

Bagmati Municipality Office of the Municipal Executive Madesh Province, Sarlahi

BATHYMETRIC SURVEY AND QUANTITY ANALYSIS REPORT OF Bagmati Fishery Pond (Pond I)



Doric Villa Engineering Consultancy (P) Limited

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ACKNOWLEDGEMENT

behalf of Doric Villa Engineering Consultancy Pvt. Ltd. (DVEC), we would like to graciously that the Office of the Municipal Executive, Bagmati Municipality, Sarlahi for awarding this contract and providing the opportunity to carry out the work on Bathymetric Survey and Quanitity Analysis of Pond 1 of Bagmati Fishery Pond.

We are particularly thankful to Chief Administrative Officer, Bimal Pokharel of the Bagmati Municipality, The Office of the Rural Municipal Executive. We would similarly like to appreciate the cooperation received from and technical personnel of the municipal executive for giving us all technical inputs needed for the study.

Last but not the least, all Municipal Officials, Key Informants, NGOs, entrepreneurs and beneficiary all enthusiastically cooperated in the participatory study of the project, and provided the necessary information sought by the study team. All of them deserve our heart-felt appreciation.

Doric Villa Engineering Consultancy Pvt. Ltd.

May, 2023





Municipality, Office of the Municipal Executive has been constructing the Artificial Lake project was bare land which has been developed as the tourism ularity in whole Madesh Province. The Antificial State visitors. Road with the green belt is constructed around the lake to promote the tourism at the site.



This project is expected to help in conserving bare land as it offers place for ground water retention and active recreational use. Public space is necessary to retain urban quality and enhances the economy of local government and the localities.

Amenities like Coffee Shops and Public Toilets has been constructed to provide the facility for the visitors. Hotel with the swimming pool at the middle of the lake and the artificial hill -Kailash Parbat with the statue of the Lord Shiva and Parbati is proposed to be built in the second phase of the project. Furthermore, Bagmati Municipality plans to develop the surrounding place of the pond to develop as the complete tourist place and will consist of parks and other attractions; which will serve as the proper tourist place to attract the visitors from all over the Nepal and India.

Development of tourism sport such as this is one of the ways to bridge this gap between people and nature. Most of the Nepalese cities are far behind in this. Without careful planning, cities will be stressed with environmental challenges. Open space exists at many different scales, in many different forms and under the jurisdiction of different organizations.





Figure: Proposed Fishery Pond Site (Source: Google Map)

However, the variations between the actual and intended use of open space and imbalances in their distribution, suggests need for evaluating the ground realities that influence open space distribution and use. Today, the rapidity of urban development and increase in the population of cities puts open space under tremendous pressure. Therefore, the anticipation and identification of the basic principles of change that open space undergo is essential for professionals to intervene effectively. Both policy and science now emphasize the critical necessity of green areas within urban social-ecological systems. The enhancement of urban green space or urban forests is one of the ways, to mitigate the adverse effects of urbanization in a sustainable manner, making cities more attractive and comfortable to live in.

This Project shall provide an array of social, health, economic and environmental benefits to individuals and to the community as a whole. Recreational Places are an essential ingredient for enhancing the livability of a city and improving the quality of life for its residents.





PROJECT HIGHLIGHTS

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ROJECT HIGHLIGHTS	* Hone Clare	मरत केला गराख
Name of the Project	Bagmati Fishery Pond	olor
Location	Wards 4 & 12	
Total Estimated Cost of Project	NRs. 882,753,106.16	
Project Completion Period	3 Years	
Total Area Covered	150 Bigha	
Total Areas of Ponds	685495.28 SQ.M (101.21 Bigha)	







wide array of beams across a "swath" of the water body floor. Bathymetric for the study of support safety of surface or sub south typically produced to support safety of surface or sub south typically produced to support safety of surface or sub south typically produced to support safety of surface or sub south typically also provide surface navigational information. Bathymetric maps (a more general term where invitational safety is not a concern) may also use a Digital Terrain Model and artificial illumination inclusion to illustrate the depths being portrayed.

For the purpose of this study, the Pond was divided into 50m x 50m grid. The measurement was followed the tentative grid point lines based on its geographical position. Section from S-N and N-S was surveyed; when one whole grid line is completed, a marking like flag was placed in the end point so it clearly indicated the surveyed area to move forward and continued the work. As well as a path was followed making an Interval of 50 m using SW maps an android based apps. A continuous recording of latitude, longitude and depth were done at around 50m interval. The displayed depth from echo-sounder was recorded in GPS with its respective latitude and longitude. The different depths measured was also verified using the tag reel. A standard echo-sounder, GPS, boat, tag reel, measuring tape was used for bathymetric survey. Besides, measurements were carried out twice at the deepest point of the Lake for verification.



Topographic survey was carried out to third order precision and the admissible error of closure were not exceed 12 K mm, where K is the distance in KM. The survey was carried out as described in ToR. In case of establishing permanent benchmark, the two bench marks at possible accessible and visible area were established according to the site condition in permanent boulders using steel rod drilled in boulder. The instruments and accessories that were used for the topographical survey included DGPS, total station (reflector and reflector less), GPS, paint etc.





the study aims to:

- Carry out Bathymetric Survey of the pond to measure depth of the pond using echo-sounder.
- Carryout Topographic Survey around the pond to prepare topographic maps with contour lines with interval of 5m cover at least up to 10 m strip around the pond's water level.
- To establish temporary bench marks at the proper site of the pond for reference. .
- To carry out Earthwork Excavation investigations of the Pond

is soope of the works are as following:

- Carry out water depth survey of the pond and calculated area, volume and other geometrical . parameters
- Construct and fix bench marks at proper site of the pond for reference using DGPS.
- Involvement of the local government authorities during the study period





Geography

Madhesh Province lies between 84027' & 86054'30" East longitude and 26023'38" & 27028'17" North latitude. It has an area of 9,661 sq.km and that is 6.56% of the total area of the country. Out of which 27.29% land is covered by forest. It is bordered by India in the south, Makwanpur and Sindhuli districts of Bagmati Province and Udaypur of Province 1 in the north and Chitwan district of Bagmati Province in the west.





