

Full Title of the proposal:- Additional Forest land requirement of 11.7943 ha. for four laning of proposed Shimla Bypass from Kaithlighat to Shakral Section (Package-I) of NH-22 (Chainage from Km. 128.835 to Km. 146.300) in already approved FCA case of the entire section from Kaithlighat to Dhalli (Chainage from Km. 128.835 to Km. 156.560) of NH-22 for 40.3 Ha in the State of Himachal Pradesh.

MUCK MANAGEMENT PLAN

1. INTRODUCTION

The project envisages four laning of proposed Shimla Bypass from Kaithlighat to Shakral Section (Package-I) of NH-22 (Chainage from Km. 128.835 to Km. 146.300) including construction of two twin-tube tunnels of 1873 m. Large quantity of material would be excavated during construction. As the project road is located in a hilly terrain, the muck generated from the excavation is required to be disposed in a planned manner so that it takes least possible space and is not hazardous to the environment. It is of prime importance that these sites will have to be rehabilitated as soon as the disposal sites are full.

The muck generation, muck disposal sites, site selection criteria, stabilization measures and adequate disposal and management guidelines along with cost estimate for management of muck generated from the project have been discussed in the following sections.

2. MUCK GENERATION

In the proposed project, muck generation is expected to be generated as a result of tunneling operations and construction of road. The component wise muck generation from the project activity is given in Table-1.

Table-1: Abstract of Muck generated and its disposal

Project component	Quantity of Muck generated (Cum)		Quantity of Muck due to swell factor (Cum)		Estimated Quantity of Muck Proposed to be utilized (Cum)		Balance quantity of Muck (Cum)		Effective Muck to be disposed (Cum) after rolling	Capacity of the Muck Disposal sites (Cum)
	Rock (41%)	Soil (59%)	Rock (5%)	Soil (3%)	Rock (39%)	Soil (100%)	Rock (61%)	Soil (0%)		
Road work	946049	1361387	993351	1402229	385454	1402229	607897	-	516712	994740
	Rock (4%)	Soil (96%)	Rock (5%)	Soil (3%)	Rock (0%)	Soil (69%)	Rock (100%)	Soil (31%)		
Tunnel	21650	519601	22732	535189	-	367565	22732	167624	161803	
Total Qty (M ³)=	967699	1880988	1016083	1937418	385454	1769794	630629	167624	678515	994740

Source-DPR Study

During construction of the various components of the project road, muck is generated both from soil and from rock excavation. Total quantity of muck / debris, generated from the project, shall be 28,48,687 cum which shall amount to 29,53,501 cum with swell factor. Out of the total muck generated, 21,55,248 cum shall be utilized on project work leaving 6,78,515 cum of muck to be dumped after rolling at designated sites. The muck generated is proposed to be utilized in road

activities such as earthwork embankment, subgrade, backfill and pavement layers depending on suitability of the material. The balance quantity of muck as shown in Table-1 shall have to be disposed off in designated sites and the muck shall be properly roller. The muck disposal sites shall also be properly protected and stabilized with Gabions Walls of suitable designed sections.

3. MUCK DISPOSAL SITES

9 muck disposal sites of total area 10.7471 ha. have been designated for muck disposal from the proposed project. Out of the 9 sites, D-1 at Suroh and part of D-9 at Mehli is already acquired. 4.3894 Ha of the muck disposal sites to be acquired is forest area and 4.5902 Ha. is non-forest area. The details of muck disposal sites along with their capacity are given in **Table-2**.

Table-2: Details of Muck Disposal Sites

Muck Disposal Site No.	Chainage	Village	Already Acquired Area (Ha.)	To be Acquired		Total Area (Ha.)	Capacity of Muck Sites in Cum	Volume of Muck to be disposed (in Cum)
				Forest Area (Ha.)	Non-Forest Area (Ha.)			
D-1	128+835	Suroh	1.3970			1.3970	183228	678515
D-2	130+800	Shogi		1.9082	0.5473	2.4555	280552	
		Goru Kanawan		0.6620	0.0000	0.6620		
D-3	132+150	Goru Kanawan		0.0000	0.0241	0.0241	41261	
		Mauri		0.5785	0.2412	0.8197		
D-4	132+280	Goru Kanawan		0.0000	0.4840	0.4840	45631	
D-5	136+700	Yaan		0.1061	0.4978	0.6039	77522	
D-6	140+100	Up Mahal Majhar		1.0912	0.2777	1.3689	101612	
D-7	142+950	Jalf		0.0000	1.1126	1.1126	39580	
D-8	142+600	Up Mahal Gusan		0.0434	0.8101	0.8535	149774	
D-9	145+300	Mehli	0.3705	0.0000	0.5954	0.9659	75579	
		Total	1.7675	4.3894	4.5902	10.7471	994740	678515

Land verified by CALA

It may be seen from the Table above that the capacity of the muck disposal sites is 9.94 lakh cum and the volume of muck to be disposed off after utilization is 6.79 lakh cum. This states that the capacity of the muck disposal sites exceeds 32% the generated muck volume. All the disposal locations shall be well supported by retaining structures and suitable slope protection measures. The location of the muck disposal sites marked on SOI Toposheet is enclosed as **Annexure I**.

Site selection Criteria

Based on the geological nature of the rocks and engineering properties of the soil, a part of the muck can be used as construction material. However, the balance requires being suitably disposed. The following points have been considered and followed as guidelines for finalization

of the areas to be used as dumping sites:

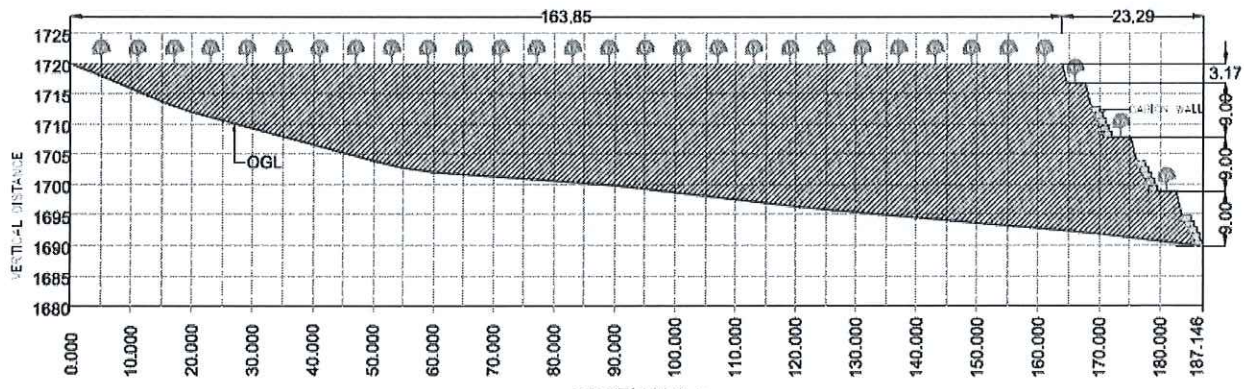
1. The dumping sites shall be selected as close as possible to the project area to avoid long distance transport of muck.
2. The sites shall be free from active landslides or creep and care has to be taken that the sites do not have a possibility of toe erosion and slope instability.
3. Existing slope of the site shall not be preferably more than 30°.
4. The dumping sites shall be either at higher level than the flood level or shall be away from the river course so that the possibility of muck falling into the river is avoided.
5. There shall be no active channel or stream flowing through the dumping sites.
6. Disposal areas shall be planned downwind of villages and townships in consultation with the forest department.
7. Wind direction shall be taken into consideration so as to avoid the erosion i.e. on wind shadow region.
8. These sites shall not be pristine habitats containing endangered /threatened species.
9. Dumping site shall be located preferably 500 m from the river/stream/nullah
10. Dumping site shall not be located in Protected Areas.

