

# Visual Landscape Assessment

Project Number: 51257-001

Revision No. 2, December 2023

## GEO: North–South Corridor (Kvesheti–Kobi) Road Project



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## Acronyms and Abbreviations

ADB	Asian Development Bank
ARP	Access Road Project
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMP	Environmental Management Plan
ESF	Environmental and Social Framework
HCRP	Historical Cultural Reference Plan
IEE	Initial Environmental Examination
KVDP	Khada Valley Development Plan
NACHP	National Association for Cultural Heritage Protection
VLA	Visual Landscape Assessment
SDA	Spoil Disposal Area
SEA	Strategic Environmental Assessment
SPS	Safeguard Policy Statement

## 1. Introduction

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### 1.1. Overview

This document provides the Visual Landscape Assessment (VLA) for the North-South Corridor (Kvesheti - Kobi) Road Project (or the “Project”).

The VLA builds upon the findings and conclusions of several existing documents, including Environmental Impact Assessment (EIA) and its associated construction management plans (2019), the Khada Valley Development Plan (KVDP) – draft Concept Master Plan (2022), the draft Khada Valley Development Plan – Strategic Environmental Assessment (2022), and the Historic Cultural Reference Plan for the Khada Valley (2023).

All these documents discuss the impact of Project on landscape and this document collates those findings to describe the landscape, how it will be affected by the Project, and the measures proposed to reduce impacts on the landscape.

The project itself expands efforts of the Asian Development Bank (ADB) and other development partners including EBRD to upgrade the country's national highway network along key economic corridors. The Project involves the construction of about 23 kilometers (km) of climate-resilient two-lane highway between Kvesheti and Kobi and about 5 km of all-weather access roads all of which have been the subject of the afore mentioned EIA. <sup>1</sup>

The Project components includes five tunnels and six bridges traversing a portion of the valley along the Aragvi river between Kvesheti and Arakveti, the Didveli Plateau (also known by various names including Kaishauri Plateau), the Khada Valley and a small portion of land in Kobi. The Project also includes a 5km connecting road on the Didveli Plateau between Zakatkari and Gudauri – referred to as the Access Road Project (ARP).

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<sup>1</sup> An Initial Environmental Examination (IEE) has also been prepared for the access road between Zakatkari Interchange and Gudauri).

Figure 1: Project Overview - Kvesheti – Kobi Sections

The length of the new road is 22.7 km and is divided into two construction packages, or 'Lots' as follows:

**Lot 1:** Tskere – Kobi portion of the Project, KM 12.7 – KM 22.7 (total 10 km) including a 9.06km long 2 lane main tunnel and emergency tunnel parallel to the main tunnel.

**Lot 2:** Kvesheti – Tskere portion of the Project, KM 0.0 – KM 12.7 (total 12.7 km) including a total of 2.5 km of tunnels, 1.5 km of bridges, five grade junctions and 3 service roads.

Each Lot is constructed by a separate Contractor.



Figure 2: Project Overview - Access Road

The ARP comprises a short section of new road, approximately 5 km in length, connecting the KK Project road at Zakatkari interchange with an existing road just south of Gudauri. The road will comprise two lanes, 3.5m in width with a design speed of 60 km per hour.

The road is intended to serve as a link between the new KK Project road and the existing road to Gudauri from Tbilisi, thereby avoiding a dangerous set of hairpin turns which currently provide access to Gudauri immediately after Arakhveti, adjacent to the Aragvi river.

Road to be constructed by Lot 2 Contractor



## 1.2. Need and Objectives

On landscape impacts, the Project EIA noted that the new alignment would change the landscape though the use of tunnels and cut and cover technique in some sections would limit the visual impacts. The Project EIA provides for landscape impacts to be mitigated through Recultivation/Land Restoration Plans and a Spoil Disposal Plan. However, it is recognized that the Project environmental management plan (EMP) could have provided better guidance for contractors. The Project EMP also incorporates additional provisions to address contractor actions on visual dimensions of landscape change but there are no other provisions in the EIA or EMP for monitoring of landscape restoration measures or for a more comprehensive landscape management plan.

Given the above, this VLA has been prepared to describe the landscape in details, identifying key viewpoints within the Project area and to propose measures to reduce the visual impact of the project, including those resulting from project aspects, such as spoil disposal areas.

## 1.3. Assessment Structure

The remaining portions of this assessment are structured as follows:

- Section 2: Legal Context – provides an overview of legal aspects.
- Section 3: Affected Areas – identifies the key areas of the Project which may be affected.
- Section 4: Landscape Management – Provides overview of design phase measures and proposes measures in terms of landscaping and site restoration / reinstatement.
- Section 5: Conclusions and Recommendations – summarizes the key points of the document and provides a set of recommendations to implement the landscape management discussed in Section 4.

## 2. Legal Context

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ADB's SPS (2009) discusses landscape only briefly and specifically in reference to cultural heritage where physical cultural resources are defined as "movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be located in urban or rural settings and may be above or below ground or under water. Their cultural interest may be at the local, provincial, national, or international level." There are no other discussions in the policy statement directly regarding visual/aesthetic impacts.

The European Bank for Reconstruction and Development (EBRD) Environmental Policy (2019) is also light on landscape considerations only mentioning in two places that "*The assessment (environmental and social) process will include consideration of potential landscape level impacts*". The European Landscape Convention (ELC) was adopted by the Committee of Ministers of the Council of Europe on 19 July 2000 in Strasbourg and opened for signature by the member States of the Organisation in Florence (Italy) on 20 October 2000, with the aim of promoting European landscape protection, management and planning and to organize international co-operation. It is the first international treaty to be exclusively devoted to all dimensions of the landscape. The Convention applies to the entire territory of the Parties and covers natural, rural, urban, and peri-urban areas. It concerns landscapes that might be considered outstanding, as well as every day or degraded landscapes. To date, 39 Council of Europe member States have ratified the Convention including Georgia.

The general purpose of the convention is to encourage public authorities to adopt policies and measures at local, regional, national, and international level for protecting, managing and planning landscapes throughout Europe so as to maintain and improve landscape quality and bring the public, institutions and local and regional authorities to recognize the value and importance of landscape and to take part in related public decisions.

The Council of Europe convention covers all landscapes, even those that are not of outstanding universal value, but does not deal with historic monuments. Its main objective is not to draw up a list of assets of exceptional universal value, but to introduce protection, management and planning rules for all landscape based on a set of principles.

Articles 5 and 6 commit signatory states to several actions which are designed to help ensure compliance with the overarching aims of the ELC. These include the need to recognize landscapes in law, to establish policies aimed at landscape planning, protection and management and the integration of landscape into other policy areas.

The convention leaves Parties the choice of means to be used within their internal legal arrangements to fulfil their obligations.

### 3. Affected Areas

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#### 3.1. General

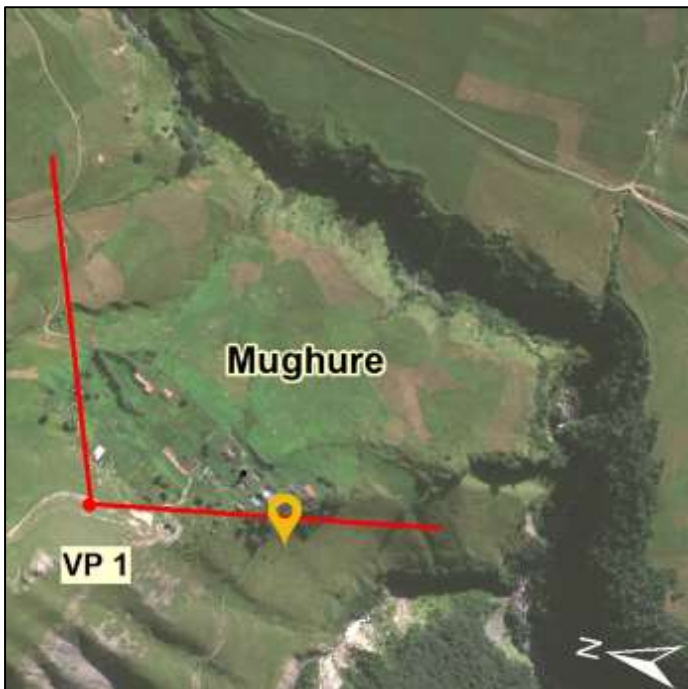
This section of the report includes a description of the ‘affected areas’. This comprises two parts, firstly affected viewpoints, selected for their aesthetic value, and secondly specific project physical elements (e.g., spoil disposal areas) which will have a direct impact on landscape value.

#### 3.2. Viewpoints

14 photomontage locations were selected to enable an understanding of the impact of the new highway on the landscape, with a specific focus on key historic locations within the Khada Valley. They show view as they were at the end of 2021. The photomontages include views looking towards the scheme from the historic villages of Mughure, Tskere, Benian-Begoni and Sviani-Rostiani. It also includes photomontages from key sacred buildings including the fortified churches at Khviratsknoveli (overlooking Tskere Village) and nationally significant complex at Khorogho. On addition, the effect on views from a number of historic towers towards the southern end of the scheme are provided, including on Kaishaurni plateau.

### Viewpoint (VP) #1

The village of Mugure is developed on a sloping curve, from where the various points of development of the Khadi valley are well read.



Viewpoint (VP) #2

Tskere is the last village in the valley, which can be seen freely as if surrounded by beads, the mountains surrounding them and the open spaces between them.



Viewpoint (VP) # 3

Benian-Begoni, due to its flat location, is overlooked from almost every point of the valley hence it is an important component of the landscape.



