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# MULILO TOTAL HYDRA STORAGE PROJECT

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## SITE CLEARANCE PLAN

### 1. PURPOSE AND SCOPE

Purpose: Provide early information on how the Main Contractor (EPC) is to manage the construction site clearance so that it aligned with industry best practises.

Scope: Mulilo Total Hydra Storage Project, De Aar, Northern Cape Region of South Africa.

### 2. SITE LOCATION

The proposed project would take place on the farm De Aar 180, portion 1 (Remaining Extent) in De Aar, Northern Cape, South Africa. The site lies approximately 5 km to the East of De Aar.

### 3. SITE ESTABLISHMENT

#### 3.1. DEMARCATION OF THE SITE

- Identify and demarcate the extent of the site and associated Works Areas as indicated on the approved EMP Final Layout Plan<sup>1</sup> using danger tape with steel droppers.
- Further demarcation will be used to define temporary storage & working areas to minimise the extent of the Works Site footprint as much as is possible and ensure that no personnel or materials move outside the demarcated areas.
- No paint will be allowed for this purpose and marking will be done using pegs or rope and droppers.
- The site demarcations will be maintained in position until the cessation of the construction works.
- Prior to Construction Works, the plants and natural features that are identified in the Environmental Impact Assessment will be addressed as required.
- Where risks to damage protected plants and natural features exist then a proper demarcation or fence will be implemented during the time this identified risk exists. The appropriate permits shall be sought should any protected species require removal.
- In sensitive environments, or where access into no-go areas takes place, then a perimeter fence must be erected around the works area, the specification of which must be adequate to address the problem (i.e.,

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<sup>1</sup> The ECO will be available to aid the Contractor with the demarcation of this area

if theft is a problem, then a 1,8m security fence with barbed wire may be specified, whereas control of staff movement may be accomplished by means of a 1,2m high diamond mesh fence).

- Maintain site demarcations in position until the cessation of construction works.
- Maintain animal movement corridors as indicated in the EMP, and / or as specified on site by ECO.
- For pipelines, a servitude width of 15m is permitted for machine excavation, and 6m for manual excavation, unless otherwise specified by the ECO. This working servitude must accommodate all construction related activities, including materials storage, access routes etc.

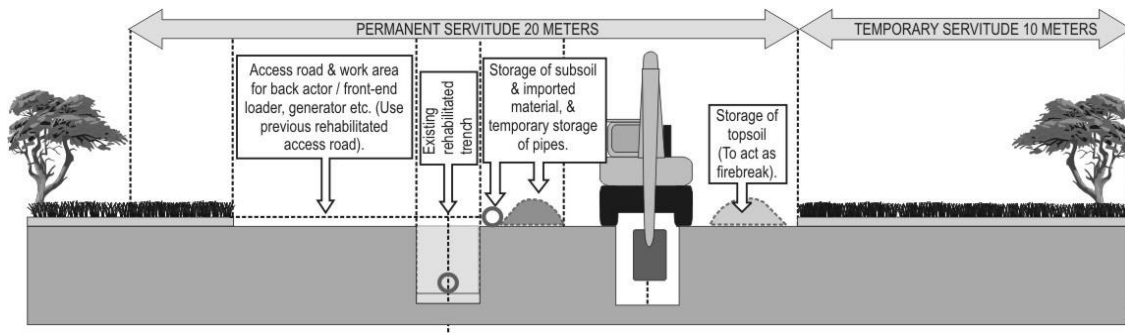


Figure 1 - Section through a typical pipeline excavation within servitude

- In sensitive environments such as wetlands, indigenous forest, pristine grasslands and sensitive social environments, this working servitude may be reduced<sup>2</sup>.
- Minimise the extent of the Works Site footprint as much as is possible.
- Maintain the demarcation line and ensure that no personnel or construction materials move outside the designated site.
- Do not use the site for any other purpose other than for the proper carrying out of the Works under the Contract.
- Do not establish any site Works besides those specified and allowed for in the successful tender, unless specifically agreed upon with the ECO.
- Do not establish any activities or operations that, in the opinion of the ECO, are likely to adversely affect the aesthetic quality of the environment.
- If such activities and operations are deemed to be necessary, then ameliorative actions to reduce the adverse effects must be taken. Actions will be specified by the ECO.
- Do not paint or mark any natural feature. Marking for surveying and other purposes must be done using pegs, beacons or rope and droppers.

<sup>2</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or EMP, whichever is relevant.

## 4. EROSION CONTROL

The Design is to use the 3D CAD technology and tools to adapt as much as possible to the original slope of the ground making no compromise with environmental respect of the Site.

The vegetation is to be disturbed as little as possible by keeping “green areas” and controlling traffic.

Rocks will not be removed unless necessary for the safe movement of construction vehicles and the installation of equipment. The areas where rock removal will be necessary should rocks be present will be planned for in the design.

The design is to identify the areas where vegetation clearance is necessary. Crushing shall be favoured over uprooting to promote regeneration and prevent unnecessary erosion and no areas that are not required for construction will be cleared. Where uprooting is necessary, mechanical methods shall be favoured and cleared areas shall be stabilised as soon as possible.

