

# DESIGN AND OPERATION OF TRASH SCREENS CASE STUDY

## CARR DYKE

### 1.0 SCREEN REQUIREMENT

#### 1.1 The Site

The Carr Dyke trash screen is situated on Carr Dyke North. It protects a syphon that carries the dyke under a minor road in Bourne, Lincolnshire. Just downstream of the syphon there is a recently constructed supermarket, which is set below the level of the road. The general area is on the outskirts of Bourne.



**Figure 1.1 General view of the present**

#### 1.2 Reasons For Installation

The trash screen was built to prevent blockages to the syphon and in turn prevent flooding to the road and adjacent areas of housing. The installation was constructed in the late 1970's and followed problems with debris blocking the syphon. The syphon had been installed a few years earlier as part of a flood alleviation scheme to the area. (*Manual, Sections 2.1.2 and 2.1.3 discuss culvert blockage*).

The syphon also presented a health and safety risk should there be any unauthorised entry. It is not known to what extent this risk was considered in the decision to screen.

#### 1.3 Decision to Screen

It is believed that the screen was installed by Anglian Water Authority who was responsible for the maintenance of the watercourse at the time. It is presumed the screen was installed to prevent culvert blockage.

#### 1.4 Consultation

It is unlikely that any consultation took place before the installation with either stakeholders directly affected or the operation staff who would be responsible for cleaning and maintaining. *(The importance of consultation is discussed in Section 3.6.2 of the Manual).*

## **2.0 DESIGN**

### **2.1 Designer**

The local catchment area board of the Anglian Water Authority undertook the design of the installation. At the time of the design, there was no suitable trash screen guidance available. And there are obvious ergonomic failings of the installation. *(The Manual will provide competent engineers with the guidance needed to avoid historical failures, see Section 1.4).*

### **2.2 Design**

No design data is available for this installation. A visual inspection reveals that no special design measures have been incorporated that would assist with the ongoing operation and maintenance of the installation. It is concluded that the 'design' effort afforded this installation was purely structural in nature with only basic attention paid to the screen layout itself.

The trash screen is situated adjacent to the public highway. It is protected on three sides by a two-bar post and rail fence, although this fence does not provide adequate protection to the public from falling over the screen.

The Dyke upstream of the screen is a trapezoidal grass bank channel, and access is unrestricted. The screen alignment to the upstream channel is good and the dyke has an unimpeded approach to the screen. The catchment area is generally rural, with some local housing. *(Manual, Section 2.2 provides guidance on risk assessment and the decision to place a screen).*

The trash screen is designed to accommodate a 1:25 year event with a characteristic design flow of  $6.7\text{m}^3/\text{s}$ . It is a single stage screen 2.83m wide and 3.17m high with reinforced concrete walls and cover slab giving a total screen area of approximately  $10\text{ m}^2$ . Using the empirical method of screen sizing for medium amounts of debris  $9\text{m}^2$  would be adequate. *(Manual, Section 3.3.4 provides guidance on screen sizing).* The channel bottom is uniform as it approaches the screen.

### **2.3 Features**

The main features of this installation are the long length of screen rake and its steepness, this together with a lack of safety provision present a major health and safety risk for operatives. Additionally there is no convenient area for the temporary storage of screenings. The screen bars are at a spacing of 140mm, which prevents unauthorised access to the syphon and does not appear to give problems with the type of debris collected.

### **2.4 Access Arrangements**

During clearance operations the contractors vehicle is parked adjacent to the screen. Operatives access the top platform directly from the adjacent footway. There is no safety harness arrangement and no dedicated lighting available. No facilities are available at the site such as for the storage of equipment or welfare facilities. (*Manual, Section 3.4.1 provides guidance on access arrangements*).

## 2.5 Modifications

No modifications have been undertaken since installation. (*Manual, Section 7 deals with existing screens, and how to undertake an appropriate review of functionality and performance*).

## 3.0 OPERATION

### 3.1 Development

There is no operations or maintenance manual available for the installation. It is understood that there has been no development/improvement of the installation itself or the method of clearing since commissioning.

There has been considerable new residential development upstream of the screen, however the type and amount of debris collected has remained constant.

The screen was designed and installed in 1979 and as such does not comply with the latest guidelines. There are no over flow measures and when the screen becomes fully blinded flooding occurs which can spill over the road into the supermarket. A number of flooding incidences have been recorded.



**Figure 3.1.1 View of the screen under normal flow conditions.**



**Figure 3.1.2 View of the screen at 1 in 20 year event. The water level is below peak at this point. Notice that there is debris behind the screen.**

### 3.2 Equipment

There is no equipment on site.

### **3.3 Access**

There are no special access arrangements. The site is open to the public directly from the highway. Operatives are required to climb the fence onto the top of the screen structure from where raking is carried out. Access to the channel bed is down the grassed slopes of the channel embankment; these are steeper than 1 in 2.

### **3.4 Reporting and Response Procedures**

There are no written operational procedures for this installation. (*Manual, Section 5.1 provides guidance on written procedures*).

The screen is checked weekly for debris. At present telemetry is not installed at the culvert and emergency alarms do not exist. The system of inspection and clearance has developed from custom and practice routines over a number of years.

Alarms relating to heavy rainfall are communicated to the Contractor by a central, regional control and standby system. The call out does not necessarily relate to screen blockage, being rainfall generated. Should the screen block in any situation other than high rainfall the operator will be unaware unless contacted by some third party.



**View of the syphon outlet downstream of the screen during high flows. The syphon creates significant turbulence downstream**

It is not believed any modifications have been undertaken to this installation.

## **4.0 MAINTENANCE**

### **4.1 Inspection Procedures**

Detailed records have not been kept of any maintenance works. It is understood that no maintenance manual exists for the structure.

It is not believed that any inspections are undertaken for the general maintenance of the installation.

The lack of compound means no equipment is stored on site. Clearance of the screen is by hand rake and debris cannot be stored on site.

Typically under normal conditions 0.2m<sup>3</sup> of debris collects per week and during an event 1.0m<sup>3</sup> collects per day.

#### **4.2 New Technology and Legislation**

There is no obvious situation where new technology would have any particular application to this screen, however it may be possible to use mobile plant to undertake a more effective screen clearance operation.

The introduction of the CDM Regulations has an impact on the health and safety aspects of the installation. The screen is unsafe in many aspects:

- Access arrangement
- Manual handling
- Debris storage
- Public duty of care

There are straightforward measures, which would improve the performance of this installation.

#### **5.0 PERFORMANCE**

Despite the readily identifiable deficiencies of the installation, there are no reports of problems in the general operation of the screen.