ASAGNIE AME STO Longeraphically, the province can be divergent four main regions starting from the Not It The Chure Region, 2) The valley basin, Dun, 3) The Inner Terai or the Bhavar region, and 4) the Low plain region - Terai or Madesh.

- Chure zone, occupies 1,52,339 ha (15.88%) of total Province land surface area. This is a mountainous region far south to the high Himalayas, bordering the country in the north.
- Dun area lies in Saptari and Parsa district of the Province. It is located to the north of Chure region and comprises 0.04% of Province land area.
- Bhabar zone comprises 25.62% of Province land area. This region extends from the base of Chure Mountain to plain lands of Terai Madhesh.
- The Terai Madesh region comprises 58.46% of the total Provincial land area. The terai zone ranges in altitude of less than 600 meters with most of the fertile land and dense forest the country.

Apart from the topographical divisions, administratively there are 8 Districts. As per the new constitutional provision there are 136 local governments composed of 1 metropolitan city, 3 submetropolitan cities, 73 municipalities and 58 rural-municipalities with 1271 wards.

Climate

Madhesh Province has climatic variations, which is associated with the diverse nature of its topography and altitude pronounced by dry and wet monsoon seasons. In hot and sunny days temperature goes up to 38 to 40 degree celcius. While winter is cold with temperature decreasing to 5 to 10 degree celcius. Province 2 has an average rainfall of between 1100-2100 mm.

Social and Cultural Diversity

Among various spoken languages in Nepal there are 62 spoken languages. Majority of population apeak Maithili (45.3%). Bhojpuri counts 18.57%, Bajjika 14.65%, Nepali 6.67% and Urdu 5.88% as their mother toungue. Ethnically there are 116 ethnic groups in the province. The largest ethnic group is Yadav (14.78%). Similarly, there are 11.58% Muislim, 5.26% Tharu, 5.09% Teli, and 4.56% Koiri/Kushwaha. Majority of population are Hindu (82.8%) in the Province predominantly followed by Muslim (9%). Similarly, 4.4% follow Buddism, 3% are Kirat, and 1.3% are Christian. Out of the total population of the province (5380242) 71.97% of the population are residing in the urban area.

60.96% of land in the province is used for agriculture purpose, followed by 25.77% forest, 5.15% river and ponds, 3.47% grassland and 3.18% land is used for housing purpose.

Economy

As per Economic Survey (2019/20), Madhesh Province contributes 14% to national GDP. Measuring GDP by provinces it is estimated to have a growth rate of 2.3% in the fiscal year 2019/20.

There are 487 commercial banks, 86 development banks, 31 finance companies, 754 Microfinance companies. Similarly, there are 244 life and 148 non life insurance companies and their branches





the processing of agricultural produce including in the arriver of the product of activity in the province accounts 13.31% of GDP, while service sector has a share of an provincial GDP. Productivity of paddy in the province is 3.4 MT per ha, which is below average productivity of 3.5 MT per ha. Out of the total paddy production in the country Province comprises 24.96%. Similarly 29.09% of Wheat is produced in the province. the cash crops 65% of sugarcane is produced by the province.

the sre 522 industries registered under department of industry. Out of total number of industries based industry shares the highest number i.e. 418. While there are only 24 Agriculture forestry based industry. There are 12961 companies registered under company act in the Madhesh Province contributes 22% to the total paddy production of Nepal. Similarly, production in the province contributes 29.3% of national production.

Madhesh Province has seen a considerable growth in electrification. According to Nepal Electricity Authority report 99.05% household in the province are electrified. Total number of decircly consumers in the province is 878582, consuming 1254188 MWh of energy annually. According to NEA, Distribution and Consumer Service Directorate loss of electricity in the province is 15.6% for the year 2076/77. Out of the total loss in distribution provincial office, Janakpur contributes the highest loss percentage of 31.32.

\$871 km of road is constructed by the local government in the Province. Out of which 2696 km is blacktopped. Similarly, 56 km of railway track under the Janakpur-Jaynagar railway project is constructed.

There are 4137 schools in the province with 1289672 students including 656779 girls and 632893 boys. All together there are 5069 teachers working in various levels of schools.

Bugmati Municipality

Bagmati Municipality was formed after the declaration of local levels by Nepal Government on 2073 by merging 4 previous VDCs (Dhungrekhola, Karmaiya, Rajghat and Shankarpur). For the complete understanding of the current status of the local level all the data in initial VDC/ Municipality level or Municipality level should be arranged in the patterns of newly formed local structure. So, each individual local level can formulate their plans by targeting the needy groups of the society. The profile needs to be prepared including the socioeconomic, cultural, environmental and many more aspects.





Municipality got its name from the Bagmati River in western part of Sarlahi District and Border of Sarlahi and Rautahat. Bagmati River is Hindu religious holy river as well as. Charactern bank of this municipality is covered with Harion Municipality and south side of this Municipality is Barahathwa Municipality. The north side of bank is bordered with Sindhuli District.

