Appendices

Appendix A: Continued Sections

5. Project Details

5.1 Brief Description of the Project

Background

In 2024, temporary remediation works were undertaken along a 100-metre section of the southern bank of the River Avon, within the KG Plant in Grangemouth (NGR: NS 94971 80419). These works were necessitated by localised bank failure and erosion, which had exposed critical infrastructure, including two 33kV electricity supply cables, one of which serves the Kinnel Plant. The erosion posed a significant risk to the integrity of the riverbank, adjacent land, and buried utilities.

To mitigate these risks, engineering and environmental compliance services were provided by Arthian. The scope of works included the construction of a temporary haul road to facilitate access for maintenance and material delivery, and the strategic placement of rock bags to stabilise the embankment and prevent further erosion. A watching brief was maintained during in-stream activities to ensure environmental compliance with the previous Marine Licence (Licence Number: MS-00010836) for the temporary works.

These temporary measures have proven effective, with recent site inspections indicating early signs of natural bank regeneration.

This Application

To ensure long-term stability and to transition the temporary structure into a permanent solution, additional rockbags are proposed to be installed atop the existing ones and additional placed at the perimeter. This will improve structural cohesion and prevent water ingress behind the current installation, which could compromise its integrity. Furthermore, the introduction of brushwood fencing around the structure, is proposed as a green engineering measure to enhance bank stabilisation and promote natural ecological recovery. These interventions are designed to reinforce the embankment, protect critical infrastructure, and support the natural regeneration of the riverbank in a sustainable manner.

5.2 Location

Site Photographs

Figure 1: Site location plan (approximate)

Figure 2: Photographs showing deterioration of the site – cable significantly exposed and no longer buried in the riverbank prior to the remediation in 2024 (before Marine Licence Number: MS-00010836)

Figure 3: Completed rock bag installation.

Figure 4: Adjacent Riverbank May 2025 – indicating no erosion

Figure 5: Regeneration of the Riverbank

Site Latitude and Longitude Co-ordinates

Figure 6: Activity - Rockbag installation with Brushwood Fencing(approximate) (red points).

5.3 Method Statements

Rock bag method statement – Extract (See the Full Method Statement attached as Appendix F from the previous construction activities)

5.3.1 Haki stairs will be set up in a safe area close to the works area. This will allow safe access and egress for an operative to gain access into the river and unhook the rock bags from the excavator.

5.3.2 The Haki stairs will be secured using 2 x ground anchors to avoid the need to fix into the ground on top of the riverbank.

5.3.3 A pontoon with stretcher and small inflatable safety boat will be positioned at the bottom of the stairs.

5.3.4 The rock bags will be delivered in quantities of 14 per flatbed Lorry.

5.3.5 The Lorry of rock bags will be reversed down the haul road while being watched by a banksman.

5.3.6 The rock bags initially will be unloaded using the long reach excavator that will be sat adjacent to the works area on the haul road.

5.3.7 Placing of the rock bags. The rock bags will be placed from the bottom up in a tiered configuration as per the design provided by Arthian. The rock bags will be carefully arranged to seamlessly blend into the upstream bank to ensure a smooth flow without any blunt ends interrupting the river's current.

5.3.8 The additional row of rock bags will be placed prior to the upstream and downstream ends being tied in, and or as directed by the site supervisor.

5.3.9 One bag will be lifted at a time. A slinger signaller will attach the drop chain connected to the excavator to the ring on the top of the rock bag. The slinger will then direct the machine operative using hand signals or radio, guiding the rock bag into position. The bag will be checked that it is laid in the correct position, before beingunhooked.

5.3.10 This process will continue for all bag placements . This will continue until all the layers and bags placed at the up and downstream extents are complete.

5.3.11 Care should be taken to follow the design, and not to step the bags too far over the top of the bag bellow.

Our primary aim is minimizing any excavation work along the riverbank wherever possible. We do not anticipate needing much, if any excavation. However, if a section of the bank is overhanging and unstable, it will need to be graded back to allow for the safe placement of the rock bags and to reduce the risk of bank collapse during nearby work.