Stabilization of Muck disposal site

The loosely held muck can lead to the rise in SPM levels and sedimentation load. Therefore, it requires stability with appropriate methods to avoid the subsequent ecological problems. The muck disposal involves both engineering and biological measures that depend on the eco-climatic conditions.

I) Engineering Measures:

The muck shall be disposed off in the sites in terraces and the slopes shall be protected with multiple gabion walls of height 5m as per the elevation profile as given the figure below.



The Muck Disposal Plan of all the sites along with elevation profile and location of gabion walls is enclosed as **Annexure II**.

II) Biological Measures:

Vegetation cover plays a very important role in holding the dumped material over a period of time and controls the hydrological and mechanical effects on the soils and slopes. Special efforts will be required to raise vegetation cover of grasses, shrubs and trees. The local grass sodding should be done on the muck when grass seed will be germinating and the grass will add humus to the dumped material.

Soil conservation and quick growing species to be planted to stabilize the slope - *Agave sisilana*, *Berberis aristata*, *Bauhinia vahilii*, *Jasminum humile*, *Rubus ellipticus*, *Prinsepia utilis*, *Justicia adhatoda*, *Ipomea carnea*, *Hypericum oblongifolium*, *Mimosa himalayana*, *Salix denticulate*, *woodfordia fruticosa*, *Alnus nepalensis* etc.



Slope Protection using Bio engineering techniques

Guidelines on Muck disposal Management

1. The muck shall be dumped preferably in the form of terraces and slope of dumped muck shall not exceed 35° and preferably shall be kept under 30° or 1:2.
2. Fencing shall be done to prevent human / animal interference
3. Dumping shall not obstruct the natural drainage pattern
4. Trees shall be retained along the contours wherever feasible so as not to disturb the natural slope.
5. Protection walls shall be constructed along the contours prior to dumping
6. Before dumping the muck chemical analysis shall be done to identify hazardous material if any. The same shall be managed as per Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. In case hazardous materials like radioactive elements, high arsenic or fluoride laden rocks are found they shall not be dumped into the dumping site and handled as per prescribed rules.
7. Settling channels may be constructed, if required, along the protection walls that will be connected to a storage / filtration chamber
8. Muck shall be carried in dumper trucks covered with heavy duty tarpaulin properly tied to the vehicles
9. Dumping may be avoided during the rainy season, to avoid slipping of muck while dumping
10. Top soil shall be stripped wherever feasible to a specified depth of 150 mm and stored in stockpiles of height not exceeding 2 m in height and used for landscaping.
11. All disposal sites shall be properly landscaped when the disposal gets completed so as to merge it in the natural surroundings.

4. RESTORATION PLAN

Once the dumpsites are filled, these sites shall be rehabilitated by covering it with fertile top soil and planting local species of trees and shrubs in consultation with the forest department so that the landscape is in harmony with the surrounding environment.

The afforestation with indigenous plant species of high ecological and economic value which can adapt to local habitat will be undertaken in consultation with the forest department depending upon the canopy cover required. Major tree and shrub species which would be planted are listed in table below.

Botanical Name	Common Name
Trees	
<i>Populus ciliata</i>	Poplar
<i>Pinus roxburghii</i>	Chir
<i>Cedrus deodara</i>	Deodar
<i>Salix acutifolia</i>	Bhains
<i>Cassia fistula</i>	Amaltas
<i>Pinus wallichiana</i>	Kail, Blue pine
Shrubs	
<i>Artemisia nilgarica</i>	Kunja
<i>Berberis aristata</i>	Kingor
<i>Berberis lyceum</i>	Kingor
<i>Tecoma stans</i>	Tecoma
<i>Hibiscus rosa-sinensis</i>	Gurhal

