AGENDA ITEM 7

APPENDIX 2

2018/0301/DET

CONSTRUCTION METHOD STATEMENT

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS NOTING PROPOSED TRACK CONSTRUCTION METHODOLOGY

Cane Nr.	Map Sheet Prefix Nr.	Section	Length	Proposed Methodology
1	10178 92081 - 10133 92069	0-46	46 LM	CUT & FILL SECTION
2	10133 92069 - 10123 92060	46-59	13 LM	CUT & FILL SECTION
3	10123 92060 - 10113 92047	59-79	20 LM	FLOATED SECTION
4	10113 92047 - 10108 92048	79-89	10 LM	FLOATED SECTION
4	10108 92048 - 10092 92047	89-109	20 LM	CUT & FILL SECTION
5	10092 92047 - 10073 92051	109-129	20 LM	CUT & FILL SECTION
6	10073 92051 - 10052 92044	129-149	20 LM	CUT & FILL SECTION
7	10052 92044 - 09991 92049	149-209	60 LM	FLOATED SECTION
8	09991 92049 - 09946 92051	209-259	50 LM	CUT / FLOATED SECTION
9	09946 92051 - 09913 92053	259-289	30 LM	CUT & FILL SECTION
10	09913 92053 - 09878 92036	289-329	40 LM	CUT & FILL SECTION
11	09878 92036 - 09849 92034	329-359	30 LM	CUT & FILL SECTION
12	09849 92034 - 09831 92032	359-379	20 LM	CUT & FILL SECTION
13	09831 92032 - 09802 92028	379-409	30 LM	CUT & FILL SECTION
14	09802 92028 - 09762 92012	409-449	40 LM	CUT & FILL SECTION
15	09762 92012 - 09742 92008	449-469	20 LM	CUT & FILL SECTION
16	09742 92008 - 09742 92000	469-479	10 LM	CUT & FILL SECTION
17	09742 92000 - 09689 91998	479-529	50 LM	CUT/FLOATED SECTION
18	09689 91998 - 09662 91991	529-559	30 LM	CUT/FLOATED SECTION
19	09662 91991 - 09629 91986	559-589	30 LM	CUT/FLOATED SECTION
20	09629 91986 - 09598 91982	589-619	30 LM	CUT & FILL SECTION
21	09598 91982 - 09598 91980	619-664	45 LM	CUT & FILL SECTION
22	09598 91980 - 09524 91984	664-734	70 LM	CUT & FILL SECTION
23	09524 91984 - 09489 91993	734-774	40 LM	CUT & FILL SECTION
24	09489 91993 - 09470 91995	774-794	20 LM	CUT & FILL SECTION
25	09470 91995 - 09451 92000	794-814	20 LM	CUT & FILL SECTION
26	09451 92000 - 09426 92006	814-844	30 LM	CUT & FILL SECTION
27	09426 92006 - 09404 92000	844-864	20 LM	CUT & FILL SECTION
28	09404 92000 - 09342 91997	864-924	60 LM	FLOATED SECTION
29*	09342 91997 - 09326 92009	924-944	20 LM	CUT & FILL SECTION
30	09326 92009 - 09297 92026	944-974	30 LM	FLOATED SECTION
31	09297 92026 - 09271 92039	974-1004	30 LM	FLOATED SECTION
32	09271 92039 - 09256 92053	1004-1024	20 LM	CUT & FILL SECTION
33	09256 92053 - 09235 92081	1024-1064	40 LM	CUT & FILL SECTION
34	09235 92081 - 09208 92101	1064-1094	30 LM	CUT & FILL SECTION
35	09208 92101 - 09180 92113	1094-1124	30 LM	CUT & FILL SECTION
36	09180 92113 - 09154 92138	1124-1164	40 LM	CUT & FILL SECTION
37	09154 92138 - 09129 92152	1164-1194	30 LM	CUT & FILL SECTION
38	09129 92152 - 09097 92178	1194-1234	40 LM	CUT & FILL SECTION
39	09097 92178 - 09048 92233	1234-1304	70 LM	CUT/FLOATED SECTION
40	09048 92233 - 09020 92255	1304-1344	40 LM	CUT/FLOATED SECTION
41	09020 92255 - 08980 92283	1344-1394	50 LM	CUT/FLOATED SECTION
42	08980 92283 - 08971 92314	1394-1424	30 LM	CUT/FLOATED SECTION
43	08971 92314 - 08928 92324	1424-1464	40 LM	CUT/FLOATED SECTION

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS NOTING PROPOSED TRACK CONSTRUCTION METHODOLOGY

Cane Nr.	Map Sheet Prefix Nr.	Section	Length	Proposed Methodology
44	08928 92324 - 08900 92351	1464-1504	40 LM	CUT/FLOATED SECTION
45	0890 92351 - 08869 92378	1504-1544	40 LM	FLOATED SECTION
46	08869 92378 - 08826 92420	1544-1604	60 LM	FLOATED SECTION
47	08826 92420 - 08810 92452	1604-1644	40 LM	FLOATED SECTION
48	08810 92452 - 08779 92482	1644-1684	40 LM	CUT & FILL SECTION
49	08779 92482	TRACK END		

Red Text 29* Denotes Highest Point of Proposed Track

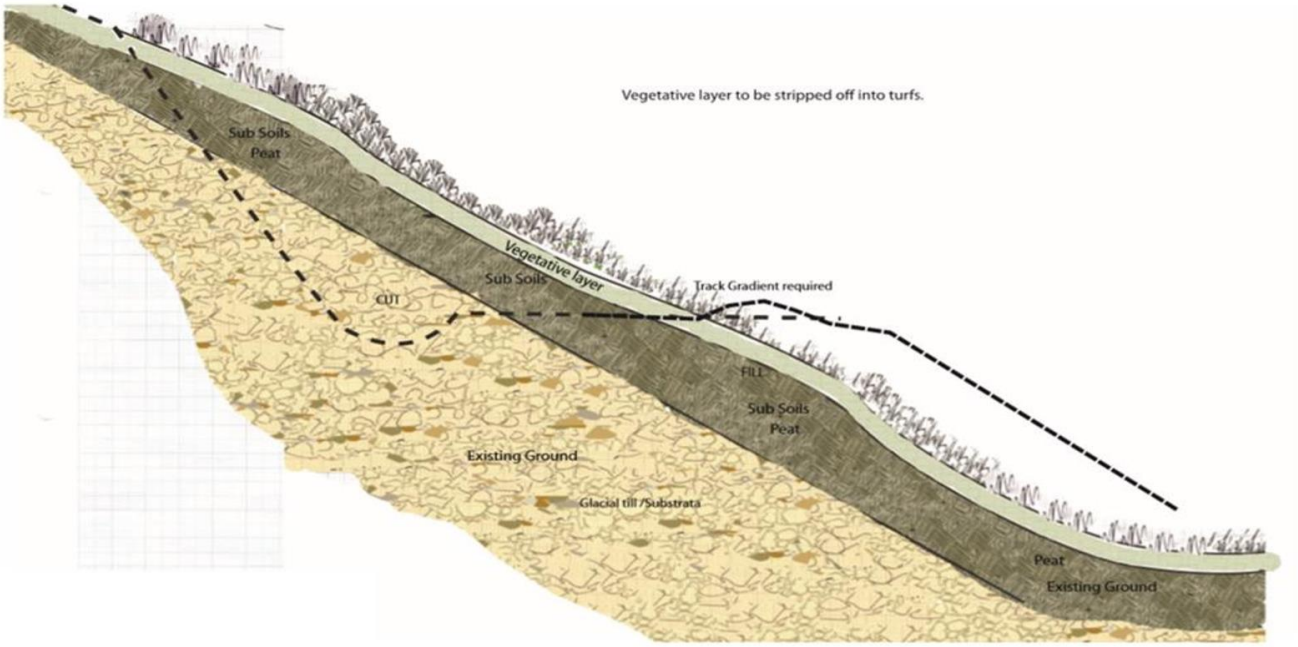
Summary	**LM**
CUT & FILL SECTIONS	904 LM
CUT & FLOATED SECTIONS	430 LM
FLOATED SECTIONS	350 LM
TOTAL	**1684 LM**

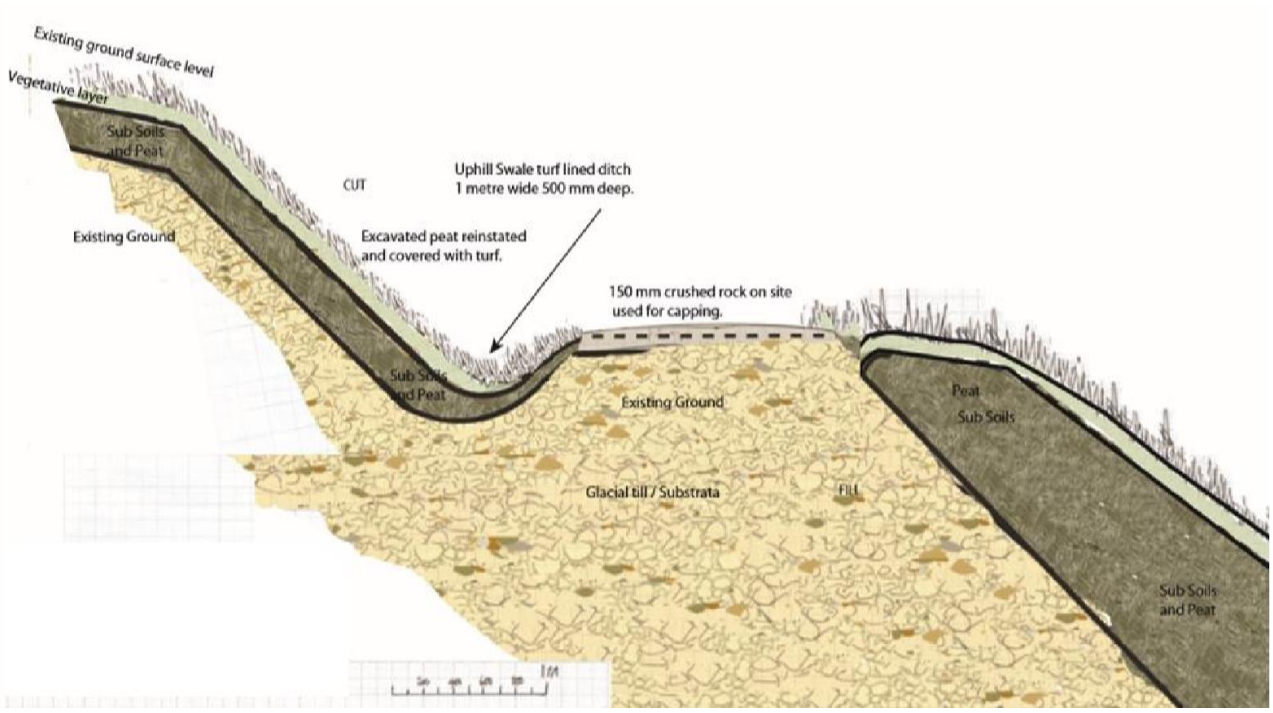
TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FILL TRACK CONSTRUCTION METHODOLOGY