Off-road vehicle movement destroys vegetation and creates erosion problems. Vehicle movement during construction shall therefore be planned for within the design to ensure maximum protection of vegetation. No vehicular or pedestrian access will be permitted into natural areas beyond the demarcated boundary of the work area.

Light equipment is to be utilised for access and deliveries as far as reasonably practicable into areas of unstable soils and in areas where erosion is evident.

Erosion control is to be implemented on any cleared areas where wind or water erosion is potentially a problem.

Natural vegetation will be retained wherever possible and vegetation clearance will be restricted to only the areas needed for the execution of the works and rocks shall not be removed unless necessary for the safe movement of construction vehicles and the installation of equipment, keeping disturbance to a minimum to reduce the loss of material by erosion.

Traffic flow, both vehicular and pedestrian, shall be strictly prohibited in areas outside of the designated work areas. In addition, once construction has been completed within a section, this section shall be deemed restricted.

Further details are found in the ***Erosion Management Plan*** included as a standalone report in the project EMP.

## 5. PROTECTION OF VEGETATION AND NATURAL FEATURES

Identify, locate, and map all plants and natural features to be protected during construction<sup>3</sup>. These plants and features include, but are not limited to, Red Data Species, Protected Plants, Sensitive Communities, Riparian

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<sup>3</sup> The ECO will be available to aid the Contractor with the identification of these features.

Vegetation, Wetlands, Drainage Lines and Aesthetically Significant Areas<sup>4</sup>. Protect identified plants (at the distance of the outermost dripline) and natural features using danger tape and steel droppers.

- Where damage to protected plants and natural features is a problem, then these should be fenced for protection.
- Maintain plant demarcations in position until the cessation of construction works.
- Locate construction camps on the outside fringe of the riparian vegetation zone.
- The ECO may add to this list, as long as motivation for doing so is in line with the criteria used to initially identify the plant or feature (i.e. either during the Environmental Impact Assessment or EMP phase, whichever is relevant).
- Do not disturb, deface, destroy, or remove plants or natural features, whether fenced or not, for the duration of the Contractor's presence on site, unless otherwise specified by the ECO.
- The Contractor will be held liable for the replacement of any plant or feature under the protection of these specifications that is removed or damaged by the Contractor's negligence or mismanagement.
- Do not remove any large tree without the permission of the ECO.
- No vegetative matter may be removed for firewood.

## 6. PROTECTION OF FAUNA

- Identify animal species, populations, and nests to be relocated<sup>5</sup>. Relocate these to areas where these will not be at risk<sup>6</sup>. Plan such operations well in advance.
- No wild animal may under any circumstance be handled, removed, or be interfered with.
- No wild animal may under any circumstance be hunted, snared, captured, injured, or killed. This includes animals perceived to be vermin. The penalty clause associated with the needless destruction of wildlife is a fine and imprisonment<sup>7</sup>.
- Ensure that the Work Site is kept clean, tidy, and free of rubbish that would attract animal pests.
- Do not make use of any pesticides, unless approved by the ECO.

## 7. PROTECTION OF THE CULTURAL HISTORICAL ASPECTS

- Identify, locate, and map all features and sites of social and / or cultural historical significance to be protected during construction<sup>8</sup>. These features include, but are not limited to, uninhabited houses, graves,

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<sup>4</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or EMP, whichever is relevant.

<sup>5</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

<sup>6</sup> It is important that a suitably qualified institution (Nature Conservation Agency) or individual be involved with the planning and execution of all animal relocation activities so that animals are not introduced into areas where population stress is already being felt.

<sup>7</sup> In terms of the Animals Protection Act (Act 71 of 1962) Section 2

<sup>8</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

historical structures, culturally significant sites (such as initiation schools) and archaeological finds<sup>9</sup>. Protect identified features using danger tape and steel droppers.

- Where damage to protected features is a potential problem, then these should be fenced for protection.
- Maintain demarcations in position until the cessation of construction works.
- Do not disturb deface, destroy, or remove protected features and sites, whether fenced or not, for the duration of the Contractor's presence on site, unless otherwise specified by the ECO.
- If any chance archaeological finds, graves or skeletal material are unearthed, halt Works in that area immediately and inform the ECO<sup>10</sup>.
- Do not resume Works in the area in question without permission from the ECO<sup>11</sup>.

## 8. TOPSOIL CONSERVATION

- Ahead of all construction, borrowing and quarrying, strip the entire available topsoil layer<sup>12</sup>. Stockpile separately from overburden (subsoil and rocky material).
- In the absence of a recognisable topsoil layer, strip the uppermost 300mm of soil.
- Co-ordinate Works to limit unnecessarily prolonged exposure of stripped areas and stockpiles. Retain vegetation and soil in position for as long as possible, removing it immediately ahead of construction / earthworks in that area.
- Strip and stockpile herbaceous vegetation, overlying grass, and other fine organic matter along with the topsoil.
- Do not strip topsoil when it is wet.
- Store stripped topsoil in an approved location and in an approved manner for later reuse in the rehabilitation process.
- Stockpile topsoil stripped from different sites separately, as reapplication during rehabilitation must preferably be site specific. If necessary, keep a stockpile register.

