Other data generally show little overall trend with time.

4.5. Eluate concentrations have been converted to the released quantities by multiplying by the sample volume (1 litre) and dividing by the sample mass (0.61256kg) to provide results in mg/kg. These are compared to the quoted values in EA comparator tables for limestone aggregate taken from the EA waste comparator tool spreadsheet and reports (it is noted that there appears to be an error in the spreadsheet where it states that the units of dissolved organic carbon are % rather than the actual mg/kg). These results are compared below:

substance	Sample released quantity			EA limestone aggregate comparator (leachable)	
	maximum	mean	median	median	90th %ile
arsenic	0.0059	0.0038	0.0037	0.008	0.008
cadmium	0.0002	0.00007	0.00003	0.001	0.001
chloride	48.97	13.22	3.265	130.5	247
chromium (VI)	<0.0049	<0.0049	<0.0049	0.051	0.073
copper	0.021	0.010	0.008	0.045	0.082
organic carbon	22.85	13.06	12.24	9.77	18.4
lead	0.0044	0.0019	0.0009	0.02	0.0226
sulphate	1,632	357	113.45	179.5	348.2
zinc	0.0277	0.008	0.0057	0.0761	0.185

All figures are mg/kg DM

4.6. All metals and chloride results compare favourably with those for limestone aggregate. pH values are similar to those found for limestone. Dissolved organic carbon mean and median values are similar to limestone, although the maximum value is a little higher than the 90th percentile of limestone values. However the maximum sample value of 22.85 mg/kg is considerably less than the inert landfill waste acceptance criterion of 500 mg/kg, indicating that there is negligible pollution potential. The sulphate maximum concentration is higher than that found in limestone samples, and was higher than the inert landfill waste acceptance criterion of 1,000 mg/kg however these results were short-lived, and the mean and median results compare with those from limestone aggregate. In the context of the site the sulphate result is not significant. Overall, the results are considered to compare favourably with the potential substitute product of limestone aggregate, demonstrating suitability for use of the cement-stabilised material.

5. Conclusions

5.1. The test results on the cement-stabilised sludge from the New Tip demonstrate that the material is suitable for use as a gas drainage and regulation layer in the base of the restoration capping for the Old Landfill, Springside Mills, Belmont. The material physical properties combine the qualities of strength, stability, low density and permeability in a way which is not available from natural products. Use of the treated material within the restoration cover to the Old Tip is therefore sustainable and beneficial and offers improved performance compared to alternatives such as mineral aggregate.

5.2. Comparison of upflow percolation test results with those for a potential substitute material, limestone aggregate, demonstrate generally similar leaching characteristics, although sulphate and dissolved organic carbon concentrations were higher in the short term. The overall results are not considered to indicate significant pollution potential and provide evidence that the treated material may be deemed to be fully recovered and no longer waste, suitable for sustainable use within the restoration of the Old Tip.

5.3. It is recommended that full scale cement stabilisation treatment is commenced to demonstrate the functionality and practicality of treatment and placement of treated product as part of the Old Tip restoration. Testing and monitoring arrangements will be included within the deployment documentation to be prepared by the waste treatment specialist contractor.

Yours sincerely
For: Smith Grant LLP

A F Smith BSc PhD MCIWM SiLC, Partner

Encs

MURRAY RIX

CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client	Urban Regen Ltd
Address	23 Spring Vale Off Bury Road Edgeworth Bolton BL7 0FS
Contract	Springside Mills
Job Number	MRN 2305
Date of Issue	08 November 2016
Page	1 of 2

Approved Signatory

S J Hutchings, A W Hutchings, A Richardson

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted. This does not, however, guarantee the balance of the materials from which the tested samples have been taken to be of equal quality.

