

# KING MOUNTAIN TRAIL RESTORATION GATINEAU PARK

SUMMARY OF ISSUES AND PROPOSED INTERVENTIONS





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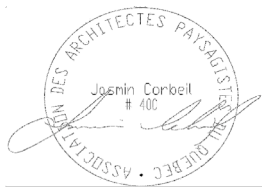
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**REFERENCES** ..... 41

Sceau / Seal		Révisions / Revisions	
			
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01	Coordination 75%	J.C.	2012-10-05
NO	DESCRIPTION	APPR.	DATE





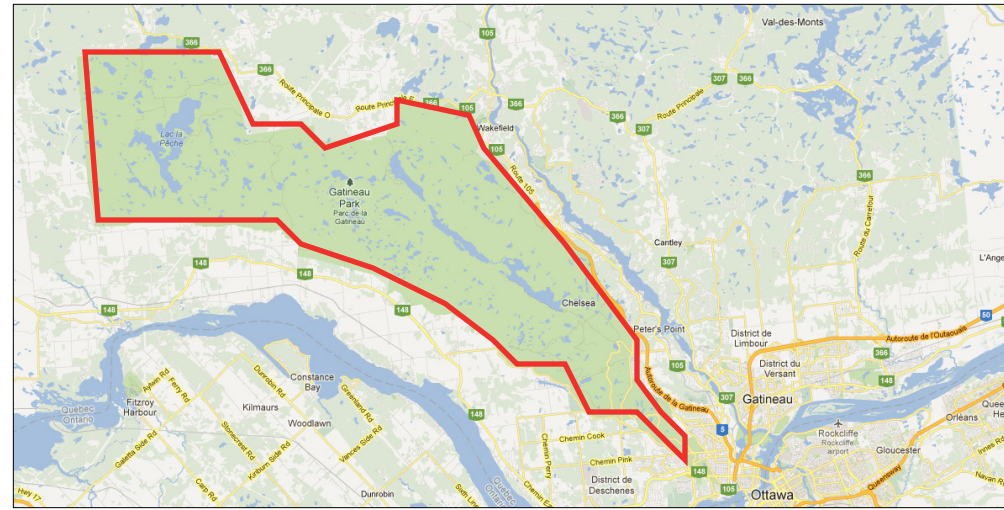
## MANDATE

The mandate is to rehabilitate pedestrian trails within Gatineau Park.

Some of the most popular trails in Gatineau Park require repairs. Built largely by volunteers many decades ago, these paths have deteriorated parts that must now be rebuilt. The objectives of the National Capital Commission of Ottawa are to extend the trails' life-span, return them back to their original state and / or allow for greater use. Should the need arise, the NCC is also favorable towards reassessing the orientation of certain trails and making appropriate changes to ensure public safety, while also extending the life of the infrastructure and ensuring the flow of surface waters by limiting the trail right-of-ways.

The current document focuses on the King Mountain Trail (approximate length 1.8 km), located in the southern part of Gatineau Park. A summary analysis of the issues is presented, as well as their associated proposed interventions.

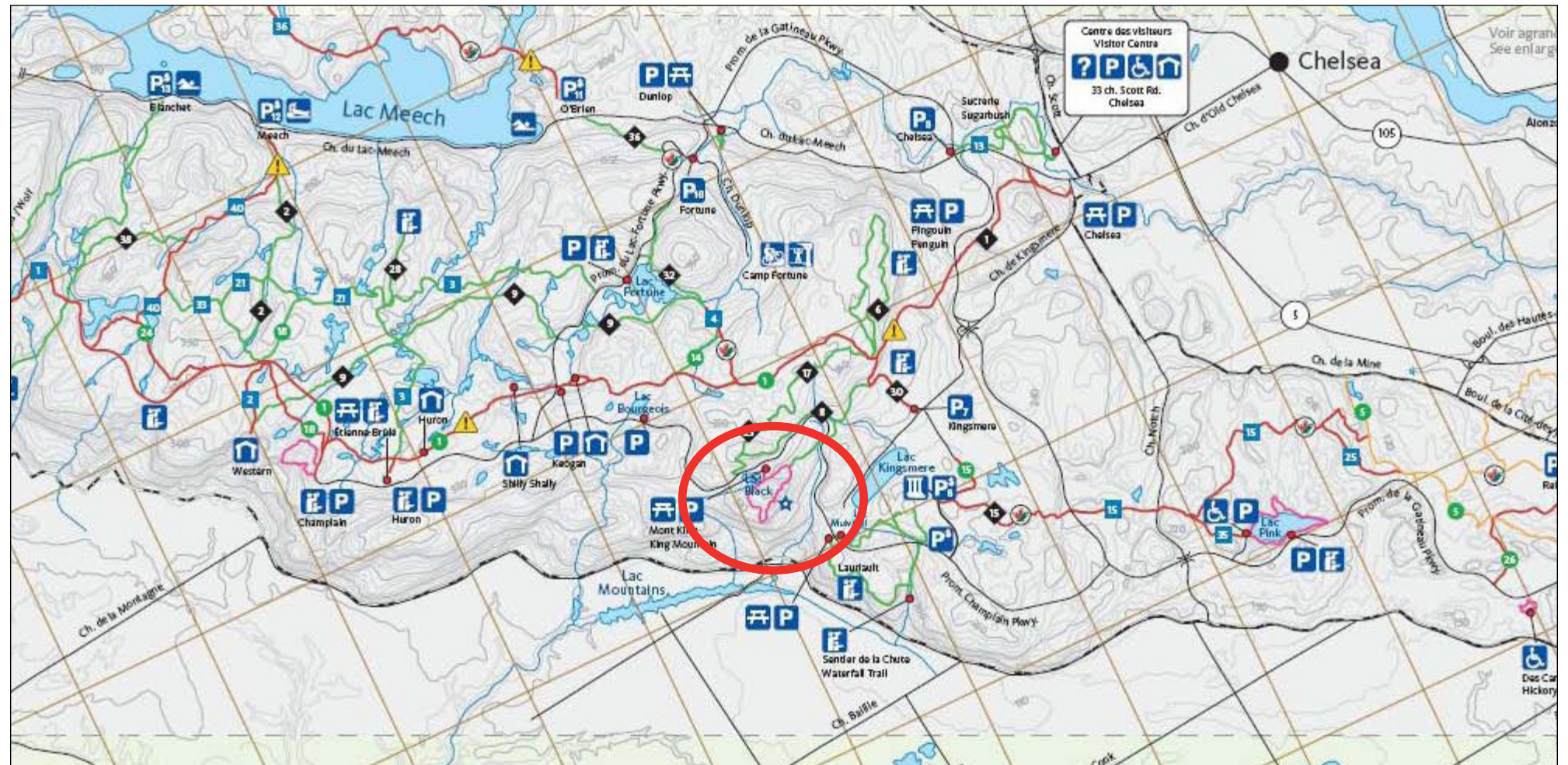
## LOCATION



Location of Gatineau Park within the region

Gatineau Park is a conservation park known for its natural attractions, its wildlife and unique flora, and the quality of its naturally situated sites. Easily accessible from the major urban centers, the park receives millions of visits each year from users who enjoy outdoor activities.

The park promotes respect for the environment and conservation. In this sense, site development should be planned with the use of sustainable, environmentally-friendly materials, as well as meticulous planning of the transportation of materials.



Location of King Mountain Trail within Gatineau Park



## DESCRIPTION OF ISSUES

### Types of Issues

The problems encountered in the paths are mostly caused by a deficiency in the drainage. These situations indirectly generate other problems that can affect the natural environment. They were identified as four types:

1. Accumulation of water created by depressions : wetland
2. Erosion / Runoff
3. Difficult and unsafe passage
4. Trail widening affecting natural environment

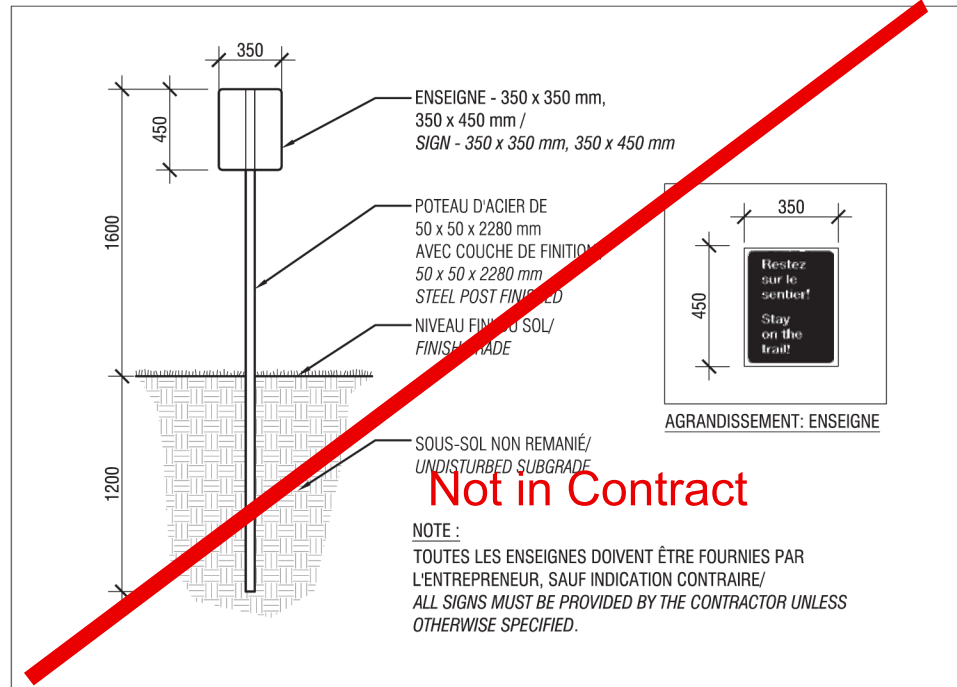
## TYPES OF PROPOSED INTERVENTIONS

### Intervention Types

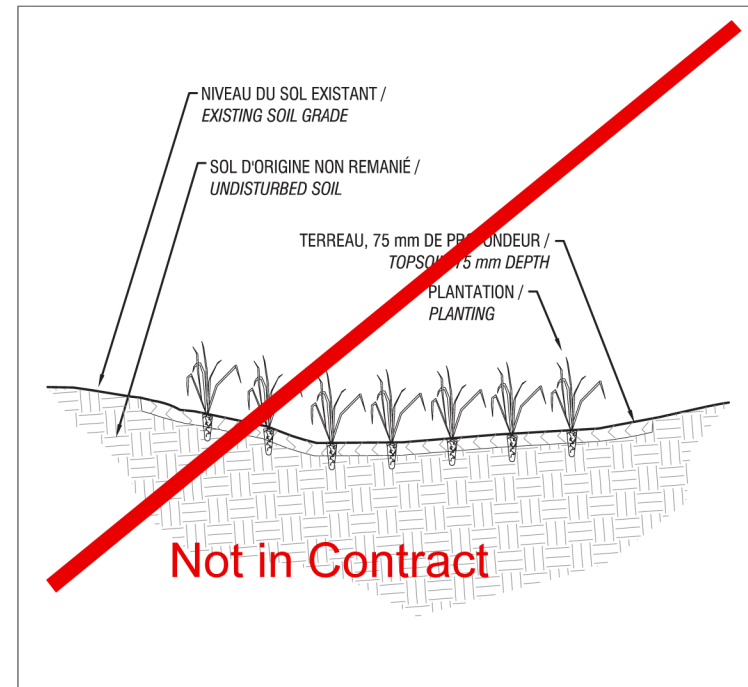
- A .Indication of passage for users
  1. Signage
  2. Planting
  3. Log / timber obstacle : simple
  4. Natural stones : obstacle, simple
- B. Drainage
  1. Cross drain
- C. Crossing of streams and ditches
  1. Fill with granite stone dust mix
  2. Stepping stones
  3. Wood bridge
  4. Wooden boardwalk
- D. Stairs and steps
  1. Wooden staircase
  2. Steps
  3. Landing with handrail

### Priority Level

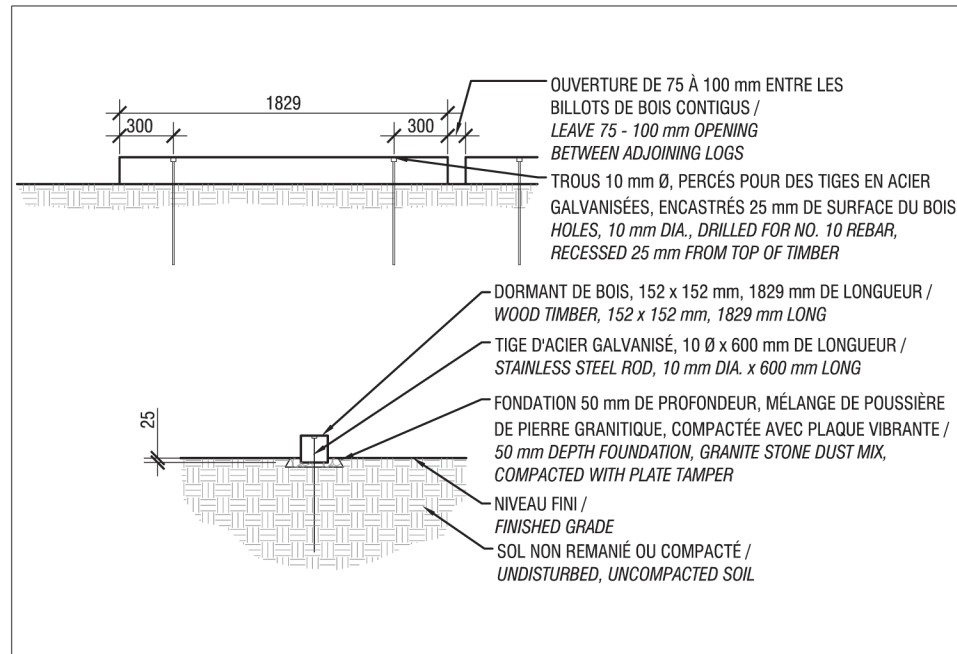
A priority level was assigned to each intervention. Depending on the degree of damage to the environment or for safety reasons, the priority level ranges from low to high.



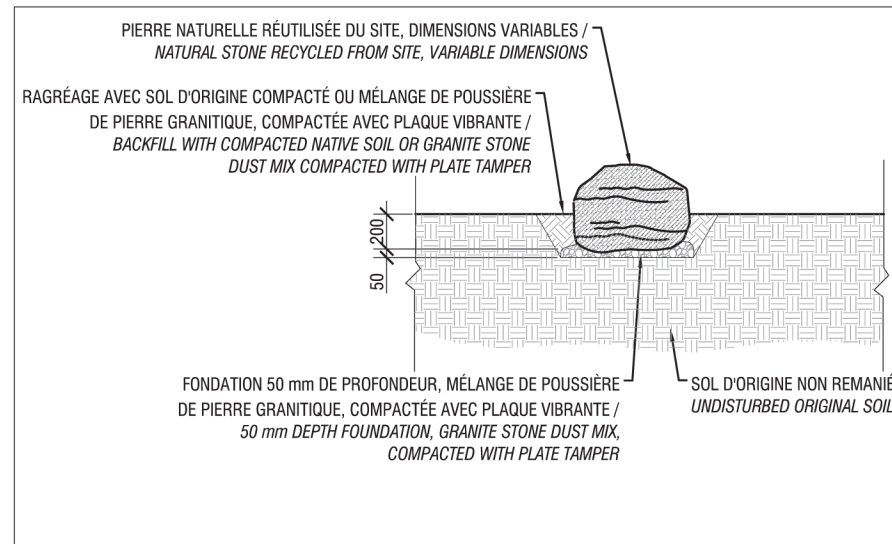
A1 - DÉTAIL TYPE D'AFFICHAGE / TYPICAL SIGNAGE DETAIL



A2 - DÉTAIL TYPE DE PLANTATION / TYPICAL PLANTING DETAIL



A3 - DÉTAIL TYPE DE BILLOT DE BOIS CARRÉ - OBSTACLE SIMPLE / TYPICAL SQUARE TIMBER DETAIL - SIMPLE OBSTACLE



A4 - DÉTAIL TYPE DE PIERRE NATURELLE - OBSTACLE OU BORDURE / TYPICAL NATURAL STONE DETAIL - OBSTACLE OR BORDER

Parc de la Gatineau / Mont King / Gatineau Park / King Mountain				
Nom latin / Latin name	Nom français / French name	Nom anglais / English name	Calibre / Size	Distance CC

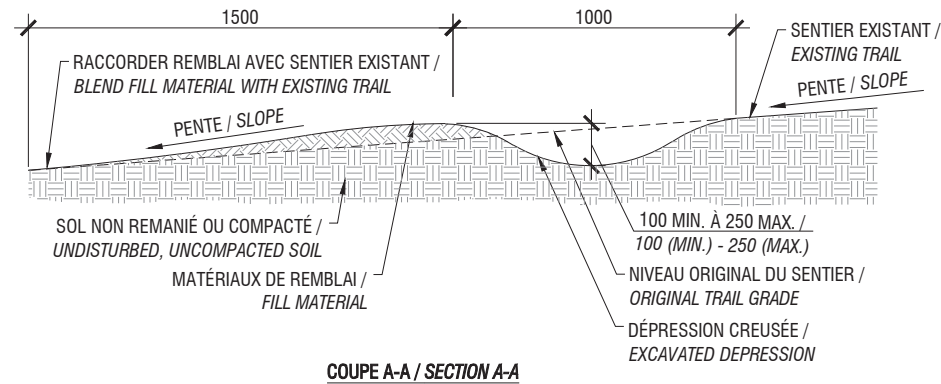
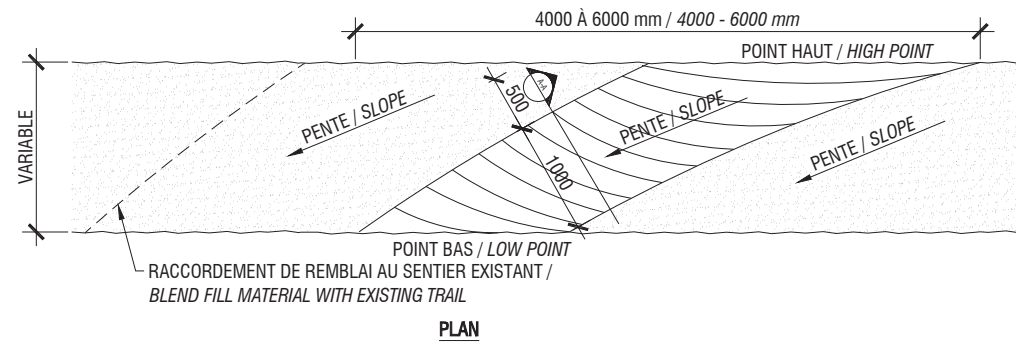
1 plateau = 45 plants multicavités / 1 tray = 45 multicavity plants				
<i>Actea pachypoda</i>	Actée à gros pédicelles	Thick-pedicled Baneberry	Multi	35 cm
<i>Aster macrophyllus</i>	Aster à grandes feuilles	Large-leaved Aster	Multi	35 cm
<i>Athyrium filix-femina</i>	Athyrium fougère femelle	Female Fern	Multi	35 cm
<i>Carex plantaginea</i>	Carex plantain	Plantain-leaved Sedge	Multi	35 cm
<i>Cystopteris bulbifera</i>	Cyoptéride bulbifère	Bulblet Fern	Multi	35 cm
<i>Linnaea borealis</i>	Linnée boréale	Twin-flower	Multi	35 cm
<i>Matteuccia struthiopteris</i>	Fougère-à-l'autruche	Ostrich Fern	Multi	35 cm
<i>Mitella diphylla</i>	Mitrelle à deux feuilles	Two-leaved Mitrewort	Multi	35 cm
<i>Tiarella cordifolia</i>	Tiarelle cordifoliée	Coolwort	Multi	35 cm
<i>Trillium grandiflorum</i>	Trille grandiflore	Large-flowered Trillium	Multi	35 cm

Note : 10 plants couvrent une superficie d'environ 1 m<sup>2</sup>. Mélanger les espèces lors de la plantation.  
Note : 10 plants cover an approximate area of 1 m<sup>2</sup>. Mix species during plantation.

