High Flood Level (HFL) and Contour Analysis Report

# 1. Introduction

<< Auto-generated introduction will appear here: Location, coordinates, area, elevation range, nearby water bodies >>

# Table-1: Significant features

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| --- | --- |
| Feature | Specification |
| Location | << Auto-fill >> |
| Coordinates | << Auto-fill >> |
| Nearest water body | << Auto-fill >> |
| Area enclosed | << Auto-fill >> |
| Contour interval | << Auto-fill >> |

Introduction:-

The proposed land parcel is situated in Bandiya village of Kachchh district, Gujarat, and is geographically located at Latitude 23°22'8.62"N and Longitude 69°0'10.69"E. The site covers an area of approximately 401 acres. The elevation (HFL) of the land parcel ranges between 63.5 meters and 83.5 meters above mean sea level (MSL), indicating a moderate variation in the terrain. This elevation range suggests that the land is relatively flat with slight undulations, suitable for various types of development, subject to detailed feasibility. In terms of water proximity, a small reservoir is located about 1.5 km to the west, while the Mitti River flows approximately 2.5 km west of the site. Additionally, the Mitti Dam, a significant water resource in the region, is situated around 17 km to the west.

Figure-1:- Location map of Bandiya Land Parcel

Table -1:- Significant features of Proposed land parcel

2. Digital Elevation Models (DEMs):- Digital Elevation Model are digital representations of the Earth's surface topography, where each cell or pixel contains an elevation value relative to a reference level, usually mean sea level. DEMs are fundamental tools in geospatial analysis and are widely used in fields such as hydrology, geography, civil engineering, environmental studies, and disaster management. They help in modeling terrain, analyzing watershed boundaries, simulating water flow, generating contour lines, conducting slope and aspect analysis, and supporting infrastructure planning.

However, in many regions—particularly in developing countries—the availability of high-resolution and accurate DEMs remains a significant challenge. Often, the available data may lack the spatial resolution or vertical accuracy necessary for reliable flood modeling. This limitation has been partly addressed by the Shuttle Radar Topography Mission (SRTM), a global initiative that significantly expanded DEM coverage. Conducted in February 2000, SRTM used radar technology aboard the Space Shuttle Endeavour to acquire elevation data for nearly the entire Earth's land surface. While SRTM data has enhanced the accessibility of DEMs for various applications, including flood inundation modeling, careful consideration must still be given to the data’s resolution and accuracy. As with any elevation dataset, the effectiveness of SRTM-based flood models depends on how well the DEM captures the topographic details of the specific study area. For most of the world, making it an invaluable resource for applications such as flood modeling, hydrological analysis, terrain mapping, infrastructure planning, and environmental monitoring. Despite its wide utility, users must be cautious about its vertical accuracy and potential data voids in certain rugged or densely vegetated regions.

## 2.1 Contour: - Contour analysis is a vital component in topographic and site suitability assessments as it helps visualize the elevation and slope variations across a land parcel. By mapping contours, planners can identify high and low areas, determine natural drainage patterns, assess slope stability, and evaluate construction feasibility. In flood risk studies, contours are especially important to compare ground elevation with nearby water bodies or dam HFL (High Flood Level) data, ensuring the site lies above potential inundation zones. Moreover, contour-based zoning aids in effective planning for infrastructure, water management, and erosion control, making it an essential tool for informed decision-making in land development projects.

# 3. HFL (Highest Flood Level) analysis:

# 3.1 Mitti Dam HFL (Highest Flood Level) analysis:-

The Mitti Dam, located approximately 17 km from the proposed land parcel has been studied for its potential influence on the site’s HFL level. Although the HFL of Mitti Dam does not directly impact the proposed land parcel, its inclusion in the analysis is essential for comprehensive verification of flood levels in the surrounding region. According to official documents such as the Disaster Management Plan ,2009–10 ( Refer page no 27 ) by the Government of Gujarat and the Mitti Water Resource Project report ( ) the HFL of Mitti Dam is recorded at 23 meters above mean sea level. Independent assessment using SRTM (Shuttle Radar Topography Mission) data from our study measured the HFL at 25 meters, which aligns closely with the reported figure and validates its accuracy.

# 3.2 Reservoir HFL (Highest Flood Level) analysis:-

A detailed contour study was conducted for the nearest reservoir and the proposed land parcel to assess the local HFL conditions. From the SRTM data analysis, it has been observed that the elevation of the nearest reservoir ranges from 51.5 to 63 meters above mean sea level. This elevation band has been further categorized into 3-meter intervals for better visualization and interpretation using color shading: 51.5–54.5 m, 54.51–57.5 m, 57.51–60.5 m, and 60.51–63 m. The analysis indicates that the 60.51 to 63 meter zone falls within the potential danger zone, with the HFL of the reservoir identified at 63 meters. This information supports the elevation analysis of the proposed land parcel, which lies between 63.5 meters and 82.5 meters, indicating that the land is safely situated above the flood influence zone of nearby water bodies.

# 3.3 Proposed land parcel’s HFL (Highest Flood Level) analysis:-

The SRTM (Shuttle Radar Topography Mission) data has been utilized for conducting the contour analysis of the proposed land parcel, providing reliable elevation information for terrain assessment. Based on this analysis, the elevation across the site ranges from 63.5 meters to 82.5 meters above mean sea level. To enhance visualization and interpretation, this elevation band has been divided into 3-meter contour intervals, categorized and color-shaded as follows: 63.5–66 m, 66.1–69 m, 69.1–72 m, 72.1–75 m, 75.1–78 m, 78.1–81 m, and 81.1–82.5 m. The use of SRTM data enables consistent and high-coverage topographic mapping, especially valuable in remote or data-scarce regions. Importantly, a reservoir located 1.5 km west of the site has a reported Highest Flood Level (HFL) of 63 meters, indicating that the 63.5–66 meter contour zone within the proposed land parcel falls within a potential flood-prone or danger zone. This underscores the significance of SRTM-based contour studies in flood risk assessment and site suitability analysis, aiding in informed decision-making for proposed site development plan.

# 4. Remarkable finding/ conclusion

The comprehensive HFL (Highest Flood Level) analysis, incorporating both official data and SRTM-based elevation assessments, confirms that the proposed land parcel is predominantly situated above the flood influence zones of nearby water bodies, including the Mitti Dam and the adjacent reservoir. While a small portion of the site (63.5–66 m zone) falls marginally above the reservoir’s HFL of 63 m, the majority of the land lies well above potential flood levels, reaching up to 82.5 m. The integration of contour mapping using SRTM data has proven instrumental in identifying elevation bands and potential flood-prone areas. This analysis enhances the reliability of the site’s topographical suitability for development, ensuring that flood risk is minimal and manageable through informed planning and appropriate mitigation strategies.

# Table-2: Contour Banding (0.5 m interval)

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| --- | --- |
| Band (m MSL) | Interpretation |

<< Auto-generated contour banding will appear here >>

# Table-3: HFL Band vs. Zoning Guidance

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| --- | --- | --- |
| Elevation Zone (m MSL) | Flood Risk | Planning Guidance |

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