

SAMPLE REPORT · GEOSPATIAL ANALYTICS

Flood & Hydrology Modelling Report

Catchment Runoff and Inundation Assessment

Hydrological and hydraulic assessment of the Kali Nadi sub-catchment (approx. 340 km²) covering DEM preparation, rainfall-runoff modelling, flood frequency analysis and 1-in-100-year inundation mapping.

Prepared by	GeoSpatial Analytics
Report reference	GSA-FHM-2025-004
Date	July 2025
Status	Sample / Illustrative

This document is a sample/illustrative report produced by GeoSpatial Analytics to demonstrate report structure, analytical depth and output format. All figures, coordinates, scores and conclusions are illustrative only and do not represent real assessments.

SECTION 1

Catchment Characterisation

Catchment name	Kali Nadi Sub-catchment (illustrative)
Area	342 km ² (delineated from SRTM 30m DEM; conditioned with CARTOSAT-1)
Outlet location	28.96° N, 78.12° E
Main channel length	68.4 km
Mean basin slope	1.8%
Land use (dominant)	Agriculture 62%, Forest 18%, Urban 11%, Water bodies 9%
Soil group	Group B–C mixed (NBSS&LUP; soil series mapping)
Gauging station	CWC Gola Gokarnath (used for calibration)

SECTION 2

Rainfall Frequency Analysis

Annual maximum 24-hour rainfall series (1981–2023, IMD gridded 0.25°) fitted to Gumbel EV-I distribution. Goodness-of-fit confirmed by KS test (p = 0.43).

Return Period	24-hr Rainfall (mm)	Peak Flow Q (m ³ /s)	Notes
1-in-2 year	78	142	Bankfull capacity approx.
1-in-5 year	112	228	Minor overbank flow possible
1-in-10 year	138	314	Moderate inundation expected
1-in-25 year	172	432	Significant floodplain activation
1-in-50 year	198	524	High risk to assets within 400m
1-in-100 year	228	638	Design standard for infrastructure
1-in-200 year	258	742	For critical infrastructure screening

SECTION 3

HEC-HMS Modelling Summary

Model type	HEC-HMS 4.11 (SCS Curve Number loss, Clark UH, Muskingum routing)
Calibration period	Monsoon seasons 2018–2022 (5 independent flood events)
Nash-Sutcliffe E	0.82 (calibration) / 0.78 (validation)
Peak flow PBIAS	-4.2% (slight underestimation of peak; conservative)
Curve Number (urban)	CN = 82 (AMC-II conditions)
Curve Number (agri)	CN = 68 (AMC-II conditions)
Time of concentration	5.8 hours (Kirpich method; validated vs observed)
Base flow	Constant monthly base flow (CWC low-flow records)

SECTION 4

Asset Flood Exposure — 1-in-100-year Event

Asset / Facility	Inundation Depth (m)	Duration (hrs)	Risk Level
Road bridge (NH-74 crossing)	0.0 (above FFE)	—	LOW
Irrigation pump station	0.6	14	MEDIUM
Village settlement (Rampur)	0.9	22	HIGH
Railway embankment km 38.2	0.0	—	LOW
Agricultural storage godown	1.4	36	HIGH
Groundwater monitoring well	Submerged	>48	HIGH

Recommendations

Priority flood protection works are recommended at the irrigation pump station and Rampur settlement. The agricultural godown should be elevated by a minimum of 1.6 m or relocated outside the 1-in-100-year envelope. Detailed 2D hydraulic modelling (HEC-RAS 2D) is recommended to refine depths and extents before final engineering design.

All flood depths are model outputs at 30m DEM resolution and carry ±0.3m vertical uncertainty. Field surveys and high-resolution LiDAR are recommended for design-stage decisions.