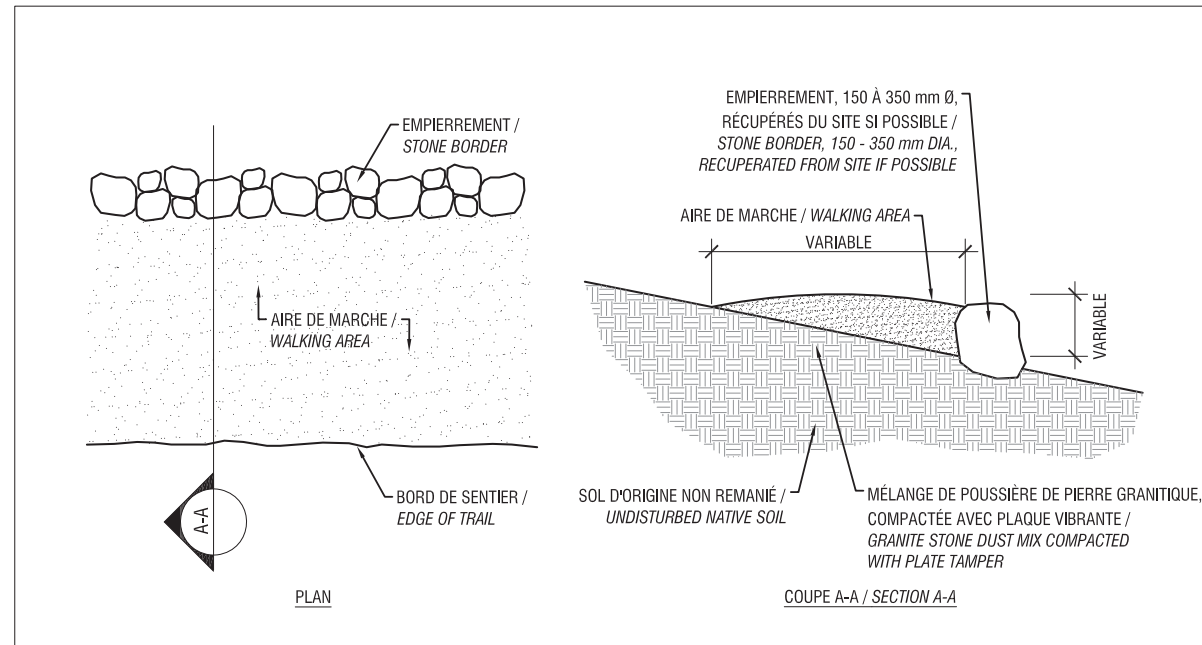


**NOTE :**

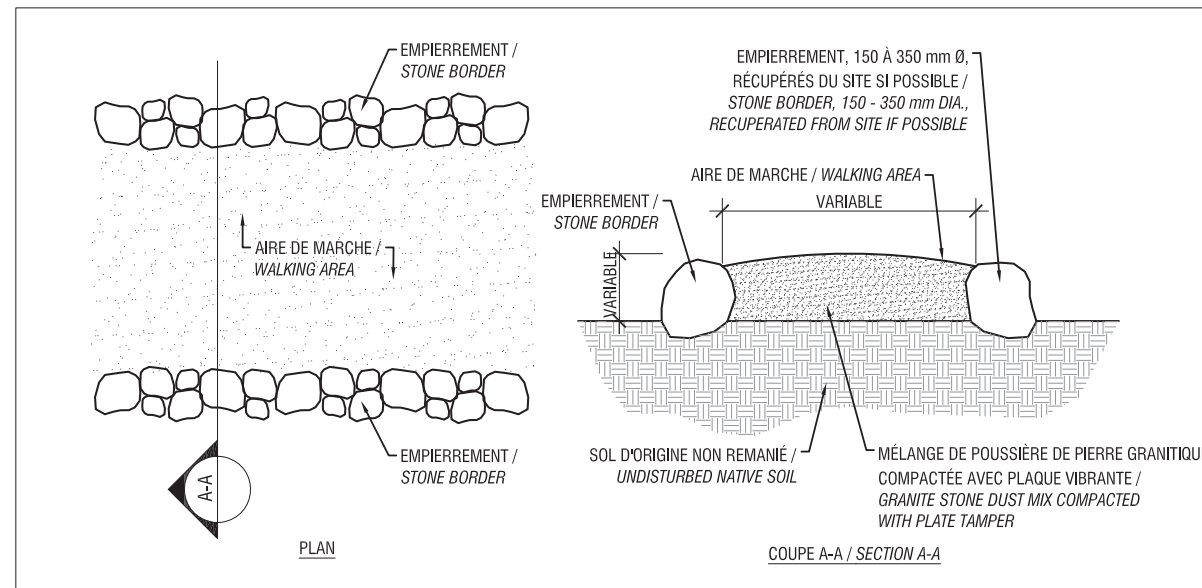
- CREUSER UNE DÉPRESSION DANS LE SENTIER ET COMPRESSER LE MATÉRIEL DE REMBLAIS POUR CRÉER LA RIGOLE TRANSVERSALE, BIEN COMPACTÉE.  
DIG A DEPRESSION IN THE TRAIL AND COMPRESS THE FILL MATERIAL TO CREATE A WELL-COMPACTED CROSS DRAIN .
- PENTE DE LA RIGOLE = 1 ½ X LA PENTE TRANSVERSALE DU SENTIER DE FAÇON À CE QUE L'EAU S'ÉCOULE RAPIDEMENT HORS DU SENTIER. /  
DRAIN SLOPE = 1 ½ X THE TRAIL CROSS SLOPE, TO ALLOW WATER TO DRAIN QUICKLY OFF THE TRAIL.
- S'ASSURER QUE LA RIGOLE SE RACCORDE BIEN AVEC LE POINT BAS DU TERRAIN NATUREL. /  
ENSURE THAT THE CROSS DRAIN COINCIDES WITH THE SURROUNDING DRAINAGE PATTERN.



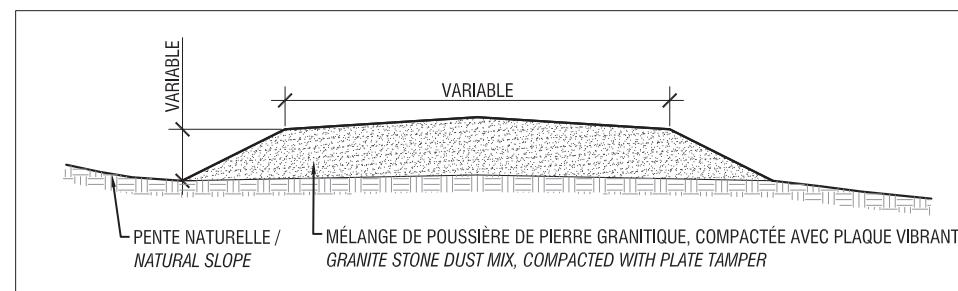
B1 - DÉTAIL TYPE DE RIGOLE TRANSVERSALE / TYPICAL CROSS DRAIN DETAIL