Cane Nr.	Map Sheet Prefix Nr.	Section	Length	Topside Ditch (LM)	Culverts Required
1	10178 92081 - 10133 92069	0-46	46 LM	46 LM	1 X 450MM DIA
2	10133 92069 - 10123 92060	46-59	13 LM	26 LM (Double Sided)	1 X 450MM DIA
4	10108 92048 - 10092 92047	89-109	20 LM	20 LM	N/A
5	10092 92047 - 10073 92051	109-129	20 LM	20 LM	1 X 300MM DIA
6	10073 92051 - 10052 92044	129-149	20 LM	20 LM	N/A
9	09946 92051 - 09913 92053	259-289	30 LM	30 LM	N/A
10	09913 92053 - 09878 92036	289-329	40 LM	40 LM	1 X 300MM DIA
11	09878 92036 - 09849 92034	329-359	30 LM	30 LM	1 X 600MM DIA
12	09849 92034 - 09831 92032	359-379	20 LM	20 LM	N/A
13	09831 92032 - 09802 92028	379-409	30 LM	30 LM	1 X 300MM DIA
14	09802 92028 - 09762 92012	409-449	40 LM	40 LM	N/A
15	09762 92012 - 09742 92008	449-469	20 LM	20 LM	N/A
16	09742 92008 - 09742 92000	469-479	10 LM	10 LM	1 X 300MM DIA
20	09629 91986 - 09598 91982	589-619	30 LM	30 LM	1 X 300MM DIA
21	09598 91982 - 09598 91980	619-664	45 LM	45 LM	1 X 300MM DIA
22	09598 91980 - 09524 91984	664-734	70 LM	70 LM	1 X 300MM DIA
23	09524 91984 - 09489 91993	734-774	40 LM	40 LM	1 X 300MM DIA
24	09489 91993 - 09470 91995	774-794	20 LM	20 LM	N/A
25	09470 91995 - 09451 92000	794-814	20 LM	20 LM	1 X 300MM DIA
26	09451 92000 - 09426 92006	814-844	30 LM	20 LM	N/A
27	09426 92006 - 09404 92000	844-864	20 LM	20 LM	N/A
29*	09342 91997 - 09326 92009	924-944	20 LM	20 LM	N/A
32	09271 92039 - 09256 92053	1004-1024	20 LM	20 LM	1 X 600MM DIA
33	09256 92053 - 09235 92081	1024-1064	40 LM	40 LM	N/A
34	09235 92081 - 09208 92101	1064-1094	30 LM	30 LM	1 X 450MM & 1 X 300MM DIA
35	09208 92101 - 09180 92113	1094-1124	30 LM	30 LM	N/A
36	09180 92113 - 09154 92138	1124-1164	40 LM	40 LM	1 X 300MM DIA
37	09154 92138 - 09129 92152	1164-1194	30 LM	30 LM	N/A
38	09129 92152 - 09097 92178	1194-1234	40 LM		1 X 300MM DIA
48	08810 92452 - 08779 92482	1644-1684	40 LM	80 LM (Double Sided)	N/A
49	08779 92482	TRACK END		N/A	1 X 300MM DIA

29* - Denotes Highest Point of the Proposed Track. Subsequent Sections descend to End Point.

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FILL TRACK CONSTRUCTION METHODOLOGY



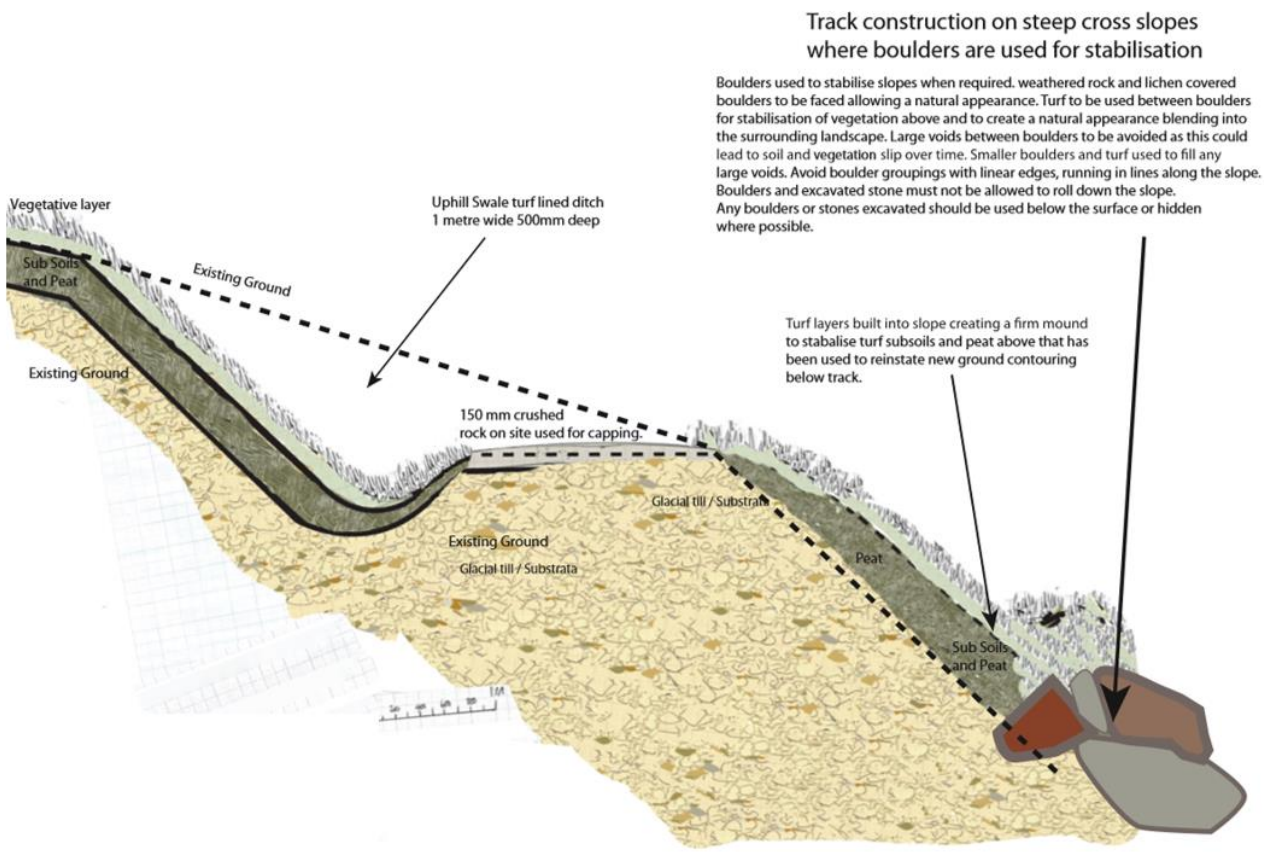


TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FILL TRACK CONSTRUCTION METHODOLOGY

THE CUT AND FILL OR BENCHED METHOD OF TRACK CONSTRUCTION IS USED WHEN THE TRACK DIRECTION TAKES IT ACROSS SIDE SLOPE.

IN GENERAL, THIS INVOLVES THE CUTTING AND EXTRACTING OF SUITABLE MATERIAL FROM THE UP-SLOPE SIDE, THEREAFTER USING EXTRACTED MATERIAL TO BUILD UP THE DOWN SLOPE SIDE TO CREATE A 'BENCH'.

- Initially, any turf/vegetation layer is removed from the proposed track line on the side slope. This is carefully set aside for reuse and final reinstatement.
- Any subsequent topsoil layer shall again be set a side for re-use at final reinstatement.
- From the up-slope side of the proposed track line, suitable sub-base aggregate material shall be excavated and decanted along the downs lope side of the track so as to build this area up to create a stable track initial layer.
- Depending on the steepness of the side slope being traversed, the bottom slope side may require further stabilising using on site won rocks and boulders or large vegetation sods placed at the downslope toe. (See Diagram Below)



- It is imperative that material used for the building up of the downslope side of the track is adequately compacted in 250-300mm layers. This ensures ultimate stability of the final track.
- A topside ditch is normally installed during this phase of the works to control ground seepage and water runoff from higher elevations.

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FILL TRACK CONSTRUCTION METHODOLOGY

- The initial Cut and fill to bring up levels of downslope side of new track line.

- Building up of Bottom Slope Side of Track

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FILL TRACK CONSTRUCTION METHODOLOGY

- Track Edge and Surround Reinstatement. Track reduced to finished width required.

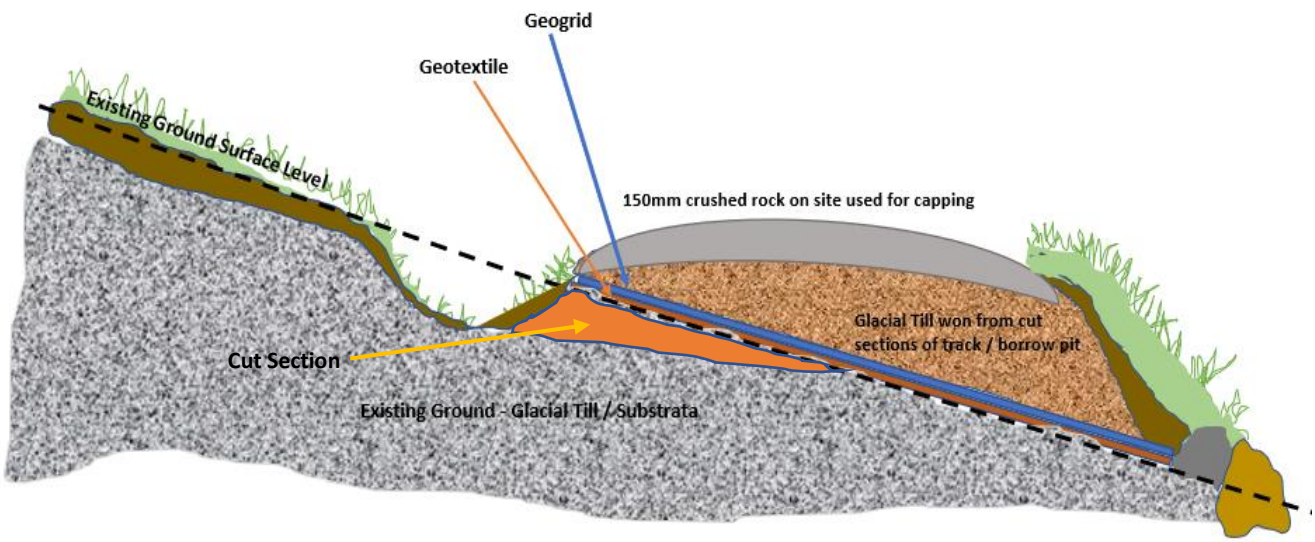
- Photograph shows final reinstatement of the bottom slope section. Note top slope cut and final reinstatement