5. BUDGET

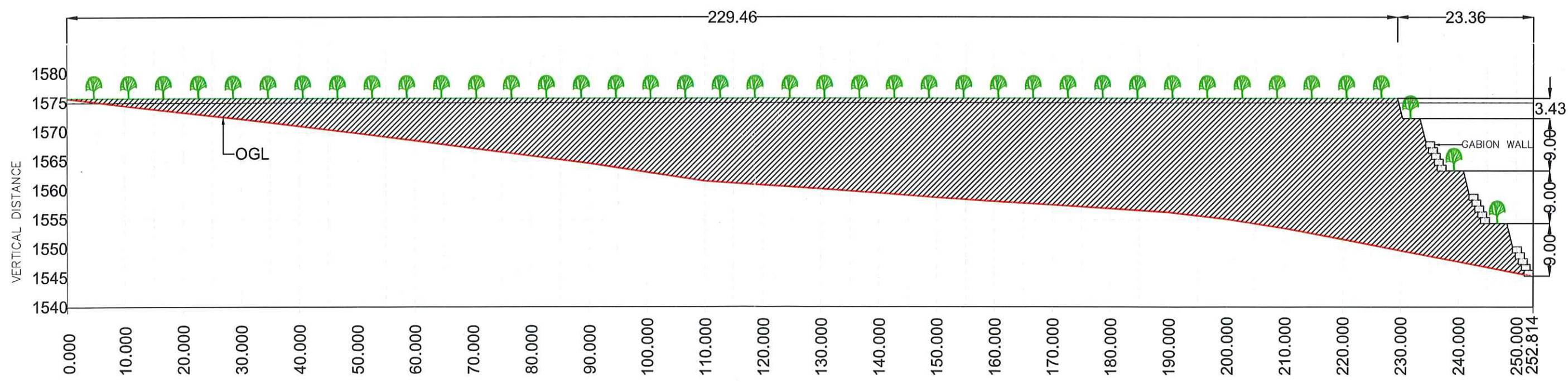
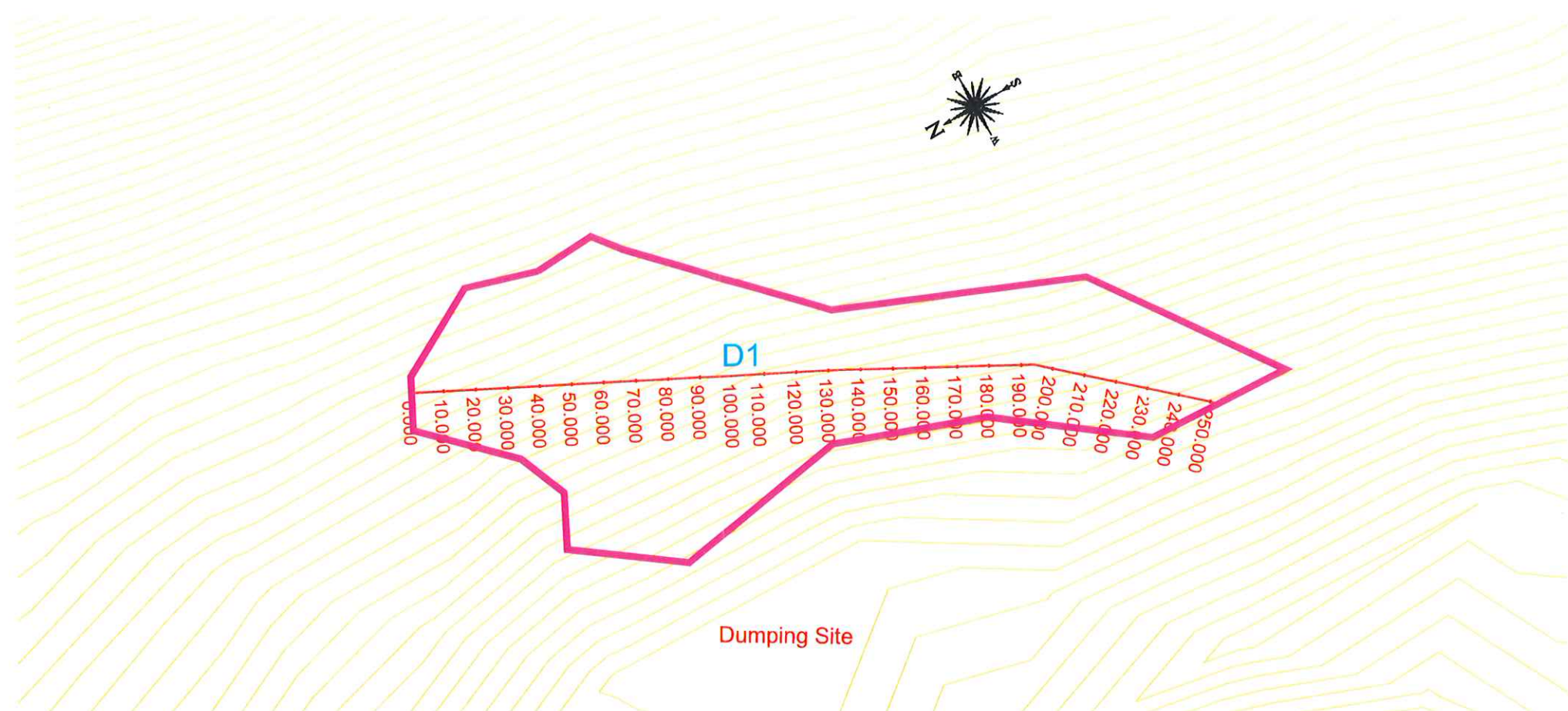
A budget of 9 crores has been earmarked towards management of muck as per components listed below.

Item No.	Descriptions
A	Removal of muck from various locations including loading, unloading and disposal at site up to average lead of 10 km.
B	Gabion wall with terracing as applicable for protection. (i) Providing & making Gabion structure with Mechanically Woven Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes as per IS 16014:2012, MORTH Clause 2500, of required size, Mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc coated, Mesh wire diameter 3.0 mm, mechanically edged/selvaged with partitions at every 1m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, tying with lacing wire of diameter 2.2mm, supplied @ 3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm, as per drawing, all complete as per direction of Engineer-in-charge. (ii) Terracing
C	Levelling, Rolling and Landscaping of top surface in slope as required of disposed soil at dumping site, all complete as per direction of Engineer.
D	Furnishing and laying of the live sods of perennial turf forming grass on embankment slope, verges or other locations shown on the drawing or as directed by the engineer including preparation of ground, fetching of sods and watering.
E	Providing, laying and spreading of 15 cm top soil layer for vegetation.
F	Stabilization of slope and Eco-restoration of disposed muck with Bio-Engineering techniques for development of vegetation.