C1 - DÉTAIL TYPE DE REMBLAI D'UNE AIRE DE MARCHÉ / TYPICAL RAISED TRAIL DETAIL - SINGLE-SIDE RETENTION

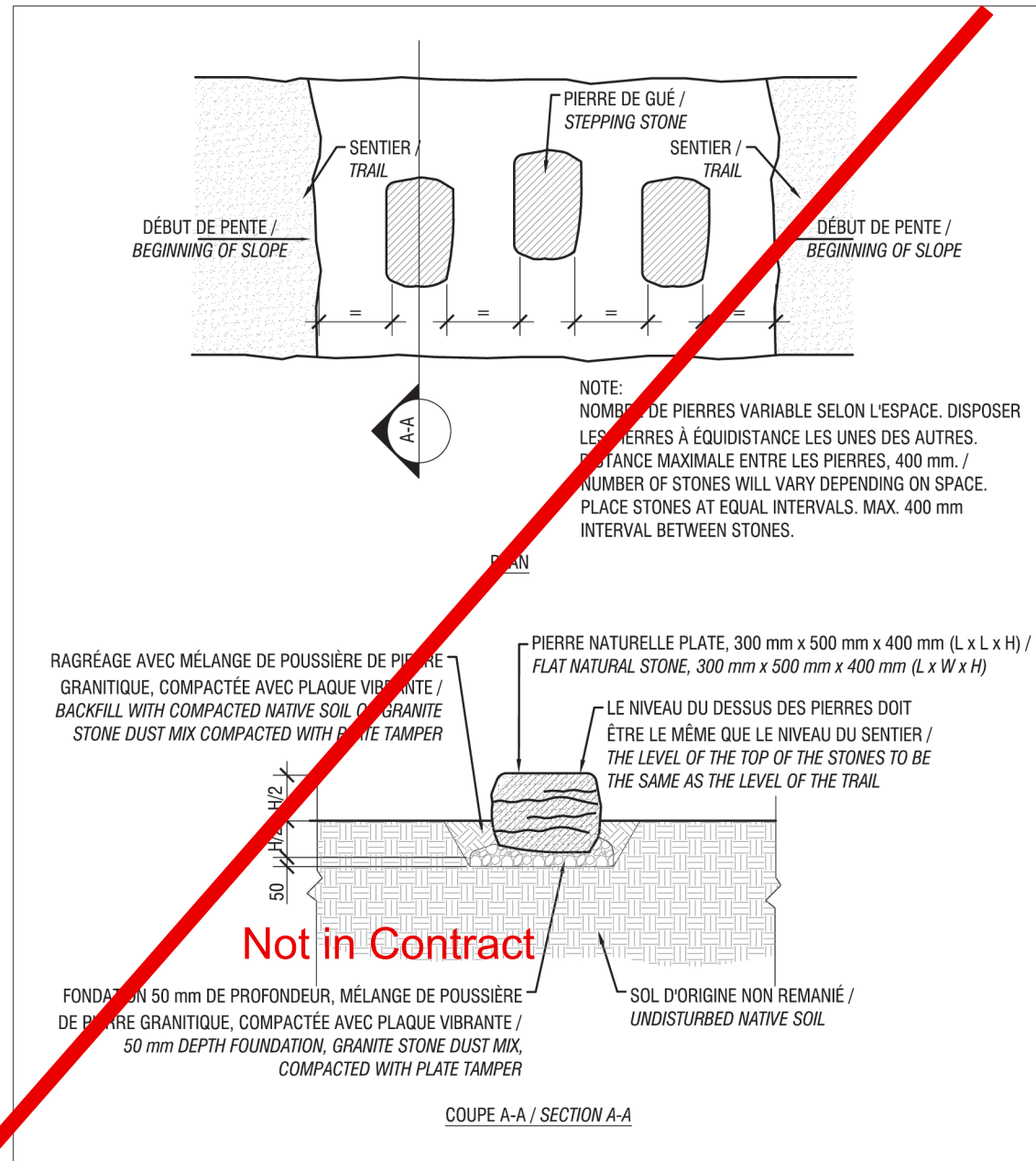


C1 - DÉTAIL TYPE DE REMBLAI D'UNE AIRE DE MARCHÉ / TYPICAL RAISED TRAIL DETAIL - DOUBLE-SIDE RETENTION

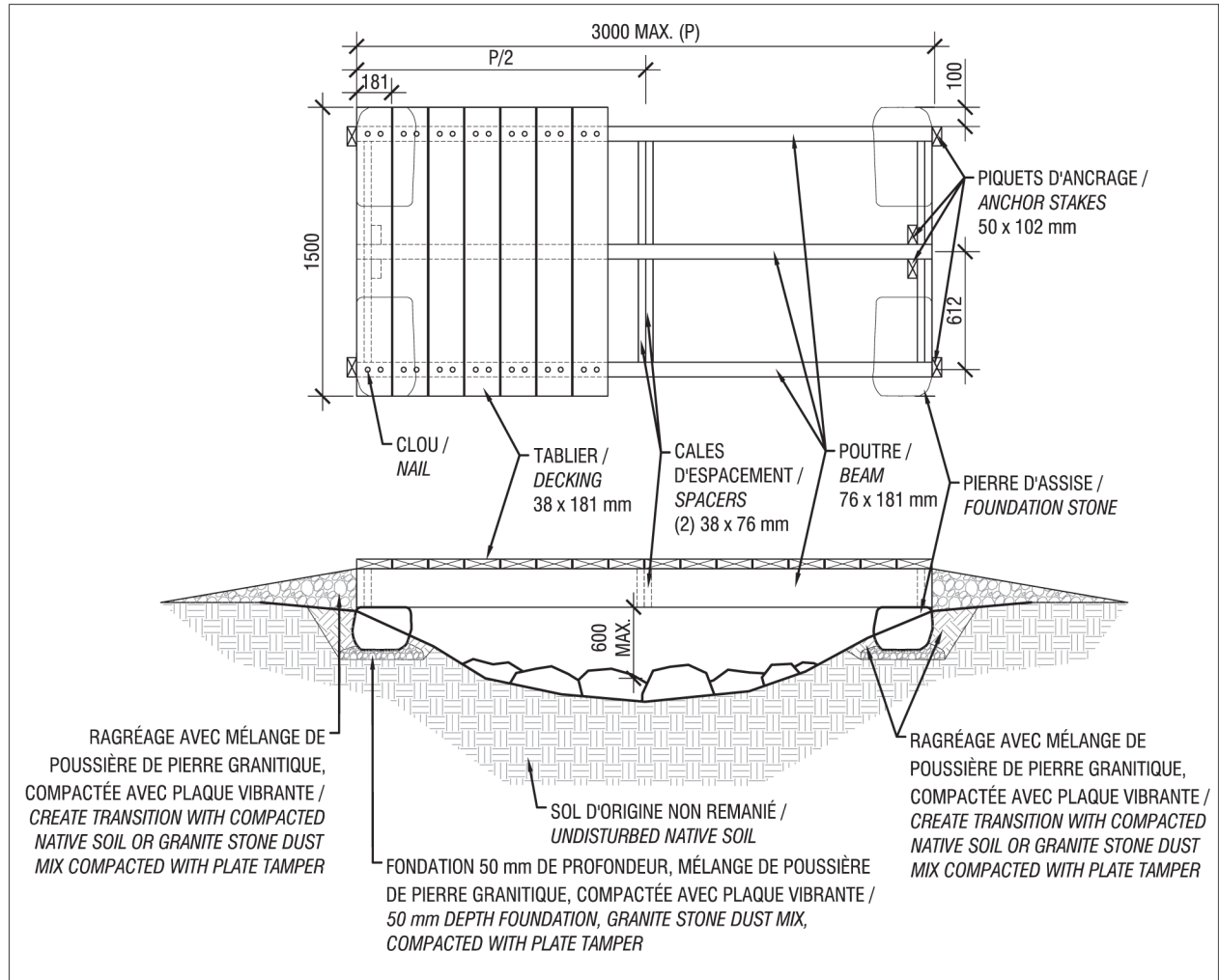


C1 - DÉTAIL TYPE DE REMBLAI D'UNE AIRE DE MARCHÉ / TYPICAL CROWNED TRAIL SECTION



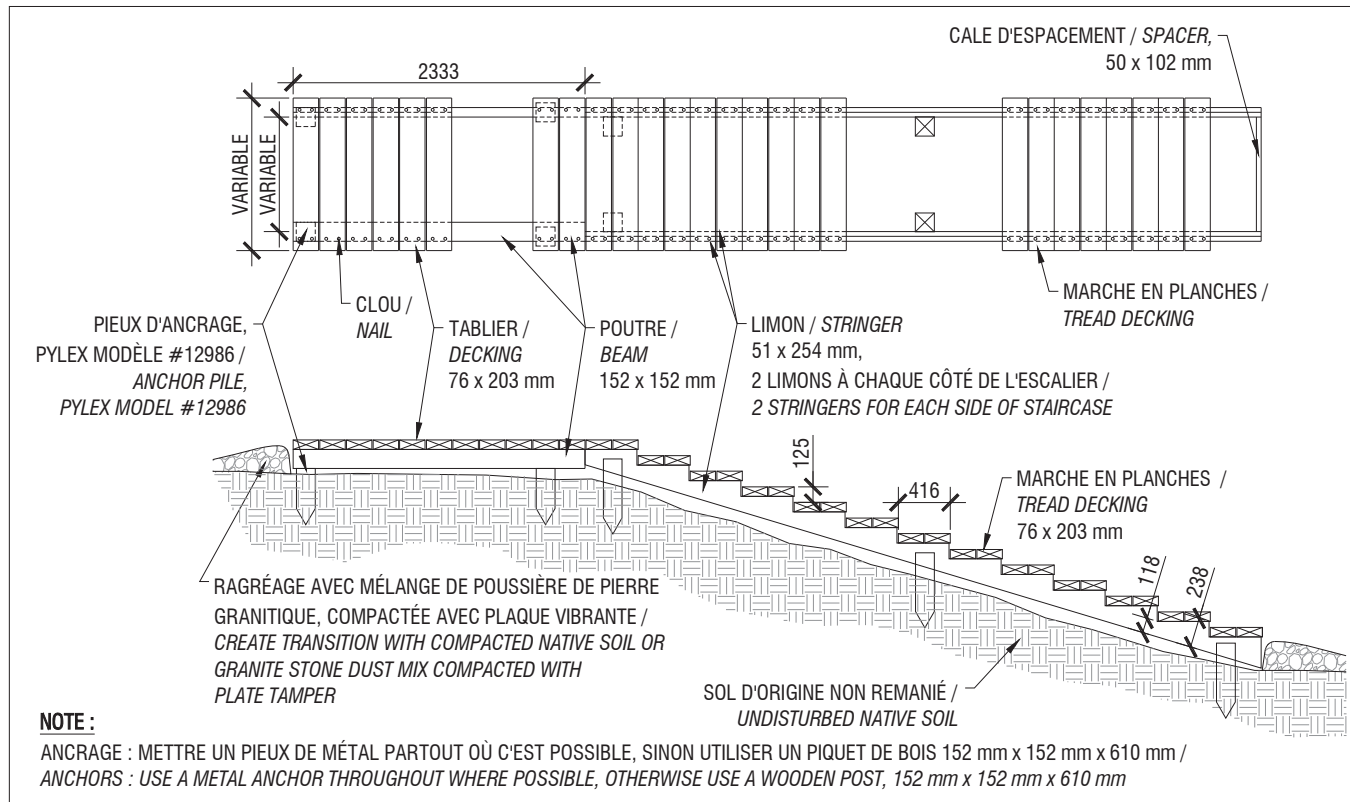


C2 - DÉTAIL TYPE DE PIERRE DE GUÉ / TYPICAL STEPPING STONE DETAIL

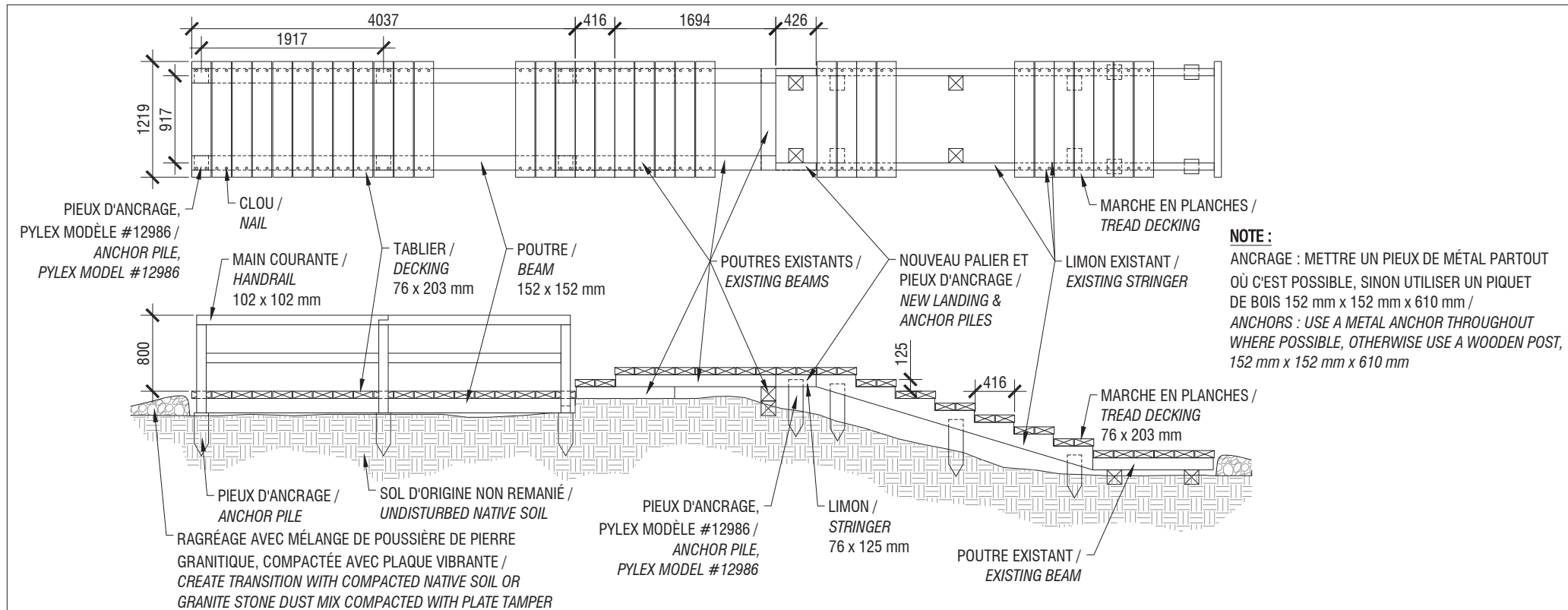


C3 - DÉTAIL TYPE DE PONT / TYPICAL BRIDGE DETAIL

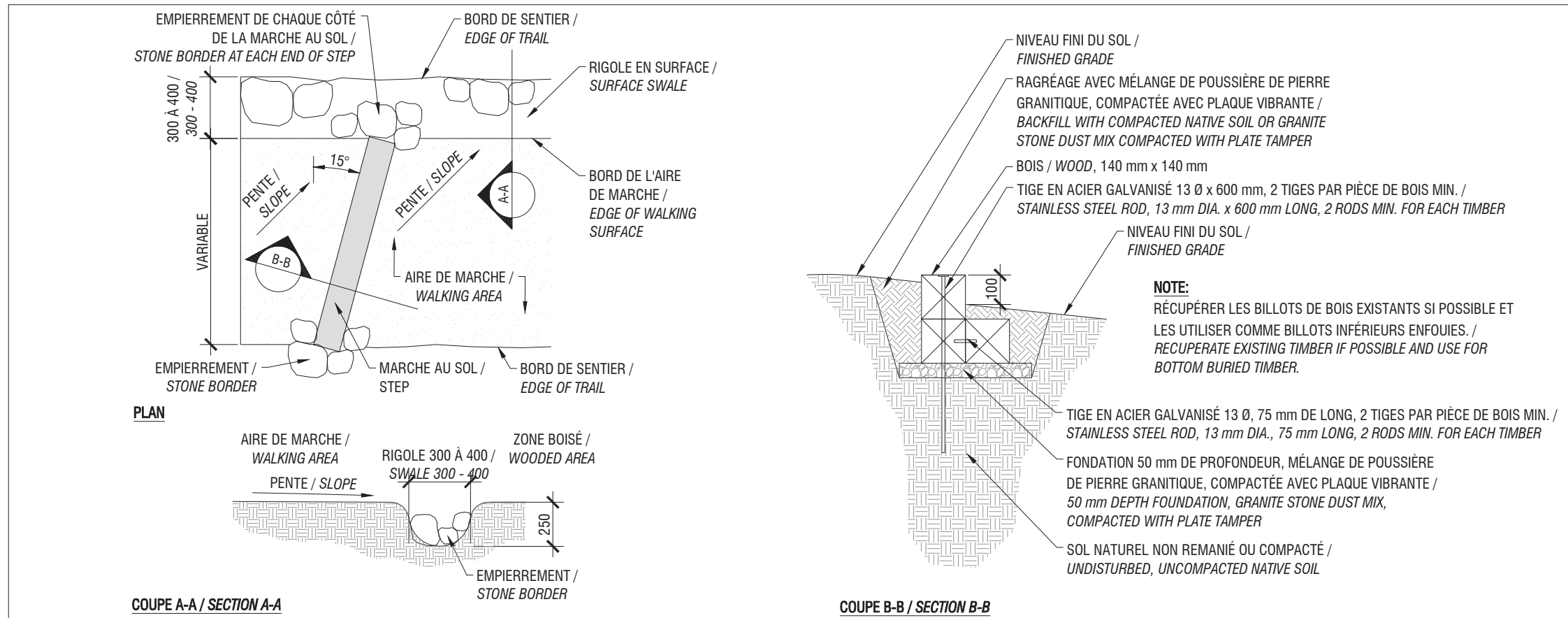
Not in Contract



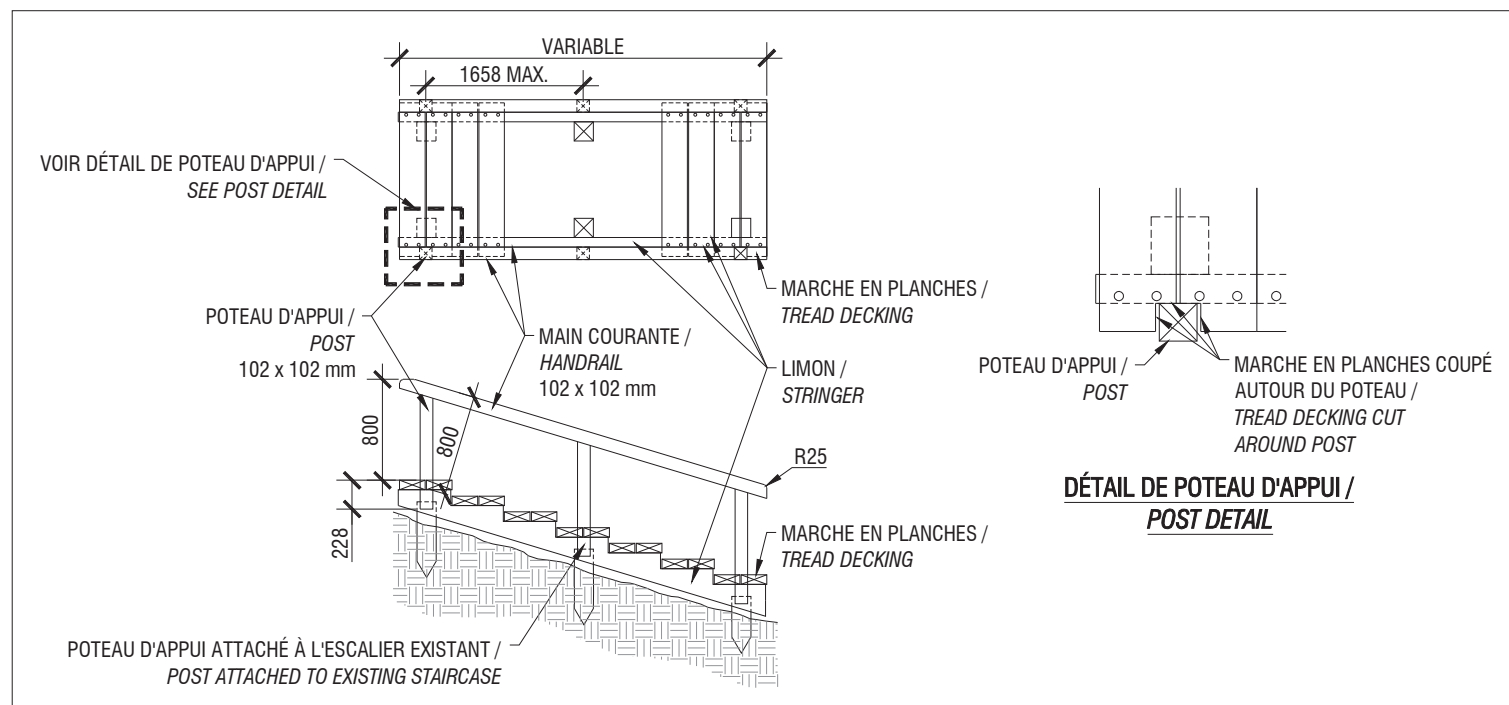
D1 - DÉTAIL TYPE D'ESCALIERS / TYPICAL STAIRCASE DETAIL



D3 - DÉTAIL ESCALIERS ET MAIN COURANTE / STAIRCASE AND HANDRAIL DETAIL

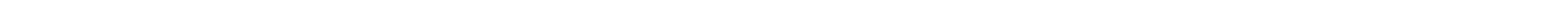


D2 - DÉTAIL TYPE DE MARCHE AU SOL / TYPICAL STEP DETAIL



D4 - DÉTAIL MAIN COURANTE / HANDRAIL DETAIL





## KING MOUNTAIN TRAIL | overall plan

Distance : 1.8 km

Activities : hiking and observation points

Trailhead : point 032

Site access : 155 metres from parking lot across steep terrain

Interventions: 16 GPS points, each corresponding with a problematic portion of the trail.

One or more interventions are proposed for each issue.



King Mountain Trail Overall Plan and GPS Points

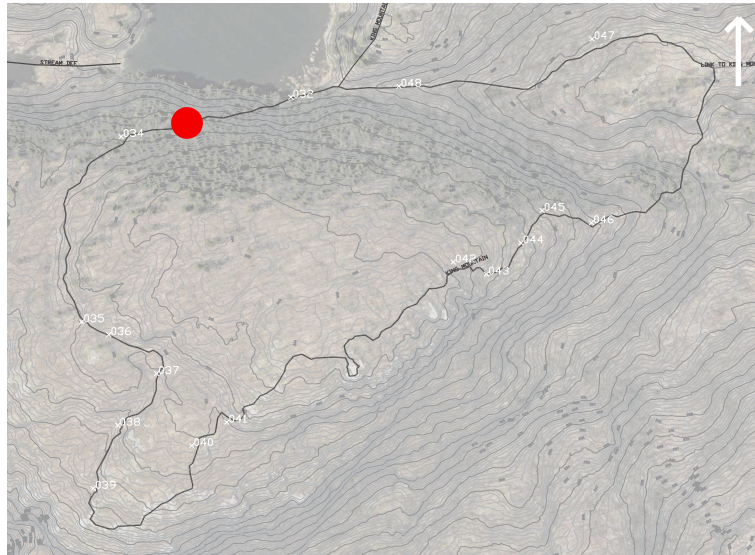
Scale = 1 : 2500



## POINT 033

N 5039189.650 E 354486.830

### LOCATION



### ISSUES

- An unnecessary square timber across the center of the trail
- Staircase with excessive height does not encourage use

### RECOMMENDATIONS

- Clear the path of unnecessary obstacles and recuperate the square timber
- Lower the upper plateau of the stairs by one level and make a one-riser approach

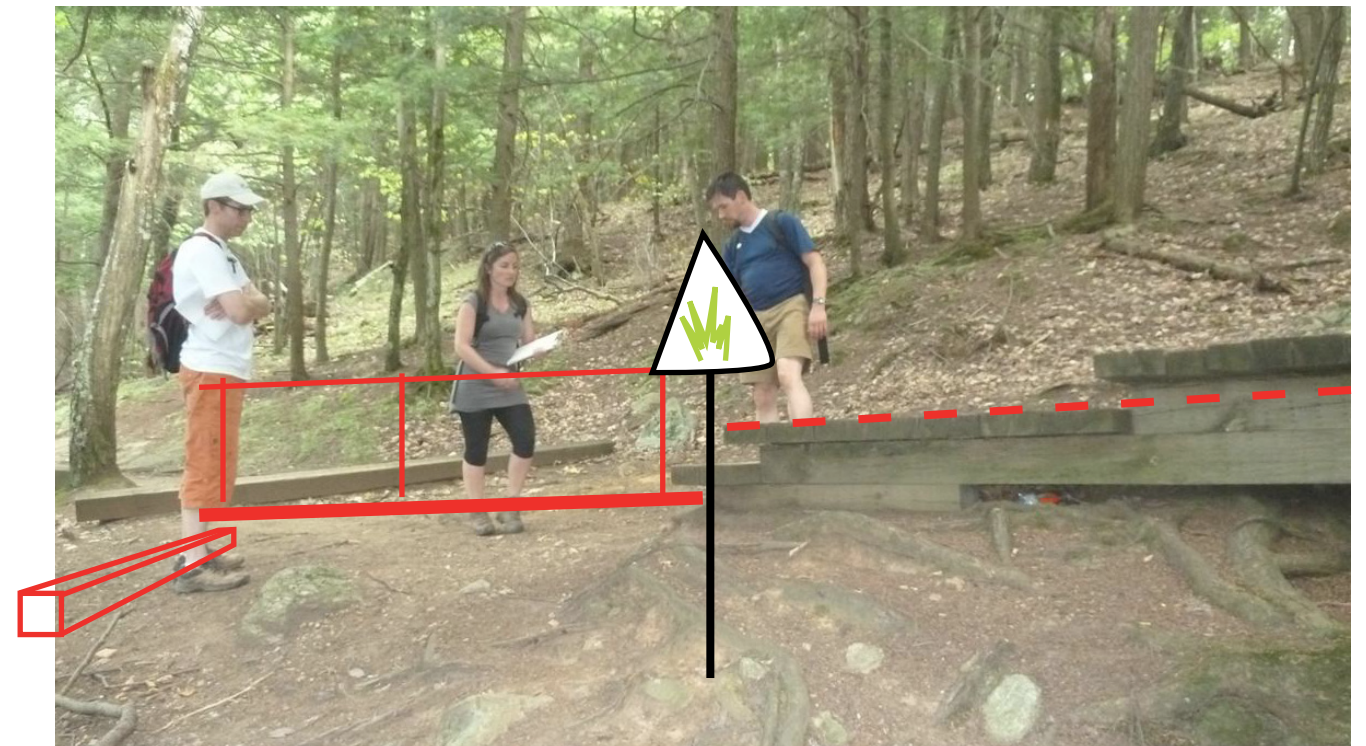
### PRIORITY LEVEL

High

### EXISTING SITUATION

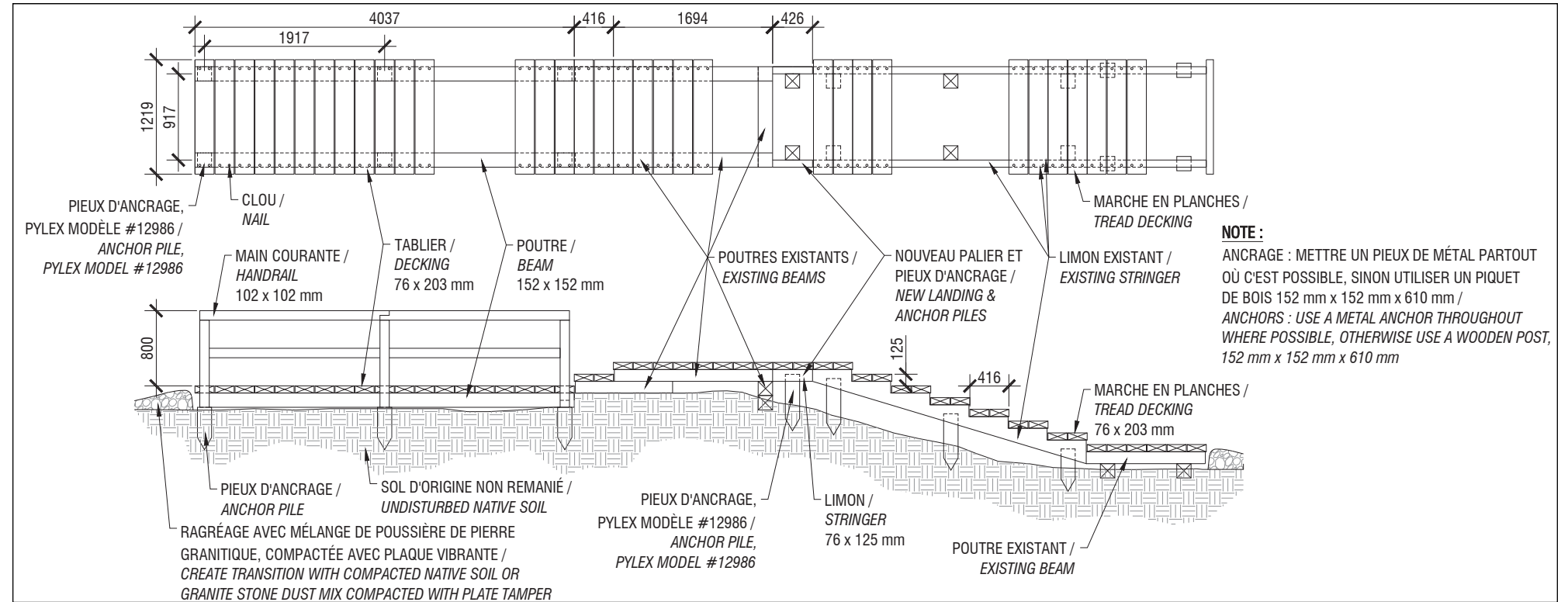


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

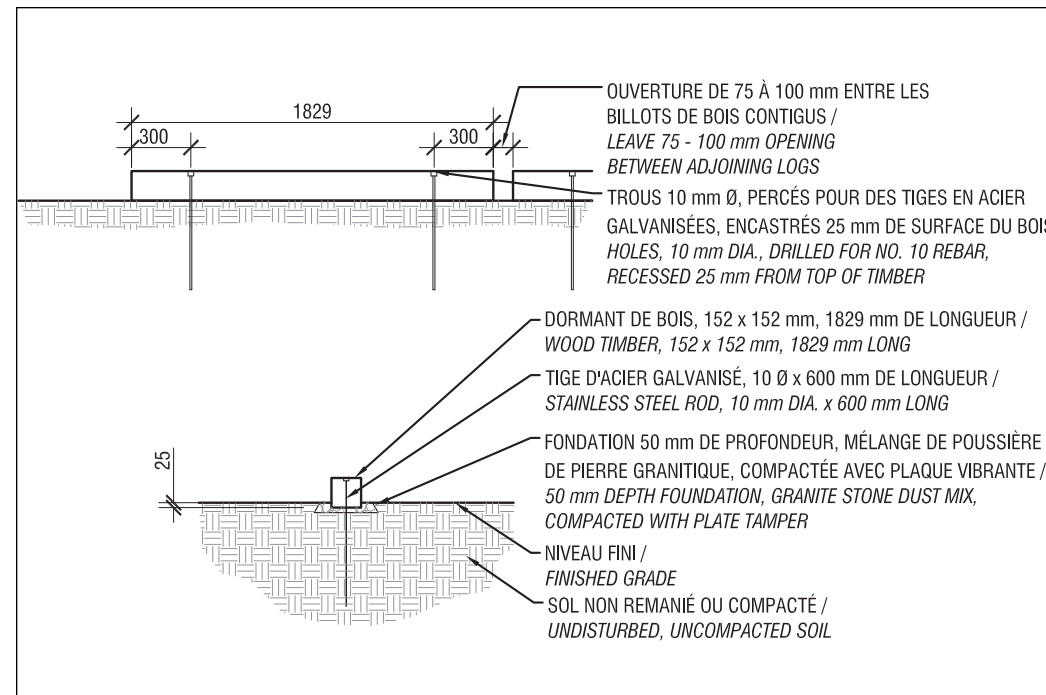
- **A-1** Install 'stay on the trail' signage to direct people to use the designated path and avoid the naturalized area
- **A-3** Install wood timbers – simple obstacles (before the stairs: opposite to the alternative trail)
- **A-3** Installer wood timbers - simple bordures (after stairs : for 10 metres)
- **D-3** Install a landing with a handrail and remove the upper landing of the existing stairs, recuperating materials if possible



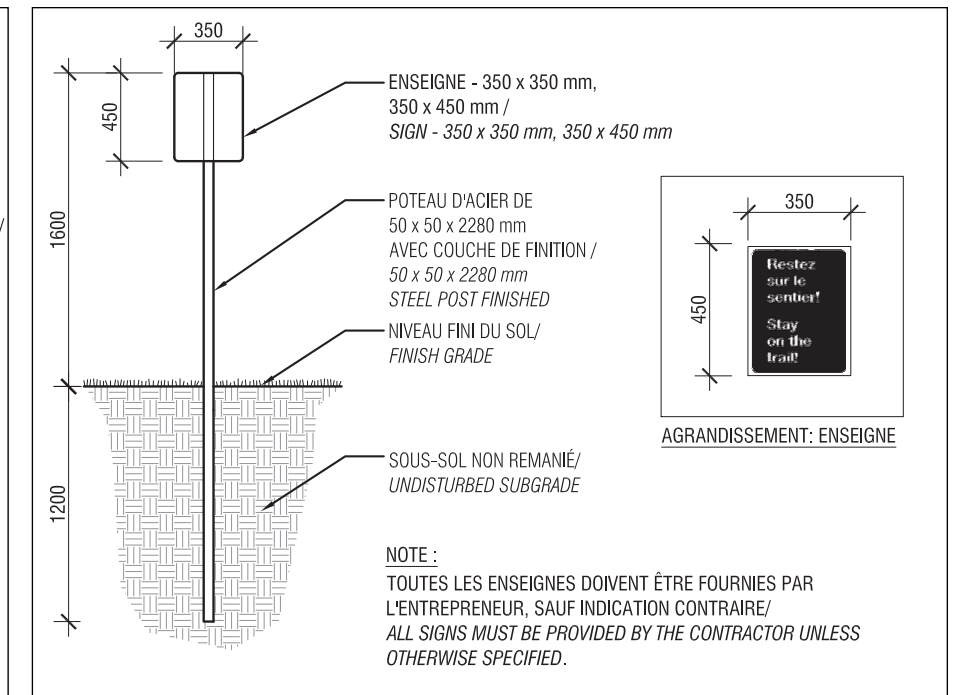
D-3. STAIRCASE AND HANDRAIL DETAIL

ITEMS

- Boardwalk and handrail : 4 metres
- Removal of square wood timber and of upper landing of existing stairs, recuperate materials if possible
- 1 row of wood timber - simple obstacle (before stairs)
- 5 rows of wood timber - simple bordure (after stairs)



A-3. TYPICAL SQUARE TIMBER DETAIL - SIMPLE OBSTACLE



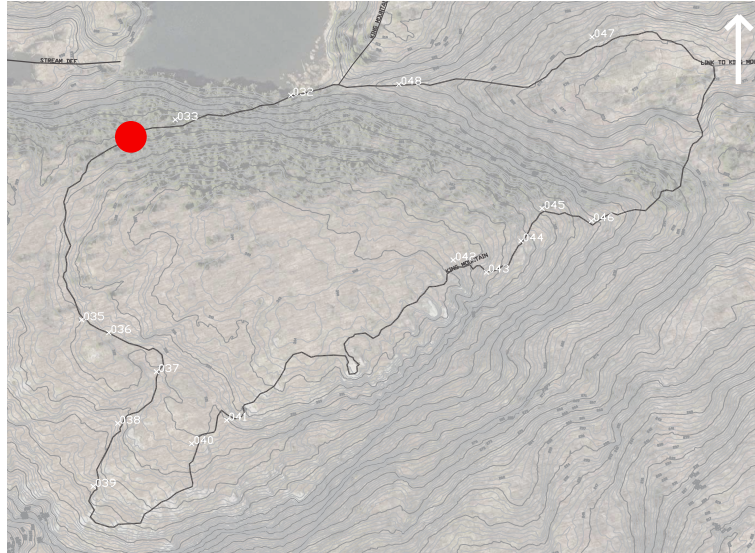
A-1. TYPICAL SIGNAGE DETAIL



## POINT 034

N 5039177.610 E 354445.380

### LOCATION



### ISSUES

- An unnecessary square timber step in the center of the trail

### RECOMMENDATIONS

- Clear the path of unnecessary obstacles and recuperate the square timber for use with other interventions
- Recuperate nearby existing natural stones to level the ground

### PRIORITY LEVEL

High

### EXISTING SITUATION



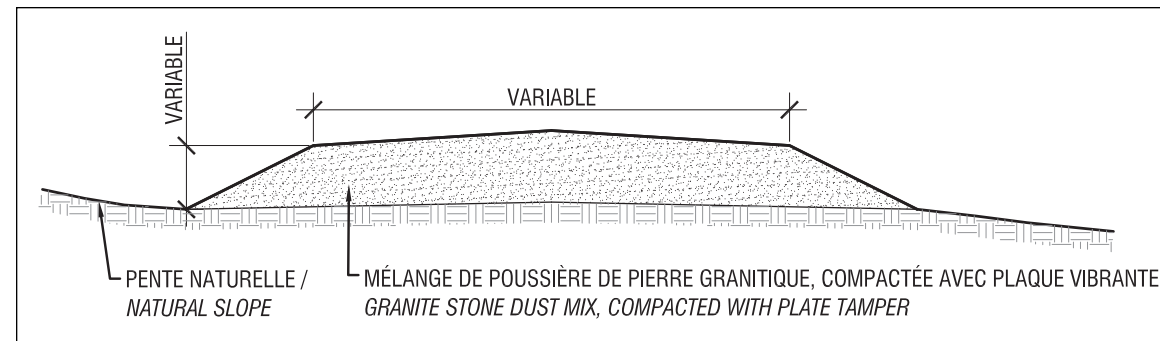
### PROPOSED SITUATION





## PROPOSED INTERVENTIONS

- **A-3** Remove the simple timber and level the surface with existing materials found on the site. Recuperate the existing timber if possible, otherwise dispose off-site.