## 9. DE-BUSHING AND DE-STUMPING

- Obtain permission from the ECO to proceed with de-bushing. Only de-bush specified areas.
- Utilise the method of de-bushing most appropriate for the environment and species in question. Favour mechanical rather than chemical methods wherever possible.
- Wood obtained from de-bushing and de-stumping remains the property of the landowner and must be stockpiled in areas designated by him and approved by the ECO.

<sup>9</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

<sup>10</sup> The ECO must contact the closest museum or the Cultural Historical Museum for record keeping and conservation / preservation actions and / or follow-up.

<sup>11</sup> A Phase 2 archaeological investigation must be undertaken, and a permit must be obtained from SAHRA regional office before any archaeological site can be destroyed. In addition, exhumation and reburial of graves must conform to the standards set out in the Ordinance on Excavations (Ordinance no. 12 of 1980). Permission must be obtained from the descendants (where known), the National Department of Health, Provincial Department of Health, Premier of the Province and the local police. In addition, permission must be obtained from the landowners (where the graves are located and where the graves are going to be relocated) before exhumation can take place. Human remains can only be handled by a registered undertaker or an institution declared under the Human Tissue Act (Act 65 of 1983 as amended). The ECO will co-ordinate.

<sup>12</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

- Dispose of remaining plant material and stumps as solid waste. Upon approval by the ECO, the plant material may be buried on site. Specifications for topsoil stripping, backfilling of excavations and rehabilitation will apply in this regard.
- Only carry out de-stumping upon instruction by the ECO. In all other instances trees must be cut as close as possible to the ground level and roots retained (for soil binding and habitat creation).

## 10. SURFACE WATER AND STORM WATER MANAGEMENT

The site is generally flat to gentle sloping and annual rainfall is low – the design considers the data obtained from the pluviometric map of South Africa for a 20 year return period. The site is located away from the ecologically sensitive “no-go” areas including a buffer area greater than 50m; all possible wetland (including pans) and riparian (including ephemeral drainage lines) features fall outside of the work area. Access roads are to be positioned in such a way that no clearing within no-go areas is required and definite drainage areas are avoided wherever possible.

“Irish Bridges” will be distributed strategically at several points to allow for the continuity of the natural flow and water passage. The Irish Bridge will consist of a concrete platform that permits the continuity of the rain flow over the designed roads; the elevation in these areas will be lower to allow the water to flow easily across the roads. Surface runoff will be collected by a system of drainage swales, but additional drainage ditches may be required in locations where there are no proposed roadways to conduct flow to the Irish Bridge flow passages.

- Should any drainage pipes be required, a standard riprap lined ditch for erosion control is to be installed for the end-of-pipe energy dissipation.
- Degradation or erosion as a result of leaking pipes, spills, muddy conditions, or washaways shall be taken into account when designing any water abstraction points. Any leaks identified must be repaired immediately.
- Cleared areas and stockpiles of aggregates or soil is to be protected in such a way that erosion or sediment inputs to ecologically sensitive areas during rainfall is prevented.
- Access to wet areas after rainy periods is to be avoided until such a time as the soil has dried out.
- Water is to be recycled during the construction phase wherever possible.

Further details are found in the **Storm Water Management Plan** and Flood Impact Assessment included as a standalone report in the project EMP.

## 11. CIVIL & STRUCTURAL DESIGN

The Solar plant uses an optimized single-axis tracker, consisting of PV modules attached to North-South oriented rectangular torque tubes. The PV modules are physically mounted to the galvanized steel torque tube by the means of clips insuring ground connection from the module frames to the structure. Each tube is supported by a set of piers placed in the ground in a concrete foundation (Concrete piles) or directly (driven piers). String Inverters will be mounted to the solar tracker structure and concrete plinths will be used for central inverters and MV transformers. Concrete foundations will be used for the buildings, containers, and substation components.

Main philosophy used for Civil Works is “Light on Land” (LoL) and the objective is to respect the existing Site conditions, avoiding unnecessary soil disturbance. Design is to adapt the product to the original slope of the ground as far as possible whilst considering the resultant impact to the original environmental site conditions.

The topsoil and vegetation are to be disturbed as little as possible by keeping “green areas” and controlling traffic.

- TREES: no trees inside the plot limits.
- OVERHEAD LINES: there are HV overhead lines which cross the project and near to the East boundary of the PV plant. A setback of 50 m has been considered from these power lines to the project perimeter fence.
- EXISTING BUILDINGS: A municipal water pipeline runs through the centre of the plant from East to West and a 15m setback have been considered.
- EXISTING FENCE: Existing fences and tracks cross the east and west boundaries defined for the new PV Plant fence.
- ROADS: There is a Transnet Rail service road close to the southern boundary of the plot. A new access road has been planned to connect with the N10 highway and is to cross this Transet railway for access to the Project.
- EXISTING UTILITIES: After studying the topographical survey and the site visit performed, the Contractor must obtain any other information necessary about existing underground utilities in the site to ensure no pipes or electrical conduits are disturbed.