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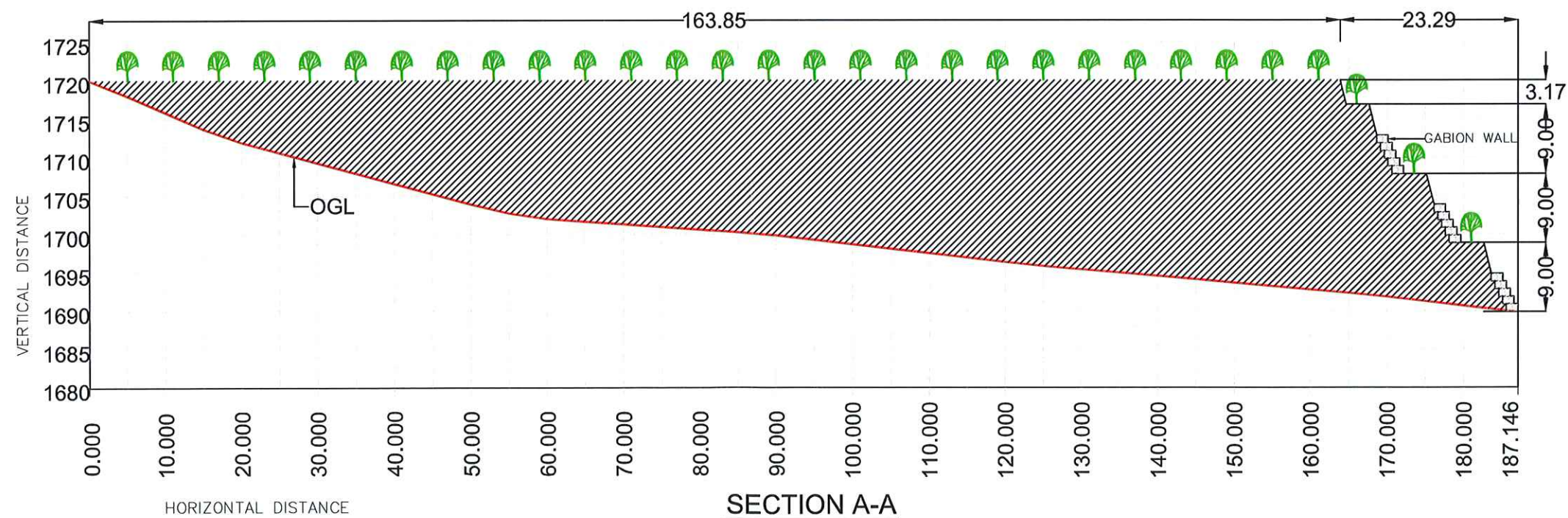
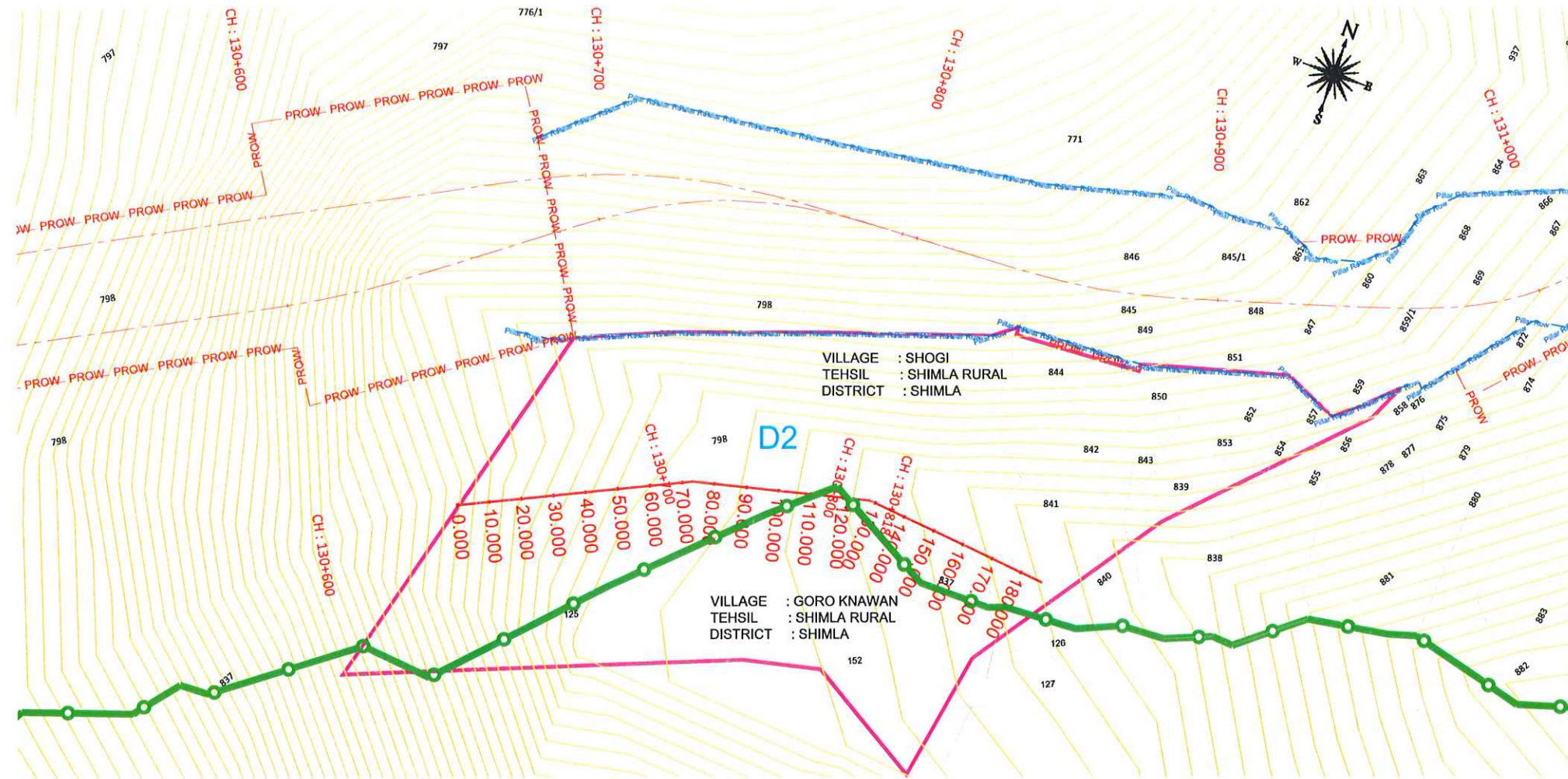
Package-1

Additional Forest land requirement of 11.7944 ha. for four laning of proposed Shimla Bypass from Kaithlighthat to Shakral Section (Package-I) of NH-22 (Chainage from Km. 128.835 to Km. 146.300) in already approved FCA case of the entire section from Kaithlighthat to Dhalli (Chainage from Km. 128.835 to Km. 156.560) of NH-22 for 40.3 Ha in the State of Himachal Pradesh.

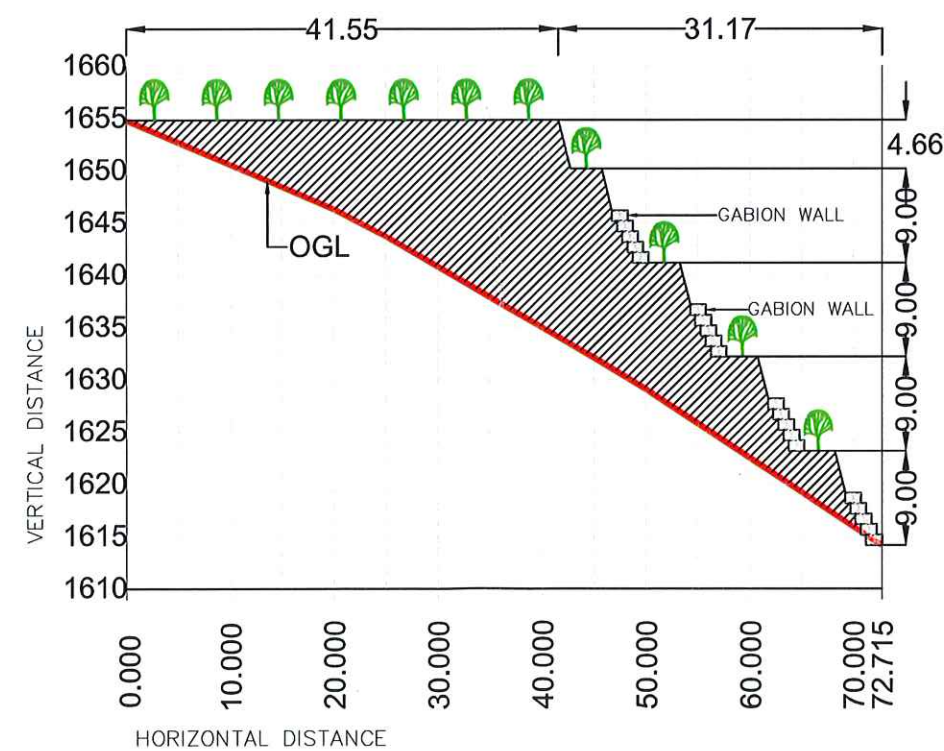
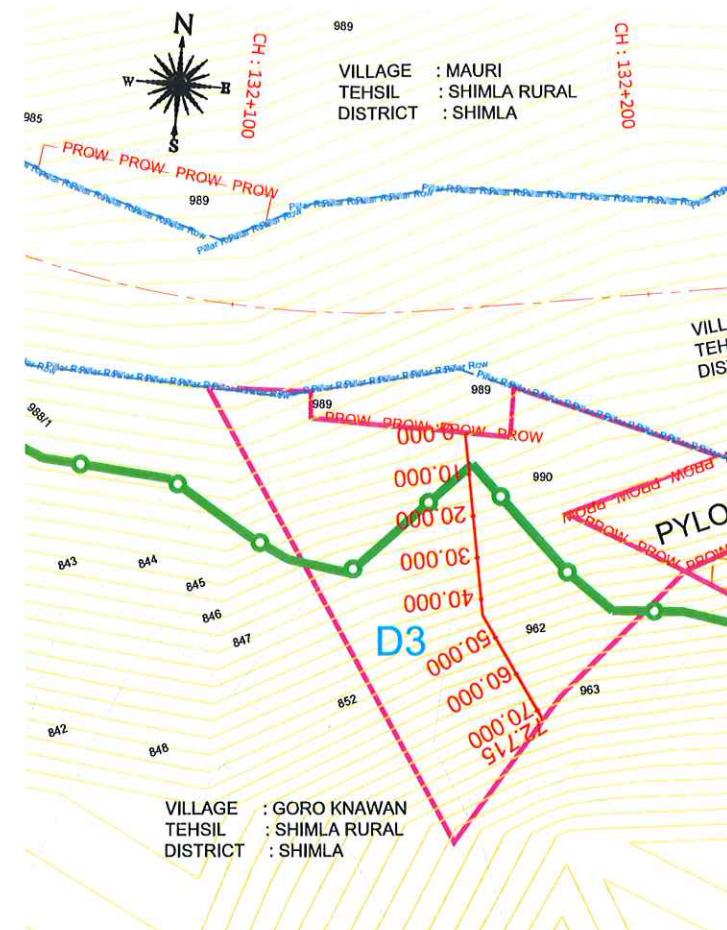