Viewpoint (VP) # 4

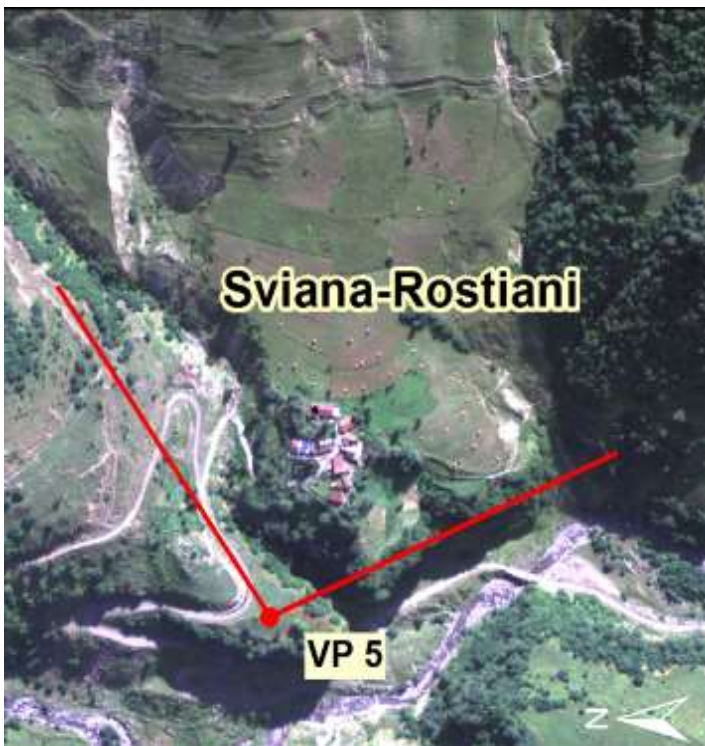
Due to its location from the natsvliant settlement, the view opens up to the complex landscape of the valley. Including the valley surrounded by mountains and the free-stretched Didveli Plateau on the right.



Viewpoint (VP) # 5

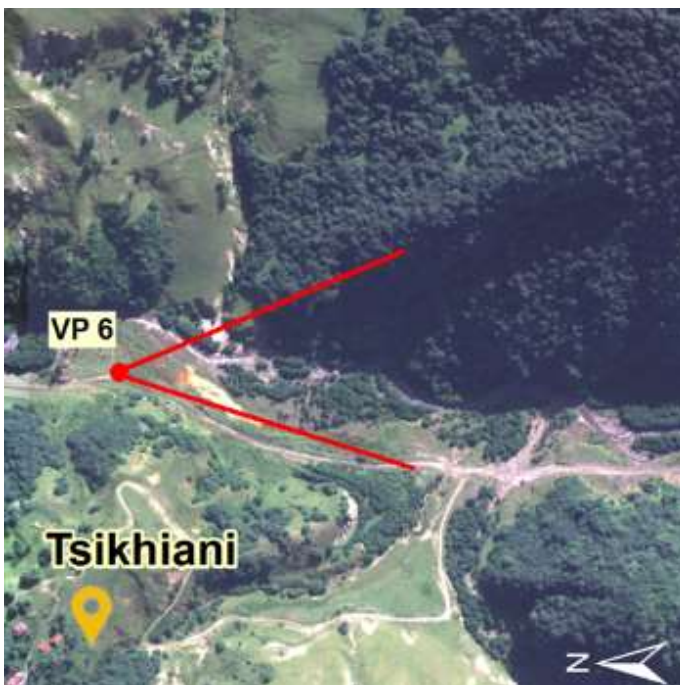
Sviana-Rostiani is a compact settlement, the value of which in addition to the urban structure, its environment is a developed landscape.

The village emerges from a number of points of view, including overlooking the road to Korogh. Due to its location, it is possible to see many clear panoramas from it.



Viewpoint (VP) # 5

From the narrow, closed space of the mineral waters, the valley can be read from a kind of geometric perspective, whose landscape is created by the dynamic silhouette of the mountains and the sky horizon.



Viewpoint (VP) # 7

Trinity Tower is a kind of crossing point from where you can see freely both Didveli Plateau and the gorge to the last village.



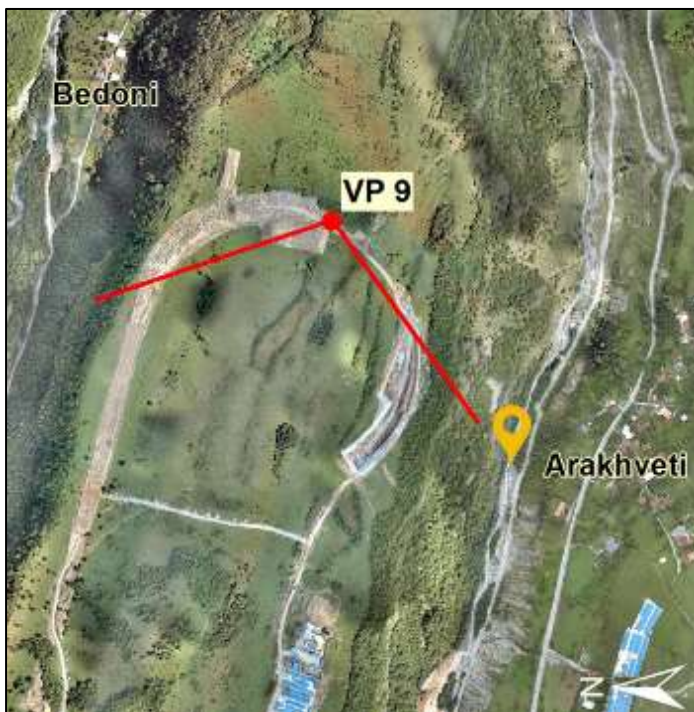
Viewpoint (VP) # 8

Landscape VP # 8 map Kobetsikhe, the same Elguja cave, is located on a rather high point in the rock, from where you can see the morphology of the Didveli plateau and the village of Zakatkari.



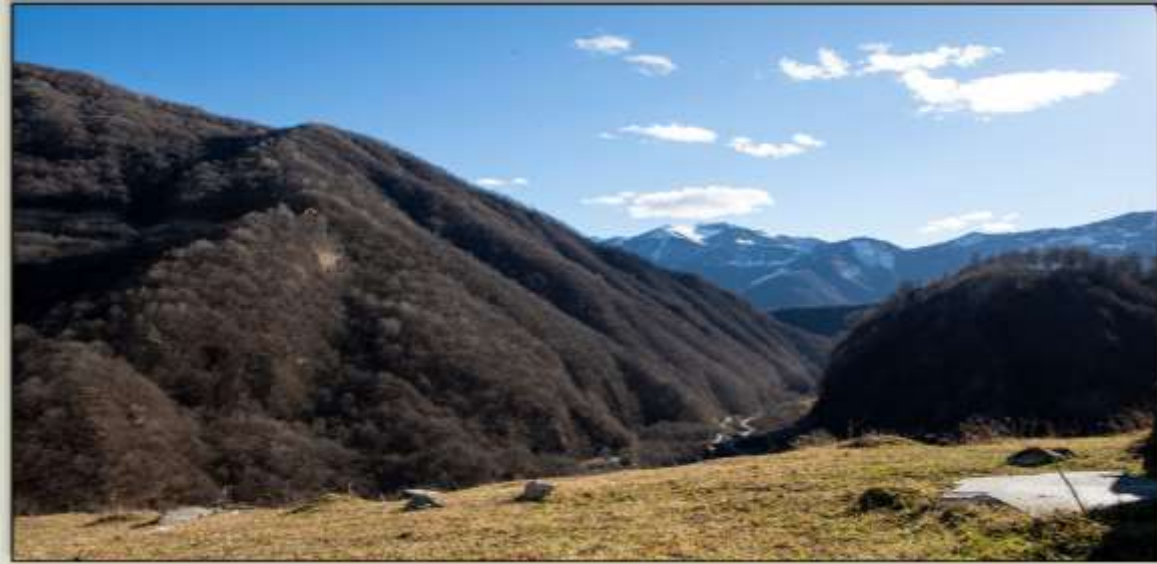
Viewpoint (VP) # 9

Kaishauri Plateau is important element of the Khada Valley landscape. The plateau can be seen from different points of view due to its location.



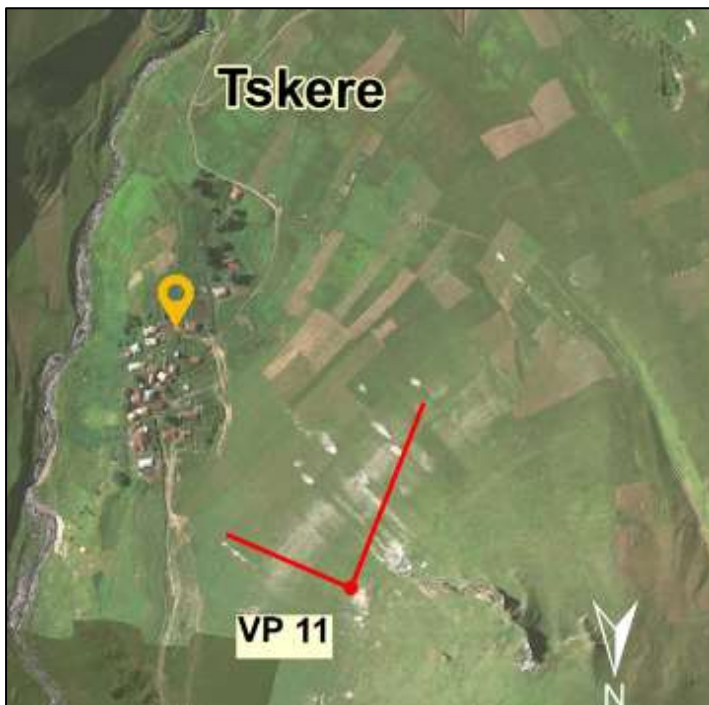
Viewpoint (VP) # 10

Tsikhiani is a village on its rather steep slope, from which the roads leading to the valley can be seen freely.