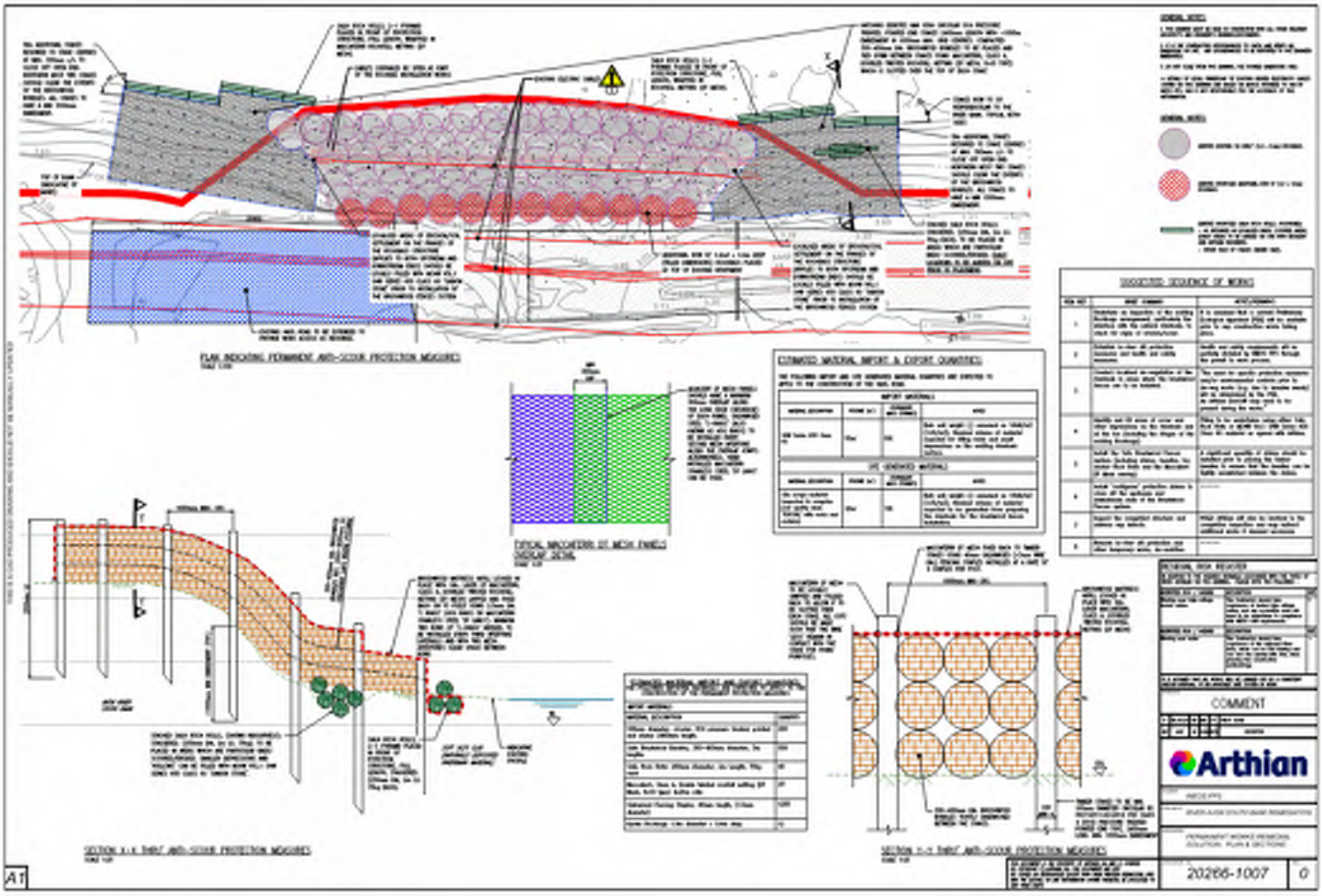
Minor reshaping may also be needed to again allow the bags to be placed stable and safe. These points outline our strategy for managing the minor reshaping and bag placement while prioritising environmental protection:

- **Minor reshaping for stability**: Only where necessary or required minor reshaping will be carried out. This will enable the safe placement of the rock bags, ensuring the stability of both the bank and the bags.
- **Silt containment measures**: If minor reshaping is needed in the lower section of the bank or in an area that does not stay above the lowest water line, we will implement localized silt curtains to contain any potential silt migration.
- **Timing for minor reshaping**: Any minor reshaping required further up the bank will be conducted when the water level is below that specific area.
- **Immediate bag placement**: Once an area has been reshaped as needed, the bag will be promptly placed. This immediate action will decrease the likelihood of silt migration into the water course once the tide reaches that level.

