

Pilot location: Torquay Town Centre, South Devon Borough of Torbay (UK)

Location and Environmental Setting

Torquay is a seaside town in the unitary authority area of Torbay, in the south-west of England (see Figure 1). It has earned the nickname of the **English Riviera** and has a **major tourist industry**. It has a **population of approx. 65,000**, but it is increased by several thousands during the summer.

The town centre of Torbay is **highly urbanised and predominantly commercial and has a history of pluvial flooding**.

The total drainage area of **Torquay comprises three catchments** which, in their natural state, drained independently to the sea. These are: (1) Babbacombe, (2) Upton Valley, and (3) Torre Valley catchment areas.

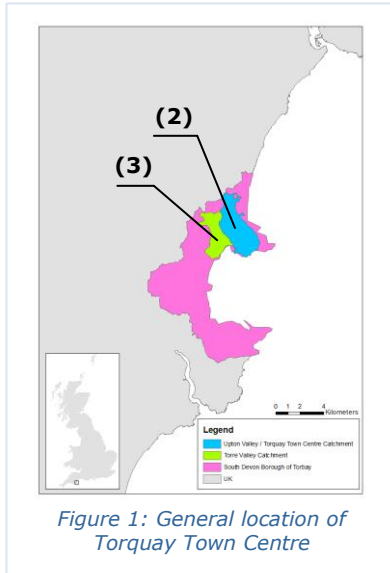


Figure 1: General location of Torquay Town Centre



Figure 2: Map and photos of the Torre Valley and Upton Valley catchment areas (Torquay)



(a) Fleet street



(b) Harbour

The study area adopted for this project includes catchments (2) and (3), which are connected by a pumping station. The study area stretches over **1466 ha** containing the **urban centre of Torquay**.

This area is mainly served by a combined sewer system, which discharges into a pumping station from where flows are pumped to the STW. **During storm conditions the sewer system is relieved by two CSO's**, which discharge into Torquay Harbour.

The **main watercourse** of this area (i.e. River Fleet) **has been culverted** and has become part of the sewer system

Urban pluvial flood risk problems and management objectives

Torquay town centre has a history of pluvial flooding, with over 7 major flood events registered between June 1991 and November 2012.

People and properties at risk in Torquay Town Centre (Source: Torbay Council)

- 50 properties estimated to be at risk during an event of 1 in 30 years
- 97 properties estimated to be at risk during an event of 1 in 100 years
- A total of 3,089 people estimated to be at risk of flooding

Pluvial flooding mechanisms:

- **Pluvial flooding is mainly driven by the local topography:**
 - **Steep slopes channel water to the natural depressions** corresponding to the former paths of natural watercourses. In fact, **flood water ponds mainly along Union and Fleet Streets (main commercial streets)**, which stretch along the natural depression corresponding to the former pathway of the River Fleet.
 - Although in the remaining areas of the town centre the depth of flooding is not excessive, **the steepness of the topography causes high velocities of flood water** and therefore flood hazard is significant.
- **Large proportion of impervious areas** causes rapid response to rainfall, thus worsening the situation.
- There are 3 **attenuation tanks** in Torre Valley. **When these are overwhelmed, flooding happens very quickly**
- **High tides reduce hydraulic capacity** of sewer system at some points



Figure 3: Union Street (Aug 1938)



Figure 4: Fleet Street (Aug 2007)

Potential urban pluvial flood risk mitigation options:

- Construction of a new **large diameter drainage pipe** in Union Street and Fleet Street
- **Separation** of surface water flows from the combined sewer
- Implementation of **property-level sustainable drainage systems** that increase infiltration, thus reducing runoff
- Raising **community awareness** + local **property resistance and resilience** measures
- **Optimisation of the existing sewer system through real time control**, using the multiple control elements within the system (i.e. storage tanks and pumps) – **supported by forecasting**