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FILL TRACK CONSTRUCTION METHODOLOGY

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FLOATED TRACK CONSTRUCTION METHODOLOGY

Cane Nr.	Map Sheet Prefix Nr.	Section	Length	Topside Ditch (LM)	Culverts Required
8	09991 92049 - 09946 92051	209-259	50 LM	50 LM	1 X 300MM DIA
17	09742 92000 - 09689 91998	479-529	50 LM	50 LM	1 X 300MM DIA
18	09689 91998 - 09662 91991	529-559	30 LM	30 LM	1 X 300MM DIA
19	09662 91991 - 09629 91986	559-589	30 LM	30 LM	N/A
39	09097 92178 - 09048 92233	1234-1304	70 LM	140 LM (Both Sides)	1 x 300MM DIA
40	09048 92233 - 09020 92255	1304-1344	40 LM	80LM (Both Sides)	1 x 450MM DIA
41	09020 92255 - 08980 92283	1344-1394	50 LM	100LM (Both Sides)	N/A
42	08980 92283 - 08971 92314	1394-1424	30 LM	60 LM (Both Sides)	1 X 300MM DIA
43	08971 92314 - 08928 92324	1424-1464	40 LM	80 LM (Both Sides)	N/A
44	08928 92324 - 08900 92351	1464-1504	40 LM	80 LM (Both Sides)	1 X 300MM DIA

Cut Section with Floated Track Layout



TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FLOATED TRACK CONSTRUCTION METHODOLOGY

- Installation of geotextile and Geogrid to existing ground levels to stabilise base of proposed new track, whilst protecting any tree root systems.

- Construction follows same remit as Cut and Fill Methodology (Building up Downslope Side of track)

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FLOATED TRACK CONSTRUCTION METHODOLOGY

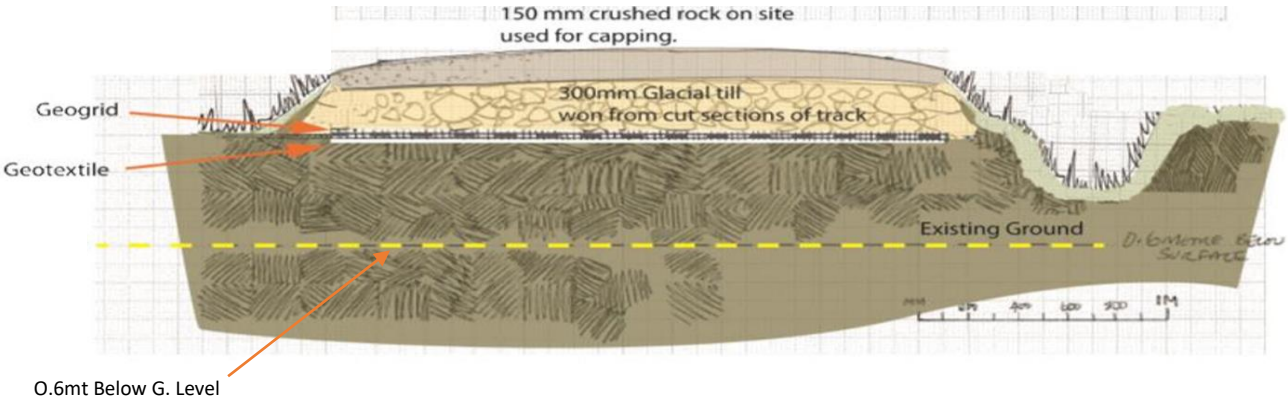
- Track bottom slope and surrounds Reinstatement. Reducing of track footprint down to required widths

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED CUT AND FLOATED TRACK CONSTRUCTION METHODOLOGY

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED FLOATED TRACK CONSTRUCTION METHODOLOGY

Cane Nr.	Map Sheet Prefix Nr.	Section	Length	Topside Ditch (LM)	Culverts Required
3	10123 92060 - 10113 92047	59-79	20 LM	40 LM (Both Sides)	1 x 300MM DIA
4	10113 92047 - 10108 92048	79-89	10 LM	10 LM	N/A
7	10052 92044 - 09991 92049	149-209	60 LM	60LM	1 X 300MM DIA
28	09404 92000 - 09342 91997	864-924	60 LM	60 LM	1 X 300MM DIA
30	09326 92009 - 09297 92026	944-974	30 LM	30 LM	1 X 300MM DIA
31	09297 92026 - 09271 92039	974-1004	30 LM	30 LM	N/A
45	0890 92351 - 08869 92378	1504-1544	40 LM	80 LM (Both Sides)	N/A
46	08869 92378 - 08826 92420	1544-1604	60 LM	120 LM (Both Sides)	N/A
47	08826 92420 - 08810 92452	1604-1644	40 LM	80 LM (Both Sides)	1 X 300MM DIA

FLOATED TRACK METHODOLOGY



TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED FLOATED TRACK CONSTRUCTION METHODOLOGY

NO DIG / FLOATED TRACK SECTIONS - USED IN AREAS IN CLOSE PROXIMITY TO TREE ROOT SYSTEMS & AREAS OF DEEP PEAT.

- The use of a geomembrane and Geogrid mesh laid initially on top of existing vegetation or after removal of the vegetation covering. Laid material will assist in the stabilisation of proposed track sub-base and prevent possible subsidence of track section from future use. Any initial removal of turf shall be carefully set aside for future reinstatement of new track surrounds.

- Initial track sub-base layer width formation will be wider than the final track width dimension (Approx. 300-500mm greater at each track side). This ensures greater overall stability to the new track edges thus preventing future edge deterioration and subsidence.

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED FLOATED TRACK CONSTRUCTION METHODOLOGY

- The subsequent building up in layers to form the track surface can thereafter be undertaken using suitably graded materials sourced from on-site borrow pits. Each individual track sub layer being compacted to refusal using a suitable sized vibrating roller.
- Culverts shall also be installed at required locations during the sub-base layer installation. These shall be located at strategic points along the track line, positioned so as to direct any side drain water to the downslope side of the track. Thereafter the water can disperse into the adjacent vegetation naturally. Culverts shall be of a suitable size/dimension so as to accommodate flash flood scenarios.
- Upon reaching the end point of the track works, the initial track sub-base formation, and culvert installation shall be completed.
- Working back from the track end point, Finer graded track capping material shall be imported along the new formed track and decanted along the track surface. An excavator with a tilti-head bucket attachment will grade the finer graded material to form the final surface, ensuring the correct crossfall/centre camber is formed during formation.

- Simultaneously reinstatement to ditch and new track edge shall be undertaken using previously saved turf/vegetation.
- During this stage the track width shall be reduced to the required width.
- As final track surface and reinstatement of surrounds progress.

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED FLOATED TRACK CONSTRUCTION METHODOLOGY

- The new formed track surface layer shall be again compacted to refusal using a suitable sized vibrating drum roller, ensuring that any formed camber is maintained within the track surface.
- The completed track should ultimately blend into the adjacent surrounding and ground levels, with no bare soil areas being evident (Depending on amount of existing vegetation available for re-use).

TRACK RE-ROUTING AT GLEN QUOICH, MAR LODGE ESTATE
SECTIONS OF PROPOSED FLOATED TRACK CONSTRUCTION METHODOLOGY

Old Track Reinstatement Works

METHODOLOGY OF REINSTATEMENT SHALL BE ADOPTED TO RE-NATURALISE & RE-VEGETATE AND CLOSE OFF THE REDUNDANT ESTATE TRACK SECTION SHALL BE AS FOLLOWS:

- Working back from the far end of the redundant track section the existing redundant track - the track surface shall be loosened using the teeth on the excavator bucket to aerate the compacted redundant track.
- Resulting loosened material from the roughening process shall be utilised to grade the old track surface to mimic adjacent changing ground levels and topography, through the creation of natural looking depressions and small knolls.
- The old track material now contains a large percentage of soil content within it, due to material migration during rainfall and dust build up over the years, thus this will be conducive to assisting in the re-vegetating of the area.
- No materials shall be required to be removed from the old redundant track section.
- As the aforementioned works progresses, simultaneously reinstatement of the new created surface be undertaken.
- Revegetating of the old track 'footprint' shall be undertaken through **'spot robbing'** the adjacent 'Donor' vegetation areas at either side of the track. Due to the good existing vegetation coverage at either side of the track 'footprint' a good overall coverage shall be achieved
- Turfs shall be carefully ‘spot’ removed using the excavator bucket. Random spot removal of turfs ensures the donor site vegetation and overall vegetation coverage is not compromised, resulting in future erosion of area.
- Upon removal of required turfs from individual spots within the donor area, the surrounding void created can be filled by carefully manipulating the adjacent vegetation using the excavator bucket.
- Ideally the excavated turfs should have sufficient soil and root depth attached to ensure good establishment when re-laid.
- Works continues until back at the old track section start point.
- McGowan Ltd, as contractor are highly experienced in such type reinstatement works within designated ground and are fully experienced in the differing methods of ground and track side reinstatement. Some Examples follow in the next pages.
- Reinstatement using spot won vegetation sods shall only be undertaken following a pre-site walkover by the Site ECOW. This will identify in advance any adjacent areas which require specific protection due to endangered flora/fauna and habitats being present. No works shall commence until the appropriate protection areas have been identified and installed. All staff to be briefed on the identified locations.

Ground Reinstatement Case Studies

- **BRUAR** - Reinstatement of a large bare area following an access track installation by another contractor. **Spot Turf Reinstatement** utilising a long reach excavator to 'rob' turf from adjacent 'Donor' vegetated areas to allow quicker vegetation coverage over bare soil area. Long reach excavator to minimise tracking and further damage to bare soil structure. This was highly specialised works, resulting good coverage of bare soil areas, whilst ensuring the integrity of the Donor site was not being compromised.

- **MAR LODGE ESTATE** - FULL REINSTATEMENT TO TEMPORARY ACCESS TRACK FOLLOWING COMPLETION OF WORKS ON SITE UTILISING SAVED TURF SODS FROM INITIAL TRACK FORMATION.