## 12. CIVIL WORKS & INFRASTRUCTURE

### 12.1. EARTHWORK AND ROADS

- The existing soil in the dedicated area shall maintain, as much as possible, its original appearance. For this reason, cut and fill activities will be designed to perform to meet minimum requirements in order to allow efficient operation of the panels. The levels to be established will be indicated in the construction drawings.
- Substantial grading and excavation have not been planned for this site. The minimum excavated material will be classified to be later used for different purposes. The structural backfilling material will be reused from excavated material as much as possible.
- Maintenance of roads shall be planned for in order to minimise erosion and undue surface damage; maintenance shall include the repair of rutting and potholing as well as the storm water control mechanisms.
- Existing tracks will be used where possible but where new tracks / roads are constructed they must have water-bars to prevent rapid runoff of water.
- Supporting layers of permanent roads will be constructed in the early stage of works, intended to be used during the whole construction phase. Prior to the delivery of the plant, worn or damaged supporting layers will be refurbished, and the finishing layer will be constructed. This layer will be laid using a motor-levelling machine, including rolling with a vibrating compacting roller of suitable weight.
- Develop all permanent and temporary roads and access routes as indicated on the approved EMP Plan and / or relevant Sketch Plans.

- Slight deviations of alignment are permitted, so as to avoid significant vegetation specimens and communities, natural features, and sites of cultural and historical significance. These deviations must be approved by the ECO.
- Ensure that adequate vehicle turning areas are allowed for.
- Where construction will obstruct existing access, be sure to allow for alternative temporary access routes.
- In general, construction routes should not be wider than 3m in sensitive areas, with passing bays where two-way traffic is required.

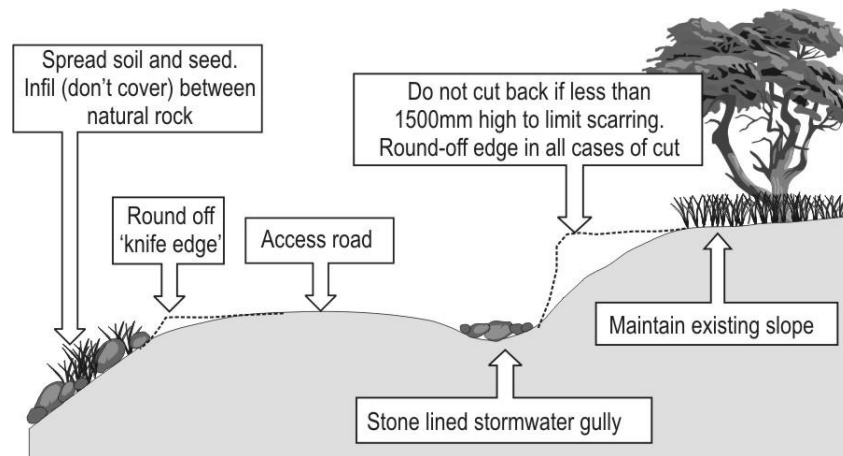


Figure 2 - Section through a typical cut and fill scenario for a road

- Any additional routes and turning areas required by the contractor must be approved by the ECO, in the form of an amended EMP Plan indicating the position and extent of the proposed route / area.
- Plan additional access roads to complement the future use of the area (e.g., for a dam, facilitate access to the future shoreline, or near the High Flood Level of the dam, in accordance with the SUP).
- Plan additional access routes to avoid significant vegetation specimens and communities, natural features, and sites of cultural and historical significance<sup>13</sup>.
- Routes should not traverse slopes with gradients in excess of 8 %. Where this is unavoidable, stabilise the road surface.
- Avoid planning routes through wetlands: seek an alternative route.
- Avoid routes through drainage lines and riparian zones wherever possible. Where access through drainage lines and riparian zones is unavoidable, only one road is permitted, preferably constructed perpendicular to the drainage line. Avoid roads that follow drainage lines within the floodplain.
- Where drifts are built through rivers, ensure that Reserve releases (i.e., for sustained downstream ecological requirements and basic human needs) are catered for and that no damming-up is experienced.

<sup>13</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant



- Adequate culverts are required as to have a minimal impact on water flow patterns through the drainage line.
- Ensure that causeways result in minimal disruption to flow patterns, both upstream and downstream of the crossing, and avoid damming of the water at the crossing.
- Enforce speed limits at all times, both on public roads and onsite roads. Unless otherwise specified by the ECO, the speed limit on construction roads is 50km/h.
- Allow for safe pedestrian and cycling access and crossing where necessary.
- Ensure that only authorised roads and access routes are used.
- Vehicles may not leave the designated roads and tracks and turnaround points will be limited to specific sites.
- Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. Repair rutting and potholing and maintain stormwater control mechanisms.
- Runoff from roads must be managed to avoid erosion and pollution problems.
- Regularly remove topsoil (and other material) accumulated inside drains of roadways to keep these open and functional.
- Clear up any gravel or cement spillage on roads.
- Clean and make good any damage to public or private roads caused by the Contractor during the construction phase.
- No off-road driving is permitted, unless authorised by the ECO.
- Prevent vehicular or pedestrian access into natural areas beyond the necessary work site.
- Plan for proper access control where routes pass through pristine / sensitive areas, to prevent unauthorised and potentially environmentally destructive access by locals.
- The Project Manager will indicate whether or not it is necessary to keep a photographic record of temporary or permanent rights of way over private property as permitted during construction<sup>14</sup>.

