

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)
SHAHPUR PUMPED STORAGE PROJECT (1800 MW)
(Sector 1(c); Cat "A")



Draft Report
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Prepared for:



M/s GREENKO ENERGIES PRIVATE LIMITED, HYDERABAD

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MUCK MANAGEMENT PLAN

Full title of the Project	:	Construction of Shahpur (1800 MW) Pumped Storage Project by M/s Greenko Energies Private Limited, in Hanumanthkhera, Mungawali villages, G.P-Subhdhara; Baint Village, G.P-Bichi; Sahjanpur Villages, G.P-Kasba Nonera; Kaloni, Shahpur Villages, G.P- Mundiyyar; Tehsil-Shahbad; Baran District, Rajasthan.
Proposal No	:	FP/RJ/HYD/121439/2021
Date of Proposal	:	03-02-2021
Diversion Area	:	407.8227 Ha

10.1 MUCK MANAGEMENT PLAN

The muck generated from various project activities during the construction of the PSP may adversely affect the environment if not properly managed. The generated muck volume, if not properly disposed, can destroy the landscape and increase the atmospheric particulate matter. The Proposed Shahpur (1800 MW) Pumped Storage Project (PSP) is located at Baran District, Rajasthan is likely to generate large volume of muck of which some quantity will be utilizable and the remaining muck volume needs to be rehabilitated at appropriate dumping sites in a technically and ecologically sound manner.

Map showing location of Muck dumping site is given at **Figure 10.1**.



Figure 10.1: Location of Muck Disposal Site

10.1.1 Quantity of Material to be Excavated

The construction activities of the project would generate muck from excavation of various project structures. The total quantity of muck likely to be generated from excavation including construction of roads is about 15.61 Mcum. The component-wise quantity of muck to be generated is given at **Table 10.6** and Quantity of Muck to be disposed at **Table 10.7**. However, after the utilization of muck for different project components and considering the swell factor of 40% for excavated material, the total quantity of muck to be disposed is worked out as **7.54 Mcum**. The entire excavated material is proposed to be dumped at one location identified specifically for this purpose as shown above.

Table 10.1: Muck to be generated from various components of the project

S. No.	Project Component	Total Quantity of Muck to be generated (Million m ³)
1	Upper Reservoir	1.04
2	Upper Intake	0.19
3	Upper Reservoir Dam	0.61
4	Penstock & Pressure Shaft	0.77
5	Powerhouse	1.35
6	TRT	0.17
7	Lower Reservoir Dam	0.40
8	Lower Intake & Tailrace Channel	0.93
9	Lower Reservoir	8.50
10	Adit	0.015
11	Roads	1.64
	Total	15.615

Table 10.2: Quantity of muck to be disposed

S. No.	Description	Quantity in Million m ³
1	Total quantum of muck generated from the project components	15.615
2	Considering the swelling factor of 40% for the muck generated (1)	6.246
3	Total Dumpable Muck	21.861
4	Total consumption (in aggregates fine & Course, Road Development, Protection works and Embankment of upper & lower reservoirs etc	14.32
5	Net Quantity of muck to be disposed (3-4)	7.54
6	Muck disposal in MD site with 30 ha area	5.61
7	Muck disposal in Dead Storage part of Lower & Upper Reservoir	1.93

10.1.2 Muck Disposal Site

For the disposal 7.54 Mcum of muck an area of 30 Ha having capacity of 5.61 Mcum has been identified and the balance muck 1.93 Mcum shall be accommodated in the dead storage of the Upper and Lower Reservoirs. The disposal site was identified taking into consideration availability of suitable area, minimum distance from generation sites. Chainage wise area available and capacity of muck dumping site is given at **Table 10.2**

10.1.2.1 Criteria for Selection of Dumping Site

The following points were considered and followed as guidelines for finalization of the areas to be used as dumping sites:

- i) The dumping sites have been selected as close as possible to the project area to avoid long distance transport of muck.
- ii) The site is free from any landslides or creep and care has been taken that the sites do not have a possibility of toe erosion and slope instability.
- iv) There is no active channel or stream flowing through the dumping sites.
- v) The site is away from human settlement areas.

The identification of muck disposal areas was done in line with the topographic and site-specific conditions as specified above.

Table 10.3 Details of muck disposal site

S. No.	Chainage (m)	Area (Sqm)	Capacity (m ³)	Total Muck to be Dumped (Million m ³)
1	0 m	11177.06	0.00	0
2	150m	7754.9	2082515.60	-
3	300m	7940.9	1177185.00	-
4	450m	6629.46	1092777.00	-
5	600m	3670.89	1261792.88	-
	TOTAL	37173.21	5614270.48	7.54

10.1.2.2 Methodology of Dumping

The muck that needs disposal would be piled at ϕ (angle of repose) maximum of 30° at the proposed dumping site. The description regarding the stabilization of the stacked material along the proposed roads has been discussed in the following paragraphs.