5.4 Any material that needed to be removed will be taken to the laydown area with the dumper. It will then be collected and disposed of correctly.

Appendix F contains the previous construction activities method statements. At the time of writing the updated proposed method statements for the additional works has not been produced. When this information is available, it will be issued to Marine Scotland.

The detailed design drawing is attached as Appendix G.



5.5 Method of Installation of Brushwood Fencing

Suggested Sequence of Works

1. Undertake an inspection of the existing rockbags arrangement, particularly at the interface with the natural riverbank to check for signs of erosion and or scour.
2. Establish in river silt protection measures such as silt fencing and health and safety measures.
3. Conduct a localised de-vegetation of the riverbank in the areas where the brushwood fences are to be installed.
4. Identify and fill areas of scour and other depressions on the riverbank and at the toe (including fringes of the existing rockbags).
5. Install Salix Brushwood Fences system which includes stakes, bundles, toe anchor rock rolls and Maccaferri DT Mesh overlay.
6. Inspect the completed structure and address any defects.
7. Remove instream mitigation measures and demobilise.

5.6 Method of Preventing Pollution

- Prior to the commencement of any works, Arthian will obtain all relevant Licenses and permits from Marine Scotland and any other regulatory authority. All works will be carried out in accordance with the above Licenses and permits. Works will also be conducted in line with SEPA Best Practices
- All plant delivered to site will be sourced from a trusted reputable company and upon ordering, will enforce the notion that any plant to be delivered will need to be cleaned and fit for purpose (no leaks or damaged pipelines or hoses).
- All materials to be used for installation will be inert and will not contain toxic elements which may be harmful to the marine environment.
- Upon arrival at the site, the site supervisor will proceed to inspect the plant for any visible signs of leaks or un-cleanliness that could potentially harm the environment.
- All plant will also come with spill kits which all personnel will be trained in the use of.
- All plant that are to be used on the riverbank will be fitted with bio-degradable hydraulic oil where it is possible to negate any potential environmental harm in the unlikely event of a spillage or leak.
- No refuelling procedures or fuel storage are to be carried out or situated within 10m of the water course as per GPP 2 'Above ground oil storage tanks.
- All equipment and liquids being used near to the watercourse will be appropriately 'bunded' to prevent any spillages from harming the local ecology and wildlife.
- If any protected species are found within the vicinity of the works, works will cease, and the client will be informed. Works will not recommence until permission is granted by the client.

All construction activities must be in accordance with Guidance for Pollution Prevention (GPP) and Environmental Authorisations (Scotland) Regulations (EASR) General Binding Rules (GBRs). Relevant GPPs and GBRs which will be adhered to include, GPP 1; GPP2; GPP 4; GPP 5; GPP 6; GPP 21; GPP 22; GBR2; GBR8; GBR9; GBR10B; 10D; GBR11; GBR22; GBR26; and GBR28. Siteworks, and surface water management will be carried out and implemented in such a way that these GBR's and GPP's are complied with.

5.7 Water Quality Monitoring

Prior to commencing any works on site, the site supervisor and or EnCoW will identify appropriate water quality monitoring locations. These identified locations will be visually monitored throughout the works and will be located upstream and downstream of the works and will also concentrate on site drainage and refuelling locations etc. There will also be identified water quality triggers, which could indicate a pollution event, which may warrant further investigation.

Water quality triggers will include but not be limited to discolouration, foam, and hydrocarbon on the surface

of the water.

On a daily basis, a specified site operative will undertake daily visual inspections of the River Avon upstream and downstream of the works. Findings from these visual inspections will be recorded, held onsite, and will be made available for inspection if requested by Marine Scotland or SEPA. The frequency of the visual inspections may increase during the rock bag placement.

Table 1: Water Monitoring Triggers

Water Quality Parameter	Trigger for Further Monitoring
Discolouration	Water directly downstream of the works is a different colour from the water upstream of the works (could be due to fines or silts escaping the temporary dam).
Foam	Foam caused by construction activities (and not natural) will appear white in colour and will only occur in a local area near the source of discharge and usually will not accumulate over large distances.
pH	Using a pH meter or similar, when the pH is 1 unit greater than the level measured upstream.
Hydrocarbon	Iridescence noted on the surface of the river, directly downstream of the temporary dam or any discharge points from site drainage or water treatment measures on site.

