APPENDIX D TRANSMISSION LINE ACCESS TRACKS STANDARD

Transmission Line Access Tracks Standard

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1. INTRODUCTION

The intent of this document is to ensure access to transmission line structures for both routine and emergency work is established and maintained at an acceptable level.

Work is to be carried out in accordance with the Cultural Heritage Management Plan and the Environmental Management Plans for the specific area.

All work is to be planned to:-

1. Ensure the use of the area for its basic intended purpose is not nullified nor diminished by the tracks present.
2. Prevent destruction of, or damage to, the general area by taking steps to avoid erosion of lands, silting of waterways & diversion of water from natural drain paths.
3. Retain as far as possible the aesthetic nature of the surrounding area.
4. Limit the destruction of, or damage to, trees, shrubs, bushes, flora & other vegetation to the minimum necessary to maintain access.
5. Avoid damage to historical sites, Aboriginal sacred sites, Aboriginal relics, monuments and other memorials.

Powerlink is very dependent on the goodwill of property owners and others for access to and information on transmission lines. Every effort must be made to foster and enhance this goodwill.

2. SCOPE

This Standard covers the work to be done on establishing easement access tracks and retaining them in, or returning them to, an acceptable condition.

This maintenance work may be preventive or corrective. Corrective maintenance covers both emergency and deferred work.

3. ACCEPTABLE STANDARD

The minimum standard requires dry weather 4WD access. In most cases a somewhat higher standard of surface will be desirable. The standard may be raised by the Principal's Representative in sections where:

1. Minimal extra expenditure would be involved or
2. The section of track is liable to be subjected to additional usage, demands, or conditions.

4. TRACK LOCATION

Initial track locations shall be determined by the Principal's Representative. The Landowner/Occupier shall be consulted by Powerlink before final decisions are made.

Existing tracks should be used where ever possible. The Principal's Representative must be contacted if there are good reasons to deviate from the existing tracks. Approval in writing must be obtained from the Principal's Representative before any deviation work proceeds.

Any bypassed section of track is to be subject to restoration work to ensure it is environmentally acceptable. The scope of work required will be determined by the Principal's Representative.

5. SURFACING

5.1. Slashing

Slashing should be considered as the preferred maintenance option if no erosion or drainage problems are evident.

A well grassed running surface is considered ideal for the Principal's purposes.

5.2. Blading

Blading is to be kept to a minimum on existing formed tracks and on track locations not requiring formation.

In these situations, blading should only be performed to remove potential management hazards (eg. Fallen limbs, stakes, etc), or to repair potential environmental damage (e.g. Drainage restriction, wheel ruts, etc).

5.3. Patch Gravelling

Patch gravelling should be used only when required to ensure traction, avoid rutting, or to maintain effective drainage.

No patch gravelling should be undertaken without the approval of the Principal's Representative and the land owner.

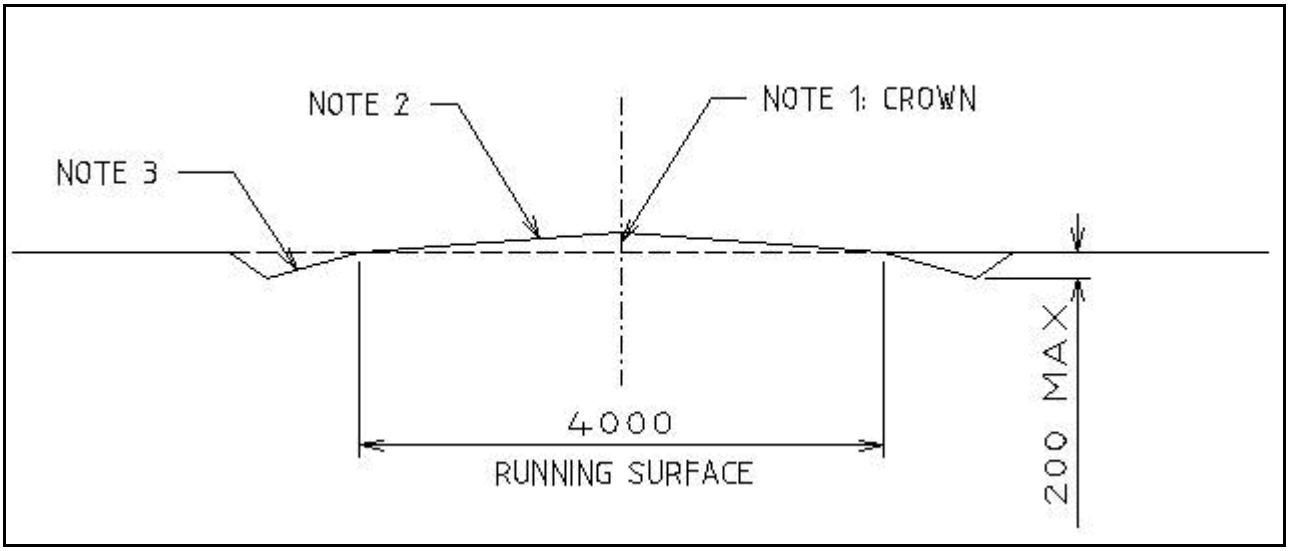
6. TRACK FORMATION

Track formation is required for the following reasons:

1. Drainage control, especially in areas where any wheel rutting or compaction is likely to intercept, concentrate and channel water.
2. Where topography of the track location or the drainage characteristics of the soil are likely to hinder access for a protracted time period following rain (e.g. 1 to 2 weeks)
3. Where natural side-slope would pose a safety hazard to potential users of the track (e.g. Patrolling officers, contractors, and land owners)
4. Where patch gravelling would be required. Often track formation can reduce or eliminate the need for patch gravelling. Where gravelling is still considered to be warranted, the formation process can remove undesirable material and / or box the imported material where it is required.

7. FORMATION PROFILES

7.1. Crowned Surface Formation

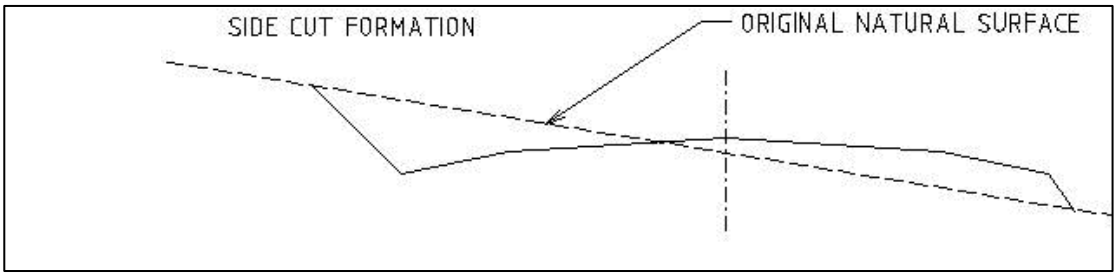


Note (1) Normally 0.1m above natural surface after consolidation i.e. ≈ 0.15 unconsolidated
Note (2) Nominal design crossfall of 5% after consolidation i.e. ≈ 7% unconsolidated
Note (3) Nominal shoulder batter of 1:5

Crowned Surface Formation

- Is suitable for tracks where water can be shed from both sides of the formation
- May be used in other situations in conjunction with suitable cross road drainage techniques (see Section 10.)
- May require down road drainage (see Section 11.)

7.2. Crowned Side Cut Formation

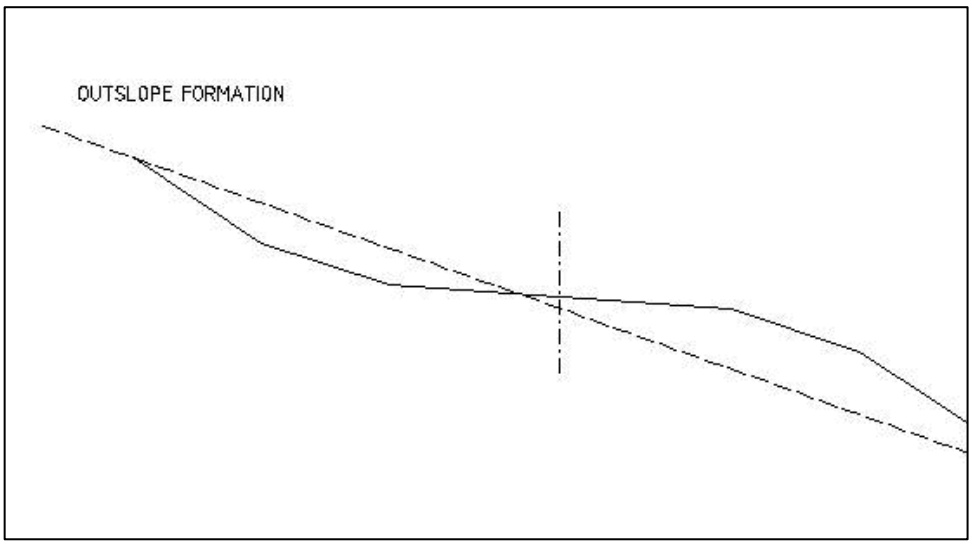


Notes and dimensions as per 7.1.

