Disclaimer:

This Feasibility Study and Partner Program has been prepared by Indian Port Rail & Ropeway Corporation Limited (IPRCL) formerly known as Indian Port Rail Corporation Limited with a clear conscience based on our experience with similar projects and should support the project initiators to take the right decisions regarding the development of the Shillong View point to Lawsohtun Ropeway Project. Any future decisions are in the sole responsibility of the project initiators, Indian Port Rail & Ropeway Corporation Limited cannot be made liable for any decisions.

This Feasibility Study and Partner Program has originally been prepared in English language. The current Study displays all the information available at the time of conducting the study.

Contents

INDEX OF FIGURES

INDEX OF TABLES

INDEX OF ABBREVIATIONS

IPRCL	Indian Port Rail & Ropeway Corporation Limited
STP	Sewerage Treatment Plant
PMC	Project Management Consultancy
DPR	Detailed Project Report
LTP	Lower Terminal Point
UTP	Upper Terminal Point
ACF	Annual Concession Fee
VGF	Viability Gap Funding
IRR	Internal Rate of Return
CAGR	Compound Annual Growth Rate
MDG	Monocable Detachable Gondola
EIA	Environmental Impact Assessment
BOO	Build- Own - Operate
BOO	Build- Own – Operate – Transfer
BOT	Build- Operate- Transfer
DBO	Design- Build- Operate
DBM	Design – Build – Maintain
BDO	Build- Develop- Operate
DBFOT	Design – Build – Finance - Operate - Transfer
MOU	Memorandum of undertaking
LPCD	Litre per capita per day

1 ABOUT IPRCL

Indian Port Rail & Ropeway Corporation Limited (IPRCL) formerly known as Indian Port Rail Corporation Limited, a first of its kind Joint Venture Company (JVC) between the Major Ports under the Ministry of Shipping and RVNL with the objective to provide efficient rail evacuation systems to Major Ports and for enhancing their capacity and throughput. IPRCL is mandated to develop ropeways across India.

- The company was registered on 10th July, 2015 as a Public Limited Company under the Companies Act, 2013. Recently IPRCL has been entrusted upon nationwide development of Ropeway Projects.
- IPRCL will play a strategic role and position itself to act as mentor & coordinator for Major Ports Railway systems and Ropeways.
- IPRCL is an interface with Government departments/ agencies and autonomous bodies on strategic issues and also work with consultants for removing bottlenecks.
- Act as consultant for bringing in best practices in areas of IT, processes, systems and other areas related to evacuation of Cargo and development of Ropeways.
- Develop technical and financial competence for undertaking DPR/PMC work.
- IPRCL can leverage the experience, expertise and linkages to various organizations (Ministry of Shipping, Major Ports, RVNL, MoRTH) to build a strong base in the initial years of its existence.
- Contribute to the role of a Think-tank to develop scalable, workable models in Ropeways & port infrastructure for evacuation of cargo.
- Effectively interface with State Governments for development of Ropeway Projects. Interface with the Indian Railways for addressing issues such as supply of rakes, pre-project approvals and post-project certifications.

- Attract investors and financial resources for development of Ropeway and port evacuation infrastructure projects.

IPRCL has focused on developing affordable and sustainable rope-based transport infrastructure projects in India for the transport of passengers and cargo in remote and mountainous areas.

1.1 IPRCL in Ropeway

For Ropeway, IPRCL has built up capacity to offer various services like preparation of Feasibility Report and DPR, Bid Process Management and PMC. IPRCL is presently dealing with many Ropeway projects in India. Some of them are Haji Bunde – Elephanta Ropeway in Mumbai, Two Ropeway Projects in the State of Manipur, two ropeway projects in Tripura, Berm park to Bhavani Island ropeway in the state of Andhra Pradesh and Ropeway Projects in Kanyakumari, Naina Devi Ji to Anandpur Sahib Ji in Himachal Pradesh and Punjab etc. IPRCL also working with MMRDA to develop urban ropeway in the city of Mumbai.

IPRCL offer following consultation services in respect of Ropeway Projects:

- Preparation of Feasibility Report
- Preparation of the Detailed Project Report
- Bid Process Management
- Project Management Consultancy for execution of the Project
- Independent Engineer and Safety certification.

For Feasibility Project Report, IPRCL undertakes reconnaissance survey to fix up the tentative alignment of the Ropeway. The details of service include

- Preliminary survey of Ropeway site by team of IPRCL ropeway experts.
- Identifying suitable locations for lower station and upper station
- Suggesting alternative ropeway alignments.
- Traffic Study.
- Ropeway System selection based on traffic study and topographic inputs.
- Project Cost Estimation
- List of Statutory Clearance required.

- EIA Inputs
- Financial Analysis

1.2 Contact Details

Mr. Sanjiv Mhetre, GM Mechanical will work as single point of contact for the project from IPRCL. He can be reached at following address for any communication,

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2 MEGHALAYA

2.1 Introduction

Meghalaya is a hilly state in northeastern India. The name means "the abode of clouds" in Sanskrit. The population of Meghalaya as of 2016 is estimated to be 3,211,474. Meghalaya covers an area of approximately 22,430 square kilometers, with a length to breadth ratio of about 3:1.

The state is bounded to the south by the Bangladeshi divisions of Mymensingh and Sylhet, to the west by the Bangladeshi division of Rangpur, and to the north and east by India's State of Assam. The capital of Meghalaya is Shillong. During the British rule of India, the British imperial authorities nicknamed it the "Scotland of the East". Meghalaya was previously part of Assam, but on 21 January 1972, the districts of Khasi, Garo and Jaintia hills became the new state of Meghalaya. English is the official language of Meghalaya. The other principal languages spoken include Khasi, Garo, Assamese and Bengali. Unlike many Indian states, Meghalaya has historically followed a matrilineal system where the lineage and inheritance are traced through women; the youngest daughter inherits all wealth and she also takes care of her parents.

The state is the wettest region of India, recording an average of 12,000 mm (470 in) of rain a year. About 70% of the state is forested.[8] The Meghalaya subtropical forests ecoregion encompasses the state; its mountain forests are distinct from the lowland tropical forests to the north and south. The forests are notable for their biodiversity of mammals, birds, and plants.

Meghalaya has predominantly an agrarian economy with a significant commercial forestry industry. The important crops are potatoes, rice, maize, pineapples, bananas, papayas, spices, etc. The service sector is made up of real estate and insurance companies. Meghalaya's gross state domestic product for 2012 was estimated at ₹16,173 crore (US$2.3 billion) in current prices. The state is geologically rich in minerals, but it has no significant industries.[7] The state has about 1,170 km (730 mi) of national highways. It is also a major logistical center for trade with Bangladesh.

In July 2018, the International Commission on Stratigraphy divided the Holocene epoch into three, with the late Holocene being called the Meghalayan stage/age, since a speleothem in Mawmluh cave indicating a dramatic worldwide climate event around 2250 BC had been chosen as the boundary stratotype.

Meghalaya, along with the neighboring Indian states, have been of archeological interest. People have lived here since Neolithic era. Neolithic sites discovered so far are located in areas of high elevation such as in Khasi Hills, Garo Hills and neighboring states. Here neolithic style jhum or shifting cultivation is practiced even today. The highland plateaus fed by abundant rains provided safety from floods and a rich soil. The importance of Meghalaya is its possible role in human history through domestication of rice. One of the competing theories for the origin of rice, is from Ian Glover, who states, "India is the center of greatest diversity of domesticated rice with over 20,000 identified species and Northeast India is the most favorable single area of the origin of domesticated rice." The limited archeology done in the hills of Meghalaya suggest human settlement since ancient times.

Figure 2-1Meghalaya view

2.2 Tourists Spot in Meghalaya

2.2.1 Shillong

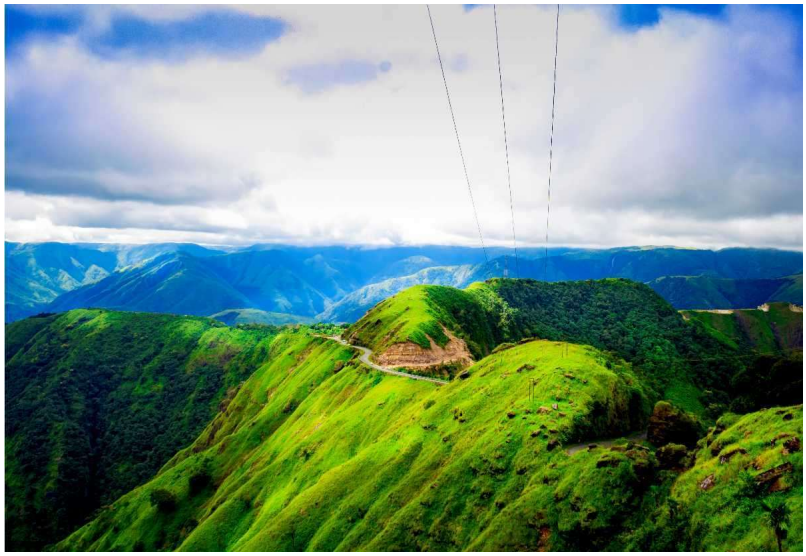


Figure 2-2 Shillong

A beautiful city encircled by pine trees, Shillong is the capital of Meghalaya. It derives its name from Lei Shyllong, an idol worshipped at the Shillong View point . Standing as tall as 1496 meters, Shillong provides a relief from the heat across the country. This hill station is known for its picturesque sights and traditions. The soothing climate makes Shillong suitable to visit in all seasons. The light drizzles and the cooling gentle wind adds to the joy of visiting this hill station. This place is also known as the 'Scotland of the East'. One can find descendants of the Khyrim, Mylliem, Maharam, Mallaisohmat, Bhowal and Langrim tribes.

Shillong, the capital of Meghalaya, is the home to numerous waterfalls. The exciting mountain peaks, crystal clear lakes, breathtakingly beautiful golf courses, museums and the zoo are the key reasons why people visit Shillong. Apart from the natural beauty, Shillong also acts as the gateway to Meghalaya, the state famous for heavy rainfalls, caving, tallest waterfalls, beautiful landscapes and amazing people and culture. Shillong in particular has been in limelight for its jovial people and their culture. Interestingly, Shillong has a very westernised culture and it has a very young feel to it. Shillong is also famous as the music capital of India, as many prominent musicians have hailed from this place. Many music events keep happening throughout the year, making it a very lively place.

2.2.2 **Cherapunji**

Figure 2-3 Double Decker Living root Bridge

Among the wettest place on the Earth, Cherrapunjee with its clean and pristine surroundings is an excellent place to sit back and unwind.

With a unique climate gifted to the area, its untouched beauty and an environment similar to the freshest dew drops, Cherrapunjee is sure to refresh you inside out. The waterfalls in the area only compliment the climate and the flattering pleasant air around. These include the Dain Thelen falls, Noh Sngithiang falls, Noh Kalikai falls and more. This rainy misty place is also famous for astounding tourists with the lavish spread of the Bangladesh plains from it's cliffs.

2.2.3 **Mawsynram**

Figure 2-4Mawsynram water fall

Acknowledged as one of the wettest place in the world, the mesmerizing village of Mawsynram is a nature lover's delight and the perfect destination to behold the beauty of the rains. Mawsynram trounces Cherrapunjee by a slight margin in being the wettest place in India.

A rain lover's paradise, Mawsynram is one of the best tourist attractions of India. The 'Maw' in Mawsynram is a Khasi word meaning 'stone'. It symbolizes the unique megaliths unearthed in the Khasi Hill area. The village is well known for its huge formation of a stalagmite, which takes after the shape of a 'Shivling'. Located in the East Khasi Hill district of Mawsynram is 1400 m above sea level. The rains are so powerful in Mawsynram that the local villagers have to make use of thick grass to sound-proof their homes from the thunderous rain.

Figure 2-5Jowai Waterfall

2.2.4 **Jowai**

Located in the Jaintia Hills district, Jowai is famous for its scenic setting and breathtaking views with the perfect mix of heritage and culture.

Located in the Jaintia Hills district, Jowai is famous for its scenic setting and breathtaking views - like all other cities of the state. The place is a rich mix of heritage and cultures which reflects in the lifestyle of the town folks. Lakes are the main attraction of Jowai. The Thadlaskein Lake and Lalong Park are the famous tourists hot spots while Syntu Ksiar is also a popular destination on the shores of river Myntdu

2.2.5 **Tura**

Figure 2-6Siju Caves

Located in the West Garo hills, Tura provides a spellbinding as well as serene environment being quite an unexplored town.

This relatively large town in Meghalaya is located in the West Garo Hills. The main attraction of this town is the Nokrek National Park which is 12km from the town where various animals such as the leopard, golden cat, wild buffalo, pheasant and many more find habitat. One may also visit the Rongbang Dar Falls, while a trip to this area, without visiting the Siju caves, would remain somewhat incomplete. The entire area has the simple nature of an unexplored destination, with a shifted world.

2.2.6 **Nongpoh**

Figure 2-7Nongpoh

Nongpoh, Meghalaya is a petite town to be found to the North of the East Khasi Hills. Situated very close to the gorgeous Brahmaputra plains, this location is quite a favourite as a stopover before reaching Shillong.

Nongpoh is the administrative headquarters of Ri-Bhoi district of the Indian state of Meghalaya which in turn makes it a very significant town of this state. Beautiful rivers, encircling plush green trees, serene climatic conditions are enough to make your trip a comfortable and enjoyable one.

2.2.7 **Williamnagar**

Figure 2-8Williamnagar

Williamnagar was formed around the former town of Simsanggre, which is based on the large plains of the Simsang River. A very remote area usually known for its abundance of natural beauty i.e. being flanked by the mountains and having a rich composition of both water and vegetation.

Williamnagar, the headquarters of the East Garo Hills district of Meghalaya, was named after Captain Williamson A. Sangma, the first Chief Minister of the State of Meghalaya. Williamnagar is of immense historical importance as it was here that the Garos made their last major resistance to the British invasion into Garo Hills during the year 1837.

2.2.8 **Baghmara**

Figure 2-9Baghmara

Situated in Meghalaya, Baghmara is not only rich in flora and fauna, but it is enveloped by lakes, rivers, hills and every significant element of the nature. Flanked by the South Garo hills and fed by the Simsang river, this minute town is host to hordes of tourists every year.

Every wildlife freak should visit this place because just 4km from the town of Baghmara, is the Baghmara Reserve Forest, inhabited with elephants, birds and langurs. For the labyrinth lovers, there are the Siju caves, the third longest cave system in the Indian subcontinent consisting of innumerable

labyrinths and chambers. The magnificent limestone rock formation inside the caves, termed as the 'Princess Di's Chamber' is particularly awe-inspiring. Like this wasn't enough, the Siju Bird Sanctuary offers to keep the bird enthusiasts hooked up with the rarest of species migrating here during the winters. If you're catching up with your old mates on a short vacation, this is the place to be.

2.2.9 **Elephant Falls**

Named after an Elephant like stone at its foot, the Elephant Falls are amongst the most popular falls in the North-East, situated next to Shillong. It is a tourists' paradise with three layers of the falls accessible to the layman from different vantage points. The Britishers named this fall so owing to the presence of an elephant-shaped rock on one side of the fall. However, the stone disintegrated and was washed away due to an earthquake in 1897. Elephant Waterfalls is a superb place for spending some time in the midst of nature while capturing the incredible moments for your keepsake.

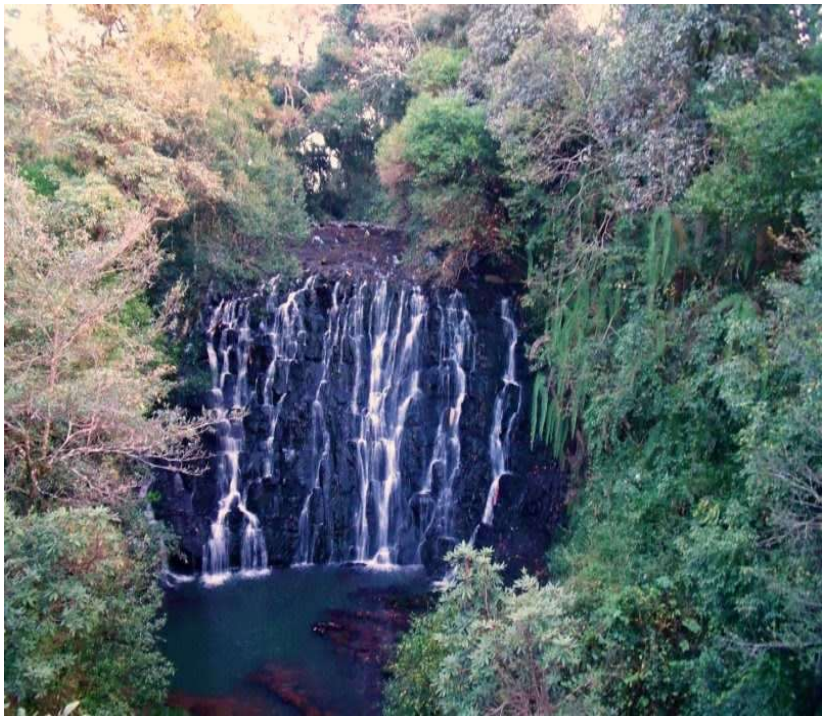


Figure 2-10Elephanta Fall

The breathtaking Elephant falls were referred to as 'Ka Kshaid Lai Pateng Khohsiew' by the local Khasi people, which means 'The Three Step Waterfalls', as these falls consist of three mesmerising falls in succession. The first of the three waterfalls are tucked between the dense trees and are very broad. The second waterfall reduces to thin strands of water and is almost negligible in winters due to the receding water levels. The third and the most visible waterfall is the tallest with clear water flowing like a sheet of milk on the dark rocks in the backdrop. Out of the three, the third waterfall tends to strike the visitors as the most impressive. Elephant Falls is a great stopover destination

before one head for further journeys into Meghalaya. Located 12 km away from the capital city of Shillong, it is one of the most visited falls in the beautiful state.

2.2.10 Nohkalikai Waterfalls

Figure 2-11Nohkalikai Waterfall

The fourth highest waterfalls in the world, Nohkalikai falls plunge some 335 meters from a verdant cliff to the ground giving the portrayal of immense and natural magnificence. The pride of the state of Meghalaya, the falls are one of the most beautiful and grand waterfalls in the country. Tucked in between evergreen rainforest of the Khasi Hill and flowing with all its majesty and might, the falls plunges into a lagoon which is as blue as the afternoon sky.

Nohkalikai Falls is one of the most popular and significant places to see in the North-East. The name of the falls is attached with a sad story of woman named Ka Likai who remarried a man, who believed that she loved his daughter more than him. So one day while Ka Likai was working outside, the man killed his daughter and cooked her flesh and served it to Ka Likai. She ate the meal and went out to look for her daughter and while doing so she found her fingers in a beet-nut basket. Seeing this she became very upset and plunged to death from the waterfall which was now renamed 'Noh Ka Likai '.

2.3 Shillong

Shillong is a hill station in the northeastern part of India and the capital of Meghalaya, which means "The Abode of Clouds". It is the headquarters of the East Khasi Hills district. Shillong is the 330th most populous city in India with a population of 143,229 according to the 2011 census.It is said that the rolling hills around the town reminded the British of Scotland. Hence, they would also refer to it as the "Scotland of the East"

Shillong has steadily grown in size since it was made the civil station of the Khasi and Jaintia Hills in 1864 by the British. In 1874, on the formation of Assam as the Chief Commissioner's Province, it was chosen as the headquarters of the new administration because of its convenient location between the Brahmaputra and Surma valleys and more so because the climate of Shillong was much cooler than tropical India.Shillong remained the capital of undivided Assam until the creation of the new state of Meghalaya on 21 January 1972, when Shillong became the capital of Meghalaya, and Assam moved its capital to Dispur in Guwahati

Shillong is at 25.57°N 91.88°E. It lies on the Shillong Plateau, the only major uplifted structure in the northern Indian shield.The city lies in the centre of the plateau and is surrounded by hills, three of which are revered in Khasi tradition: Lum Sohpetbneng, Lum Diengiei, and Lum Shillong.

Shillong, the capital city of Meghalaya is just 100 km (62 mi) from Guwahati which can be accessed by road along NH 40, a journey of about 2 hours 30 minutes through lush green hills and the magnificent Umiam lake in between.

2.3.1 Tourists Attraction in Shillong

- **Elephant Falls**: 12 km on the outskirts of the city, the mountain stream descends through three successive falls set in dells of fern covered rocks.
- **Lady Hydari Park**: The park stretches over a kilometre and has an adjacent mini zoo.
- **Wards Lake**: Known locally as Nan-Polok. It is an artificial lake with garden and boating facilities, built during the colonial era.
- **Shillong Golf Course**: Shillong has one of the largest natural golf courses in Asia: Gleneagles of the East. It enjoys the rare distinction of being one of the few natural golf courses in Asia. Not only is the Shillong Golf Course scenic and enjoyable, it is also challenging. A group of British civil service officers introduced golf to Shillong in 1898 by constructing a nine-hole course. The present 18-hole course was inaugurated in 1924. The course is set in a valley covered with pine and rhododendron trees. The tight fairways, carpeted with a local grass which hardens the soil, are difficult to negotiate. The number of out-of-bounds streams that criss-cross every fairway makes it all the more trying. Obstructions come in the form of

bunkers, trees and rain. The longest hole is the 6th, which is a gruelling 594 yards. Shillong Golf Course is considered to be the "Glen Eagle of the East" at the United States Golf Association Museum. It was set in a valley at an altitude of 5,200 ft in 1898 as a nine-hole course and later converted into an 18-hole course in 1924 by Captain Jackson and C. K. Rhodes.

- **Motphran**: The "Monument of France" which is locally known as "Motphran" was erected in memory of the 26th Khasi Labour Corps who served under the British in France during World War I. It bears the words of the Latin poet Horace "Dulce et decorum est pro patria mori" which can be roughly translated as "It is sweet and honorable to die for one's country. Due to government neglect and public apathy, this monument is now in a dilapidated condition standing.

- **Shillong View point** : A picnic spot, 10 km from the city, 1966 m above sea level, offers a panoramic view of the scenic countryside and is the highest point in the state. Obeisance is paid to U Shyllong at the sanctum sanctorum at the peak's summit every springtime, by the religious priest of Khyrim/Mylliem State.

- **Capt. Williamson Sangma State Museum**: For those interested in ethnic tribal culture and tradition this government museum offers insights to the lifestyle of the people. This museum is in the State Central Library complex where monuments for the great patriots of the state were erected besides the statue of Smt. Indira Gandhi and Netaji Subhash Chandra Bose.

- **Don Bosco Centre for Indigenous Cultures**: The Don Bosco Museum is part of DBCIC (Don Bosco Centre for Indigenous Cultures). DBCIC comprises research on cultures, publications, training, animation programmes and the museum, which is a place of knowledge-sharing on the cultures of the northeast in particular, and of culture in general. DBCIC with its Don Bosco Museum is situated at Mawlai, Shillong.

- **Wankhar Entomological Museum** (Butterfly Museum): A privately owned museum of M/s Wankhar, Riatsamthiah, Shillong about 2 km from police bazar is the only known museum in India devoted to moths and butterflies.

- **Chrysalis the Gallery**: This art gallery is on the second floor of Salonsar Mansion at Police Bazaar, the commercial hub of Shillong. Chrysalis has flexible spacing to display paintings (canvases), sculpture, photography and handicrafts. Run by a local artist, Jaya Kalra, the gallery caters to exhibitions of artists and artisans especially from the northeast and also from the rest of India.
- **State Museum**: Located at the State Central Library complex
- **Cathedral of Mary Help of Christians** is in Don Bosco Square
- **Bishop and Beadon Falls**: Both cascade down the same escarpment into a deep valley
- **Sweet Falls**: Sweet Falls (also called "Weitdem," in the native dialect) is a waterfall located about 5 km from the Happy Valley and is about 96 m in height.