### Viewpoint (VP) # 11

The diverse landscape of the valley, the open panoramas and the villages located in it are well overlooked from the village of Tskere, which is an integral part of its landscape.



Viewpoint (VP) # 12

Khorogho is one of the highest points of the Khada Valley, therefore the landscape of the valley and its largest panorama can be freely viewed from it.



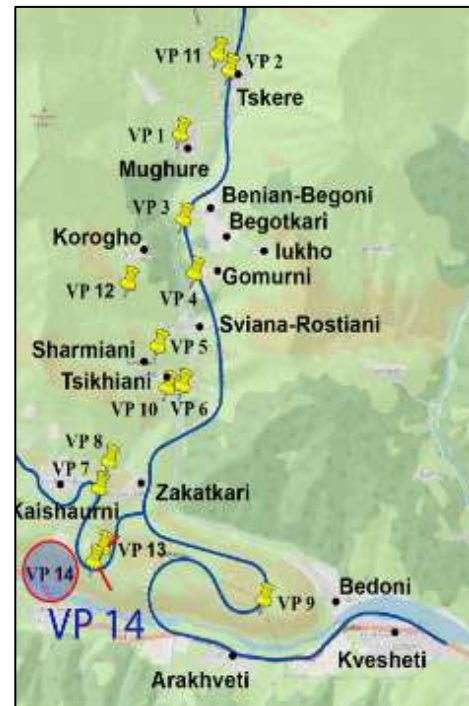
### Viewpoint (VP) # 13

Sunni Castle is a kind of crossing point, from where the view opens both in depth and in the lower plain of the valley. From here it is possible to see a single complete panorama.



Viewpoint (VP) # 14

Kaishauri Tower is located at the most important crossing point, overlooking both the Kaishauri Plateau and the depth of the valley.



### 3.3. Project Physical Elements

The Project can broadly be broken down into the following physical elements that will all be visible during the operational phase of the Project, i.e., permanent structures. The following elements are included in the Project design:

- Bridges
- Tunnels
- Road pavement (and associated cut and embankments)
- Interchanges
- Drainage structures
- Avalanche protection structures
- Tunnel operation buildings

In addition to these permanent structures, several temporary facilities are needed during the construction phase, they include:

- Construction accommodation camps
- Batching plants
- Temporary access roads & river crossings
- Other ancillary facilities, such as segment plant.

There is one additional item which is both relevant to both the construction and operational phases; spoil disposal areas (SDA). Planned SDAs is developed during construction and will remain after construction is completed. The following tables describes these items in more detail.

Table 1: Permanent Road Components

Item & Description	Illustration
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**Bridges**

The project comprises six bridges, all of which are located within Lot 2. They include:

- Bridge 1 (length 27.8m, height 14m, 2 lane)
- Bridge 2 over the Aragvi river (length 435.28m, height 62m, 3 lanes)
- Bridge 3 - Arch bridge over the River Khadistskali (length 426m, height 164m, 3 lane)
- Bridge 4 over the left tributary of River Khadistskali river (length 147.80m, height 26m, 3 lane)
- Bridge 5 (length 322m, height 55m, 3 lane)
- Bridge 6 (length 218m, height 48m, 3 lane)



Render of the view west to east across Khada Valley towards Bridge 6

Item & Description

Illustration

**Tunnels**

Five tunnels are included in the Project. Tunnels represent approximately 50% of the project alignment. Accordingly, less than 12km of the alignment will have permanent impacts on landscape.

- Tunnel 1 (length 1540.64m)
- Tunnel 2 (length 193.42m)
- Tunnel 3 (length 388.38m)
- Tunnel 4 (length 299m)
- Tunnel 5 – 9.06 km long bidirectional, 2 lane tunnel which includes:
  - Two cut and cover sections of Tunnel 5 (200m –south portal and 8m – north portal) to protect from avalanches and move entrance portal farther from Tskere.
  - 9.062 km emergency gallery parallel to Tunnel 5.



Render of the view towards Tunnel 3 northern portal from Begoni

Item & Description	Illustration
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**Road pavement (and associated cut and embankments).**

The total road length is 22.7km comprising:

- Lot 1: Tskere – Kobi: Chainage KM 12.7 – KM 22.7 (10 km)
- Lot 2: Kvesheti – Tskere: Chainage KM 0.0 – KM 12.7 (12.7 km)

The ARP includes a further 5km of 2-lane pavement.

Pavement type is concrete asphalt.

Cuts and embankments will be required along the alignment to meet the Projects technical specifications and safety requirements.

The illustration opposite shows the planned embankments and pavement on Didveli Plateau.



Render of the Didveli Plateau

Item & Description

Illustration

**Interchanges**

The project comprises several junctions, but only one major interchange on the Begoni Plateau.

The interchange provides direct access to villages in the valley, including Gomurni and Benian-Begoni.

The plan opposite shows the proposed layout of the interchange (and its proposed landscaping which is discussed in more detail in Chapter 4).



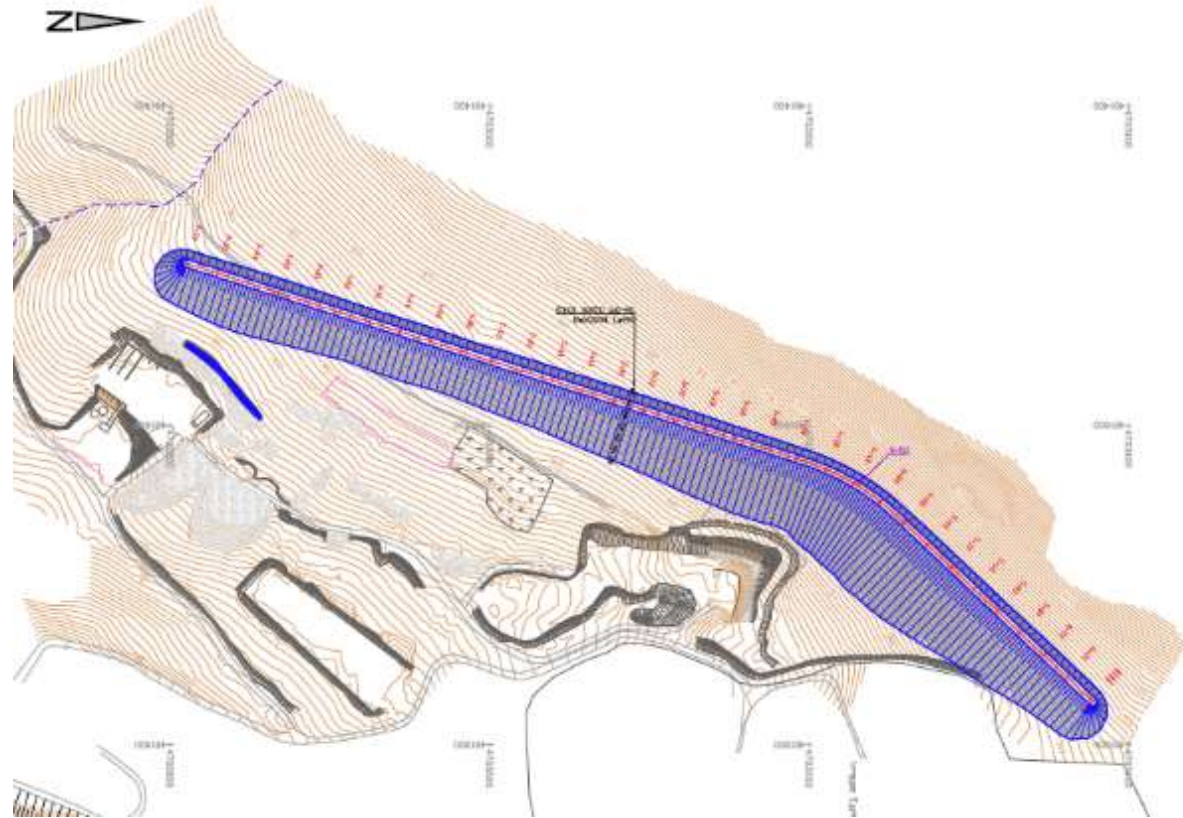
Item & Description

Illustration

**Avalanche protection structures**

These structures are necessary in two locations:

1. On the right side of the section km12+000 – km12+700 to protect exit portal of Tunnel No. 4, Bridge No.6 and local road section to village Tskere which falls under Lot 2 section of Kvesheti-Kobi Road Project.
2. On the left side of the of section km 12+800 – km 12+900 to protect exit portal of Tunnel No. 5 and adjacent to section km13+100 – 13+300 (which is tunnel section) to protect village Tskere from avalanches which falls under the Lot 1 section of Kvesheti-Kobi Road Project.



Avalanche Protection Wall 2

Item & Description

Illustration

**Tunnel Technical Buildings**

There will be technical buildings at the tunnel portals. The technical buildings will accommodate:

- Pump room with fire water tank – below ground structure entirely designed with in-situ reinforced concrete. The room accommodates fire pumps, water tank with capacity sufficient for 1 hour.
- Facilities Building – for ventilation utilities. Above ground part of the structure consists of 9m wide and 6m high section to accommodate ventilation utilities and lateral electrical building.
- It is advised by draft KVDP to change green color of Tunnel Technical Buildings to brown.



Table 2: Temporary Facilities

Item & Description Illustrations

**Construction accommodation camps**

The project comprises five accommodation camps:

- Lot 1 – Kobi camp and Tskere camp
- Lot 2 – Arakveti camp, Didveli Plateau camp and Begoni camp.

These camps, constructed from prefabricated units also include office space for contractors and engineers' staff.