TEMPORARY TRACK CREATION

FINAL REINSTATED TRACK

- **Beauly-Denny Line** Track Reinstatement Works undertaken by McGowan Ltd following the initial installation of a new estate track by another contractor. Spot Robbing from adjacent areas adopted

The above Photograph also notes a newly installed grass seeded central grass strip, in keeping with other tracks within the estate.

- **Bienn A'Ghlo Trail** - Notes the importance of saving turf/vegetation during the initial trail construction phase. Readily available turf /vegetation sods ensure **Full Reinstatement** of trail surrounds with no bare soil areas evident.

❖ **Borrow Pit Reinstatement**

PROPOSED FINAL TRACK ALIGNMENT - PEGGING & TAPING

The proposed new track alignment shall be marked on the ground with coloured marker stakes positioned along the centre line of the proposed track line. Marker posts shall be installed at the noted grid reference points within the Site survey sections.

Upon completion of the centre line marking out, a further line of marker stakes will be installed at a distance away from either side of the centre line coloured marker posts. The distance between the edge markers to the centre marker shall identify the working corridor along the new track route.

The working corridor shall be kept as narrow as practicable so as to minimise un-necessary damage to existing vegetation/habitats, and ultimately reduce reinstatement to the new track surrounds.

All Site staff to be made aware of the limits of working areas at initial induction and through further reinforcement during daily briefings.

TREE, FLORA, AND FAUNA PROTECTION AREAS

Once the new track working corridor has been established and marked on site, this will identify more clearly 'on the ground', where the need for tree protection mitigation is required before construction works can commence. Tree protection areas shall be installed on site using temporary barrier fencing to identify and segregate areas from future works. Tree Protection signage shall be installed at the individual areas along the track route surrounds as a further marker.

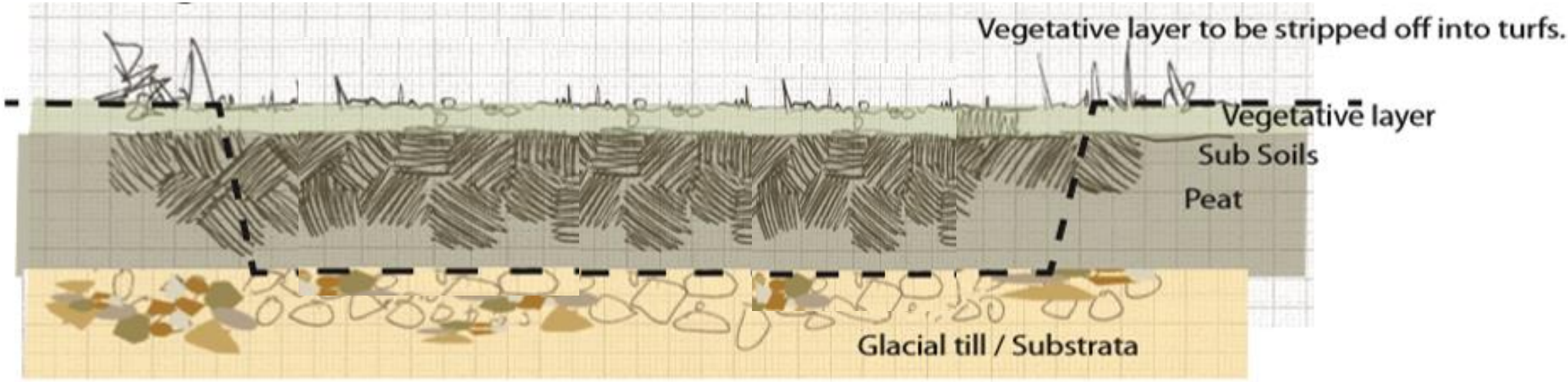
The new track corridor will also allow the site ECOW to inspect the area in advance of any works to ensure no protected flora and fauna will be unduly affected by future works on site. The ECOW shall inspect the working corridor and the immediate periphery areas to either side during the inspection. Areas which require special protection, shall be identified to all staff on site. Additional signage shall be installed at these locations as a further visual aid on site.

Contractor will AT ALL TIMES, ADHERE to any ECOW report recommendations and instructions as to the required protection / further protection of these areas.

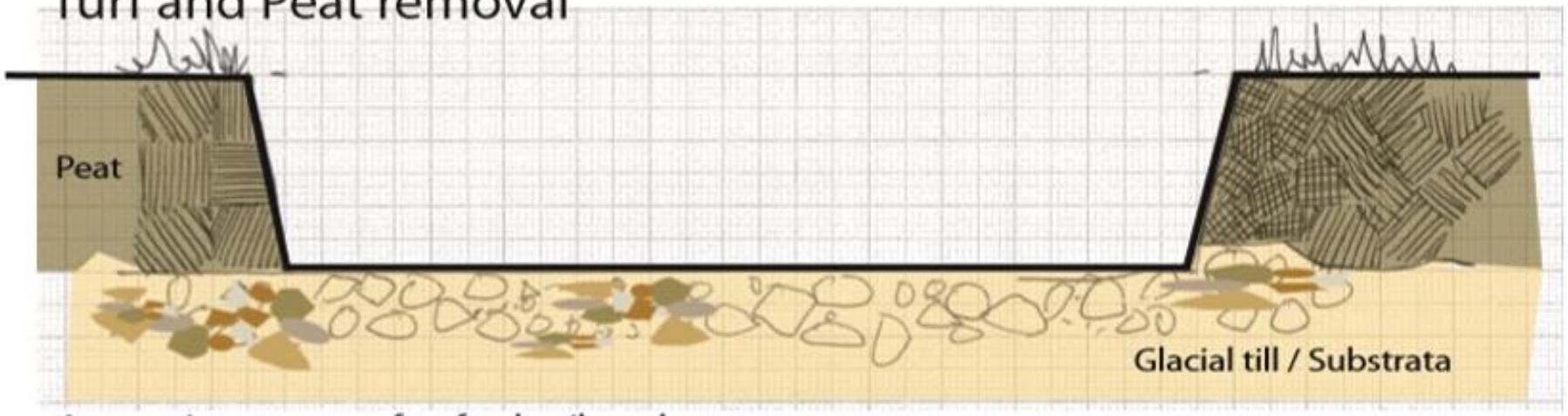
GLEN QUOICH PROPOSED NEW TRACK ALIGNMENT
PROGRAMME OF WORKS

		WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10	WEEK 11
	PRE-COMMENCEMENT WORKS											
1	INITIAL SETTING OUT ON SITE											
2	ECOW SITE VISIT / INSPECTION											
3	INSTALL PROTECTION AREAS / SIGNAGE											
4	INSTALL SILT PROTECTION MITIGATION											
5	UNDERTAKING ANY FURTHER PROTECTION WORKS IDENTIFIED BY ECOW											
	TRACK CONSTRUCTION (6 WEEKS)											
6	IDENTIFYING AND OPENING OF INITIAL BORROW PIT AREA											
7	BORROW PIT MATERIAL GRADING											
8	TRACK LINE - INITIAL TURF/VEGETATION SOD REMOVAL / SET ASIDE / STORAGE (Track Start Point to End Point)											
9	TRACK LINE - INITIAL SOIL REMOVAL / SET ASIDE / STORAGE (Track Start Point to End Point)											
10	INITIAL TRACKLINE SUB-BASE MATERIAL INSTALLATION / COMPACTION (Track Start Point to End Point)											
11	SIDE DRAIN FORMATION AND CULVERT INSTALLATION											
12	WORKING BACK FROM TRACK END POINT - BRING ONTO SITE CAPPING LAYER - GRADE ACROSS TRACK SURFACE /FORM REQUIRED CAMBER											
13	REINSTATEMENT TO TRACK SURROUNDS USING INITIALLY PREVIOUSLY SAVED TOPSOILS WITH FINAL REINSTATEMENT USING PREVIOUSLY SAVED TURF/VEGETATION SODS											
14	FINAL TRACK COMPACTION - VIBRATING TWIN DRUM ROLLER											
	OLD TRACK REINSTATEMENT (3 WEEKS)											
15	OLD TRACK REPLACEMENT / REINSTATING OF FINAL BORROW PIT											
16	ADVERSE WEATHER CONTINGUENCY											

