HYDROLOGY

7.

Hydrology Study

The following chapter considers the hydrology of Abbey Fields. It is a study and not a detailed hydrology survey but provides an overview of the hydrology of the Fields, its constraints and opportunities. A field survey along with EA flood data and historical hydrological events have informed the study. It is advised to undertake a detailed hydrological survey to determine further opportunities within the Fields.

It should also be noted that engagement with Historic England at an early stage will be required to ensure that any suggested interventions can be supported.

Site features and background

Finham Brook and Luzley Brook

Abbey Fields centres around two brooks, Finham Brook and Luzley Brook. Finham brook runs from west to east and Luzley Brook south to north. Luzley Brook merges with Finham Brook to the centre of the Fields just west of the leisure centre.

Finham Brook is set within a deep, wide channel that towards the Leisure Centre has steep walled embankments associated with the two bridges and what appears to be the

infrastructure of an historic mill. The base of Finham Brook is gravel and pebbles. It is heavily vegetated, but its width provides a sense of openness to the brook, with gaps allowing views into the brook.

Luzley Brook is a heavily vegetated and silty brook. It is deep in places with fine willow roots slowing the flow and creating interesting eddies. A narrower brook, vegetation appears to encroach the brook although regular maintenance keeps a 1m channel clear of succession. It has shallower sides compared to Finham Brook with a large

number of weeping willows along its length as well as wide areas of vegetation limiting access to the brook, preserving its character as a wildlife rich corridor and a feature within the Fields. Its connection with Finham Brook is wide and uninterrupted.

Abbey Fields Lake

Abbey Fields Lake is located to the north of Finham Brook, and west of the leisure centre. A more recent 20th Century addition, this covers a large area of land midway up to Castle Road. It is a man-made lake and is controlled by a managed intake and outlet, with any movement of water into and out of the lake agreed with the Environment Agency. Originally the land was managed as a flood water meadow, with dams and a sluice network used to control the water. However, following the development of the leisure centre, the pipework was

unfortunately damaged and the flood meadow ceased to exist resulting in the development of a marshland landscape. However, it was later agreed in 1997 on its formation as a permanent lake feature, and the area was dug and filled with water under control.

Services

There are a number of services that cut through Abbey Fields, with a known mains water pipe that runs under Abbey Lake and services that run through the lower reaches of South Brook and Hillside.

Flooding

Both Finham and Luzley Brook flood and the lower reaches of the Fields including the lake are identified as being within flood zone 3. The connection that this has with the wider area can be seen in Map 1. Map 2 identifies the extent of flood zone 3 around Lakeside and South Brook zones. Whilst Map 3 shows that there are minimal areas of flood zone 2 within Abbey Fields, generally identified within the tennis courts. The land rises steeply either side of flood zone 3 preventing the possibility of increasing capacity within the Fields from flood incidence.

Map 1: Wider Flood Zone Map around Abbey Fields

Map 2: Flood Zone Map around Lakeside, South Fields and parts of Hillside

Map 3: Flood Zone Map around parts of Hillside and Play & Leisure Zone

Water issues and opportunities

There are hot spot areas for water throughout the lower reaches of the Fields as well as issues along Finham and Luzley Brooks and the Lake.

Lakeside

Finham Brook

Finham Brook undergoes severe erosion to the embankments mainly caused by dog and pedestrian access/egress which in localized areas is causing issues for path stabilization mainly to the northern side of the brook. A number of repairs have been undertaken to the worst affected locations, but there is a need to manage pedestrian and dog movements into and out of the water. This can be undertaken with clearly identified locations for water interaction and fencing the remainder of the northern bank of the brook alongside the lake in order to prevent substantial subsidence to the entire path.

There appears to be potential grey water entering Finham Brook at the pipe outfall near to the Castle Road entrance on the Lakeside boundary.

It was noted that there are a number of Air Valves along the length of Finham Brook. These are associated with Severn Trent Water pipework. Air valves prevent failure of large or long stretches of pipework by performing a number of functions.

In long stretches of pipework vacuums can build up in the pipework or alternatively air bubbles can form. The air valves allow for the movement

of air into and out of the pipework to relieve pressure. The valves are often clearly marked, with brick headwalls to delineate their position along the brook, with manholes located not far from the headwall. In some instances there is an AV blue marker adjacent to the headwall. All of the headwalls have vegetation growing within them.

Opportunity

1. **To formalize two access points along the northern bank into Finham Brook to welcome positive interaction with the brook. Fencing the rest of Finham Brook along the lake between these two access points and also around the leisure centre will prevent further damaging access to the brook embankments. The southern side and the remainder of Finham Brook with Abbey Fields to be left open for free access.**

2. **To inform the Environment Agency of the potential for misconnection causing pollution to Finham Brook.**

3. **Check the requirements for maintenance of Air valves with Severn Trent Water and if required ensure that the valve headwalls remain clear of vegetation.**

4. **Obtain accurate service records for locations of services within Abbey Fields for future management of the Fields.**

Lake

The lake has well vegetated margins along the majority of its perimeter and with hidden fencing this protects the margins well. There are 2 beach locations that encourage positive interaction with the lake, one to the north and one to the south of the lake. The southern beach is grassed and gently grades into the lake creating a feature and positive interaction within this area. The larger hard standing beach area to the north of the lake is showing signs of degradation as the timber edging is rotting. It has a drop into the water which may not be suitable as a family friendly edge. This area experiences wave washing from the predominant wind direction. All margins to the lake either side of this beach were undergoing erosion and have been revegetated through careful management.

There is also undercutting of the footpath margins towards the south east of the lake. It appears that the log roll edging has rotted and water is undercutting the bank. This is not helped by the volume of footfall in this location when feeding the ducks.