The options like dumping muck in stages and allowing it to consolidate/settle through the monsoon, compacting the dumped muck with Bulldozer movement, zoning of the dump judiciously to ensure the stability of 30° slope under all superimposed conditions will be explored and utilised. The plan and cross-sections of the proposed muck dumping site is given at **Figures 10.2 and Figure 10.3**.



Figure 10.2 : Plan of Muck Dumping Site



SECTION 1-1 AT CHAINAGE 0.00M



SECTION 2-2 AT CHAINAGE 100.00M



SECTION 3-3 AT CHAINAGE 200.00M



SECTION 4-4 AT CHAINAGE 450.00M



SECTION 5-5 AT CHAINAGE 650.00M

Figure 10.3 : Cross Section of Muck Dumping Site

The main objectives of process of muck dumping and restoration of these muck disposal sites are:

- to protect and control soil erosion;
- to create greenery in the muck disposal area;
- to improve and develop the sites into recreational site;
- to ensure maximum utilization of muck for the construction purpose;
- to develop the muck disposal site/ dumping yard to blend with the surrounding landscape; and

In Shahpur Pumped storage Project, a scientific approach and methodology was followed for identification of the dumping site. All possible alternate sites were inspected and examined before rejecting or selecting any site. The dumping site is characterized by:

- i) no forest cover,
- ii) the populated /settlement areas are away from the dumping site and therefore will have least impact on human settlements, and
- iii) the identified muck site is close to the area of generation to avoid hazards related to transport of muck for long distances and minimizing traffic problems.

The generated muck will be carried in dumper trucks tightly covered in line with international best practices. All precautionary measures will be followed during the dumping of muck. All dumpers will be well maintained to avoid any chances of loose soil from being falling during the transportation. All unpaved routes will be periodically wetted with the help of sprinklers prior to the movement of dump trucks. Dumping would be avoided during the high-speed wind, so that suspended particulate matter (PM₁₀) levels could be maintained. After the dumping the surface of dumps will be sprayed with water with the help of sprinklers and then compacted.

As mentioned above, for disposal of 7.54 Mcum of muck, an area of 30 Ha having capacity of 5.61 Mcum has been identified and the balance muck 1.93 Mcum shall be accommodated in the dead storage of the Upper and Lower Reservoirs. The spare capacity has been earmarked for temporary storage of usable muck, traffic movement of dumpers and lifters. The spoil from various construction sites would be disposed of at designated site in a controlled and orderly manner. All measures would be adopted to ensure that the dumping of muck does not cause injury or inconvenience to the people or the property around the area. The general topography of the disposal area has a very mild slope. The spillage of muck will be prevented by making concrete retaining walls to retain the piled muck. The top surface would be leveled and graded after the capacity of any dumping site is exhausted. The top surface will be covered with soil and grass seeding will be ensured to promote vegetation cover.

Suitable retaining walls shall be constructed prior to dumping of muck, and terraces would be developed to support the muck on vertical slope and for optimum space utilization. Loose muck would be compacted layer-wise. The compacted muck will be ultimately covered with fertile soil, and suitable plants will be planted adopting suitable bio-technological measures (see Figures 10.4).