Bagmati Municipality lies in Madesh Province and was formed after the declaration of local levels by Nepal government 2073 by merging 4 previous VDCs (Dhungrekhola, Karmaiya, Rajghat and **Bhankarpur**).

The total population of this municipality as up to the last survey of last of Ashadh 2076 is 47,007. The population density as such is found to be 464 person per sq. km. Geographically the topography of this Municipality is Terai-A lowland region in southern Nepal and northern India that lies south of the outer foothills of the Himalayas that consists of old and new alluvium, both of which constitute alluvial deposits of mainly sand, clay, silt, gravels and coarse fragments. The new alluvium is renewed every year by fresh deposits brought down by active streams, which engage themselves in fluvial action. Old alluvium is found rather away from river courses, especially on uplands of the plain where silting is a rare phenomenon. The Road network has touched almost all the wards however; most of the roads are Gravel roads and some roads are black topped.





Analys, Salar Maraiya, Mandal, Thakuri etc. population of other ethnic Maraiya, Maraiya, Salar Maraiya, Sal

the source of the second secon lie in the plain part. Ward no. 11, 12 4, 5, 6, and 7's western parts is situated in the mati river. Ward No. 8 is the major market center where trade and agriculture are the of income. Among 12 numbers of wards almost all the wards are mostly dependent agriculture for income.

the propert of tourism is very good for the municipality being already lay down on the bank of However; possibilities extend now but hope to cover internal and external tourists in upcoming days.







Added and after construction phases. The main focuses of study were towards the study analyzed after the people including indigenous people and after towards the study analyzed after the people including indigenous people and after towards the study analyzed after the people including indigenous people and after towards the study analyzed after the people including indigenous people and after towards the study analyzed after the people including indigenous people and after towards the study analyzed after the people including indigenous people and after towards the study analyzed after the people including indigenous people and after towards the study analyzed after the study a

Profile

of the Bagmati Municipality is show in the table Below:

S.N	Ward No.	Previous VDC /Municipality	Population	Area Sq. KM
1	1	DhungreKhola(1,2,4)	4772	9.75
2	2	DhungreKhola(5,6,7)	S VDC Population Sq. KM eKhola(1,2,4) 4772 9.75 eKhola(1,2,4) 4772 9.75 eKhola(5,6,7) 3014 8.27 ekhola(8,9) 4573 5.17 ya (7-9) 3681 23.49 (6-8) 3898 5.55 (4,5,9) 2808 9.36 (1-3) 3480 8.55 rpur (3-5) 3341 4.14 rpur (1,3,6,8) 2782 2.68 rpur (7,9) 2617 12.78 ya (1-3) 2930 4.27	8.27
3	3	Dhungrekhola (8,9)	4573	5.17
4	4	Karmaiya (7-9)	3681	23.49
5	No. /Municipality Population Sq. KM 1 DhungreKhola(1,2,4) 4772 9.75 2 2 DhungreKhola(1,2,4) 4772 9.75 2 2 DhungreKhola(5,6,7) 3014 8.27 3 3 DhungreKhola(5,6,7) 3014 8.27 4 Karmaiya (7-9) 3681 23.4 5 5 Rajghat (6-8) 3898 5.55 6 6 Rajghat (6-8) 3898 9.36 7 7 Rajghat (1-3) 3480 8.55 8 8 Shankarpur (3-5) 3341 4.14 9 9 Shankarpur (1,3,6,8) 2782 2.68 10 10 Shankarpur (7,9) 2617 12.7 11 11 Karmaiya(4-6) 2503 7.18 12 12 Karmaiya (1-3) 2930 4.27	5.55		
6	6	Rajghat(4,5,9)	VDC Population Sq. KM a(1,2,4) 4772 9.75 a(5,6,7) 3014 8.27 a(8,9) 4573 5.17 a) 3681 23.49 3898 5.55 a(8,9) 2808 9.36 3480 8.55 3-5) 3341 4.14 ,3,6,8) 2782 2.68 7,9) 2617 12.78 a) 2930 4.27 40399 101.19	
7	7	Rajghat (1-3)	3480	8.55
8	8	Shankarpur (3-5)	3341	4.14
9	9	Shankarpur (1,3,6,8)	2782	2.68
10	10	Shankarpur (7,9)	2617	12.78
11	11	Karmaiya(4-6)	2503	7.18
12	12	Karmaiya (1-3)	2930	4.27
Tota	1		40399	101.19

Table: Population of the Bagmati Municipality

elature of migration and outside influx

Migration is the movement by people from one place to another with the intentions of settling apporarily or permanently in the new location. The movement is often over long distances and nom one country to another, but internal migration is also possible; indeed, this is the dominant form globally. Migration may be individuals, family units or in large groups.

and pattern classification

Settlement pattern

All the permanent settlements along the entire area are outside the ROW which is 25m from the center line for National Highway category of road. The settlements have developed as ribbon ettlement along the main roads especially at the road junctions and have been developed as bazaar reas. Such settlement development rates along the main road have been noticed to be very fast because the main road is also considered to be of commercial value, and almost all the houses along the road have rented shops in the ground floor and are used as residential purposes for upper floors. This type of commercial cum residential buildings is seen in dense form at the Karmaiya area. The settlements along the adjoining lateral roads are in the growing stage.





t in a stud wildlife

HERAL BAGMENTE LIGTER Enumative Hazar is major part of the Bagmati Municipality. It is historical place in Nepal. Bagma agriculture production in Nepal. The people grow wheat, corn, green vegetables tomato, banana, beetroot, bitter gourd, bottle gourd, brinjal, cabbage, carrot, dentifies the second se

the subtropical zone. The major forest types area includes Schima- Castanopsis forest, Pinus roxburthii forest and Alnus and the lower altitude and Sal forest in the lower altitude along the road alignment.

