

# Hydrographic Survey Conducted on River Jhelum between Pampore and Chattabal to check Feasibility of Inland Water Transportation

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**Abstract** – To know the existing condition of river Jhelum for feasibility of Inland Water Transportation, hydrographic survey was conducted between Pampore and Chattabal. For conducting the hydrographic survey ground control (horizontal & vertical) are very essential. The topographic survey was carried out with the help of Automatic Levels.

Cross sections of river bank at suitable intervals, not exceeding 200 m on straight and 100 m where river turns/meanders its course were recorded by conventional methods (Reconnaissance Survey, Chainage) and soundings were taken with the help of sounding pole.

The hydrological investigations revealed that the waterway under study is subjected to large variations in water level. The maximum water level variation is about 7.1 m. The velocity of flow in the channel is generally 0.2 to 0.5 m/sec in lean season, but the quantum of discharge is adequate to provide the required depth for navigation. Morphological studies indicate that the waterway has adequate widths to accommodate the design vessel for IWT.

**Key Words:** Inland Water Transportation, Hydrographic survey, River Jhelum, Vessel Design, Dredging, River drainage system,

## 1. Introduction

Considering the present traffic congestion, frequent jams, Hydrographic survey is the basic requirement for determining the existing condition of river. It reveals the feasibility of improving the waterway for navigation by selected craft or in deciding the craft suitable for the waterway.

For conducting the hydrographic survey, ground control (horizontal and vertical) are very essential. The topographic survey was conducted to delineate banks, channel and other ground features.

## 2. Methodology

- Study area falls in the 'Restricted Zone' of Survey of India Maps and Triangulation Data. The topographic survey was started with Reconnaissance Survey and an Auto Level was used for running the traverse and fixing the control points.

- With the help of fixed control points on the guide bund of river, planimetry survey was conducted for delineating the ground features.
- Leveling work was done with the help of an Auto Level with known bench mark for fixing temporary bench mark and water level at X-section.
- Cross-section of flow channel at suitable intervals, not exceeding 200 m on a straight and 100 m where river turns/meanders its course.
- A single longitudinal profile of river bed along deeper course was recorded. Current measurements at three locations viz. at U/S end, mid-way and D/S end of study reach was conducted during survey period.
- Three gauges were established at suitable locations and connected with BM to determine the water level.
- All details of bridges, lock gates and weir were collected.
- 4-5 sediment/bed samples were collected at 2-3 locations on river Jhelum and analyzed for grain size distribution and other properties.

## 3. Topographic Survey

Due to the study area falling in 'Restricted Zone' of SOI Maps and Triangulation Data, traverse was started taking origin marked on a cemented pillar of Ferry Ghat at Kadlabal on right bank of Jhelum and assuming coordinate 30,000 m East and 10,000 m North. An open traverse was run along the river coarse for fixing the horizontal control point for planimetry with the help of precision theodolite. All precautions were taken to ensure the accuracy and permissible errors were adjusted. All topographical details were picked up with the help of control points by plane table method.

## 4. Hydrographic Survey

In the study reach, i.e., from Pampore to Chattabal, the width of the river channel varies from 45 m to 210 m and almost

90% stretch of the river was exposed during survey period. Cross sections at an interval of not exceeding 200 m on straight and 100 m where river takes turn/meanders were taken using conventional methods and instruments like rope, sounding pole, tapes etc. The soundings were taken with the help of a tape and sounding pole. Thalweg surveys were carried out from Kadlbal to Chattabal along the deeper course of the waterway.

## 5. Hydrological Observations

Long period hydrological observations such as water levels, discharge, flow velocities are very essential to study the water potentiality for introduction of navigation and to fix the standard low water level/chart datum for reduction of soundings. Data of the past ten years for discharge and water levels (monthly maximum & minimum) at Pampore, Ram Munshi Bagh & Chattabal gauge sites were collected from P&D Division of Kashmir Irrigation and Flood Control Department, Srinagar. To know the existing flow of water and water gradient, water level observation at three locations, i.e., Pampore, Zero bridge and Chattabal were established and recorded at a time interval of 30 min. Current observations at gauge sites, Pampore, Zero Bridge and Chattabal were conducted.

## 6. Choice of Chart Datum

For clear depiction of the river bed, soundings have to be expressed with reference to a selected chart datum. Chart Datum/Standard Low Water Level (SLWL) is a reference level close to lowest flow level and selected in such a way that the water level will seldom fall below it. Therefore, depth shown on the chart shall be available normally throughout the year for navigation. The basic principle behind the adoption of a chart datum/SLWL is to have a realistic picture of the river bed with reference to a known plan to facilitate comparison of the past with present survey and assess the changes in the river bed. SLWL / chart datum cannot be horizontal but will be sloped to get a realistic picture of the depth. Thus, for this study, sloped chart datum has been selected.

## 7. Description of Waterway

The Jhelum River, called as the life line of Kashmir, originates from the Pir Panchal mountain ranges in the south eastern part of the valley. The river originates from a spring, Verinag, located at the foothills of Pir Panchal. It acts as a perennial source for the river. The river also has a non-perennial source at Vyethvathru Nallah, located a few kilometres away from Verinag.

When the river Jhelum flows out of Verinag, it is just a trickle. The majesty it acquires later is mainly due to a number of glacier-fed tributaries contributing their waters to it. At Khanabal it is joined by six mountain streams namely Sandran, Bringi, Arapath, Veshav, Rambiarra and Lidder.