Table 2: Potential Sources to Inform Mitigation and Environmental Management

Source of Information	Available Guidance
SEPA Pollution Prevention Guidelines and Guidance for Pollution Prevention	GPP 1 Understand your Environmental Responsibilities – Good Environmental Practices GPP2 Above Ground Oil Storage Tanks GPP4 Treatment and Disposal of Wastewater Where There is No Connection to the Public Foul Sewer GPP5 Works and Maintenance in or Near Water GPP6 Working at Construction and Demolition Sites PPG7 Safe Storage – The Safe Operation of Refuelling Facilities GPP8 Safe Storage and Disposal of Used Oil GPP21 Polluting Incident Response Planning GPP 21 Pollution incident response planning GPP22 Dealing with Spills
SEPA Environmental Authorisations (Scotland) Regulations	GBR2: Abstraction from the water environment less than 10m^3 per day GBR8: Bank works up to one channel width or 10 metres GBR9: Operating vehicles, plant or machinery in or near any surface water or wetland GBR10B: Run-off from developments built after 1 April 2007 GBR10D: Run-off from a small construction site less than or equal to 4 hectaresGBR11: Discharge into surface water drainage system

	GBR22: Run-off from waterbound roads and tracks including during construction GBR26: Storage of non-waste oil in a portable container less than 200 litres GBR28: All other storage of oil
SEPA Position Statements	WAT-SG-78 Sediment Management Authorisation CIRIA C692 Environmental Good Practice on Site (third edition)
Construction Industry Research and Information Association	CIRIA C532 Control of Water Pollution from Construction Sites CIRIA C648 Control of Water Pollution from Linear Construction Projects
Other Guideline	River Crossings and Migratory Fish: Design Guidance, A Consultation Paper, The Scottish Executive WAT-SG-23: SEPA (2008), Engineering in the Water Environment, Good Practice Guide - Bank Protection Rivers and Lochs, Version1 WAT-SG-26: SEPA (2010), Engineering in the Water Environment, Good Practice Guide, Sediment Management, Version 1 WAT-SG-31: SEPA, (2006) Special Requirements for Civil Engineering Contracts for the Prevention of Pollution, Version 2

Table 3: Activity Specific Mitigation Measures

Activity	Risks/Potential Impact	Mitigation
Site clearance/ de-vegetation	Run-off into watercourses from exposed areas Fuel spills entering surface / groundwater. Plant debris entering surface waters. Silt runs off to surface waters from stripped areas. Potential spread of invasive non-native plant species	Site walkover to identify drainage channels. Silt fencing to be installed at work areas (dug in at ground level) and next to watercourses to remove silt run-off, if runoff is noted after work commences. Refuelling and oil storage carried out in line with GBR 26 and 28. Avoid unnecessary vegetation clearance. Where possible maintain a buffer zone of vegetation on the bank of the watercourse Consult ecological constraints report and implement a buffer area around any INNS such as Japanese Knotweed which was identified during the PEA and or any subsequent site visits. Follow controls outlined in the INNS Management Plan (to be developed). Clear all vegetation required to facilitate the works outside of breeding bird season (March- August), where possible. Nests checks should be done no more than 48 hours before clearance. If the nest is found, the site team should stop working and contact the environmental team. Plant debris removed from watercourses on completion of work or netting installed to prevent debris falling into waterbody.
Delivery of materials to site	Fuel/biodegradable hydraulic oil pollution from plant. Run-off entering existing drains or watercourses	Refuelling and oil storage carried out in line with GBR 26 and 28. All plant to have spill kits for cleaning and containing spills. Spill response procedures are to be in place in the event of an emergency or spills. No refuelling of plant/equipment within 10m of a watercourse All plant and equipment to be removed at the end of every working shift to a safe location, set back from the river – at least 10m. Visual daily monitoring for oil leaks on plant or spills in the watercourse.
Activity to be Authorised - Rock bag installation	Silt or fines entering the watercourse. Contamination of water environment through uncontrolled spillage or discharge. Fuel/biodegradable hydraulic oil pollution from plant.	Rock bags to be placed one at a time in a controlled manner. Placement will only take place during suitable river conditions i.e. not in spate or during high tide. Visual daily monitoring for oil leaks on plant or spills in the watercourse. Daily water monitoring for silts in the river caused by the works. Should any bank regrading be required, silt curtain will be installed in the watercourse to prevent fines from being carried away. Refuelling and oil storage carried out in line with GBR 26 and 28. All plant to have spill kits for cleaning and containing spills. Spill response