S.N.	Local Name	Botanical Name
1	Sal	Shorea robusta
2	Okhar	Juglans regia
3	Banana	Musa Nepalensis
4	Mango	Mangifera indica
5	Aaru	Prunus Persica
6	Bamboo	Bambusa spps
7	Chilaune	Schima wallichii
8	Pipal	Ficus religiosa
9	Simali	Vitex negudo
10	Simal	Bombax ceiba

Table: List of Plant Species Recorded during the Field Survey

China (Panthera pardus), Mirga (Muntiacus spp), Ban biralo (Felis chaus), Syal (Canis Bhalu (Ursus thibetanus), Phyauro (Vulpes Montana), Kharayo (Caprolagus hispidus), (Naemorhedus goral), Monkey (Macaca mulatta), Bandel (Sus scrofa) Musa (Rattus Malsanpro (Martes flavigula), Lokharke (Ratufa spp) are the wild animals reported in the of proposed road alignment. Similarly, birds found are Koili (Cuculus micropterus), Oliver (Streptopella senegalensis), Chibe (Dicrurus sp.), Kag (Corvus splendens), Parewa (Columba libiya), Jureli (Pycnonotus cafer), and Chil (Milvus migrans). The road does not fall under any protected or buffer zone area.







ODOLOGY WORKS METRIC SURVEY

for determining geometric parameters and preparation of bathymetric map, the field survey was conducted from 6 May to 8 May 2023. The depth of Bagmati Fishery Pond 1 were measured using digital Echo Sounder CVS 126 made of Japanese company Koden Electronics. The depth **measuring** range of the echo sounder was up to 14 m and the accuracy was $\pm 0.1\%$. The instrument was operated in dual frequency of 50 kHz and 200 kHz for depth measurement. Basically, low frequency have more accuracy in higher depth and higher frequency is reliable for lower depth. The detail follow. can be found in the link as http://www.raymarine.corn/view/?id=197&fbclid=IwAR1s3ndk1rsHr99M-

ZIG s9zQXxqnakJxU0rzWWeNsZ gBJ-qzUg8FF03xY#Frequency. This model of echo sounder is more advanced than analog echo sounder in terms of the method of processing and displaying received signals. The detail specification of the echo sounder is presented in Annex IV.





was followed by the centerline of the Pond. The other measurements were based on of first line by maintaining less than 10 m distance. The measured depth points were the path line of that day. With its reference the next path line was created for other process was repeated continuously till the end of the work. GIS tools were used to his process. The lines were converted to shape file and inserted in SW maps, an android of mobile phone, which made easier to take a path line in the lake for survey. Almost of nearly 10 m x 10 m grid point of the lake were located and tracked using GPS (Global J System) to record the depth of the lake. The depth of the lake was also verified if y using the tag reel. The depth measured by echo sounder and the depth using tag reel was to be exact. To find the deepest part of the lake, around 5 times the boat was moved making of role, then small circle in different places. The deepest part of lake was verified measuring near and around twice.

RAPHIC SURVEY

the members of the survey team walked around the Pond, where accessible to select perfect for the establishment of permanent benchmark, to overview general layout of the Pond wegetation cover around the Pond. The team also thoroughly studied the 1:50,000 scale topographical map of sheet number 2982 16 published by the Survey Department of Nepal for the inaccessible location was carried out through boat. Easily accessible locations were selected for the placement of permanent benchmarks using DGPS. The topographical survey work started establishing the DGPS benchmark. The benchmarks are established at accessible and visible sites.

The established benchmark becoming far though visible and straight from edge of the Pond. The topographical survey was conducted as per the standards required and as per the scope of works according to ToR. Necessary Bench Marks were fixed at the accessible location using the Sanding DOPS, Topcon total station. DGPS benchmark point coordinates are picked by observing 6 hrs data from satellite on each base point. Traverse is carried out by total station within given accuracy. Errors on total station and DGPS were already calculated and eliminated. The accuracy of the



459-531121 and observed as 20 to 37 in different

angle was 15⁰. Sanding DGPS, Topcon and Sokia were used to carry out the survey stream of the lake to the farthest downstream outlet of the lake. Traversing was done 1, DGPS 2 and cp1. The errors calculated was -0.019 m in easting and -0.012 in Adjustment made in 3 benchmarks was +0.006 m easting and +0.004 m in northing.

obtained was in WGS 84. So this data was projected to Modified UTM 84 with an overlay sheet which was basis for further calculation. Nepal has greater East-West expansion so accuracy for cadastral survey and various other purpose, UTM has been modified to (Modified UTM); Gauss-Krueger projection-based coordinate system, thus the designation. In this projection system Earth is divided in 120 zones each of 3⁰. Nepal meridian of 81⁰,84⁰ and 87⁰. The scale factor of 0.9999 is used for central meridian for 84⁰ and 00 55' east or west of central meridian has the scale factor of 1 (meaning no). False Easting at central meridian is 500 000 m in order to keep all the coordinates the country positive, and False Northing at the Equator is 0 m.

topographic survey was conducted using total station and DGPS which includes Pondsurroundings and river cross sections. The area of the lake was surveyed using DGPS. For the calculation of area, the DGPS base was fixed near the access road, located at the edge of the **Pond**. And the rover was used to survey the lake. The boat was propelled about 2 m far from the edge of the lake and the survey was carried out using DGPS. The area, length and width of the ake were calculated using CAD software.