Later on it is joined by Romshi, Sindh, Doodh Ganga, Ferozepur nallah and Pohru. The river flows through Srinagar and Wular Lake before entering Pakistan.

The Kishenganga (Neelum river), the largest tributary of Jhelum joins it at Muzaffarabad. The next largest tributary, the Kunhar River, joins it in Kaghan valley. It is then joined by the Poonch River and flows into the Mangla Dam reservoir in the district of Mirpur. The Jhelum enters Punjab in the Jhelum district.

It ends in a confluence with river Chenab. The Chenab then merges with Sutlej which then joins the Indus River.

Some believe the name of the river, that is, Jhelum is derived from the words Jal (pure water) and Ham (snow). Still others believe that its name has been derived from the city of Jhelum in Punjab province through which the river flows. It is called as Vitasta in Sanskrit and Hydaspes in ancient Greek. The Vitasta is believed to have been one of the major seven rivers mentioned in the holy scriptures of the Indo-Aryans, the Rigveda. The name survives in Kashmiri as Vyeth. River Jhelum in the stretch of Pampore to Chattabal is navigable throughout the year due to the ponding effect created by the Chattabal weir.

### 6.1. Pampore to Panthachowk (Lasjan Bypass Bridge) (9.4 km)

The waterway of this reach is normally 50 m to 100 m wide and depth of water below chart datum in mid-stream is varying from 0.4 m to 5.5 m. This waterway is crossed over by two bridges, i.e., Kadlbal and Jhelum Bridge (PRC) near Lasjan. Under these bridges 3.27 m/4.8 m & 6.06 m/5.39 m vertical clearance is available over Highest Flood Level / Dominant Flood Level respectively. This area is normally free from movement of house boats.

### 6.2. Lasjan to Zero Bridge (11 km)

The channel width of this reach is 60 m to 100 m and depth of water below chart datum in mid-section is varying from 0.4 to 13.6 m. In the stretch of Batwara to Zero Bridge, river flows in confined banks and banks are protected at sharp bend by wooden piling and retaining wall. U/S of Zero Bridge house boats are moored on both banks. Provision exists for spill channel/flood channel to control the floods in city area, start at left bank of river at ch.17.00 km and meet river again at D/S of Chattabal Weir.

### 6.3. Zero Bridge to Chattabal Weir (7.3 km)

The waterway in this reach varies from 40 m to 120 m and depth below chart datum varies from 1 m to 5.5 m except some shallow patches near Habba Kadal, Zaina Kadal, & Aali Kadal. Both the banks of river in this area are thickly populated. House boats are chained on both banks on this section. This waterway is crossed by 12 bridges viz. Zero Bridge (DST), Abdullah bridge (PRC), Amira Kadal (PRC),

Budshah Kadal (DST), Habba Kadal (old DST & new under construction/PRC), Fateh Kadal (PRC), Zaina Kadal (old DST & new PRC), Aali Kadal (Steel), Nawa Kadal (PRC/DST) and Safa Kadal (PRC). River passes through main Srinagar City. In this reach, banks are stable and houses are constructed on the bank of the river. Some ghats (stone/RCC) are built up by habitants and used for washing the clothes and other domestic use. Abandoned bridges piers could be seen in the waterway near U/S of Amira Kadal and U/S of Zaina Kadal. A spill channel Called Kut Kul starts at D/S of Old Secretariat on the left bank and meets the river flow at U/S of Safa Kadal on left bank. Connecting nallah called Chunti Kul takes off from river Jhelum U/S of Zero Bridge and meets again on right side of river Jhelum at Dubji Ghat.

#### 6.4. Restriction of Bridges/Lock gates imposed on Waterway

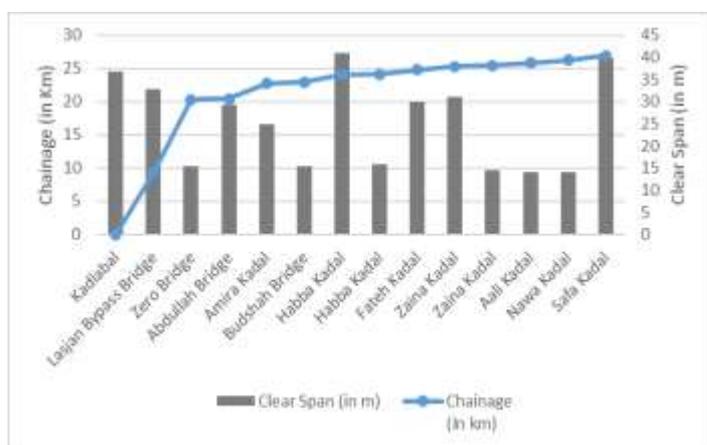
There are several bridges crossing the Jhelum River within study area which facilitate the road network traffic. Most of them impose vertical/horizontal restrictions for free movement under the bridge above DFL/HFL.

#### 6.5. Crossing of Power Line / Telephone Line

39 power lines/telephone lines cross the proposed waterway. Most of them do not have the vertical clearance between lowest conductor and HFL/ DFL for safe navigation. Hence they need to be removed.



Graph 1. Jhelum - HFL vs Chainage



Graph 6. Jhelum - Chainage vs Clear Span

### 7. CONCLUSION AND RECOMMENDATIONS

Based on the above study the following recommendations are made:

- i) The project needs immediate implementation considering its tremendous potential of socio-economic benefits, as the economic rates of return are as per the accepted norms.
- ii) Further, this project can further be expanded to Anantnag in South and Baramulla in North Kashmir.

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