2.4 Festivals

Shad Suk Mynsiem

The Shad Suk Mynsiem also known as ‘Shad Phur’ is the annual thanks giving dance festival of the Khasi Community which is celebrated in the month of April at the Weiking Grounds of Shillong. This three days long festival, a counterpart of the Garo Harvest Festival incorporates a traditional Khasi Dance, also known as the ‘Dance of Contentment’. The Khasi men and women fully clad in traditional fineries dance to the tunes of drums and tangmuri pipes and worship the harvest deity for a good crop.

Figure 2-12Celebrating Shad Suk Mynsiem feasitval

Nongkrem Dance Festival

Nongkrem Dance Festival celebrated in the month of November is one of the most important festivals of the Khasi Tribe that honors the protector God of Shillong; 'Lei Shyllong' and the Khasi Goddess 'Ka Blei Synshar' and seeks their blessings for good harvest and universal prosperity. At the time of the Nongkrem Dance Festival, the 'Pemblang Ceremony' (animal sacrifice, generally a cock or goat) is performed by the Syiem of Khyrim; the head of the Khasi State and Ka Syiem Sad; the high priest. On the forth day of the festival the Ka Pemblang Nongkrem Dance is performed when young unmarried girls dance in the inner circle of the arena wearing expensive silk clothes and dazzling gold ornaments while men dressed in dhoti, full-sleeved shirt, coat and turban dance around them in the outer circle. They hold a white Yak hair whisk in their left hand and a sword in their right hand. The Nongkrem Dance Festival is celebrated at Smit which is located just 14 kilometers to the south of Shillong.

Figure 2-13Celebrating Nongkrem Dance Festival

Wangala Festival

Wangala, also known as 'Wanna Rongchuwa' is the harvest festival of the Garo Community celebrated in the months between September and December wherein Lord Misi Saljong; the Sun God of Fertility is worshipped and thanked for affluent harvest. This two to three days long festival frequently extends over a week. The beginning of the Wangala Festival is marked with Rugala and Sasat Sowa ceremonies while the festival concludes with the Dama Gogata ritual. During the days of festivity,

the Garo people dress up in their traditional colorful outfits Dokmanda, Gando or Doksari and the feathered cap known as Do'mi and dance to the beats of the 'Dama'; the long oval-shaped drums. The chief dances performed during the Wangala Festival include Katta Dokka, Dani Dokka, Chambil Mesa (Pomelo Dance) and Ajea.

Figure 2-14Celebrating Wangala Festival

Behdeinkhlam Festival

Behdeinkhlam Festival celebrated at Jowai for three days in the month of July is a traditional Jaintia festival which literally means eradicating evil and epidemics by wooden sticks. During this festival men dance in the streets to the tunes of drums and pipes while women cook sacrificial food at home and offer it to the spirits of their ancestors. A tall decorative structure known as the Ratha is erected in each locality which is carried by 30 to 40 muscular men to the lake of Aitnar for immersion. During the afternoons a type of soccer, locally called 'Datlawakor', is played between two teams; Upper Myntdu Valley and Lower Myntdu Valley with a wooden ball. It is believed that the winners are blessed with a bountiful harvest in the coming year. The Behdeinkhlam Festival ends with the fetching of the Khnong Tree; a sacred tree in each locality.

Figure 2-15 Celebrating Behdeinkhlam Festival

Laho Dance Festival

The Laho Dance Festival celebrated annually subsequent to harvest is a thanks giving festival of the Jaintia community that depicts the intimate relationship between man and God. Women wear the traditional one-piece Muga Jainsem dress tied at the waist with Khyrwang Belt and a long sleeved blouse and embellish themselves with coral beads & gold necklace, chains, gold earrings and bangles. Both men and women together perform the Laho Dance to the tunes of the Kabom and Kadhulok / Sing Kynthei drums and other musical instruments; flute (Kashawiang), cymbals (Kashalamen) and a wind instrument made of bamboo (Ka Chakudiah). The dancers are accompanied with a cheer leader who spontaneously creates the ribald couplets and recites them for the encouragement of the dancers and the entertainment of the audience.

Figure 2-16 Laho Dance

Chad Sukra

Chad Sukra is the annual sowing festival celebrated by the Pnar people during mid April or early May. They invoke their harvest God and appeal Him to protect their crops from all calamities and also

establish peace and harmony amongst the mankind. Farmers start sowing the seeds in their farms only after the celebration of the Chad Sukra Festival.

Autumn Festival

The Autumn Festival is organized by the State Tourism Department in Shillong between October and November every year. The chief attractions of the Autumn Festival of Shillong are; fashion shows, food & wine festivals, fishing competitions, kite flying competitions, flower shows, golf tournaments, music and rock festivals, and many others. Both locals and tourists enjoy during the Autumn Festival to their hearts content. Other festivals also celebrated in Shillong include Strawberry Festival and Ranikor Festival.

2.5 Climate

The climate is warm and temperate in Shillong. The summers here have a good deal of rainfall, while the winters have very little. The Köppen-Geiger climate classification is Cwb. The average annual temperature in Shillong is 17.1 °C. Precipitation here averages 3385 mm.

The driest month is December, with 8 mm of rainfall. Most of the precipitation here falls in June, averaging 851 mm.

The warmest month of the year is July, with an average temperature of 21.2 °C. January is the coldest month, with temperatures averaging 10.4 °c

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature (°C)	10.4	12.3	16.4	18.9	19.6	20.8	21.2	21.1	20.5	18.1	14.4	11.4
Min. Temperature (°C)	4.9	7.3	11.2	14.4	15.9	17.9	18.5	18.2	17.3	14.1	9.3	5.9
Max. Temperature (°C)	15.9	17.4	21.6	23.5	23.4	23.7	23.9	24.1	23.7	22.2	19.5	16.9
Avg. Temperature (°F)	50.7	54.1	61.5	66.0	67.3	69.4	70.2	70.0	68.9	64.6	57.9	52.5
Min. Temperature (°F)	40.8	45.1	52.2	57.9	60.6	64.2	65.3	64.8	63.1	57.4	48.7	42.6
Max. Temperature (°F)	60.6	63.3	70.9	74.3	74.1	74.7	75.0	75.4	74.7	72.0	67.1	62.4
Precipitation / Rainfall (mm)	13	17	79	180	403	851	696	480	387	234	37	8

Figure 2-17Meghalaya Climate

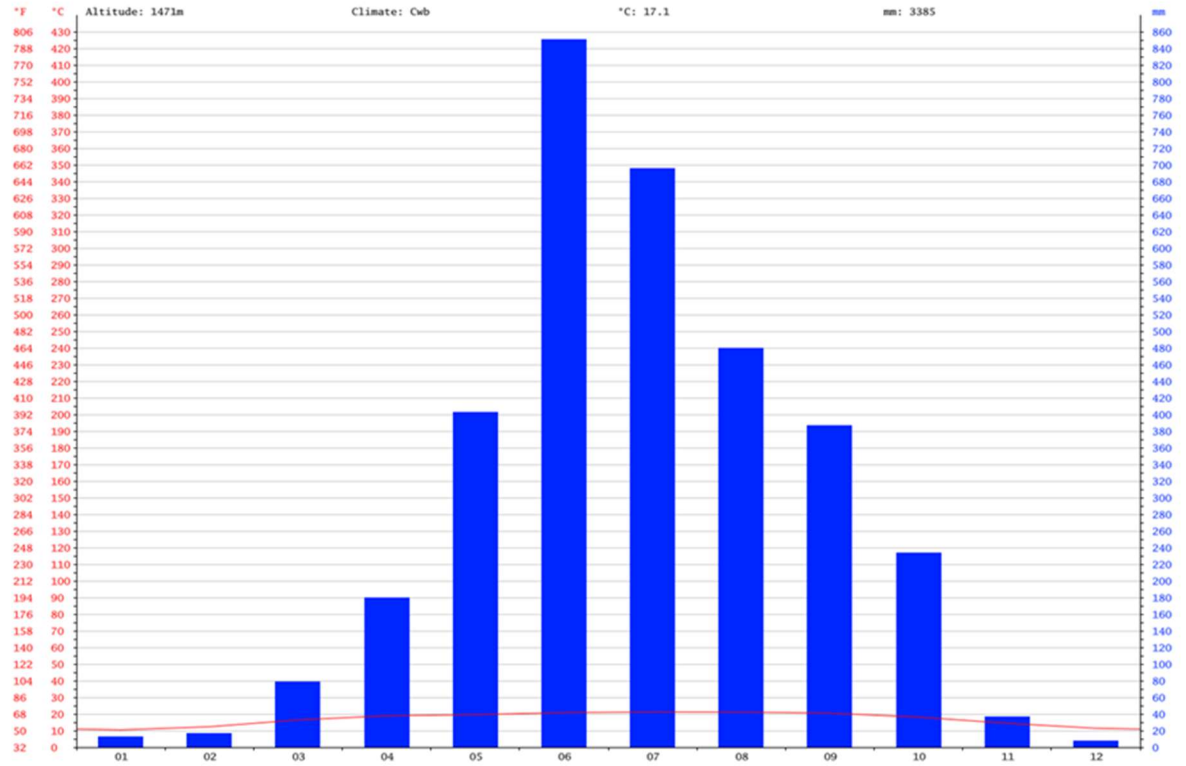


Figure 2-18Rainfall and Temperature Graph

2.5.1 **Wind Pressure**

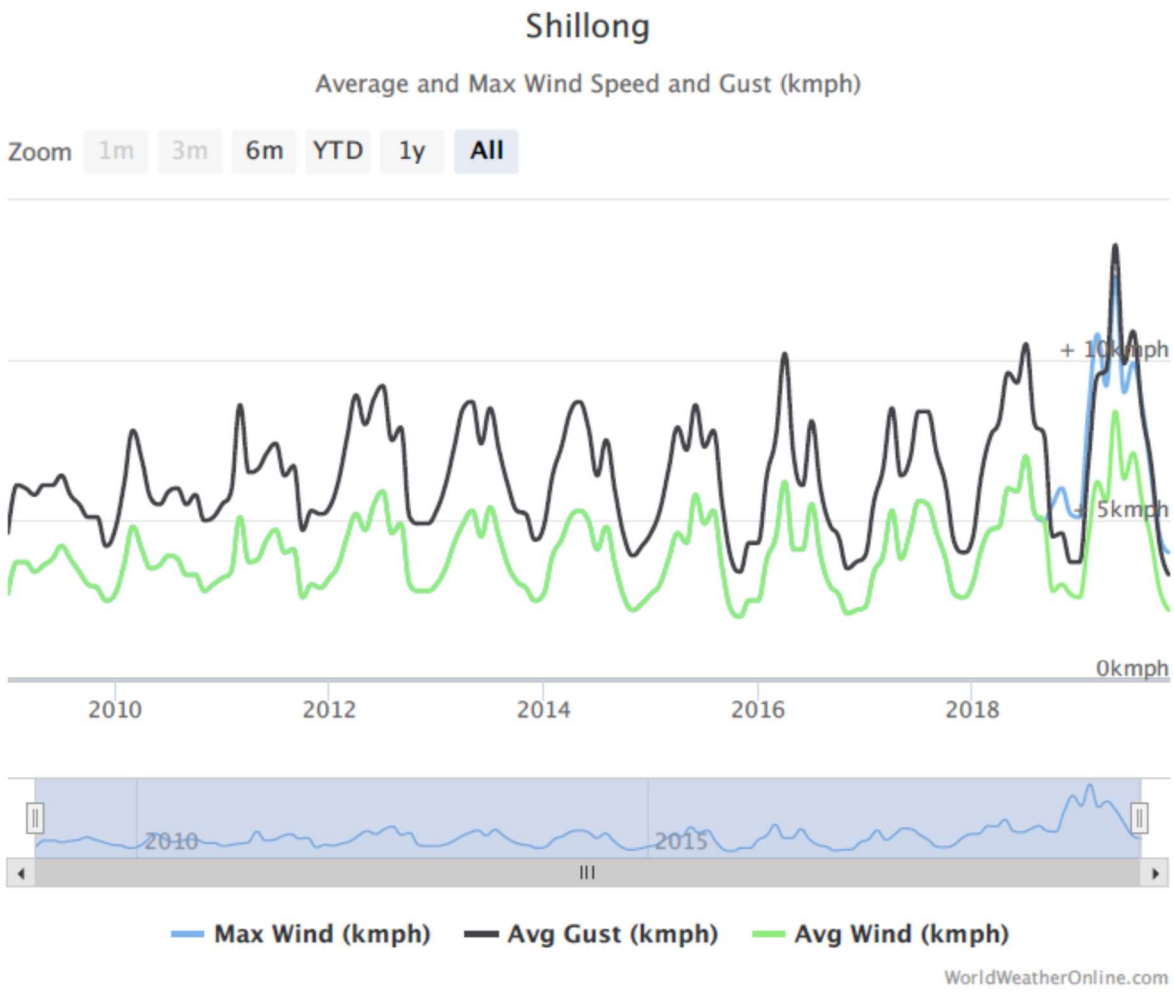


Figure 2-19Wind Pressure of Shillong

From the last 10 year data, It is clear that the maximum wind speed in Shillong is about 14 Kmph in April 2019. The ropeway system should be designed to consider this factor.

2.6 Seismic Factors

The Shillong Plateau is an earthquake-prone region in the northeastern India. Based on regional seismotectonic studies, we present here a deterministic seismic hazard assessment (DSHA) and maps of peak horizontal accelerations (PHA) for three largely populated districts – the East Khasi hills, the Ri-Bhoi, and the West Garo hills – within the Shillong Plateau. The hazard analysis methodology is based on the analysis of 72 earthquake sources (active faults) located within 500 km seismotectonic region around

the plateau. Using an average sample log-likelihood approach, suitable ground motion prediction equations (GMPEs) are identified. As a variation in hypocentral distances can affect the ranks (or weights) of selected

GMPEs, DSHA is performed separately for the three selected districts. Analyses show that the northern part of the East Khasi hills, eastern part of Ri-Bhoi district and the West Garo hills districts exhibit the highest PHA value of 0.46 g at site class A (hard rocks). In addition, response spectra for the Shillong city, Nongpoh, and Tura indicate that the maximum spectral acceleration reaches 0.67 g, 0.77 g, and 0.64 g at 0.1 s, respectively. These assessments indicate that the Barapani, Oldham, and Dauki faults influence significantly the seismic hazard in the studied region.

Figure 2-20Seismic zone of India

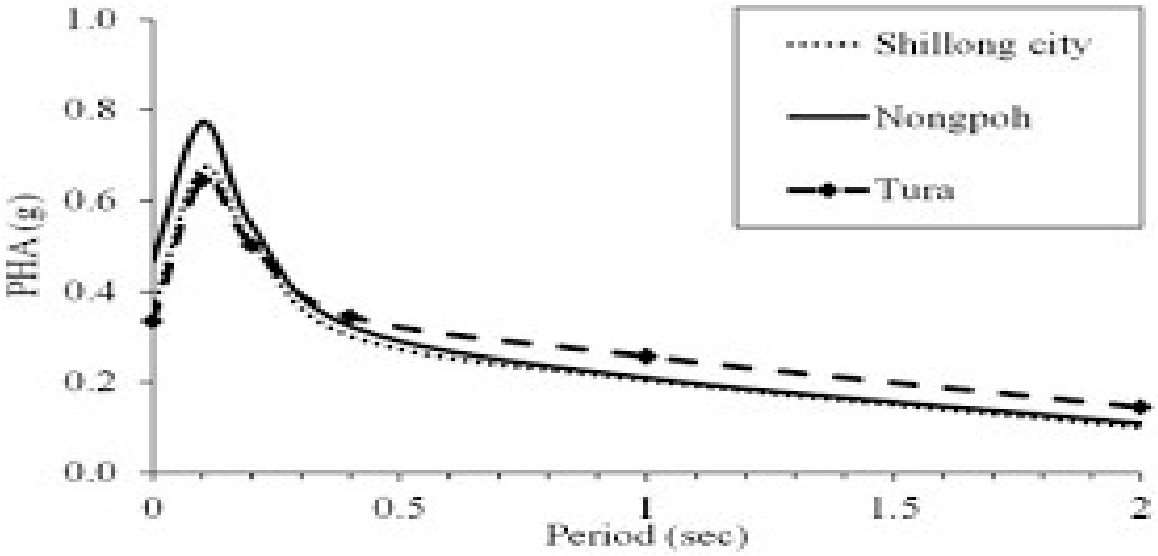


Figure 2-21PHA Factor

3 THE PROJECT

3.1 Introduction

Shillong viewpoint is the highest point of Shillong which is at 6,449 feet (1,966 m) above sea level. It is about 15 KM far from Laitumkhrah circle. Local taxi charges upto Rs. 1000/- to reach Shillong Viewpoint for four persons. It is said that Shillong gets its name from the Shillong Viewpoint itself. Regional tales tell that the patron deity 'Leishyllong' resides in the hills and protects the city from all evils. The U Shulong site at the top of the peak is sacred and every spring, a ritual is organized there. The Shillong Viewpoint is situated at the air force base and features a radar station of the Indian Air Force. Due to security reasons, heavy checking is done at the gates, and tourists are asked to deposit their cameras.

Due to high traffic it takes minimum 1 hour to reach Air Force Entrance Gate. As limited area is available at viewpoint, the vehicle is stopped at the entrance gate and Air force allows vehicle to go to the viewpoint if any other vehicle is not retuning back from viewpoint. Because of this, approximate 1- 1:30 Hrs extra waiting is needed at Air Force entrance. Tourists are permitted from air force entrance only between 9:00 AM to 03:00 PM. It is reported that about 500 tourists per day visit Shillong Viewpoint during visit hours. Due to more waiting time and limited visit hours, many tourists are not able to visit Shillong Viewpoint. October and November months are peak months for tourist. In these months the number of tourists is increased upto 700-800 per day.

In order to remove above discussed problems Government of Meghalaya has proposed a construction of ropeway from Lawsohtun to Shillong Viewpoint and intends that a feasibility report for the same will be worked out. Further this project is proposed to develop under PPP mode. IPRCL has been mandated to prepare the feasibility Report.

Figure 3-1Shillong Peak

3.2 Scope of Feasibility Study

IPRCL team visited Shillong to explore the feasible location for Ropeway projects in Meghalaya. IPRCL submitted the preliminary survey report for preparation of feasibility report on 12.06.19. Meghalaya Infrastructure Development & Finance Corporation Limited had issued preliminary work order on 24.07.19 to prepare Feasibility Report of Shillong ViewPoint to Lawsohtun and Umiam Watersports Complex to Umiam Lake Viewpoint Ropeway Projects for the following scope of work:

- Preliminary Survey of site by team of IPRCL experts.
- Identifying suitable locations for Lower stations, Intermediate station and upper station.
- Fixing up Alternative Ropeway alignments
- Topographic survey of Ropeway
- Preliminary Traffic Study
- Ropeway System Selection based on traffic study and topographic inputs.
- Abstract Cost Estimation
- Abstract Financial ROR (Approximate)
- Listing of required Statutory Clearances.

3.3 Methodology of Preparing Feasibility Report: -

Following methodology is adopted for preparation of Feasibility Report for Shillong Viewpoint to Lawsohtun.

- A team of experts drawn from various disciplines was constituted to undertake the study. Experts were deployed to Shillong for undertaking field survey and collect relevant data in a coordinated manner and to create a Background Information Platform (BIP) by sourcing all available information. A comprehensive strategic work plan was devised keeping in view the objective and the time frame of the study.
- Following information was sought from Meghalaya Tourism Department.
  - Total number of tourists -in- flow to Meghalaya from the year 2005 to 2018,
  - Total number of tourists in-flow to Shillong in the last 5 years with month-wise data. But as non-availability of data, government provided the data from yr. 2015.
  - Details of traffic to the Shillong Viewpoint for 5 years. As informed by tourism department, the data for requested duration was not available since records are maintained from year 2017.
- The willingness to use and pay for the ropeway was assessed through a questionnaire specially designed for the purpose.
- Site visits were made by project team to collect the firsthand information of the project and to assess the tourists potential of the proposed ropeway project.
- IPRCL Survey team and team of local government officials visited the site to fix Lower Terminal Point (LTP) and Upper Terminal Point (UTP) of the alignment proposed.
- Based on the above data, a draft report is prepared and submitted bringing out the traffic potential, cost and financial viability of the project.

3.4 Methodology of Assignment

Sighting Data, collection and evaluation

Identify the suitable locations for terminal stations

Fixing up the Ropeway Alignment

Topography Survey and Traffic Survey of Alignment

Analysis of data and Selection of ropeway-systems

Cost overview of evaluated systems

Evaluation of ropeway-systems and conclusion

4 PROPOSED ROPEWAY

A ropeway is proposed to connect Shillong viewpoint from Lawsohtun, Shillong. Now a days Shillong viewpoint is open from 09:00AM to 03:00 PM for tourists because the entry starts from air force premises. After the construction of ropeway, the access from air force will not be required. ropeway operation of 8 hours in a day is considered for estimation of PPH. The timings can be 9 AM to 5 PM or any other suitable timings. The operation timings of the ropeway can be decided by the operator with the permission from state government authorities. In this scenario some commercial development (like café, restaurant, events on special occasions) is also proposed at the viewpoint ropeway station so that more tourists are attracted to ropeway and can visit in the evening or in the early morning.

Figure 4-1 Distance to Shillong View Point

Sr. No.	Distance to Shillong Viewpoint air force entrance	Distance	Travel time (in mint.)
1	Laitumkhrah, Shillong	16 KM	40 mint

2	Lawsohtun, Shillong	15 KM	45 mint

4.1 Lower Terminal Point (LTP) Station: -

Figure 4-2 LTP as per Survey

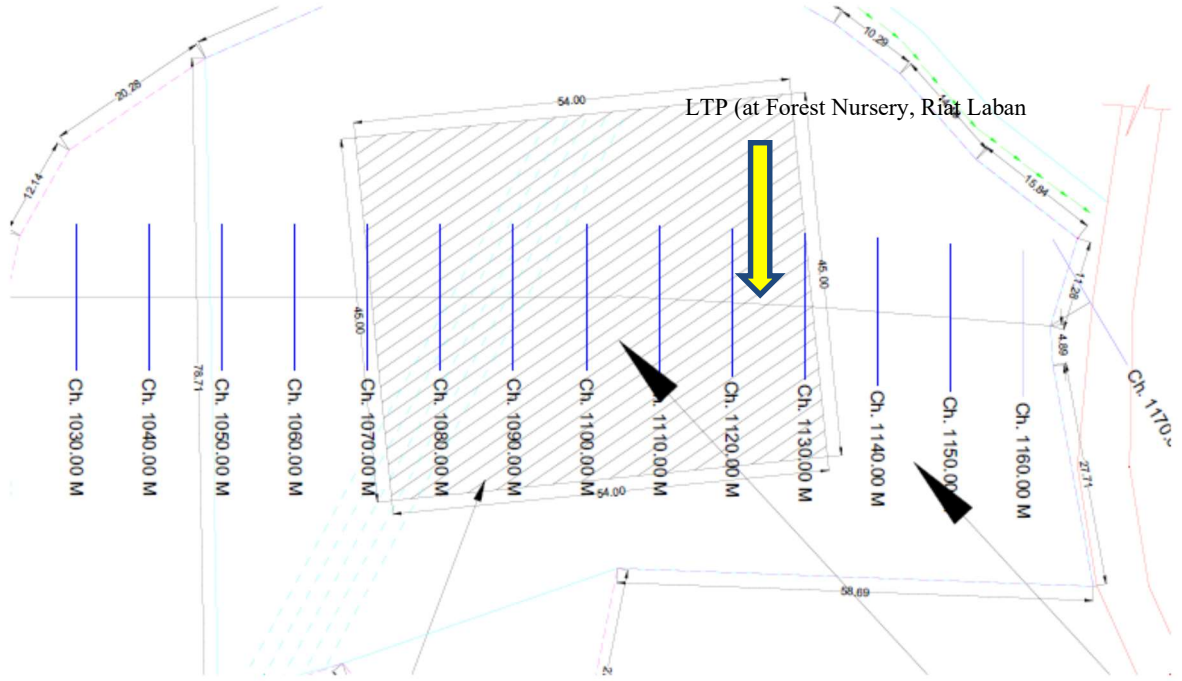


Figure 4-3 Proposed LTP station at Forest Nursery, Riat Laban

The Lower Terminal Station is proposed in existing forest nursery Riat Laban near Madan Laban Nepali Secondary school. This land belongs to forest department and forest department has in principally agreed to hand over the land to the tourism department for the proposed ropeway project.