Crowned Side Cut Formation

- Suitable for smaller lengths of side cut where water can be shed from the confined water table further down the road e.g. at ridge top saddle.
- May be used in limited situations for longer runs if used in conjunction with acceptable cross drainage techniques (see Section 10).

7.3. Outslope Formation



Note (1) Normally 0.1m above natural surface after consolidation i.e. ≈ 0.15m unconsolidated
Note (2) Nominal design crossfall of 5% after consolidation i.e. ≈ 7% unconsolidated
Note (3) Nominal shoulder batter of 1:5 (20%)

Outslope Formation

- Suitable for longer lengths of side cut where water cannot be shed from the confined shoulder of the road except across the running surface
- This design profile should be used in conjunction with approved cross drainage techniques (see Section 10).

8. CLEARING AND TRACK WIDTHS

- The normal formation width (including batters, table-drains and running surface) should be ≈ 6metres
- Clearing should extend 1 metre either side of the formation width
- On steep topography, especially in areas of long lengths of side cut, hand felling is the required method of clearing outside the formation widths.
- Clearing may be extended to remove unsafe or unsound trees.
- Long batter lengths will require limited additional formation and clearing widths.

9. DRAINAGE OF ACCESS TRACKS

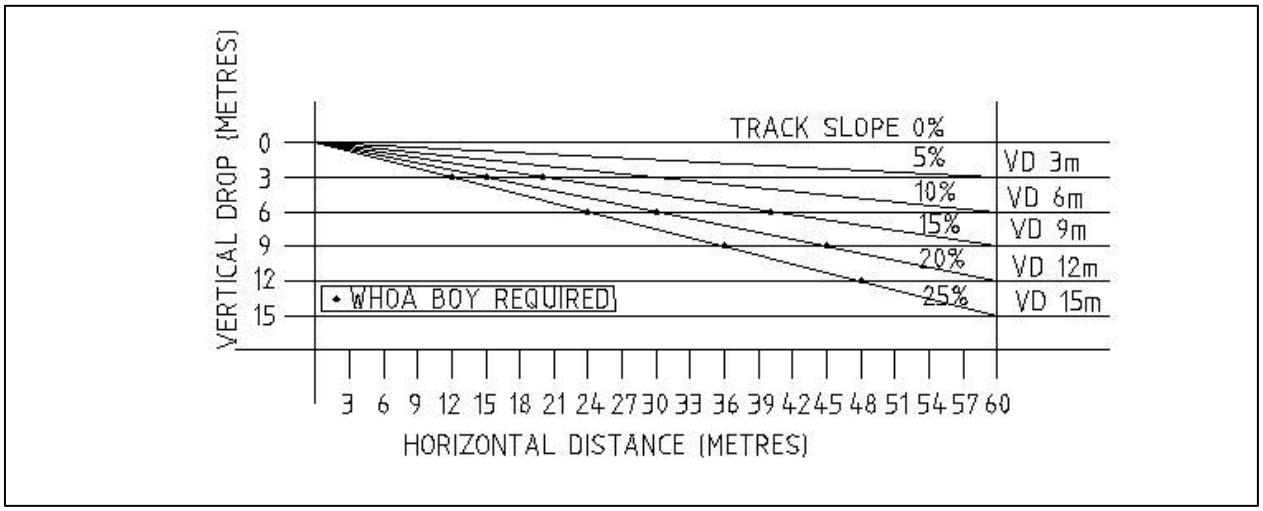
9.1. Berms

- Berms are rills of excess or unsuitable roading material windrowed on to the side of the worked area.
- Any berm must be discontinuous. Breaks must be opened at intervals of less than 20m.
- Any drainage must extend through the berm
- Berms should be placed on the uphill side of workings; especially in locations suitable for outflow track formation. (See Section7.3).Where possible they should be incorporated into the track shoulder.

9.2. Spacing

Water flow should be intercepted and dispersed from table drains at safe locations at least every 3 metres of vertical fall of the track centre line.

It is acknowledged that soil type, slope and climatic zones may vary the ideal from this specification. This specification is to be used as a minimum requirement; any variation to this standard must be authorised in writing by the Principal's Representative



Calculating:

Slope % = $\frac{\textit{Vertical Drop (m)}}{\textit{Horizontal Distance (m)}}$ x 100

e.g. $\frac{\textit{1.5m}}{\textit{15m}}$ x 100 = 10% slope

Calculating:

Maximum Horizontal Spacing (m) = $\frac{\textit{Maximum Allowable Vertical Drop (m)}}{\textit{Actual Slope (\%)}}$ x 100

e.g. Max Allowance Vertical Drop 3m
Actual Slope 10%

So
Maximum Horizontal Spacing (m) = $\frac{3}{10}$ x $\frac{100}{1}$ = 30m

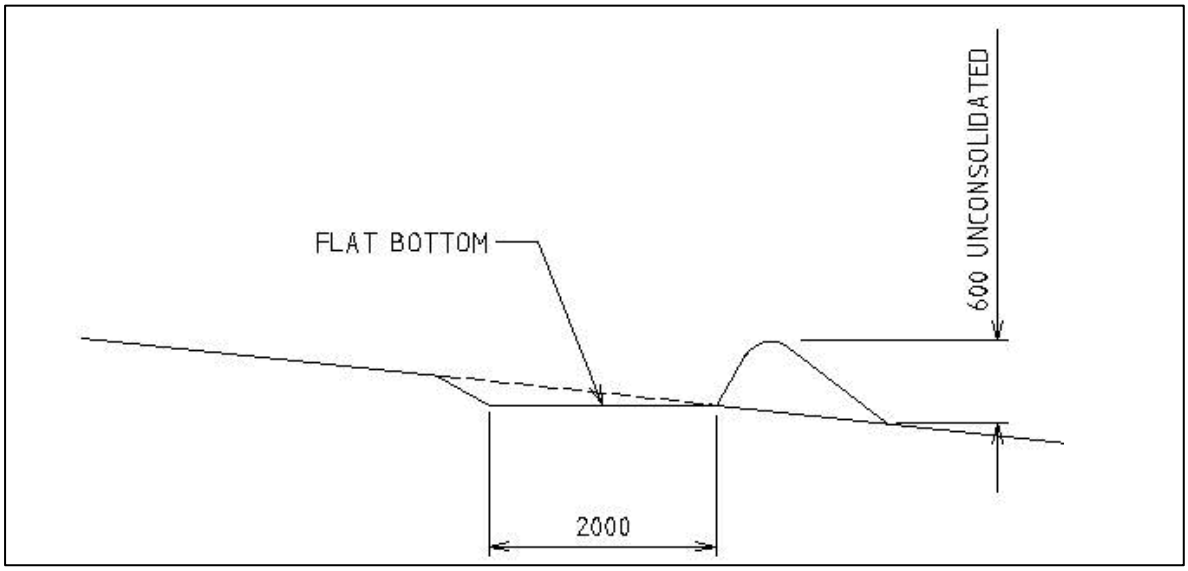
9.3. Turnouts (Also Called Side or Spur Drains)

Turnouts generally:

1. Should be as short as possible.
2. Should be terminated in as wide (level) a discharge as is practical.
3. Should run at approximate 1.5% grade (the lead out of the table drain may exceed this limit but must not be more than 1.5 metre in length.
4. Must have an effective table drain stop.
5. Should extend as far as is required to prevent discharged water from flowing back to the road further down the slope (see diversion drains Section 9.4.)

6. Must discharge onto stable areas of undisturbed vegetation and not onto fill slopes, exposed soils or directly into a water course.

9.4. Diversion Drains



All batters less than 1:1.5.
Slope of Diversion Drain 0.5% to 1.5%.

These structures may need to be constructed to:
1. Intercept a major concentration of overland water flow.
2. Prevent road discharge water from flowing back onto the formation

They should:
1. Be constructed with a grader
2. Be flat bottomed ≈ 2 metres wide
3. Capture no more than 2Ha of catchment
4. Run at 1.0% ± 0.5%
5. Discharge onto stable areas of undisturbed vegetation and not onto fill slopes, exposed soils, or directly into a water course.
6. Be surveyed (eg using dumpy level and staff) prior to construction.
7. May need to be seeded with approved and appropriate grass species (e.g. Jap millet, oats, couch, natives) as specified by the Principal's Representative.
8. Have batters of less than 1:1.5
9. Have an unconsolidated mound height of 600 mm.

10. CROSS ROAD DRAINAGE TECHNIQUES

10.1. Culverts

A culvert is defined as any pipe box or arch construction used for cross road drainage that is covered and below the surface of the road. Culverts are only to be installed at the express and written instructions of the Principal's Representative.

Existing culverts are to be preserved and culvert heads left in a clean and functional condition.

If existing culverts are damaged during maintenance, the location and extent of damage is to be recorded in writing and relayed to the Principal's Representative with in 24 hrs.

10.2. Inverts

Inverts are man-made or naturally occurring open topped depressions in the surface of the roadway which allow for concentrated cross road drainage.