For establishing the benchmarks, all the permanent ground control stations were fixed/marked with a cross-mark on permanent boulders with center 16 mm dia.



RRORS IN SURVEY AND BATHYMETRY

Navigation Satellite Systems (GNSS) refers to a satellite constellation used to position, navigation and timing. Global Positioning System (GPS) of the US, NAvigatsionnaya Sputnikovaya Sistema (GLONASS) of Russia, Galileo of BeiDou Navigation Satellite System (CNSS) of China and NAVigation with (NAVIC) of India are examples of Global/Regional - Navigation Satellite). Atmospheric delay in the ionosphere and neutral atmosphere are major error NSS measurements. Ionospheric errors are mostly eliminated by observing at two or ies. But the tropospheric delay is a valuable meteorological information. Ground receivers are used to measure geospatial position.

can also be affected by multipath issues, where the radio signals reflect off terrain; buildings, canyon walls, hard ground, etc. These delayed signals cause errors that are different for each type of GPS signal due to its dependency on the

nearer the horizon (but above the mask angle). Imagine a vast umbrella that encompasses of the sky, where the satellites form the tip and the ends of the umbrella spines.

coordinates calculated when satellites are clustered close together in the sky suffer from 1 of precision (DOP), a factor that multiplies the uncertainty associated with User lent Range Errors (UERE - errors associated with satellite and receiver clocks, the satellite orbits, and the environmental conditions that lead to multipath errors). The of DOP results in values that range from 1 (the best case, which does not magnify) to more than 20 (in which case, there is so much error the data should not be used). to Van Sickle (2001), the lowest DOP encountered in practice is about 2, which doubles uncertainty associated with UERE.

receivers report several components of DOP, including Horizontal Dilution of Precision (VDOP) and Vertical Dilution of Precision (VDOP). The combination of these two components the three- dimensional position is called PDOP - position dilution of precision. A key element of CIPS mission planning is to identify the time of day when PDOP is minimized. Since satellite orbits are known, PDOP can be predicted for a given time and location.

Total station is a device used in surveying. Like any other devices, total station also have some sources of error which can affect the surveying report. Total station measure angles with some degree of imperfection. These imperfections result from the fact that no mechanical device can be manufactured with zero error. In the past very specific measuring techniques were taught and employed by surveyors to compensate for minor mechanical imperfections. With the advent of electronic total station, the mechanical errors still exist but are related to in a different way.





Another and the optical axis of the instrument is not exactly trated information into the field book Another incorrect instrument in and the second axis. The two most common errors are reading an angle incorrectly information into the field book. Another common (and potentially In Incorrect instrument or rod height. The optical plummet or tribrachs must for misalignment. This would include total stations with laser plummets. .ecducation.psu.edu/geog160/node/1924)

errors occurred during bathymetry. Such errors are mainly due to handling of in operation. If the submerged transducer could not place vertically and stably, depth may observe different in the same location. These are because of water boat and installation of transducer in the boat.

ON METHOD

method involves plotting cross sections of the existing and proposed levels at across the project site. For each of the cross sections, the cut area and the fill area The volume between each pair of sections is estimated by multiplying the average of the two sections by the distance between them. Once these volumes have been each pair of sections the total cut and fill volumes are obtained by adding them all tissuener.

several different methods used to determine the areas of cut and fill, once the sections plotted. Perhaps the simplest (but most time consuming) method is to plot the sections paper and count the grid cells of the cut and fill areas. Multiplying the cell count by the ented by each of the grid cells gives the cut or fill area for the section. Other methods include drawing the sections in CAD and exporting areas or calculating areas mathematically using included with this report includes formulae which have the process of calculating section areas using the trapezoidal rule. This can save a great time if you are using the cross section method.

the cross section method depends to a large degree on the distance you choose to and between the sections. Closer sections improve the accuracy of the estimate, but take longer to A balance has to be made between accuracy on the one hand, and speed of generating the estimate on the other.





unoful visual summary of the estimation, which present the cut and fill depths across the in a very clear way. One of the disadvant

Siletion No.	Cut Area (m²)	Fill Area (m ²)
11	4,295	5,376
12	4,573	4,359

Average cut area = $\frac{4,295 + 4,573}{2} = 4,434m^2$

Average fill area = $\frac{5,376 + 4,359}{2} = 4,868m^2$

 $Distance \ between \ sections = 50m$

Cut volume = $50 \times 4,434 = 221,700m^3$

Fill volume = $50 \times 4,868 = 243,400m^3$

Complete relation for the volumes between two sections of the example for the sections, and the sections, and the sections, and the section of the sectio

off the method is that it can be extremely laborious to extract cross sections from the drawing, ml to determine the areas of the sections.





the depth is the depth is calculated in the dept volumes for the project can be estimated.

for each cell is found by subtracting the average existing level of the cell from level. If the resultant depth is positive then this is a fill cell, while a negative • out cell. In either case, the volume is calculated by multiplying the cut or fill of the grid cell.

has been calculated for each grid cell, all of the cut cells are added together to out volume. The same is done for the fill cells to get the total fill volume. from-section method, the accuracy of the grid method depends upon the size of grid unod A compromise has to be made between the accuracy which is required, and the will be taken to produce the estimate.

of the grid method are that the basis of the estimate can be fully summarised on the which presents a very clear summary of the calculations for others to check. One of s are no graphical summary is generated for the estimation. Also, like the section id method is time-consuming and tedious to implement.