## 12.2. GATES AND FENCES

- Protect and maintain existing private property, fences, and gates.
- Respect the open or closed status of gates for the duration of the construction period.
- Prevent unnecessary vehicular and personnel access into adjacent undisturbed areas.
- In the interests of containing environmental damage and ensuring public and wildlife safety, it may be necessary to erect temporary fencing around the portion under construction<sup>15</sup>.
- For linear projects, small sensitive areas may be fenced where necessary, as the work site progresses.

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<sup>14</sup> In terms of SABS 1200 AD 5.3.1, the acquisition of such permission is the responsibility of the Project Manager.

<sup>15</sup> The ECO will be available to aid the Contractor with the demarcation of these fences.

- Additional fencing may be specified by the Safety Officer or ECO to counter problems arising on site. The contractor must erect such fencing and / or gates when and where required by the ECO and re-erect and maintain temporary fencing and or gates, as necessary.
- Fences must be aligned to avoid significant vegetation specimens and communities, natural features sites of cultural and historical significance and animal movement corridors<sup>16</sup>. All alterations must be approved by the ECO.
- Limit clearing for fencing to the removal of trees and shrubs within 1 m of the fence line. No removal of the grass cover or topsoil is to occur within this width.
- Where practicable use shade cloth to screen Works Areas that are exposed to public areas and roads.
- Retain temporary fencing and / or gates in position until replaced by permanent fencing or until the ECO directs their earlier removal.
- If temporary fencing and / or gates are removed temporarily for the execution of any part of the Works, then these must be reinstated as soon as practicable by the Contractor.

### 12.3. STRUCTURES AND OFFICES

- Locate all buildings and structures, including offices, workshops, stores, site laboratories as well as the weather station within predetermines zones as per the approved EMP Final Layout Plan.
- Locate all temporary and permanent labour housing within predetermined zones off site as per the approved EMP Plan and / or relevant Sketch Plans.
- Secure construction site using 1.8-2.4m high fence. In areas where security or theft is a problem, the fence may be topped with razor wire. These fences are to remain in position until the cessation of Works.
- Ensure that essential services (including showers, appropriate sanitation, and drinking water facilities) are provided for all housing sites.
- Maintain essential services in a functional state. These may not be overloaded. Defects and inadequacies must be rectified immediately.
- Provide a designated place for food storage, preparation, and consumption. Food storage must be separate from sleeping quarters and waste storage areas.

### 12.4. CONTRACTORS CAMP AND LAY-DOWN AREAS

- Locate all storage areas and material laydown sites within predetermined zones as per the approved EMP Plan.
- Additional areas required by the contractor for laydown and storage must be approved by the ECO, in the form of an amended EMP Plan indicating the extent and anticipated utilisation of the storage and laydown area.

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<sup>16</sup> As referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

- Keep the camp and all its storage and laydown areas secure and neat at all times and employ appropriate access control measures during construction.
- Clearly indicate which activities are to take place within which areas of the site.
- Position security lighting so that it does not pose a nuisance to residential properties or tourist facilities or pose a danger to road users.
- Locate all other structures (including site offices, site laboratories, substations, workshops, wash bays, stores, substations etc.) as indicated on the approved EMP Plan.

## 12.5. BATCHING PLANTS

- Position batching plants on the basis of convenient location to the Work Sites as well as environmental limitations / opportunities<sup>17</sup>.
- In linear developments, plan the progressive movement of batching plants to have the least disturbance<sup>18</sup>.
- Do not locate batching plants or associated sludge dams within the 1:100 year flood line, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland.
- Do not locate batching plants or associated sludge dams within any riparian vegetation zone<sup>19</sup>.
- Protect the batching plant on the up-slope side by an earth berm or sandbag system to deflect clean surface runoff away from the plant.
- Contain the batching plant on the down-slope side by a trench and earth berm or sandbag system to control contaminated runoff and construction water emanating from within the plant.
- Collect all construction water and contaminated runoff emanating from within the batching plant (and associated wash bays) and contain within a sludge dam for later disposal in the appropriate manner.
- Clean out all sludge dams on a regular basis and dispose of sludge in the appropriate manner.
- Ensure that appropriate measures are in place to prevent the overflow of sludge dams during heavy rains and storm conditions.
- Scrape waste concrete and cement sludge off the side of the batching plant on a regular basis and dispose of in the appropriate manner.

## 12.6. CRUSHER PLANTS

- Position crusher plants on the basis of convenient location to the Work Sites as well as environmental limitations / opportunities<sup>20</sup>. A position closer to the quarry site will reduce transport requirements.
- Utilise the minimum area required for the storage of different stone sizes.

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<sup>17</sup> As allowed for on the approved ESM&R Plan.

<sup>18</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

<sup>19</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

<sup>20</sup> As allowed for on the approved ESM&R Plan.