Lot 1: Kobi Camp



Lot 2: Camp 1

**Batching plants**

There are five concrete batching plants.

- Lot 1: Kobi plant and Tskere plant (see photos opposite)
- Lot 2: Kvesheti plant, Begoni plant and Didveli plant

These prefabricated units will be dismantled when the project ends.



Lot 1: Kobi batching plant



Lot 1: Tskere Batching Plant

**Temporary access roads & river crossings**

Numerous access roads and several bridge crossings are required. Some of these temporary structures may be retained, at the request of the local community.



Lot 2 Access Road



River crossing and access road to Tskere

**Other ancillary facilities**

These facilities include rock crushing plant, segment plant, laydown areas, etc. These facilities will all be removed once the project is completed.




Lot 1 Segment Plant, Kobi



Lot 2 Laydown area, Kvesheti

Table 3: Spoil Disposal Areas

Item & Description	Illustration
<p><b>Spoil Disposal Area (SDA)</b></p> <p>The Project comprises 4 SDAs as follows:</p> <p>Lot 1: SDA #1 next to highway and SDA #3 at the bottom of the mountain - Kobi. SDA #2 was cancelled - rejected by the Kobi water company. Lot 1 has no permanent SDA on Tskere side.</p> <p>Lot 2: SDA #1 on Didveli Plateau, SDA #2 on Didveli Platea (cancelled), SDA #3 in Kvesheti (next to road alignment), SDA #4 in Bedoni (backfilling of the village area).</p>	 <p data-bbox="1339 1189 1505 1220">Lot 1: SDA#3</p>

## 4. Landscape Management

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### 4.1. Introduction

Management of impacts on the landscape can be discussed under three headings:

- Design Interventions – These are measures included in the road design to reduce visual intrusion, e.g., the use of tunnels.
- Landscaping Interventions – These measures broadly involve landscaping around the permanent road structure by planting trees and shrubs.
- Construction Interventions – This includes measures to reduce visual impacts during the construction stage and more specifically to reinstate temporary construction facilities and SDAs to soften visual impacts during the operational phase of the Project.

### 4.2. Design Interventions

Several design interventions have been incorporated into the project to reduce visual impact (as well as for other reasons, such as technical requirements and to reduce other socio-environmental impacts, such as noise). The key design interventions included in the project were the use of tunnels, extension of tunnels using cut and cover, and the use of natural landforms.

#### 4.2.1. Tunnels

The road design includes approximately 50% of the alignment between Kvesheti and Kobi (Lot 1 & 2) in tunnels. Tunnelling eliminates the visual impact of the Project on the landscape, except for the visual impact of technical buildings required for Tunnel 5 and tunnel portals. These impacts can be addressed through landscaping interventions.

#### 4.2.2. Cut and Cover

Tunnel 5 has been extended an additional 200m using cut and cover technique on the southern side to reduce impacts to villagers in Tskere and to also reduce the visual impact of the tunnel further on the village.

#### 4.2.3. Use of Natural Landforms

The Project design carefully incorporates the road into the natural landform of the project area. Where practical it avoids the use of high embankments and in other areas has moved the road into excavated 'cut' areas below the natural ground level. These cut areas can be screened by additional landscaping and provide additional noise mitigation. An example of the use of natural landforms can be seen in Benian-Begoni (Figure 3) where the road has been aligned to the western edge of the plateau to avoid the visual intrusion of the road through the center of the plateau.

Figure 3: Cut Section, Benian-Begoni



#### 4.2.4. Arch Bridge

This solution has been adopted to avoid the construction of piers in the riverbed and to reduce the visual impact of tall piers directly in the Khadistskali gorge.

Figure 4: Arch Bridge (Bridge #3)

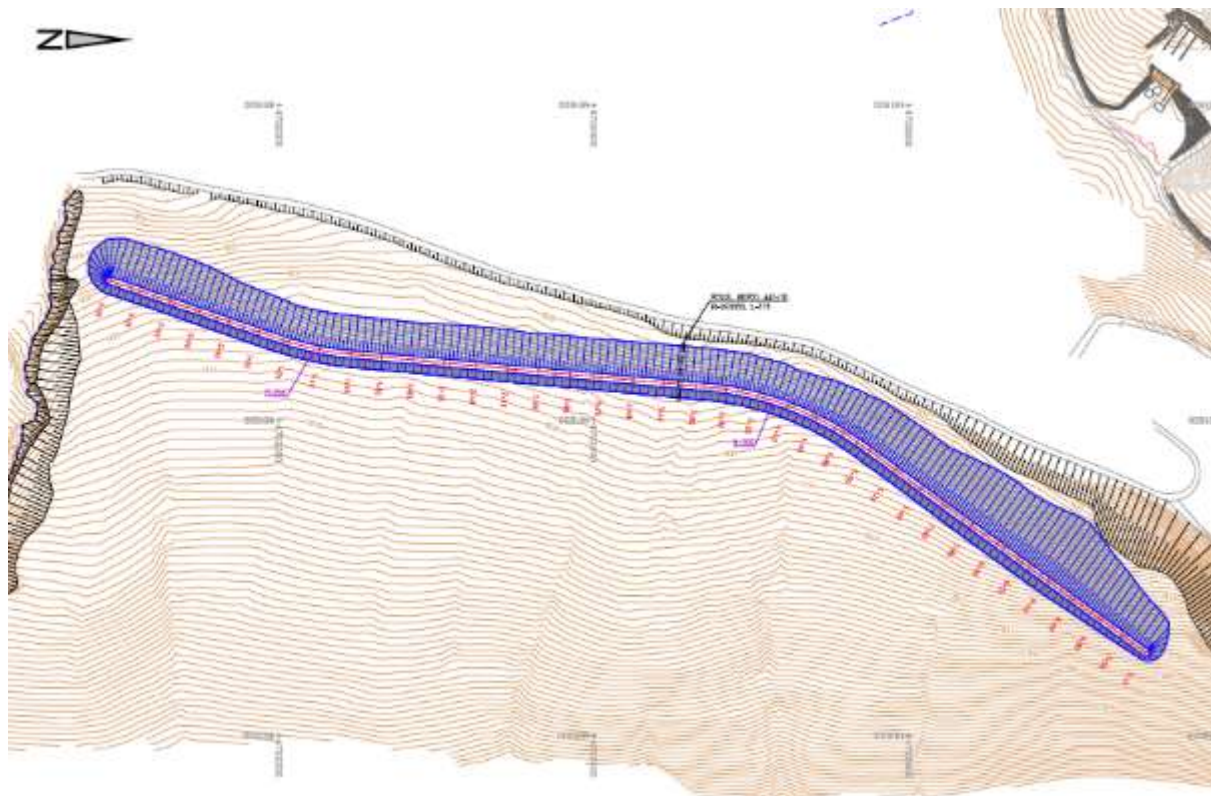


#### 4.2.5. Avalanche Protection

Avalanche protection is not directly connected to the construction of the road. This is a measure to protect the road. The Avalanche Protection walls will be visible from the Tskere-East, Mughure Church and Korogho Church- North viewpoints. It is not possible to achieve complete shielding of a dam, it is only possible to reduce its visual impact to the landscape scene.

The intervention is designed with the aim of mitigating the negative visual impact of the unnatural technical element in the very softly shaped part of the western slope of the Khada valley. This will be achieved through constructing a smooth curved structure instead of a hard straight-lined wall. Land still must be negotiated with locals and design may change based on this.

Figure 5: Avalanche Protection Proposed Soft Shaped Forms



#### 4.3. Landscaping Interventions

The landscaping proposal included as part of the draft KVDP Concept Master Plan includes specific landscaping interventions for the Khada Valley.

The draft KDVP Concept Master Plan applied the following key principles for all proposed landscape interventions:

- priority is given to restoring the natural component of the territory, (most of the trees will not fully function as a visual screen during winter (deciduous trees), but it is assumed that during winter tourism in the valley is not based on hiking trails due to the high snow cover),
- trees typical of natural vegetation in the Khada Valley will be used for planting, e.g.<sup>2</sup>:
  - deciduous trees: Field Maple (*Acer campestre*) Norway Maple (*Acer platanoides*) Sycamore maple (*Acer pseudoplatanus*), Black Alder (*Alnus barbata*) Litwinow's Birch (*Betula litwinowii*), Common Hornbeam (*Carpinus betulus*) Wild Cherry (*Cerasus silvestris*), Oriental Beech (*Fagus orientalis*), Common Ash (*Fraxinus excelsior*), Caucasian Wild Apple (*Malus orientalis*), Common Aspen, (*Populus tremula*), Cherry Plum (*Prunus divaricata*), Caucasian Pear (*Pyrus caucasica*), White Willow (*Salix alba*), Goat Willow (*Salix caprea*), Caucasian Rowan (*Sorbus caucasigena*),
- coniferous trees: Oriental Spruce (*Picea orientalis*), Sosnowsky's Pine (*Pinus sylvestris* var. *hamata*\_ *Pinus Sosnowskyi*),
- shrubs: European Barberry (*Berberis vulgaris*), Common Hazel (*Corylus avellana*), Common Hawthorn (*Crataegus* sp.), Yellow Azalea (*Rhododendron luteum*), Black Elder (*Sambucus ebulus*).

<sup>2</sup> Recommended tree species can be changed based on Dendrologists recommendation

- when choosing tree species, it is always necessary to consider the specific conditions of the individual intervention (e.g., altitude, orientation, humidity),
- the soil removed from the surface during the construction of the road will be used for planting,
- the shaping of the plantings will respect the natural structures of the vegetation in the valley,
- for plantings whose main goal is the elimination of noise pollution, skeletal target trees (beech, oak, maple, ash) will be used in combination with fast-growing trees (birch, alder, poplar) and shrubs.

The following sub-sections describe the proposed landscaping interventions for the Khada Valley.