		procedures are to be in place in the event of an emergency or spills. No refuelling of plant/equipment within 10m of a watercourse.
Waste	Degradation of the environment with waste materials being left in situ	All waste materials are to be removed from site following the completion of works. Waste materials to be appropriately re-used, recycled or disposed of in the appropriate manner by a licensed waste disposal company.
General construction	Runoff from construction sites can contain toxic elements, which could have adverse effects on in-stream flora and fauna. Such toxic elements may build up on the stream bed and remain in situ for some time before they are degraded or dispersed. Intense or prolonged periods of inclement weather have the potential to exacerbate most of the potential risks related to flooding and suspended solids. Equipment used on site could introduce INNS if it has not been thoroughly disinfected and cleaned before being used onsite. Increased sedimentation within the water can result in fish gills becoming blocked and can result in moralities.	Daily visual monitoring of the River Avon and adherence to discussed guidance above in table 3 to protect the watercourse from degradation. Frequent monitoring of weather forecast and tides, mitigation measures such as silt fencing properly installed prior to works being carried out. No de-vegetation during heavy rain. Adhere to INNS exclusion zones and management plans / biosecurity controls. Silt fencing installed at perimeters of work areas (properly dug in at ground level) and next/adjacent to the watercourses/drains to remove silt from any run-off. Appropriate measures will be implemented to provide protection to bare areas of soil, including modified areas of riverbank, in proximity to the watercourse. This may include the installation of biodegradable matting, or silt fencing remaining in place until vegetation has re-established.
Activity to be Authorised - Brushwood Fencing	Disturbance to aquatic habitat which may impact fish, birds, and invertebrate populations. Sediment release into watercourse Damage to existing vegetation through clearing and or trampling riparian plants. Flood risk during installation, sudden rainfall may cause material to be washed away.	Conduct works outside sensitive periods (e.g., spawning season). Use silt curtains or barriers to minimise sediment spread. Phase works to minimise exposed areas. Use temporary erosion control (e.g., coir matting). Install sediment control measures such as silt fencing. Use hand tools where possible. Limit access routes and use low-impact machinery. Check weather forecasts and avoid works during high-risk periods. Materials will be store above flood level and located in a suitable laydown area on site.

5.8 Potential Impacts and Proposed Mitigation in response to Potential Impacts

The Firth of Forth RAMSAR, Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) are located approximately 0.8km north-east of the point of interest. This site has three designations and supports important habitats including maritime cliff, salt marsh, transition grassland, as well as vascular plant and beetle assemblages. The site supports important populations of non-breeding and breeding wading and migratory birds. The site regulatory supports in excess of 20,000 individual waterfowl. Avon Gorge SSSI is located approximately 0.7km south-east of the site of interest. This site supports one of the remaining ancient, semi-natural woodland sites in the Falkirk council area.

The PEA concluded that the remediation work is not likely to have any direct or indirect impact on designated sites within 5km, nor on the ancient woodland within 1km, as they are sufficiently distant from the proposed site location. The vegetation of the proposed site is widespread and so a non-significant amount of habitat loss to accommodate the proposed works will have a limited impact. Where vegetation removal is required, it is recommended that it is kept to a minimum and a replacement vegetation scheme is considered.

The main risks from the proposed construction activities are the potential for run-off, silt or fines to enter the water environment.

The site operatives will be briefed ahead of works commencing on site to highlight the importance of good housekeeping and management of oils and chemicals. Protective measure will be prepared and implemented in the event of inclement weather. Weather forecasts and tide times will be closely monitored so the mitigation measures can be implemented in preparation. Visual water monitoring will be undertaken daily to ensure efficiency of mitigation measures.

Works will be programmed around tide times, avoiding high tides and times when the watercourse is in spate.

The proposed works will not be instream as the existing rockbags are above the water level and the new works will be on the banking. Therefore, the passage of fish through the channel should not be restricted by the proposed works. The site operatives will be briefed that at no point should they undertake any activities that will inhibit the free passage of fish through the river channel.