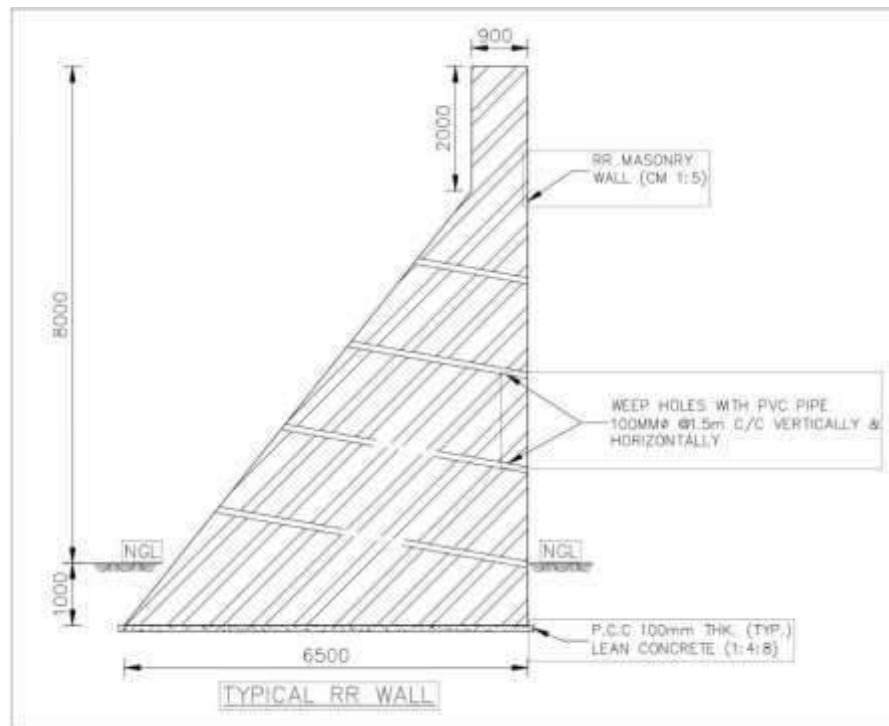


Figure 10.4 : Cross-section of Retaining Wall

10.1.3 Rehabilitation of Muck Disposal Site

The Rehabilitation plan of muck dumping site includes engineering and biological measures. The project authorities would ensure that the dumping yards blend with the natural landscape to develop the site with patches of greenery in and around it. The site can also be developed later as recreational park or any other purpose with sufficient greenery by planting ornamental plants. The muck dumping site would be developed as Eco-Park which would not only help in rehabilitation of disposed muck site but also help in propagating biodiversity conservations measures.

The following engineering and biological measures have been proposed for the development of spoiled areas.

10.1.3.1 Engineering Measures

For stacking of dumped material, RR masonry retaining wall is proposed to be built before dumping of any material on the site. The minimum length of dumping site is 2576 m and height of retaining wall is proposed to be 8 m. The retaining wall shall have PCC base of 100mm thick and a width of about 6.5 m. The masonry wall is proposed with weeping pipes with PVC pipes of 100 mm for drainage. The leveling & Sloping would be done after dumping the material; after every cycle and simultaneously improving the drainage of the disposal site.

All the approach road to various project structures will be constructed with minimal environmental damage. The methodology consists in developing the formation width is half cutting and half filling, so that the materials obtained from cutting are utilized in filling. The excavation on hill side will be done to get a stable slope for the materials encountered. At places breast wall, gabion walls shall be done in natural slope to retain filled material, particularly where there is problem of retaining the slope.

i) Retaining Wall

Total area for the dumping of muck is 30 ha which can accommodate 5.61 Mcum. The height of the retaining wall will be approximately 8 m. A typical sketch of the retaining wall is given at **Figure 10.4**.

ii) Compaction

Compaction is an engineering measure, which would reduce bulk density of the muck thereby optimizing the use of muck disposal area and would make it suitable for the plantation and other biological measures. Top surface would be levelled and graded to make the alternative use. The muck will be spread in layers of 500-700mm thick layers. Top surface would be levelled and graded to make the alternative use. On top a layer of soil would be spread to make the land suitable for plantation. The total cost for the process of compaction is **Rs. 250.00 lakh**.

iii) Fencing

Fencing is a bio-engineering measure. After rehabilitation of muck the dumping area need protection for some time from disturbing by human and domestic animals. For this reason, fencing around the muck deposited is required. Barbed wire strands with two diagonal strands, clamped to wooden/ concrete posts placed at 3 m distance are proposed around the dumping piles. Project authorities will establish temporary wind barriers around 3 sides of dumps in close of settlement area.

Estimated cost of engineering measures is given at **Table 10.4**.

Table 10.4: Estimated Cost of Engineering Measures

S. No.	Particular	Volume	Rate in Rs./cum	Cost in Rs. Lakh
1	Earthwork for foundation (Cum)	3536	250	8.84
2	PCC 100 mm Thick M10 Grade Concrete (Cum)	1800	4500	81.00
3	R.R. Masonry	15000	3500	525.70
4	Weep Holes with PVC Pipe 100 mmØ @1.5m C/C Vertically & Horizontally (Rmt)	22000	150	33.00
5	Compacting and land leveling, etc.	LS	LS	250.00
	Total			898.54

10.1.3.2 Biological Measures

Top surface area of the dumping is about 30 ha. This area will be treated for the purpose of plantation. Vegetation cover controls the hydrological and mechanical effects on soils and slopes. Therefore, biological measures to stabilize the loose slope are essential. To implement the biological measures in dumping area the following activities would be taken into account. The biological measures include the following:

i) Soil treatment

Muck dumped at various sites is not considered to be nutrient rich as it is excavated from tunnels and other structures. In order to make it suitable for the plantation it will be provided bio treatment.

ii) Plantation

The selected species will be planted after their nurseries have been developed. The dumping areas are very small therefore; separate nursery would not be required. Saplings for plantation should be procured from forest department nursery. Nearly 1-2 years old saplings would be used for the plantation. Grasses and herbaceous species would be used in the inter space of tree and shrub species. They will help in providing the continuous chain of support in retaining debris, reinforcing soil and increasing the infiltration capacity of the area.