The average cut or fill depths are determined for each cell in the grid. From these depths the volumes of each grid cell can be calculated, and by adding the cell volumes together the total cut and fill volumes are obtained







Avarage Existing = <u>312+215+364+356</u> = 31.7m

A versue Proposed = 93+0.0+0.0 = 2.3m

Assessed a Depth = 2.3m - 31.7m = -29.4m (cut)

• 50m x 50m = 2500m²

• 29.4m x 2500m² = 73,500m³

of the volume for one of the grid cells, in the example







2009

And Discussion

the topographic, L and X section and other map are prepared. The is shown in figure 11. The A0 size printed map are placed in Annex





and the survey

HAMA BUT DIT

the

and recorded depth points of Pond are shown in figure below. The point highlighted the location of the deep points of the lake. The deepest part of the Lake was m. The measured horizontal distances and the corresponding depths were plotted on

0 0

topographic map of the pond. The contour lines were drawn using interpolation and extrapolation tochniques. The contour lines were drawn at an interval of 5 meters. The map are generated with



A the bathymetric map of Bagmati Fishery Pond and A0

was converted to Triangular Irregular networks (TIN) and then to 20m which is a digital means to represent surface morphology using ArcGIS like contour, volume and area were all computed from the TIN using Volume tool respectively in ArcGIS. Above computed values were ric curve, and Elevation-Area- Volume Curve.

Farihanak Calculation

drawing a uniform grid onto a plan of the earthworks project, and taking proposed ground levels at each node of the grid. With these values the average required on each cell of the grid is calculated, and the volume for each cell is ing the depth by the cell area. By adding the volumes for each cell together volumes for the project can be estimated.

for each cell is found by subtracting the average existing level of the cell from level. If the resultant depth is positive then this is a fill cell, while a negative out cell. In either case, the volume is calculated by multiplying the cut or fill of the grid cell.

has been calculated for each grid cell, all of the cut cells are added together to cut volume. The same is done for the fill cells to get the total fill volume. **Gross-section** method, the accuracy of the grid method depends upon the size of grid used. A compromise has to be made between the accuracy which is required, and the will be taken to produce the estimate.







CONCLUSION

The echo sounder used for this CVS 126 of whose frequency of transducer was set at 50 kHz and 200 kHz. The has capacity to measure water depth of 2.5 m to 800 m. The bathymetric map and the prepared based on the measured data. The total volume of Excavated culated as 1718,750 Cu.M., which can vary by around 10-15%. Also excavated increase by 20-30% due to bulking factor as per Soil Nature.

section and X-section map of Lake is prepared.



Americs





tanet IV tarrument Specification: t the hounder

	A DESCRIPTION A
A V/A.4 hold Calentizo	Output powe
And Distances and the second se	Output freque
128	Output metho
	Display size
(DIGITAL)	Display resol
	Basic range
Brings Big Catch	
bi mgo big eaten	Zoom range
	Range unit
CVS-126	Shift step
	Presentation
	Presentation
	Back ground
	Alarms
	Image speed
(Martines)	Functions
	Auto function
	Language
	Input data for sentences
CVS_129	Output data fi sentences
CTJ-120	NMEA port(s)
	Power supply
	Contraction of the local division of the loc

and the second se								
Model	CVS-126	CVS-128						
Output power (RMS)	600 W	600W or 1kW						
Output frequency	50 kHz and 200 kHz							
Output method	Single or Alternate							
Display size and type	5.7 inch color TFT LCD	8.4 inch color TFT LCD						
Display resolution	320 x 240 pixels (OVGA)	640 x 480 pixels (VGA)						
Basic range	2.5 to 800 (m), 10 to 2800 (fl), 2.5 to 600 (fm / 1, fm) 2.5 to 600 (fm / 1, fm) 2.5 to 700 (fm / 1, fm)							
Zoom range	2.5 to 200 (m), 10 to 650 (h), 2	5 to 150 (fm / I. fm)						
Range unit	m, ft, fm, I, fm							
Shift step	tm, 10m, 1/8, 1/4							
Presentation modes	High frequency, Low frequency, (Bottom lock, Bottom discrimina Bottom follow zoom), Nav mode A-scope can be displayed at all	Dual frequency, Zoom image tion, Bottom zoom, Zoom, , Vertical split, Horizontal split, above modes						
Presentation colors	64 colors, 16 colors, 8 colors, M	onochrome						
Back ground color	Marine blue, Blue, Black, White,	Nighttime color, Other 5 colors						
Alarms	Bottom, Fish, Temperature *, Sp	beed"*, Azrival***, XTE ***						
Image speed	9 steps & stop							
Functions	Interference rejection, Color rejection, VRM Draft correct, Water temperature correct, B Sona-Tone ⁷⁴ , Fishing Hot Spot, Event mer Power reduction, Fish information, Detectio	 Noise rejection, White line, out speed correct, Store image (10 images), nory, Simple piotter, Panel illumination, an area display etc. 						
Auto functions	Range, Shift, Gain							
Language	Traditional Chinese, English, Frenc Spanish, Thai, Danish, (Simplified I	h, Greek, Italian, Japanese, Konsan, Chinese CVS-126 only)						
Input data format and	NMEA0183 Ver.1.5/2.0/3.0							
sentences	GGA, GLL, HDT, MTW, MWV, RMC, VHW, VTG, ZDA							
Output data format and	NMEA0183 Ver.2.0 (DBT: Ver.1.5)							
Santances	DBT, DPT, GGA, GLL, HDT, MTW,	MWV, RMC, TLL, VHW, VTG, ZDA						
NMEA port(s)	Total 1 : input and output							
Power supply	10.8 to 31.2 V DC	an Alexandra da Alexandra						









Garmin Oregon 700 Handheld GPS

Garmin's Oregon 700 Handheld GPS provides accurate position with its built-in GPS and GLONASS receivers. A rugged and waterproof 3" touchscreen display. The Oregon 700 offers a Worldwide Basemap, Electronic Compass, Barometric Altimeter, Active Weather, Wireless Sharing and more making this handheld a top choice among outdoorsman.