ORGANIC MATERIAL REMOVAL EXAMPLE

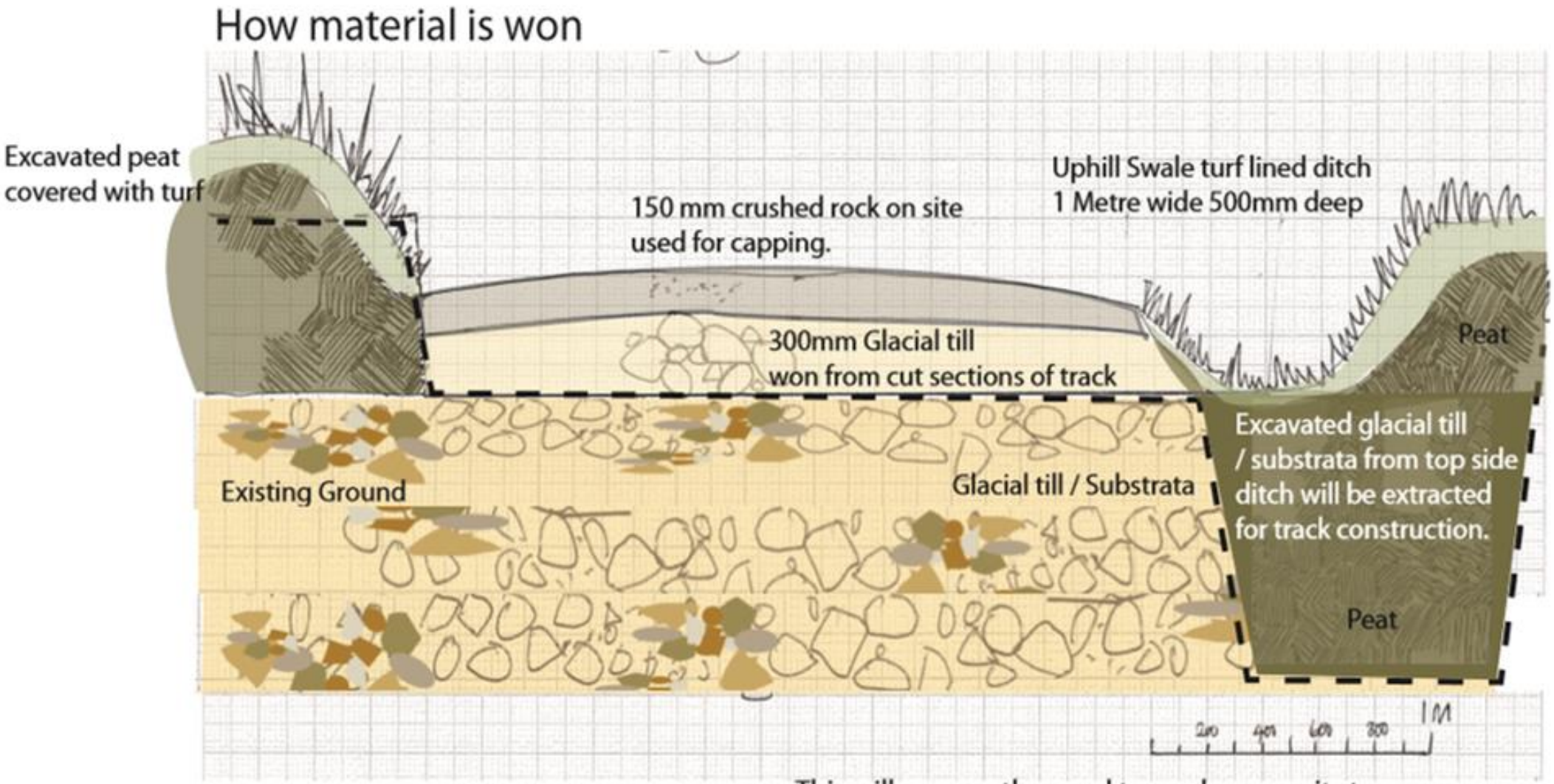


Turf and Peat removal



Appropriate storage of turf, subsoils and peat
for reinstatement and ground shaping

HOW MATERIAL IS WON

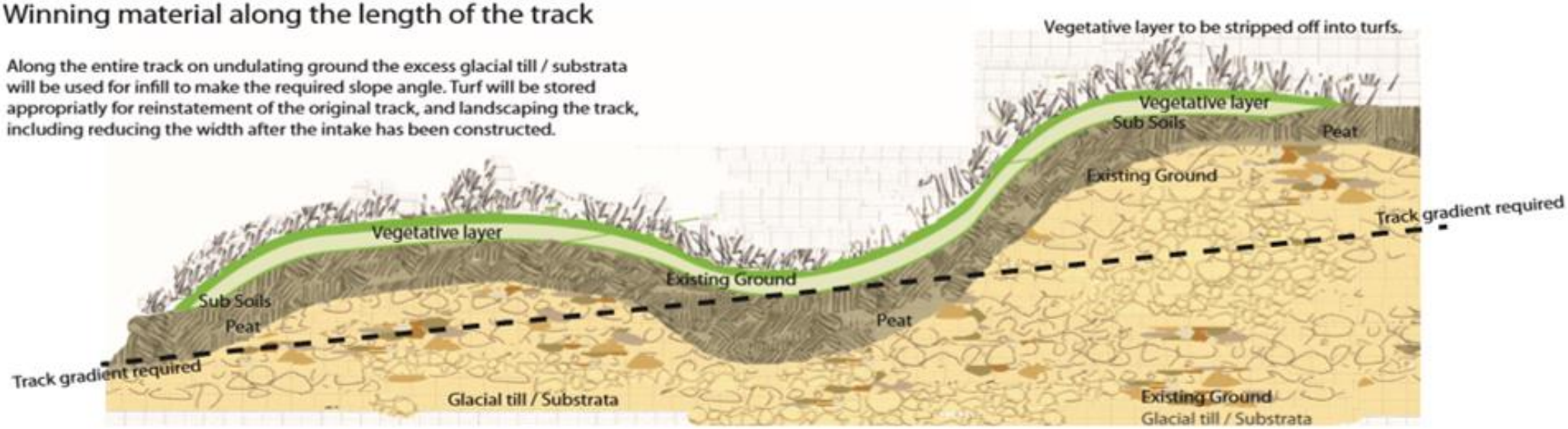


This will remove the need to use borrow pits to secure material and avoid further ground disruption and regrading. The void will be reinstated with peat.

WON MATERIALS ON SLOPES

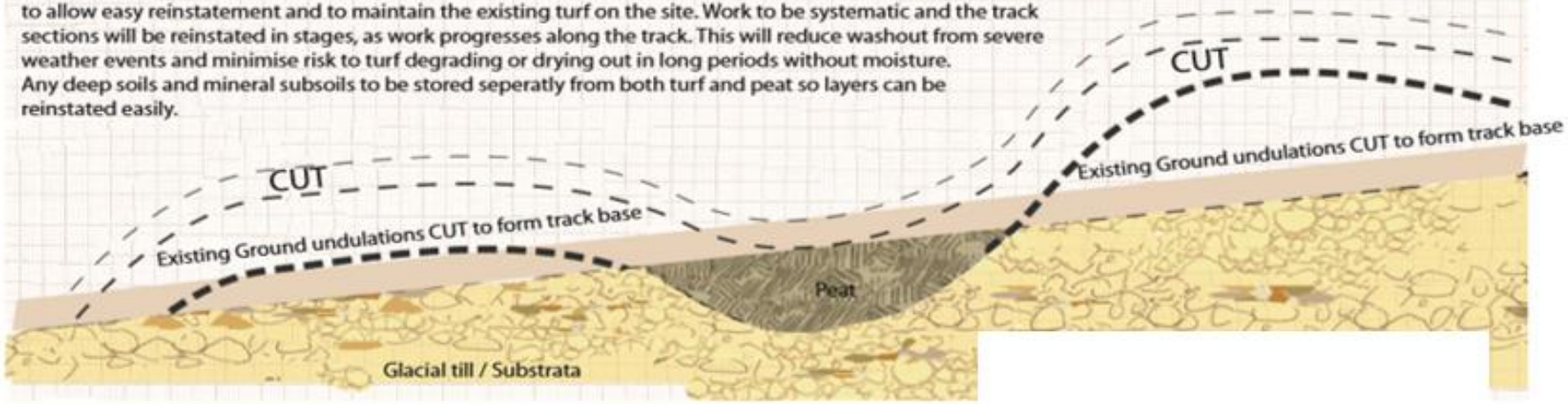
Winning material along the length of the track

Along the entire track on undulating ground the excess glacial till / substrata will be used for infill to make the required slope angle. Turf will be stored appropriatly for reinstatement of the original track, and landscaping the track, including reducing the width after the intake has been constructed.



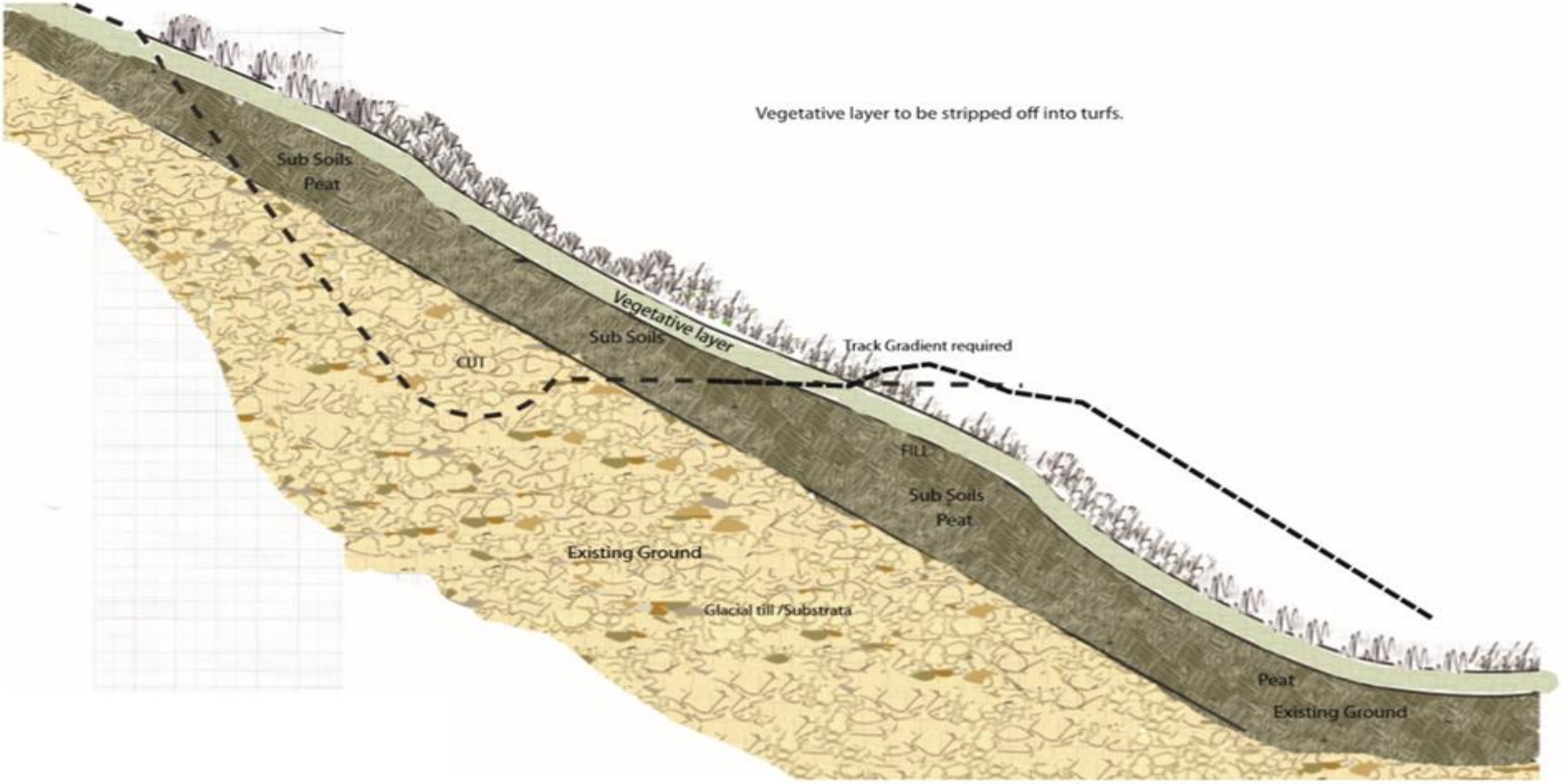
Removal of turf , sub soils and peat

Turf to be cut and stored on the margins along the track length. Stored surface to surface to allow easy reinstatement and to maintain the existing turf on the site. Work to be systematic and the track sections will be reinstated in stages, as work progresses along the track. This will reduce washout from severe weather events and minimise risk to turf degrading or drying out in long periods without moisture. Any deep soils and mineral subsoils to be stored seperatly from both turf and peat so layers can be reinstated easily.

