A Comprehensive Report on Gokul Area, U.P.

Rivers of the World Foundation
Web: https://rowfoundation.org **email:** **rowfoundation@gmail.com**

The Rivers of the World (ROW) Foundation arranged for the Kolkata team including Sucharit Dutta and Tushar Kanti (Swapan) Guha to visit Gokul in February 2020 to interact with the Gokul team and gather water quality data. Upon receipt of information from the Kolkata team, it prompted the ROW Foundation, USA to look at other available data/reports on Gokul from previous studies and visits to compile a comprehensive picture of this historically important town.

Purpose

The primary purpose of this comprehensive report is to inform and involve the public in activities that foster the protection, enhancement, and establishment of clean water/river resulting in a sustainable development along the Yamuna River banks. This report should also help in identifying and addressing threats to the biological, cultural, and economic growth of the Gokul area.
The visits by the ROW team focuses on involving local people through active coordination of the local team and encourage voluntary participation to restore biological, economic, and cultural wellbeing of the Gokul Village on the bank of the Yamuna River.

I. Introduction

Gokul is a small town in Uttar Pradesh on the east side of the Yamuna River. A general location of Gokul in relation to Mathura and Agra is shown in Figure 1. below. Gokul is located 15 km southeast of Mathura in Uttar Pradesh. According to Vedic Scripture, Lord Krishna was brought up under the care of Nanda and Yoshoda, the first family of the village. The river Yamuna used to flow near the village as it still does.

Being a small town, Gokul has a permanent population of about 8000 people. However, during the festivals, such as “Janmasthmi” the floating population rises to as high as 500,000. Gokul has an average literacy rate of 70%.

Gokul, a major religious town of the country, is home to many temples. There are approximately 10 major temples with a number of small ones. Most income is generated through tourism especially during the festive seasons. Only10 to 15% of the population is involved in agriculture.

According to a field study conducted in 2010 by S&M Engineering Services the following summary information is provided below [1]:

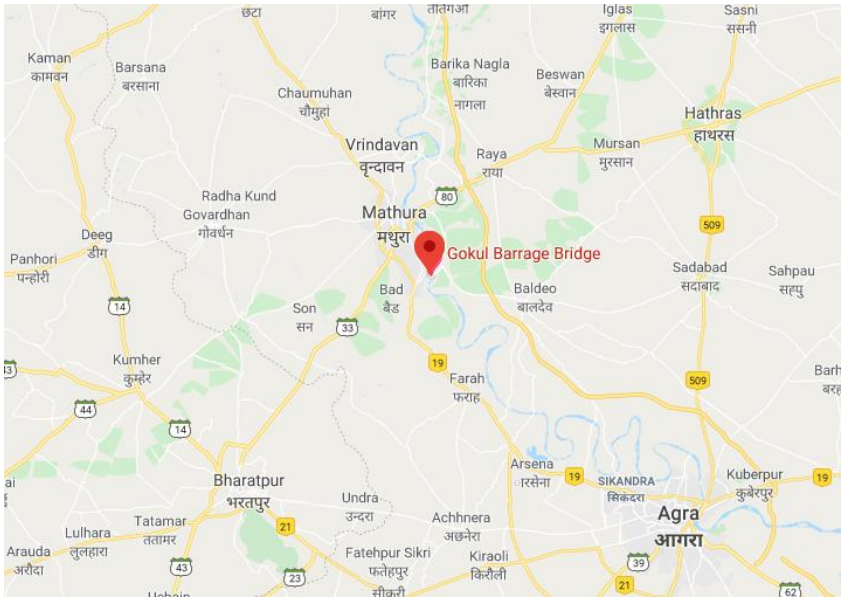

Figure 1: General location Gokul Area courtesy of Google Maps

During the earlier study, the ROW team visited the site on January 15, 2010 at a time when the Solar Eclipse had just started at that location. We had a team of 4 people (Figure 2- Mr. Subijoy Dutta, Mr. Sumit Dutta, Mr. Dick Lahn, and Ms. Ginny Harris) during the visit. Sumit had keen interest in Eclipse and watched the eclipse with local people there.