After the process of compaction dumping site will be available for the plantation. In consultation with the horticultural department as well as forest department.

The afforestation with indigenous plant species of high ecological and economic value which can adapt to local habitat will be undertaken with 400-600 plants per hectare depending upon the canopy cover required. Major tree species which would be planted are listed in table below.

S. No.	Family	Scientific Name	Habitat
1	Anacardiaceae	<i>Mangifera indica</i>	Tree
2	Anonaceae	<i>Polyalthia longifolia</i>	Tree
3	Bignoniaceae	<i>Jacaranda mimosifolia</i>	Tree
4	Combretaceae	<i>Terminalia tomentosa</i>	Tree
5	Combretaceae	<i>Terminalia bellirice</i>	Tree
6	Fabaceae	<i>Albizia lebbeck</i>	Tree
7	Fabaceae	<i>Cassia fistula</i>	Tree
8	Fabaceae	<i>Dalbergia sissoo</i>	Tree
9	Fabaceae	<i>Dalbergia penniculata</i>	Tree
10	Fabaceae	<i>Acacia nilotica</i>	Tree
11	Fabaceae	<i>Acacia catechu</i>	Tree
12	Lamiaceae	<i>Tectona grandis</i>	Tree
13	Magnoliaceae	<i>Magnolia champaca</i>	Tree
14	Meliaceae	<i>Azadirachta indica</i>	Tree
15	Meliaceae	<i>Toona ciliata</i>	Tree
16	Myrtaceae	<i>Syzygium cumini</i>	Tree
17	Rubiaceae	<i>Anthocephalus Cadamba</i>	Tree
18	Rutaceae	<i>Aegle marmelos</i>	Tree
19	Sapotaceae	<i>Madhuca indica</i>	Tree
20	Acanthaceae	<i>Justicia adhatoda</i>	Shrub
21	Apocynaceae	<i>Nerium indicum</i>	Shrub
22	Euphorbiaceae	<i>Jatropha curcas</i>	Shrub
23	Poaceae	<i>Dendrocalamus strictus</i>	Shrub
24	Sapindaceae	<i>Dodonaea viscosa</i>	Shrub
25	Verbenaceae	<i>Vitex negundo</i>	Shrub

The estimated cost of these measures would be **Rs. 169.50 lakh**. This cost includes the cost of turfing of slopes, preparation of ground, spreading of manure, etc., providing 5 cm of soil cover and transportation and carriage. It also includes the cost of fencing, irrigation, watch and ward, etc. (see Table 10.5).

Table 10.5: Total financial outlay for the biological measures at dumping sites

S. No.	Particulars	Quantity	Rate (in Rs.)	Amount (Rs. in lakh)
1	Site preparation (Levelling and spreading of fertile soil)	30 ha	10,000	5.00
2	Pitting (size: 0.45 m x 0.45 m x 0.45 m)		Lumpsum	15.00
3	Manure and soil filling in pits including transportation		Lumpsum	12.00
4	Cost of plant material		Lumpsum	10.00
5	Transportation of Plant material from nursery	-	Lumpsum	5.00
6	Cost of RCC fence post and B/Wire	30 ha	25000.0	12.50
7	Planting of entire Plants raised in P/bag	30 ha	20,000	10.00
8	Maintenance for 5 years			50.00
9	Misc. (watering, transport, etc.)	-	Lumpsum	50.00
	Total			169.50

10.1.4 Financial Requirement

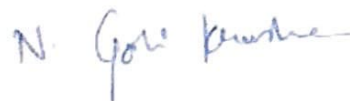
The estimated cost of the relocation and rehabilitation of excavated material is given in Table 10.6. The total cost of these measures will be Rs. 1068.04 lakh.

Table 10.6: Financial requirements for implementation of Muck Disposal Plan

S. No.	Item	Amount (Rs.in lakh)
1.	Engineering measures	898.54
2.	Biological measures	169.50
	Total	1068.04

Date: 20.06.2023

Name: Gopi Krushna N



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Place: Hyderabad

Authorized Signatory


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