It should be underlined that proposed landscaping interventions in draft KVDP is not final and can be changed, based on safety reasons. Moreover, if the lands where intervention activities should be preformed are private properties, they will not be used. For the intervention, private lands can be used if private owner confirms that intervention is acceptable.

#### 4.3.1. Tskere

Two landscaping interventions are proposed at Tskere. The aim of landscape intervention 1 is to lower the visual impact of artificial landscaping along east side of the Tskere entry road and retaining wall along west side. Intervention 1 will also positively affect visual quality of entryway to Tskere village. Planting trees and bushes will also strengthen conditions for biodiversity.

The aim of landscape intervention 2 is to soften the edge of the terrain cut in the area of the road's technical equipment, so that it is not visible from distant views. An important part of the intervention is also a detailed solution of the inner space of technical equipment area, i.e. a re-evaluation of the current design of the material solution and plantings according to the road project. Planting on the top of the terrain cut will also hide a fence which obviously will be necessary to ensure safety along the terrain edge.

## Landscape Interventions

Intervention 1: The landscaping proposal is based on the existing groups of bushes and trees representing the remains of the original gardens of the Tskere peripheral development. Plantings will be thickened in such a way that they visually block parts of the road construction when viewed from the viewpoint, but also from other places on the way to the waterfall. The floor plan shape of the plantings must be based on the normal structures of tree stands, they must have a natural character as much as possible. This intervention will be done if lands are not private property, or if owner will allow to do tree planting activities.



Intervention 2: The design of the landscaping consists in the extensive planting of the terrain edge and the area in front of it with bushes and groups of trees. The terrain edge will probably be fenced for security reasons, this fencing should be visually minimal (for example wire). Native trees should be used for planting, the structure responds to growths, for example, on the edge of the Khada river gorge, where groups of trees and shrubs are common.

Recommended tree species<sup>3</sup>:

- Sycamore maple (*Acer pseudoplatanus* (main)),
- Caucasian Wild Apple (*Malus orientalis*),
- Caucasian Pear (*Pyrus caucasica*),
- Crack willow (*Salix fragilis*),
- Common Hazel (*Corylus avellana*),
- Yellow Azalea (*Rhododendron luteum*).

Apart from planting trees and bushes, there are two more topics to cover:

- protection of existing meadow and the view of Tskere
- support of the stream leading water from the village along the meadow.

In detailed planting project it is necessary to keep the existing meadow (yellow line) without trees to keep the views on the village from the south. Rare bushes are acceptable, preferably on the edge of the meadow and green belt along the village.

The green line shows the possible maximum height of existing and new trees of the landscape intervention at this place, so the existing view of the village from the south is protected.

This intervention will be done if lands are not private property, or if owner will allow to do tree planting activities.

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<sup>3</sup> Recommended tree species can be changed based on Dendrologists recommendation

Figure 6: Areas to keep free of trees, Tskere



The following renders illustrate the current situation and the situation after implementation of the proposed interventions.

Figure 7: Actual view from viewpoint Tskere-east



Figure 8: Visualization of landscaping (Tskere 1) from viewpoint Tskere-east



Figure 9: Actual view from viewpoint Mughure Church



Figure 10: Visualization of landscaping (Tskere 2) from viewpoint Mughure Church



Figure 11: Visualization of Landscaping, Tunnel 5 Portal, Tskere <sup>4</sup>



#### 4.3.2. Benian-Begoni

North of Benian-Begoni is a short section between Tunnel 4 and Bridge 6. Here, plantings are proposed at the transitions from the bridge and tunnel to the surface part of the road. These are simply groups of shrubs. Three different measures are proposed in the road section on the edge of the Benian-Begoni plateau:



1. On the edge of the cut adjacent to the settlement, a dense green band of bushes on elevated terrain is designed, which will visually separate the plateau from the road cut and will especially contribute to the reduction of noise pollution in the settlements.
2. On the side facing the gorge of the Khada River, a variably wide strip of bushes with several dominant trees is designed in the northern part. This strip serves mainly to eliminate the visual impact of the technically solved edge of the cut.
3. In the southern part, where the cut attacks the edge of the Khada river gorge, extensive afforestation is proposed between the edge

<sup>4</sup> It is advised by draft KVDP to change green color of Tunnel Technical Buildings to brown



of the existing forest and the edge of the road cut.

This intervention will be done if lands are not private property, or if owner will allow to do planting activities

#### 4.3.3. Intersection

This intersection is visible from viewpoints Lukho, Tsikhiani, Zaktakari and Zakatkari Tower.

Landscape interventions include several partial plantings connected to individual exits from the road. Groups of trees and shrubs are designed here without specific landscaping. Inside the intersection, there are shrub plantings in smaller areas and dominant tree plantings with groups of shrubs in two large planting areas.

Figure 12: Intersection Landscaping



#### 4.3.4. Zakatkari

The landscape design in the vicinity of the Zakatkari village is quite extensive, as it responds to the surface part of the road in the northern part of Didveli plateau. To ensure the overall integration of the road into the plateau environment, modifications are also proposed on the opposite side of the road. Another part of the intervention

is landscaping southeast of the village. Although the new road is cut, the noise load will be high (over 55 decibels) due to the elevated position of the village. The proposal represents the possibility of increasing the terrain and creating an anti-noise embankment, supplemented by trees on the outer slope and bushes.

The modifications respond to existing trees and shrubs or their groups, which will be preserved or restored after the road construction is completed. The free areas between the existing groups will be supplemented with trees and bushes with the aim of blocking parts of the road construction from views from the viewpoints, but also from other places, especially in Zakatkari. The floor plan shape of the plantings is based on the normal structures of tree stands, it must have a natural character as much as possible. Recommended tree species; Oriental Beech (*Fagus orientalis*), Sycamore Maple (*Acer pseudoplatanus*), Caucasian Pear (*Pyrus caucasica*), Cherry Plum (*Prunus divaricata*), Wild Cherry (*Cerasus sylvestris*), Caucasian Rowan (*Sorbus caucasigena*), Goat Willow (*Salix caprea*), and Sosnowsky's Pine (*Pinus sylvestris* var. *hamata*).

Recommended shrub species; Firethorn (*Pyracantha coccinea*), Common Hazel (*Corylus avellana*), Common Hawthorn (*Crataegus* sp.), and European Barberry (*Berberis vulgaris*).