C-1. TYPICAL CROWNED TRAIL SECTION

## ITEMS

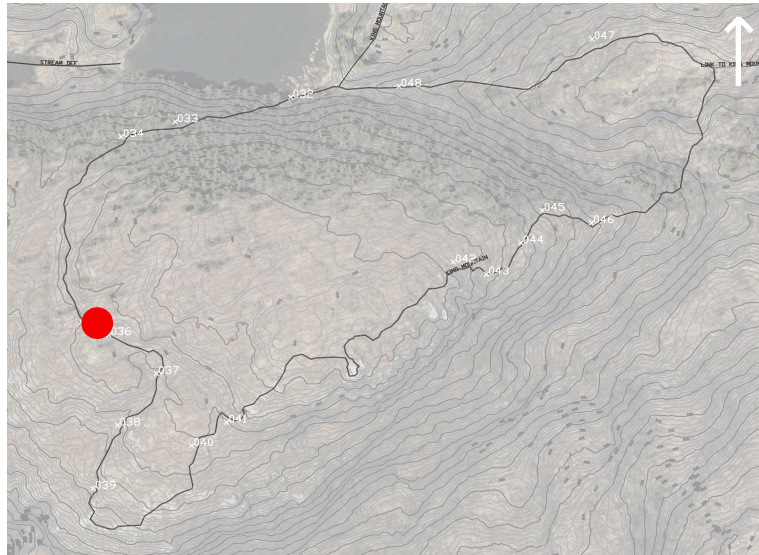
- Removal of existing wood timber and levelling of the surface
- Fill with granite stone dust mix if necessary



POINT 035

N 5039027.870 E 354415.100

LOCATION



ISSUES

- An unstable square timber step
- Indications of erosion caused by surface runoff

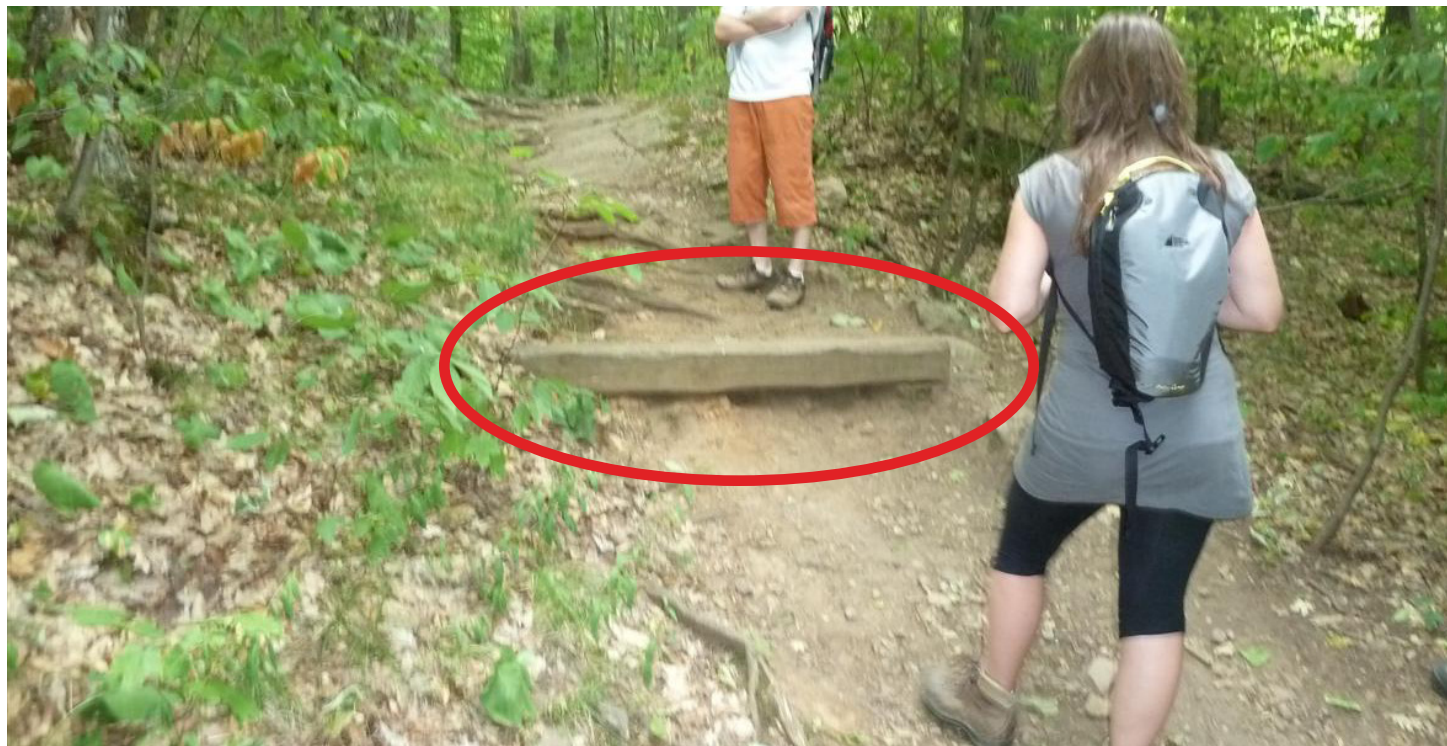
RECOMMENDATIONS

- Stabilise the timber to create a step

PRIORITY LEVEL

High

EXISTING SITUATION



PROPOSED SITUATION

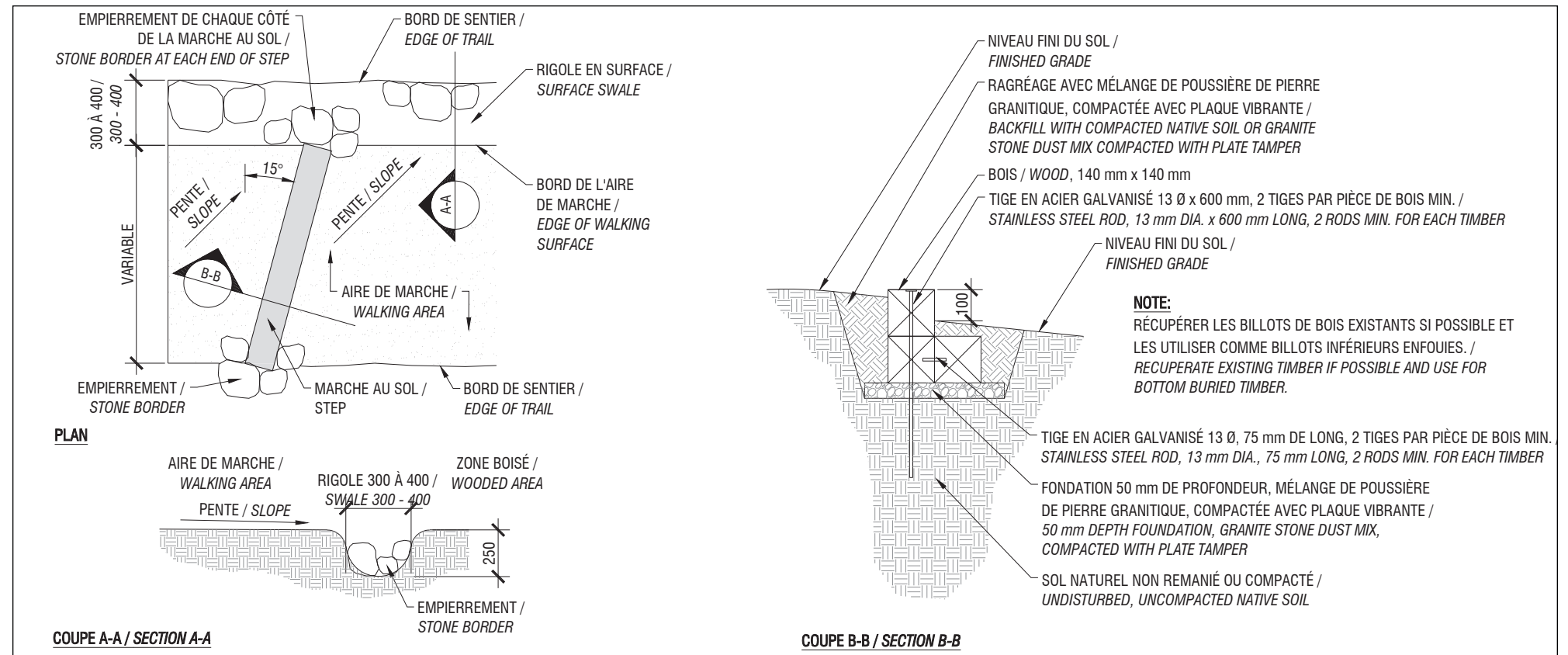


PROPOSED INTERVENTIONS

**D-2** Remove the existing timber and install a step. Recuperate the existing timber if possible, otherwise dispose off-site.

ITEMS

- Removal of existing wood timber and levelling of the surface
- Install a step : 1.6 metres wide

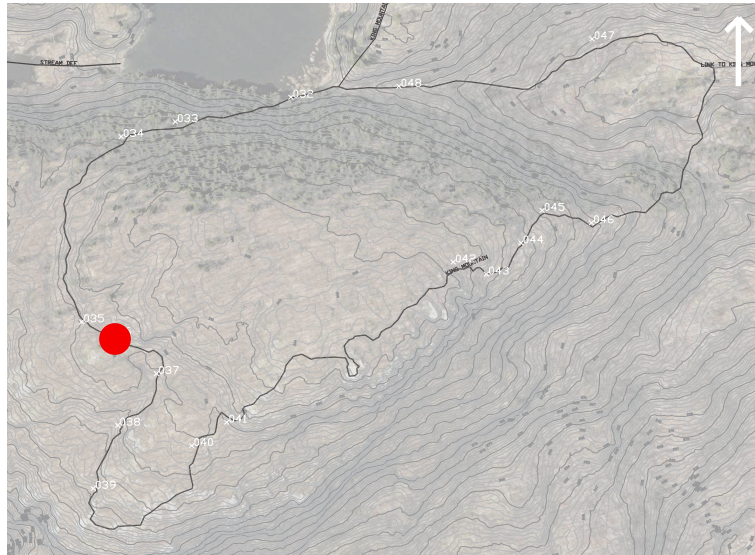


D-2. TYPICAL STEP DETAIL

## POINT 036

N 5039017.490 E 354435.920

### LOCATION



### ISSUES

- Two square timber steps are unstable and too high
- Indications of erosion caused by surface runoff

### RECOMMENDATIONS

- Stabilise the timbers to create steps and adjust their levels

### PRIORITY LEVEL

High

### EXISTING SITUATION



### PROPOSED SITUATION

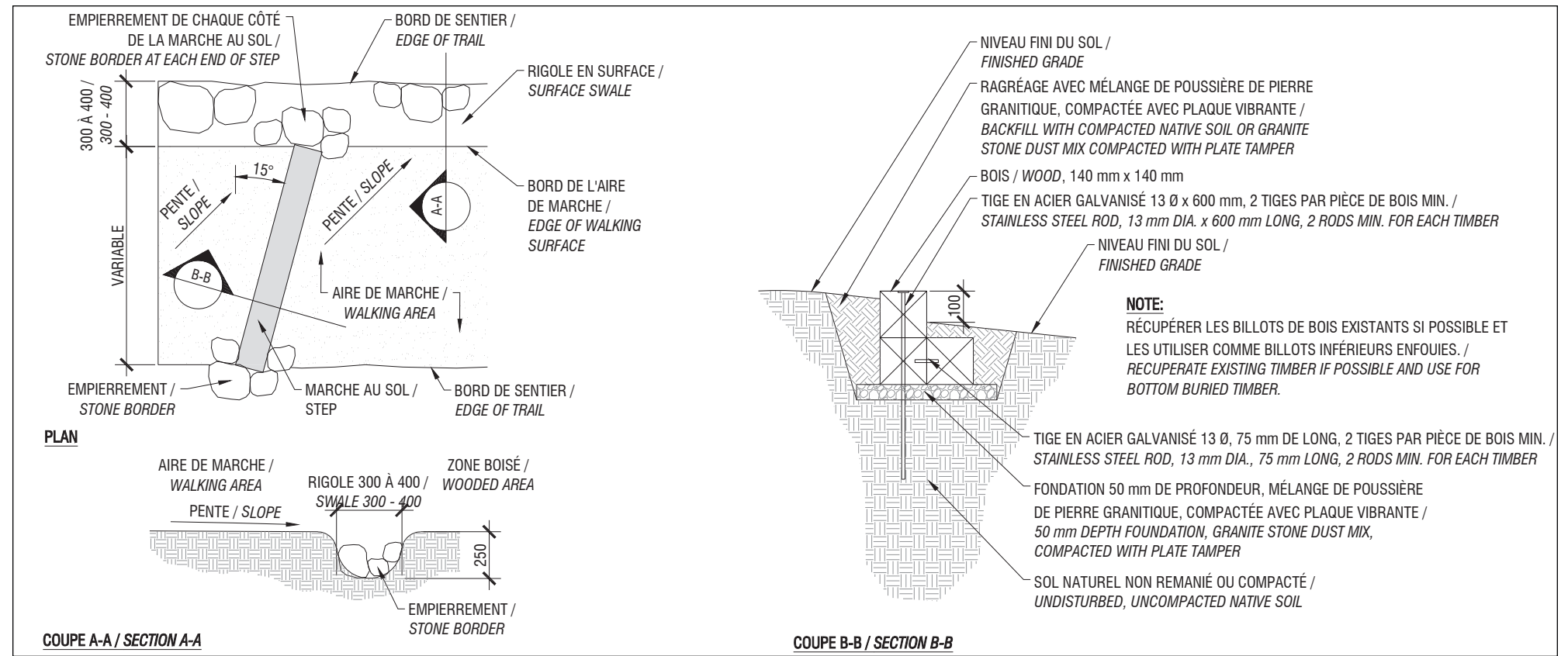


PROPOSED INTERVENTIONS

**D-2** Remove the existing timber and install a step. Recuperate the existing timber if possible, otherwise dispose off-site.

ITEMS

- Removal of existing wood timbers (2)
- Install two (2) steps : 1.3 metres wide

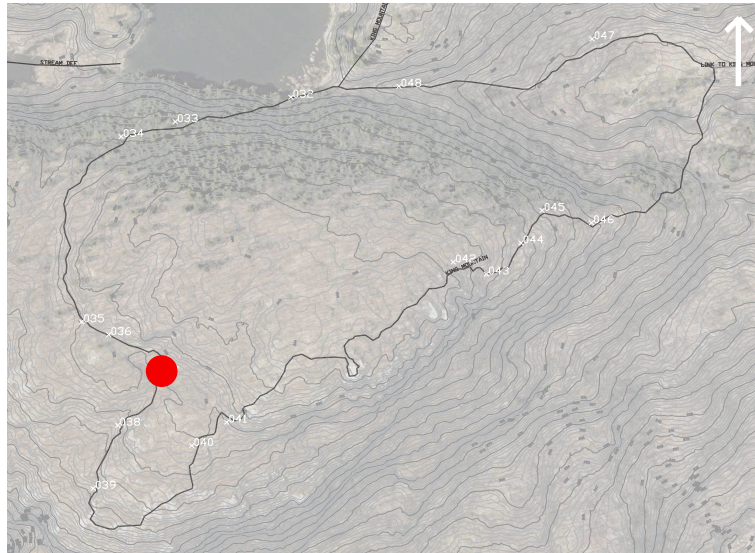


D-2. TYPICAL STEP DETAIL

## POINT 037

N 5038985.990 E 354472.450

### LOCATION



### ISSUES

- Three square timber steps are unstable and too high
- Indications of erosion caused by surface runoff

### RECOMMENDATIONS

- Stabilise the timbers to create steps and adjust their levels

### PRIORITY LEVEL

High

### EXISTING SITUATION

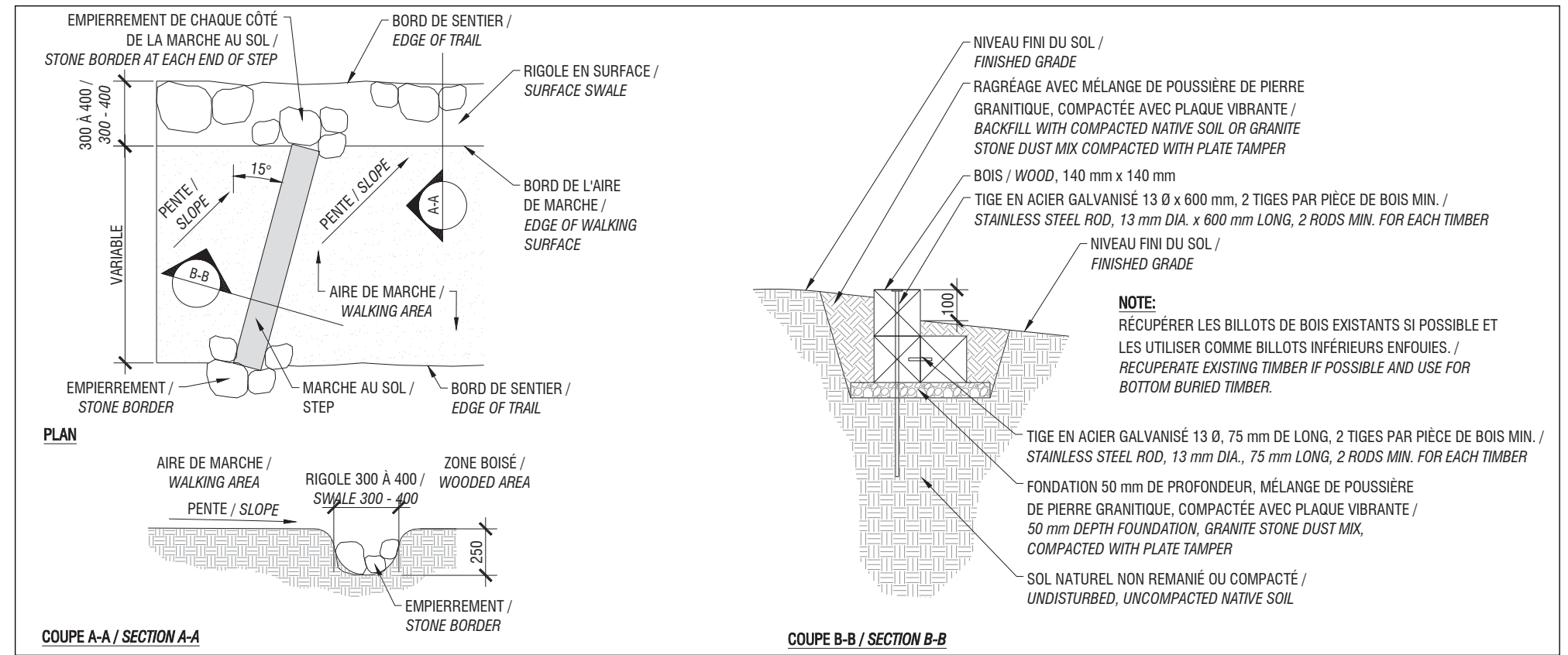


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

**D-2** Remove the existing timber and install a step. Recuperate the existing timber if possible, otherwise dispose off-site.