10.3. Cross Flow Whoa Boys

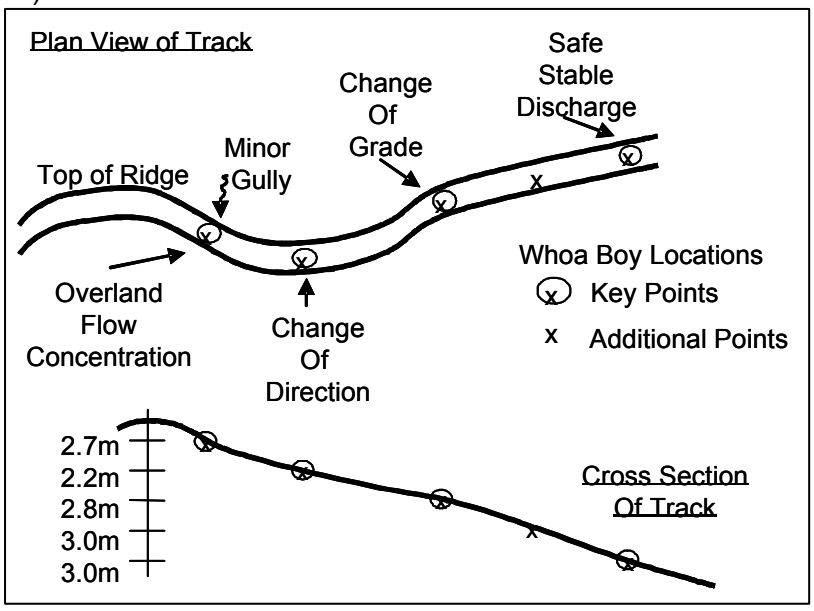
These structures are used to invert water across the road.

10.3.1. Locating Cross Flow Whoa Boys

Placement of cross flow Whoa Boys requires care and planning. They should be constructed at critical points where there is:

- A significant change of grade
- A significant change of road direction
- A significant point of overland flow concentration
- A safe stable discharge point.

After these key points are located, additional Cross Flow Whoa Boys will need to be constructed so as to remain within the minimum specification of 3 metres of vertical fall. (see spacing of access track drainage Section 9.2.)

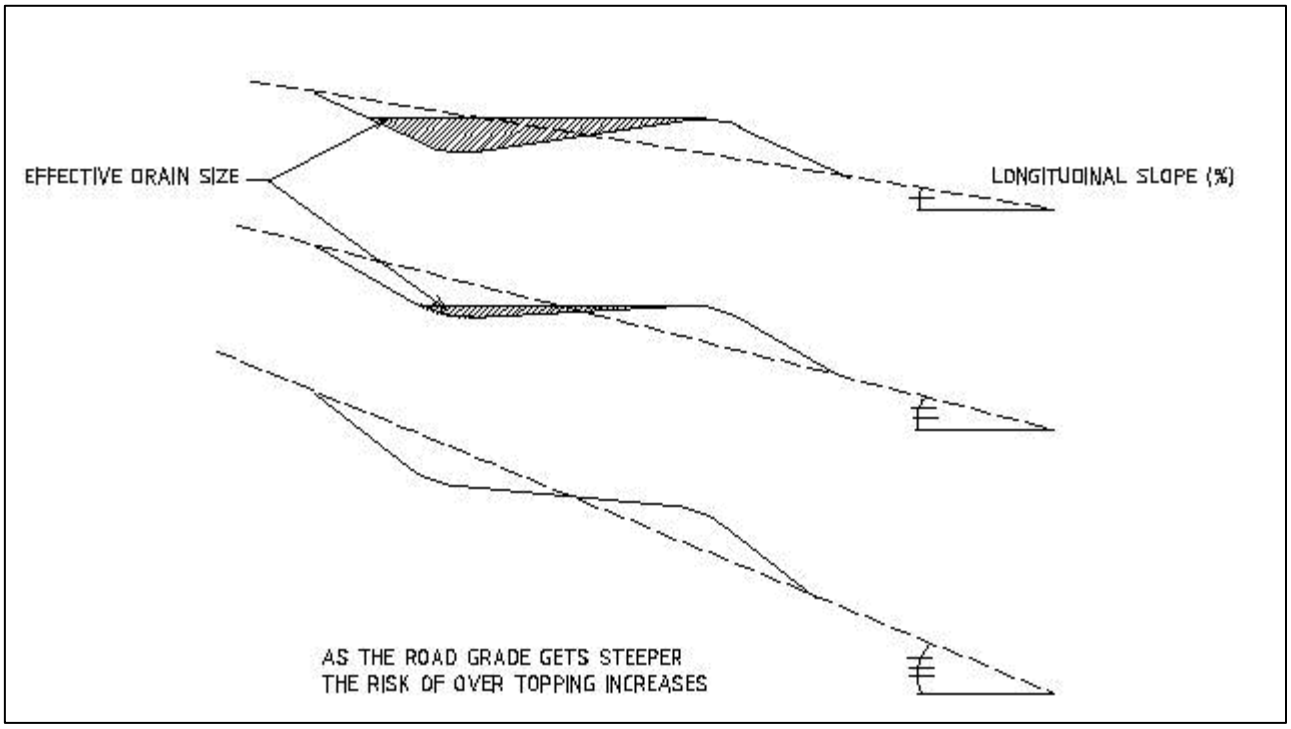


10.3.2. Dimensions of Cross Flow Whoa Boys

Whoa Boys must be easily trafficable and must drain water across the road without scouring, ponding or overtopping.