Figure 13: Detailed Landscape Intervention, Zakatkari

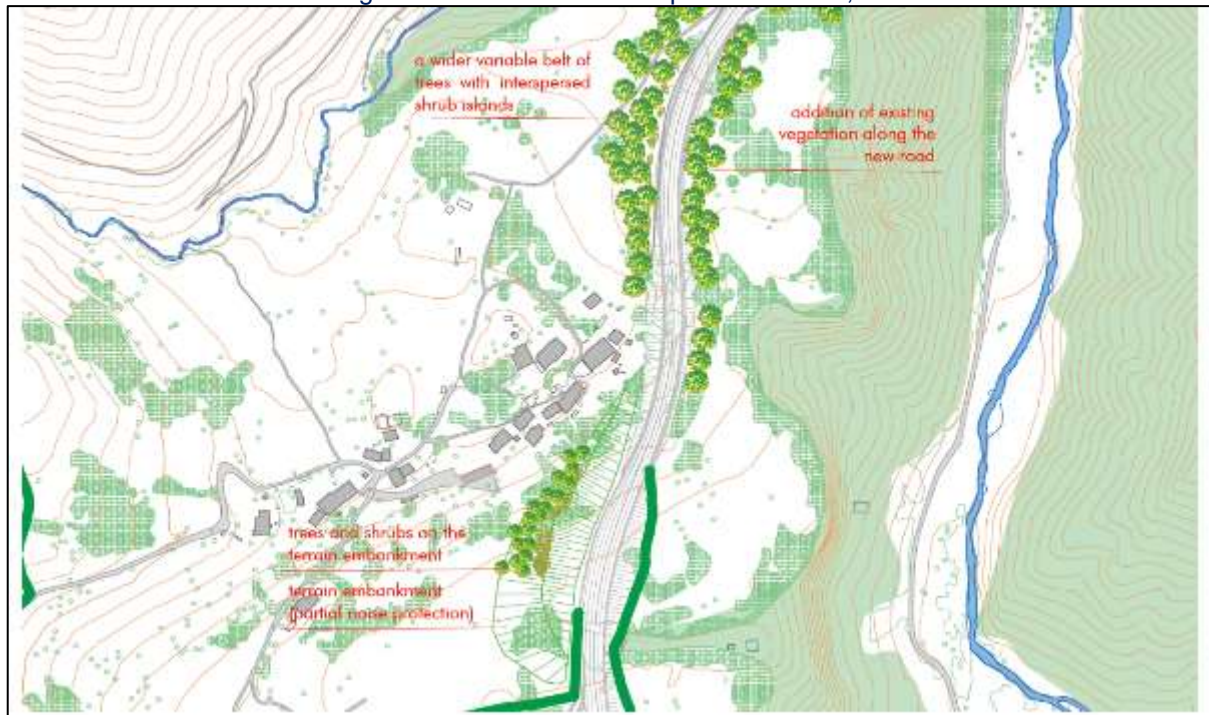
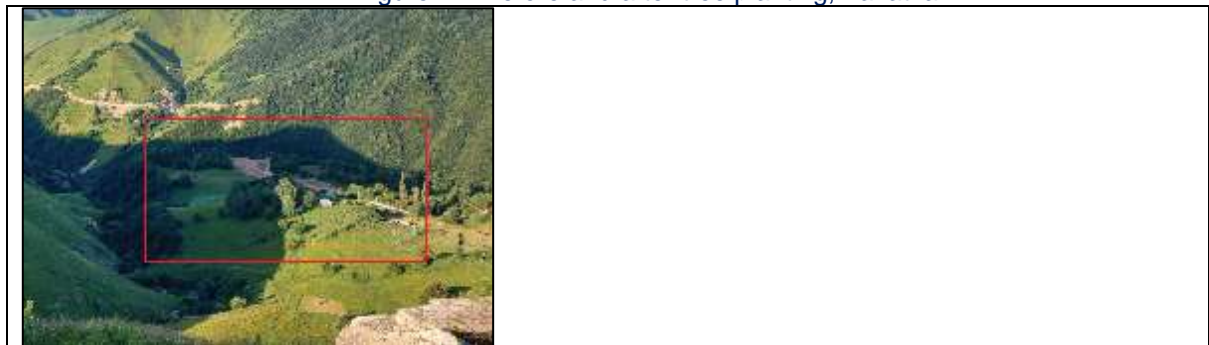
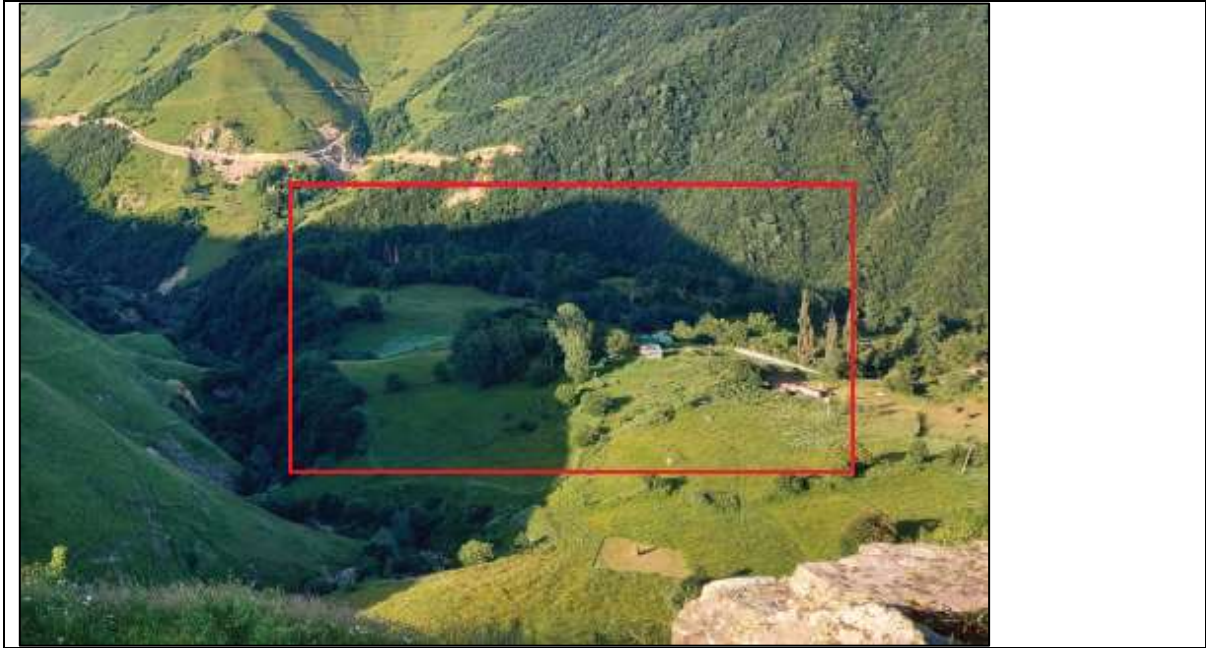


Figure 14: Before and after tree planting, Zakatkari

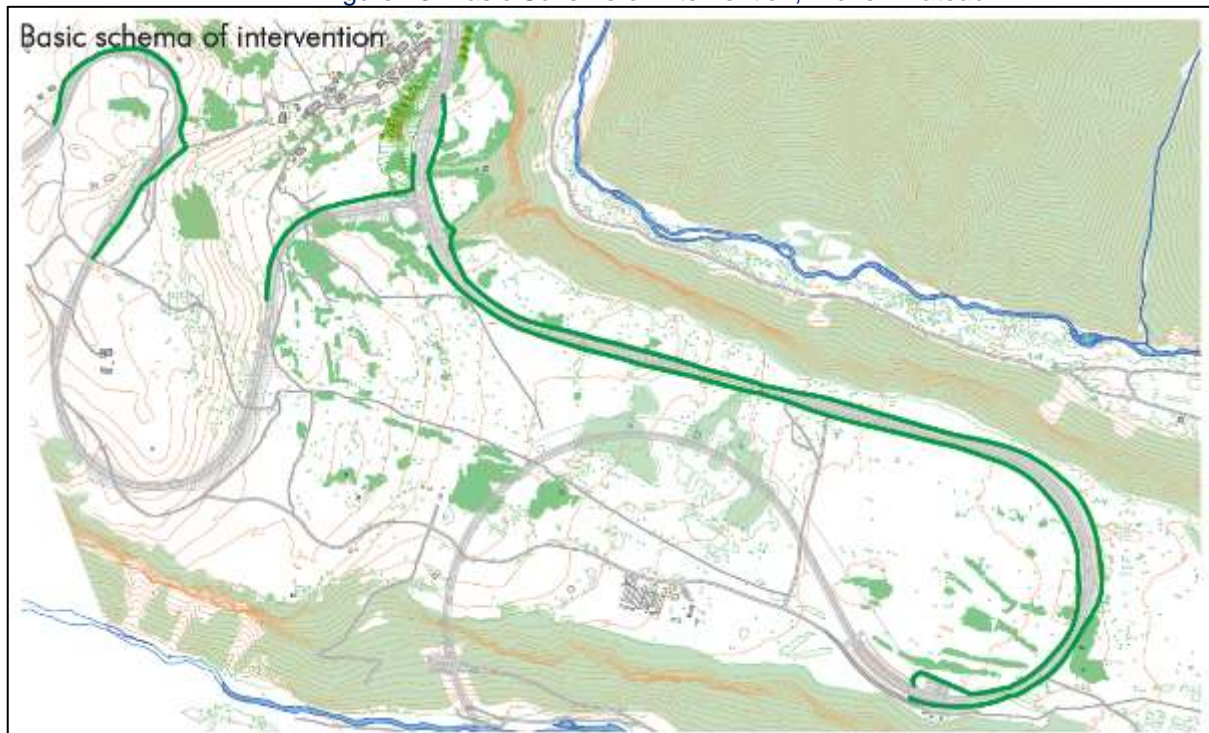




#### 4.3.5. Didveli Plateau

The related landscaping of the Zakatkari- Gudauri Conjunction will not be visible from important viewpoints, but at that point the road narrowly passes the important landmark, monument and observation point of the Zakatkari Tower, therefore it is necessary to provide vegetation along the road so that the views from this tower are not disturbed. The purpose of both of these interventions is not to obscure the road from view, but rather to integrate it into the existing landscape. The reason is also the fact that these are relatively long sections of the road passing through a relatively simply shaped landscape. The existing greenery along the road in the Didveli Plateau area is being eliminated in a wide strip due to the construction of a new road. A more detailed planting plan will have to be decided after the completion of the construction works. It is advised by draft KVDP to change green color of Tunnel Technical Buildings to brown<sup>5</sup>.

Figure 15: Basic Scheme of Intervention, Didveli Plateau



<sup>5</sup> Detailed plan will be prepared based on Dendrologists recommendation

#### 4.3.6. Tunnel Portals & Cut slopes

Tunnel portals serve multiple purposes and are specifically designed with safety in mind, e.g., to prevent rock falls onto the road, or to drain water from slopes above the portal. Cut slopes are present along the road alignment and along temporary access roads. Several techniques should be included for restoration of immediate areas around the portals and cut slopes by the Contractors depending on the soil types.

- For the tunnel entrance slope with good soil quality, gentle slopes and exposed soil surface, the ecological restoration technology of grass and shrub spot sowing and broadcast sowing is recommended for greening.
- For the tunnel entrance with unstable soil quality, temporary engineering protection or strong weathering unprotected rock slope is designed, and the ecological restoration technology of base material soil spraying and hydroseeding is adopted for greening.
- For the tunnel entrance slope with slope engineering protection, the ecological restoration technology of planting bag is recommended for greening.<sup>6</sup>

#### 4.4. Construction Interventions

Several construction activities will contribute to the changes in landscape, both temporarily and permanently. However, it is important to note that these changes can be managed through reinstatement of the land they currently occupy. The following section outlines the interventions required to manage construction phase impacts on the visual landscape.

##### 4.4.1. SDA

No spoil disposal site is required at the Khada Valley.