The LTP building will be G + 4 floors structure (approximate 20 metres height,) located on a plot of land of size 50 m X 80m. The station building will be 50 m X 40m floor area block of G + 4 floors. The ground floor will have covered parking (2000sqm) for two-wheeler and four-wheeler. First floor and second floor of the station building will be utilized as covered parking for 4 wheelers. Third floor of the station building will house recreational facilities, sanitary block and food court. The fourth floor will be the station area including gondola parking.

Details of LTP station Land: -

Table 4-1: Details of Land Required at LTP

Sr. No.	Floors	LTP Covered Area in Sqm	Description	Alignment
1	4th floor	1200	Ropeway Station including boarding/ deboarding area.	40m along the alignment and 30m across the alignment

2		800	Gondola Parking	40m along the alignment and 20m across the alignment
3	3rd floor	2000	Recreational facilities	
4	2nd Floor	2000	Parking for 88 four-wheelers	
5	1st floor	2000	Parking for 88 four-wheelers	
6	Ground Floor	150	Parking for 50 two-wheelers	
		1850	Parking for 82 four-wheelers	
	Total	10000		

Note: - It is proposed to construct parking of 258 four wheelers and 50 two- wheeler for the time being. As per para 6.9, total 305 four- wheelers vehicle parking is required over the concession period in conservative scenario. The parking for remaining 47 four- wheeler (1057 sqm) can be provided on the vacant land (9900sqm- 4000sqm – 500 sqm= 5400 sqm) as and when need arises.

Area for one four-wheeler = 22.5 sqm (including circulating area)
Area for one two-wheeler = 3 sqm (including circulating area)
FSI = 2 (excluding covered ground floor area if it is exclusively used for parking). (Please refer Annexure E for reference)
The total covered area calculated at LTP will be 10000 Sqm as indicated in above table.
The land requirement for construction of LTP station will be 4000 Sqm. This requirement can be met on a plot of size 50 m X 80 m = 4000 Sqm.

Coordinates of Station Building (50m x 40m)

LTP 1: 25°33'19.46"N 91°52'9.49"E	**LTP 2: 25°33'20.43"N 91°52'10.92"E**
LTP 4: 25°33'19.08"N 91°52'11.67"E	**LTP 3: 25°33'18.40"N 91°52'10.36"E**

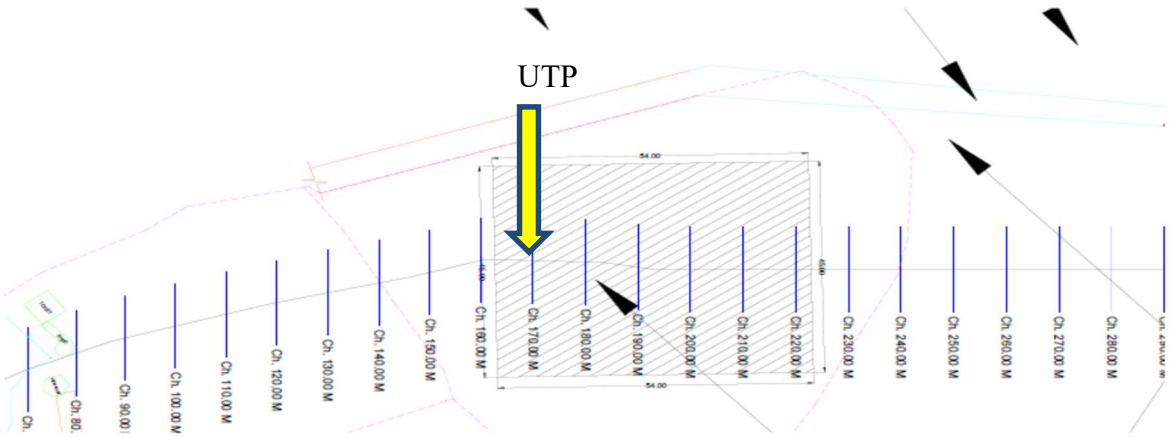
The survey of new LTP location and new ropeway alignment is done by MIDFC. The details of trees are not given in the survey file given by MIDFC. The details are requested to be submitted.
However, it can be assumed that the density of the trees is same as the new alignment is also part of the same forest. As per earlier survey report prepared by IPRCL for the old ropeway alignment, 58 trees were to be cut for construction of 5 towers (i.e. 500 sqm area). Therefore, the tree density was 12 per 100 sqm. The LTP is going to be located on forest nursery where density of the trees can be assumed 50% than the forest area density. Thus no. of trees required to be cut for construction of LTP on 2000 sqm land will be 120.

4.2 Upper Terminal Station (UTP) Station: -

Many locations near viewpoint were visited to find out the best suitable location for upper terminal station. The following location is adjudged the best suitable for development of Upper Terminal Station –

Coordinates of Station Building

UTP 1: 25°32'53.66"N 91°52'26.29"E	**UTP 2: 25°32'54.14"N 91°52'27.24"E**
UTP 3: 25°32'52.99"N 91°52'27.93"E	**UTP 4: 25°32'52.53"N 91°52'26.98"E**



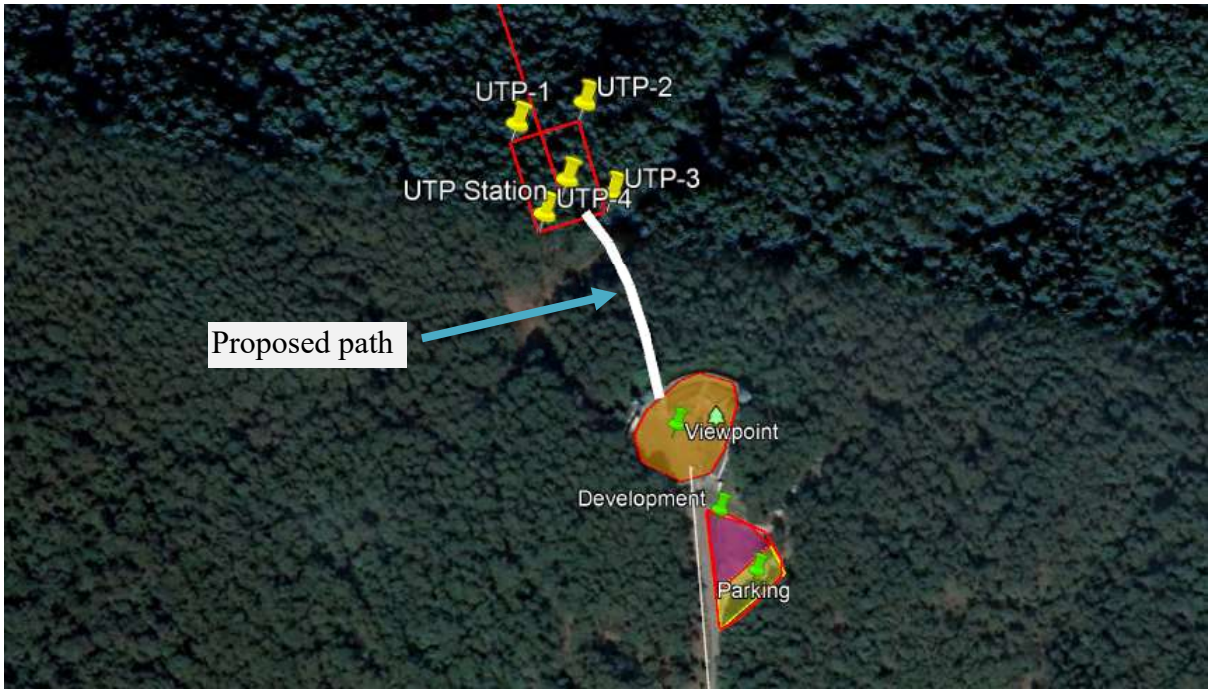


Figure 4-4 Google earth Image of UTP Option

Earlier the UTP location was proposed at the end of the fireline. This location was partially on the forest land and partially on the community land. Therefore as per the new survey done by MIDFC, this location is slightly shifted towards right to occupy community land only. Due to shifting of UTP, the existing pathway to access viewpoint

from the ropeway station cannot be used. The new UTP location is about 85 metres from viewpoint. A new *kaccha* pathway of the size 85 m X 10 m is now proposed in community land. The alignment is now increased to 955 m from 937 m.

The development of ropeway station at this location does not affect the view of Shillong from view point.

The UTP building will be G + 3 floor structure (approximate 20 metres height,) located on a plot of land of size 40 m X 60m. The station building will be 40 m X 30m floor area block of G + 3 floors. The ground floor, first floor and second floor will be utilized for waiting area, recreational facilities, sanitary block, food court, etc. The third floor will be the station area.

Table 4-2 Space requirement at UTP

Sr. No.	Floors	UTP Covered Area in Sqm	Description	Alignment
1	3rd floor	1200	Ropeway Station	40m along the alignment and 30m across the alignment
3	2nd Floor	1200		For office Purpose, guest room etc
4	1st floor	1200		Recreational facilities, food court
5	Ground	1200		Garden, waiting area etc.
	Total	4800		

Assuming FSI = 2, The land requirement for construction of UTP station will be 4800 /2= 2400 Sqm. (Please refer Annexure E for reference)

The station building will be constructed on 40 m X 30m (1200 Sqm) land area. As mentioned in earlier para 12 x 12 = 144 nos. of trees will be required to be cut for construction of UTP building.

4.3 Alignment from LTP to UTP

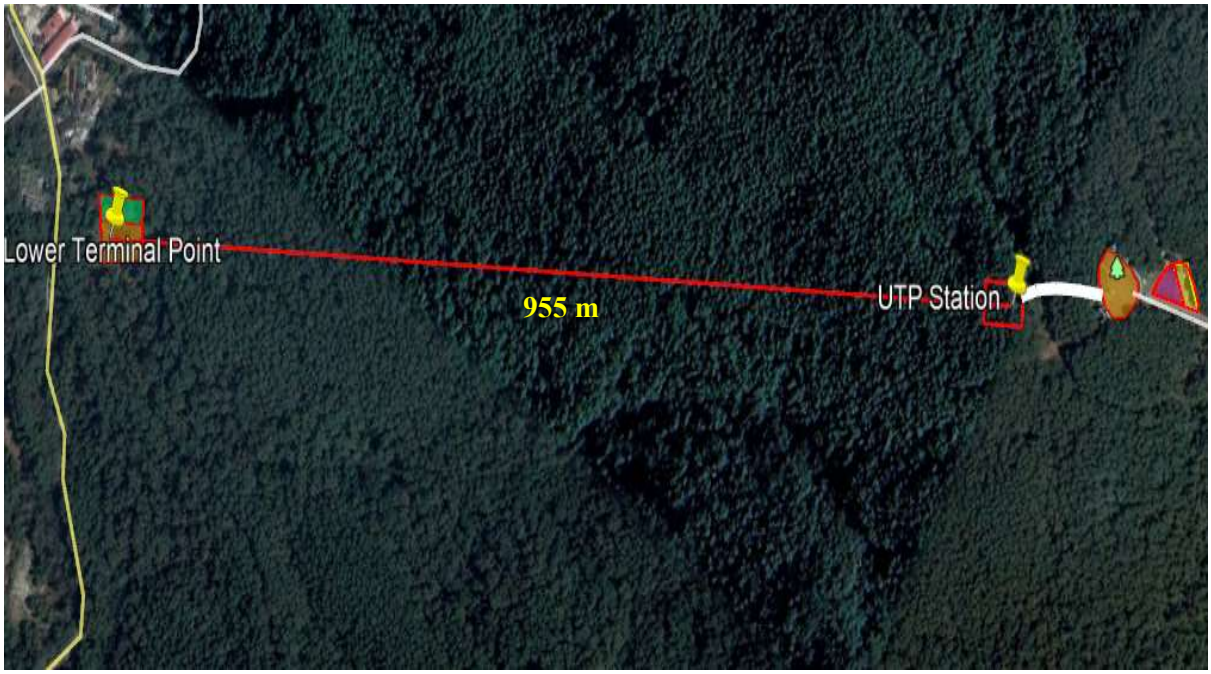


Figure 4-5UTP area for Option- 1 LTP

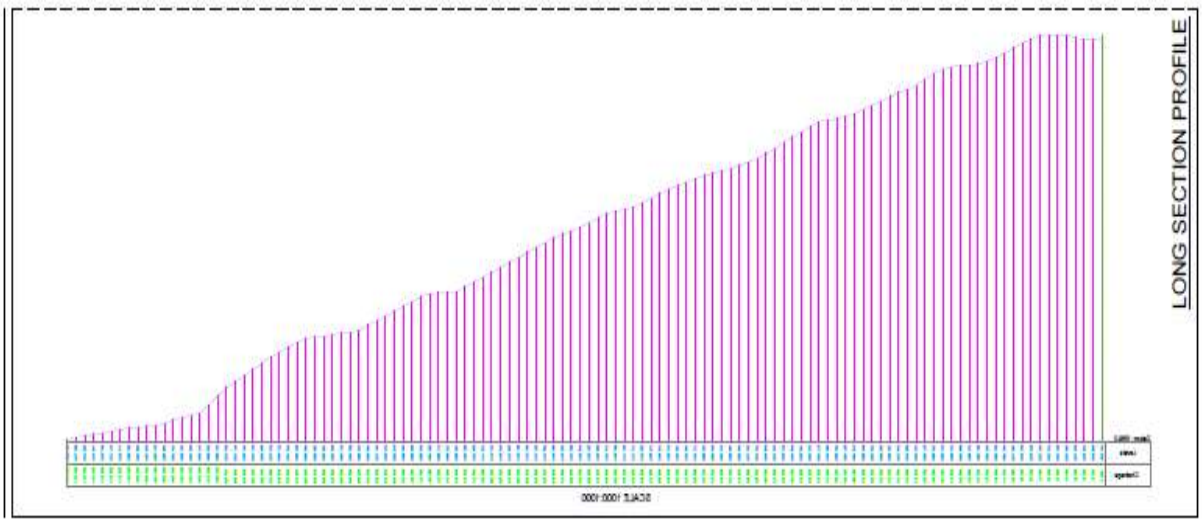


Figure 4-6Alignment from LTP to UTP

- Length of the Ropeway = 955 metre
- Vertical Rise= 318 metre
- Area indicative under green rectangle represent ROW for the alignment which may not be required to be acquired.
- For construction of five towers, 500 sqm land area will be required. As mentioned in earlier para 12 x 5 = 60 nos. of trees will be required to be cut for construction of towers. However, this requirement is subject to change as per the design of ropeway system and tower locations by the concessionaire.

5 TOPOGRAPHIC SURVEY

5.1 Aim

The aim is to carry out detailed topographical survey from "Shillong Viewpoint – Lawsohtun" in a scale of 1:1000 and establishing control points in the project area.

To start detailed topographic survey, the control points has been established in the project area. DGPS and Drone Fly must be conducted to establish the control points in a controlled network. The x,y, z coordinate of these established control points will serve as reference for carrying out detailed topographical survey in the project area.

5.2 DGPS Survey

DGPS survey is the survey carried out to fix the horizontal and vertical control points in an area. DGPS uses position corrections to attain greater accuracy. It does this using a reference station. The reference station (or base station) may be a ground-based facility or a geosynchronous satellite, in either case it is a station whose position is a known point. This process has been adopted to check the coordinates of points established by Rites. This process has been mainly adopted to speed up the work as the ground condition became difficult due to the obstruction caused by crops such as sugarcane and high bushes.

5.2.1 Principles of DGPS Survey

Differential GPS (DGPS) gets around the accuracy problem by relying on several fixed points on the earth whose GPS coordinates are well-known. Base stations or reference stations are located at these fixed points. The DGPS system works as follows:

- Base stations constantly measure the accuracy of the GPS signal received from each of the satellites that it has a Line-of-Sight (LoS) or direct visibility to.

- The base station calculates how much of a correction (compared to the known accurate position) is required per satellite and broadcasts this information to DGPS units in its vicinity.
- Using the original signal received from the satellite and the correction information received from the nearest fixed point (or points) the DGPS unit can then establish a more accurate estimate of its current position.

The basic assumption is that GPS receivers that are close to each other suffer from similar atmospheric effects, and so in all likelihood the base station and the closest DGPS unit will experience the same amount of error. Clearly, the accuracy of DGPS will depend on the distance from the closest base station. A DGPS unit, thus, needs to have the additional capability of receiving the signal from base stations) and carrying out the post-processing.