Figure 2. Visiting Team from US

Mr. Subijoy Dutta, Mr. Sumit Dutta, Mr. Dick Lahn, a
Ms. Ginny Harris Crake

Mr. Pawan Sharma (Figure 3) greeted the team and arranged for a discussion on the project needs and the scope of our data collection activity using a Garmin Global Positioning System (GPS) here.

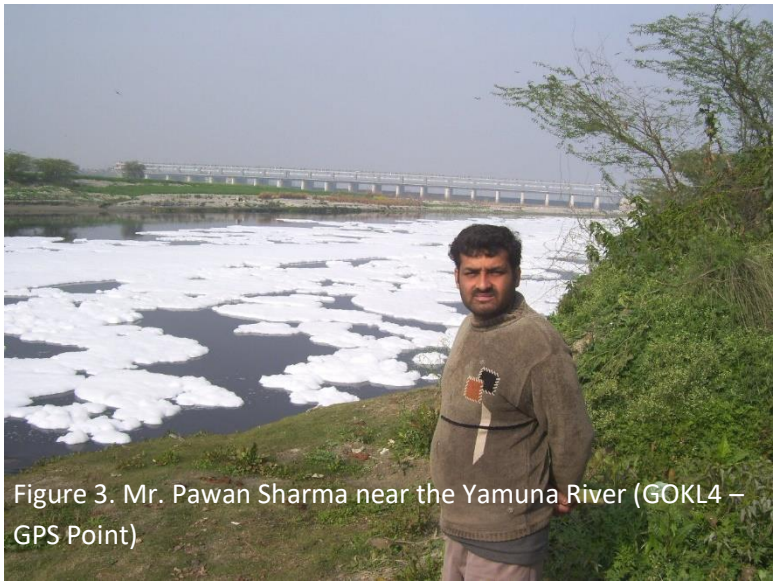

Figure 3. Mr. Pawan Sharma near the Yamuna River (GOKL4 – GPS Point)

Since data points were needed from the whole area to get some rough elevation for evaluating a suitable drainage and other wastewater treatment systems for the area, the team chalked out a plan to cover the whole town from the very central location. With the help of Pawan Sharma the team gathered over 70 data points for the area. Figure 4 shows GPS data points overlay on satellite imagery for Gokul (North half).