MURRAY RIX

33C VAUXHALL IND. ESTATE, GREG STREET
REDDISH, STOCKPORT SK5 7BR
TEL 0161 475 0870 FAX 0161 475 0871

TEST CERTIFICATE

CALIFORNIA BEARING RATIO
BS EN 13286-47:2012
MOISTURE CONTENT METHOD BS EN 1097-5:2008

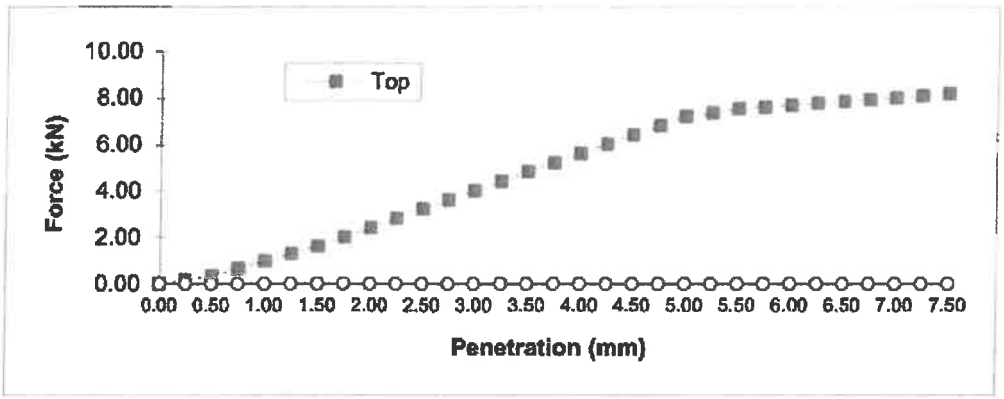
CLIENT	Urban Regen Ltd
SITE	Sprinside Mills
JOB NUMBER	MRN 2305

SAMPLE LABEL	Paper Pulp	DATE SAMPLED	N/A
LAB SAMPLE No	68358	DATE RECEIVED	04-Nov-16
DATE TESTED	07-Nov-16	SAMPLED BY	Client

MATERIAL	Paper Pulp
ADVISED SOURCE	Site

COMPACTION METHOD	Recompacted at as received moisture content using the 2.5kg rammer			
TEST CONDITION	0 Day Cure	SURCHARGE MASS	2.00	kg
PROVING RING No.	1155-9-18608	CALIBRATION	0.008011	kN/div
BULK DENSITY(Preparation)	1.04	DRY DENSITY (Preparation)	0.91	Mg/m3
BULK DENSITY(At time of test)	1.04	DRY DENSITY (At time of test)	0.91	Mg/m3

AGE OF SPECIMEN AT TEST		0 Day	CURING TIME	0 Day
CURING CONDITIONS	Sealed	20 °C	SOAKING TIME	N/A



CBR value 35.0 % **Moisture Content** 15 %

REMARKS
0% retained on the 22.4mm sieve, Surcharge weight shown represents 1 surcharge ring

SIGNED

NAME A Richardson (Laboratory Manager) DATE 08-Nov-16

SCIENTIFIC ANALYSIS LABORATORIES
DELIVERING SCIENCE

Scientific Analysis Laboratories is a limited company registered in England and Wales (No 2514788) whose address is at Hadfield House, Hadfield Street, Manchester M16 9FE

Scientific Analysis Laboratories Ltd

Certificate of Analysis

Hadfield House
Hadfield Street
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Manchester
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Tel : 0161 874 2400
Fax : 0161 874 2468

Report Number: 612259-2

Date of Report: 19-Dec-2016

Customer: Urban Regen LTD
23 Springvale
Edgworth
Bolton
BL7 0FS

Customer Contact: Mr. John Bamforth

Customer Job Reference:
Customer Site Reference: Springside Mills Belmont
Date Job Received at SAL: 04-Nov-2016
Date Analysis Started: 07-Nov-2016
Date Analysis Completed: 19-Dec-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

UKAS TESTING
1549

Report checked and authorised by :
Mr Richard Wong
Project Manager

Issued by :
Mr Richard Wong
Project Manager

SAL Reference: 612259
Project Site: Springside Mills Belmont
Customer Reference:

Leachate
Metals

Analysed as Water

				SAL Reference	612259 002	612259 003	612259 004	612259 005	612259 006	612259 007	612259 008	612259 009	612259 010	612259 011
				Customer Sample Reference	Sample 1 1	Sample 1 2	Sample 1 3	Sample 1 4	Sample 1 5	Sample 1 6	Sample 1 7	Sample 1 8	Sample 1 9	Sample 1 10
				Date Sampled	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating
Determinand	Method	Test Sample	LOD	Units										
As (Total)	T301	Total	0.2	µg/l	1.7	3.1	3.2	3.6	2.2	1.9	1.5	1.2	2.4	2.3
Cd (Total)	T301	Total	0.02	µg/l	<0.02	0.10	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	0.06	0.07
Chromium VI	T686	AR	3	µg/l	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Cu (Total)	T301	Total	0.5	µg/l	5.5	13	8.4	7.2	5.8	4.8	4.8	4.3	4.9	4.3
Ni (Total)	T301	Total	1	µg/l	2	4	1	<1	<1	<1	<1	<1	2	3
Pb (Total)	T301	Total	0.3	µg/l	0.5	2.4	0.5	1.5	0.6	<0.3	0.3	<0.3	2.7	2.7
Zn (Total)	T301	Total	2	µg/l	<2	17	4	3	3	<2	4	<2	6	8

SAL Reference: 612259
Project Site: Springside Mills Belmont
Customer Reference:

Leachate
Miscellaneous

Analysed as Water

				SAL Reference	612259 002	612259 003	612259 004	612259 005	612259 006	612259 007	612259 008	612259 009	612259 010	612259 011
				Customer Sample Reference	Sample 1 1	Sample 1 2	Sample 1 3	Sample 1 4	Sample 1 5	Sample 1 6	Sample 1 7	Sample 1 8	Sample 1 9	Sample 1 10
				Date Sampled	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating	Deviating
Determinand	Method	Test Sample	LOD	Units										
Ammoniacal nitrogen	T686	F	0.05	mg/l	<0.05	0.17	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.11
Chloride	T686	F	1	mg/l	1	30	4	2	2	1	1	1	18	21
Nitrate	T686	F	0.5	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.6	1.2
Sulphate	T686	F	0.5	mg/l	70	1000	500	280	140	43	20	9.3	69	45
Total Organic Carbon	T21	AR	1	mg/l	5	14	11	9	6	5	5	4	11	10
pH	T7	AR			7.4	7.1	7.4	7.3	7.3	7.3	7.4	7.4	9.7	10.5

Index to symbols used in 612259-2

Value	Description
Total	Total
AR	As Received
F	Filtered
U	Analysis is UKAS accredited

Method Index

Value	Description
T7	Probe
T301	ICP/MS (Total)
T21	OX/IR
T686	Discrete Analyser

Accreditation Summary

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Ammoniacal nitrogen	T686	F	0.05	mg/l	U	002-011
Chloride	T686	F	1	mg/l	U	002-011
Nitrate	T686	F	0.5	mg/l	U	002-011
Sulphate	T686	F	0.5	mg/l	U	002-011
Total Organic Carbon	T21	AR	1	mg/l	U	002-011
pH	T7	AR			U	002-011
As (Total)	T301	Total	0.2	µg/l	U	002-011
Cd (Total)	T301	Total	0.02	µg/l	U	002-011

Determinand	Method	Test Sample	LOD	Units	Symbol	SAL References
Chromium VI	T686	AR	3	µg/l	U	002-011
Cu (Total)	T301	Total	0.5	µg/l	U	002-011
Ni (Total)	T301	Total	1	µg/l	U	002-011
Pb (Total)	T301	Total	0.3	µg/l	U	002-011
Zn (Total)	T301	Total	2	µg/l	U	002-011

Contaminated Land
Air Quality
Environmental Audit

SMITH GRANT
Environmental Consultancy
LLP

Partnership No: OC 300776

R1635-L09/afs

27th February 2017

John Bamforth
Urban Springside Ltd.

By e-mail: john.bamforth@urbanregen.co.uk

Dear John

Further risk assessment for cement-stabilised New Tip Waste sludge, Springside Mills, Belmont

1. Background

1.1. It is proposed to utilise cement-stabilised New Tip sludge treated to form a stable granular lightweight aggregate as a regulation and gas drainage layer across the Old Tip; this will comprise the basal part of the restoration capping. Upflow percolation testing on the treated New Tip sludge has demonstrated the suitability of the treated material for use as a base layer in the restoration capping of the Old Tip (ref: SGP Letter R1635-L08). However in reviewing the results of this testing the Environment Agency has requested additional assessment of risk to controlled waters with respect to potential sulphate and total organic carbon releases from the treated material due to results in excess of comparable results from limestone aggregate.