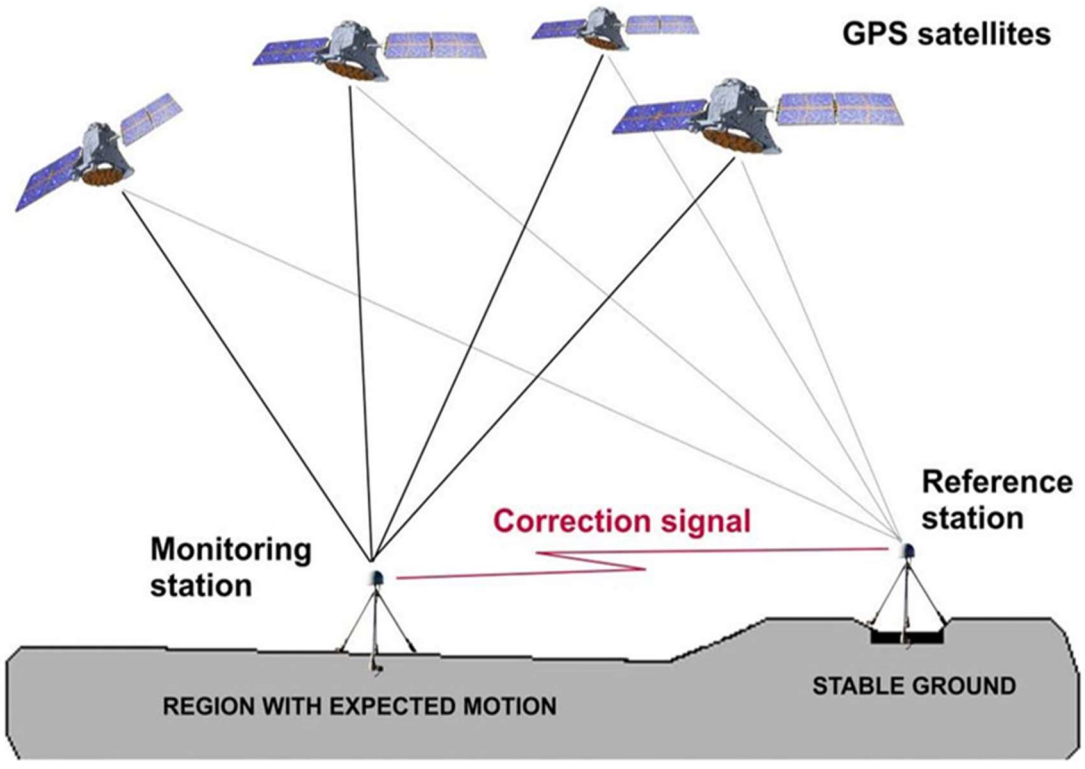


Figure 5-1 Working of DGPS

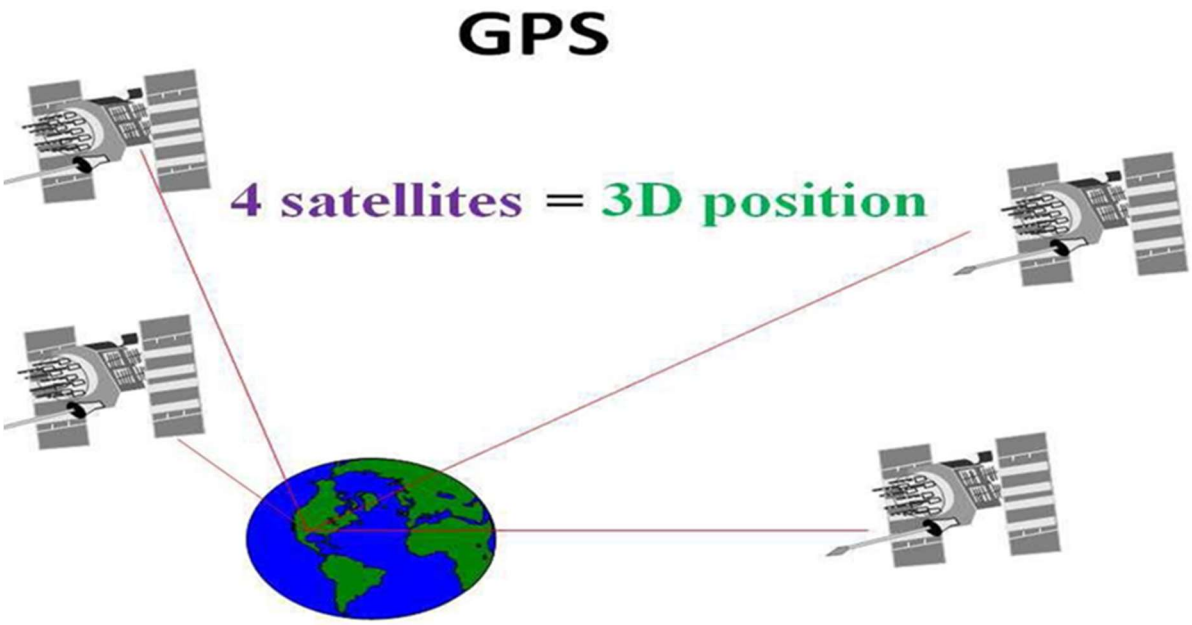


Figure 5-2GPS

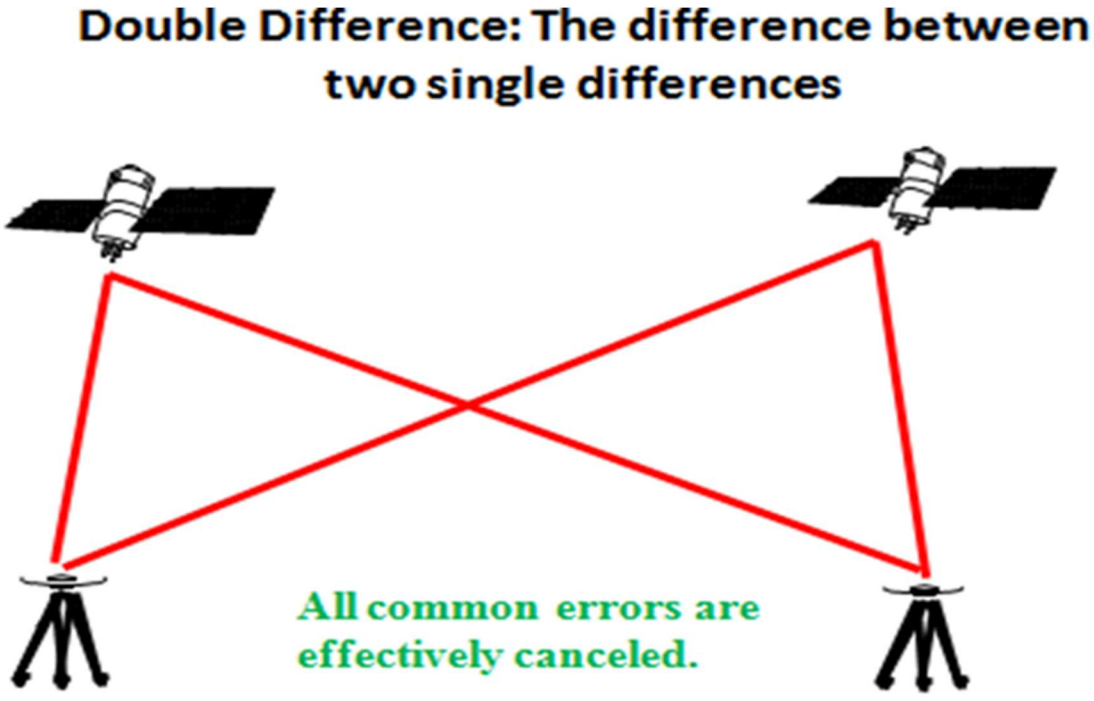


Figure 5-3Double Difference

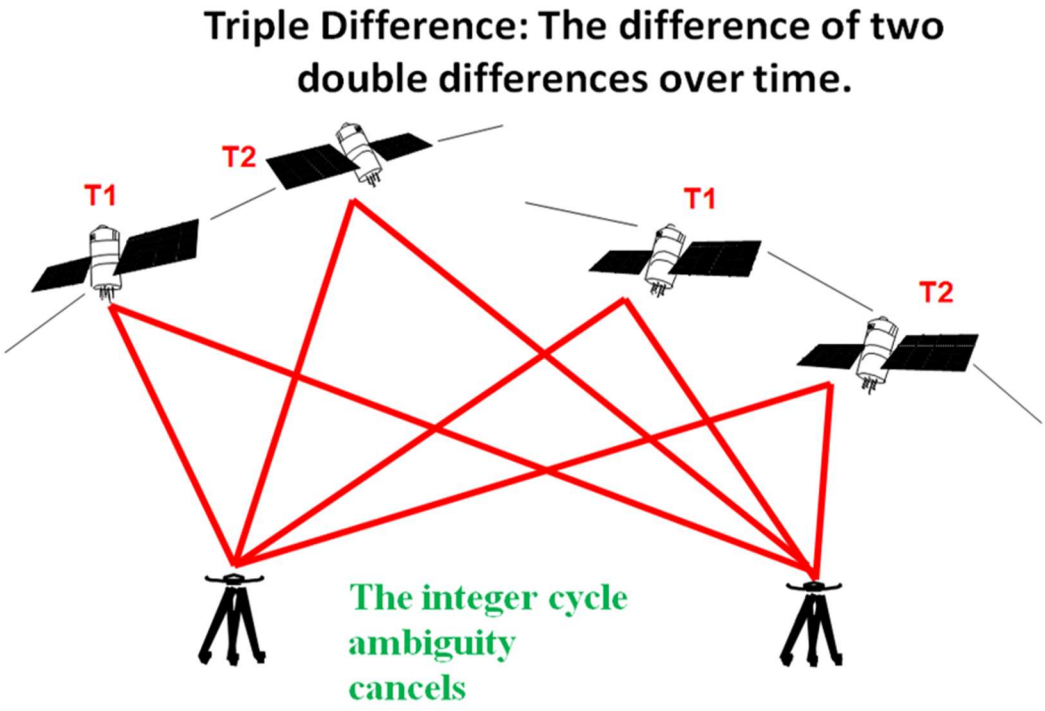


Figure 5-4Triple difference

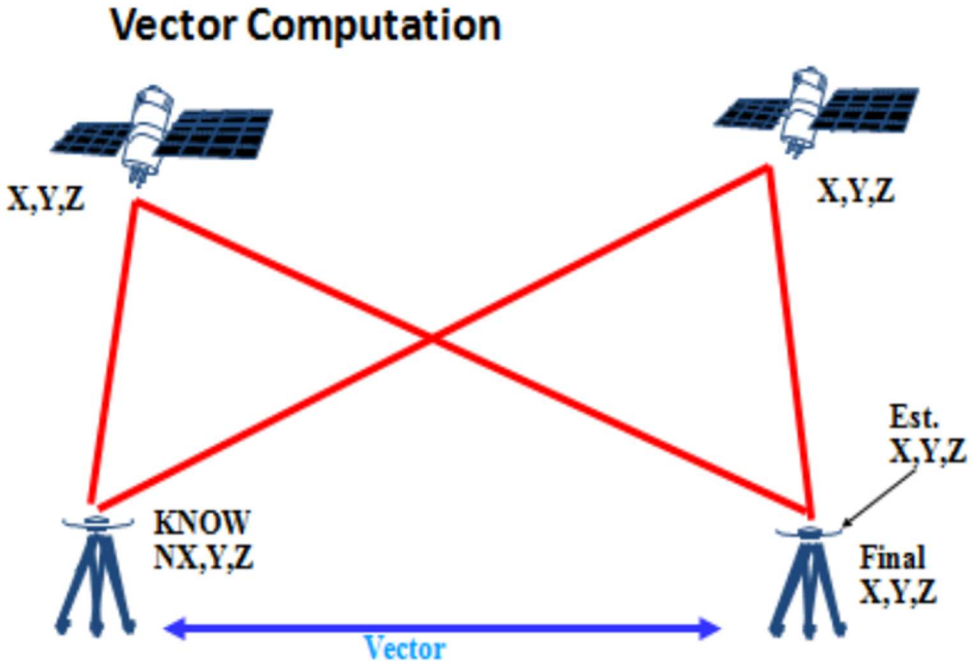


Figure 5-5Vector Computation

5.2.2 Work Methodology

- Survey Team commenced the DGPS Control survey for Shillong Peak ropeway and proceeded as per proposed triangulation Network.
- The planned GCP's were located roughly using handheld GPS and then verified at site.
- For DGPS survey, Survey Team used Four Sokkia make GRX 1 dual frequency receiver for making triangulation.

Figure 5-6 DGPS

The points were marked and DGPS Receivers were set up in following steps: -

Figure 5-7 DGPS Leveling

- The tripod was roughly setup on top of the point.
- Then Tri-Brach and adopter was fixed on top of the tripod.
- Through the Optical plummet check the center of the point.
- Level the adopter with the help of the three-foot screw and check the center point again. Repeat this process till the center point and level is correct.
- Then fix the GPS Receiver after inserting the internal battery on to it.
- Press the power button to start the GPS receiver and see the satellite light should display orange or green.
- For starting the observation, power key needs to be pressed three times, the receiver will start logging the raw data in internal memory (SD card).
- All receivers were start at same time and if it is not possible then the last receiver in a triangle is started, the time of stop logging count form that time

5.2.3 Data Processing

The data has been processed in Magnet tools software. The sample map view and occupation view of the DGPS data for the project area has been shown in the Figure5:8

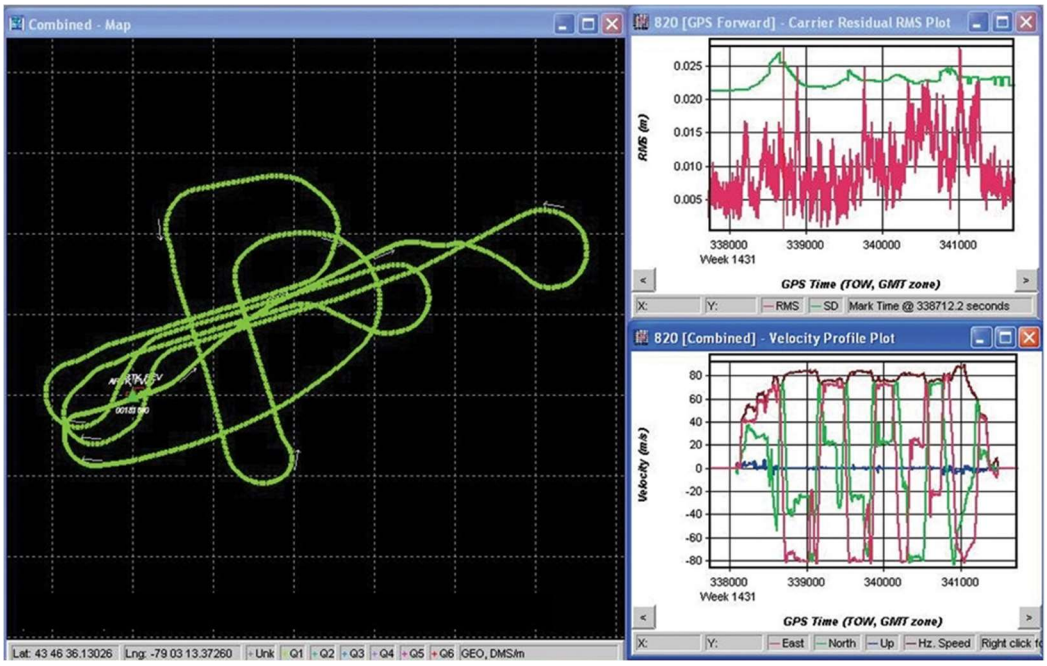


Figure 5-8Processing of DGPS data

Steps for Processing

- After baseline formed, we have to check the common time.
- After checking the base line common hour observation, we have to Process the baseline.
- We have to check that all base line result should be fixed not float and fail.
- If the base line result is fixed then colour of the line will changed automatically by the software, if the base line was not fixed then the colour of base line will remain grey.
- The baselines were checked in the Magnet tool software and Network adjustment command was given in the software. The software will calculate the final coordinates of all the points and result of the points will be saved in the HTML format.
- The HTML file saved by the software consists of all the information.

Details of Data observed on site by DGPS is enclosed to below for every point.

DESCRIPTION OF TBM	NORTHING	EASTING	AMSL	REMARK
TBM-1	2826028.287	386976.238	1922.881	Benchmark at Shillong Viewpoint (UTP)
TBM-2	2826017.906	386980.495	1922.824	Benchmark at Shillong Viewpoint (UTP)
TBM-3	2826044.788	386987.912	1922.814	Benchmark at Shillong Viewpoint (UTP)
TBM-4	2826016.418	386960.342	1923.637	Benchmark at Shillong Viewpoint (UTP)
TBM-5	2826018.998	386948.983	1921.607	Benchmark at Shillong Viewpoint (UTP)
TBM-6	2826055.869	386902.820	1903.541	Benchmark at Shillong Viewpoint (UTP)
TBM-7	2826061.536	386897.222	1902.213	Benchmark at Shillong Viewpoint (UTP)
TBM-8	2826198.397	386810.706	1855.084	Benchmark at Fire Line
TBM-9	2826506.531	386710.068	1752.643	Benchmark along the Corridor
TBM-10	2826486.584	386691.445	1751.644	Benchmark along the Corridor
TBM-11	2826832.321	386513.963	1613.487	Benchmark along the Corridor
TBM-12	2826997.305	386458.780	1569.261	Benchmark at Lower Terminal Station (LTP)
TBM-13	2826989.669	386438.317	1569.881	Benchmark at Lower Terminal Station (LTP)

5.2.4 **Preparation of Drawings & Report:**

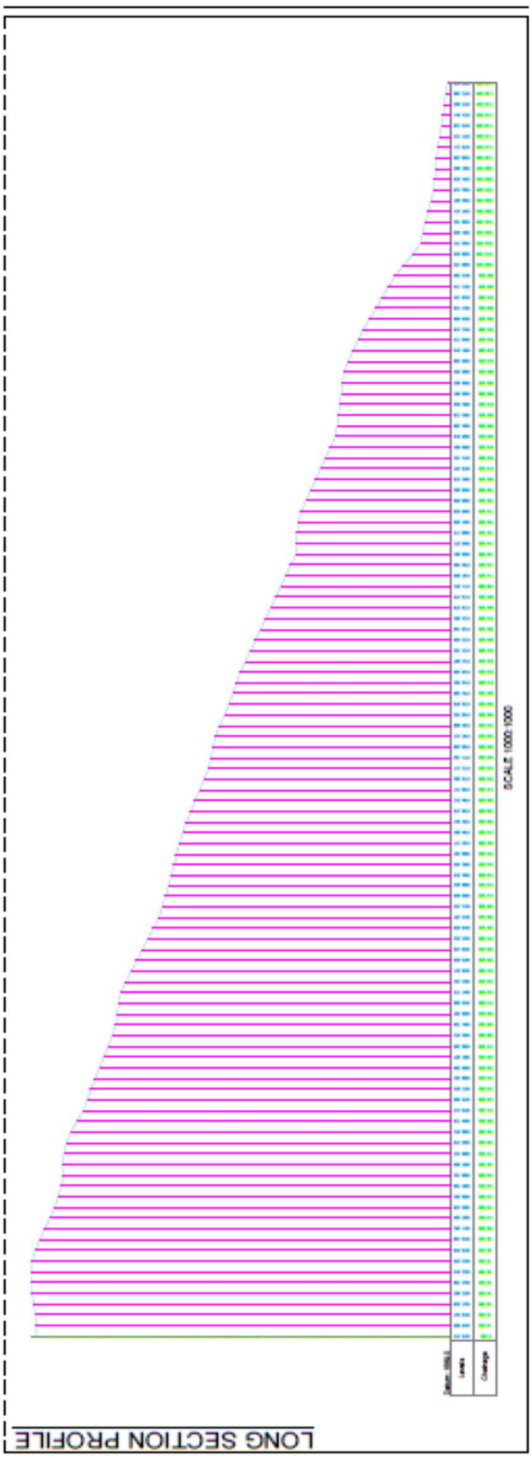
All the data collected were drawn in the form of a drawing in AutoCAD format. The drawing were prepared on AutoCAD with the specification of topo-survey collected on project site as mentioned below:-

- Scale of survey is 1:1000
- Marking of permanent benchmark point at both the terminal.
- Marking of control point along the alignment, wherever possible.
- Plot area survey of LTP, tentative boundary
- Plot area survey of UTP, tentative boundary

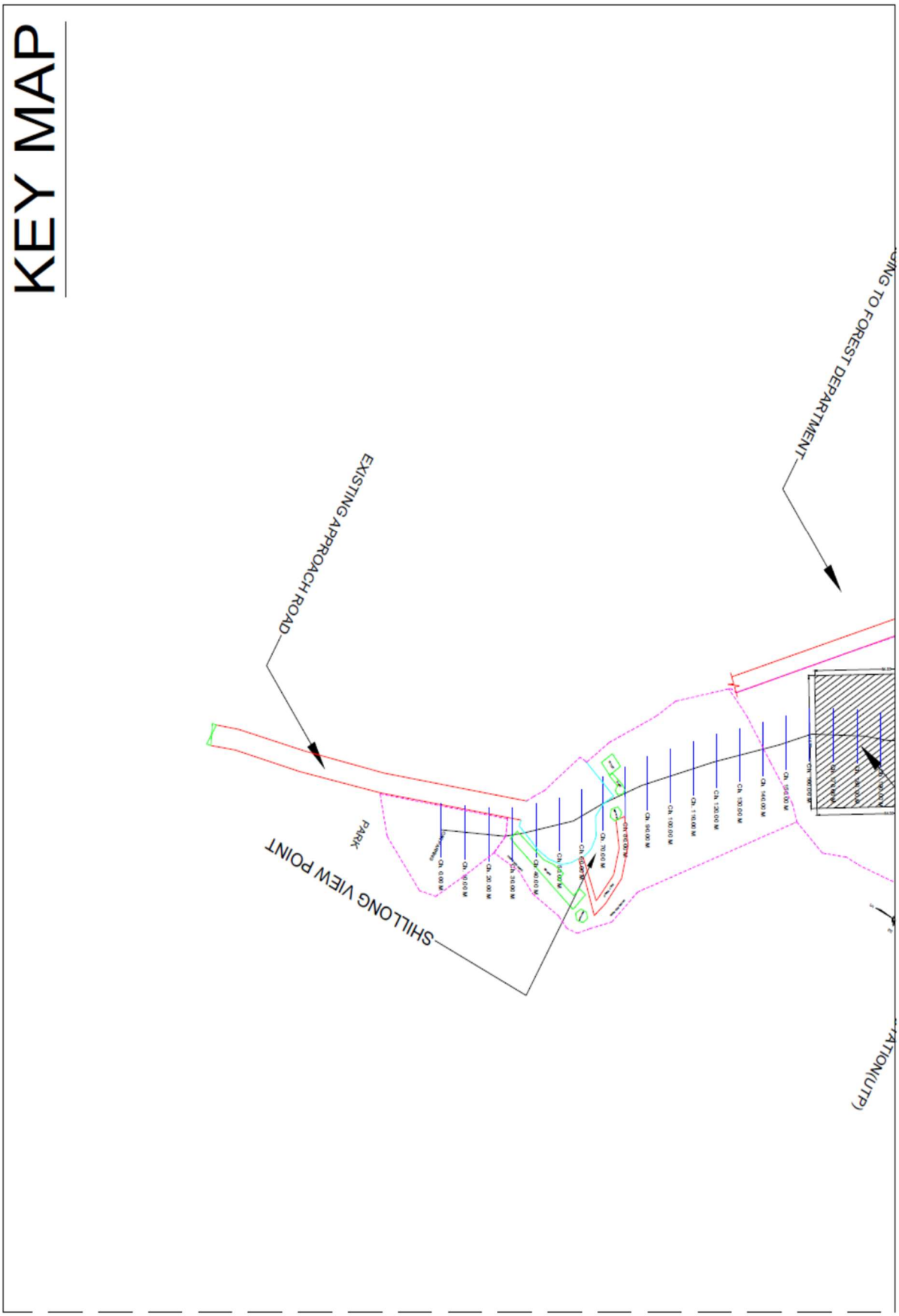
- Plot area survey to be in correspondence with the connecting road to LTP & UTP.
- Marking of Contour lines at 1m interval.
- Indicate intersections such as ('No Tower zone") like roads, Paths, ridges, stream, pipes, power lines etc.
- Drawing development - X,Y,Z coordinate of all points (in detailed Auto cad drawing)
- Water level at an interval of 10m.
- Details survey work along the alignment covering width of 10 m either sides of C/L Picking of details along the alignment like ground profile, contouring surface data, high rise building, electric line, tress, water bodies all existing details.