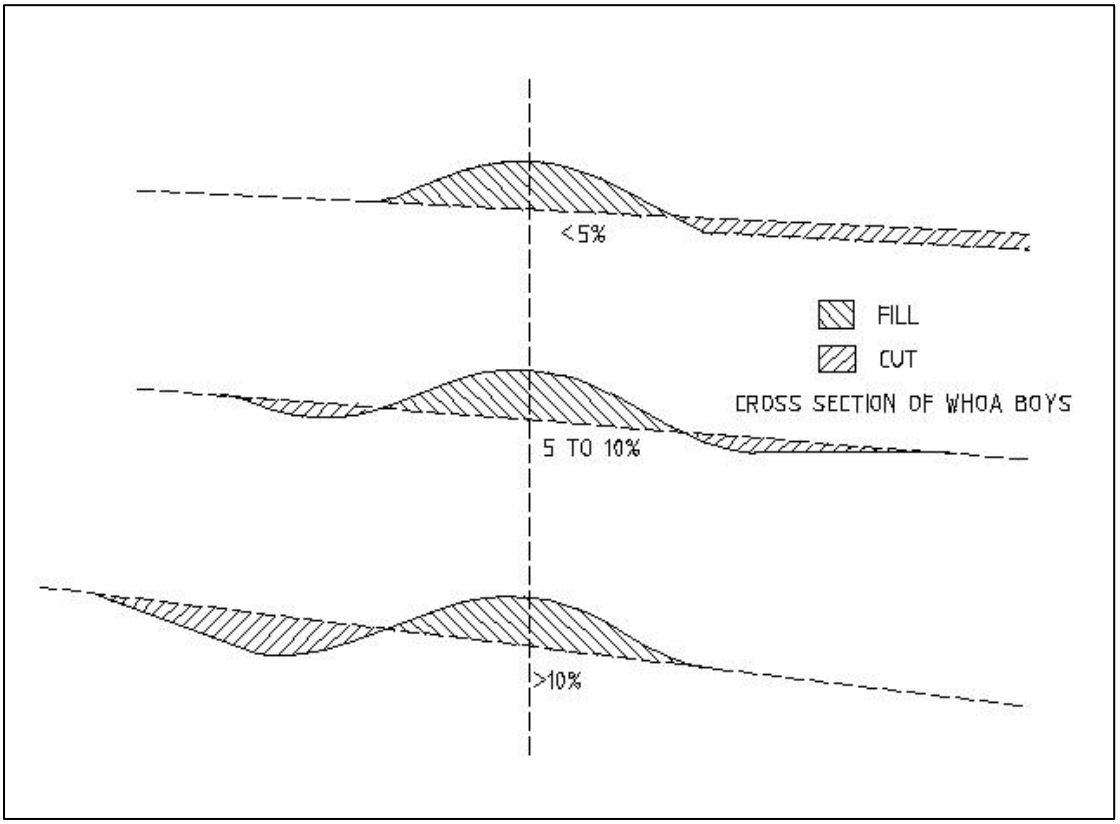
They should be ≈ 0.6m high (unconsolidated) and be battered for a minimum of 2 metres on both top & bottom sides of the mound.

As the longitudinal slope (grade) increases so too does the risk of overtopping. A corresponding degree of care with construction is warranted to preclude any risk of the structure failing.



Generally:
For slopes <5%, materials should be sourced from the lower side of the mound.
For slopes 5% to 10%, materials should be sourced from both sides of the mound
For slopes >10%, all material should be sourced from above the mound

In some very steep situations additional material may be required. Gravel may need to be sourced externally and imported to the required Whoa- Boy location.



11. DOWN ROAD DRAINAGE TECHNIQUES

These techniques specifically relate to dispersal of water confined or concentrated on the running surface of the track (eg in wheel ruts or compacted zone).