1.2. The hydrogeology of the Old Tip is described in SGP report R1635-R01-v3. The conceptual site model in relation to the proposed placement of the treated sludge layer summarised below:

2. Conceptual Site Model

2.1. *Sources:*
Treated sludge subject to leaching via (i) rainfall (across general area of Old Tip sludges ~ 6000m², as average 0.5m thick layer) or (ii) intermittent saturation by groundwater (low-lying area adjacent to Mill Lodge ~100m²) – pollutants of interest are a) dissolved calcium sulphate and b) total organic carbon, principally in the form of fine cellulose fibres;

Upflow percolation tests for the above substances gave the following eluate concentration results:

Table 1. Upflow percolation test results for proposed cover material (treated sludge)

substance	maximum	mean	median	surface water environmental quality standard (EQS)
sulphate	1000	218.7	69.5	400
total organic carbon	14	8	7.5	-

All figures are mg/l

There is no specified surface water environmental quality limit for sulphate under the Water Framework Directive (2000/60/EC) or daughter directives. The Environment Agency non-statutory EQS is derived from recommendations by the Water Research Council (WRC). WRC noted that there was little evidence for sulphate toxicity in aquatic systems, but that impacts were most likely to arise as a result of osmotic effects, as for salinity. Other regulatory authorities have imposed sulphate standards as a consequence of veterinary effects (as a laxative) upon watering livestock, with Australia and Canada setting guideline values of 1,000 mg l^{-1} to protect livestock drinking water.

Due to the absence of observed toxic effects, the World Health Organisation has not recommended a human health based standard for sulphate in drinking water. A standard of 250 mg l^{-1} has been suggested for drinking water (and hence groundwaters supporting potable supplies); this is principally to avoid possible taste or odour, although it is noted that many groundwater resources in former mining areas and regions with natural dolomite or evaporite bedrocks cannot meet this standard, and that bottled mineral waters frequently contain much higher concentrations of sulphates.

Sulphate is a compound of sulphur and oxygen. Sulphur is an essential plant and animal nutrient. There are chemical and biological processes by which sulphate can be removed from solution in water, generally involving reduction to remove the oxygen, or the addition of cations that form an insoluble precipitate with sulphate. Reduction processes involve the generation of sulphide ions, or dissolved hydrogen sulphide gas. Sulphides will form insoluble precipitates in reaction with many metal salts including iron, but sulphide or hydrogen sulphide gas are particularly toxic to aquatic organisms; the EQS for dissolved sulphide is 0.25 µg l^{-1}.

Total organic carbon (TOC) is a measurement of all organic carbon, and in relation to the treated sludge the key organic constituents are natural compounds of plant cellulose and lignin. The potential significance of these lies within the potential for degradation by micro-organisms leading to possible deoxygenation of the water. This potential may also be expressed in terms of Chemical Oxygen Demand (COD) which is the amount of oxygen required to oxidise all matter to carbon dioxide and water in the sample; COD testing is routinely carried out on leachates, groundwater and surface water around the Old Tip. The stoichiometry of cellulose $(C_6H_{10}O_5)_n$ means that each carbon atom in the cellulose will, if fully degraded, potentially react with one oxygen molecule, and typically COD will therefore be a factor of ~3 times the TOC concentration. Accordingly the eluate TOC results indicate equivalent COD values typically as follows: maximum 42 mg/l, mean 24 mg/l.

2.2. *Controlled waters receptors:*

a) Mill Lodge surface water impoundment and overflow to downstream Three Nooked Shaws Brook (TNSB), flowing to Eagley Brook
b) Eagley Brook via original valley pathway (see below)

Existing water quality data including sulphate and COD values are available for a number of monitoring points over several years. Data for the last 2 years of quarterly monitoring are summarised in the table below.