D-2. TYPICAL STEP DETAIL

ITEMS

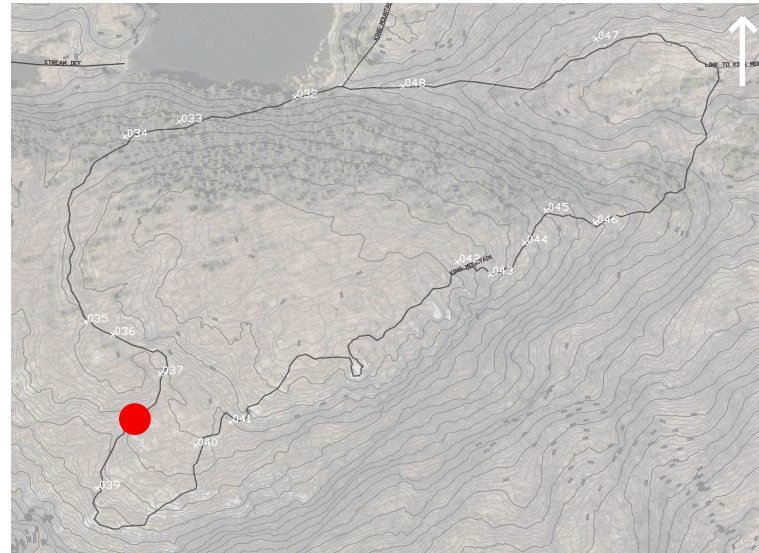
- Removal of existing wood timbers (3)
- Install three (3) steps : 1.2 metres wide



## POINT 038

N 5038944.290 E 354442.720

### LOCATION



### ISSUES

- Barriers created at the center of the path by natural stones and roots
- Three square timber steps are unstable and too high
- Indications of erosion caused by surface runoff

### RECOMMENDATIONS

- Clear the path to ensure safe passage
- Stabilise the timbers to create steps and adjust their levels

### PRIORITY LEVEL

High

### EXISTING SITUATION



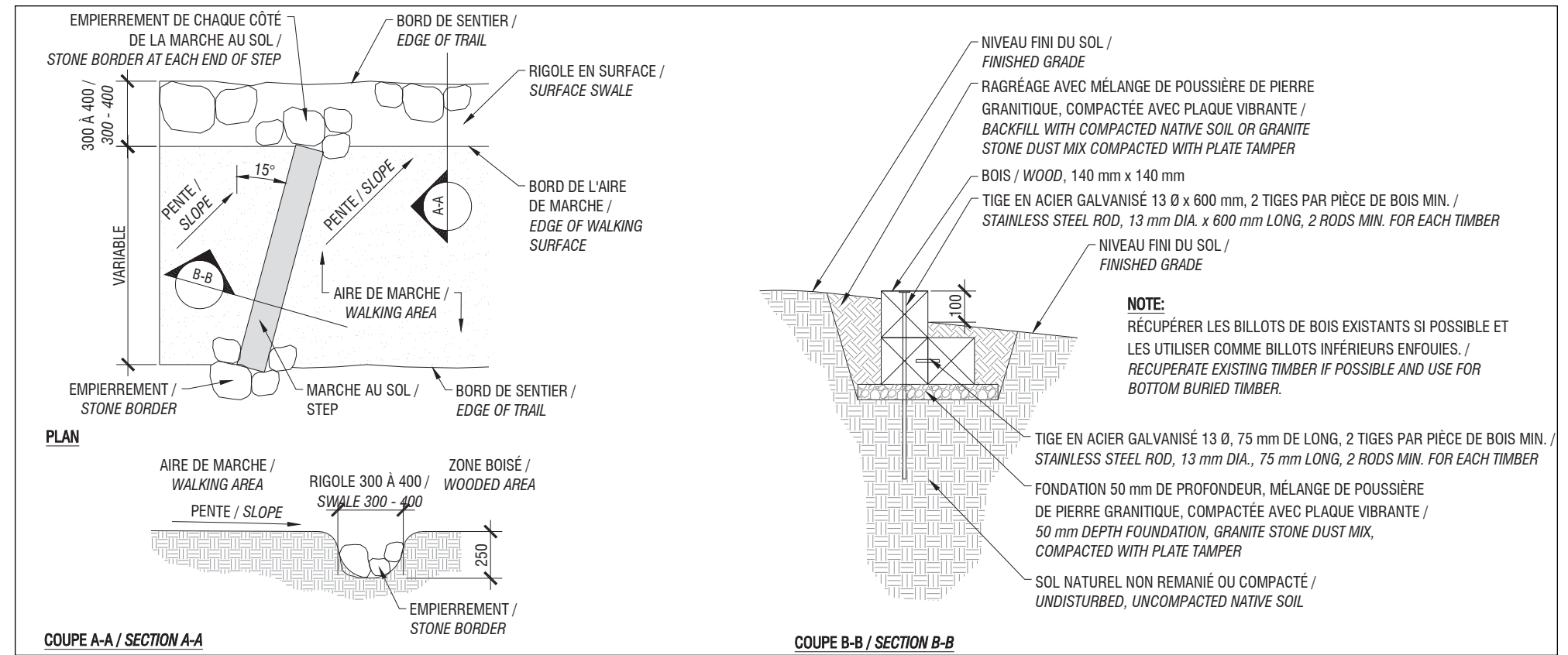
### PROPOSED SITUATION





PROPOSED INTERVENTIONS

- **A-4** Remove the natural stones, recuperating and relocating on-site.
- **D-2** Remove the existing timber and install a step. Recuperate the existing timber if possible, otherwise dispose off-site.



D-2. TYPICAL STEP DETAIL

ITEMS

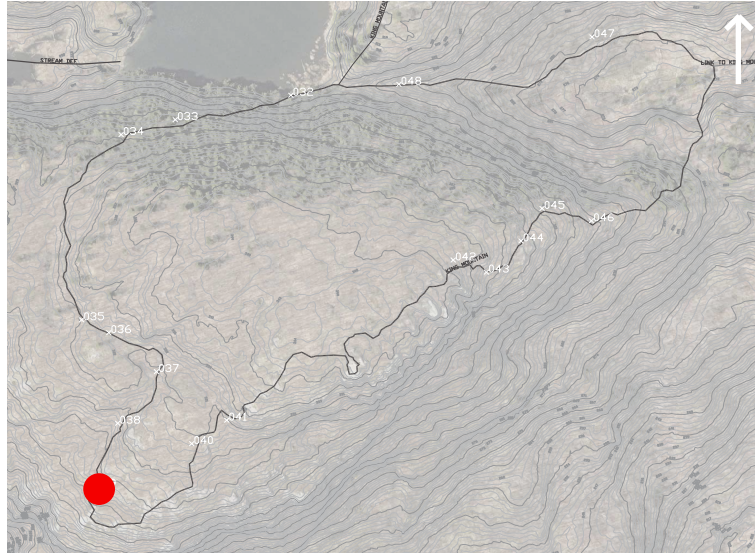
- Removal of natural stones and existing wood timbers (3)
- Install three (3) steps : 1.2 metres wide



## POINT 039

N 5038893.250 E 354424.040

### LOCATION



### ISSUES

- Three square timber steps are unstable and too high

### PRIORITY LEVEL

High

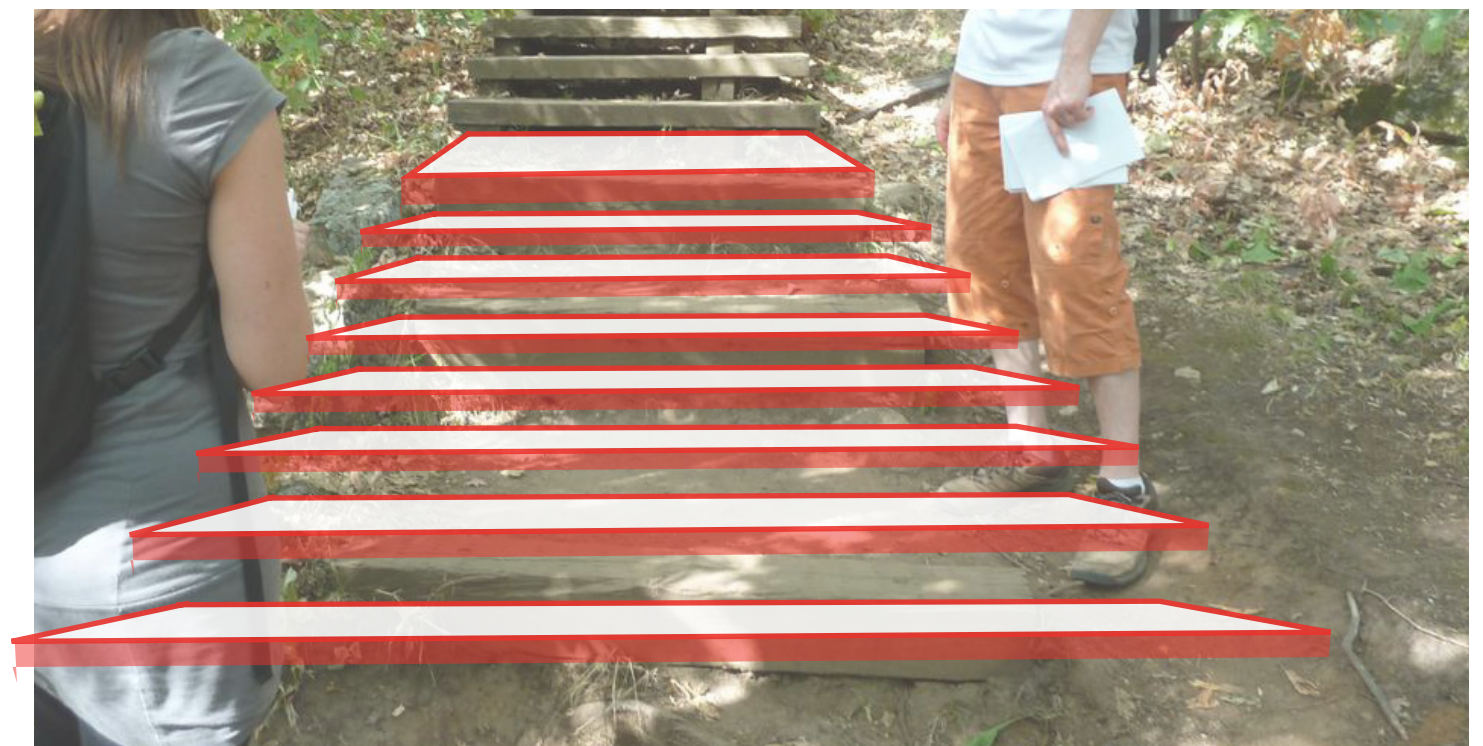
### RECOMMENDATIONS

- Remove 3 timbers to create a continuous elevated staircase with a landing

### EXISTING SITUATION

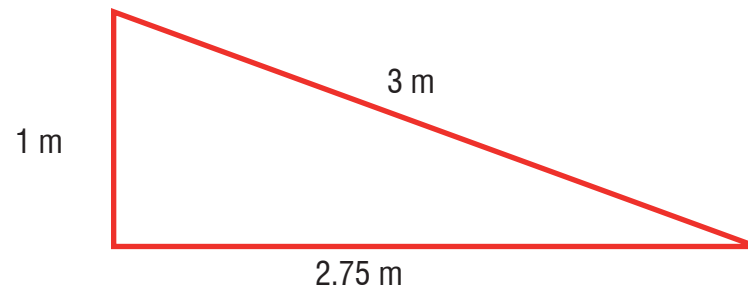


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

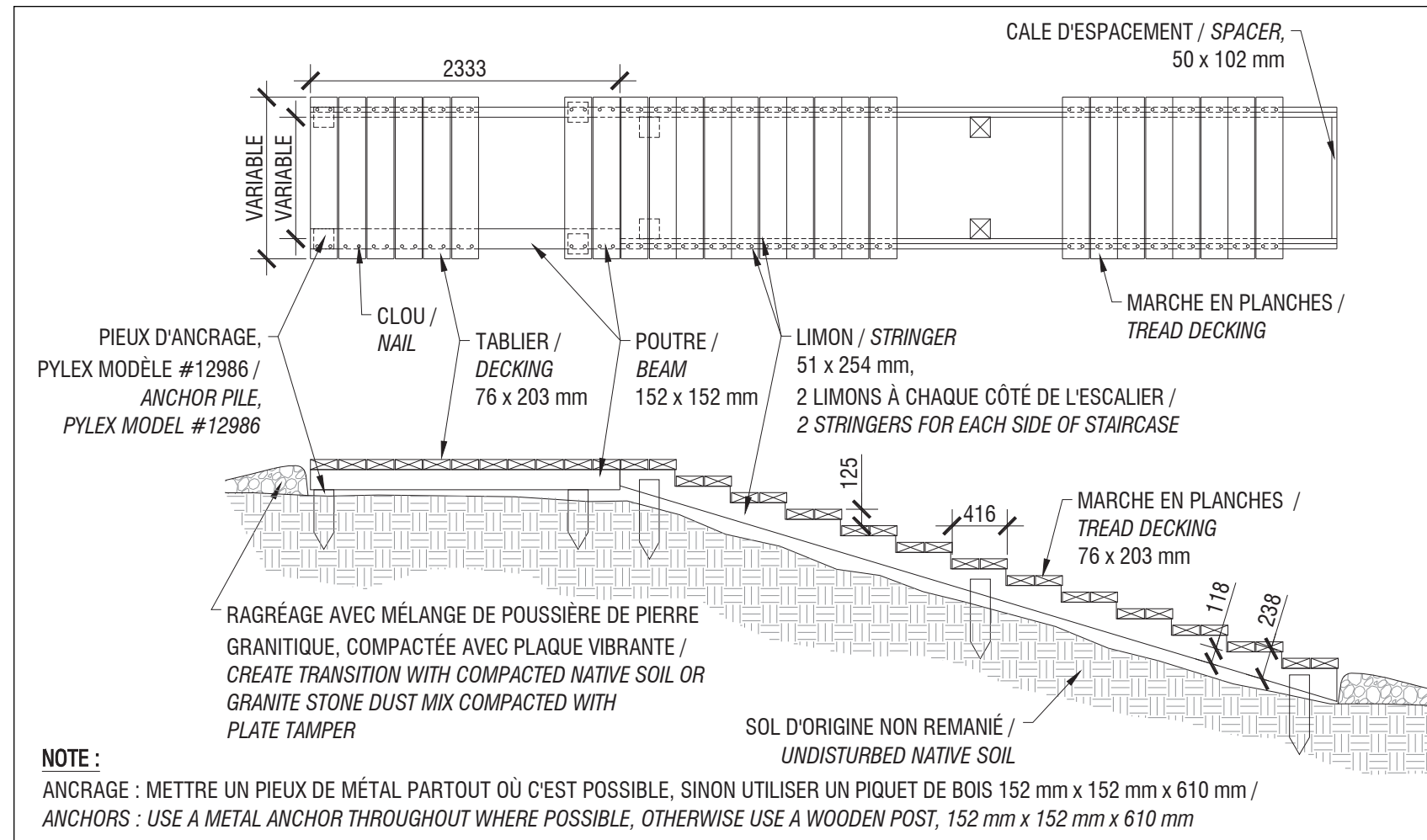
- D-1 Remove the existing timbers and install an elevated staircase with a landing



Note: Approximate dimensions only, to be validated on-site during the work

ITEMS

- Removal of existing wood timbers (3)
- Install a staircase with a landing : 3 metres long, 1.2 metres wide



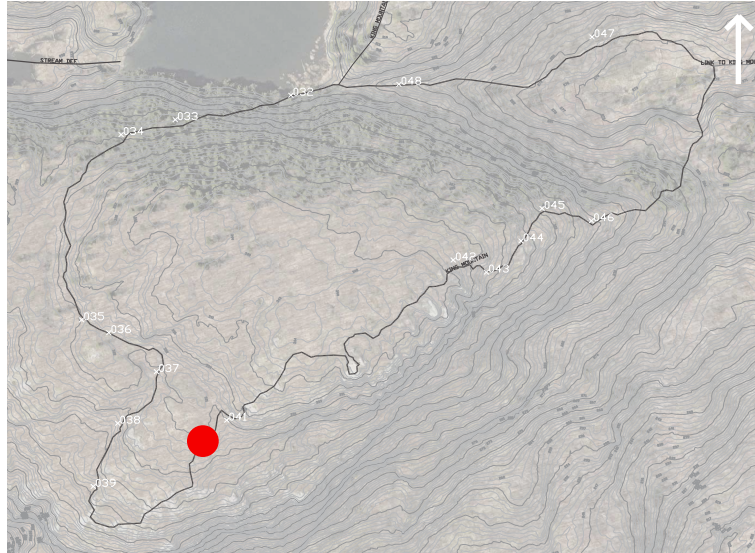
D-1. TYPICAL STAIRCASE DETAIL



## POINT 040

N 5038927.800 E 354499.420

### LOCATION



### ISSUES

- One square timber step is unstable and too high
- Indications of erosion caused by surface runoff

### RECOMMENDATIONS

- Stabilise the timbers to create steps and adjust their levels
- Fill and adjust levels to drain water more slowly

### PRIORITY LEVEL

High

### EXISTING SITUATION

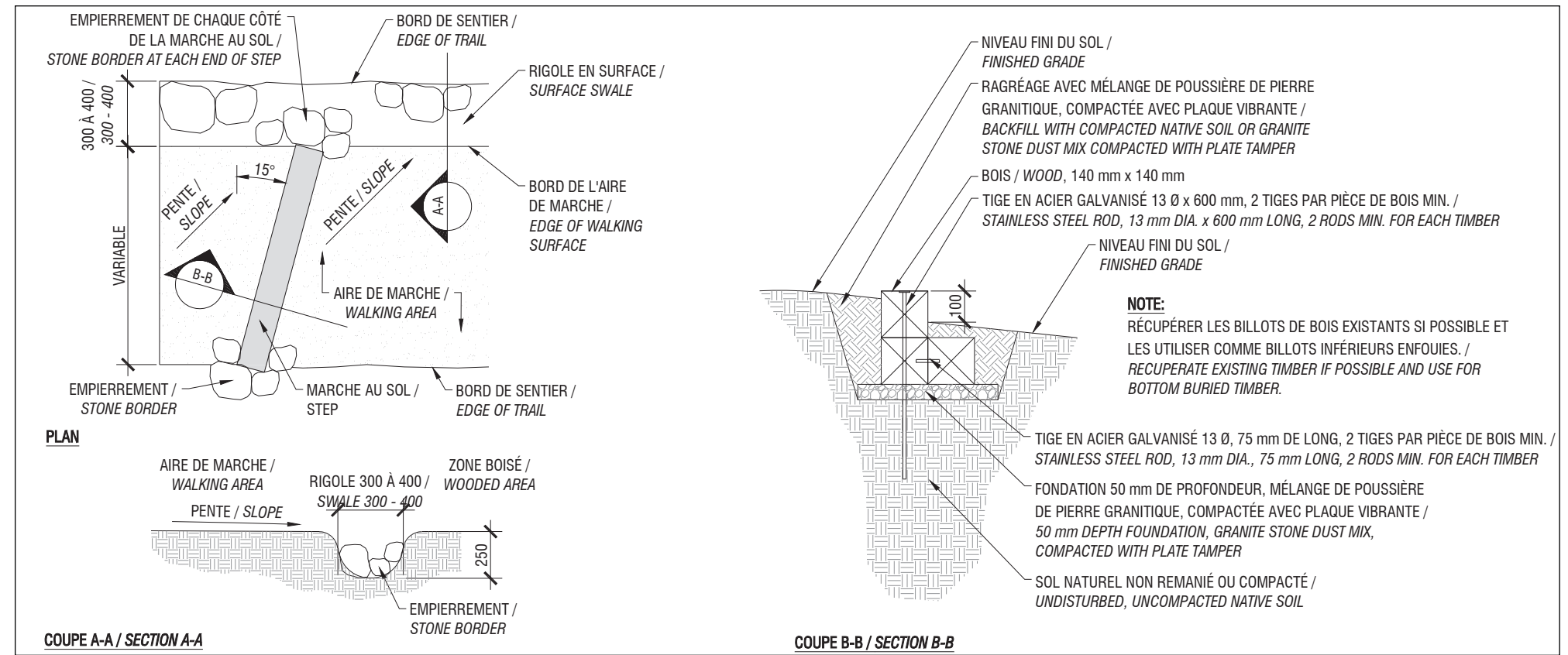


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

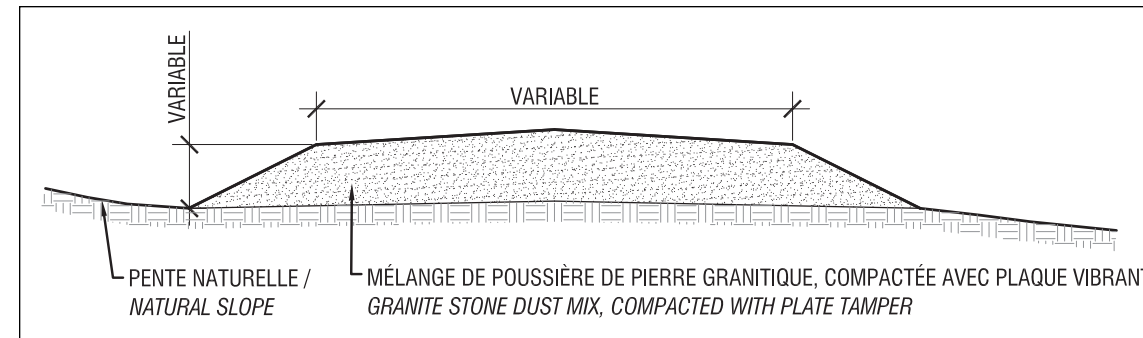
- C-1 Fill the trail with granite stone dust mix, 0-19 mm dia, compacted with plate tamper
- D-2 Remove the existing timber and install a step. Recupérate the existing timber if possible, otherwise dispose off-site.