Water is to be dispersed using:

a) Cross Fall of running surface
b) Whoa boys
c) Combination of a) & b)

11.1. On Formed Tracks

Normally the cross fall of the running surface will suffice. Exceptions occur where the formation is :

1. On very steep slopes where the longitudinal slope is much greater than the cross fall of the formation and even minor ruts may channel the water and frustrate water shedding from the running surface.
2. In areas of highly erodible soil types

In these situations additional protective techniques should be incorporated. The techniques include cross road drainage structures if applicable; or if not applicable, Minor Whoa Boys should be installed.

11.2. On Unformed Tracks

If the track intercepts and concentrates overland flows of water then normal cross flow Whoa Boys should be constructed. In these situations it is imperative that the structure discharge extends a sufficient distance to preclude any chance of this water migrating back to the track.

If overland flow is not a problem then Minor Whoa Boys would be acceptable.

11.3. Minor Whoa Boys

11.3.1. Locating Minor Whoa Boys

Placement of minor Whoa Boys requires care and planning. They should be constructed at a critical point where there is:

- A significant change of grade
- A significant change of road direction
- A safe stable discharge point.

After these key points are located, additional Minor Whoa Boys will need to be constructed so as to intercept the potential flow every 6 metres of vertical fall.

These structures must be free draining. Discharges must extend a sufficient distance to preclude any chance of this water migrating back to the track.

11.3.2. Dimensions of Minor Whoa Boys

Minor Whoa Boys must be easily trafficable and must drain water off the running surface without scouring, ponding or overtopping.

They should be ≈ 0.4m high (unconsolidated) and be battered for a minimum of 2 metres on both top & bottom sides of the mound.

As the longitudinal scope (grade) increases so too does the risk of overtopping. A corresponding degree of care with construction is warranted to preclude any risk of the structure failing.

Generally:
For slopes <5%, materials should be sourced from the lower side of the mound.
For slopes 5% to 10%, materials should be sourced from both sides of the mound
For slopes >10%, all material should be sourced from above the mound
In some very steep situations additional material may be required. Gravel may need to be sourced externally and imported to the required Whoa- Boy location.

(See Section 10.3.2 for indicative diagrams)

12. CREEK, GULLY & WATERWAY CROSSINGS

As far as possible, these should:

- Be avoided (alternative access to the next section of track may be possible and desirable)
- Cross at right-angles
- Be situated to avoid box cuts
- Have minimal clearing
- Be protected by drainage structures immediately above the approach slopes.

If the watercourse bed requires gravel or stone, the existing surface should be excavated to the depth of anticipated fill. The completed crossing surface should approximate to the original bed level. Any resulting spoil should be removed from the bed and banks of the watercourse and disposed of as directed by the Principal's Representative.

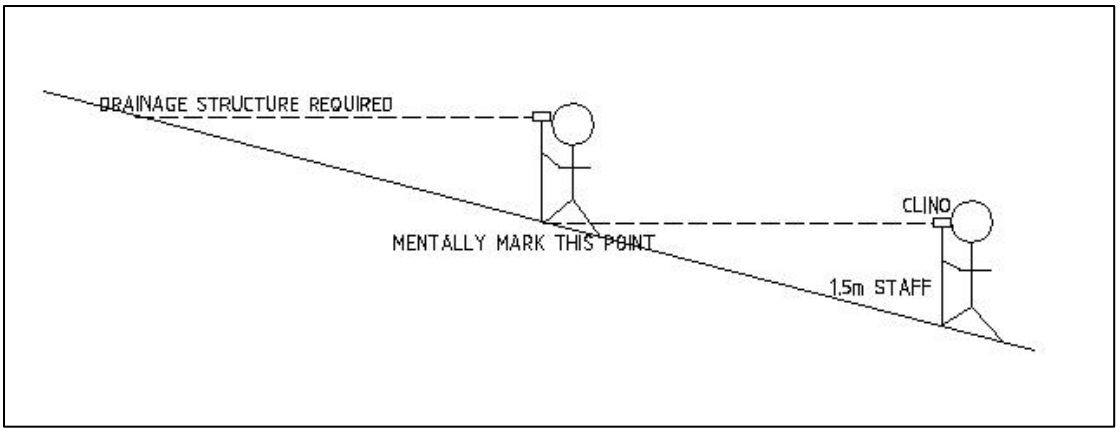
13. ATTACHMENT 1

Suitable Methods of Estimation of 3m Vertical Fall.

A) Dumpy Level and Staff.
B) Laser Distomat Device.
C) Clinometer.
D) Any other method approved by the Principal's Representative.

Method C)

Mark turnout from bottom of slope



Equipment Required:

Clinometer.
1.5m Stake.

Method:

From bottom of slope or last drainage structure.