Table 2. Last 2 years of quarterly water monitoring data at key locations

		Apr-15	Jul-15	Oct-15	Feb-16	May-16	Jul-16	Oct-16	Feb-17	mean	median	max	95%ile
Old Tip discharge	SO4	*0.5*	*0.5*	4.9	4.4	0.6	2.3	1.6	2.4	2.2	2.0	4.9	4.7
	COD	45	42	38	16	33	45	45	25	36.1	40.0	45.0	45.0
Old Tip Leachate (BH3/11)	SO4	*0.5*	*0.5*	*0.5*	*0.5*	*0.5*	2.5	*0.5*	1.6	0.9	0.5	2.5	2.2
	COD	920	590	330	190	480	420	400	270	450.0	410.0	920.0	804.5
Mill Lodge (SWR1)	SO4	11	6.7	7	8.8	7.5	8.2	9.5	5.3	8.0	7.9	11.0	10.5
	COD	26	20	50	13	5	16	16	35	22.6	18.0	50.0	44.8
"Ochre" Culvert (SWR5)	SO4	69	99	130	120	63	54	56	63	81.8	66.0	130.0	126.5
	COD	8	5	13	0.5	5	5	15	27	9.8	6.5	27.0	22.8
Eagley Brook (SWR6)	SO4	7.6	9.8	8.3	8.4	71	7.2	6.5	4.9	15.5	8.0	71.0	49.6
	COD	20	16	37	21	11	35	32	30	25.3	25.5	37.0	36.3

results are mg/l, results in italics are below the limit of detection

Environmental data for TOC are not routinely collected, but samples obtained on 22/02/17 from the Mill Lodge and Eagley Brook sampling sites (SWR1 and SWR6 respectively) provided TOC values of 12 and 14 mg/l (results certificate attached).

The catchment contains extensive peat moorland and the local surface waters are typically peaty, containing suspended solids of natural humic acids, lignin and cellulose.

Flow monitoring data for the local watercourses are not available, with the nearest monitoring station downstream being the River Croal at Farnworth Weir (NRFA Station 69024). The catchment area for this station is 145km^2 and the long-term mean flow is 2.988m^3/s. This equates to an average effective rainfall rate of 650mm/y; this may be low when related to the actual site catchment alongside Winter Hill where rainfall is typically in the range 1300-1700 mm/y. The catchment for Eagley Brook below the site is estimated to be 15.8 km^2, and taking the above rainfall rate of 650mm/y this gives a mean river flow at the downstream side of the site of 0.33m^3/s. The catchment for TNSB at the Mill Lodge outlet is estimated to be 1.3 km^2 and the derived mean flow is 0.03m^3/s. The mean flow in the Ochre Culvert downgradient of the Old Tip is estimated at 1-3 l/s.

From the above catchment analysis, typical mean dilution rates for water draining between the Old Tip potential source area (0.6 ha) and Mill Lodge/TNSB and Eagley Brook are estimated to be at least 1:100 and 1:1000 respectively. In dry weather conditions it is likely that flows through the cover of the Old Tip will reduce to negligible rates, and therefore risks of pollution transport into receiving waters are likely to be mimimal under low-flow conditions.

2.3. *Pathways*

a) Sub-horizontal drainage through base of placed cover over existing waste surface westwards to Mill Lodge; Mill Lodge then drains via TNSB culvert to Eagley Brook;
b) Vertical infiltration of seepage entry to Old Tip landfill body with subsequent lateral drainage westwards to Mill Lodge
c) Vertical infiltration of seepage entry to Old Tip landfill body with subsequent lateral drainage eastwards via infilled valley to "Ochre Culvert" and Eagley Brook

The geology surrounding the site is low permeability glacial till and all site drainage either flows west (estimated ~80%) to Mill Lodge, or east (estimated ~20%), as perched groundwater within made ground and relict drains via the ash-filled valley to Ochre Culvert and Eagley Brook. Ochre Culvert also collects drainage from other parts of the valley including old ash tips and the former paper mill complex.

3. Risk Assessment – Total Organic Carbon

3.1. The maximum and mean eluate concentrations for treated sludge were 14 and 8 mg/l respectively. The TOC concentrations of the surface water receptors at Mill Lodge and Eagley Brook on 22/02/17 were 12 and 14 mg/l respectively. On this comparison, the placing of treated sludge as part of the Old Tip restoration (as worst case, using upflow leaching data to represent total inundation of cover) produces short-term concentrations similar to or lower than the receiving surface waters. This is highly unlikely to result in any significant increase in TOC levels within either the Mill Lodge or Eagley Brook, even without considering attenuation or dilution effects.