SECTION A-A
LONGITUDINAL PROFILE OF D1
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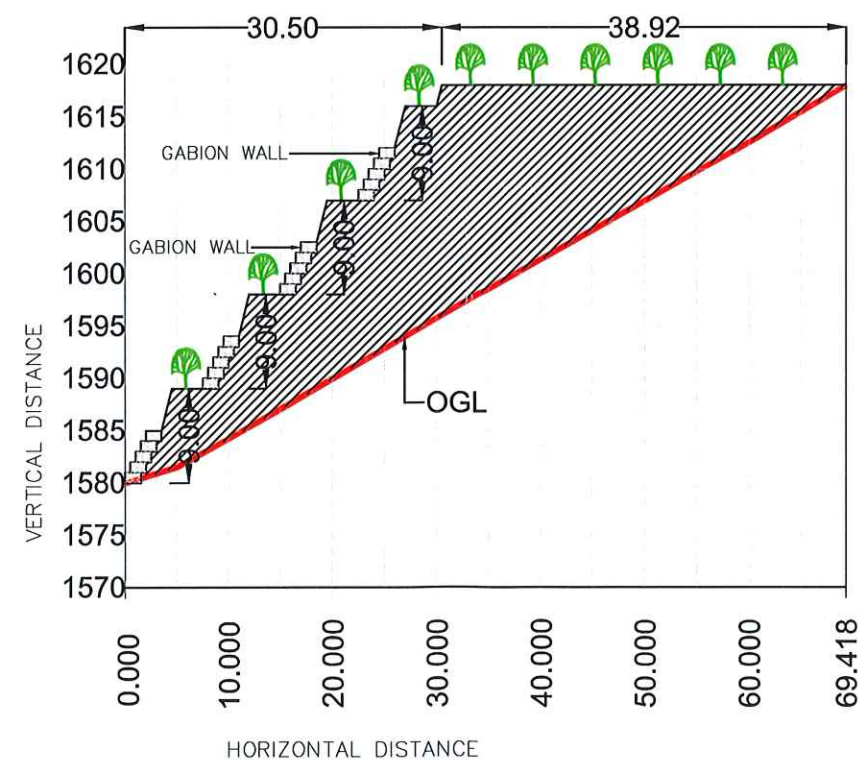
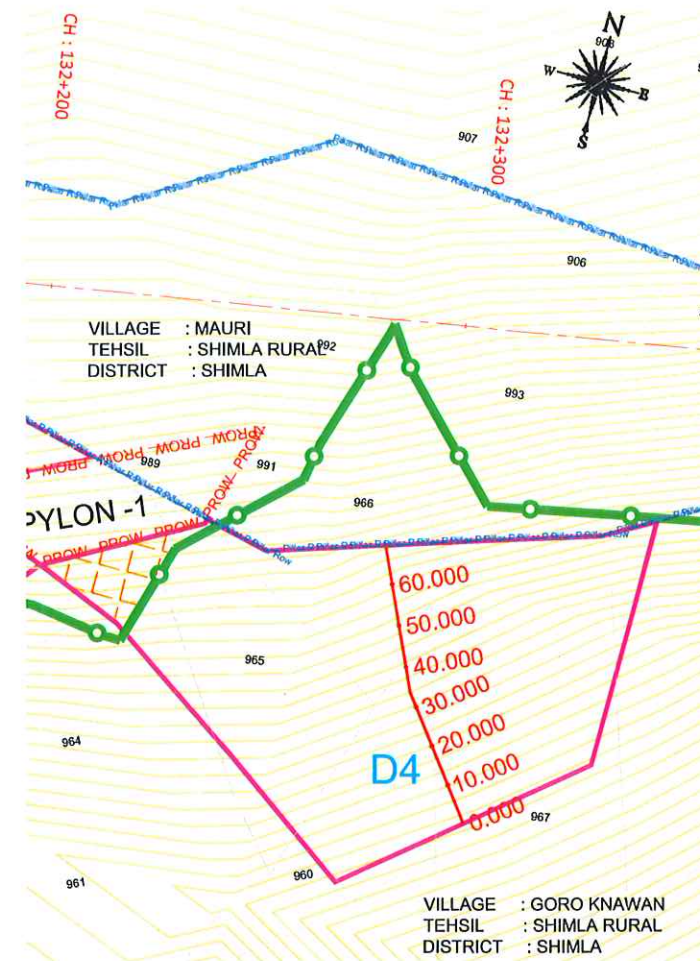


