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Head

Department of Civil Engineering

Thapathali Campus, Institute of Engineering

Kathmandu, Nepal



# Cover Page

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

THAPATHALI CAMPUS

DEPARTMENT OF CIVIL ENGINEERING

**DESIGN OF PRESTRESSED BOX GIRDER BRIDGE**

BY

AASHISH GHIMIRE(THA074BCE002)

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE

BACHELOR'S DEGREE IN CIVILENGINEERING

January, 2022

Kathmandu, Nepal

# Title Page



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# Certificate

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

THAPATHALI CAMPUS

DEPARTMENT OF CIVIL ENGINEERING

**CERTIFICATE**

This is to certify that the work contained in this report entitled **"** **Design of prestressed box girder bridge"** in partial fulfillment of the requirement for the Bachelor's degree in Civil Engineering, as a record of research work, has been carried out by **“Aashish Ghimire(THA074BCE002)”** under my supervision and guidance in the Institute ofEngineering, Thapathali Campus, Kathmandu, Nepal. The work embodied in this report has been submitted elsewhere for degree.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Supervisor, name of Supervisor

Title

Name of the Department

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Co- Supervisor, name of Co-Supervisor,

Title

Name of the Organization,

Date

TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

THAPATHALI CAMPUS

DEPARTMENT OF CIVIL ENGINEERING

**DESIGN OF PRESTRESSED BOX GIRDER BRIDGE**

By

AASHISH GHIMIRE(THA074BCE002)

A project report submitted in partial fulfillment of the requirements of the Bachelor's Degree in Civil Engineering

|  |  |  |
| --- | --- | --- |
| …………………………… | …………………………… |  |
| Name | Name |  |
| Supervisor | Internal Examiner |  |
|  |  |

|  |  |  |
| --- | --- | --- |
| …………………………… | …………………………… |  |
| Name |  |  |
| External Examiner | Head of Department, Civil |  |
| IOE, Thapathali Campus |  |
|  |  |

July, 2020

Kathmandu, Nepal

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I acknowledge the help, advice and guidance rendered by Head of the Civil Engineering Department, Ram Pd. Neupane. The support provided by Administrative staffs, Name is unforgettable.

I am also grateful to all the colleagues …………………………………………. .

# Abstract

**ABSTRACT**

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# **ABBREVIATIONS**

# **CHAPTER I**

## **1.0 INTRODUCTION**

### **1.1General**

# **CHAPTER II**

## **2.0 Engineering Survey**

Surveying is the technique of determining the relative position of different features on, above or beneath the surface of the earth by means of direct or indirect measurements and finally representing them on a sheet of paper known as plan or map. In the project various data were collected from site in order to draw the contour map of the bridge site, to locate the high flood level and to draw the overall picture of the site and the river.

Topographic survey was carried out to locate the surrounding features in relation to the bridge site. Topographical survey was conducted over a distance of about 600 m upstream, 600 m downstream and about 700 m and 200 m on longitudinal directions. Cross Sections and L-Sections of the river were also located and mapped through autocad.

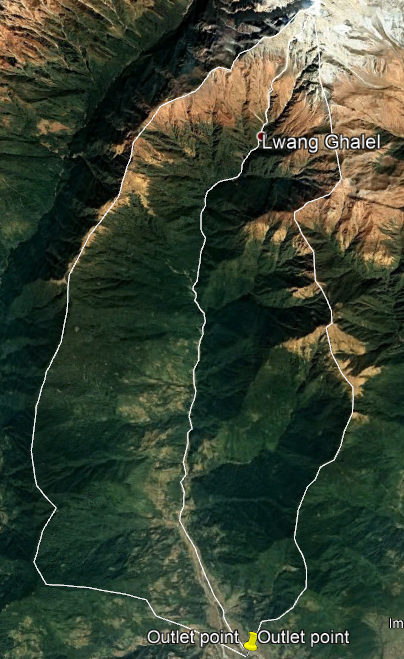
The general topographic and survey data were provided by LRSBU and later verified by our project group.

# **CHAPTER III**

## **3.0 Geological Study**

The proposed bridge site at Mardi Khola at Bhedetar is located in a valley area.

# **CHAPTER IV**

**

## **4.0 Hydrological Study**

### **4.1 Hydrological Design**

In hydrological analysis catchment area was calculated from topo map.

To calculate design discharge, we apply various methods, and among them, suitable discharge was chosen. In all methods, we choose Return Period: 100 Years

*Outlet point @ 28 19 N 18 54 E*

The design discharge can be calculated by using various methods as given below:

**Design Parameters:**

Catchment Area = A = 105.7 km2

Area under 3000m = 78,981,907m2

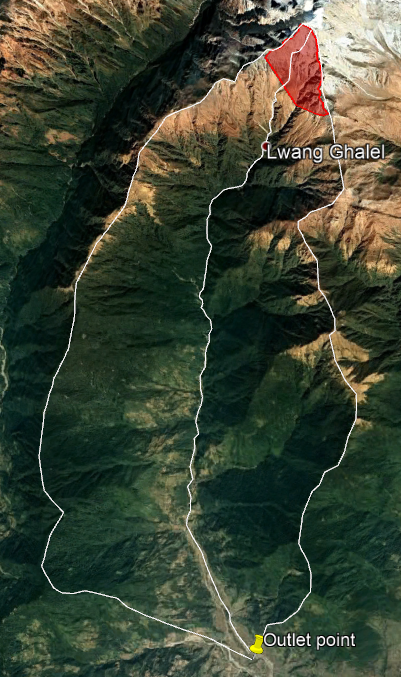
Perimeter under 3000 = 41970m

**Rational Formula**

Q = CIA/360

Figure 1 Catchment Area

Where,



L = 21.6 km

S = 4398/21600

= 0.2042

Tc= 78.08 minutes

C = 0.2

Where, K=5.914,

T= 100 years

x= 0.1623

a= 0.50

n= 1.0127

i= 68.8 mm/hr

Q = CiA/360

= 404.01 m3/sec (Taking C = 0.2 for hilly forest)

Figure 2 Catchment area under 3000m

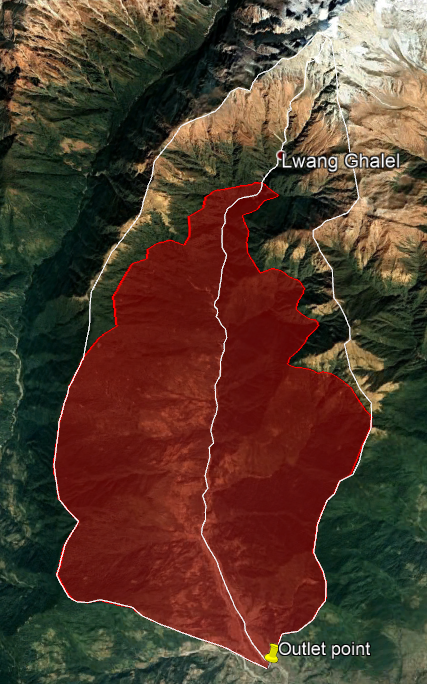
**Dickens Formula (1865):**

*QP = CDA3/4*

Where Cd = 14

A = 105.7km2

Figure 2 Snow covered Catchment area

****

Q = 461.51 m3/s

**Modified Dickens:**

*Q= CTA3/4*

Where

T = 100

As = Snow covered catchment area = 1.90km2

= 1.854

Ct = 15.68

Q = 516.89m3/s

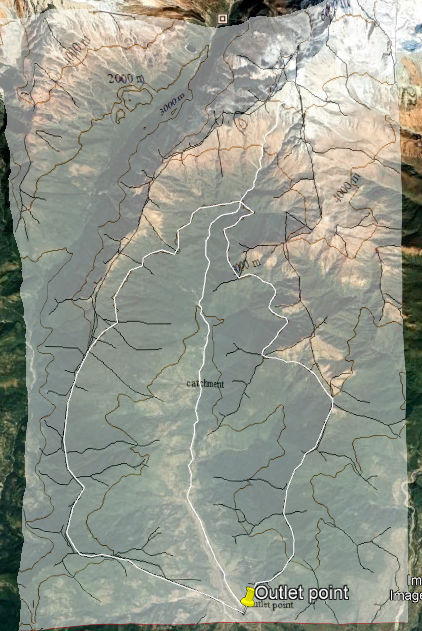
**Ryve’s formula:**

*Q= CRA2/3*

Where CR = 10.2

Q = 228.0255m3/s

Figure 3 Catchment area under 3000



**WECS Method:**

The formula for 100-year return period is given by  
 Q100=14.63(A3000+1)0.7342

Where, A3000 = 78.98 km2

Q100 = 365.1m3/s

Figure 4 Contour map overlay and tracing of catchment area under 3000

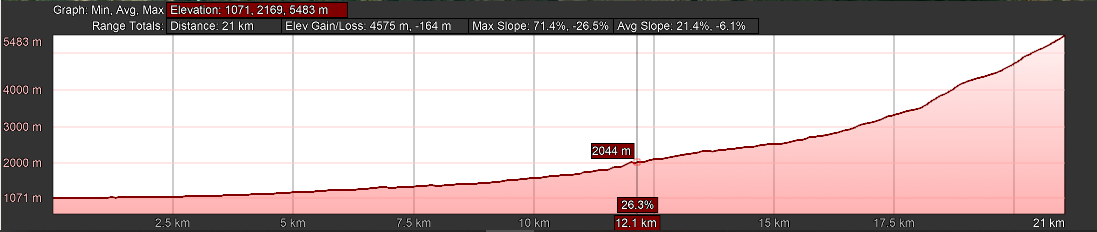


Figure 5 River elevation profile

|  |  |  |
| --- | --- | --- |
| **S.No** | **Method** | **Discharge** |
| 1 | Dicken’s Formula | 461.51 m3/s |
| 2 | Ryves Formula | 228.025 m3/sec |
| 3 | WECS | 365.1 m3/sec |
| 4 | Rational method | 404.01 m3/sec |
| 5 | Modified Dicken’s Formula | 516.89 m3/s |