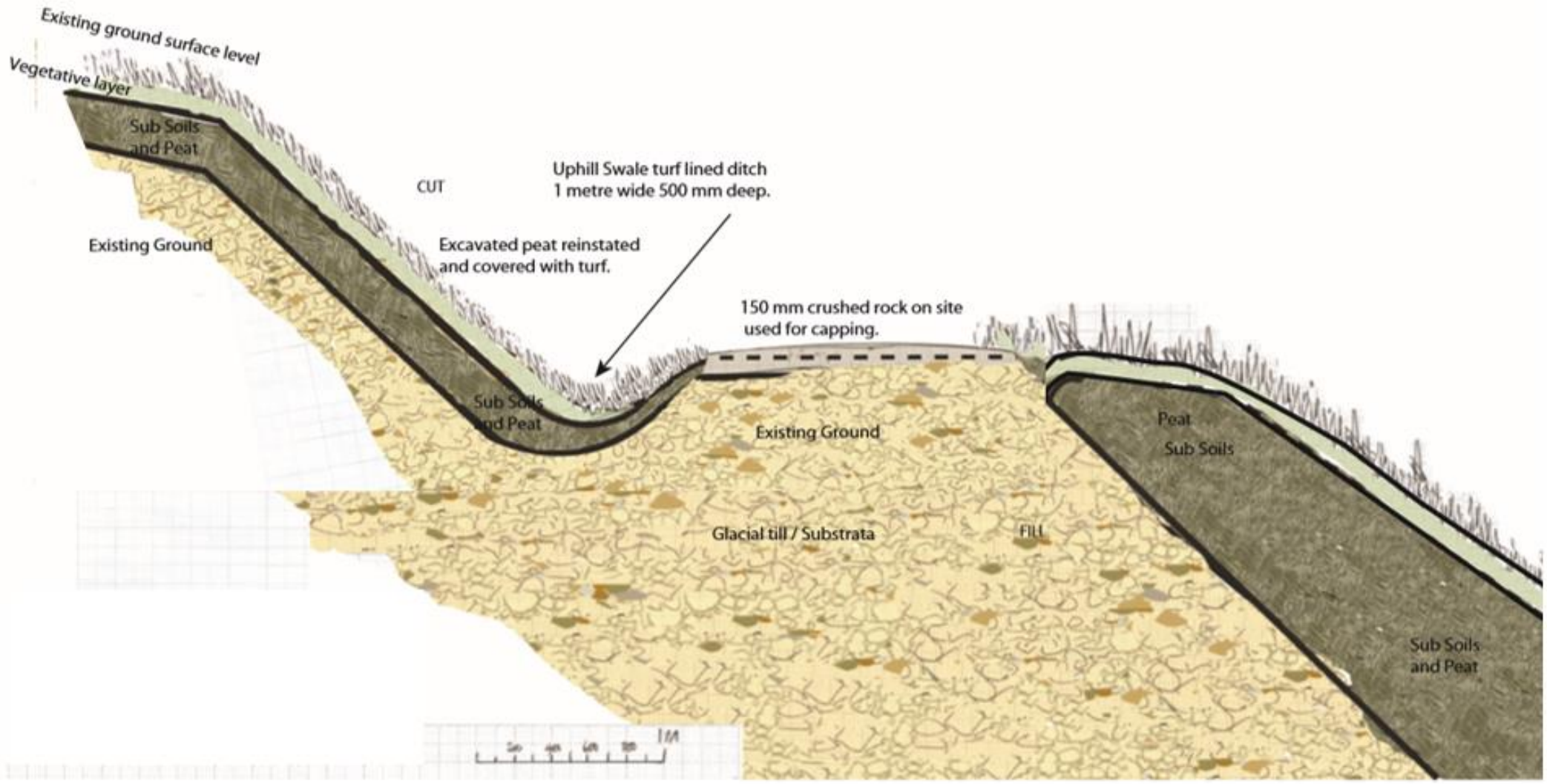


TRACK CONSTRUCTION ON STEEP CROSS SLOPES

Track construction on steep cross slopes



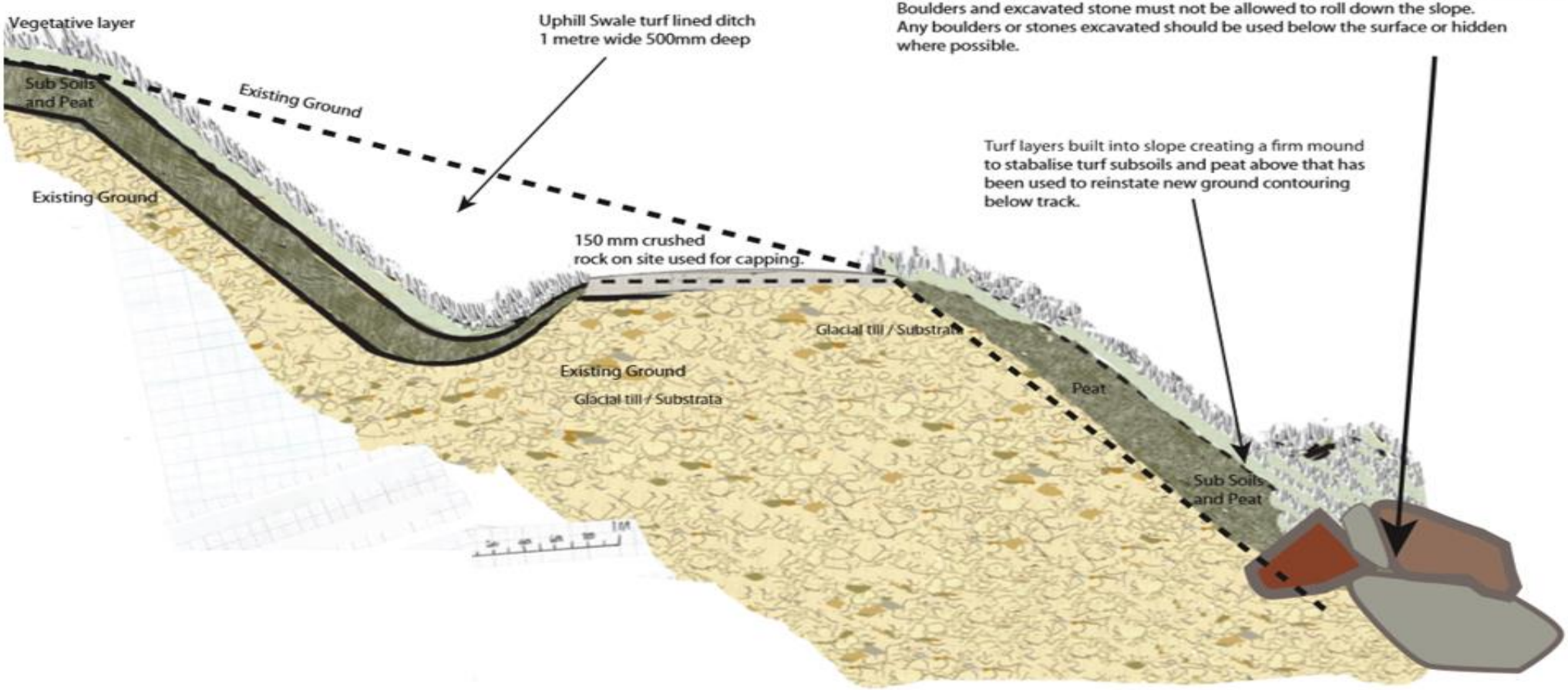
Track construction on steep cross slopes



BOULDER STABILISATION ON STEEP CROSS SLOPES

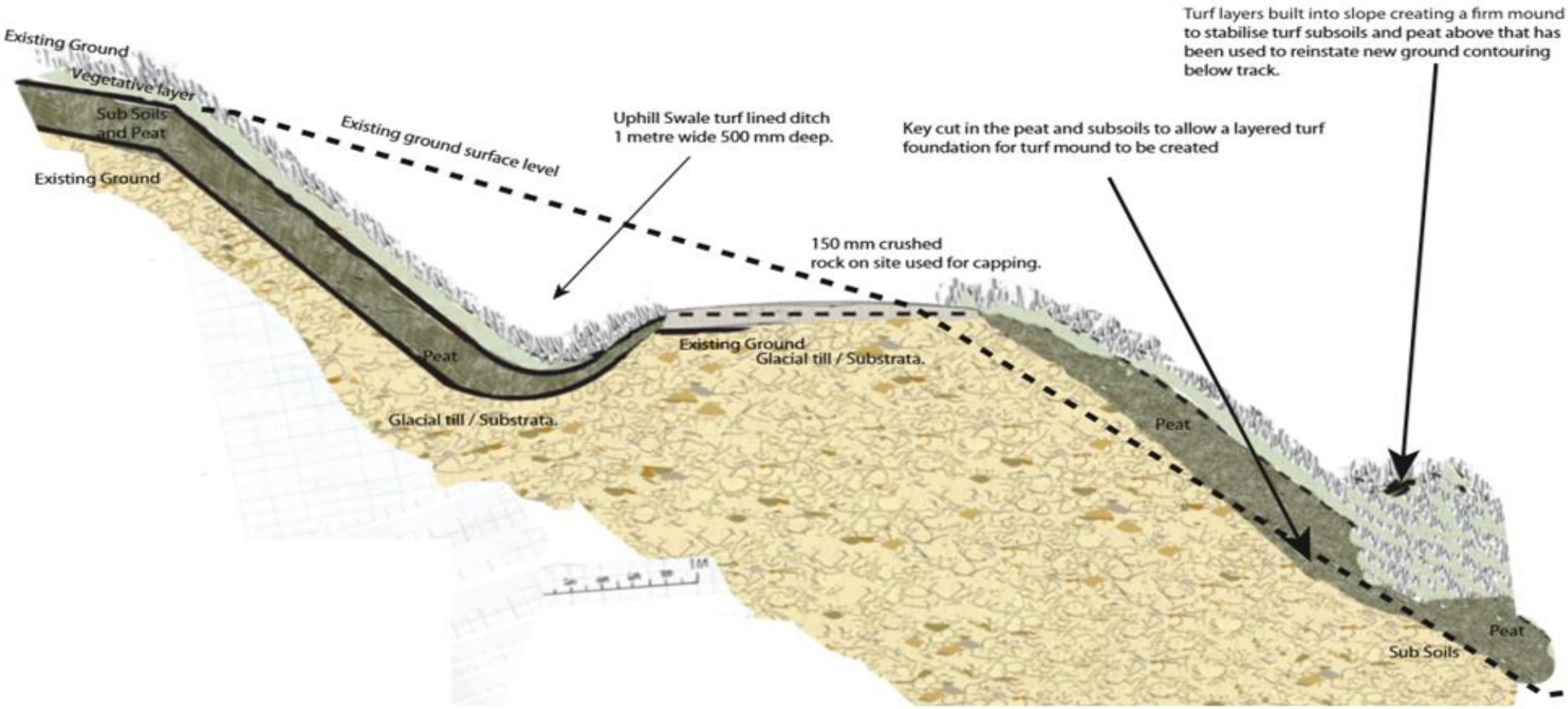
Track construction on steep cross slopes where boulders are used for stabilisation

Boulders used to stabilise slopes when required. weathered rock and lichen covered boulders to be faced allowing a natural appearance. Turf to be used between boulders for stabilisation of vegetation above and to create a natural appearance blending into the surrounding landscape. Large voids between boulders to be avoided as this could lead to soil and vegetation slip over time. Smaller boulders and turf used to fill any large voids. Avoid boulder groupings with linear edges, running in lines along the slope. Boulders and excavated stone must not be allowed to roll down the slope.
Any boulders or stones excavated should be used below the surface or hidden where possible.