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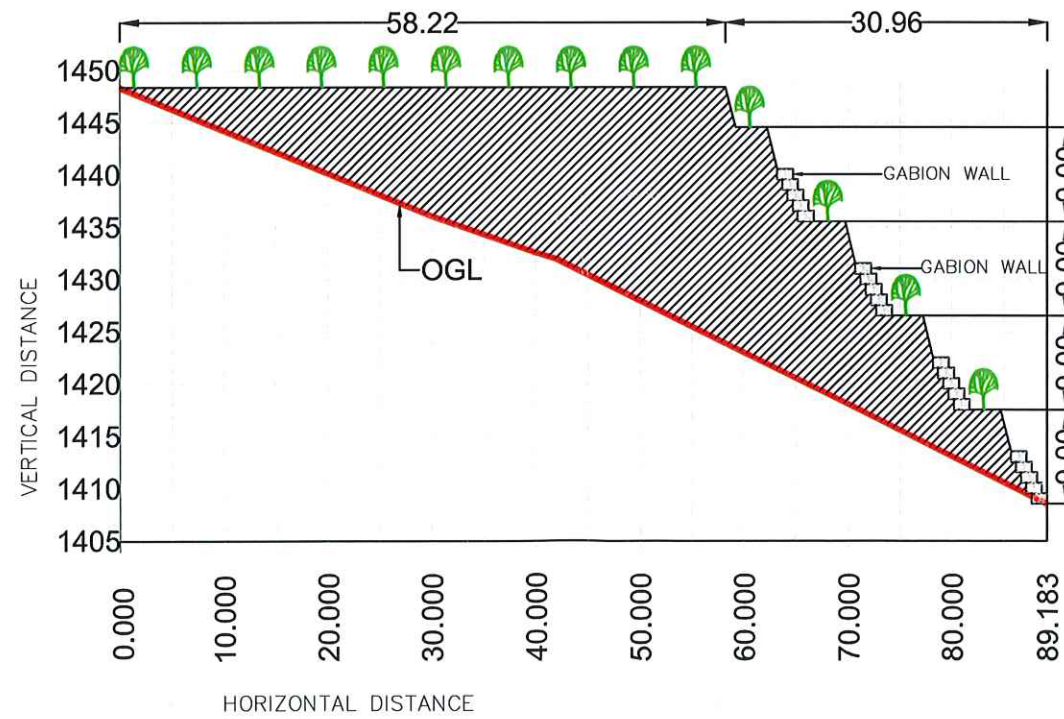
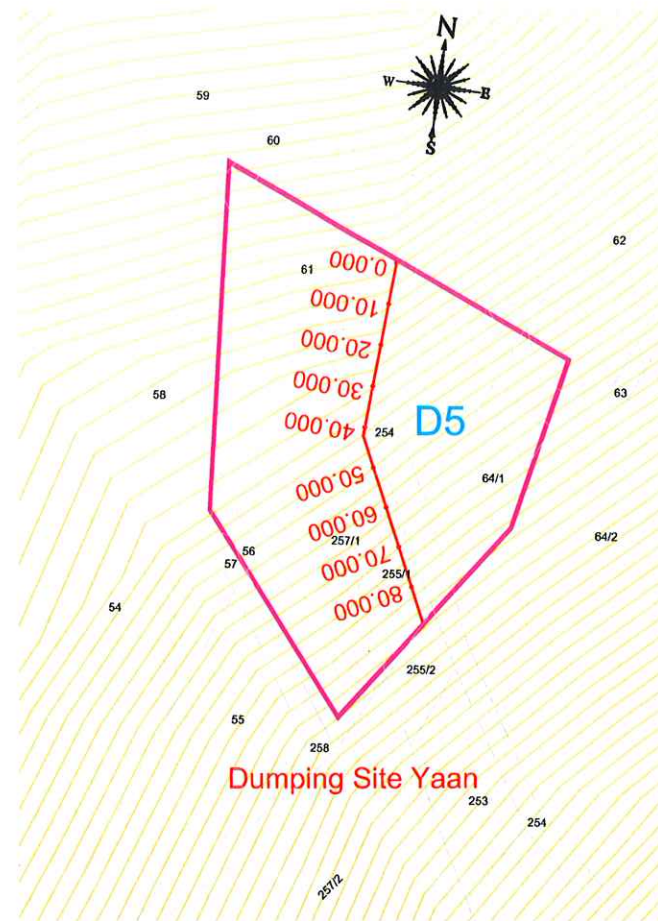
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QUANTITY = 41261.4 CUM

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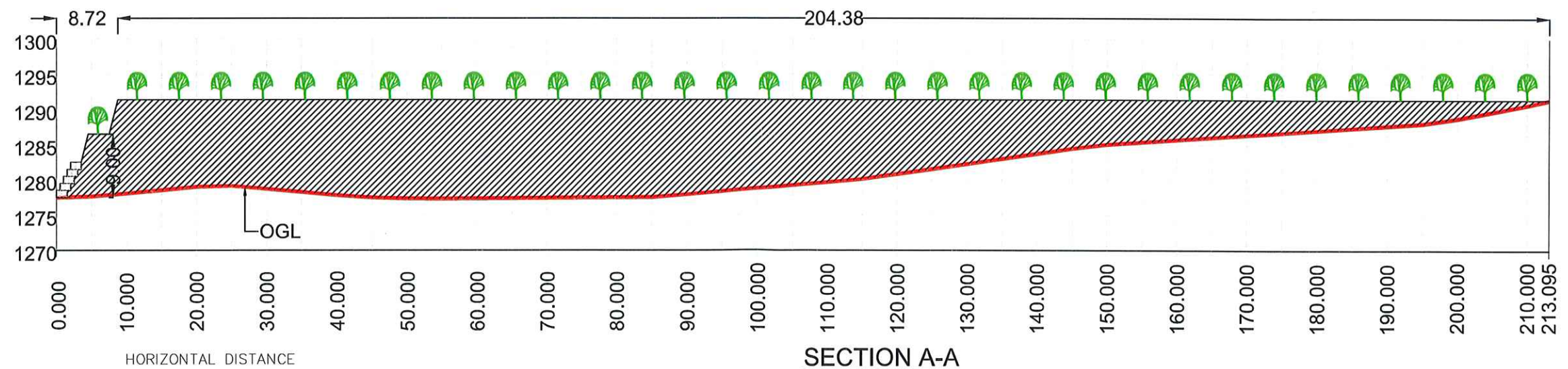
SECTION A-A
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QUANTITY = 45631.4 CUM

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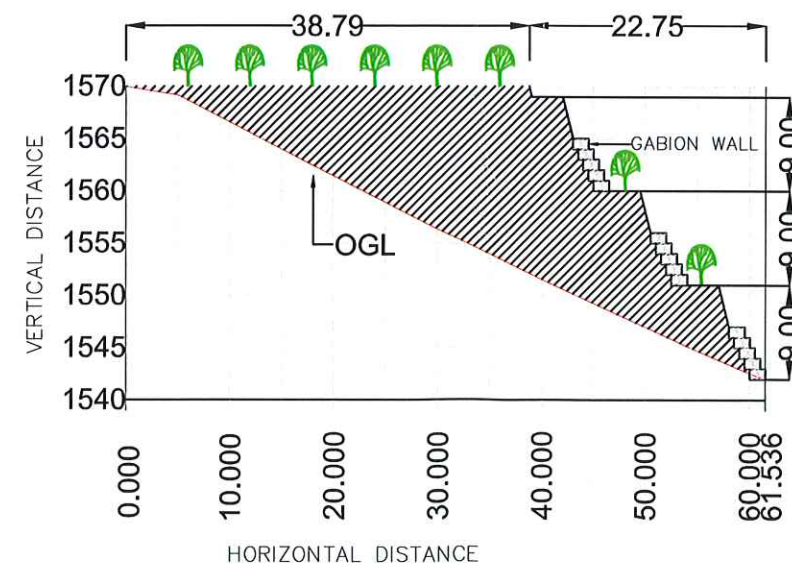
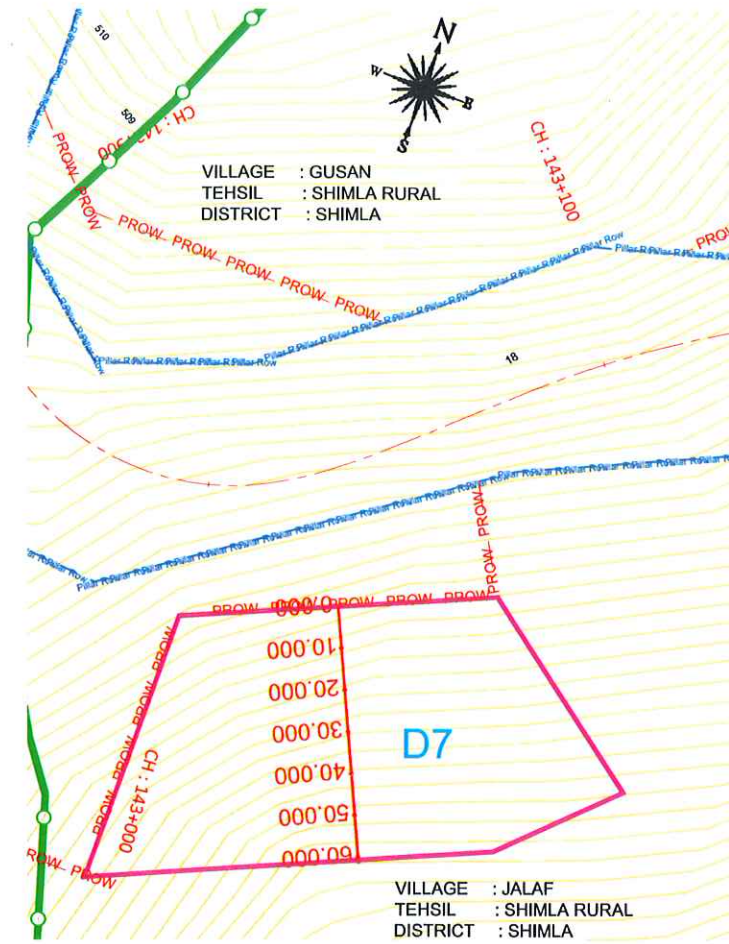