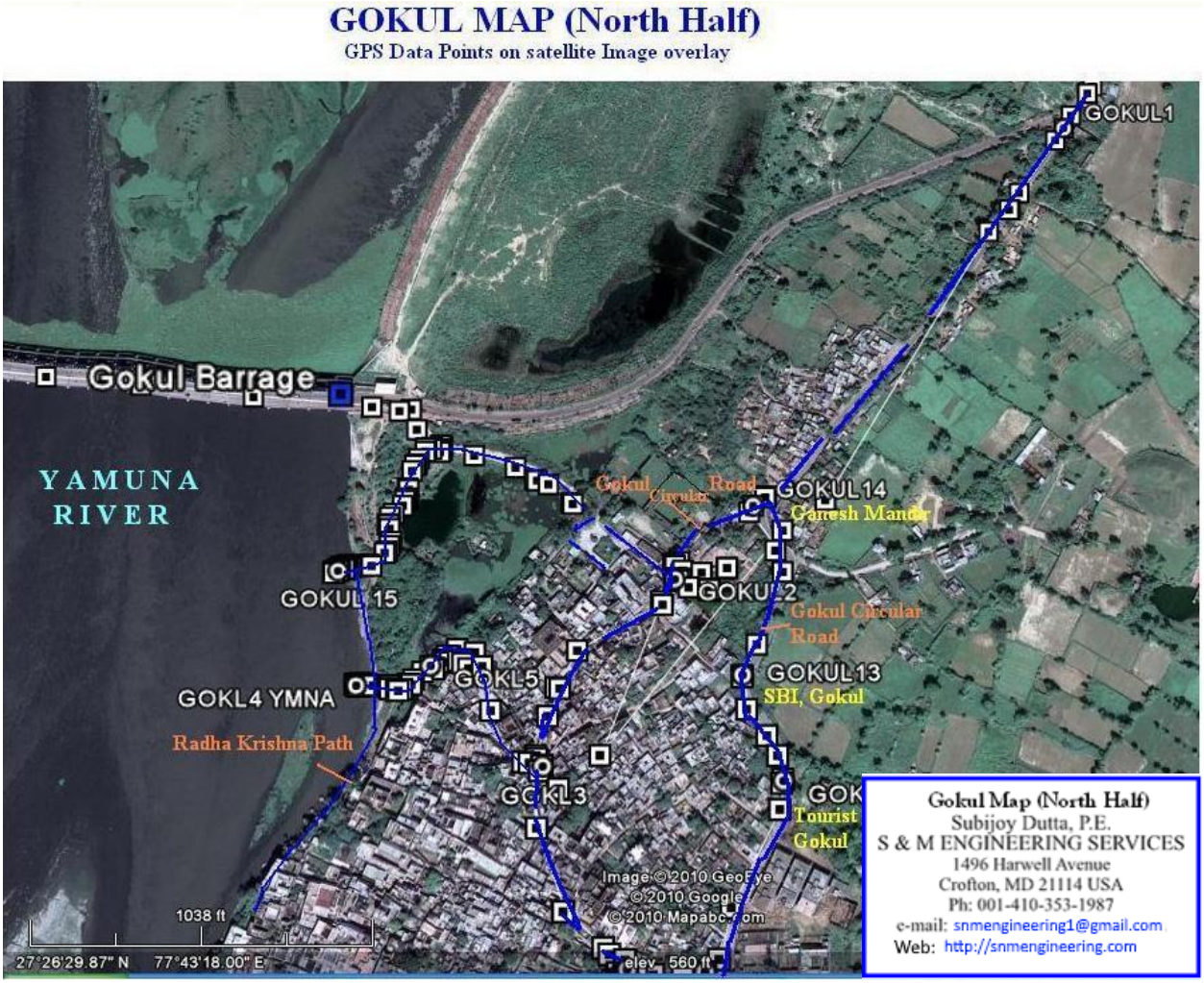

Figure 4. GPS data points overlay on satellite imagery for Gokul satellite image: Courtesy Google Maps

A general elevation profile developed from the data is shown in Figure 5 below:

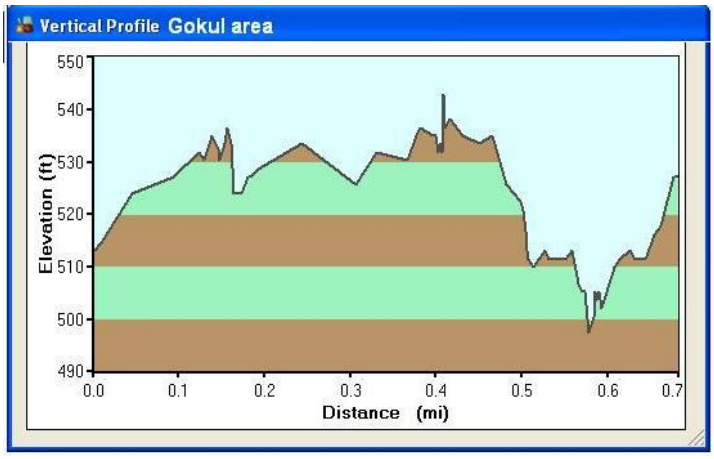

Figure 5. A general elevation profile of Gokul.