The location of the works in relation to the designated sites and is typically out with the general non-breeding disturbance buffer for many of the species (geese being the most sensitive and is considered to be around 600m) and therefore the works are unlikely to disturb waterfowl species within the boundary of the SPA. As the River Avon is tidal, there may be some minor feeding by species associated with the SPA, but the works area is not considered critical to the designation or offering significant opportunities. Furthermore, the proposed rock bag installation is short term and temporary with no significant changes to the baseline foraging and roosting opportunities expected, so no further mitigation is considered necessary.

All works near the river must follow best practice measures to ensure its protection against pollution, silting and erosion. Site operatives will be briefed on soil management best practices in line with the GPPS and GBRs, which should include measures for any soil storage and final bunding is sufficient that any material does not fall back into the river.

The proposed remediation works are not likely to impact the areas of Ancient Woodland within 1km, as they are of a sufficient distance to not to result in an impact to these sites. The vegetation surrounding the collapsed bank comprises common species which are widespread within the wider landscape, but if any trees are to be

lost to accommodate the works, this will result in a high impact, given the time it takes for trees to reach maturity. All trees must be retained where possible. It is recommended that only the absolute minimum of vegetation is removed, and a scheme of replacement considered.

Protected Species

There was no evidence of badger, otter, or reptiles during the Preliminary Ecological Appraisal survey which was caried out by Arthian (Formerly IKM Consulting) on 22nd February 2024. If any vegetation removal is required to accommodate the works, and this is to be undertaken within the recognised breeding season (considered to be March to August, inclusive in Scotland) a nesting bird check must be carried out of all areas to be cleared, no more than 48 hours ahead of the clearance, by a suitably qualified ecologist.

The following mitigations should be followed during all remediation works for any commuting otters:

- All works in or near the river must follow best practice measures to ensure its protection against pollution, silting and erosion;
- Any temporarily exposed excavations, trenches or holes must be provided with mammal exit ramps e.g. wooden planks or earth ramps when Contractors are off site to allow animals to escape;
- All works should be timed to avoid the periods around dusk and dawn when otters are most active; and
- An emergency procedure should be implemented by site workers if otters or potential otter shelters are unexpectedly encountered. All work within 30m (100m for high noise/vibration activities) or 200m for breeding sites will cease until a suitably qualified ecologist has inspected the site and determined the appropriate course of action.

INNS

A large area of Japanese Knotweed was recorded to the west of Road 33 Bridge, out with the repair area. This stand was approximately 5x5m in size.

Where INNS are present within the proposed works areas, a 4 or 7m (dependant on species) exclusion zone from all stands should be marked out and no works, storage or passing through should take place within these zones. Where works within these exclusion zones are required, it is recommended that an invasive species specialist contractor is contacted to develop an invasive non-native species management plan for the proposed remediation works. This may include the removal or treatment of the species. During the works, it is also recommended that a toolbox talk is provided to all site personnel and any sub-contractors. This must cover the location of the plants on site, identification of the species on site, health and safety issues (giant hogweed) and legal implications of the spread of invasive non-native plant species.

The Japanese Knotweed located near the haul road was delt with stringently as per the SEPA best practice guidance to ensure that there was no spread. The INNS was covered by the haul road and therefore poses no further risk of spreading.

Below is a table for the existing material volumes and the additional material volumes.

Table 4: Material Volumes

Existing Material Volumes		Additional Material	Volumes
Macferri MacTex H1000 and Maccweb 3015-P	200m^2	Rock rolls	Netting with <1% plastic filled with fine to coarse gravel. 40 No. 2m lengths, 0.25m diameter.
SHW Series 600 Class 6N Fill	Volume: 40m^3 / Weight: 76 kg	Stakes	200 No. up to 2.5m lengths (0.1m diameter)
KYOWA Eco-Green 2tonne rock bag *(per bag)*	1.24 m^3 / 2 t *(per bag)*	Salix brushwood bundles	500 bundles (assuming 3m lengths, 0.3m diameter)
Seeded topsoil	Volume: 5m^3 / Weight: 7.5 t	Seeded topsoil	Volume: 20m^3 / Weight: 30 t
Maccaferri BioMac CJ350 350g *(Jute coir matting)*	120m^2	Maccaferri DT mesh (Replacing jute coir matting)	approximately 125m (5 to 6 rolls)
		SHW Series 600 Class 6N Fill	Volume: 50m^3 / Weight: 80 kg
		KYOWA Eco-Green 2tonne rock bag (per bag)	1.24 m^3 / 2 t *(per bag)*
		Macferri MacTex H1000 and Maccweb 3015-P	200m^2