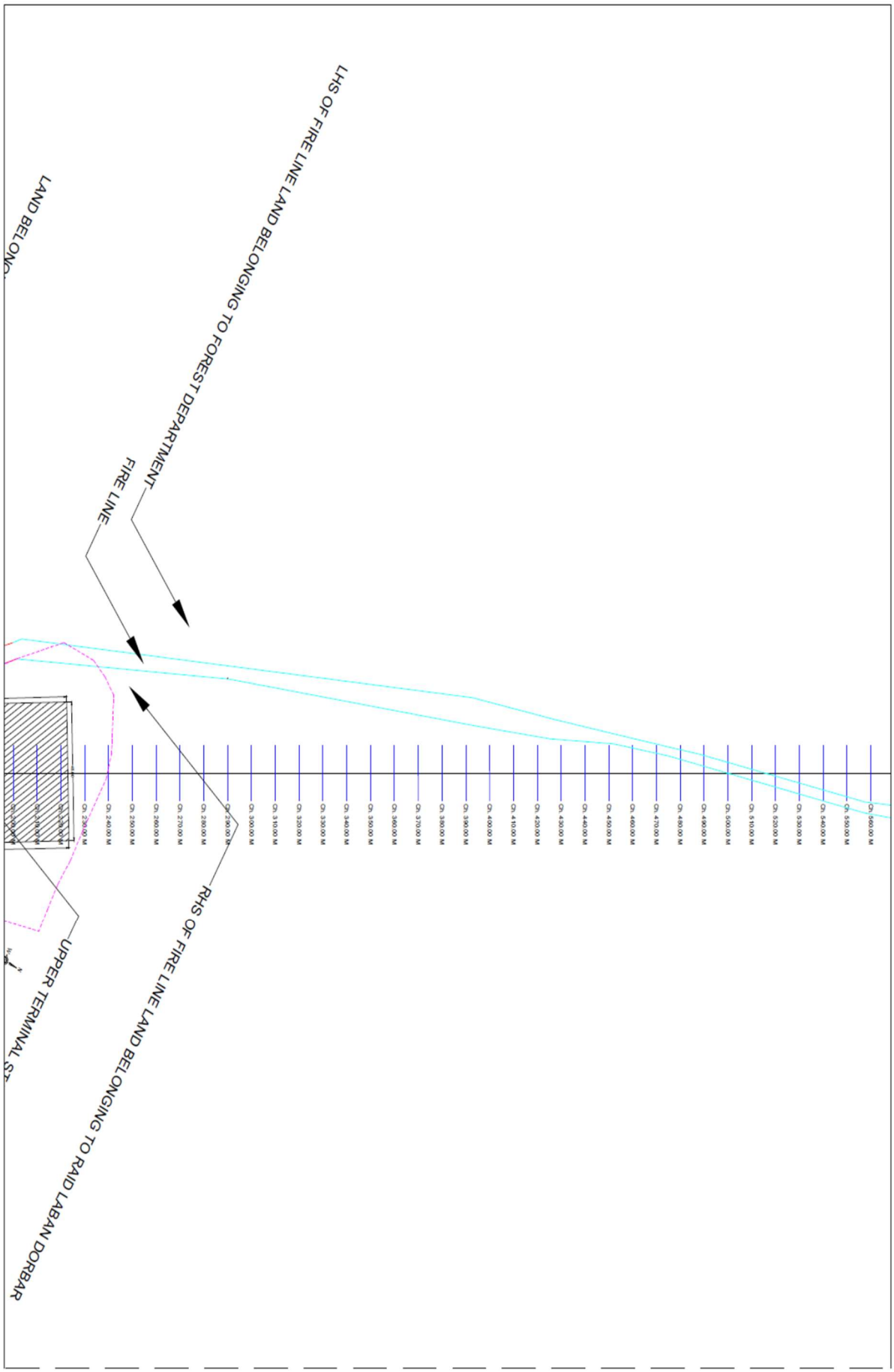
5.3 Drawing

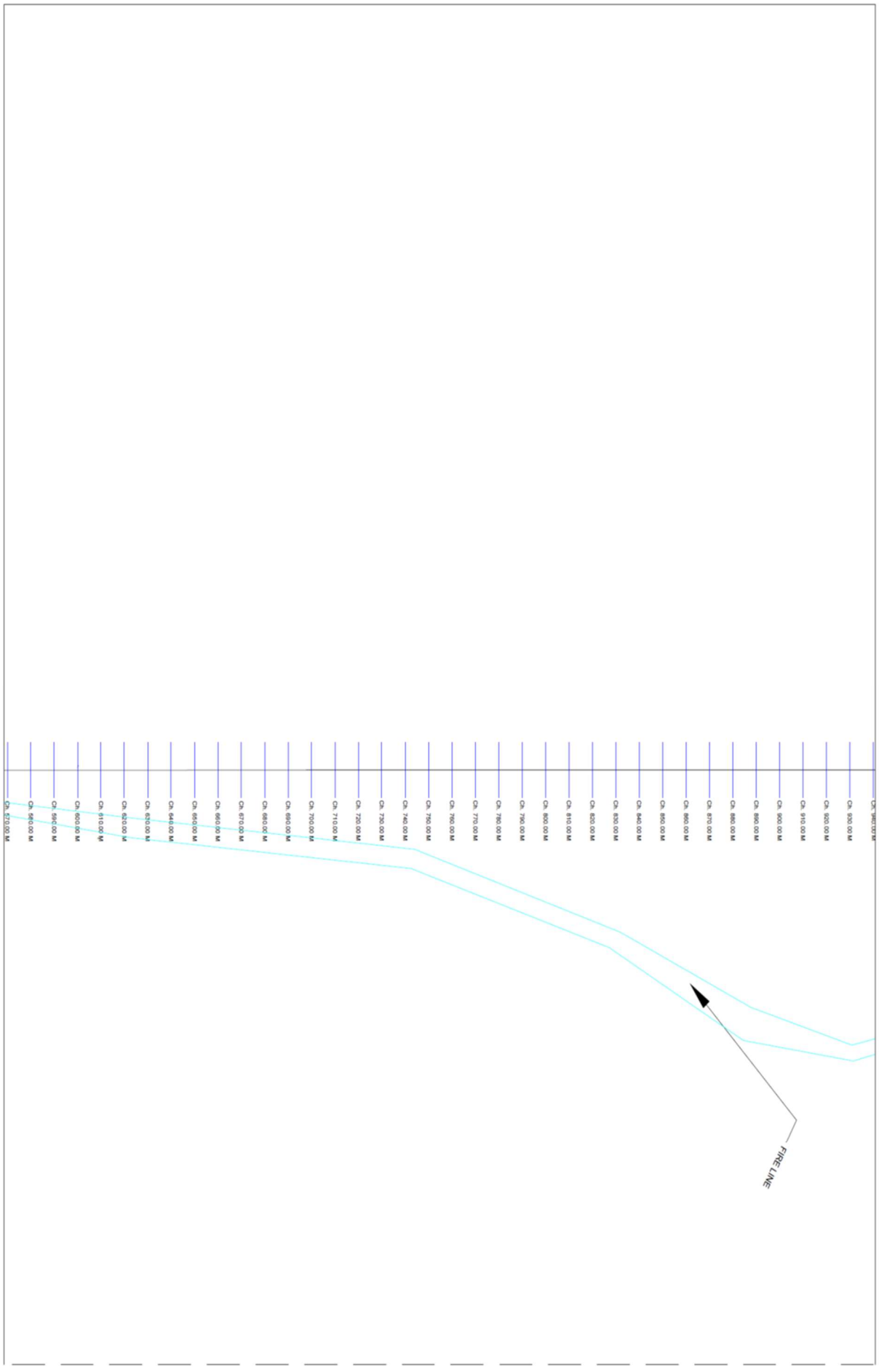
5.3.1 Ground Profile of Alignment

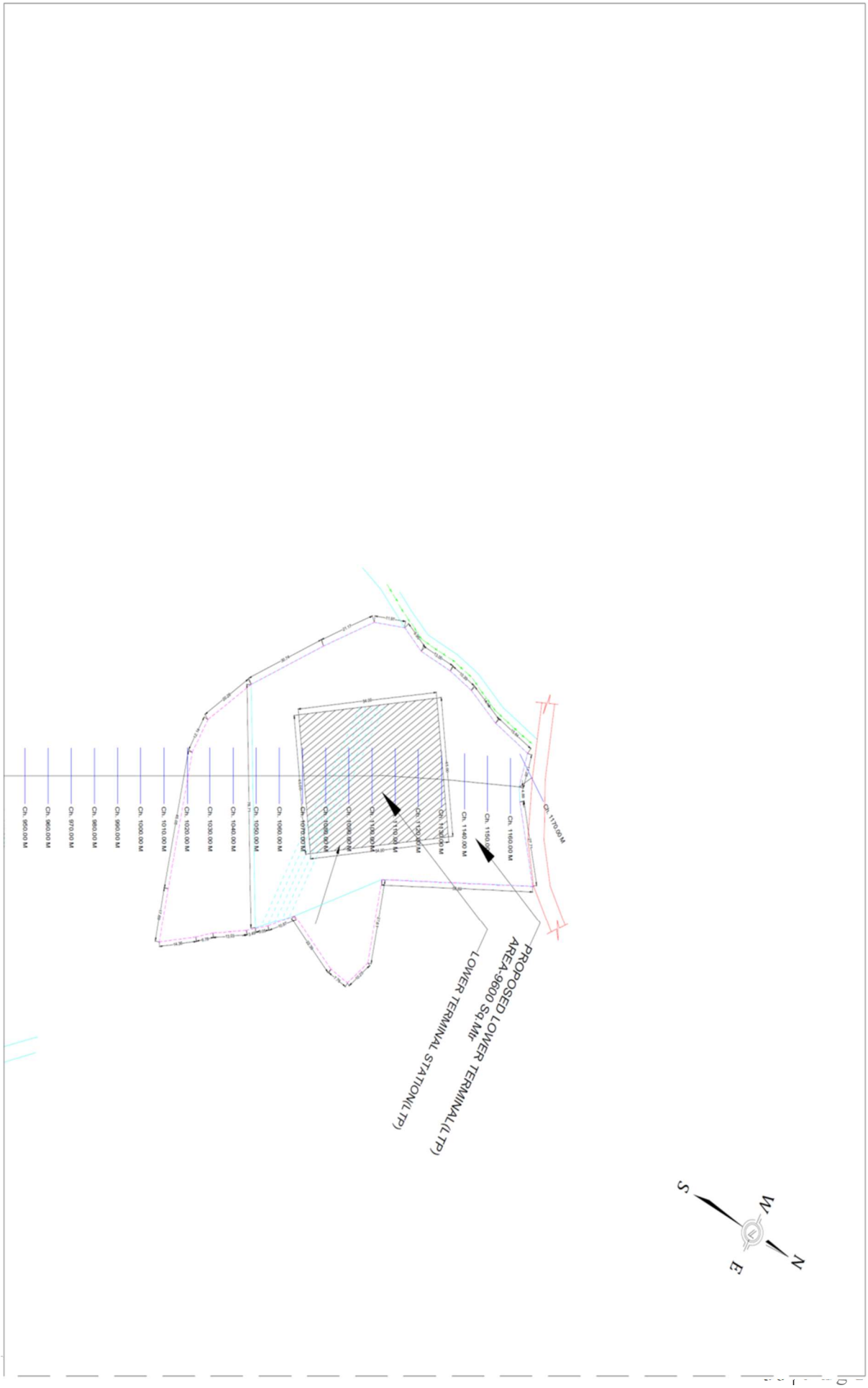


5.3.2 **Topographical Plan**


KEY MAP
EXISTING APPROACH ROAD
SHILLONG VIEW POINT
PARK


LAND BELONG
LHS OF FIRE LINE LAND BELONGING TO FOREST DEPARTMENT
FIRE LINE
UPPER TERMINAL ST
RHS OF FIRE LINE LAND BELONGING TO RAID LABAN DORBAR


FIRE LINE


Ch. 950.00 M
Ch. 960.00 M
Ch. 970.00 M
Ch. 980.00 M
Ch. 990.00 M
Ch. 1000.00 M
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Ch. 1020.00 M
Ch. 1030.00 M
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Ch. 1070.00 M
Ch. 1080.00 M
Ch. 1090.00 M
Ch. 1100.00 M
Ch. 1110.00 M
Ch. 1120.00 M
Ch. 1130.00 M
Ch. 1140.00 M
Ch. 1150.00 M
Ch. 1160.00 M
Ch. 1170.00 M
LOWER TERMINAL STATION(L.T.P.)
PROPOSED LOWER TERMINAL(L.T.P.)
AREA-9600 Sq.Mtr.
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6 TRAFFIC STUDY

6.1 Methodology: -

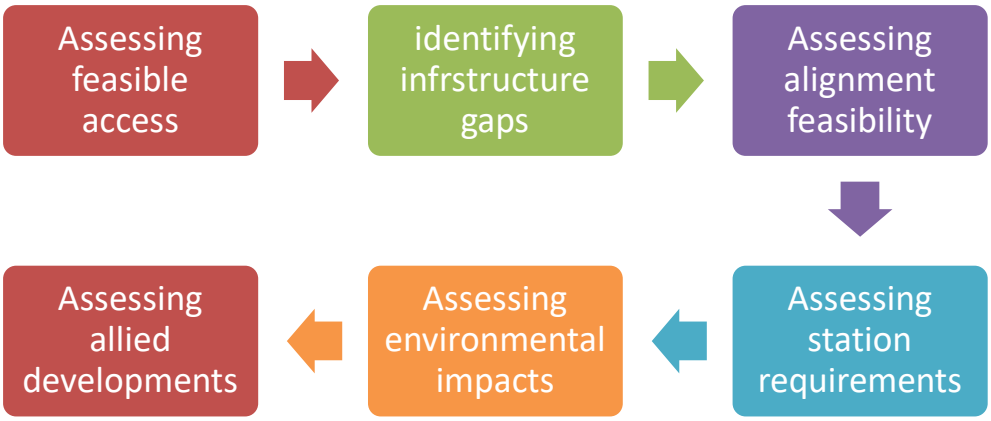
Physical visit to the project sites were made in order to ascertain the prospect of traffic potential. After accumulating the relevant data, the following methodology was adopted in order to infer and make projections of traffic potential.

- Linear trend analysis – the past trend of traffic was extrapolated to estimate the futuristic traffic level.
- Exponential growth estimate – based on the exponential growth of the last 3-5 years, CAGR is used to estimate the future projections.
- End use method- First-hand information – response from the project locations has been taken in order to estimate the projections and draw the assessments.
- Potential growth is assessed, based on the known plans of future development in the hinterland, the expected population growth, Industrial and Agricultural growth.
- Peak Tourists footfalls data was analyzed to get the traffic trends
- Competition analysis and Market acceptance.

The detailed activities involved in carrying out site study are listed below:

1. Collection of secondary data and visits to sites identified for development of ropeway projects
2. Mapping out data requirements
3. Estimating land requirement.

6.2 Technical Studies



1. Assessment of various connectivity feasible to access stations with available infrastructure.
2. Identifying infrastructure gap
3. Assessing technical Feasibility of alignment
4. Assessing feasibility of base station and top station in terms of facilities to be provided to tourists like parking, boarding, and lodging, support infrastructure (power, water etc.) refreshment facilities, etc.
5. Preliminary feasibility with respect to environment, social aspects of project
6. Assessing allied infrastructure developments

6.3 Traffic Survey

A field survey was conducted at the above locations with the objective to collect the first-hand information from the tourists and local visitors. A small questionnaire was developed by the Consultant to know existing travel pattern with the money spent for the visit, wiliness to shift and paying capacity for the ropeway project. Further, primary

interaction was undertaken with Local populate, besides discussion with Tourism Department officials of Govt. of Meghalaya. Secondary data on tourists inflow to Meghalaya and Shillong was provided by Tourism Department, Government of Meghalaya, **A sample of questionnaire is attached as Annexure F.**

6.4 Origin Destination Survey

The objective of the Origin-Destination (O-D) survey is to gather information regarding travel characteristics of different road users on the project road. Results of the O-D survey are used to describe the user characteristics of passengers, such as distribution of local and through traffic. The main emphasis of O-D Survey is to capture catchment areas characteristics, willingness to pay characteristics, Trip frequencies etc. O-D Survey was conducted from 7. 10.2019 to 9.10.2019 at Shillong Viewpoint. This period was specifically chosen for traffic survey as there was holiday on 8th October 2019, being Dusshara and 7th and 9th were regular working days. This holiday on the 8th is assumed to be representative of traffic to Shillong Viewpoint on weekends and holidays. It is observed that the tourists visit in a group of 3-4 therefore a sample size of 100 was considered adequate in the present traffic scenario.

6.5 Stated Preference Survey

Stated preference survey regarding proposed ropeway from Shillong Viewpoint to Lawsohtun has been conducted on the tourists visiting Shillong View point

Following is the outcome of stated preference survey and willingness to pay for proposed ropeway.

No of times tourists visited Shillong Viewpoint

Table 6-1Tourists visited Shillong Viewpoint

Frequency	Percentage (%)
Once	51
2 Times	23
3 Times	19
Almost Every Year	7

Total	100

From the above table only 7% tourists regularly visit Shillong viewpoint every year. It is more likely that these 7% tourists who are regular visitors may not use ropeway for their visits to Shillong Viewpoint. Therefore, it is assumed that 93% tourists will use ropeway.

Mode of travel for tourists visiting Shillong Viewpoint

Table 6-2 Mode of travel for tourists visiting Shillong View Point

Mode	Percentage (%)
By Bike	2%
By Share taxi	61%
By Own arrangement	37%
Total	100%

From the above table it is clear that 37% tourists visit by own vehicle and 2% come by 2-wheeler. This data will be used in calculation of requirement of parking spaces.

Origin of tourists visiting Shillong Viewpoint

Table 6-3 Origin of tourists

Tourists	Percentage (%)
Local Passenger	3%
Outsider	97%

From the above table it is clear that 3% visitors are local passengers. It is most likely that they may not use ropeway to visit Shelling Viewpoint.

Willingness to use Shillong Viewpoint Ropeway

Table 6-4 Willingness to use Shillong View Point

	Percentage (%)
Yes	99%
No	1%

Form the above table it is clear that 99% of the surveyed tourists have shown willingness to use ropeway if it is constructed.

Willingness to pay for Shillong Viewpoint Ropeway

Table 6-5 Willingness to Pay for Ropeway

In Rs.	Percentage (%)

Less than 100	9%
100 to 200	42%
200 to 300	44%
More than 300	5%

From the above table about 91% tourists have shown willingness to pay Rs. 100-200 for the ropeway facility and 9% are ready to pay less than Rs. 100/- for using ropeway facility.

Preferred timings to visit Shillong Peak

Table 6-6 Preference of ropeway user

In Rs.	Percentage (%)
Morning	43%
Afternoon	31%
Evening	26%

Maximum number of tourists i.e. 69% have shown preference to visit Shillong Viewpoint in the morning and evening. Therefore, 8 hours working timings for ropeway between 9:00 AM to 5:00 PM are proposed.

6.6 Existing Tourists Inflows

6.6.1 Year Wise Traffic Statistics in Meghalaya

Meghalaya despite having several bottlenecks has been able to attract large number of tourists. Meghalaya tourism department has shared a tourist data visiting Meghalaya from the Year 2000 to Year 2018. To estimate traffic growth tourist data of the last 10 years is used.

The total tourists visited in Meghalaya state in the last 10 years is as under:

Table 6-7Tourists Visiting Meghalaya

Tourists visiting Meghalaya					
Year	**Indian**	**Foreign**	**Total**	**Percentage growth**	**% Foreign Passengers**
1	**2**	**3**	**4**	**5**	
2009	591398	4522	595920		0.76%
2010	652756	4177	656933	**10.2%**	0.64%
2011	667504	4803	672307	**2.3%**	0.71%
2012	680254	5313	685567	**2.0%**	0.77%

2013	691269	6773	698042	**1.8%**	0.97%
2014	717789	8664	726453	**4.1%**	1.19%
2015	751165	8027	759192	**4.5%**	1.06%
2016	830887	8476	839363	**10.6%**	1.01%
2017	990856	12051	1002907	**19.5%**	**1.20%**
2018	1198340	18114	1216454	**20.94%**	**1.49%**
	CAGR			**8.25%**	

(Source Department of Tourism, Govt. of Meghalaya)

As seen in the above table, there is a visible growth of tourists in the last 10 years**, the CAGR traffic growth from 2009 to 2018 is 8.25%.** It can be seen that average percentage of foreign passenger of the total passengers visiting Meghalaya is 1%.

6.6.2 Year-Wise Traffic Statistics in Shillong

Meghalaya tourism department has shared a tourists data visiting Shillong from the Year 2015 to Year 2018. Traffic growth of tourists visiting Shillong is calculated below:-

Table 6-8Year wise tourists statistics at Shillong

Year	Total tourists of Meghalaya	Total Tourists of Shillong	Percentage of tourists to Shillong out of tourists to Meghalaya
2005	381010	-	-
2006	404546	-	-
2007	462952	-	-
2008	554873	-	-
2009	595920	-	-
2010	656933	-	-
2011	672307	-	-
2012	685567	-	-
2013	698042	-	-
2014	726453	-	-
2015	759192	644391	85%
2016	839363	706819	84%
2017	1002907	835967	83%
2018	1216454	1094425	90%
	Average %		**85%**

(Source of Shillong Statistics: Department of Tourism, Govt. of Meghalaya)

On an average 85% of the tourists visiting Meghalaya also visit Shillong.

6.6.3 Month-Wise Traffic Statistics at Shillong

Month-wise registered tourists visited Shillong in the last four year (2015-2018) as given by the tourism department is presented as under:

Table: 6.6

Table 6-9 Month wise traffice at Shillong

Year/Month	2015	2016	2017	2018
Jan	41607	46276	53941	69104
Feb	45872	42874	54405	68956
Mar	44699	53838	58099	72140
Apr	25501	39318	62968	86806
May	71801	62277	74317	110376
Jun	77313	69059	79087	93558
Jul	70196	78475	92726	108488
Aug	52238	59452	61949	123868
Sep	51222	60570	71523	72755
Oct	64155	74433	78531	98544
Nov	50957	59985	70928	90242
Dec	48830	60262	77493	99588
Total	644391	706819	835967	1094425
Avg. Traffic per month	53700	58901	69663	91202
Peak Traffic	44%	33.20%	33%	21%
Average % Peak Traffic	**32.8%**			

(Source of Shillong Statistics: Department of Tourism, Govt. of Meghalaya)

(Peak traffic is percentage of traffic over and above normal traffic in a month)

It can be seen from the above table that May to July and October is the peak month. The lean month is January to April, August to September and November to December, as per the tourists statistics. The peak season can be defined from May to July and October whereas the lean season can be defined as January to April, August to September and November to December. **It is observed that on an average peak traffic is 32% above normal traffic**

6.6.4 Month-Wise Traffic Statistics at Shillong Viewpoint

Meghalaya tourism department has shared a tourists data visiting Shillong Viewpoint from the Year 2017 to Year 2019 (till September). Month-wise registered tourists

visited Shillong Viewpoint in the last three years as given by the tourism department is presented as under:

Table 6-10Month wise traffic at Shillong View Point

Year/Month	2017	2018	2019
Jan	4500	3350	5400
Feb	5250	5900	4450
Mar	6000	5350	7050
Apr	9000	13450	11550
May	7500	17650	7000
Jun	10500	24800	12650
Jul	12000	6500	12100
Aug	4750	7500	5850
Sep	9700	6000	6700
Oct	12500	14600	-
Nov	6650	10050	-
Dec	9100	14350	-
Total	**97450**	**129500**	**72750**

(Sources: Department of Tourism, Govt. of Meghalaya)

The tourists data at Shillong Viewpoint is being maintained by the tourist department of Meghalaya State Government since 2017.

6.6.5 Year-Wise Traffic Statistics at Shillong Viewpoint

Table 6-11Yearwise traffic Statistics at Shillong view Point

Year	Shillong	Shillong Viewpoint	Percentage of tourists visiting Shillong Viewpoint
2017	835967	97450	11.65%
2018	1094425	129500	12%

It is observed that on an average 12% of the tourists visiting Shillong also visit Shillong viewpoint.

Reasons for the limited traffic in Shillong viewpoint is as under: --

- Only Indian tourists are allowed at the Air force Entrance Gate.
- Every Wednesday, the viewpoint remains closed.

- Passengers are allowed to visit viewpoint from 9:00 AM to 3:30 PM (Very narrow span)
- A High waiting time at the Air Force Entrance Gate (Approx. 2 Hrs to 3 Hrs).

6.7 Traffic Forecast for Meghalaya

It can be seen from the above table 6.7 that, the number of tourists to Meghalaya has grown at average of 8.25% from year 2009 to 2018.

It is assumed that the ropeway construction may start in the year 2022 as indicated in Annexure B. It is also assumed that the concession period will be 30 years including construction period of 1 year and preconstruction period i.e. condition precedent period of 12 months. The concession period of 30 years is assumed as per the Model Concession Agreement of NITI Aayog. Thus, the ropeway operation will commence in year 2023. Therefore, the total traffic projection for Meghalaya from year 2019 to year 2053 is considered.

Three different scenarios have been adopted to forecast the tourists traffic of Meghalaya.

Scenario-1: Optimistic Scenario
Scenario-2: Business-As-Usual
Scenario-3: Conservative Scenario

6.7.1 Optimistic Scenario:

In this scenario consultant have assumed an aggressive growth of 10.0% for the first 20 year from the base year i.e. 2019-2038 after that 8.0% for the next 10 year i.e. 2039-2048 and kept it constant is in the next remaining years.

6.7.2 Business-As-Usual

In this scenario consultants have assumed an aggressive growth of 8.25% for the first 20 year from the base year i.e. 2019-2038 after that 6.25% for the next 10 years i.e. 2039-2048 and kept it is constant for the remaining years in the next remaining years.

6.7.3 Conservative Scenario

In this scenario consultant have assumed an aggressive growth of 6.25% for the first 20 year from the base year i.e. 2019-2038 after that 4.25% for the next 10 years i.e. 2039-2048 and kept it is constant for the remaining years in the next remaining years.

Table 6-12 Traffic forecast Scenario

Year	Optimistic Scenario	Business as Usual Scenario	Conservative Scenario
Growth in Yr 2019-2038 (20 years)	10.00%	8.25%	6.25%
Growth in Yr 2039-2048 (10 years)	8.00%	6.25%	4.25%
Growth in 2048-2053 (5 years)	0%	0%	0%

6.7.4 Traffic forecast for Meghalaya under three Scenarios

Table 6-13 Traffic Forecast in Meghalaya

Tourists for Meghalaya			
Year	**Optimistic Scenario**	**Business as Usual Scenario**	**Conservative Scenario**
Growth	10.0% (2019-38) 8.0% (2039-48) 0% (2049-53)	8.25% (2019-38) 6.25% (2039-48) 0% (2049-53)	6.25% (2019-38) 4.25% (2039-48) 0% (2049-53)
2018	1216454	1216454	1216454
2019	1338099	1316811	1292482
2020	1471909	1425448	1373263
2021	1619100	1543048	1459091
2022	1781010	1670349	1550285
2023	1959111	1808153	1647177
2024	2155022	1957326	1750126
2025	2370525	2118805	1859509
2026	2607577	2293607	1975728
2027	2868335	2482829	2099211
2028	3155168	2687663	2230412

2029	3470685	2909395	2369813
2030	3817754	3149420	2517926
2031	4199529	3409247	2675296
2032	4619482	3690510	2842502
2033	5081430	3994977	3020159
2034	5589573	4324562	3208919
2035	6148531	4681339	3409476
2036	6763384	5067549	3622568
2037	7439722	5485622	3848979
2038	8183694	5938186	4089540
2039	8838390	6309323	4263345
2040	9545461	6703655	4444538
2041	10309098	7122634	4633431
2042	11133826	7567798	4830351
2043	12024532	8040786	5035641
2044	12986494	8543335	5249656
2045	14025414	9077293	5472766
2046	15147447	9644624	5705359
2047	16359243	10247413	5947837
2048	17667982	10887876	6200620
2049	17667982	10887876	6200620
2050	17667982	10887876	6200620
2051	17667982	10887876	6200620
2052	17667982	10887876	6200620
2053	17667982	10887876	6200620

6.8 Traffic Forecast for Shillong Viewpoint Ropeway

The following assumptions have been made for forecasting ropeway ridership during the concession period of 30 years.

- *As per the table 6.7 it is clear that on average 1% are the foreign tourists of the total tourists visiting Meghalaya. Foreign tourists at present do not visit Shillong viewpoint because Air force does not allow them to visit (indicated in para 6.6.5). If ropeway is constructed, then foreign tourists can visit Shillong Viewpoint. It is*

assumed that 1% foreign tourists visiting Meghalaya will also visit Shillong viewpoint using ropeway.