II. Local Geology and Hydrogeology

The Gokul area/Region mainly lies in the Indo-Gangetic plain of almost uniform topography [2]. Except the hilly tracts of Rajasthan, the remaining area comes under Indo-Gangetic alluvium of Quaternary age of variable thickness ranging between 200 - 300 m. The lithological logs of tube wells to a depth of 30 m. as inventoried in different parts of Mathura district show that the fluvial sediments constitute different grades of sand and clay with Kankar in varying proportion. Kankar is a local name of calcareous concentrations of nodular limestone. It is found on both sides of river Yamuna. Two principal aquifers have been encountered over the area. The first one lies between 30-80 m and second one between 125-175 m below ground. Deeper aquifers contain saline/brackish ground water. The fresh ground water potential of the area is limited. The ground water in shallow aquifer occurs under unconfined state while in deeper zone it lies under semi-confined to confined state. The depth to water table over the district lies between 5-10 m below ground during pre-monsoon season, with an average rise ranging between 0.5-1.0 m during post monsoon [3]. A Geologic Cross-section is shown in Figure 6 below.

Figure 6. Typical Hydrogeologic Cross-section for the General Gokul Area

III. Wastewater Treatment Options:

Gokul area had a small wastewater treatment plant housed in the southern part of the town However, for the past decade the plant is inoperative and the wastewater from the area is discharging either directly to the Yamuna River or through locally built septic tank systems. The river thus gets further polluted with the wastewater discharged from the Gokul area without proper treatment. Looking at the local condition and population load the ROW team suggested a

deep pond system with an aeration pond and a shallow polishing pond for this town. Other options considered was to build a subsurface flow constructed wetland system.

IV. Water Quality and Other Relevant Information from Site Visits by the ROW team in February 2020

During the recent visit the ROW Kolkata team met Pawan Sharma (ROW coordinator, Gokul) and Jagdish Kewat, volunteer, who did a trash cleanup program for the World Water Day (WWD) 2019. Jagdish runs a boat in Yamuna every day to help pilgrims to see the other bank of the Yamuna River and he is well aware of the condition of the Yamuna River on a daily basis.

The water quality for the Yamuna River was measured by the TCS meter, which measures the Total Dissolved Solids (TDS), Conductivity, Salinity and temperature of the water. The TDS value ranged from 603 mg/l to 1206 mg/l at a water temperature of 18.50°C. This is a high level of TDS for any potable use. Moreover, the floating foam was present in the water as shown in Figure 7 below, where it shows the foaming Yamuna river downstream of Gokul barrage.

Figure 7. Yamuna River flowing southwards from Gokul Photo: Sucharit Dutta, Feb 18, 2020

This location is of utmost importance because Gokul is a major pilgrimage center located on the bank of river Yamuna, one of the major tributaries of the river Ganges.

Gokul is of great significance for the Indian people, but ironically river Yamuna is one of the most polluted rivers in the country. Because of its association with Lord Krishna, Gokul is an important pilgrimage center located close to Vrindaban on the bank of the Yamuna River.

Mr. Pawan Sharma, Coordinator, for the Rivers of the World (ROW) Foundation, Gokul organized a trash cleanup program with his team and volunteers on March 24th, 2019 for the World Water Day 2019. All of the participants including children wholeheartedly participated in the event. The water quality for the Yamuna River was very poor as measured by the Lamotte TCS (TDS, Conductivity and Salinity) instrument. The total dissolved solids (TDS) value ranged from 1140 mg/l to 1220 mg/l at a water temperature of 17.5° C (63.5° F). This is a high level of TDS for any potable use. Moreover, a thick layer of floating foam was also present in the river.

About 250 people gathered for cleaning up of Ghats or Landings for the Yamuna River. ROW volunteers, School Children, local community including young and old plus the local police trainees and forces joined. The focus of the event was to clean up the non-biodegradable trash and teach students and local community the importance of water quality for a healthy life.

During the ROW team visit on February 18, 2020 the team presented the Best Community Participation Award for WWD 2019 to the Gokul team, and discussed about organizing WWD 2020.

The picture (Figure 8) below shows (from L to R) Jagdish Kewat, Pawan Sharma of the Gokul team receiving an Award and a Certificate from Sucharit Dutta from the ROW team Kolkata.