D-2. TYPICAL STEP DETAIL

ITEMS

- Removal of existing wood timber (1)
- Install one (1) step : 1.2 metres wide
- Fill with granite stone dust mix over a surface of 2.25 m<sup>2</sup> to a depth of 300 mm (1.5 m x 1.5 m x 300 mm) : volume 0.7 m<sup>3</sup>



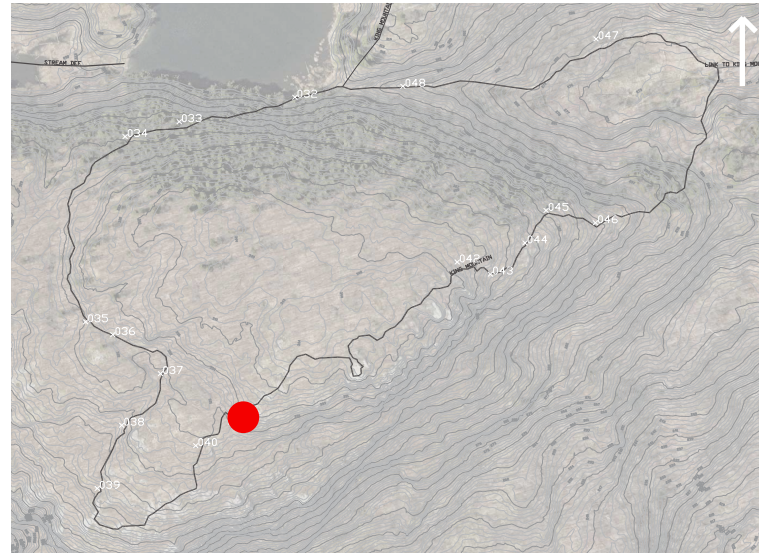
C-1. TYPICAL CROWNED TRAIL SECTION



## POINT 041

N 5038946.770 E 354526.220

### LOCATION



### ISSUES

- Three square timber steps are unstable and too high
- Indications of erosion caused by surface runoff

### RECOMMENDATIONS

- Remove 3 timbers to create a continuous elevated staircase

### PRIORITY LEVEL

Low

### EXISTING SITUATION

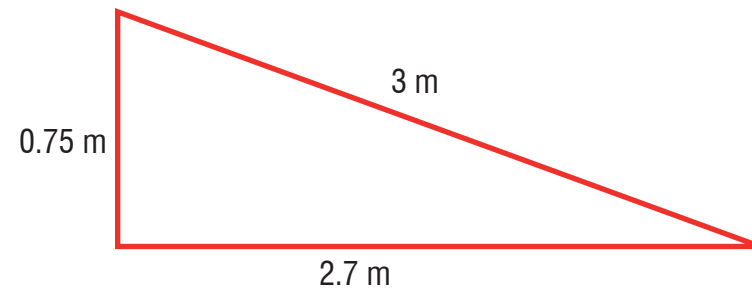


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

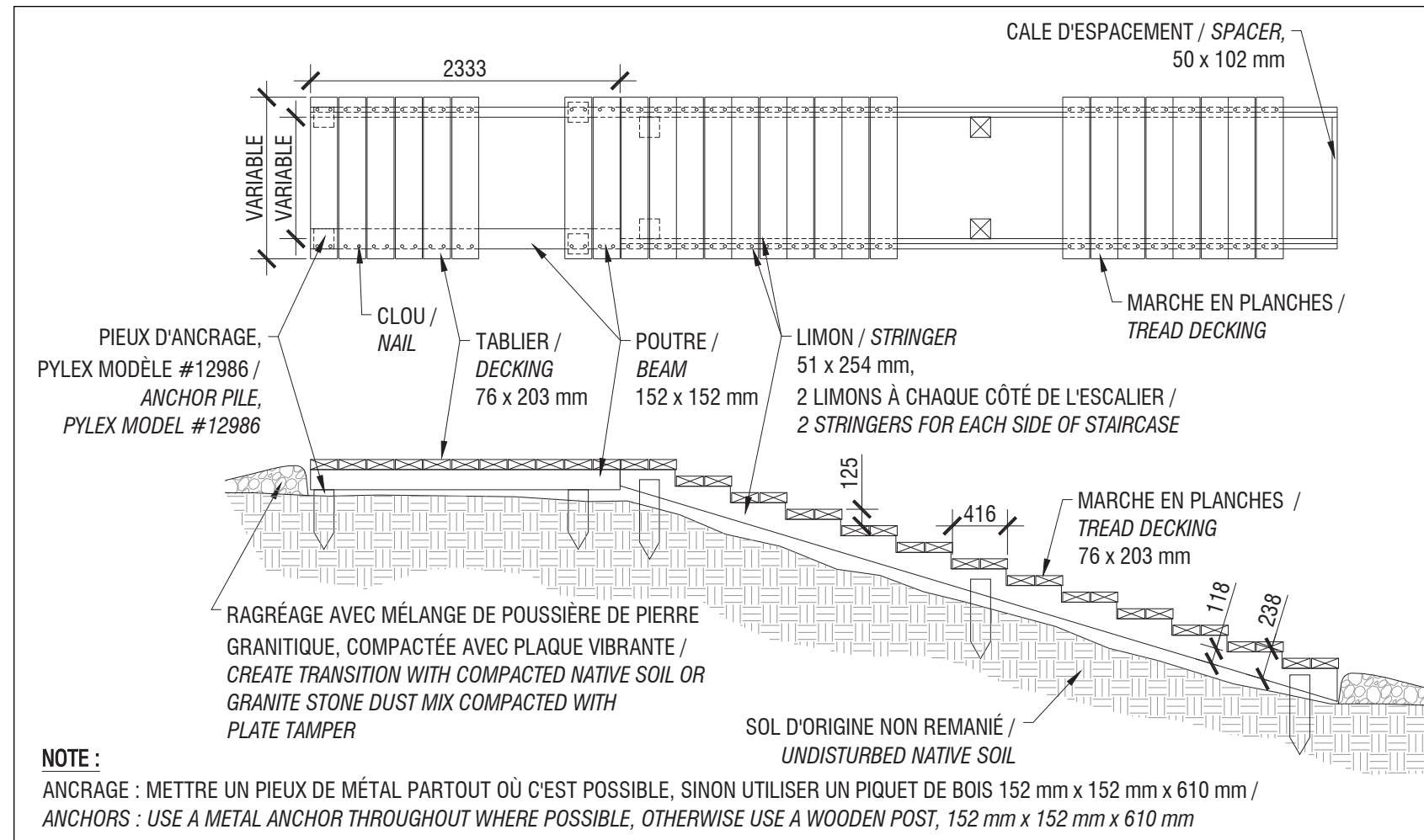
- D-1 Remove the existing timbers and install an elevated staircase with a landing



Note: Approximate dimensions only, to be validated on-site during the work

ITEMS

- Removal of existing wood timbers (3)
- Install an elevated staircase :  
3 metres long, 1.5 metres wide



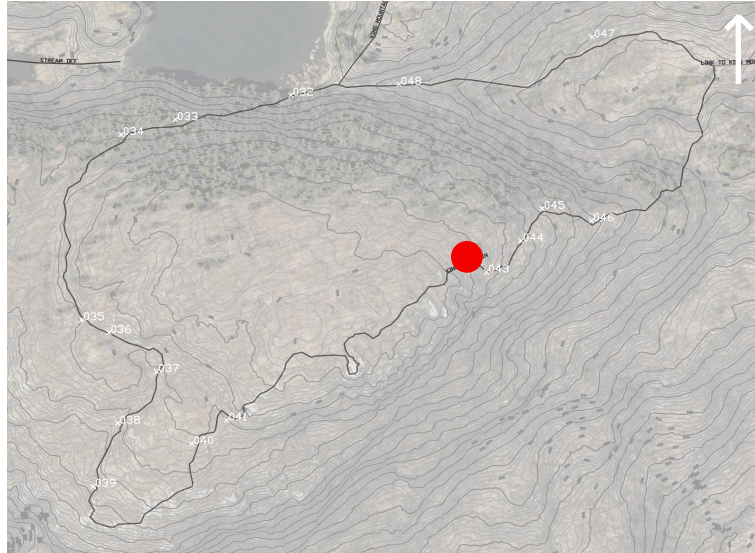
D-1. TYPICAL STAIRCASE DETAIL



## POINT 042

N 5039076.220 E 354699.600

### LOCATION



### ISSUES

- Two square timber steps, at the bottom of the stairs, are unstable and too high
- One square timber step is unstable and too high : located after the stairs
- Indications of erosion caused by surface runoff

### PRIORITY LEVEL

High

### RECOMMENDATIONS

- Remove the 2 steps to create a continuous elevated staircase
- Stabilise the timbers to create steps and adjust their levels
- Lengthen the existing staircase to protect the path

### EXISTING SITUATION



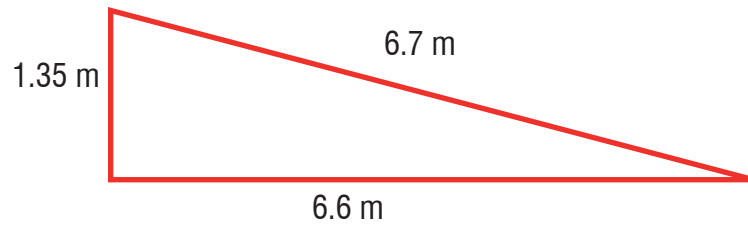
### PROPOSED SITUATION





PROPOSED INTERVENTIONS

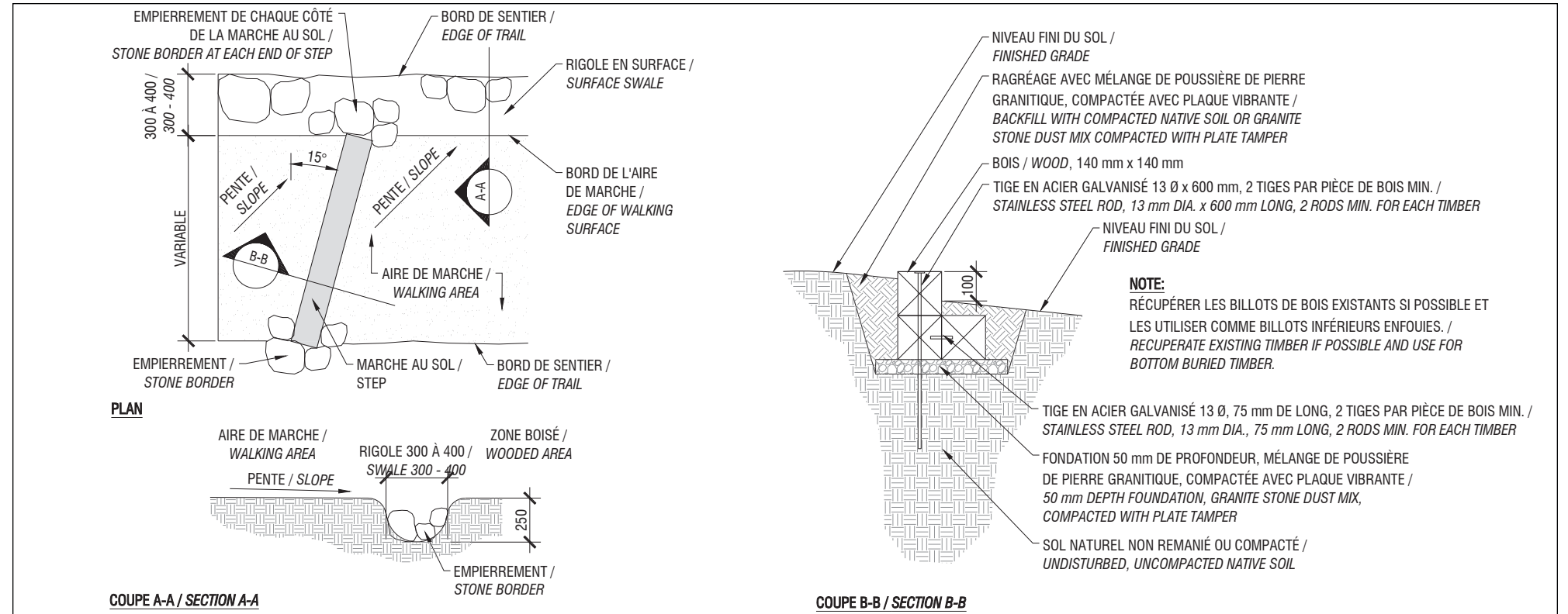
- D-1 Remove the existing timbers and install an elevated staircase (allow for approximately 2 landings)
- D-2 Remove the existing timber and install a step. Recupérate the existing timber if possible, otherwise dispose off-site.



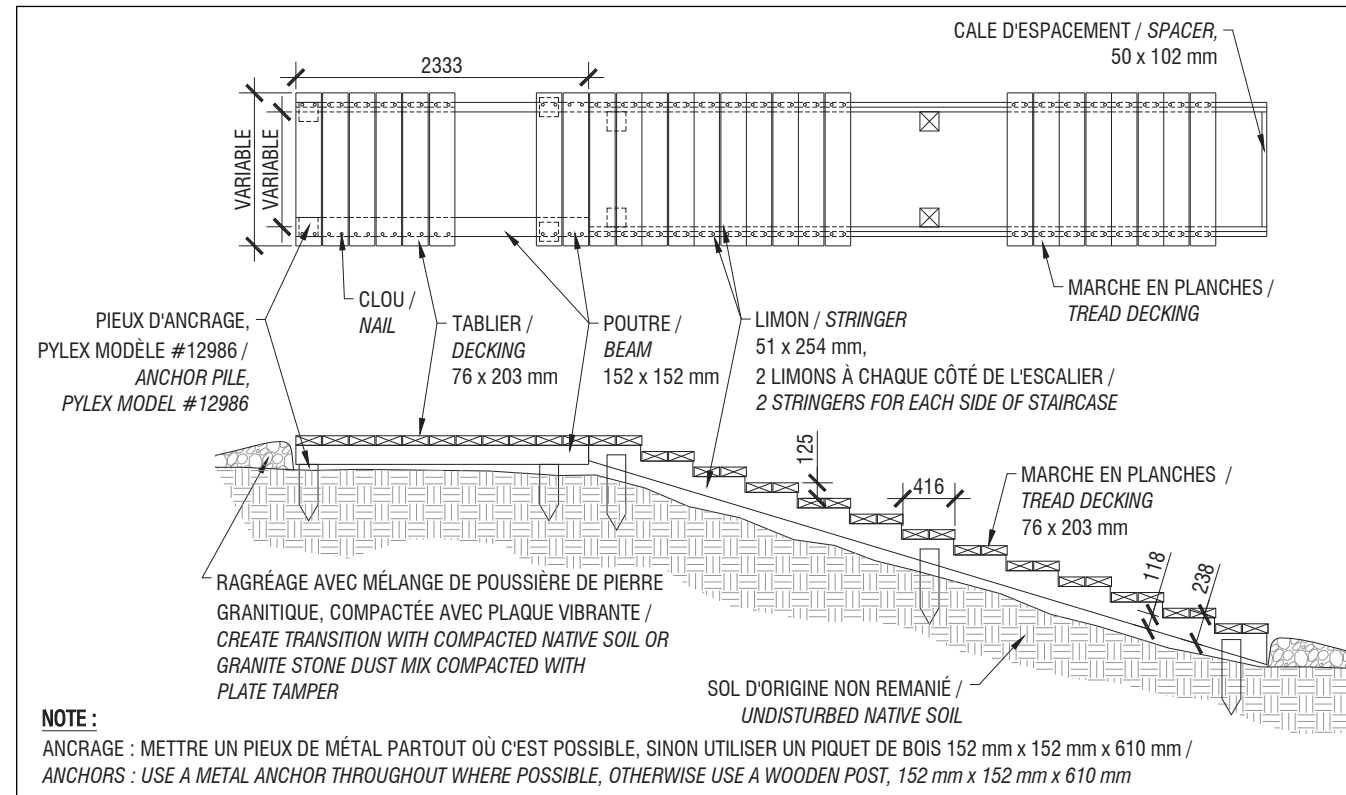
Note : Approximate dimensions only, to be validated on-site during the work

ITEMS

- Removal of existing wood timbers (3)
- Install one (1) step : 1.5 metres wide
- Install an elevated staircase : 6.7 metres long, 1.5 metres wide



D-2. TYPICAL STEP DETAIL



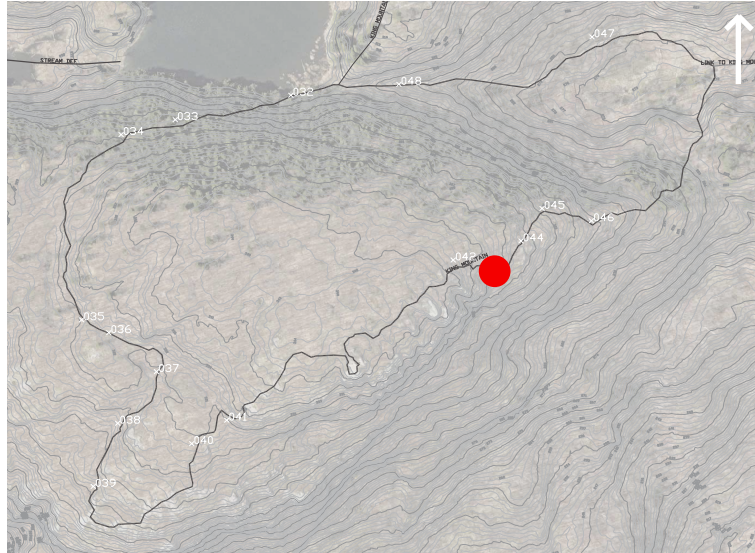
D-1. TYPICAL STAIRCASE DETAIL



## POINT 043

N 5039066.430 E 354725.000

### LOCATION



### ISSUES

- Two square timber steps, at the center of the trail, are unstable and unnecessary
- Indications of erosion caused by surface runoff

### RECOMMENDATIONS

- Remove the 2 timbers, leveling the trail and placing the existing stones to create a safe route of passage
- Install the timbers to create steps and adjust their levels