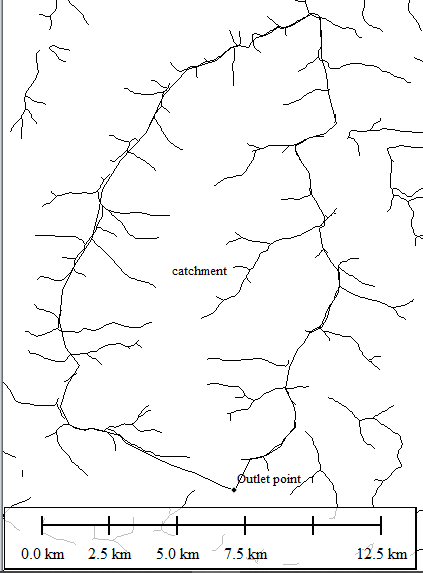
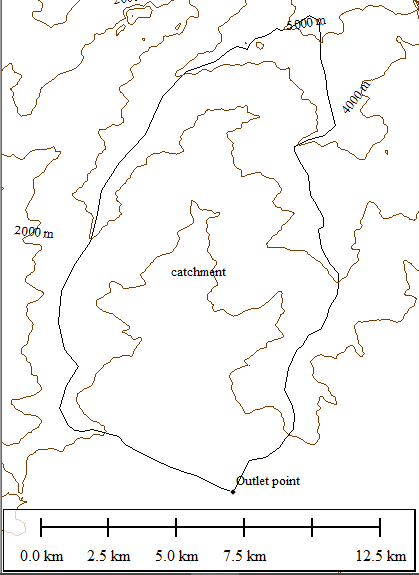


Figure 6 Ridge lines

Figure 7 Contour map (Interval 1000m)

**Table 4.1: Discharge Table**

### 

### **4.1 Site Verification**

**Tribhuvan University**

**Institute of Engineering**

**Thapathali Campus**

**Department of Civil Engineering**

**Levelling Sheet**

Date:2078/8/23

Group no:7?

Members: Aashish Ghimire, Bishal Shakya, Emaduddin Ahmad, Kushal Acharya, Milan Joshi, Nikesh Dawadi

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.N. | BS | | | Mean BS | S1=T-B | FS | | | Mean FS | S2=T-B | Rise/Fall +/- | Stadia Interval S=S1+S2 | Hz. Dist. (m) S\*100 | Cumul. Hz. Dist. | Distance from right bank | Correct RL | Remarks |
| T | M | B | T | M | B | (m) |
| 1 | 0.98 | 0.912 | 0.845 | 0.912 | 0.135 |  |  |  |  |  |  | 0.135 | 13.5 | 13.5 | 273.3 | 1065.490 |  |
| 2 | 1.485 | 1.4 | 1.31 | 1.398 | 0.175 | 2.24 | 2.16 | 2.08 | 2.16 | 0.16 | -1.248 | 0.335 | 33.5 | 47 | 243.8 | 1064.242 |  |
| 3 | 1.482 | 1.385 | 1.29 | 1.386 | 0.192 | 1.565 | 1.4 | 1.34 | 1.433 | 0.23 | -0.035 | 0.422 | 42.2 | 89.2 | 203.3 | 1064.207 |  |
| 4 | 1.36 | 1.24 | 1.12 | 1.24 | 0.24 | 1.84 | 1.76 | 1.67 | 1.753 | 0.175 | -0.368 | 0.415 | 41.5 | 130.7 | 166.6 | 1063.84 |  |
| 5 | 1.2 | 1.095 | 0.985 | 1.093 | 0.215 | 0.985 | 0.87 | 0.76 | 0.872 | 0.225 | 0.368 | 0.44 | 44 | 174.7 | 120.1 | 1064.208 |  |
| 6 | 1.27 | 1.16 | 1.055 | 1.162 | 0.215 | 1.88 | 1.78 | 1.67 | 1.775 | 0.21 | -0.682 | 0.425 | 42.5 | 217.2 | 77.6 | 1063.526 |  |
| 7 |  |  |  |  |  | 1.647 | 1.52 | 1.4 | 1.521 | 0.251 | -0.36 | 0.251 | 25.1 | 242.3 | 31 | 1063.167 | Lowest Bed Lvl. |
|  |  |  |  |  |  |  |  |  |  |  | -2.323 |  |  |  |  |  |  |

**Site Measurements,**

Approximate river width ≈28m

Total measured distance on site=242.3+28+8 ≈ 278.3m

Approximate deepest flow depth ≈38 cm

Width of right bank ≈ 8 m

**Design Data,**

Total Linear Waterway calculated from 100-year design flood = 243 m

HFL before construction= 1064.418m

Lowest Bed Level at design section = 1063.167m

Design high flood depth = 1.2512m

**Check,**

HFL at 243m LWW as measured on site = 1064.242 m < Calculated HFL at section (OK)

Hence the approximate check on section is ok and design can proceed as calculated from 100-year maximum flood.

# **CHAPTER V**

## **5.0 Detailed Design**