- *It is observed from table 6.11 that on an average 12% of the tourists visiting Shillong also visit Shillong viewpoint. This observation is based on the secondary traffic data. However, following observations are made about the existing tourists visiting Shillong viewpoint based on the primary survey as indicated in para 6.5: -*

    i. *From the table 6.1 only 7% tourists regularly visit Shillong viewpoint every year. It is more likely that these 7% tourists who are regular visitors may not use ropeway for their visits to Shillong Viewpoint. Therefore, it is assumed that 93% tourists will use ropeway.*

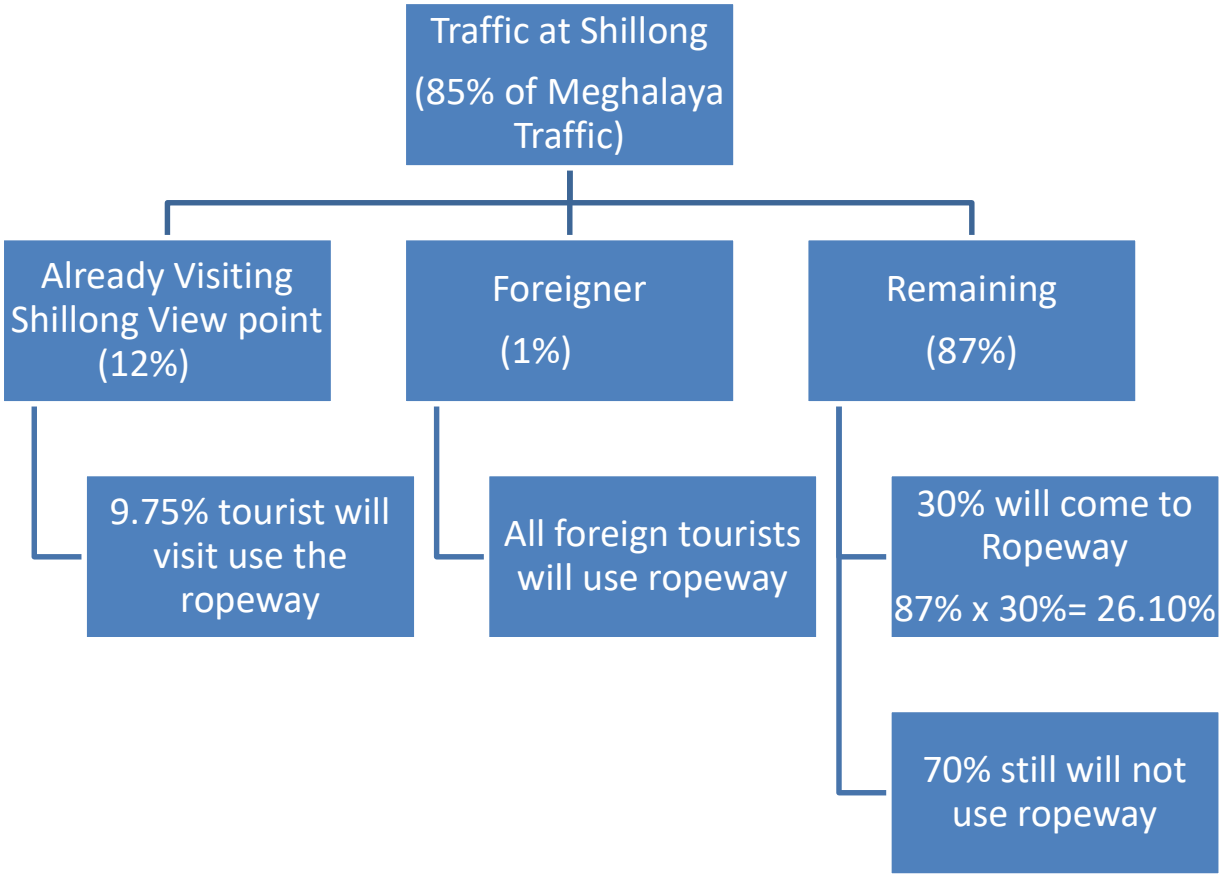
    ii. *From the table 6.3, it is clear that 97% tourists are outsider of Shillong. It is considered that the local tourists will not use the ropeway.*

    iii. *From the table 6.4, it is clear that 99% tourists have shown their willingness to use ropeway facility to reach Shillong viewpoint.*

    iv. *From the table 6.5, it is clear that 91% tourists have shown their willingness to pay the fare between Rs. 100 to 200.*

From the above we can say that 12% X 93% X 97% X 99% X 91% = 9.75% from the existing tourists will use the ropeway.

- *It is assumed that the 30% of remaining tourists who are at present not visiting the viewpoint due to constraints will start visiting the Shillong View point if ropeway is constructed owing to availability of convenient, faster, quick, cheaper alternative mode of transportation and removal of Air Force entry. This is highly conservative assumption as Shillong View Point is the utmost tourists destination in Shillong and interaction with the tourists indicate that all the tourists desire to visit Shillong Peak but many of them do not/ cannot visit Shillong Peak due to constraints mentioned above.*



From the above, it is estimated that the total 36.85% of the tourists to Shillong (1% foreign tourists + 9.75% existing tourists + 30% due to induction of remaining 87% i.e. 26.10%) will use the ropeway to visit Shillong View point.

Table 6-14Traffic Calculation for Shillong Peak Ropeway

Traffic to Ropeway	% of Shillong Traffic
Foreign Tourists	1%
Existing Tourists (from 12%)	9.75%
Due to Induction (30% of remaining 87%)	26.10%
Total Traffic	36.85%

Other assumptions: -

- *330 working days in a year have been considered allowing downtime for maintenance, breakdown and extreme weather conditions.*
- *Peak traffic is 30% higher than the normal traffic.*
- *Operation time of Ropeway in a day is considered as 8 hours.*

6.8.1 Traffic Forecast for Shillong Viewpoint Ropeway (Optimistic Scenario)

Determining the design capacity: - Optimistic scenario is considered for design purpose of ropeway only. For estimating the design capacity, we have taken into account traffic projection under optimistic scenario. The Peak hours traffic and 365 days working in a year.

Table 6-15 Optimistic Scenario for Shillong View Point Ropeway

Year	Traffic in Meghalaya	Traffic in Shillong	Traffic for Shillong Peak Ropeway in 365 day	Per day Traffic to Ropeway	Per Hours Traffic	Peak Hour Traffic
	A	B= 0.85 x A	C= .0.3685 x B	D= C / 365	E=D/8	F= (1+30%) x E
2018	1216454	1033986	381024	1044	130	170
2019	1338099	1137384	419126	1148	144	187
2020	1471909	1251123	461039	1263	158	205
2021	1619100	1376235	507143	1389	174	226
2022	1781010	1513859	557857	1528	191	248
2023	1959111	1665245	613643	1681	210	273
2024	2155022	1831769	675007	1849	231	301
2025	2370525	2014946	742508	2034	254	331
2026	2607577	2216441	816758	2238	280	364
2027	2868335	2438085	898434	2461	308	400
2028	3155168	2681893	988278	2708	338	440
2029	3470685	2950082	1087105	2978	372	484
2030	3817754	3245091	1195816	3276	410	532
2031	4199529	3569600	1315398	3604	450	586
2032	4619482	3926560	1446937	3964	496	644
2033	5081430	4319216	1591631	4361	545	709
2034	5589573	4751137	1750794	4797	600	779
2035	6148531	5226251	1925873	5276	660	857
2036	6763384	5748876	2118461	5804	726	943
2037	7439722	6323764	2330307	6384	798	1037
2038	8183694	6956140	2563338	7023	878	1141
2039	8838390	7512631	2768405	7585	948	1233
2040	9545461	8113642	2989877	8191	1024	1331
2041	10309098	8762733	3229067	8847	1106	1438
2042	11133826	9463752	3487393	9555	1194	1553
2043	12024532	10220852	3766384	10319	1290	1677

2044	12986494	11038520	4067695	11144	1393	1811
2045	14025414	11921602	4393110	12036	1504	1956
2046	15147447	12875330	4744559	12999	1625	2112
2047	16359243	13905356	5124124	14039	1755	2281
2048	17667982	15017785	5534054	15162	1895	2464
2049	17667982	15017785	5534054	15162	1895	2464
2050	17667982	15017785	5534054	15162	1895	2464
2051	17667982	15017785	5534054	15162	1895	2464
2052	17667982	15017785	5534054	15162	1895	2464
2053	17667982	15017785	5534054	15162	1895	2464

On the basis of above calculations, the highest capacity requirement is worked out to be 2464 passenger per hour in the year 2053.

6.8.2 Traffic Forecast for Shillong Viewpoint Ropeway (Conservative Scenario)

For estimation of revenue from the ticket sales, traffic projections as per conservative scenario have been worked out as follows: -

Table 6-16Conservative Scenario for Shillong Peak Ropeway

Year	Traffic in Meghalaya	Traffic in Shillong	Traffic for Shillong Peak Ropeway in 365 days	Traffic for Shillong Peak Ropeway in 330 days	Per day Traffic	Per Hour Traffic	Peak Hour Traffic
	A	B= 0.85 x A	C= 0.3695 x B	D=C x 330 / (365)	E=D/330	F=E/8	G= (1+30%) F
2018	1216454	1033986	381024	344487	1044	130	170
2019	1292482	1098610	404838	366018	1109	139	180
2020	1373263	1167273	430140	388894	1178	147	192
2021	1459091	1240228	457024	413200	1252	157	203
2022	1550285	1317742	485588	439025	1330	166	216
2023	1647177	1400101	515937	466464	1414	177	230
2024	1750126	1487607	548183	495618	1502	188	244
2025	1859509	1580583	582445	526594	1596	199	259
2026	1975728	1679369	618847	559506	1695	212	276
2027	2099211	1784330	657525	594475	1801	225	293
2028	2230412	1895850	698621	631630	1914	239	311
2029	2369813	2014341	742285	671107	2034	254	330
2030	2517926	2140237	788677	713051	2161	270	351
2031	2675296	2274002	837970	757616	2296	287	373

2032	2842502	2416127	890343	804967	2439	305	396
2033	3020159	2567135	945989	855278	2592	324	421
2034	3208919	2727581	1005114	908733	2754	344	447
2035	3409476	2898055	1067933	965529	2926	366	475
2036	3622568	3079183	1134679	1025874	3109	389	505
2037	3848979	3271632	1205596	1089991	3303	413	537
2038	4089540	3476109	1280946	1158116	3509	439	570
2039	4263345	3623844	1335386	1207336	3659	457	595
2040	4444538	3777857	1392140	1258647	3814	477	620
2041	4633431	3938416	1451306	1312140	3976	497	646
2042	4830351	4105799	1512987	1367906	4145	518	674
2043	5035641	4280295	1577289	1426042	4321	540	702
2044	5249656	4462208	1644324	1486649	4505	563	732
2045	5472766	4651851	1714207	1549831	4696	587	763
2046	5705359	4849555	1787061	1615699	4896	612	796
2047	5947837	5055661	1863011	1684366	5104	638	829
2048	6200620	5270527	1942189	1755952	5321	665	865
2049	6200620	5270527	1942189	1755952	5321	665	865
2050	6200620	5270527	1942189	1755952	5321	665	865
2051	6200620	5270527	1942189	1755952	5321	665	865
2052	6200620	5270527	1942189	1755952	5321	665	865
2053	6200620	5270527	1942189	1755952	5321	665	865

6.9 Vehicle Parking

As per table 6.16, the PPH at the end of concession period of 30 year i.e. year 2053 is 865. Each tourist may require about 2 hours turnaround time. A normal family size of Indians is four. As per table 6.2, 37% tourists visit Shillong viewpoint by their own vehicles. On an average 4 persons will require one vehicle. Therefore 37% of 865 i.e. 320 passengers will come by 4-wheeler. If 4-person capacity of 4-wheeler is assumed, then 80 4 -wheeler will come in a hour. If a 4- wheeler is parked for 2 hours, then parking of 160 4-wheeler is required. 61% of 865 i.e. 580 passengers will come by shared taxi. If 4-person capacity of 4-wheeler is assumed, then 145 taxies will be required. If a taxi is parked for 1 hour, then parking of 145 taxies is required. Therefore total 4-wheeler parking of 305 (i.e. 145+160) is required at LTP. From table 6.2, only 2% tourists visit Shillong viewpoint by 2-wheeler. It means 2% of 865 i.e. 17

passengers will come by 2-wheeler. If 2-person capacity are considered and a 2-wheeler is park of 2 hours than 17 two-wheeler parking is required. However, parking requirement of 50 2-wheeler is considered.

7 ROPEWAY SYSTEM

There are basically five (5) types of suspended aerial ropeway systems that can be considered as cable Propelled Transit (CPT):

i. Mono- cable Gondola
ii. Bi- cable Gondola
iii. Tri-Cable Gondola
iv. Pulse Gondola and
v. Jig-Back/Dual line Tramway

7.1 Mono- Cable Gondola

The Mono-Cable Gondola (1S) is a single cable, detachable grip system where the

Figure 7-1 MDG System

vehicles (cabins) detach and attach to the moving haul cable (wire rope) in the stations. The tensioned haul cable itself provides the guideway for the vehicles and no support; a track cable is required. The cableway of circulating gondolas has multiple cabins spaced equally along the line. This 1S mode provides for the narrowest system pathway operating in an envelope as narrow as 12m with code mandated lateral clearances.

Carrying Capacity: 1,000 to 4,500 passengers per hour, per direction
Cabin Capacity: 8 to 12 passengers

Headways: 10 to 30 seconds
Max Speed: 21 KMPH
ROW Width: 12m to 18 m

7.2 Bi- Cable Gondola (2S)

The Bi-Cable Gondola (2S) system is the original lift technology used for gondola cabin-type cableways. Here too numerous gondola cabins that are equally spaced along the

Figure 7-2Bi Cable Ropeway System

cable loop that circulate between the system's stations. To provide support between more widely spaced towers, the cabins travel on a highly tensioned stationary cable on each side of the cableway. Thus, there are two (2) cables per direction, a haul cable and a support track cable. The 2S system allows for higher speeds and larger cabins compared with mono-cable technology.

Carrying Capacity: 1,000 to 5,000 passengers per hour, per direction
Cabin Capacity: 15 to 20 passengers
Headways: 12 to 30 seconds
Max Speed: 30 kmph
ROW Width: 15m to 22m

7.3 Tri-Cable Gondola (3S)

The Tri-Cable Gondola (3S) system is a more specialized cableway technology used especially for long spans and high-profile guideways. It is essentially a Bi-Cable Gondola (2S) system with a second fixed track cable on each side for more stability. Typically, the passenger cabins are larger with detachable grip cabins that circulate between the end and inline stations. Compared with the bi-cable the 3S provides for longer spans between towers and larger cabins.

Carrying Capacity: 2,000 to 7,000 passengers per hour, per direction
Cabin Capacity: 20 to 35 passengers
Headways: 15 to 45 seconds
Max Speed: 40 Kmph
ROW Width: 20m to 30m

Figure 7-3Tri Cable Ropeway

7.4 Pulse Gondola

This type of system has limited application due to its relatively low passenger carrying capacities. This type of system is similar to the jig-back tramways, except that it is a circulating gondola with tramway type of movement. There can be only a haul cable

and no track cables, or a single-track cable and single haul cable. There are groups of two to four small cabins, rather than 2 large cabins; and the pulsed groups of cabins "circulate" between the stations on a continuous cable loop rather than jig-back between them. This is a fixed grip system where the cabins do not come to a complete stop in the stations, but move slowly through the stations for boarding, as do detachable gondolas, which helps to increase capacity.

Carrying Capacity: 300 to 700 passengers per hour, per direction
Cabin Capacity: 6 to 10 passengers
Headways: 2 to 5 minutes
Max Speed: 15 kmph
ROW Width: 12m to 20m

Figure 7-4Pulse Gondola Ropeway

7.5 Jig-Back and Dual-Line Gondola

The Jig-Back and Dual Line Aerial Tramway system is the original aerial cableway technology used for transit or general public transportation. There are several of these systems that have delivered passenger service continuously for over 100 years. Typically, there are two (2) large cabins on the same haul cable at opposite ends of the loop cable system that go back and forth; they "jig-back" between the stations. The cabins can also run on independent cable loops, a configuration called a "Dual Line,"

on which they go back and forth between stations independently. New York City's Roosevelt Island CPT is a Dual Line Aerial Tramway.

Carrying Capacity: 500 to 2,000 passengers per hour, per direction

Cabin Capacity: 50 to 200 passengers

Headways: 4 to 15 minutes

Max Speed: 40 Kmph

ROW Width: 30m

Figure 7-5Jig Back Ropeway

7.6 Passenger Ropeways in India

In India, Passenger ropeway concept is at very nascent stage and ropeways are used for tourism purpose. There are over 25 Ropeways for tourism mainly situated at various hill stations and pilgrimage centres in India. Majority of these ropeways were built and operated by Indigenous suppliers. Some of them procure some ropeway components from International manufacturers and assemble them. There are ropeway manufacturers in India who build BIS standard ropeways.

The Indian Standard ropeway systems are mostly built in India as Indian Ropeway systems are several times cheaper than International one (Especially European Systems), CEN standard systems are widely used across the world. There are very few ropeway systems conforming to European CEN standard in India.

Following table gives comparison of some of the ropeways in India –

Table 7-1Ropeways in India

Sr. No.	Name of Project	Technology	Length(km)	Capacity (PPH)	Tariff (Rs per person-Return trip)
1	Vaishno Devi, Ropeway	CEN	0.45	800 PPH	Rs. 100
2	Patnitop, Ropeway	CEN	2.60	600 PPH	Rs. 1000
3	Gun Hill, Ropeway	BIS	0.40	NA	Rs 150
4	Kempty Falls, Ropeway	BIS	0.13	400 PPH	Rs 150
5	Maa Mansa Devi, Ropeway	BIS	0.57	800 PPH	Rs. 115
6	Maa Chandi Devi, Ropeway	BIS	0.67	800 PPH	Rs. 165
7	Naina Devi Ji, Ropeway	BIS	0.54	640 PPH	Rs. 110
8	Jakhu, Ropeway	BIS	0.40	250 PPH	Rs. 500
9	Saptashrungi Ropeway	BIS	0.30	600 PPH	Rs. 90
10	Namchi, Sikkim	BIS	0.80	300 PPH	Rs. 150/-
11	Gangtok, Sikkim	BIS	0.80	250 PPH	Rs. 117/-

Note: All are MDG except Sr. No.1.

7.7 Indian Case Studies

7.7.1 Gulmarg Gondola, J & K.

Table 7-2Gulmarg Ropeway Technical Details

Location:	Srinagar, Jammu & Kashmir
Route :	2- Stage Ropeway between Gulmarg resort to Aparwath Peak Station (Stage-1: Gulmarg resort to Kongdori station; Stage-2: Chair car ferries skiers to Apparwath Peak from Kongdori station)
Stretch :	Approx. 2500m
Standard	CEN
Ropeway Type	Stage:1 Detachable grip type Gondola (MDG) Stage:2 Detachable Grip type gondola (MDG)
Carrying Capacity	Stage-1 1500 PPH, Stage-2 : 600 PPH
Ticket Cost	Stage-1: Rs. 600; Stage 2: Rs. 800
SPV	J & K State cable car Corporation
Technology Provider	Technology by POMA

7.7.2Auli Cable Car, Uttarakhand

Table 7-3Auli Cable Car details

Location:	Garwal, Uttarakhand
Route :	Auli to Joshimath, offering magnificent view of Himalaya
Stretch:	Approx. 4000m
Standard	CEN
Ropeway Type	Hybrid Ropeway- Containing Gondola (2S Detachable) and Chair lift/ Ski lift
Carrying Capacity	Gondola: 400 PPH, Chair lift: 400 PPH
Ticket Cost	Return fare is Rs. 400-700
SPV	Garhwal Mandal Vikas Nigam Limited
Contractor	Damodar Ropeways & Infra Limited GMM (Gimar Montaz Mautino) of France

7.7.3Solang valley Ropeway, Himachal Pradesh

Table 7-4Solang Valley Ropeway Details

Location:	Manali, Himachal Pradesh
Route :	Solang Valley
Stretch :	Approx. 1300m
Standard	CEN
Ropeway Type	Gondola (2S Detachable)
Carrying Capacity	1200 PPH
Ticket Cost	Return fare is Rs. 500/-
SPV	Ski Himalayas Ropeway Pvt. Ltd.
Contractor	Poma of France

8 PROPSOED ROPEWAY SYSTEM

8.1 Monocable Detachable Gondola (MDG)

While selection of right technology, we need to keep few points at back of mind like sustainability, future maintenance support and lower operations cost etc. We recommend Monocable detachable gondola system (1S) for Lawsohtun- Shillong viewpoint to be considered for implementation in this project.

The Circulating **Mono-cable Detachable Gondola System (1S)** is recommended for this section and it is selected for the following reasons:

- Ninety percent of all currently operating CPT (Cable Propelled Transit) systems are mono-cable gondolas, because they are least expensive to build and operate.
- The transportation industry and CPT operators have the most experience with this type of Ropeway technology
- Requiring the narrowest ROW, it is the most appropriate CPT for built environments using existing roadways

Figure 8-1Proposed monocable Ropeway

- The mono-cable gondola is a standard product requiring the least amount of custom architecture and engineering

- ❖ Tower and other components are standard and can be constructed in less than 18 months once all approvals are in place
- ❖ MDG system is selected for this alignment for due to all above reasons and it can handle the required capacity for this alignment.

The guideway, or line, for a mono-cable gondola CPT system is an aerial rotating steel cable loop driven and tensioned at the end stations and supported and guided by sheave-train rollers mounted on cross arms supported by vertical, steel line towers along the route. The support towers can be constructed along the centreline of the alignment. The height of the towers and cables can range between 15m to 50m depending on numerous clearance factors such as pedestrians below, roadways and traffic below, other transit and stations below, buildings and structures below, obstacle clearance, crossing over waterways, highways and bridges, view corridors, privacy issues of commercial and residential buildings along the route, etc. Schematic diagram of circulating monocable detachable gondola system is shown below.

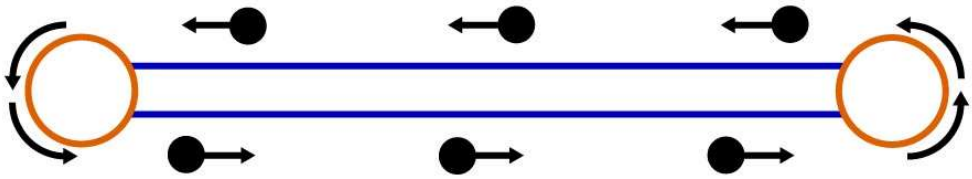


Figure 8-2Circulating system of Monocable ropeway

In the case of Lawsohtun- Shillong viewpoint Ropeway, the spacing of the towers along the alignment depend on factors, such as desirable / undesirable tower base locations, acceptable cable sag, suitability of ground for tower foundations, buildings and obstacles, crossing over forest.

In this type of ropeway the vehicles are automatically coupled to the rope on leaving the station and automatically detached on arrival at the station.