SECTION A-A
LONGITUDINAL PROFILE OF D5
QUANTITY = 77522.0 CUM

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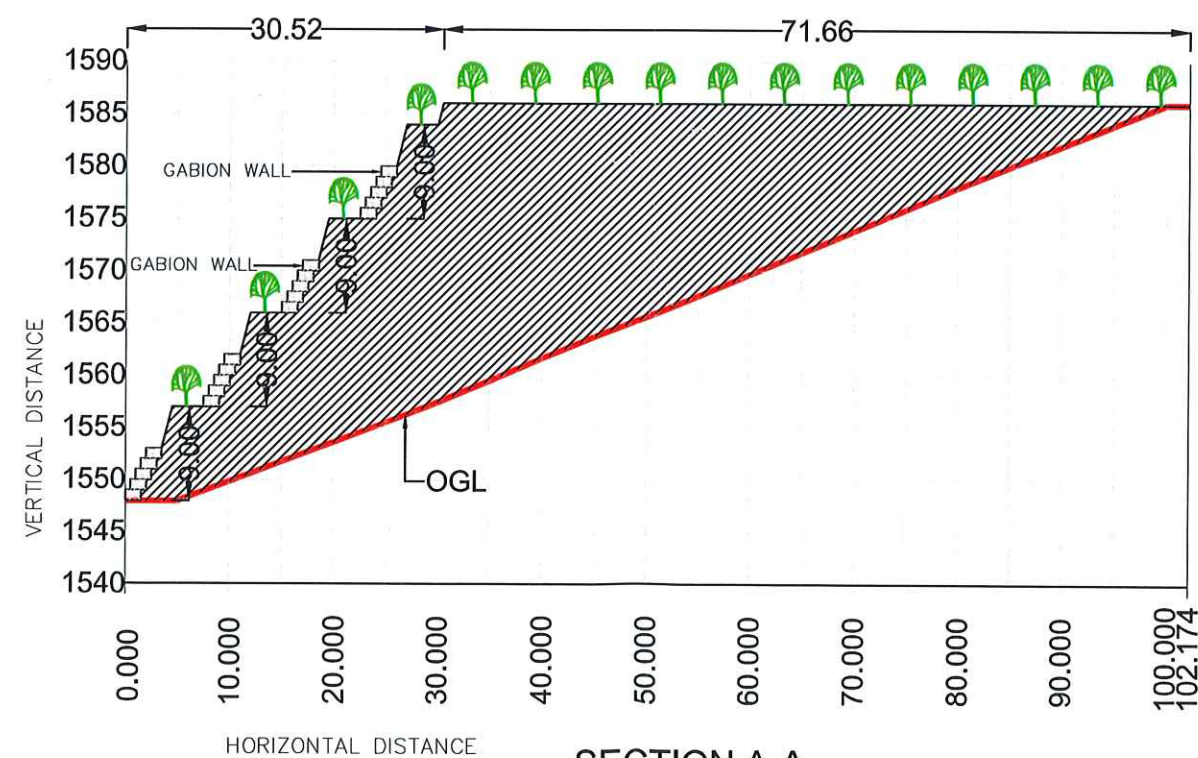
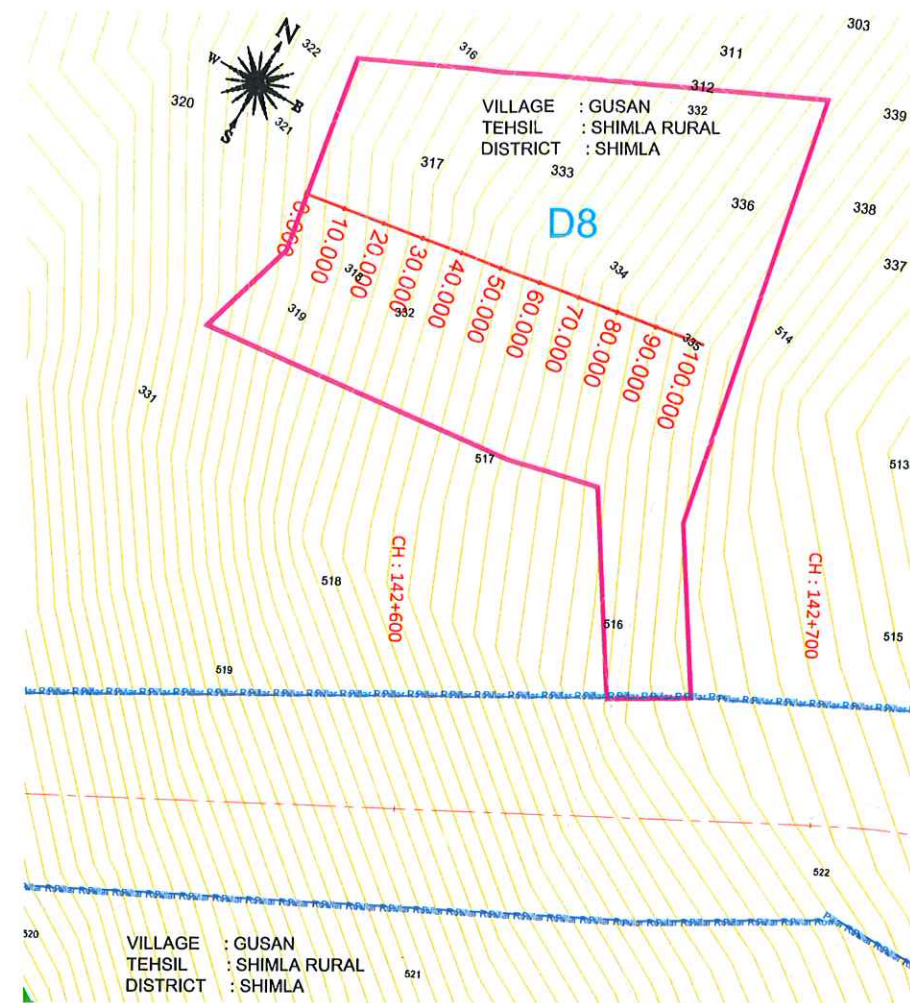