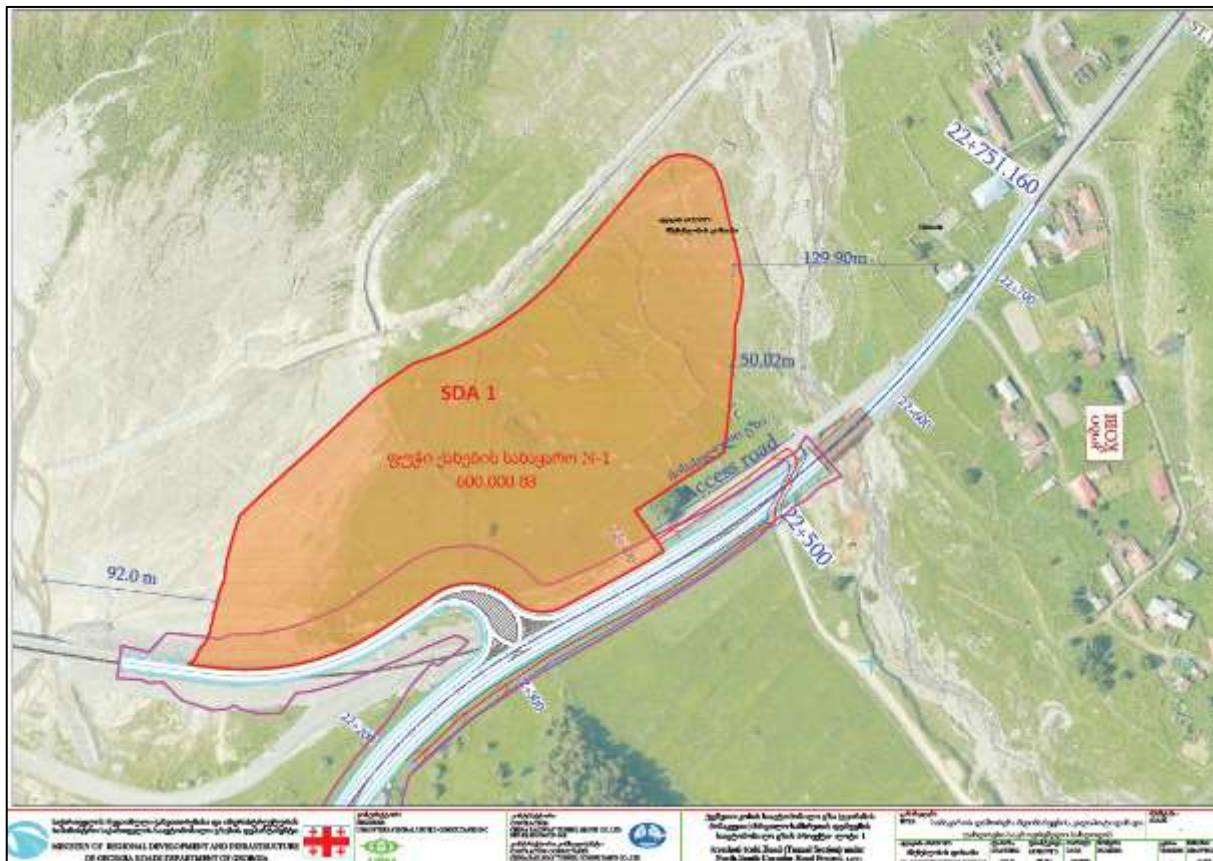
##### **Lot 1:**

The total area of SDA 1 is 58,789 ha and it includes two terraces with the total height 18m (first terrace – 10m, second – 8m). After completion of construction activities, SDA 1 will be leveled with the road.

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<sup>6</sup> Discussion on Landscape and Greening Technology of Highway Structural Tunnel Entrance. E3S Web of Conferences 261, 03035 (2021)

Figure 16: Lot 1, SDA1



SDA3 is located on the left bank of the river Tergi, about 100m from the stream. The site consists of two units – section I and section II. The spoil disposal area will be arranged as a two-step terrace with a slope not exceeding 35°. The maximum height of each terrace will be 6 m. max height of SDA will be 12 m.

Prior to the construction activities the topsoil was stripped from the SDAs and stored in accordance with the Resolution No. 424 of 2013 of Georgian Government on “Removing Fertile Layer of Soil, Storing, Using and Re-cultivating”. After completion of the works the territory will be re-cultivated following the re-cultivation plan which is approved by the MoEPA.

According to the Re-Cultivation Plan Topsoil will be reinstated after final reinstatement (including backfilling, compaction and levelling) of the subsoil layer. Topsoil will be reinstated separately, with care taken to avoid mixing of the subsoil materials.

The reinstated topsoil will then be harrowed, where practical, to protect the stability and promote vegetative growth. On slopes areas, the Contractor will use track bulldozers across the reinstated topsoil perpendicularly to the slope to roughen the surface. Where topsoil is reinstated to agricultural land the surface will be prepared for seeding.

Figure 17: Lot 1, SDA3



## Lot 2

SDA#1 area is located on the Didveli plateau, the left bank of the Tetri Aragvi River at 1636 and 1640m asl, in around 489m distance from the Tetri Aragvi, 251m above the riverbed. The site is located in 725m from the Camp #2/Batching plant #2, in 324m from the south portal of the Tunnel 1. The site has been proposed at environmental impact assessment stage and is capable to accommodate  $V=28,000\text{m}^3$  of spoil material.

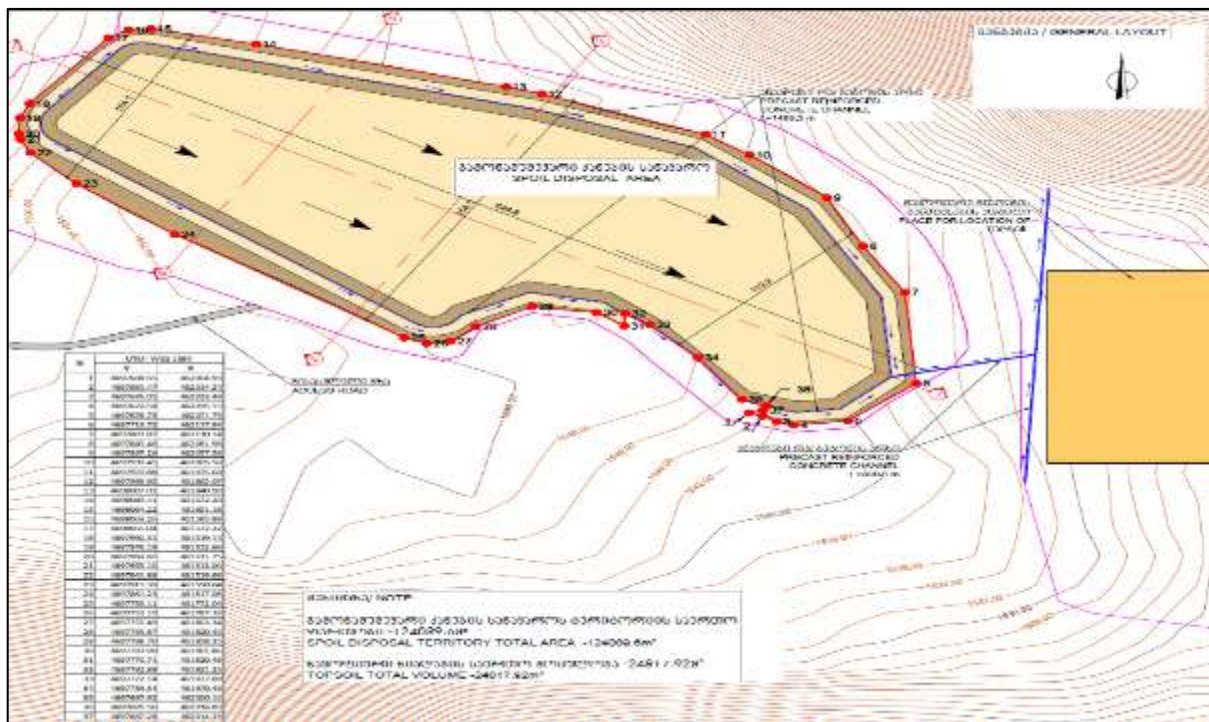
Prior to commencement of works planned under Kvesheti-Kobi (Lot 2) project topsoil was removed from SDA#1 and stored at the pre-selected temporary location until use for re-cultivation of spoil disposal area.

The spoil disposal site will be re-instated upon completion of works at the site. Topsoil will be spread over the surface, herbaceous plants -seeded. For recultivation local (similar) species as those removed during the site clearance will be used. Recultivation will be carried out according to approved Recultivation Management Plan.

The technical recultivation will be followed by biological recultivation (seeding with grass). The following recommendations will be considered:

- The seeds will be evenly distributed. 15g-20g of seeds per square meter will be used.
- The seeds will be spread evenly. Too many seeds too close together causes seedlings to fight for room and nutrients leading to weak or thin growth in such areas.
- The grass seed bed will be kept moist to enhance germination.
- The area will be watered lightly (don't saturate), and frequently (at least once daily), until new grass is around 5 cm high.

Figure 18: Lot 2, SDA1



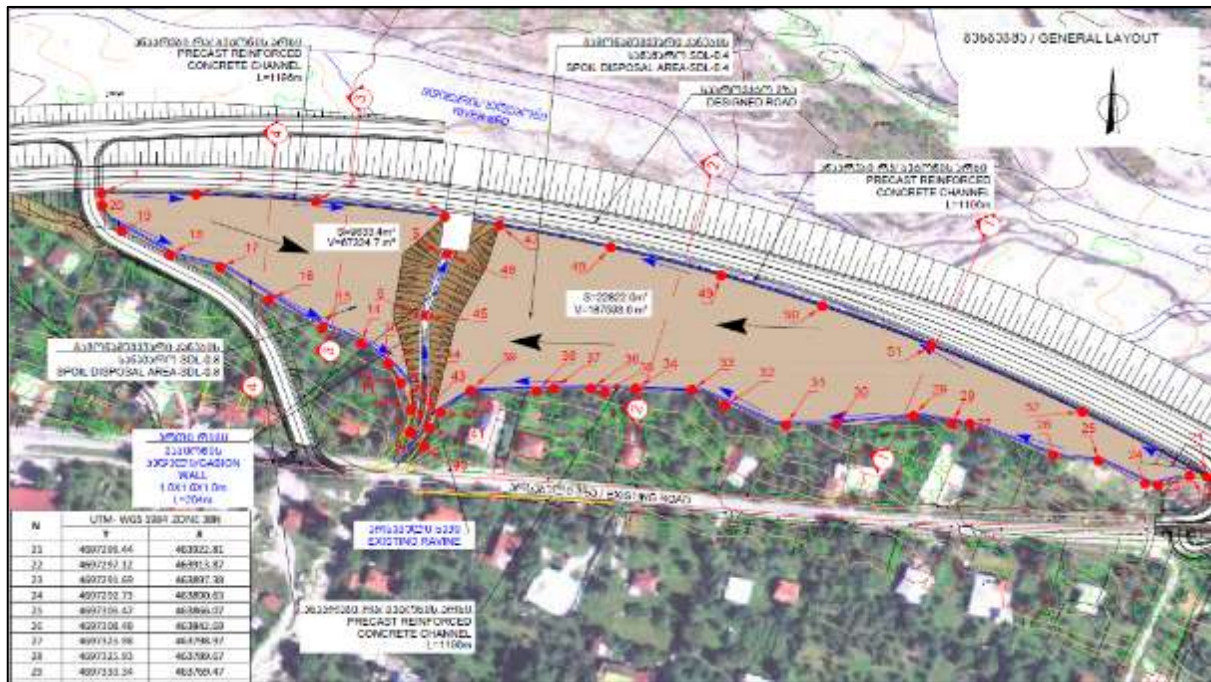
**SDA#3 area** – Proposed SDA area is in Kvesheti bypass section, on the right bank of the Tetri Aragvi. The site is capable to accommodate  $V= 254,918\text{m}^3$  of spoil material.