3.2. Converting the eluate TOC to equivalent COD values by using a factor of 3, the eluate CODs would be 42 mg/l (maximum) and 24 mg/l (mean) respectively. These are compared to the long term COD values of leachate within the Old Tip waste body (920 max, 450 mean mg/l) and discharge point adjacent to the Mill Lodge (45 max, 36 mean mg/l). Again it can be seen that the treated waste carries lower concentrations than the directly adjacent waters associated with the Old Tip, and therefore the proposed treated sludge use in restoration would not increase concentrations in these bodies.

3.3. The overall concentrations of TOC (and likely equivalent COD) in the eluate are considered to be low and are unlikely to result in any significant deoxygenation of surface waters. The risks from TOC are therefore concluded to be insignificant with respect to all controlled waters receptors and dependent ecosystems.

4. Risk Assessment – Sulphate

4.1. The maximum and mean eluate sulphate concentrations for treated sludge were 1,000 and 219 mg/l respectively. Given that the sulphate is likely to arise from cementitious material combined with limestone fillers, the dominant chemical form is likely to be calcium sulphate. Typically, sulphate and high pH leachate from cement-stabilised soils will rapidly decrease over time due to the completion of cement curing and carbonation of calcium salts, and therefore the elevated sulphate levels are considered to be a temporary phenomenon.

4.2. The maximum eluate concentration of sulphate exceeds the EQS however the EQS value is non-statutory and sulphate is a non-priority pollutant under the WFD. The under-pinning research by WRC showed that sulphate had low toxicity and should be regarded as having similar effects to elevated salinity, i.e. effects would only be apparent under brackish concentrations; the 400 mg/l standard recommended by WRC was considered by them to be arbitrary. The principle concern relating to sulphate at low concentrations relative to brackish water is potential effect on drinking water for farm livestock, where some authorities have set a limit of 1000 mg/l to protect against laxative effects.

4.3. Sulphate concentrations are routinely monitored for a variety of locations including within tip leachate, groundwaters and surface waters around the site. Natural concentrations in the local environment are typically around 25mg/l in Eagley Brook and the Mill Lodge. Higher concentrations are evident in the Ochre Culvert at around 50 mg/l due to the industrial catchment. Concentrations in the Old Tip leachate are very low due to the anaerobic environment where any sulphate present will be reduced to sulphide; sulphide is not required to be monitored outside the Old Tip and there is no visual or odour evidence of significant sulphides leaving the Old Tip in leachate. It is likely that sulphides within the Old Tip will combine with metal ions to form insoluble precipitates.

4.4. Taking the key identified pathway for drainage across the stabilised sludge used in the Old Tip cover laterally towards the Mill Lodge, little attenuation in sulphate concentration is expected between the source and principal surface water receptor. Therefore at the point of discharge via the dam wall of the Mill Lodge there will be dilution in the water body but probably slow attenuation as a result of biological uptake. Sulphate reduction to sulphide is not likely given the well oxygenated conditions and flow through the Lodge. For a typical minimum dilution rate of 100 between drainage from the Old Tip cover and the TNSB / Mill Lodge water, the predicted concentrations within the mixed water would rise from a baseline of 25 mg/l to ~35 mg/l for the short-term eluate maximum (1000 mg/l in discharge), falling to ~27 mg/l for the eluate average (219 mg/l in discharge). These concentrations are insignificant in terms of potential impact upon TNSB and Mill Lodge, and subsequently Eagley Brook, where further very substantial dilution would occur.