Figure 8. Gokul team receiving award. Photo: Tushar K. Guha, ROW Kolkata

Water Testing Information by the ROW Team (Yamuna-Gokul)

Location: Lat: 27°26'25.9"N Lon: 77°43'04.2"E

See location Map below**.**

Water Testing Results for the Yamuna River at Gokul from the past two years are

Date	Parameters	Results	Remarks
Feb 18, 2020	TDS (ppm)	603	
Mar 24, 2019	TDS (ppm) (Average)	1180	

April 7, 2020 update: The Gokul team recently reported a significant improvement in the Yamuna water clarity and quality, including complete absence of foam in the river water due to the "lockdown" mandate from the central authorities in India to protect against the corona virus pandemic. This caused all activities in the upstream to shut down resulting in stoppage of all industrial discharges flowing into the Yamuna River.

V. Observations and Analysis of the Site Data

From the visual observations during the site visits in 2010 and 2020, it is apparent that the local people are more aware of protecting their water resources. They are making efforts to manage

the municipal waste generated in the Gokul area for protecting the river. Although the arrangements are temporary, the local community seems to work collectively to keep the river clean and protected. For the past decade, the Gokul team conducts the World Water Day annually by getting people from all sectors in the town actively engaged in trash cleanups, environmental education, discussion, school events, local business events and other activities for raising water/environment awareness amongst people. The are more trash bins in the town for people to throw waste. The household waste, such as paper, plastics, temple waste etc. which was a commonplace in 2010 are not dotting every lane/road now.

The floating foam was still visible in February 2020, but the thickness of the foam layer was less compared to March 2019. The TDS value of the river in February 2020 was much less compared to the previous year as listed in the Table above. Although, the water quality of the river is still very poor and not suitable for potable use or bathing at TDS level of 603 ppm, there seems to be some progress in the right direction compared to the previous year.

VI. Conclusions and Recommendations

Upon reviewing the above information, the ROW Foundation draws the following conclusions for the Gokul town and the neighboring area.

- The waters of the Yamuna River in the Gokul area, as of February 2020, is not safe for bathing or ingesting by local people.
- The river water is receiving domestic wastewater and other discharges mainly from upstream of the Gokul barrage. The local discharges from the Gokul area also make their way into the Yamuna river with much less volume and contaminant load.
- The water quality of the river needs to be improved to potable level for the local people and the pilgrims to use safely.

The ROW team recommends the following.

- Continuation of the progressive awareness program focusing on the direct relationship between water quality and environment on the health of the local people, covering residents from all parts of the Gokul town including the temple priests.
- A short awareness briefing should be provided to the visiting devotees and monks.
- The local authorities should make an effort to improve the water quality of the river. This may involve –
    - Looking into local discharges from the Gokul area and arrange for proper wastewater treatment prior to discharging to the Yamuna River.
    - Identifying the pollution sources upstream of the Gokul barrage by conducting a general watershed analysis through support from the state/central authorities.

    - Developing a comprehensive plan to arrange for treatment of all discharges into the Yamuna River and disallowing all polluted/untreated discharges from industrial and other sources to the river.

- The local authorities should arrange to have an engineered disposal facility for the Municipal Solid Waste generated from the Gokul area. The facility could be planned for future capping and use for other suitable land use.
- The authorities need to arrange a detail study of the local Geology of the area and look into possible water recharge and ground water monitoring systems to protect the drinking water supplies (private wells) for the area.
- The authorities should begin such effort without delay to protect human health and the local environment. This will provide economic growth of the town by providing an environmentally sound pilgrimage and attract national and international visitors.

Please send any questions or comments about this report to rowfoundation@gmail.com .

VII. References:

1. S&M Engineering Services, Maryland, USA "A field study of usable water quality and waste management status of Gokul, UP, India", January, 2010.
2. Saha, A, Kansa, M.L., Mishra, G.C., and Gupta, R.P. Restoration of the Traditional Small Water Bodies in Braj, South Asian Journal of Tourism and Heritage (2010), Vol. 3, No. 2
3. Pollution of surface waters with phosphorus and nitrogen. Ecol. Appl. 8:559-568. CGWB (2003). "Hydrogeology and ground water potential of Mathura district, U.P.", Ministry of Water Resources, Govt. of India, p. 6-7.