- Do not locate crusher plants or associated settlement ponds within the 1:100 year floodline, or within a horizontal distance of 100m (whichever is greater) of a watercourse, drainage line or identified wetland.
- Do not locate crusher plants or associated settlement ponds within any riparian vegetation zone<sup>21</sup>.
- Protect the crusher plant on the up-slope side by an earth berm or sandbag system to deflect clean surface runoff away from the plant.
- Contain the crusher plant on the down-slope side by a trench and earth berm or sandbag system to control contaminated runoff and construction water emanating from within the plant.
- Collect all construction water and contaminated runoff emanating from within the crusher plant and contain within a closed settlement pond system.
- Filtered water from the settlement pond may be liberated into the environment in an appropriate manner.
- Clean out settlement pond on a regular basis and dispose of sludge in the appropriate manner.
- Ensure that appropriate measures are in place to prevent the overflow of settlement ponds during heavy rains and storm conditions.

### 12.7. EXCAVATIONS AND TRENCHES

- Undertake excavations carefully, incorporating appropriate drainage.
- For significant trees (as indicated by the ECO), trenching must occur 3m away from the stem.
- Excavate and backfill trenches on a progressive basis.

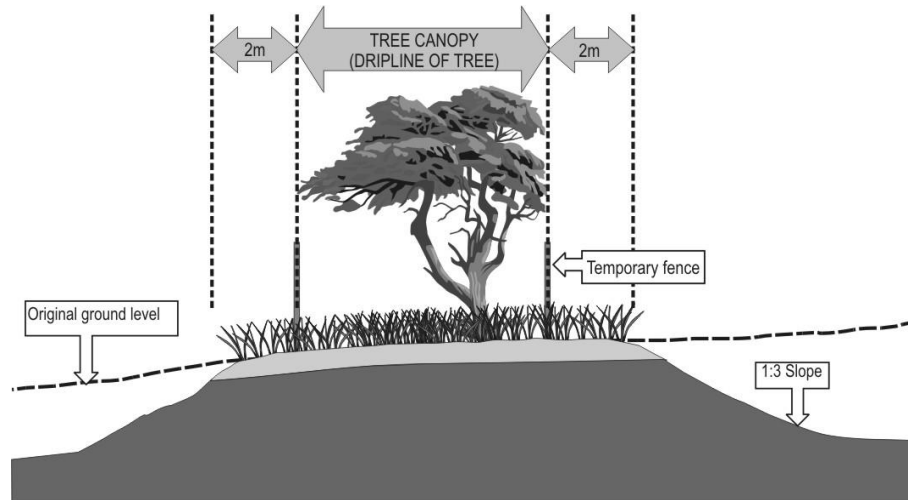


Figure 3 - Section through an excavation around a tree, allowing for the conservation thereof

<sup>21</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant.

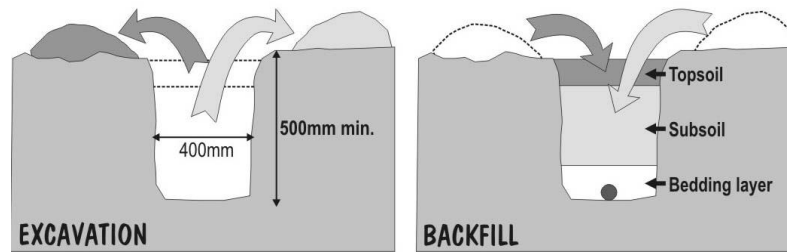


Figure 4 - Section through a typical trenching operation

- Ensure that no trench longer than 1000m is exposed at any one time.
- Do not allow excavations to stand open for longer than 2 days where possible. Excavations should preferably be opened and closed on the same day.
- Programme excavation to take place once the required materials are on site. This facilitates the immediate laying of services and / or construction of subsurface infrastructure and minimises open trench time.