4.5. Sulphate in seepage entering the body of the Old Landfill would be subject to microbial reduction to sulphide in the strongly anaerobic environment of the waste mass. Sulphides would then either continue to migrate within the Old Tip leachate with attenuation through the formation of insoluble metal sulphides or possible emission of hydrogen sulphide gas alongside existing methane and carbon dioxide emissions to atmosphere. Sulphide in leachate from the Old Tip has not be a problem to date, and the potential for any change in this situation following capping of the site is considered to be minimal given the relative sizes of cover material (~3000m^3) to the existing volume of Old Tip paper sludge wastes (estimated at 19,500m^3). The construction of the Old Tip restoration cover is designed to mitigate such emissions by forming an aerobic soil zone where methane (and hydrogen sulphide) will be largely oxidised by autotrophic bacteria. Gas monitoring of the Old Tip has shown very low existing hydrogen sulphide concentrations in the landfill gas emissions (see SGP landfill gas risk assessment report, R1635-R02-v2).

4.6. The introduction of sulphate via leaching from the cover material into the Old Tip waste body is expected to be minimal, with most drainage likely to be sub-horizontal across the surface of the waste. However in the course of this drainage, it is possible that some sulphate reduction could occur at the existing waste surface of the tip, and there is a potential short-term risk of sulphide entering the Mill Lodge. The extent of any risk is uncertain, and it is therefore proposed that monitoring for sulphide be included within the overall suite of water testing to be carried out during the restoration and aftercare phases for the Old Tip. In the event of sulphide concentrations approaching or in excess of the EQS being detected, with possible risk to fish or other aquatic organisms, mitigation could be implemented by means of water aeration of the Mill Lodge using bubble diffusers.

5. Conclusions and Recommendations

5.1. The Environment Agency has requested additional risk assessment for controlled waters to support the proposed use of cement stabilised New Tip sludges in the restoration of the Old Tip with specific respect to potential sulphate and total organic carbon (TOC) emissions from the treated material.

5.2. Groundwater in the natural cohesive soils and underlying bedrock down-gradient of the Old Tip is not in significant hydraulic continuity with the tip and will therefore be unaffected. Groundwater/leachate flowing from the Old Tip both passes westwards directly to the Mill Lodge or eastwards via industrial fills in the down-valley drainage and Ochre Culvert to Eagley Brook. No significant pollution attributable to Old Tip landfill leachate has been detected within the Mill Lodge, Ochre Culvert or Eagley Brook over years of regular monitoring.

5.3. TOCs released during upflow percolation testing of the treated material are of low concentration and are consistent with existing levels of TOC in the receiving surface waters of the Mill Lodge / Three Nooked Shaws Brook and Eagley Brook. The character of the organic materials detected in the TOC testing are generally similar natural plant-derived substances of cellulose and lignin. No negative impact from TOCs are therefore likely and it is noted that the test results indicate worst case conditions that are likely to be very temporary.

5.4. Sulphate concentrations were temporarily elevated in the eluate testing and this is consistent with cement-based stabilisation methods, with concentrations reducing over time as the cements complete their curing process over weeks or months. The maximum sulphates exceed the surface water Environmental Quality Standard, however the standard is non-statutory, arbitrary and unsupported by evidence of impacts; the evidence indicates that sulphates are of low toxicity and only become significant at much higher concentrations similar to those found in brackish waters. High rates of dilution between drainage carrying sulphates from the Old Tip restoration cover into the Mill Lodge indicate that the potential rise in concentration within the Mill Lodge and downstream would be marginal, and would remain considerably below the EQS.

5.5. Sulphates in water entering the Old Tip waste body would be subject to conversion to sulphides, and there is a potential risk of some additional sulphides entering the Mill Lodge. The risk is uncertain but likely to be low, and mitigation by means of monitoring and remedial treatment if necessary to remove sulphides are proposed. Any effects of sulphates or sulphides are likely to be very short-lived before the landfill cover is fully stabilised.

5.6. Overall, the restoration of the Old Tip is expected to result in an improvement in water quality surrounding the site as a result in the reduction of direct runoff from the landfill into the Mill Lodge, and reduction in infiltration of rainfall to the Old Tip as a result of the establishment of cover system incorporating drainage and managed vegetation cover..

5.7. It is recommended that full scale cement stabilisation treatment is commenced to demonstrate the functionality and practicality of treatment and placement of treated product as part of the Old Tip restoration. Testing and monitoring arrangements will be included within the deployment documentation to be prepared by the waste treatment specialist contractor.

Yours sincerely
For: Smith Grant LLP

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Encs