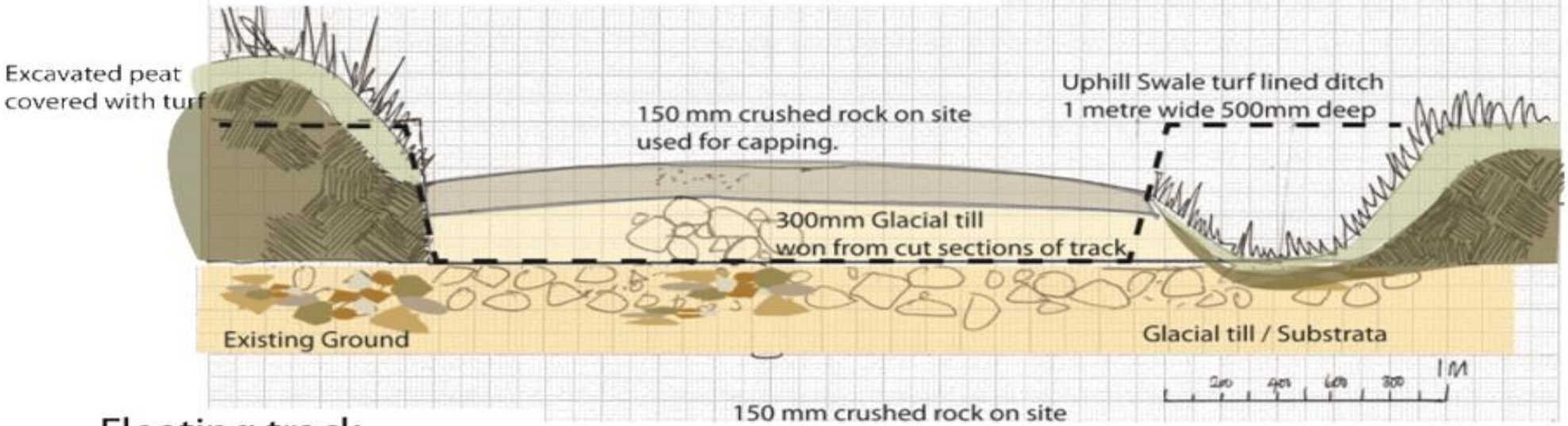
TURF STABILISATION ON STEEP CROSS SLOPES

Track construction on steep cross slopes where turf is used for stabilisation

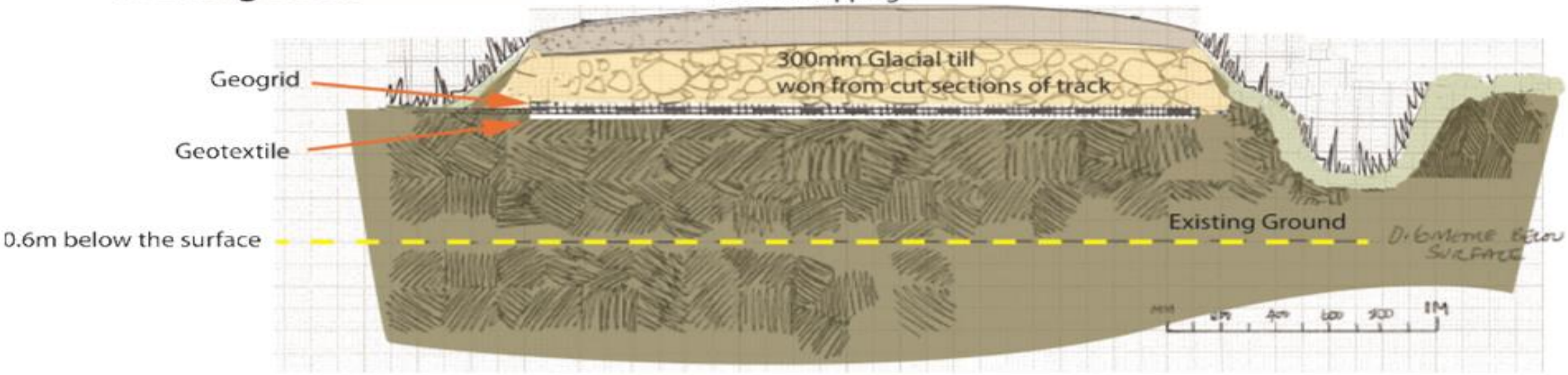


TRACK CONSTRUCTION GROUND SHAPING AND FLOATING

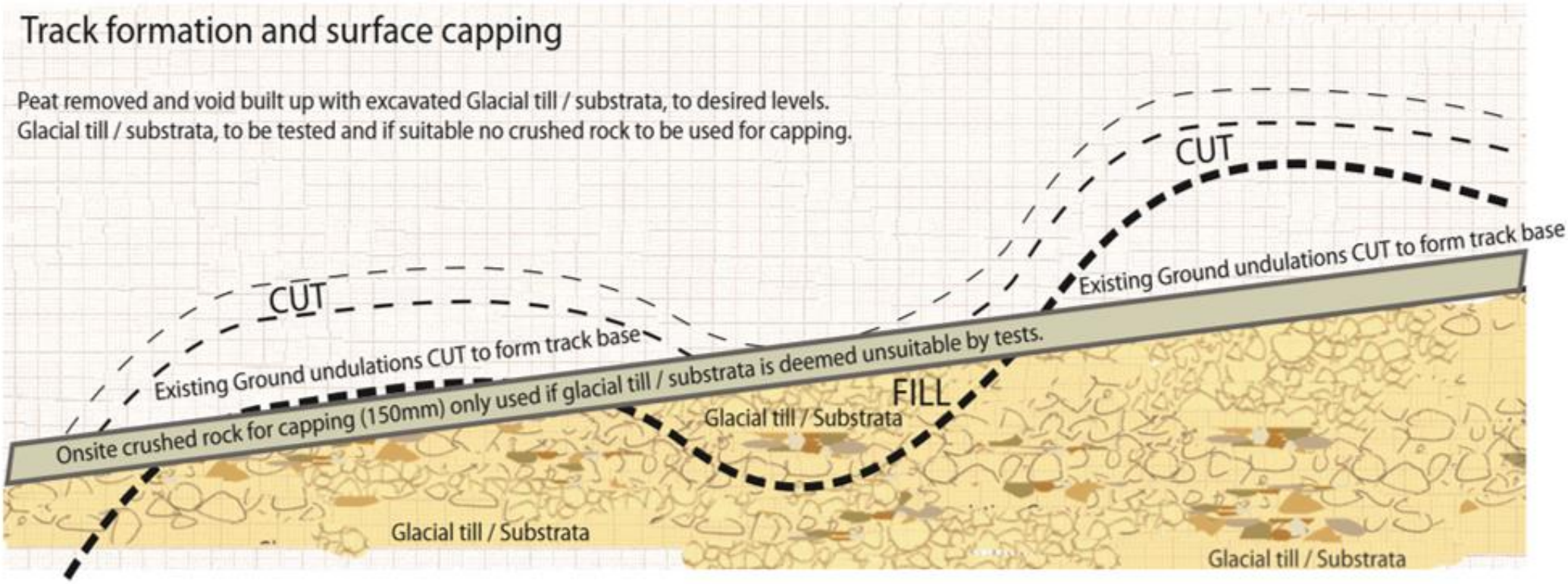
Track construction and ground shaping



Floating track



TRACK FORMATION AND SURFACE CAPPING



BORROW PITS

The opening of Borrow Pits in order to extract suitable path/track construction materials is common practice in rural and estate type locations.

Location of Borrow Pits

Ideally, Borrow Pits should be close to the path/track route so as to minimise costs, and time for the transportation of materials. A trial dig hole is normally carried out to determine the suitability of material for use in construction.

Health & Safety Considerations

As with all excavations, measures be in place to ensure no person accidentally falls into the pit / falls as a result of standing on unstable borrow pit sides.

- Adequate Site Safety Signage must be displayed to warn other site users of potential hazard.
- Further protection can be used to cordon off the area during pit excavation and material extraction - post and rope fence/post and hazard tape barrier.
- At the end of each working day, borrow pits shall be 'closed off' or cordoned off when being left unattended overnight.

Opening the Borrow Pit

Once trial dig hole identifies suitable material for extraction, the borrow pit can then be 'opened up'

- Using excavator, carefully strip off all the existing vegetation layer from the area to be opened. Carefully set aside new stripped turfs for re-use later at final reinstatement of area.
- Thereafter, the existing site topsoil layer is removed from the area - Again this will be carefully set aside in a separate stockpile for re-use at final reinstatement of area.

Material Extraction

Excavation work of suitable material from the borrow pit can now commence. Extracted materials will be systematically graded into different material sizes and stockpiled separate, in preparation for use within the various path/track construction layers.