8.2 Technical Details

Table 8-1 Technical Details of Proposed Ropeway

Sl. No.	Description	Based on CEN standard
1	Horizontal Length	955 m

Sl. No.	Description	Based on CEN standard
2	Vertical Rise	343 m
3	Speed	6.0 m/s
4	Hourly Capacity	600 PPH (initial)
5	Hourly Capacity	2500 PPH (Final)
6	Cabin Capacity	8 Passenger
7	Headway	48 Sec, 11 Sec
8	Travel Time	3 min 10 sec
9	No. of Cabins	8 Nos., 34 Nos.
10	Dia. Of Rope	40 -52 mm
11	Rope Length	2390 m
12	Motor Power	360-560 KW
13	No. of Towers	5
14	No of Stations	2

8.3 Tower locations for Ropeway

Table 8-2Tower Location for CEN standard Ropeway

Sr. no.	Chainage	Elevation in metre	Tower Height
1	(LTP Station)	1577	-
2	25 m (Tower-1)	1580	20 m
3	275 m (Tower-2	1664	40 m
4	525 m Tower-3)	1752	40 m
5	775m (Tower-4)	1834	35 m
6	935 m (Tower-5)	1890	15 m
7	955 m (Upper Terminal)	1895	-

8.4 Land Required for the Ropeway

Table 8-3Land Requirement Details

Sr. No.	Description	CEN Standard
1	Land for LTP Station	4000 Sqm
2	Land required for UTP Station	2400 Sqm
3	Land required for Tower Peer (10 x 10 m for Each)	500 Sqm
4	Land under ROW (20m x 955 m)	19,100 Sqm

Note: The complete ROW is full of trees. The forest area under ropeway passage shall not be included in the total area requested for diversion of the project. The dispensation shall be allowed for construction of public utility ropeways and if they are

constructed at least 5 metre above the tree line. Ref: MOEF F. no. 5-2/2017-FC dated 05.07.2019. Therefore, land under ROW will not be required to be procured. (Pease refer Annexure C)

9 LIST OF EQUIPMENT IN ROPEWAY

- Safety device
- Service brakes
- Emergency. Brake
- Emergency drive
- Drive bull wheel with bearing assembly
- Drive Sheave
- Return Sheave
- Maintenance Platform
- Rope Derailment Detection
- Door Closing Control Device
- Coupling
- Station Infrastructure
- Station rope saddle (Use only Track Rope)
- Roller chain
- Counterweight
- Main Gear Box
- Haul rope
- Rope tensioning system
- DG Set(both)
- Carriage/Grip
- Cabin
- Main Motor
- sheaves, towers & platforms, foundations, etc.,
- Mechanical equipment of the line
- Wind speed indicators
- Lightening protection
- Electrical protection:
- Transformer

9.1 Safety features in electrical system

Various safety features provided in electrical system are listed below.

- Speed regulation of Over Speed
- Under / Over Voltage protection
- Overload / Over current
- Tension System interlock with system safety
- Cabin swing at tower
- Cabin entry sensing automatically
- Hydraulic pump healthiness check
- Rope earthing
- Lightening Protection
- Over Wind Speed
- Regenerative power control
- Phase sequence monitoring
- Transformer temperature monitoring
- Motor temperature monitoring

10 BACKUP SYSTEM

10.1 Diesel Generator

In case of power failure, standby Diesel Generator of adequate capacity to handle the load of ropeway system and ropeway station lighting should be available for smooth running of complete ropeway system.

10.2 Rescue System

10.2.1 Auxiliary Drive

In case the main motor or its controls are not functioning, a standby electric motor with drive should be provided to run the ropeway at slow speed to move passengers to a terminal for safe evacuation.

10.2.2 Diesel Rescue Engine

In the event of an electric power failure including Diesel Generator or any defect in the drive motor or in auxiliary drive, a Diesel Engine Drive Unit should be provided to run the ropeway at slow speed to move passengers to a terminal for safe evacuation. The engine shall be of reputed make and shall be fitted with independent gearbox, clutch, accelerator, brake mechanism, fuel tank etc. as required.

10.2.3 Vertical Rescue System

In the unlikely event of being unable to move the rope, a rescue system has also been provided to bring the stranded passengers down to ground.

In this system, Rescuer reaches the stranded cabin with the help of Rescue Carriage and lowers the passengers on the ground with the help of Rescue Chair. Rescue Chair is handled by ground team to lower passengers. The entire operation to evacuate all passenger takes approximately 1-2 hours

11 STATION DEVELOPMENT

11.1 Lower Terminal Station Development

- It should be fully covered RCC and high strength hollow blocks to prevent injury during wall collapse.
- The station will have G + four floors segregating waiting area from boarding, deboarding area at fourth floor. The waiting area, recreational facilities, restaurant, sanitary block, etc. will be situated on the third floor and boarding, deboarding area will be on the fourth floor.
- The recommended passenger waiting area of the proposed ropeway station should not be less than 1.2 Sqm per person. This will provide sufficient space for waiting and circulation. The area can be made airconditioned for more comfort. Reception area is proposed at the ground floor
- Parking – Two-wheeler and four-wheeler parking area of 6000 sqm is proposed on ground floor, 1st floor and second floor.
- DG set of minimum 750 KVA is also proposed at this ropeway station.
- Control room, ticketing, administration office, cabin garage will be on the third floor.

11.2 Upper Terminal Station Development

- It should be fully covered RCC and high strength hollow blocks to prevent injury during wall collapse.
- The station building will have G + three floors. At UTP parking is not required. The recreational facilities, waiting area, food court, sanitary block, etc. will be situated on the ground floor, first floor and second floor. The Boarding, deboarding will be on the third floor along with control room, ticketing, administration office, cabin garage.
- A DG set of about 100 KVA is proposed at upper terminal station.
- The recommended passenger waiting area at upper station of the proposed ropeway should not be less than 1.2 Sqm per person. This will provide sufficient space for waiting and circulation.

- 10 m wide pathway of approx. 85 mtr from Station to Viewpoint is proposed.

12 POWER AND WATER REQUIREMENT

12.1 Power Supply

Power connection of the order 1 MVA is required at lower station and about 100KVA is required for Upper Terminal Station. Each station should have independent power supply from the state electricity board. 11 KV power supply is available near proposed LTP by the MEECL. The commercial power at 415V should be made available for station building etc. at LTP and UTP. Power availability at the drive terminal i.e. LTP of the recommended alignment would not pose a problem because the same could be laid from nearby.

The cost of the installation of this power line is included in project cost estimate. Necessary stepdown transformer is provided to supply LT power for ropeway electrical equipment and lighting at LTP.

The ropeway system will work on power supply arranged by MEECL. The lower station is proposed to have driving unit so full power backup is required to be provided to run ropeway system in case of power failure at LTP. In case regular power supply fails, the system will operate on standby Diesel Generator (DG) power supply. Apart from system power backup, a separate DG set is recommended to run station amenities and services. Therefore, it is recommended to have separate DG set at each station. The DG power system shall be noise-free and air pollution free as per code of Practices.

12.2 Water Supply

Estimation of demand for water is the key parameter in planning a water supply scheme.

12.2.1 Construction Phase:-

During construction Phase, water will mainly be required for construction, dust suppression & human consumption. It is estimated that around 5 KLD of water shall be required.

12.2.2 Operation Phase

The total water requirement has been estimated as 211.5 KLD for both stations as detailed below. Water shall be used mainly for flushing, drinking, hand washing & horticulture purposes.

Table 12-1 Calculation of Water Requirement

Sr. No.		Population	Approx. Factor (LPCD)	Water Requirement in KLD
1	Passengers	20000 *	10	200
2	Staff	35	45	1.5
3	Other purpose like cleaning, horticulture etc.			10
	Total Water Requirement			211.5

* 2500 (PPH) X 8 (Operating Hours) = 20000 population

Municipal Water connection is easily available at both the terminal stations. The concessionaire can take connection as per requirement.

For sewerage waste STP is mandatory for the project. Therefore, the developer shall adopt the most appropriate and techno economical feasible treatment process technology and shall design the STP ensuring a effluent quality which complies with the effluent discharge and disposal standards as prescribed by the Central Pollution Control Board / Meghalaya State Pollution Control board as may be applicable as per the law.

Rainwater Harvesting is also mandatory as per The Meghalaya Building Bye Laws, 2011. The plan submitted at the time of construction shall indicate the system of storm water drainage along with points of collection of rainwater in surface reservoirs or in recharge wells.

The indicative cost related to water supply, STP and rainwater harvesting are incorporated in the civil cost.

13 ENVIRONMENTAL IMPACT

13.1 Waste (Solid and Liquid) Management

13.1.1 Construction Phase

Different categories of wastes would be generated during construction period. These wastes include construction debris, metal wastes and other recyclable wastes etc.

During construction phase, a considerable quantum of waste generated at the Project site shall be inert waste, mainly comprising of clay, sand, gravel, concrete, Concrete block, asphalt, pipes, conduits, steel waste and perhaps some hazardous waste (mainly “used oil” from the contractors’ DG sets, if used). A major portion of this waste (particularly the construction debris) shall be used at the project site for leveling work. Mitigation plan for waste management could be prepared which suggest maximizing the reuse of recyclable wastes, safe disposal of non-reusable wastes from the site and proper disposal of hazardous waste to reduce the impact to insignificant levels. It is proposed that recyclable wastes will be disposed off through scrap dealers/recyclers. Some of the wastes are disposed of to the landfill located in nearby area from the site or as per the direction of the State Pollution Control Board. Thus, the waste will not be allowed to accumulate on-site by periodic, systematic and regular disposal to prevent any health impacts. The mitigation plan includes maximizing the reuse of recyclable wastes, safe disposal of non- reusable wastes from the site and proper disposal of hazardous waste to reduce the impact to significant levels.

13.1.2 Operation Phase

The proposed Ropeway project is expected to generate certain types of wastes which would include both non-hazardous and some hazardous waste. The non-hazardous wastes generated at the Ropeway project site would include paper & cardboard wastes, food wastes etc. Solid & liquid waste and other waste to be generated from the proposed Ropeway Project would be classified as given below in the table:

Table 13-1 Waste Management

Sl. No.	Types of Solid Waste and Other waste	Description	Sources
1.	Food waste	Waste from the cafeteria of kitch including preparation, Cooking and serving of food.	Cafeteria/Canteen
2.	Rubbish	I. Combustible (Primary Organic) Paper, cardboard, cartons, wood, boxes, plastics, rags, cloths, bedding, rubber, leaves, yard trimming etc. II.Non-combustibles (Primary Inorganic) Metals, tin cans, metals foil, dirt, stones, bricks, ceramics, crockery, glass bottles, other metal refuse.	Administrative office, ropeway stations and commercial establishments such as cafeteria, stores etc.
3.	Horticultural waste	Tree trimming, leaves, waste from Park/garden	Park/garden
4.	General domestic waste From office and Administration	Paper, General domestic waste etc.	Administrative office and ropeway stations.

The solid waste generated shall mostly be Bio-degradable and very little Non-biodegradable. The solid waste will be collected separately by putting two types of separate bins at the source of generation. Solid waste generation is likely to be somewhat high during the peak tourists seasons. Apart from this, some used oil would be generated during maintenance of the Ropeway systems. Within the Municipal area the conservancy department of the Municipal Board will collect the solid waste.

The generation of used oil is expected to be very little as the DG sets shall run only in emergencies in case of power failures which is very rare.

13.2 Atmospheric Emission

During construction activities for the proposed ropeway stations there will be fugitive emissions such as particulate emissions etc. on small scale. The operation of ropeway will not involve major air emission. The emissions may be mainly due to operation of DG sets in case of electricity shortage proposed as power backup for ropeway project. Stack height of 5.5 m above the roof of station needs to be provided to discharge the

effluent gases from DG set at certain height. The proposed ropeway shall not have any significant impact on ambient air environment.

13.3 Air Pollution

13.3.1 During Construction Phase

During construction phase, the main source of air pollution is anticipated during earthwork involving excavation/cutting etc. and emission from diesel engine used for running concrete mixer. Furthermore, incoming loads shall be covered to avoid loss of material in transport, especially if material is transported off-site.

Control of fugitive dust during the construction period shall be done using the most cost-effective dust suppressant i.e. water, because a source of water tends to be readily available on a construction site. Water shall be applied using water trucks, handheld sprays.

13.3.2 During Operation Phase

Reduction in emissions from vehicular Traffic

The proposed Ropeway is going to contribute to reduce air pollution in the area, as it would reduce the number of vehicle movement from Shillong town to Shillong Peak which is about 15 KM from the town reducing significantly the source of emission (presently private and public vehicles operating on fossil fuel especially diesel are the major source of air pollution).

Reduction in emissions from DG operations

During operational phase, the major air pollutant emissions likely to occur from various envisaged operational & maintenance (O& M) activities such as DG set which can be controlled through providing Stack Height Requirement for Diesel Generator Set and Compliance with Specific Emissions Standards for DG sets

13.4 Noise Pollution

During construction phase, source of noise will be of construction equipment, vehicles for transportation of raw material, DG sets etc. However, noise during this phase will

be only for specific period of construction. During operation to reduce DG set noise, silent DG sets may be installed at station locations.

13.5 Socio economic environment

There will be no human displacement or immigration of population due to proposed project. Wherever elderly, children, disabled people who needs to climb the hill will be able to take safe and convenient travel by using ropeway. Thus, a positive benefit is likely to be created on the socio-economic environment.

13.5.1 DURING CONSTRUCTION PHASE:

The proposed Ropeway project is not going to affect any private and public property in the project area. Hence there will not be any negative impact on the society. However, due to this project, enough employment will be generated during the construction phase. It is proposed that local people will be engaged for various activities during construction period.

13.5.2 DURING OPERATION PHASE:

After completion of construction work, local people will be engaged for various activities during the operation phase. It is proposed that local people will be engaged as per their qualifications and skills. Hence, there will be direct employment generation due to the project. The local economy shall get a big boost. There shall also be huge indirect employment as the project shall generate self-employment opportunities for taxies, local shopkeepers, guides, photographers etc. due to increase in tourists activities in the area and source of income and hence associated business activities will flourish in the project area, which would further generate employment for the local people.

14 GENERAL SAFETY MEASURES

- Suitable signboards and information should be displayed at prominent places to instruct and guide public
- Operating procedures should include safety of staff involved in operation, inspection, examination, testing, maintenance and in emergency procedures.
- Proper operation manuals, safety certificates, design verification documents shall be obtained from manufacturers
- Every specified activity of operation of ropeway should be supervised by competent person
- Safety related to components should be regularly examined.
- Maintenance records should be maintained and kept available for all the time for any review and troubleshooting.
- Periodic system safety audits from competent agency should be carried out on yearly basis to continue safe operation of ropeway.

15 INDICATIVE APPROVALS REQUIRED FOR PROJECT

Following approvals may be required to start construction activities of ropeway project. These may be secured before start of construction.

15.1 EIA Clearances

Please go to the website of MoEF by clicking http://moef.gov.in/impact-assessment-related-notifications/. Please refer Sr. 1, 4 and 9 (Attached in annexure H) of Environmental Impact Assessment Notification-2006 to understand the procedure for obtaining EIA clearance.

Further please refer NABET website (http://nabet.qci.org.in/status-amp-register to obtain the list of accredited agencies for preparing DPR to obtain EIA clearance.

15.2 Land Diversion and Forest Clearance

In all cases of diversion of forest land for non-forestry purposes, action is to be taken up by District Collector/District Magistrate in consultation with the State Forest Department as per provisions of the Forest Conservation Act, 1980. The process of uploading Forest Rights Act Clearance by the DC/DM is provided in the centralized forest clearance website : https://parivesh.nic.in (letter No. 7-2/2019 -ROHO(Pt) dated 03.12.2019 of MoEF, Government of India may be referred, Attached in Annexure I)

In case of tree felling in forest land (Government or private), the matter is to be processed under Forest Conservation Act, 1980 as provided in the forest clearance website https://parivesh.nic.in.

In this connection a website of invest Meghalaya (https://investmeghalaya.gov.in/resources/homePage/17/megeodb/checklist-preestablishment.html) may be referred.

Regarding tree felling in Non-Forest land, the provisions of the Meghalaya Tree Felling (Non Forest Areas) Rules, 2006 as well as the Meghalaya Tree Preservation Act, 1976 applies.

State forest department and land revenue department is well versed with the procedures for land diversion and their assistance can be sought for expeditious processing of the proposals.

15.3 Building Permission

Building Bye Laws given on the website of Meghalaya Urban Development Authority (http://megurban.gov.in/laws/building.pdf) are referred for preparation of this report.

15.4 Air Force Clearance

Should follow the procedure given in guidelines issued by Air Force for issue of NOC for constructions around Indian Air Force aerodromes (https://indianairforce.nic.in/sites/default/files/Guidelines%20for%20Issue%20of%20NOC%20for%20Constructions%20around%20IAF%20aerodromes_NOV2019.pdf)

15.5 Pollution Control Board

Under the Provisions of Section 25 & 26 of the Water (Prevention & Control of Pollution) Act, 1974 and Section 21 of the Air (Prevention & Control of Pollution) Act, 1981, previous consent of the State Pollution Control Board is mandatory to establish or operate any industry, operation or process, or any treatment and disposal system or an extension or addition thereto by any person.

The Consent of the Meghalaya State Pollution Control Board is granted in 2(two) stages:-

- Consent to Establish (CTE) – granted for the purpose of establishment of the industry, etc.
- Consent to Operate (CTO) – granted for the purpose of operation of the industry, etc.

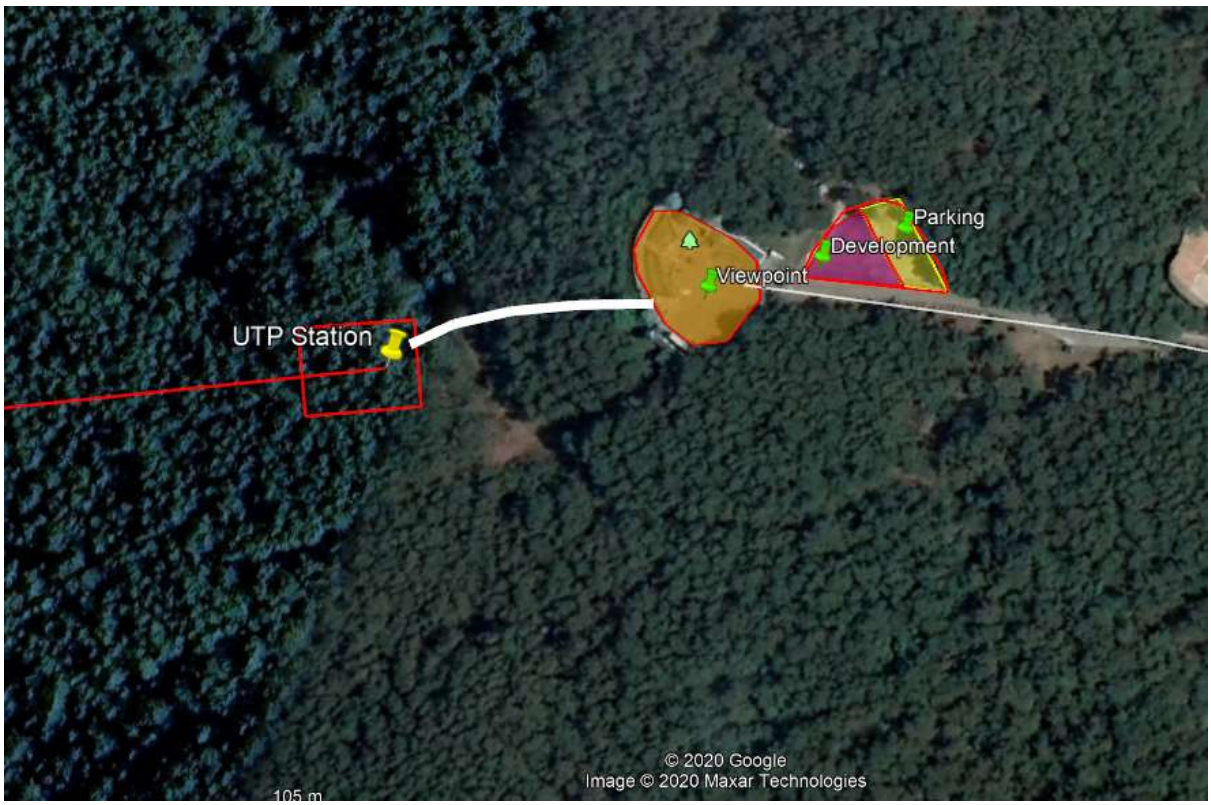
The details of these procedure is given in Meghalaya State Pollution Control Board website.(http://megspcb.gov.in/consent.html)

15.6 Other Clearances

1. No Objection Certificate from State Government.
2. Land allocation for Station and Right of Way
3. Land rights transfer to the Project SPV

4. Municipal clearance for construction and building plans
5. Consent to establishment from Pollution control board
6. Police clearance for material transport and traffic diversions
7. State Electricity Board Clearance

16 PROJECT DETAILS WITH DEVELOPMENT AT UTP



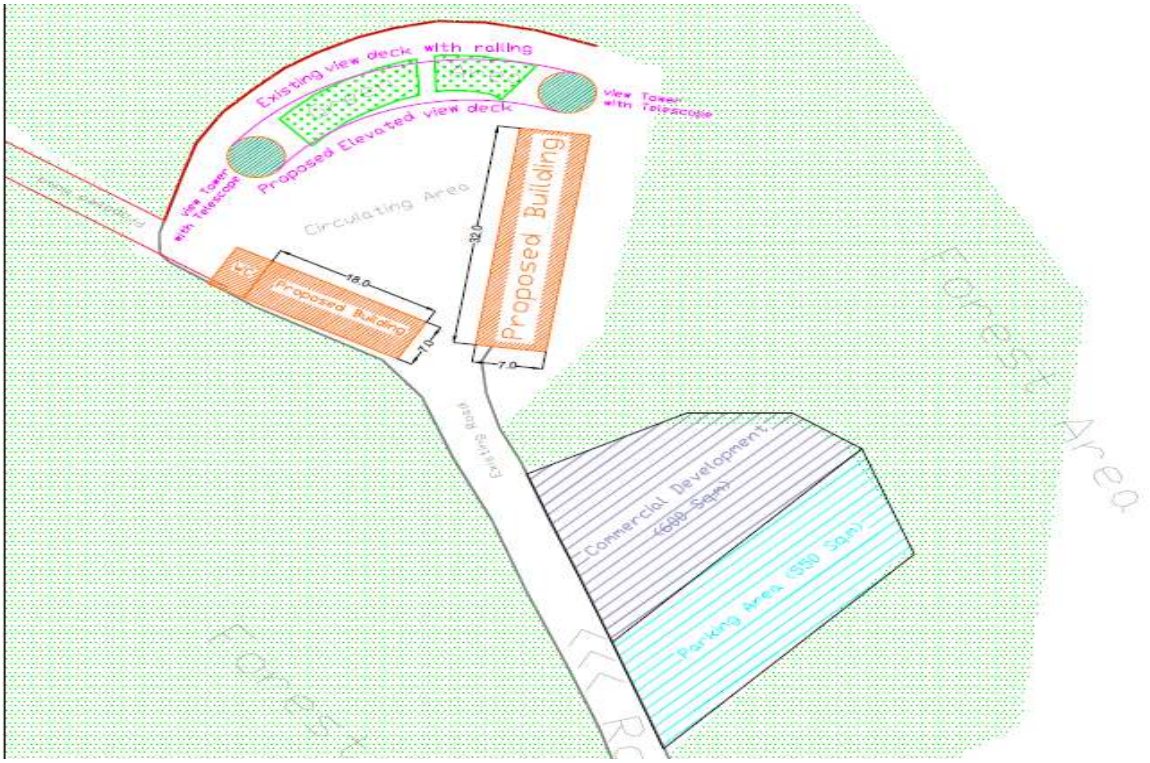
At Shillong view point following 2 locations are available for development: -

i. Development at Viewpoint
ii. Development at Parking area

16.1 Development at Viewpoint

The area available at viewpoint is about 1800 sqm. Presently there are two view towers, viewing gallery and few shops. The open area in the middle is used for parking.