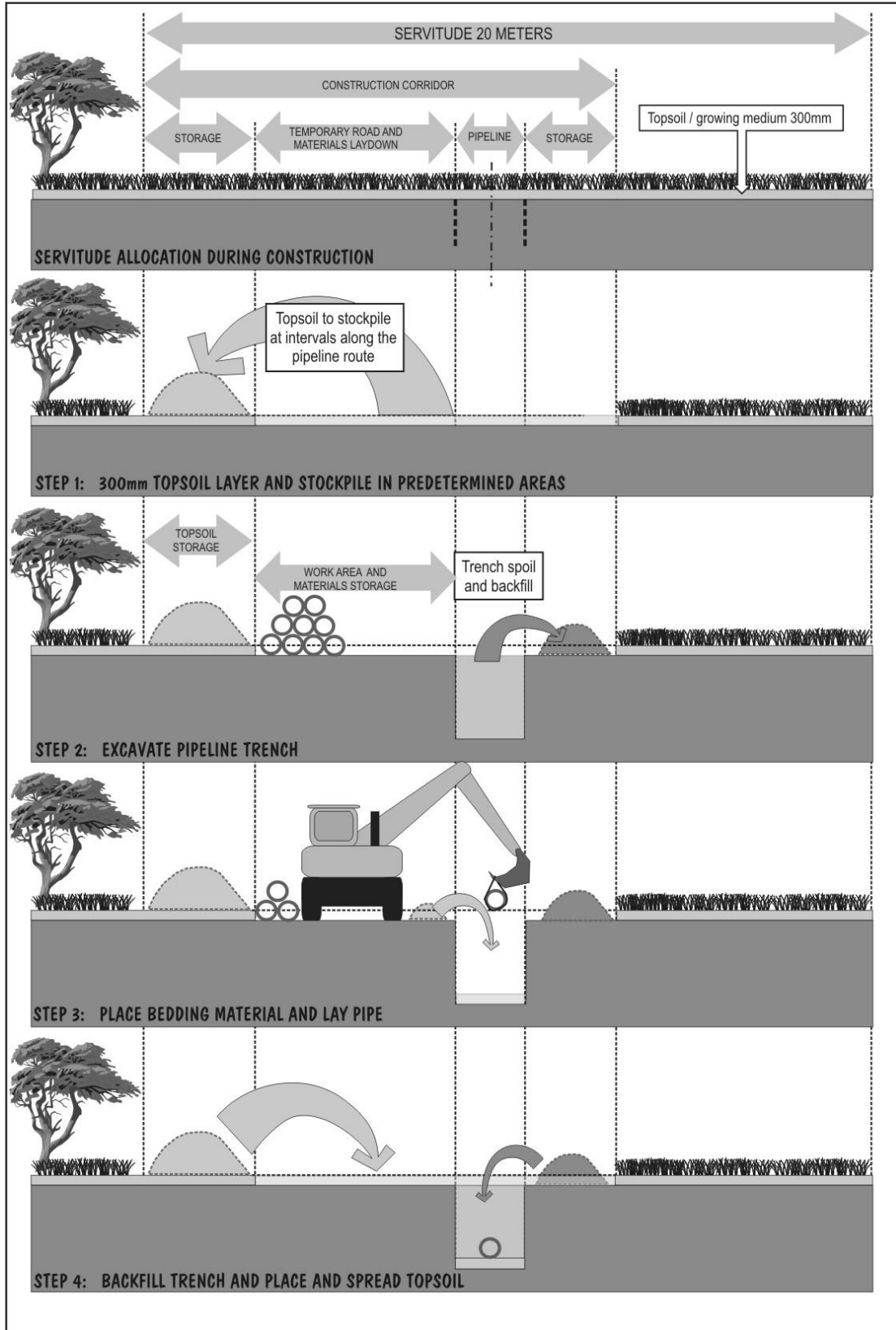
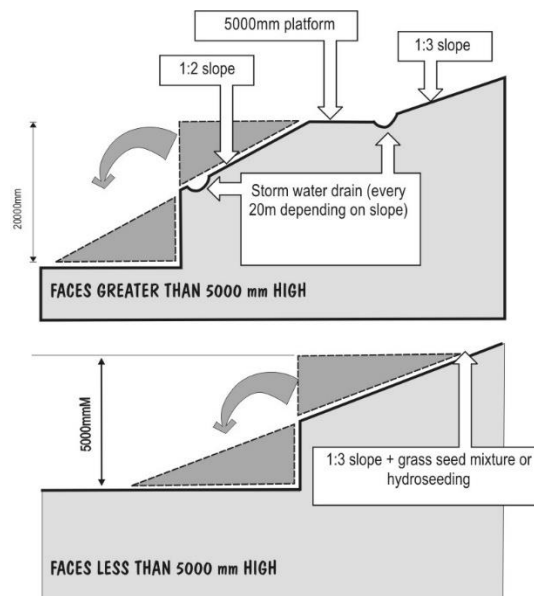


Figure 5 - Typical lifecycle of a trenching operation showing a fully rehabilitated site at the end of works

- Trenching through wetlands and drainage lines may only be undertaken upon instruction by the ECO. In such a situation be sure to return the profile of the wetland / drainage line to one similar to the pre-construction profile. No ridge or channel feature may remain.
- During construction through a wetland, the majority of the flow of the wetland must be allowed to pass down the stream (i.e. no damming must be allowed to take place). In-stream diversions should be used rather than the construction of new channels.

### 12.8. CUT AND FILL

- Cut slope gradients must not exceed the natural angle of repose for the particular soil type<sup>22</sup> wherever possible.
- In general, no slopes steeper than 1(V):3(H) will be allowed. Steeper slopes must be stabilised using the most appropriate approved method and technology as specified by the ECO.
- The ECO may identify additional cut and fill areas in need of protection and will specify a solution in terms of the most appropriate approved method and technology.
- Finish blasted areas and cut and fill slopes as roughened surfaces which emulate the natural surroundings and accumulate soil.
- Ensure that no concrete rubble is present within the top 1,5m of any embankment.