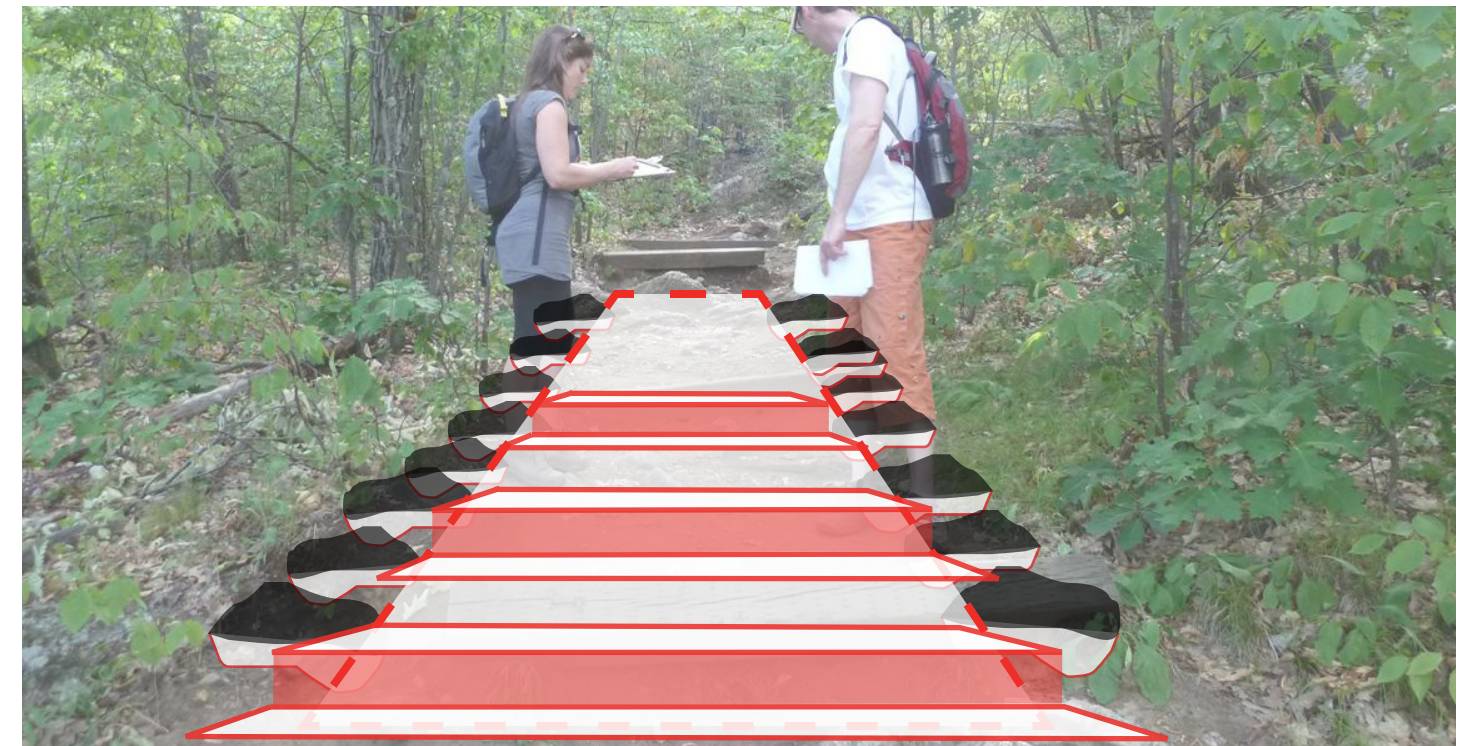
### PRIORITY LEVEL

High

### EXISTING SITUATION

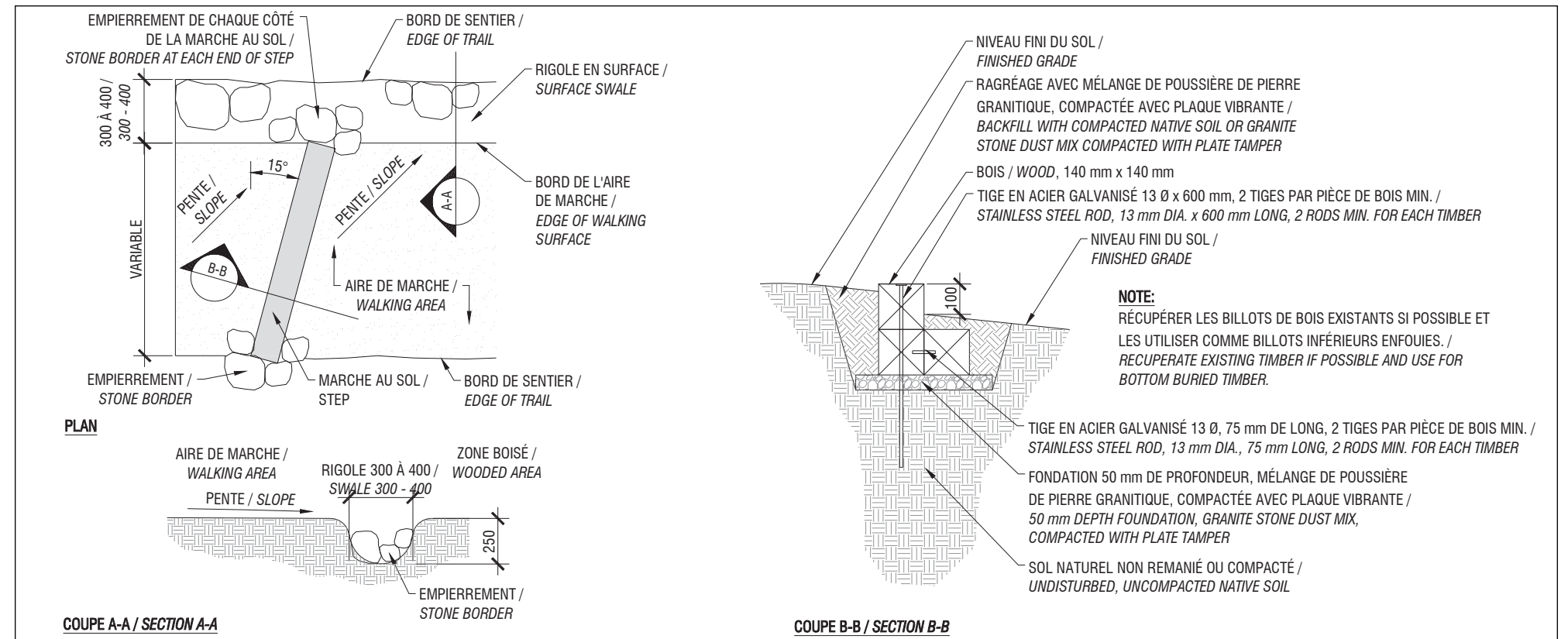


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

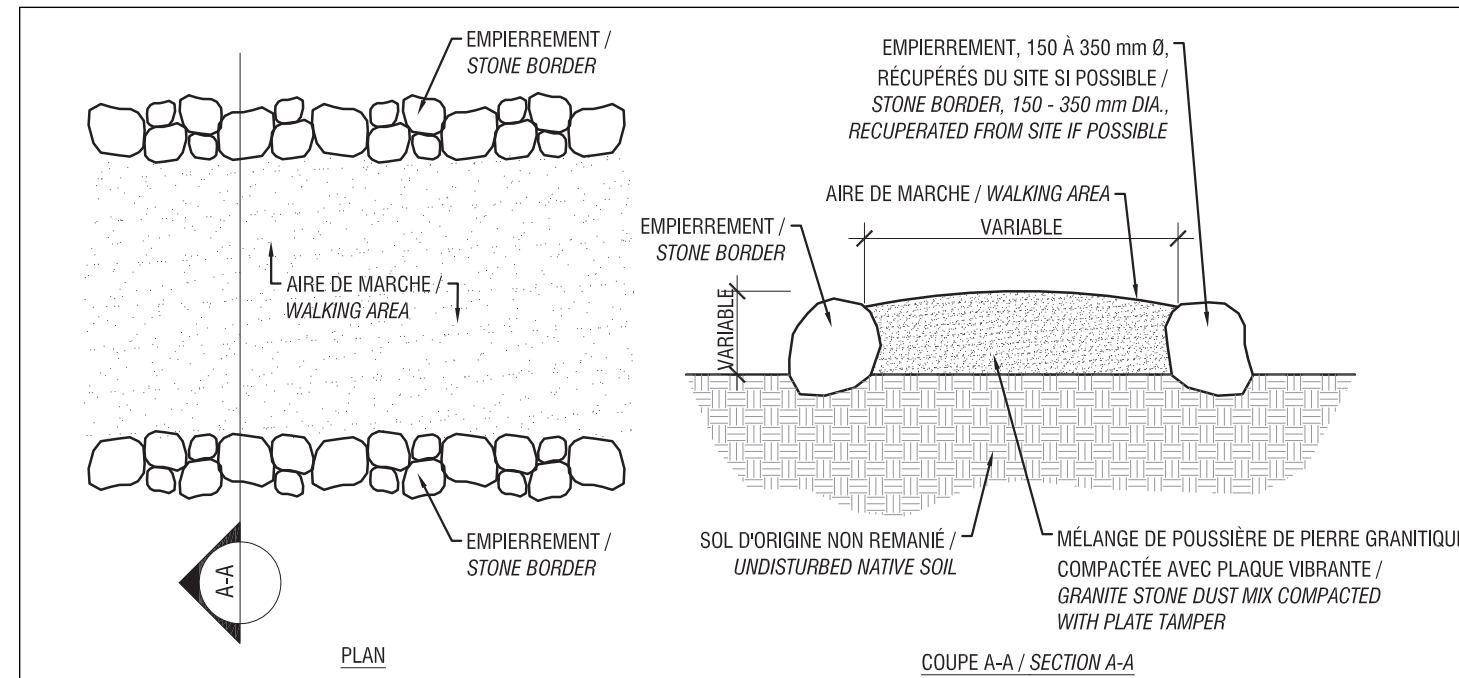
- **C-1** Fill the central portion of the trail, raising the area with granite stone dust mix, 0-19 mm dia., compacted with plate tamper. Align the natural stones to delineate the edges of the path to take.
- **D-2** Remove existing timbers and install the steps. Recupérate the existing timbers if possible, otherwise dispose off-site.



D-2. TYPICAL STEP DETAIL

ITEMS

- Removal of existing wood timbers (2)
- Install three (3) steps : 1.75 metres wide
- Fill with granite stone dust mix over a surface of 12.25 m<sup>2</sup> to a depth of 300 mm (7 m x 1.75 m x 300 mm) : volume 3.7 m<sup>3</sup>



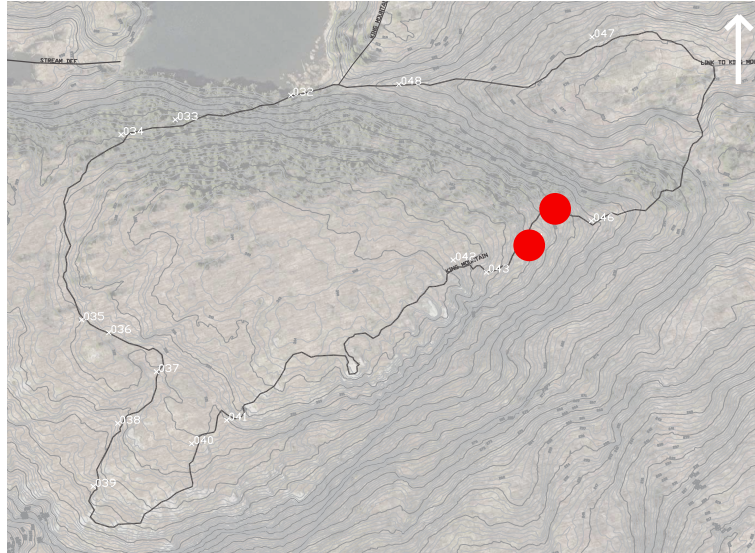
C-1. TYPICAL RAISED TRAIL DETAIL

## POINT 044 à 045

N 5039091.640 E 354751.480

N 5039117.910 E 354767.610

### LOCATION



### ISSUES

- About 12 square timber steps, in the center of the trail, are unstable
- Indications of erosion caused by surface runoff

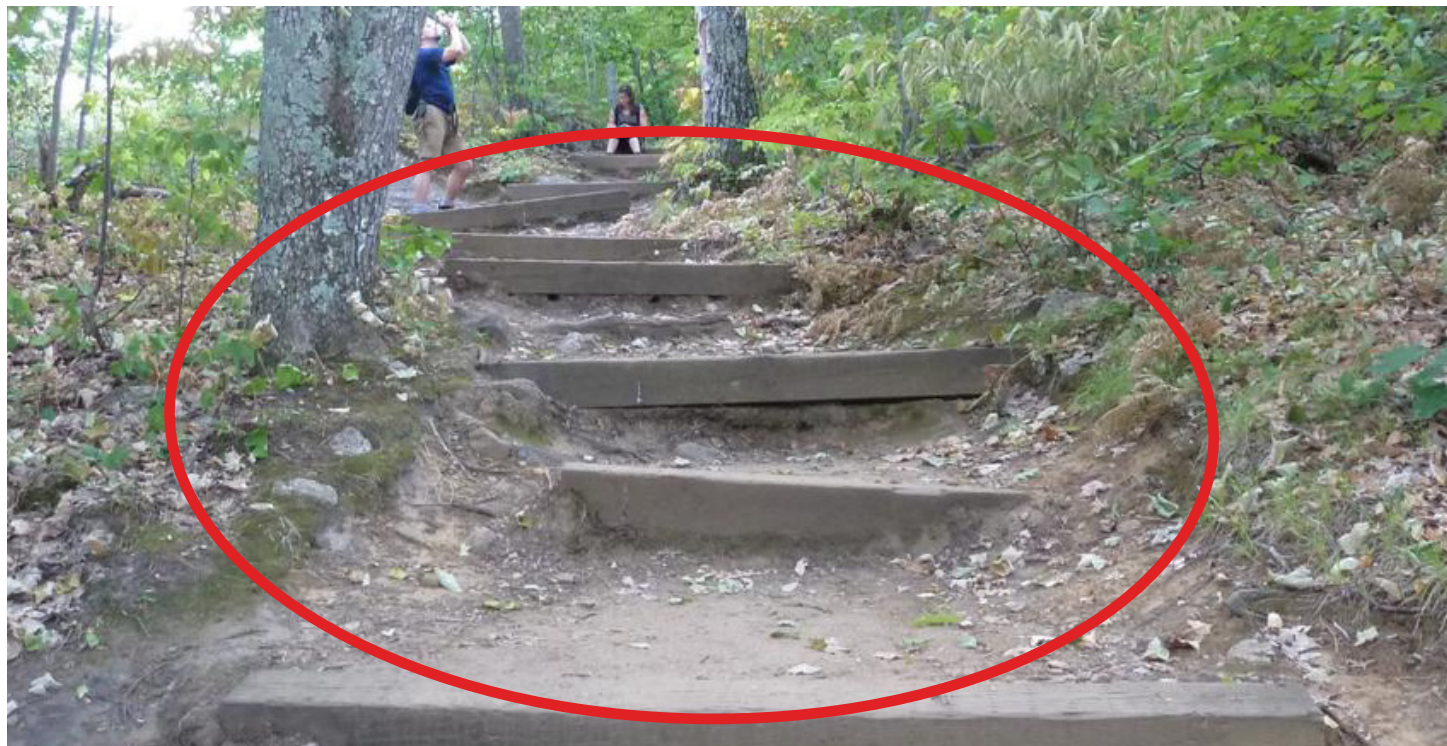
### RECOMMENDATIONS

- Remove the timbers to create a continuous elevated staircase
- Recuperate the square timbers for use in other interventions

### PRIORITY LEVEL

High

### EXISTING SITUATION

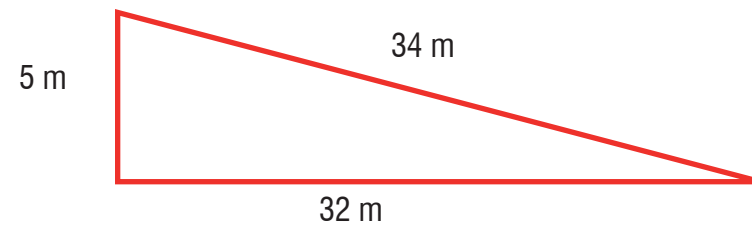


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

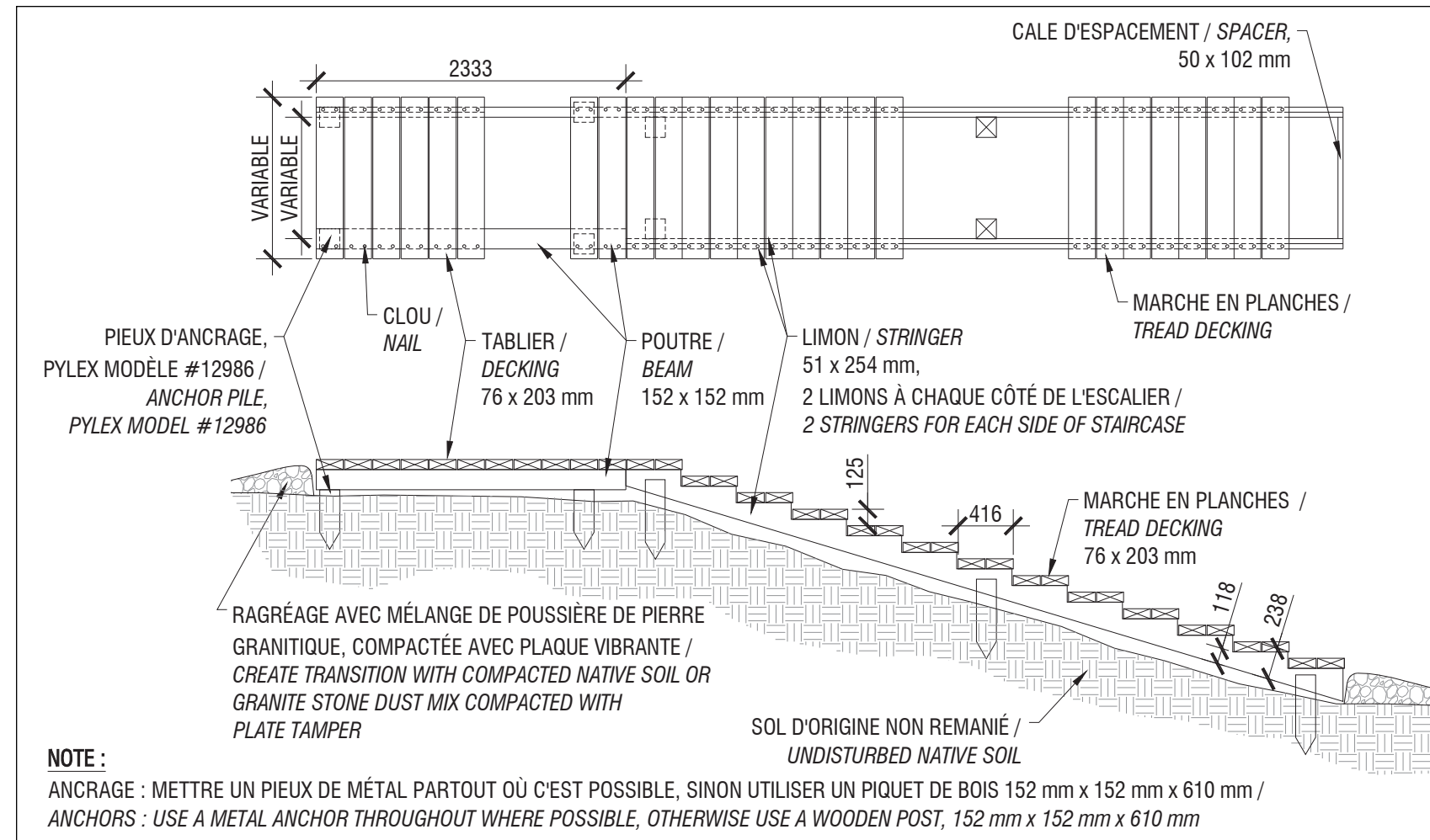
- D-1 Remove the existing timbers and install an elevated staircase (allow for approximately 8 landings, 1.5 metres long)



Note : Approximate dimensions only, to be validated on-site during the work

ITEMS

- Removal of existing wood timbers (about 12)
- Install an elevated staircase : 34 metres long, 1.5 metres wide
- Adjustment of soil grades



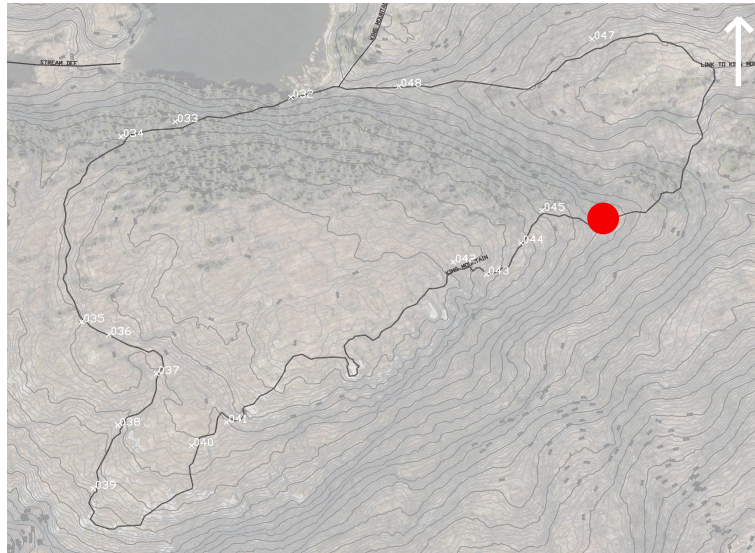
D-1. TYPICAL STAIRCASE DETAIL



## POINT 046

N 5039107.930 E 354805.390

### LOCATION



### ISSUES

- Visible geotextile caused by : steep slope and the gravel mix is washing off the surface
- The staircase of this portion does not have a handrail and is steep

### RECOMMENDATIONS

- Keep the path safe by cutting the excess geotextile and levelling the trail as needed
- Install a handrail for the portion of the existing staircase