As suggested by Meghalaya Tourism Department, following scheme is proposed for development of this area: -



As per desktop study two buildings are proposed on 350 Sqm land (Building1 = 7m x 32m= 224 sqm and Building2 = 7m x 18m= 126 sqm) with G+1 floor. The total built up area in these two buildings for commercial development is about 700 sqm. Remaining land will be used for constructing elevated view deck of about 250 sqm and circulating area as shown.

16.1.1 Indicative list of development at Viewpoint

The list of development in open area and proposed buildings given below is merely indicative and is given for illustration purpose only -

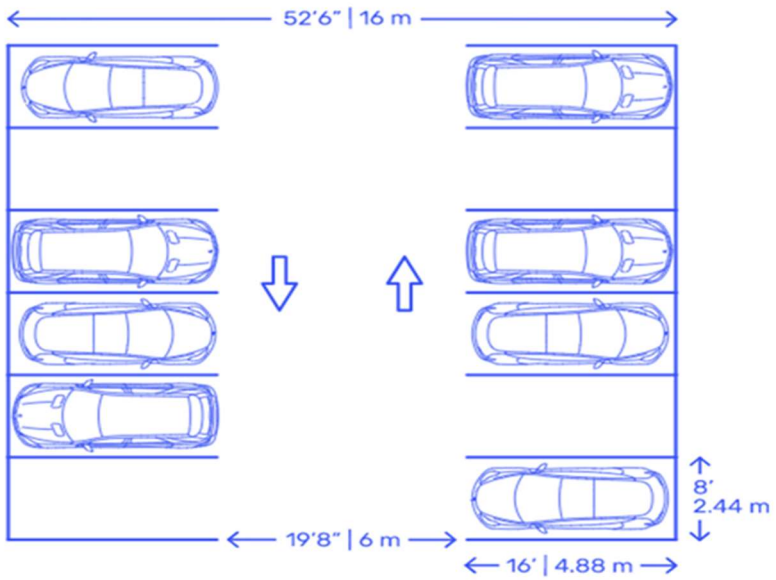
- Modern and aesthetic viewing gallery
- Selfie corners
- Museum
- Soft play area / Gaming Arena for kids
- Restrooms and Sanitary Block
- Gift / Souvenir Shops
- Baby care room
- Local emporium

- Photo Shops

It is suggested that development plan for UTP should be developed by engaging a reputed Architectural Agency/ Destination Development Agency. Alternatively, it can be a part of scope of the Concessionaire.

16.2 Development at Parking

This area is about 1230 sqm and used for parking. Due to ropeway, most of the tourists will prefer to travel by ropeway. A few tourists can travel by vehicle/taxis/mini bus. Presently vehicle is parked adjacent to viewpoint tower. But now that area is proposed for commercial development. Therefore, limited area of about 550 sqm is proposed for parking of about 25 vehicles. Remaining area of about 680 sqm can be used for Restaurants and Food Court including circulating area.



16.3 Total Area Development

Sr. No.	Description	Area	Remark
At Viewpoint			
1	Construction of 2 buildings	700 sqm	Land= 350 Sqm Floor = G+1
2	Remaining land development	1450 Sqm	1800 sqm (total land) – 350 sqm (building land)
3	Construction of elevated view deck	250 Sqm	Development at elevated level in 1050sqm land
At Existing Parking Area			
4	Construction of parking (Open)	550 sqm	
5	Development near proposed parking	600 sqm	

16.4 Way Forward

- List of various clearances required for the project is given in Chapter 15 of the report. Process of obtaining important clearances like forest clearance, EIA clearances etc. is also given in this chapter.
- The government may initiate the process of land acquisition for the project and may also initiate the process for obtaining important clearances.
- Alternatively, the process of obtaining clearances can be initiated and completed during condition precedent period after the concessionaire is on board.

- It is suggested that government may hire reputed architectural agency for planning development at UTP.

ANNEXURE -A

Proposed Timelines from November 2020-March 2023

Sl. No.	Activity	Duration	M 2	M 5	M 8	M 11	M 14	M 17	M 20	M 23	M 26	M 29	M 32
1	Tender Process	5 months											
2	Condition Precedent	12 Months											
3	Financial Closure	6 Months											
4	Concept Design	6 Months											
5	Schematic design	6 Months											
6	Detail Design & GFC	6 Months											
7	Geotechnical Investigations	6 Months											
8	Construction Period	12 Month											
9	Commissioning and System Safety Certification	1 Month											
10	Commercial date of Operation												

ANNEXURE B

F. No. 5-2/2017-FC
Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)

Indira Paryavaran Bhawan,
Aliganj, Jorbagh Road,
New Delhi-110003
Dated: July, 2019

To

The Principal Secretary (Forests),
Government of Himachal Pradesh,
Shimla.

Sub: Exclusion of Ropeway Projects from the ambit of the Forest (Conservation) Act, 1980 and payment of NPV – reg.

Sir,

I am directed to refer to the State Government of Himachal Pradesh's DO No. FFE-B-F(10)2/2018 dated 20th April, 2019 on the above subject requesting this Ministry to exempt the Rope way projects from the purview of the Forest (Conservation) Act, 1980 citing the fact that ropeways are extremely useful for improving the connectivity and are an eco-friendly alternative as compare to construction of road which involves considerable forest land. In this connection, it is to inform that proposal of the State Government was considered by the Forest Advisory Committee in its meeting held on 27th June, 2019. Minutes of the meeting may kindly be seen at the website of the Ministry at www.parivesh.nic.in .

The FAC, after thorough deliberation and discussion with Nodal Officer, Himachal Pradesh, accepted the justification provided by the State Government. It was understood that the ropeway projects are eco friendly mode of connectivity and contribute to conservation if they are constructed at least 5 meters above the tree line and without felling of trees along the alignment of the cable way. Hilly terrains are more prone to erosion and landslides. Construction of roads augments the process of erosion and leads to ample destruction of natural resources whereas construction of ropeways is an alternate mode of connectivity with minimum destruction and without fragmentation of habitats. In this backdrop FAC recommended to accept the request of Government of Himachal Pradesh with following specific conditions.

(i) The dispensation shall be allowed for construction of public utility ropeways.
(ii) The lowest point of the proposed ropeway shall be atleast 5 meters above the tree line. The forest area under ropeway passage shall not be included in the total area requested for diversion for the project under the provisions of FCA 1980.
(iii) The forest area under the terminal stations and intermediate line towers shall be considered for diversion under the provisions of FCA 1980.
(iv) The user agency will have no claim on the forest land under the ropeway.
(v) Permission of laying the ropeway above 5 meter of tree line do not give any right to the user agency to use the forest land, under the ropeway, for any non forestry purpose in future without approval under Forest (Conservation) Act, 1980.

Yours faithfully,

5.06.2019
(Sandeep Sharma)
Assistant Inspector General of Forests

Copy to:
1. The Principal Chief Conservator of Forests, Government of Himachal Pradesh, Shimla
2. The Dy Director General of Forests (Central), Regional Office, Dehradun
3. The Addl. PCCF & Nodal Officer (FCA), Office of the PCCF, Government of Himachal Pradesh, Shimla
4. Monitoring Cell, FC Division, MoEF, New Delhi
5. Guard File

5.06.2019
(Sandeep Sharma)
Assistant Inspector General of Forests

ANNEXURE – C

In Himachal Pradesh Aerial Ropeway (amendment) 2015 at sr. 4" of Section-6 it is written that **"10m height between rooftop of the houses or building and base of the cabin, in the case of ropeway project to be build under PPP mode".**

(a) in sub-clause(iv), for the figures "1956", the figures "2013" shall be substituted.; and

(b) in sub-clause(v), for the words, figures and signs "Indian Railways Act, 1890 (9 of 1890)", the words figures and signs "Railways Act, 1989 (24 of 1989)" shall be substituted.

3. Amendment of section 5.—In section 5 of the principal Act, for the words, figures and signs " of section 4 of the Land Acquisition Act, 1894 (1 of 1894)", the words, figures and signs "the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (30 of 2013)" shall be substituted.

4. Amendment of section 6.—In section 6 of the principal Act, in sub-section (4), after clause (xiii), the following clause shall be inserted, namely:-

"(xiii-a) the minimum headway of 10 meters between the rooftop of the houses or buildings and base of the cabin, in the case of ropeway projects to be build under Public Private Partnership (PPP) mode;".

5. Insertion of new section 18-A.--After section 18 of the principal Act, the following section shall be inserted , namely:--

"18-A. Fixation of fare rates of Public Private Partnership and Built Operate and Transfer Ropeway Projects.- (1) The State Government, on the recommendations of the Expert Committee, shall fix and notify the maximum limit of the fare rates for the Ropeway Projects build under Public Private Partnership (PPP) and Built Operate and Transfer (BOT) mode.

(2) Every application made under this section for fixation of fare rates shall be decided within a period of 90 days from the date of receipt of such application, failing which the application shall be deemed to have been accepted for fixation of fare rates." .

6. Insertion of new section 20-B.--After section 20-A of the principal Act, the following section shall be inserted, namely:--

"20-B. Insurance cover.- (1) In case of any accident or mishap, the promoter shall provide comprehensive insurance cover, in the manner as may be prescribed, to the persons availing aerial ropeway services of the Ropeway Projects built under Public Private Partnership(PPP) or Built Operate and Transfer (BOT) mode:

Provided that the State Government shall not be liable for any claim on account of any accident or mishap in such Ropeway Projects.

(2) The rate of comprehensive insurance shall be decided by the State Government on the advice of the Expert Committee.".

7. Amendment of section 30.—In section 30 of the principal Act, for the words, figures and signs "Part VII of the Land Acquisition Act, 1894 (1 of 1894), whether the said promoter is or is not a company as defined in the Land Acquisition Act", the words, figures and signs "the Right to Fare Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (30 of 2013) whether the said promoter is or is not a company as defined in the said Act" shall be substituted.

ANNEXURE D

As per Building bye Laws document permissible FAR = 2 considered

40. The specific Floor Area Ratio and Plot Coverage stipulations shall be as per Table VIII below.

TABLE VIII

FLOOR AREA RATIO & MAXIMUM COVERAGE

Sl. No.	Type of Occupancy	Maximum permissible (F.A.R)	Maximum permissible (coverage percentage of plot area)	Maximum Floor permissible (excluding basement)	Maximum Height permissible (In meters)
1.	**2.**	**3.**	**4.**	**5**	**6**
1.	Residential Bungalow	2.0	50%	4	15 mts With ground floor parking 19 mts.
2.	Residential Apartment	2.0	50%	4	15 mts With ground floor parking 19 mts
3	Institutional	1.5	40%	4	15 mts With ground floor parking 19 mts
4	Mercantile (Commercial)	2.0	60%	4	15 mts With ground floor parking 19 mts
5	Public or Semi-Public Business	2.0	50%	4	15 mts With ground floor parking 19 mts
6	Assembly	1.5	40%	4	15 mts With ground floor parking 19 mts
7	Industrial	1.5	40%	3	12 mts With ground floor parking 16 mts.
8	Storage	2.0	70%	3	12 mts With ground floor parking 16 mts
9	Hazardous	1.2	25%	2	8 mts with ground floor parking 12 mts.
10	Special Buildings	3.0	50%	6	23 mts with ground floor parking 27 mts.
11	Industrial Zone (factory)	1.0	40%		As per functional requirement.

Note 1:- If the Ground Floor is exclusively earmarked for Covered Parking purposes, an additional floor with height as indicated above shall be permitted and the Ground Floor covered parking will not be counted for F.A.R.

Note 2:- Mumty (stair cover) over staircase on top floor, atrium / cut outs Machine room for lift on top floor as required for the lift machine room installations shall not be taken for FAR calculations. Lift shaft (s) for one floor only shall be taken for FAR calculation.

Note 3:- Rockery, well and well structures, plant, nursery, water-pool. Swimming pool (if uncovered), platform around a tree, water tank; fountain, bench, ramps, compound wall, gate, slide, steps outside building, domestic washing place, swing, fire escape staircase, overhead water tank on top of buildings, underground suction tank having roof slab 0.50 mtr. above ground level, cooling tower of A.C. plant rest above the top roof slab and Drainage culvert,

32

ANNEXURE E

Sample of Questionnaire: -

PASSENGERS FEEDBACK & SUGGESTIONS

Date:
Time:

Q. No:

Name		Age	Years	Sex	☐ Male	☐ Female	
Travel From		Destination					
Occupation	☐ Service	☐ Business/Self Employee	☐ Student	☐ Retired Person			
Monthly Income	☐ <20K	☐ 20K – 50K	☐ 50K – 1L	☐ >1L			
1. How many times have you visited Shillong Peak?	☐ Once	☐ 02 Times	☐ 03 Times	☐ Almost Every Year			
2. What is the mode of travel?	☐ By taxi	☐ By own arrangement	☐ Bike				
3. a. Willingness to use Ropeway facility if provided to reach Shillong Peak from Lawsohtun?	☐ Yes	☐ No					
b. What should be ticket price in Rs. for the Ropeway?	☐ Below 50 ☐ 100-150	☐ 50-100 ☐ More than 150					
4. preference timing for Visit Shillong Peak	☐ Morning	☐ Afternoon	☐ Evening				
5. How much you paid to Visit Shillong Peak							
Any Suggestions for implementing Ropeway Services:							

Date of Survey	☐ October 2019
Name of the Surveyor	
Signature of the Surveyor	

ANNEXURE F

Limitations of the Study

- Limited secondary traffic data availability for Shillong
- Limited secondary traffic data availability for Shillong Viewpoint.

ANNEXURE G

S.O 1533 (E) dated the 14th September,2006.

(1)	(2)	(3)	(4)	(5)
7(e)	Ports, Harbours	≥ 5 million TPA of cargo handling capacity (excluding fishing harbours)	< 5 million TPA of cargo handling capacity and/or ports/ harbours ≥10,000 TPA of fish handling capacity	General Condition shall apply
7(f)	Highways	i) New National High ways; and ii) Expansion of National High ways greater than 30 KM, involving additional right of way greater than 20m involving land acquisition and passing through more than one State.	i) New State High ways; and ii) Expansion of National / State Highways greater than 30 km involving additional right of way greater than 20m involving land acquisition.	General Condition shall apply
7(g)	Aerial ropeways		All projects	General Condition shall apply
7(h)	Common Effluent Treatment Plants (CETPs)		All projects	General Condition shall apply
7(i)	Common Municipal Solid Waste Management Facility (CMSWMF)		All projects	General Condition shall apply

S.O. 3067 (E) dated the 1st December, 2009 – Pt (xvi)

(xv) against item 7(f),

(a) in column (4), for the entry, the following entry shall be substituted namely:-

"(i) All State Highway Projects; and
(ii) State Highway expansion projects in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive areas.";

(b) in column (5) for the existing entry, the following entry shall be substituted, namely:-

"General Condition shall apply.

Note:
Highways include expressways.";

(xvi) against item 7(g),—

(a) in column (3), for the entry, the following entry shall be substituted, namely:—

"(i) All projects located at altitude of 1,000 mtr. and above.
(ii) All projects located in notified ecologically sensitive areas.";

(b) in column (4), for the entry, the following entry shall be substituted, namely:—

"All projects except those covered in column (3).";

(xvii) after the Schedule, in the 'Note', for sub-heading relating to 'General Condition (GC)', the following shall be substituted, namely:—

S.O. 2204 (E) dated the 19th July 2013.

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग II—खण्ड 3—उप-खण्ड (ii)
PART II—Section 3—Sub-section (ii)
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 1698] नई दिल्ली, शुक्रवार, जुलाई 19, 2013/आषाढ़ 28, 1935
No. 1698] NEW DELHI, FRIDAY, JULY 19, 2013/ASHADA 28, 1935

पर्यावरण और वन मंत्रालय

अधिसूचना

नई दिल्ली, 19 जुलाई, 2013

का.आ. 2204(अ).—पर्यावरण समाघात निर्धारण अधिसूचना, 2006, जो भारत के राजपत्र, असाधारण, भाग II, खंड 3, उपखंड (ii) में का.आ. 1533(अ), तारीख 14 सितंबर, 2006 द्वारा प्रकाशित की गई थी, का और संशोधन करने के लिए निम्नलिखित प्रारूप अधिसूचना जिसे केंद्रीय सरकार पर्यावरण (संरक्षण) अधिनियम, 1986 (1986 का 29) की धारा 3 की उप-धारा (1) और उप-धारा (2) के खंड (v) द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए, बनाने का प्रस्ताव करती है, जनता की जानकारी के लिए प्रकाशित किया जाता है, जिनकी उससे प्रभावित होने की संभावना है और सूचना दी जाती है कि उक्त अधिसूचना पर उस तारीख से, जिसको इस अधिसूचना से युक्त राजपत्र की प्रतियां जनता को उपलब्ध करा दी जाती हैं, साठ दिन की समाप्ति के पश्चात् विचार किया जाएगा ;

प्रारूप अधिसूचना में अंतर्विष्ट प्रस्ताव पर आक्षेप या सुझाव, सचिव, पर्यावरण और वन मंत्रालय, पर्यावरण भवन, सीजीओ काम्प्लेक्स, लोदी रोड, नई दिल्ली-110003 को भेजे जा सकेंगे । आक्षेप या सुझाव, इस प्रकार विनिर्दिष्ट अवधि की समाप्ति के पूर्व उक्त प्रारूप नियम की बाबत किसी व्यक्ति से प्राप्त किए जा सकेंगे, उन पर केंद्रीय सरकार द्वारा विचार किया जाएगा ।

प्रारूप अधिसूचना

1. पर्यावरण समाघात निर्धारण अधिसूचना, 2006 में, पैरा 11 के पश्चात् निम्नलिखित पैरा अंतःस्थापित किया जाएगा, अर्थात् :--

11क. पर्यावरण संबंधी समाघात निर्धारण (ईआईए) रिपोर्ट तथा पर्यावरण संबंधी प्रबंध योजना (ईएमपी) की तैयारी और प्रस्तुतिकरण -

पर्यावरण संबंधी परामर्शी संगठन जो, भारतीय गुणवत्ता परिषद् (क्यूसीआई) या राष्ट्रीय शिक्षा और प्रशिक्षण प्रत्यायन बोर्ड (एनएबीईटी) या किसी अन्य अभिकरण, जिसे समय-समय पर पर्यावरण और वन मंत्रालय द्वारा अधिसूचित किया जाए, उस विशिष्ट सेक्टर या क्षेत्र में तथा उस सेक्टर या क्षेत्र के लिए परियोजना के प्रवर्ग हेतु प्रत्यायित हैं, उस सेक्टर और प्रवर्ग में किसी परियोजना की पर्यावरण संबंधी समाघात निर्धारण रिपोर्ट तथा पर्यावरण संबंधी प्रबंधन योजना तैयार करने और संबद्ध विशेषज्ञ आकलन समिति (ईएसी) या राज्य विशेषज्ञ आकलन समिति (एसईएसी) के समक्ष उपसंजात होने के लिए अनुज्ञात किए जाएंगे ।

[जे-11013/56/2004-आईए. II (I)]

अजय त्यागी, संयुक्त सचिव

टिप्पण :-मूल नियम, भारत के राजपत्र, असाधारण, भाग II, खंड 3, उप-खंड (ii) में अधिसूचना सं. का.आ. 1533(अ), तारीख 14 सितंबर, 2006 द्वारा प्रकाशित किए गए और तत्पश्चात् निम्नानुसार संशोधित किए गए-

1. का.आ. 1737(अ), तारीख 11 अक्तूबर, 2007;
2. का.आ. 3067(अ), तारीख 1 दिसंबर, 2009;
3. का.आ. 695(अ), तारीख 4 अप्रैल, 2011;
4. का.आ. 2896(अ), तारीख 13 दिसंबर, 2012; और
5. का.आ. 674(अ), तारीख 13 मार्च, 2013 ।

MINISTRY OF ENVIRONMENT AND FORESTS

NOTIFICATION

New Delhi, the 19th July, 2013

S.O. 2204(E).—The following draft notification further to amend the Environment Impact Assessment Notification, 2006 published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (ii) vide number S. 1533 (E) dated the 14th September, 2006, which the Central Government proposes to make, in exercise of the powers conferred by sub-section (1) and clause (v) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986), is hereby published for the information of the public likely to be affected thereby and notice is hereby given that the said notification will be taken into consideration after the expiry of sixty days from the date on which copies of the Official Gazette containing this notification is made available to the public;

Objections or suggestions on the proposal contained in the draft notification may be forwarded to the Secretary, Ministry of Environment and Forests, Paryavaran Bhawan, CGO Complex, Lodi Road, New Delhi -110003. Objections or Suggestions which may be received from any person with respect to the said draft rules before the expiry of the period so specified will be considered by the Central Government.

Draft Notification

1. In the Environment Impact Assessment Notification, 2006 after paragraph 11, the following paragraph shall be inserted, namely :-

11 A. Preparation and Presentation of Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP).-

The Environmental consultant organization which are accredited for a particular sector or area and the category of project for that sector or area with the Quality Council of India (QCI) or National Accreditation Board for Education and Training (NABET) or any other agency as may be notified by the Ministry of Environment and Forests from time to time shall be allowed to prepare the Environmental Impact Assessment

report and Environmental Management Plan of a project in that sector and category and to appear before the concerned Expert Appraisal Committee (EAC) or the State Expert Appraisal Committee (SEAC).

[J-11013/ 56 / 2004- IA.II (I)]

AJAY TYAGI, Jt. Secy.

Note : The principal rules were published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (ii) vide notification number S.O. 1533(E), dated the 14th September, 2006 and subsequently amended as follows:-

1. S.O. 1737(E) dated the 11th October, 2007;
2. S.O. 3067(E) dated the 1st December, 2009;
3. S. O. 695(E) dated the 4th April, 2011;
4. S.O. 2896(E) dated the 13th December, 2012; and
5. S.O. 674 (E) dated the 13th March, 2013.

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ANNEXURE H

By Speed Post

File No. 7-2/2019-ROHQ (Pt.)
Government of India
Ministry of Environment, Forest and Climate Change
Regional Offices Headquarters Division
...

Indira Paryavaran Bhawan,
Aliganj, Jor Bagh Road,
New Delhi- 110003
Dated: 03rd December, 2019

To,

1. The Dy. Director General of Forests
   All Regional Offices, MoEFCC, Government of India

2. The Principal Secretary (Forest)
   All State Government/UTs.

Subject:- Physical copies of Stage-I and Stage-II approval under Forest (Conservation) Act, 1980 on PARIVESH Portal – reg.

Sir,

As you are aware, the proposals seeking approval for use of forest land for non-forestry purposes under Forest (Conservation) Act, 1980, are mandatorily being processed online in the PARIVESH portal. As a result, the whole process is not only becoming faster and more transparent, it is now possible to get status of any proposal or generating any report directly from the above mentioned portal.

2. However, it is seen that the physical copies of the General approvals by State Governments and approvals of proposals as delegated to the Regional Offices are being sent to the Ministry. Having an organized online portal of PARIVESH, it is not only superfluous to distribute physical copies, it also consumes a lot of resources in managing and keeping record of those references in the Ministry.

3. In view of this, State Governments, UTs and Regional Offices of the Ministry are requested not to send physical copy of any order of Stage-I and Stage-II approvals under Forest (Conservation) Act, 1980 to the Ministry henceforth. However, it must be ensured that the copies of such approvals are uploaded and made available on the PARIVESH Portal of this Ministry without fail.

Yours faithfully,

03/12/2019

(Bhawan Kumar Verma)
Deputy Inspector General of Forests

Copy to:

1. PCCFs/Nodal Officers (FCA), All States/UTs
2. DIGF(FC)/AIGF(FC).
3. PPS to DGF&SS/PPS to ADGF (FC)/PS to IGF (FC), MoEF&CC, GoI.