<sup>22</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant

Figure 6 - Section through a typical cut and fill operation to obtain acceptable gradients

## 12.9. SHAPING AND TRIMMING

- Execute bulk (shaping) and fine (trimming) earthworks according to design (aimed at the prevention of soil erosion, of efficient stormwater control, of the eventual reestablishment of vegetation and of ultimately achieving aesthetically acceptable landscapes).
- Shape areas to correct contours to within a tolerance of 300mm. This tolerance applies to areas where the final contours are shown on the drawings.
- Trim areas already shaped to within a tolerance of 50mm, with all undulations following a smooth curve. This tolerance applies to areas where the final contours are shown on the drawings.
- Dispose of excess material in the agreed manner.
- Plan shaping and trimming operations to allow for topsoil application: final trimmed levels must make provision for the specified depth of reapplied topsoil.
- Leave trimmed surfaces slightly rough to facilitate topsoil binding for the natural establishment of vegetation.
- Trim areas requiring grassing so that the finished surface of the area is approximately 25mm below the top of adjacent kerbing, channelling or pavement.
- Where machine operations are not practicable, trimming must be carried out using hand tools.
- Trimming of rock outcrops or koppies will not be required.

## 12.10. STOCKPILES, STORAGE AND HANDLING

### 12.10.1.1. Topsoil

- Topsoil is to be handled twice only - once to strip and stockpile, and once to replace and level.
- Position topsoil stockpiles as indicated on the approved ESM&R Plan.
- Any additional topsoil stockpile areas required by the contractor must be approved by the ECO, in the form of an amended ESM&R Plan indicating the position and extent of thereof.
- Position topsoil stockpiles on the higher side of a disturbed area, and above a 1:50 year flood line wherever possible.
- Ensure that all topsoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.
- In linear projects, stockpile topsoil in windrows parallel to the excavation.
- In riverine areas, stockpile topsoil above the riverine zone.
- Where it is necessary to remove sediment (i.e. during gauging weir maintenance), replace this evenly along the downstream river banks for slow release with high flows.
- Do not stockpile topsoil in drainage lines.
- Do not stockpile topsoil in heaps exceeding 2m in height.
- Protect topsoil stockpiles from erosion.
- Remove exotic / invasive plants and broad leaf weeds that emerge on topsoil stockpiles.



- If topsoil is to be stockpiled for extended periods, especially during the wet season, then the ECO may recommend one of the following measures:
  - The re-vegetation of the stockpiles with indigenous grasses<sup>23</sup>.
  - The covering of the stockpiles with a protective material such as hessian mats.
- Ensure that topsoil is at no time buried, mixed with spoil (excavated subsoil), rubble or building material, or subjected to compaction or contamination by vehicles or machinery. This will render the topsoil unsuitable for use during rehabilitation.
- The Contractor will be held liable for the replacement of any topsoil rendered unsuitable for use during rehabilitation, for reasons due to his negligence or mismanagement on site.

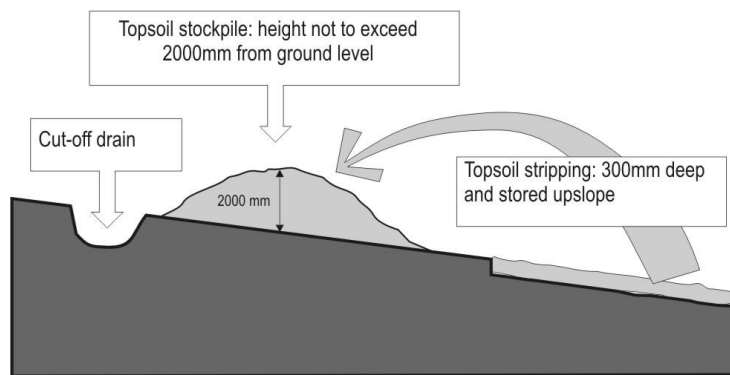


Figure 7 - Section through a typical topsoil stripping and stockpiling operation

#### 12.10.1.2. Spoil

- Position spoil (excavated subsoil) as indicated on the approved ESM&R Plan.
- Any additional spoil storage area required by the contractor must be approved by the ECO, in the form of an amended ESM&R Plan at least 30 days prior to initiating the activity. The following information is required for approval:
  - The location, description of and access to proposed sites.
  - The quantity of material to be stored as spoil.
  - The type of material to be stored as spoil (i.e. blast rock, excavated rock, subsoil etc.).
  - The proposed method of storing spoil.
  - A proposal for the reinstatement and rehabilitation plan, including the final profile.
  - Written approval from the landowner / relevant authority that material may be stored on the land in question, subject to conditions.
- In linear projects, spoil must be positioned in windrows parallel to the excavation.

<sup>23</sup> To be indicated by the ECO as referenced in the Environmental Impact Assessment or Project Screening Exercise, whichever is relevant

- Position spoil on the higher side of a disturbed area, and above a 1:20 year flood line wherever possible.
- Ensure that all spoil is stored in such a way and in such a place that it will not cause the damming up of water, erosion gullies, or wash away itself.
- Do not store spoil in drainage lines.
- Properly rehabilitate any permanent spoil dumps as soon as work in that area is complete.
- In general, no slopes steeper than 1(V):3(H) will be allowed.
- Bury the coarser material beneath the finer material and overlay all permanent spoil heaps with a layer of topsoil at least 200mm thick.

End