The site consists of two units – SDL-0.4 and SDL-0.8 (as indicated in the detailed design of the road and the Project EIA). SDA#3 is a void between the current terrain and embankment of the design road in this section.

Re-cultivation will be carried out according to approved Re-cultivation Management Plan. Technical and biological re-cultivation will be performed. Procedure will include compaction of the area, reintroduction of topsoil stripped from the area at the site preparation stage. The topsoil storage area will be arranged to the east of the SDA that will reduce the transportation distance and time, i.e., duration and scale of impact on air quality (less exhaust emissions generated by topsoil transportation trucks).

The height of SDA#3 will be a maximum of 16 meters. The site is practically a part of the design road. As indicated in the EIA, after completion of works leveling and re-cultivation it will act as a natural barrier separating new road from the residential area (Kvesheti) and potentially used as recreation space.

Figure 19: Lot 2, SDA3



#### 4.4.2. Laydown / Parking Areas

Upon completion of works the laydown/parking area east of Kvesheti will be reinstated. Reinstatement of this area is relatively straightforward as it is located with the wide floodplain of the Aragvi River and no topsoil or grassing works are needed. The following table provides the reinstatement requirements for this area.

Table 4: Laydown / Parking Area Reinstatement

Requirement	Activity	Responsibilities	Schedule
Reinstatement of site	Removal of all equipment	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of waste material	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of any areas of contaminated soils	Contractor	On completion of works and upon issuance of Performance Certificate
	Grading of the site to be level with the existing ground.	Contractor	On completion of works and upon issuance of Performance Certificate

#### 4.4.3. Segment Plant

The segment plant in Kobi forms part of the main construction area around tunnel portal. This construction area also comprises accommodation camp, SDAs, Batching Plant and control areas for the Tunnel Boring Machine and equipment. This area is located close to the Baidara river floodplain, and partially in it. It is important that all elements of the segment plant are removed, including the sites concrete base. The site should then be graded and left to naturally revegetate as part of the floodplain.

Table 5: Segment Plant Reinstatement

Requirement	Activity	Responsibilities	Schedule
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Reinstatement of site	Removal of all equipment, including buildings	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of waste material	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of concrete base	Contractor	On completion of works and upon issuance of Performance Certificate
	Grading of the site to be level with the existing ground	Contractor	On completion of works and upon issuance of Performance Certificate

#### 4.4.4. Temporary Access Roads & River Crossings

Temporary access roads and river crossings may have, over the course of the construction period, been used extensively by the community to access their land. It is possible that they may request the structures to remain in place after construction is complete. The following table sets out the requirements for removal structures and reinstatement of roads, but consultation with the community should be undertaken prior to any removal / reinstatement works to confirm that there is no need for these facilities in the operational stage of the project.

Table 6: Temporary Access Road & River Crossing Reinstatement and Landscaping

Requirement	Activity	Responsibilities	Schedule
Consultation	Consultation with community to determine if access roads or river crossings shall remain.	Contractor to consult with landowners.	6 months prior to the completion of works
Reinstatement & Landscaping of Access Roads	<p>Contractor to prepare reinstatement / landscaping plans for each access road.</p> <p>The plans shall account for the slope gradient and soil types and the practicalities of revegetating slopes.</p> <p>Where this is not possible, the plans will outline measures to landscaping the areas around the access roads using trees and shrubs. The landscaping measures shall be designed to minimize visual impacts from the view points identified in this reports.</p>	<p>Contractor to prepare plans.</p> <p>Engineer to approve plans</p>	On completion of works and upon issuance of Performance Certificate
Reinstatement of bridge sites	Contractor to prepare reinstatement / landscaping plans for each bridge.	<p>Contractor to prepare plans.</p> <p>Engineer to approve plans</p>	On completion of works and upon issuance of Performance Certificate
	Removal of bridge slabs or pipework and no pipe to be left in the rivers	Contractor	On completion of works and upon issuance of Performance Certificate

	Repairing channel width to pre-project dimensions	Contractor	On completion of works and upon issuance of Performance Certificate
	Ensure no concrete, or other construction materials are left in the river	Contractor	On completion of works and upon issuance of Performance Certificate

#### 4.4.5. Batching Plant

Batching plant equipment will be removed by the contractor. The following table provides the required reinstatement for these areas.

Table 7: Batching Plant Reinstatement

Requirement	Activity	Responsibilities	Schedule
Reinstatement of site	Removal of all equipment, including buildings	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of waste material	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of concrete base and other concrete structures, e.g. waste water pits. No concrete structures should remain on the site.	Contractor	On completion of works and upon issuance of Performance Certificate
	Soil sampling across the site to determine any residual contamination on site. Removal of contaminated soils, if identified.	Contractor	On completion of works and upon issuance of Performance Certificate
	Grading of the site to be level with the existing ground.	Contractor	On completion of works and upon issuance of Performance Certificate
	Covering site with topsoil	Contractor	On completion of works and upon issuance of Performance Certificate
	Revegetation (seeding) with grass across the site using local grasses.	Contractor	On completion of works and upon issuance of Performance Certificate

#### 4.4.6. Construction Accommodation Camps

Accommodation camps are prefabricated structures. They will be removed by the Contractor. Other structures associated with the camps, such as boundary fences, access roads and concrete foundation bases must be removed. It is possible that the landowners may request the concrete bases to remain in-situ after construction, and this should only be permitted if agreed upon by the agencies and departments responsible for land use permitting. Other structures, such as septic tanks shall be excavated and removed from the site.

Table 8: Camp Site Actions

Requirement	Activity	Responsibilities	Schedule
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Consultation	<p>Consultation with landowners to determine what part of the camp are to remain.</p> <p>If the landowner requests portions of the site to remain in-situ, the relevant permits for permanent use of the site will need to be obtained.</p>	<p>Contractor to consult with landowners.</p> <p>Landowner to obtain necessary permits for the required land use.</p>	6 months prior to the completion of works
Reinstatement	Removal of all equipment, including buildings	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of waste material	Contractor	On completion of works and upon issuance of Performance Certificate
	Removal of concrete base and other concrete structures, e.g. waste water pits. No concrete structures should remain on the site.	Contractor	On completion of works and upon issuance of Performance Certificate
	Soil sampling across the site to determine any residual contamination on site. Removal of contaminated soils, if identified.	Contractor	On completion of works and upon issuance of Performance Certificate
	Grading of the site to be level with the existing ground, or grading of slopes.	Contractor	On completion of works and upon issuance of Performance Certificate
	Covering site with topsoil	Contractor	On completion of works and upon issuance of Performance Certificate
	Revegetation (seeding) with grass across the site using local grasses.	Contractor	On completion of works and upon issuance of Performance Certificate

#### 4.5. Intervention Results

Based on the proposed interventions the following renders have been produced for all the Viewpoints identified in Section 2.

Viewpoint 1

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 2

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 3

Current situation (2022)



Post-construction (2025)



15 years after completion (2040)



Viewpoint 4

Current situation (2022)



Post-construction (2025)



15 years after completion (2040)



Viewpoint 5

Current situation (2022)



Post-construction (2025)



15 years after completion (2040)



Viewpoint 6

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 7

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 8

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 9

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 10

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 11

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 12

Current situation (2022)



Post-construction (2025)



15 years after completion (2040)



Viewpoint 13

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



Viewpoint 14

**Current situation (2022)**



**Post-construction (2025)**



**15 years after completion (2040)**



## 5. Conclusions & Recommendations

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### 5.1. Conclusions & Recommendations

The assessment has identified a number of locations within the Khada Valley that represent important ‘view points’ primarily for neighbors and touring travelers.

A number of mitigation and management measures have therefore been proposed that would limit impacts within the Khada Valley and the project area in general. These measures have been sub-divided into three categories, design interventions (e.g., the use of tunnels), landscaping interventions (based on the broad recommendations of the KVDP) and construction interventions (specifically relating to reinstatement of work zones on completion of works).

**Design interventions** have already been included in the Project and no further recommendations are required.

For **landscaping interventions**, the measures set out in this report should be followed. However, more detailed planting schemes will be required for the Didveli Plateau on completion of construction activities and these plans must consider the dual aspects of road safety and existing landownership.

**Construction interventions** shall be completed by the Contractor and this assessment has set out the requirements for reinstatement in these areas, some of which are more complex than other and require consultation with stakeholders.

Renders of the selected viewpoints have been prepared showing the current situation and the post-construction situation (2025 and 2040). The renders show how the proposed interventions will reduce the impact of the project on the landscape within the Khada Valley.