Garmin Oregon 700 Handheld GPS Details

Each Garmin Oregon 700 Handheld GPS comes with: Garmin Oregon 700 Handheld GPS, USB Cable, Carabiner Clip, Documentation and a One-Year Warranty.

Size: 2.4"W x 4.5"H x 1.3"D

Garmin Oregon 700 Handheld GPS Special Features

- 3° Touchscreen Display
- Electronic Compass and Barometric Altimeter
- GPS and GLONASS Receivers
- 1 Year Birds-Eye Included
- Rugged and Waterproof to IPX7

DEPN

Surveying Performance	T66							
Channel	220 Channels							
	BDS B1, B2, B3							
	GPS L1C/A, L1C, L2C, L2E, L5							
	GLONASS L1C/A, L1P, L2C/A, L2P, L3							
lignal Tracking	SBAS L1C/A, L5 (only for the satellites supporting L5)							
Annel An	Galileo GIOVE-A, GIOVE-B, E1, E5A, E5B							
	QZSS, WAAS, MSAS, EGNOS, GAGAN, SBAS							
	Positioning output rate: 1Hz~50Hz							
Signal Tracking GNSS Features Positioning Precision Code Differential GNSS	Initialization time: < 10s							
	Initialization reliability: >99.99%							
Positioning Precision								
ode Differential GNSS	Horizontal: ±0.25 m + 1 ppm							
	Vertical: $\pm 0.50 \text{ m} + 1 \text{ ppm}$							
Ignal Tracking Ignal I Ignal Ig	SBAS positioning accuracy: typically<5m 3DRMS							
GLONASS L1C/A, L1P, L2C/A, L2P, L3 GLONASS L1C/A, L5 (only for the satellites supporting L5) Galileo GIOVE-A, GIOVE-B, E1, E5A, E5B QZSS, WAAS, MSAS, EGNOS, GAGAN, SBAS Positioning output rate: 1Hz~50Hz Initialization time: Initialization reliability: >99.99% Positioning Vertical: ±0.25 m + 1 ppm Vertical: ±0.50 m + 1 ppm SBAS positioning accuracy: typically<5m 3DRMS								







	Sto Drawland Net
	Vertical: $\pm 5 \text{ mm} + 0.5 \text{ ppm}$
teal-Time Kinematic	Horizontal: ±8 mm + 1 ppm
(inseline<30km)	Vertical: $\pm 15 \text{ mm} + 1 \text{ ppm}$
	Horizontal: ±8 mm + 0.5 ppm
Network RTK	Vertical: $\pm 15 \text{ mm} + 0.5 \text{ ppm}$
	RTK initialization time: 2~8s
Physical	
Dimension	12.9 cm X 11.2cm
Weight	970g (including installed battery)
Material	Magnesium aluminum alloy shell
Environmental	
Operating	-45°C ~ +60°C
Morage	-55°C ~ +85°C
lumidity	Non-condensing
aterproof/Dustproof	IP67 standard, protected from long time immersion to depth of Im IP67 standard, fully protected against blowing dust
shock and Vibration	OFF Status: Withstand 2 meters pole drop onto the cement ground naturally. ON Status: Withstand 40G 10 milliseconds sawtooth wave impact test.
lectrical	
'ower Consumption	2W
Battery	Rechargeable, removable Lithium-ion battery
	Single battery: 7h (static mode)
Battery Life	5h (internal UHF base mode)
	6h (rover mode)
ommunications and Data	a Storage
	5PIN LEMO external power port + RS232
/O Port	7PIN LEMO RS232 + USB
	1 network/radio data link antenna port
	SIM card slot
Vireless Modem	Integrated internal radio receiver and transmitter 0.5W/1W
	External radio transmitter 5W/25W
Vorking frequency	410-470MHz
ommunication protocol	Trim Talk450s TrimMark3 PCC FOT SOUTH







Collular Mobile Network	WCDMA 3.5G module, GPRS/EDGE compatible, CDMA2000/EVDO 3G optional
Module Bluetooth	BLEBluetooth 4.0 standard, supports connection with Android and iOS.
	Bluetooth 2.1 + EDR standard
MFC Communication	Realizing close range (<10cm) automatic pair between R6 and controller
	(controller equipped with NFC wireless communication module is required.)
Data Storage/Transmission	4GB internal storage, more than 3 years' raw observation data (about 1.4M/day),
	based on recording from 14 satellites plug and play mode of USB data transmission.
Data Format	Differential: CMR+, CMRx, RTCM 2.1, RTCM 2.3, RTCM 3.0, RTCM 3.1, RTCM 3.2
	GPS output: NMEA 0183, PJK plane coordinates, binary code
	Network model support: VRS, FKP, MAC, supporting NTRIP protocol
nertial Sensing System	
Ill Survey	Built-in tilt compensator, correcting coordinates automatically according to the tilt direction and angle of the centering rod
lectronic Bubble	Controller software display electronic bubble, checking leveling status of the centering rod real time
ser Interaction	
luttons	One-button operation, visual operation





References

Inventory of Nepal's wetlands. (1996). I. nternational Union for Conservation of Nature. Bastola, S. C. (13). Study of Physico-Chemical Parameter. Journal of Interdisciplinary Studies. Bathymetric Survey of Lake. (2015). Department of Hydrology and Meteorology. Bhandari, B. B. (2009). Wise use of in Nepal. Banko Janakari.