Reinstatement of Borrow Pit

OPEN BORROW PIT DURING MINERAL EXTRACTION

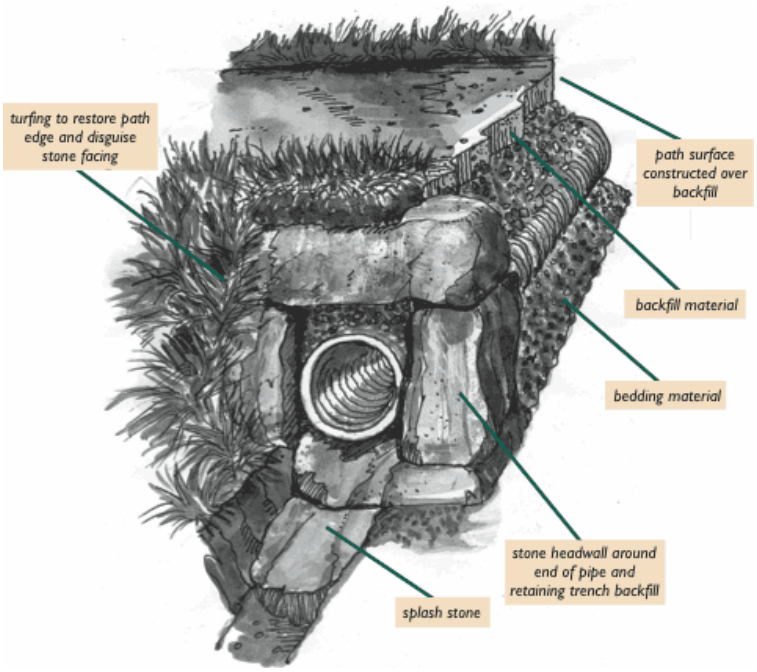
SAME BORROW PIT FULLY REINSTATED

- Ideally borrow pit reinstatement is best undertaken as soon as the required materials have been extracted for track construction, and before opening a further borrow pit further along the track route.
- Restoration of borrow pits involves, where possible levels to be filled up to match adjacent ground levels and/or neighbouring topography. This may include the use of surplus soils and materials, from road construction to be used to infill the borrow pit.
- The use of peat to infill should be used with precaution. Generally it is accepted a peat depth between 0.5 – 1.5 metres is acceptable with a 50cm turf is appropriate.
- Re-grading of the borrow pit, in particular the back walls of the pit is critical.
- On regrading of soils / infill, turfs can be laid across the area. Where there are no existing turfs available nearby a suitable nearby donor site shall be identified.
- Finished regrading and vegetation should result in the restored area matching seamlessly into the adjacent ground and neighbouring topography.

PIPED CULVERT INSTALLATION

Overview

The piped culvert is one of the few cases where synthetic material is introduced into upland trackwork. They are only used where traditional drainage techniques are not possible, mainly when a path crosses soft ground, particularly deep peat, and it is impractical to build cross-drains. Large piped culverts are also required to cope with streams where covered drains are needed, and there is no suitable material for stone culverts. Stone facing, or headwalls, help to hide the plastic pipe.



Overview - Function

The piped culvert serves the same function as a crossdrain, or stone culvert - to channel water from one side of the track to the other, generally from drainage ditches installed to protect the track. This situation commonly occurs when the track is traversing wet hillsides or stretches of poorly drained ground. The culvert does not catch water draining down the track; a continuous walking surface is provided over the top.

Overview - Positioning

The assessment for positioning piped culverts is largely the same as for stone culverts and cross-drains. When installed with a new track over soft ground, the track alignment can affect location and frequency. To reduce the visual impact of too many piped culvert's design the track to reduce the need for water to cross it. Avoid using piped culverts on steeper gradients, where they block quickly and are prone to becoming exposed.

Positions to consider include:

- at the best place for a ditched waterflow to cross under the track, often the lowest point
- where water crosses the track, from a small stream, spring or mossy flush
- at the best place for water to be dispersed away from the track

Construction - Components

The piped culvert consists of:

- synthetic pipe laid in excavated trench
- bedding material in base of trench to hold the pipe in position and level
- backfill material over the pipe to protect it from pressure of track use; also provides a compacted base for path construction
- headwalls around exposed pipe ends, comprising base stone, two side walls supporting one top stone, and splash stones at both ends

With careful turfing, headwalls hide the existence of the synthetic pipe, minimising the visual impact in the landscape. Headwalls also serve to retain the backfilled trench and stabilise the track edge. These are weak points of the feature. Without protection they may erode and collapse with path use.

The inflow and outflow to the pipe are also weak points, particularly if there is a steep drop to or from the culvert in soft ground. Without large splash plates they become undermined and eroded by pressure of reduce the depth and fall required to flow into the pipe under the track. The outflow ditch will also need careful alignment to ensure dispersal away from the track edge.

Construction - Dimension Guidelines

These will depend on the situation in which the piped culvert is being used, and the size of pipe required.

- the culvert will normally be straight across the track, but may need angling to allow for the fall in the pipe, and the alignment and fall of the inflow and outflow ditches
- the drainage fall of the pipe should be at least 5° so that water will flow easily and reduce the amount of silting
- the pipe diameter depends on the volume of water - the size most suited to an upland hill track landscape is a minimum of 300mm dia. is preferable
- bedding material should be approximately 100mm depth to provide a level base and retain the pipe alignment
- backfill material should be compacted to a depth of at least 300mm, to protect the pipe from pressure of path use, and exposure through path damage; it also provides a firm base for the track surfacing
- the trench and bedded pipe should extend at least 300mm each side of the track width
- headwall dimensions will depend on the pipe size, but the outer edge should extend in front of the pipe by at least 150mm, to hide the pipe; and the top and side stones should retain the trench backfill and path edge, and fully enclose the pipe extending outside the track width
- there should be at least 100mm of backfill or bedding material between the inside faces of headwall stones and the pipe
- the base stone should extend under the pipe and bedding material by at least 150mm; and in front of the pipe by approximately 300mm to provide a splash plate on the outflow side, and splash plate base on the inflow
- the top stone surface should be lower than the finished track surface, and allow turfing over to match adjoining track edge landscaping

Construction - Materials

The most common pipe used is black polypropylene, which has less visual impact. It can be easily cut to the length required, and for easy transport. Alternatives such as concrete and clay are available but will be heavy to transport to remote sites.

Types of Polypropylene Pipe			
Diameter	**Colour**	**Form**	**Length**
225, 300 or 450mm	Black	Single walled flexible pipe	30m coils
225, 300 or 450mm	Black	Twin walled rigid pipe	6m length

Local, weathered stone for the headwall should be found within reach of the track. Points to note when selecting stone:

- the base stone should be at least 200mm deep; wide and level enough to support the side stones, if possible; long enough to serve as the splash plate
- the side stones should be large and deep enough to sit on the base stone, or be set in each side of it, and support the top stone above the pipe
- the top stone should be wide enough to span the side stones; and not extend above the track surface level
- top and side stone should be long or deep enough to hide the exposed pipe and retain the trench and track edge

Bedding material should be gravel, or small aggregate, won from borrow pits or stream beds within close reach of the track.

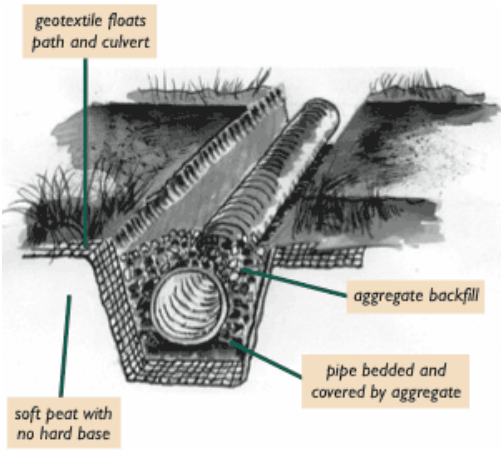
Backfill material must compact well; trench excavated material should be suitable, unless it is peat when material should be won from borrow pits or stream deposits.

Construction Methodology

Step 1

Excavate a trench.

- dig the trench long and wide enough for the required pipe length, diameter and bedding surround; and deep enough for bedding material, pipe diameter and compacted backfill below the track surface
- the angle, and base of the trench must provide the required fall for the pipe
- if the track is on deep peat, and floated on geotextile, the matting and geogrid are taken into the trench to line it; for fitting, and ease of laying, the geotextile should be cut and overlapped across the full trench width



Step 2

Position the pipe

- cut or trim the pipe to the exact length required
- compact and level the bedding material in the trench base working up from the outflow end to maintain the required draining fall
- position the pipe and align correctly, adjusting the drain fall, if necessary
- pack the sides of the pipe using bedding material topped with compacted backfill
- taking care not to move or damage the pipe with any large or sharp stone, backfill the trench across the track width, compacting in at least two layers, to the required level
- construct the headwalls prior to final compaction

Step 3

Construct the headwalls

- set in the base stone to extend under the pipe bedding and the required length out from the pipe, making sure it is level if used to support the side stone
- set the side stones firmly on the base stone, or at each side, and set back to retain the trench and enclose the pipe, leaving the required margin around it, and providing level top surfaces for the top stone
- set additional side stones, if needed to achieve the required height, and to provide solid and stable side walls
- position the top stone to span the side stones, set back to retain the trench or track edge and enclose the pipe, leaving the required margin above it, and the top surface to the required level.
- wedge, pin and pack all stonework firmly before completing the backfill, with gaps packed tightly with smaller stone, to prevent any movement
- set splash plate stones, as required, with the surface level below the base stone at the outflow, above the base stone at the inflow

Step 4

Complete the track construction over the backfill base to tie in with the adjoining surface.

Step 5

Complete the inflow and outflow ditching, connecting to drainage ditches as required. Ensure the required draining fall is maintained to collect and disperse the waterflow.

Step 6

Restore all areas damaged during construction. The track edges and the area above the headwall should be carefully landscaped using turf and spoil, won from ditching and excavations. Turfing over the top stone must be stable and form a containing edge to the track. Lay turf up to the side stones to minimise the impact of the pipe and stonework, ensuring the feature is as natural and unobtrusive as possible.

Trouble Shooting

Key points to watch out for:

- use the correct diameter of pipe for the volume of water
- maintain the pipe and ditch run - ensure that water will flow through the pipe
- set in headwall base stones and splash plates firmly - prevent undermining by waterflow pressure
- make sure the headwall protects the trench and track edge - prevent track edge collapse over the pipe
- set the pipe at least 300mm below the track surface - if not it will become exposed with use

Variations

Larger piped culverts are needed when there is no suitable material for stone culverts, and covered drains are essential for the nature of track use. They are also required to channel streams with high flows. Where large pipes are used, substantially wider and higher revetted headwalls, with several courses of stone, will be necessary.

Another variation for high volumes of water, is to use two pipes side by side with a wider headwall. Two pipes are harder to disguise than one.

Where no block stone is available on site to construct a stone-faced culvert headwall, an alternative is to use geotextile grid and large turves to construct a reinforced turf bank. This is built using alternative layers of strong turf and geotextile grid, build up around the mouth of the culvert pipe. Build the bank so that it shapes back, with a batter of 30°- 45°, and use large turves to prevent movement. This solution will not be as solid as a stone headwall, but is preferable to an unsupported and uncovered culvert end.