### PRIORITY LEVEL

High

### EXISTING SITUATION

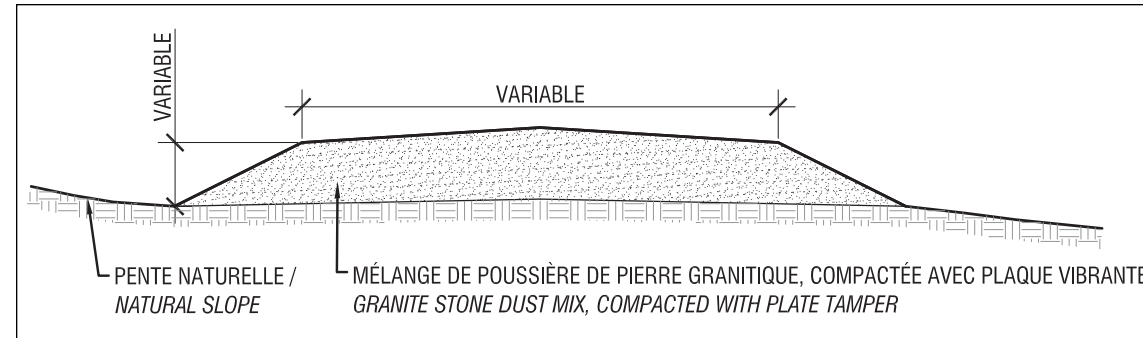


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

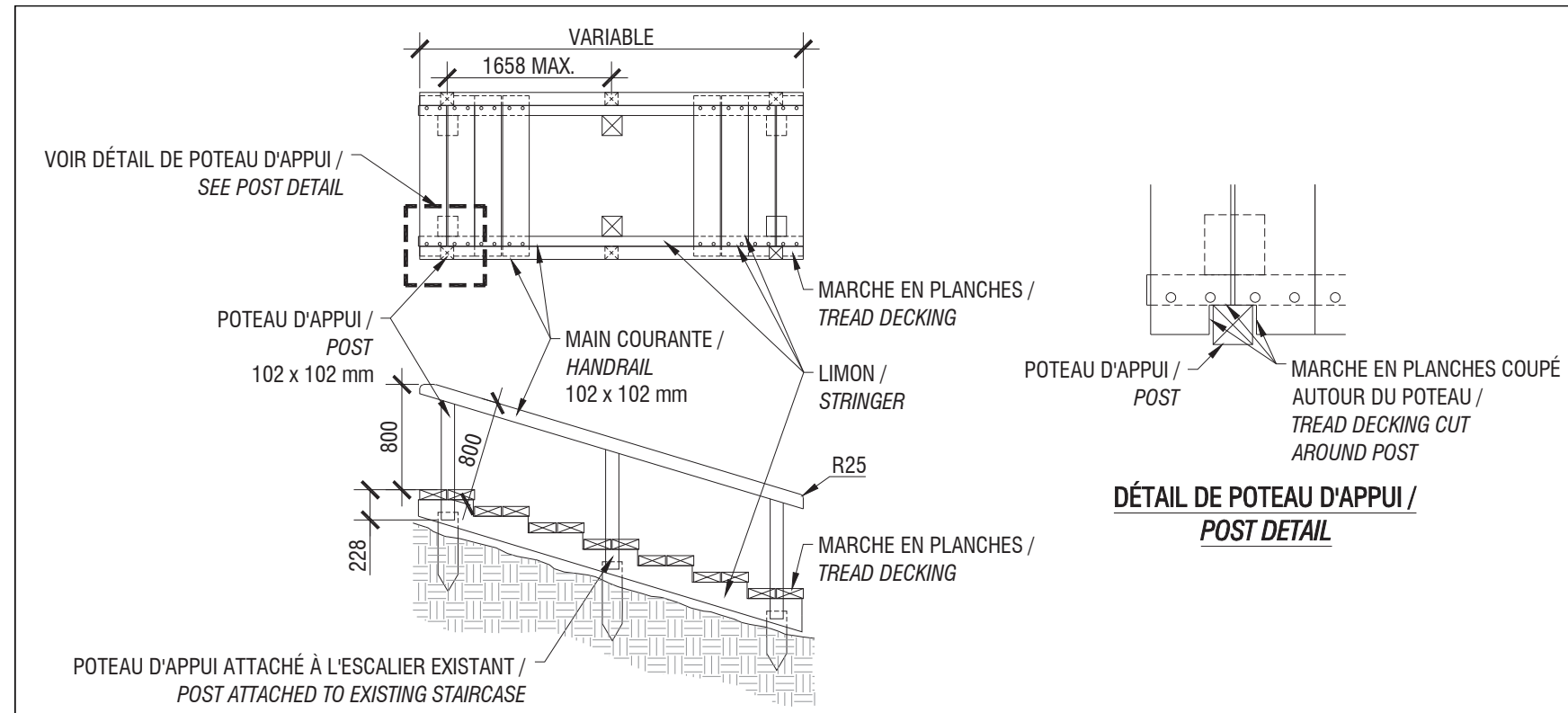
- **C-1** Remove the geotextile and level the material on-site. As needed, fill with granite stone dust mix, 0-19 mm dia., compacted with plate tamper.
- **D-3** Install handrail for existing staircase



C-1. TYPICAL CROWNED TRAIL SECTION

ITEMS

- Removal of geotextile
- Fill with granite stone dust mix over a surface of 2 m<sup>2</sup> to a depth of 200 mm (2 m x 1 m x 100 mm) : volume 0.2 m<sup>3</sup>
- Install a handrail according to the length evaluated on-site



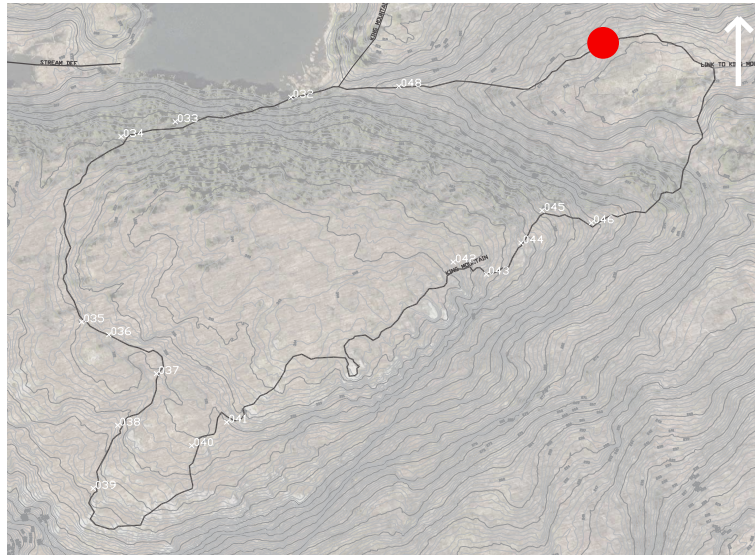
D-3. HANDRAIL DETAIL



## POINT 047

N 5039256.580 E 354805.830

### LOCATION



### ISSUES

- A square timber on the boardwalk is too high

### RECOMMENDATIONS

- Replace the timber to create safe passage

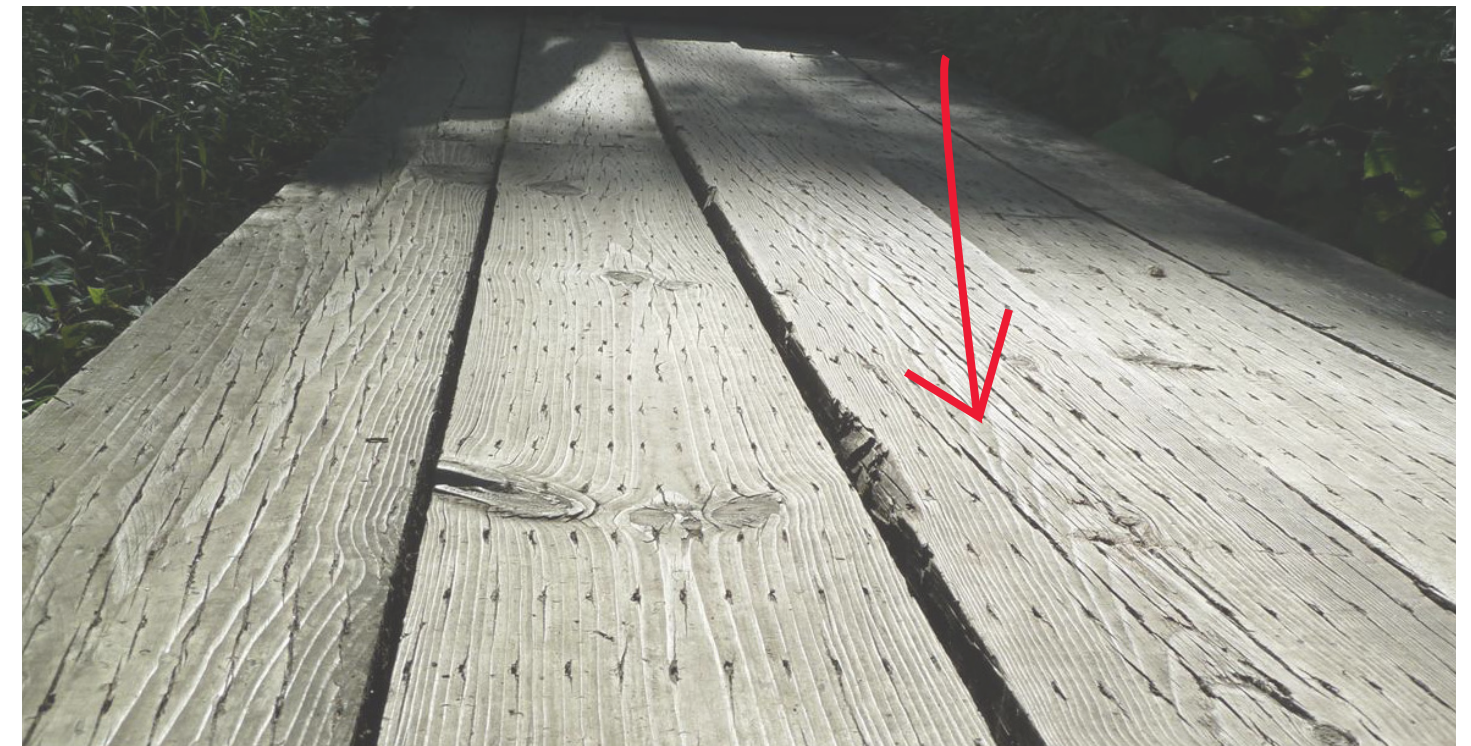
### PRIORITY LEVEL

Medium

### EXISTING SITUATION



### PROPOSED SITUATION





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POINT 047 N 5039256.580 E 354805.830

PROPOSED INTERVENTIONS

- Adjust the elevated timber on the existing boardwalk as shown in the previous picture

ITEM

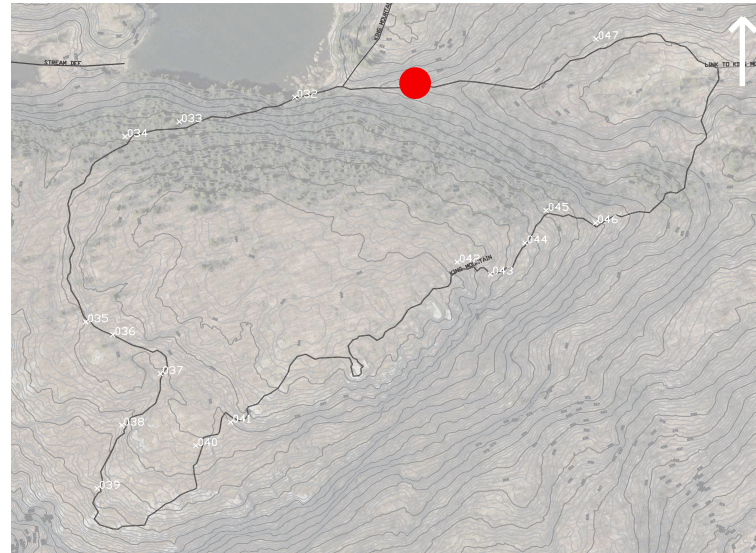
- Adjustment of the boardwalk board



## POINT 048

N 5039218.234 E 354658.005

### LOCATION



### ISSUES

- Long trail with steep slope showing geotextile caused by the washing away of gravel

### PRIORITY LEVEL

Medium

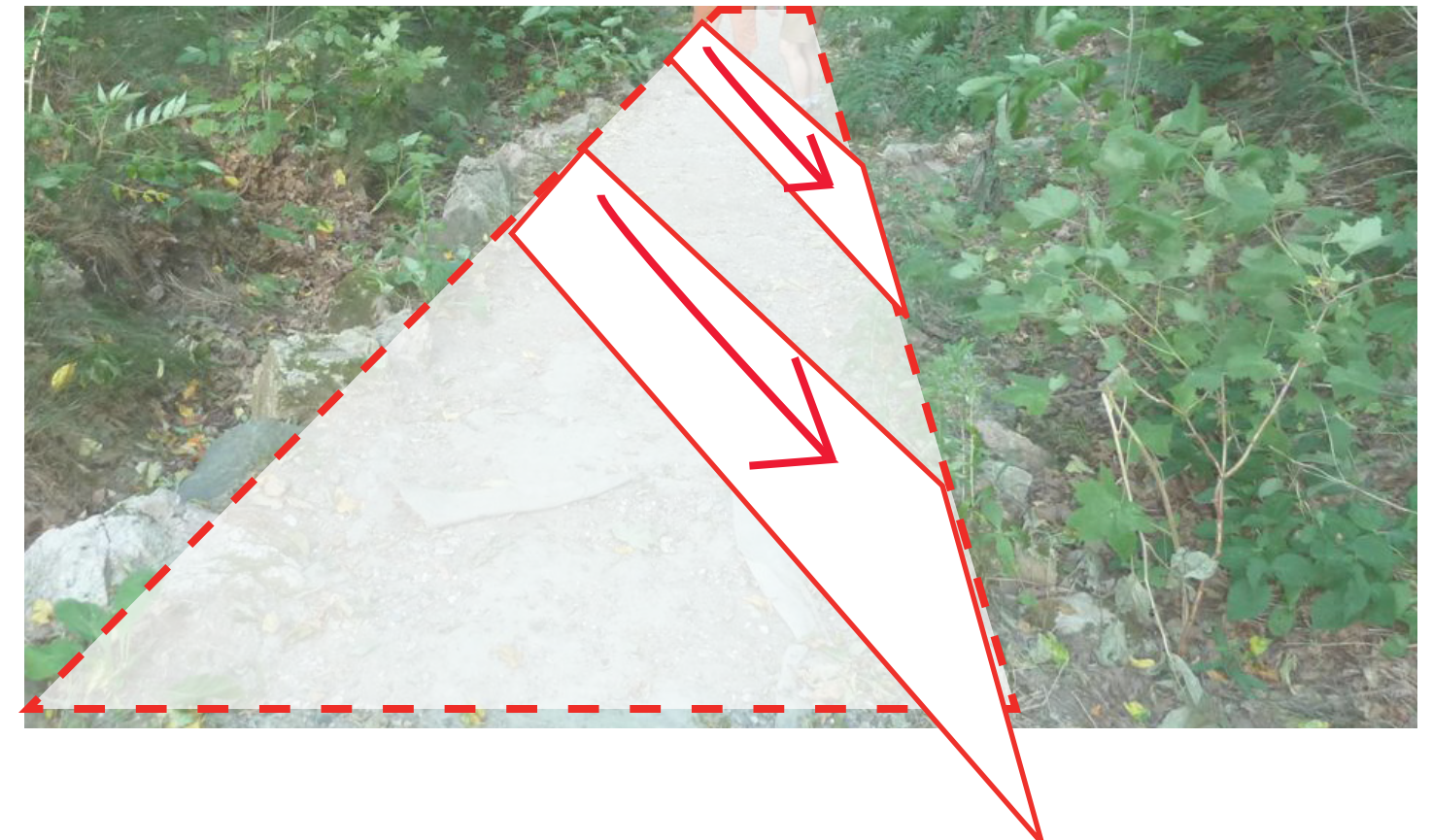
### RECOMMENDATIONS

- Remove the geotextile and realign the water drainage
- Intervene at the source and direct the water to the lowest grade point, preventing it from running along the length of the path
- Focus interventions on three zones of the trail to optimize water captation

### EXISTING SITUATION

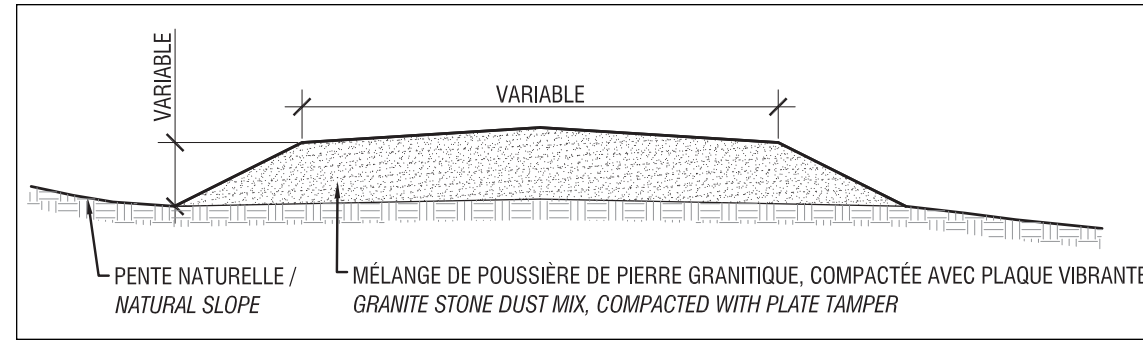


### PROPOSED SITUATION



PROPOSED INTERVENTIONS

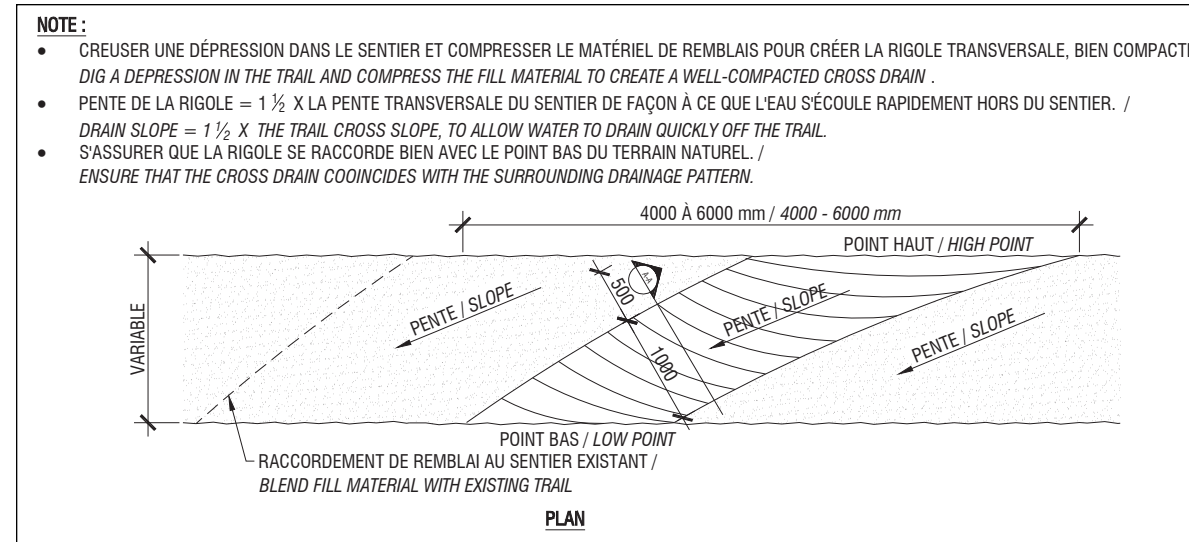
- B-1 Install cross drains along the trail (3 interventions)
- C-1 Fill the central portion of the trail with granite stone dust mix, 0-19 mm dia., compacted with plate tamper, after having removed the geotextile



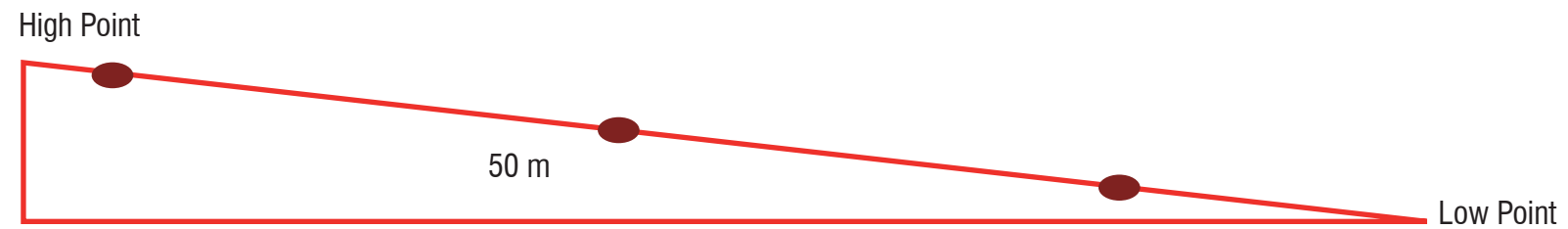
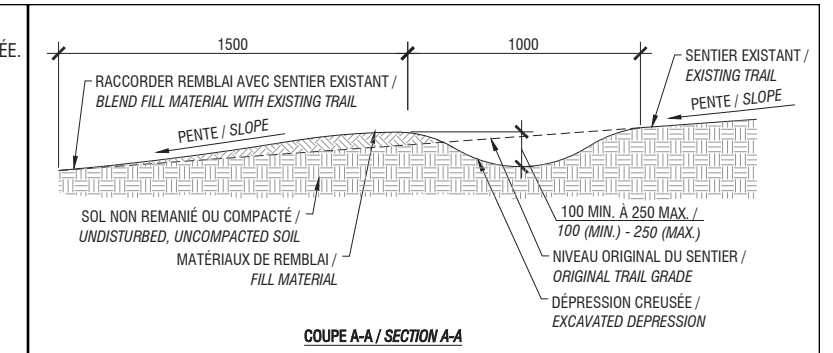
C-1. TYPICAL CROWNED TRAIL SECTION

ITEMS

- Removal of geotextile
- Cross drains (3)
- Fill with granite stone dust mix over a surface of 60 m<sup>2</sup> to an average depth of 35 mm (50 m x 1.2 m x 50 mm) : volume 3 m<sup>3</sup>



B-1. TYPICAL CROSS DRAIN DETAIL



SCHEMATIC LONGITUDINAL SECTION OF 3 TRAIL INTERVENTIONS





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## REFERENCES

*Aménagement, évaluation et entretien des sentiers pédestres au Québec – Normes et critères.* Published by Fédération québécoise de la marche, 2004

*Construction et entretien des chemins de randonnée pédestre.* Published by Office fédéral des routes (OFROU) Suisse Rando, 2009

*Guide de constructions en milieu naturel.* Published by Service de l'éducation en conservation du ministère des Forêts, Government of Québec, 1991

*Infrastructure Drawings.* Published by Ministry of Forest, Lands & Natural Resource Operations, Government of British Columbia.  
<http://www.sitesandtrailsbc.ca/about/site-and-trail-maintenance.aspx>

*Managing Mountain Biking.* Published by IMBA Canada, 2009

*Recreational Manual – Chapter 10: Recreation Trail Management.* Published by Ministry of Forest, Lands & Natural Resource Operations, Government of British Columbia.  
<http://www.sitesandtrailsbc.ca/about/infrastructure-drawings.aspx>

*US Forest Service National Trail Drawings and Specifications.* Published by US Forest Service.  
[www.fs.fed.us/ftpoot/pub/acad/dev/trails/trails.htm](http://www.fs.fed.us/ftpoot/pub/acad/dev/trails/trails.htm)