An An Anthony

Department of Hydrology and Meteorolgy. (2014). Community Based Flood and Glacial Lake Outburst Reduction Project.

M., Braucher, R., Bourles, D., Guillou, V., & Rimal, L. (2014). Geomorphic impacts, age and ficance of two giant landslide dams in the Nepal Himalayas: Ringmo-Phoksundo (Dolpo District) and Dhampu- Chhoya (Mustang District). EGU General Assembly.

Lakes of Nepal: 5358 - A Map Based Inventory. (2009). National Lake Conservation Development Committee. Ministry of Tourism and Civil Aviation, GoN.

Ministry of Tourism and Civil Aviation, GoN. (2009).

Mool, P., Bajracharya, S. R., & Joshi, S. P. (2001). Inventory of glaciers, glacial lakes and glacial lake outburst floods: monitoring and early warning systems in the Hindu Kush-Himalayan region – Nepal.

National fisheries development plan-1992/93. (1993). Department of Agricultural Development. Fisheries Development Divisionk, GoN.

Nepal Biodiversity Resource Book: Protected Areas, Ramsar Sites, and World Heritage Sites. (2007).

Nepal Climate Vulnerability Study Team. (2009).

Population Census. (2011). Central Bureau of Statistics, GoN.

Preparation of Bathymetric Map of Begnas Lake. (2011). Department of Hydrology and Meteorology.

Preparation of Bathymetric Map of Phewa Lake. (2010). Department of Hydrology and Meteorology.

Preparation of Topographic and Bathymetric Map of Phoksunod Lake. (2004, 2008). Department of Hydrology and Meteorology.

Raya, R. B., Sharma, S., & Gurung, G. (2008). Impact of Land Use on Water Quality of Phewa-Lake Pokhara, Nepal.

Shrestha, A. B., Wake, C. P., Mayewski, P. A., & Dibb, J. E. (1999). Maximum Temperature Trends in the Himalaya and Its Vicinity: An Analysis Based on Temperature Records from Nepal for the Period 1971–94. Journal of Climate.

Study of Climate and Climatic Variation over Nepal. (2015). Department of Hydrology and Meteorology, GoN. Topographic and Bathymetric Survey of Imja Glacier Lake. (2009). WWF Nepal Program.





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2	/	1	1	/	103 / 101 2.0(cut)	103 / 100 3.0(cut)	103 / 99 4.0(cut)	103 / 101 2.0(cut)	103 / 101 2.0(cut)	103 / 101 2.0(cml	103 / 102	103 / 102	1	1	1	1	/	1	1	1	1	1	1	1	1	1		
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4	r	1	103 / 101	103 / 99	103 / 99	103 / 96	103 / 98	103 / 97	103 / 98	103 / 98	3.0(cut) 103 / 99	1.0(cut)	1.0(cut) 103 / 102	1.0(cut) 103 / 102	1	1	1	1	1	i	1	1	1	1	1	I.		
5	1	103 / 101	2.0(cut)	4.0(cut) 103 / 95	4.0(cut)	7.0(cut)	5.0(cut)	5.0(cut)	5.0(cut)	5.0(cut)	4.0(cut)	1.0(cut)	1.0(cut)	1.0(cut)	-										-	<u> </u>		
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6	/	103 / 101 2.0(cut)	103 / 99 4.0(cut)	103 / 96 7.0(cut)	103 / 96 7.0(cut)	103 / 94 9.0(cut)	102 / 94 8.0(cut)	102 / 95 7.0(cut)	101 / 97 4.0(cut)	101 / 99 2.0(cut)	102 / 100 2.0(cut)	102 / 101 1.0(cut)	103 / 102 1.0(cut)	103 / 102 1.0(cut)	1	1	1	/	1	1	1	1	1	1	1	1		
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vsis May 2 Scale:	2023	1-02		Lighting Pirl. Light

Grid 50M X 50M

Original Level Data Map

Consultant:	Client:	Project:
DoricVIIIa Engineering Consultancy P. Ltd. Kathmandu, Nepal, Vi www.dorkcvIIIa.con, D. mal@doricvIIIa.com Phone No. +977-01-2296403, +977-9851205150	Bagmati Municipality The Office of the Municipal Executive Province No.P., Sarlahl, Nepal	Bathymetri of Bagmati

Bathymetric Survey & Quantity Analysis of Bagmati Fishery Pond

Base Level Data Map

Consultant:	Client:	Project:
Doric VIIIa Engineering Consultancy P. Ltd. Kathmandu, Nepal, VI www.doricvilla.com, E. mail@doricvilla.com Phone No. +977-01-2296403, +977-9853205150	Bagmati Municipality The Office of the Municipal Executive Province No.2, Sarlahi, Nepal	Bathymetric Survey & Quantity Analy of Bagmati Fishery Pond

And Municipant Karmalya, Saclahi
S. S
Grid 50M X 50M Sectional Distance 50M

Grid 50M X 50M Sectional Distance 50M

Original Level Data Map

	Consultant:	Client	
Agn		Client.	Project:
hap	Doric VIIIa Engineering Consultancy P. Ltd. Kathmandu, Nepal, V. www.doricvilia.com, E. maliledoricvilia.com Phone No. +977-01-2296403, +977-9851205150	The Office of the Municipal Executive Province No.2, Sarlahi, Nepal	Bathymetric Survey & Quantity Analys of Bagmati Fishery Pond