1. Carefully sight along road to a point 1.5m above original ground level.
2. Mentally mark this location and move to it, placing the staff on this mark.
3. Repeat step 1)
4. Repeat step 2)
5. Assess suitability. If unsuitable, move the location of structure downhill.
6. Mark proposed structure position on ground. From this position repeat steps 1 to 6 until crest is reached.

14. ATTACHMENT 2

Guidelines for Value Ratings of Access Track Construction & Maintenance

>20% deviation from specifications is considered MAJOR.
<20% deviation from specifications is considered MINOR.

Major Deviation from Specifications on __ % of Work = ____	
Component Rating (a)	
> 10%	2
5 to 10%	4
2 to 5%	6
< 2 %	8
Nil	10

Minor Deviation from Specifications on ____ % of Work = ____	
Component Rating (b)	
> 10 %	1
5 to 10%	2
2 to 5%	3
< 2 %	4
Nil	5

Value Rating = Component Rating (a) + Component Rating (b)

Components with qualitative rather than quantitative criteria require a subjective evaluation on scale of deviation from the specified ideal.

The decision to carry out remediation work is a function of perceived environmental damage potential, location within the landscape, economic costs, and equipment availability.

The final determination on the appropriate response rests with the Principal's Representative

15. ATTACHMENT 3

Access Track Audit Sheet

Sect. Ref	Component Accessed	NA	YES	NO	NOTINGS	Remediation required	Value	Rating
4	Track location						+ =	
5	Surfacing-Appropriate degree of working						+ =	
6 & 7	Appropriate track formation used						+ =	
5.2 & 7	Track profile constructed to specs.						+ =	
8	Clearing & track widths OK						+ =	
9.1	Berms absent or discontinuous						+ =	
9.2	Turnout drains - spacing OK						+ =	
9.3	Turnout drains - construction OK						+ =	
9.4	Diversion drains OK						+ =	
10.1	Culverts clean and sound						+ =	
10.3.1	Whoa-boys - spacing OK						+ =	
10.3.2	Whoa-boys - construction OK						+ =	
11	Down road drainage OK						+ =	
11.3.1	Minor Whoa-boys - spacing OK						+ =	
11.3.2	Minor Whoa-boys - construction OK						+ =	
12	Crossings OK for location						+ =	

Sect. Ref	Component Accessed	NA	YES	NO	NOTINGS	Remediation required	Value	Rating
12	Crossings OK for construction Communications & supervision OK						+ = + =	
		OVERALL VALUE RATING as a % Rating of Work Components Assessed						#DIV/0!

Sect. Ref	Component Accessed	NA	YES	NO	NOTINGS	Remediation required	Value	Rating
4	Track location		#				10+5 =	15
5	Surfacing-Appropriate degree of working		#				10+5 =	15
6 & 7	Appropriate track formation used			#	1	Yes	8+5 =	15
5.2 & 7	Track profile constructed to specs.			#	2	No	8+1 =	9
8	Clearing & track widths OK			#	3	No	2+1 =	3
9.1	Berms absent or discontinious		#				10+5 =	15
9.2	Turnout drains - spacing OK			#	4	Yes	8+1 =	9
9.3	Turnout drains - construction OK			#	5	No	10+2 =	12
9.4	Diversion drains OK	#					+ =	
10.1	Culverts clean and sound	#					+ =	
10.3.1	Whoa-boys - spacing OK			#	6	Yes	8+1 =	9
10.3.2	Whoa-boys - construction OK		#				10+5 =	15
11	Down road drainage OK			#	7	Yes	2+1 =	3
11.3.1	Minor Whoa-boys - spacing OK			#	7	Yes	2+1 =	3
11.3.2	Minor Whoa-boys - construction OK			#	7	Yes	2+1 =	3
12	Crossings OK for location	#					+ =	
12	Crossings OK for construction	#					+ =	
	Communications & supervision OK				8		10+2 =	12
					OVERALL VALUE RATING as a % Rating of Work Components Assessed			65.7

Comments by Assessor

1. Track needs Crowned Surface Formation for 200m between tower 716 & 717 Low swampy ground. FIX
2. Shoulders on formed track a bit too steep Talk to Contractor
3. Clearing Width Excessive Warn Contractor that this practice is not acceptable
4. Drain Missing 200m Nth of Tower 714, 100m Nth of Tower 723, 300m Nth of Tower 327. FIX
   ~25% of drains @ 3.5m Vertical. Spacing Talk to contractor.
5. All acceptable. ~10% a bit long.
6. 3.6m vertical spacing very common. Explain that this is not the desired spacing. 3 Missing as per noting 4 FIX
7. ~20% of track requires down road drainage. No minor whoa-boys installed. FIX
8. A few minor problems with communications