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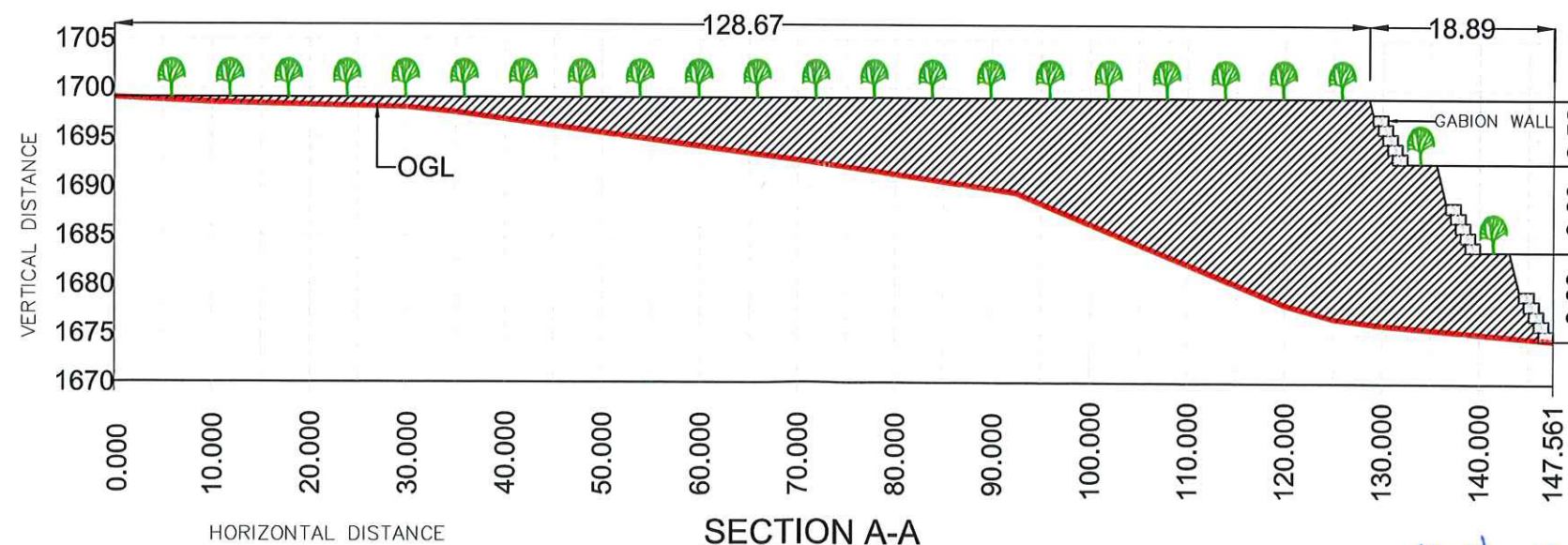
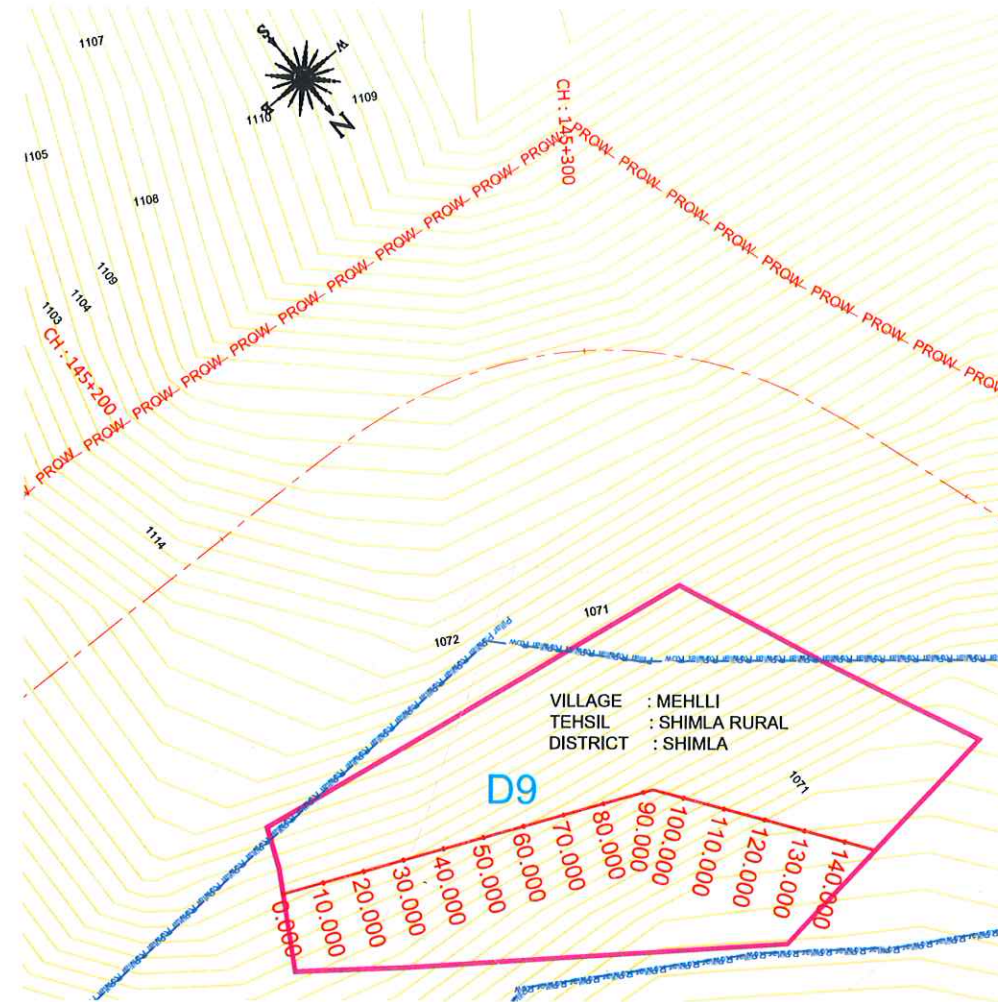
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LONGITUDINAL PROFILE OF D7
QUANTITY = 39579.9 CUM

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SECTION A-A
LONGITUDINAL PROFILE OF D8
QUANTITY = 149774.4 CUM

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SECTION A-A
LONGITUDINAL PROFILE OF D9
QUANTITY = 75578.8 CUM

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