There is a large Severn Trent Water main that runs under the lake. The exact location is unknown but Severn Trent Water have created two shut off valves either side of the Fields in order to isolate the water main should any issues arise in the Fields.

Water is controlled into and out of the Lake through Environment Agency approval via a managed intake and outlet. It is understood that in periods of hot weather the lake has the potential to dry out and in order to save water, in these situations it would not be allowed to extract water from the brook to the lake.

Opportunity

5. **Consider removing the timber edging to the beach location and create a gentle sloped beach into the lake to allow for a more positive interaction with the lake at this location. Retain all vegetation to the sides of the beach area.**

6. **Investigate the extent of undercutting and replace the log wrap with suitable alternative that also acts as an extended platform for feeding the ducks. This may require a solid platform that would need further consultation with the Environment Agency.**

7. **Obtain accurate service records for locations of services within Abbey Fields for future management of the Fields.**

8. **Consider the possibility of utilizing rainwater from the proposed leisure facility to feed into the lake.**

Primary Entrance off Castle Road/Meadow

The primary entrance off Castle Road to the north of Finham Brook although tarmacked has drainage issues to the entrance area, with ponding and muddy hotspots as the camber of the footpath does not allow for drainage either into Finham Brook or onto the meadow to the north of the path. This meadow to the west of the lake is a damp grassland and has large clumps of rushes suggesting it is of a wetter nature.

Opportunity

1. **It is advised that with the reconfiguration of the entrance the drainage of this area is redesigned. Adjusting the camber and creating water egress points (i.e. small channels through the grass) would allow rainwater to flow towards the meadow west of the lake. During periods of low rainfall when Finham Brook is not in flood this will be an effective drainage mechanism, whilst helping to clean and slow the flow of water from hard surfaces.**

Hillside

Wetland

A wet and marshy area lies to the lower aspects of the war memorial path within the Hillside zone, north of Finham Brook and the leisure centre. The inevitable ponding has created a broad marshland, with a series of small ponds visible by their bullrushes. This is a well walked cut through to the Lake and between the wetter spots becomes increasingly muddy.

Water was originally running over the path and the area was dug a number of years ago to investigate the cause of the water issue. It was believed to be historic and potentially associated with the former Mill and was subsequently closed without repair. An Historic England approval was granted for the drainage of this location. This included a pipe under the path to a sump with a French drain leading from this location into the wetter area. However, only the pipe under the path was constructed with a temporary cover placed over the incomplete sump. The sump and the French Drain has yet to be completed and installed, with the temporary cover still in position.

There is also currently no physical connection between these small waterbodies and Finham Brook, although water does

appear to collect in the historic hedgerow ditch to the west of the marshland.

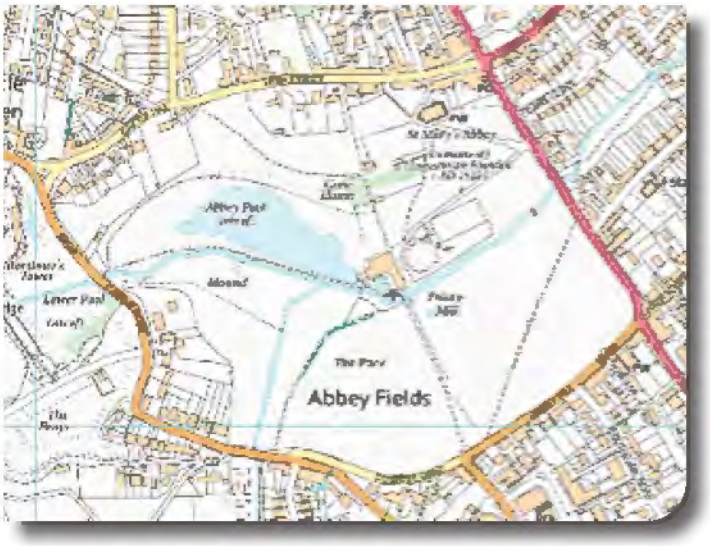
Opportunity

2. **Complete the outstanding drainage work approved by Historic England and remove the temporary cover**

3. **Embrace the wet spot and manage the marshland allowing encroachment of vegetation and Phragmites.**

4. **Consider installing further swale drainage from the wet spot to the hedgerow ditch, with pipework under the footpath and series of swales towards Finham Brook, allowing movement of water in a controlled but natural way. This would need further design and approval from Historic England considering the proximity to the former Mill.**

Hillside Wetland & Pond



It is identified on the OS map that there is a pond further east of the footpath and hedgerow at the base of Hillside. It was also noted on the Ecological Survey that this area had some indicator wetland species.

The site visit identified that the ground dips with two small hollows that appear to be a seasonal pond, but during the site visit there was no sign of collecting water. A large crater is located further east of this area and this is advised to be retained as a feature and not incorporated into this wetland area.

At the time of study this area was dry and the meadow area cut and land maintained. Adjacent to this area nearer to Finham Brook, water collects and puddles creating muddy areas that are regularly walked through. Avoidance of these areas creates a wider erosion problem. This area has been identified within the Ecological assessment as having potential for the creation of small ponds subject to approval.

Opportunity

1. **Consider creation of a wetland area and allow wetland species to flourish. Refer to the ecology section for recommendations.**

2. **Provide an informal drainage channel from the muddy area into the pond adjacent to create a dryer area for pedestrians and encourage water into the pond.**

Finham Brook margins

Further east on Hillside between two mature trees along the vegetated bank of Finham Brook the ground is wet and boggy and appears to have species suitable to wetter ground.

Opportunity

1. **Potential to broaden the margins of the brook bank to encourage more of the wetland habitat and move the informal path to a dryer location at the base of the Hillside embankment.**

Adjacent to Bridge Street to the base of Hillside is a damp landscape on the banks of Finham Brook as it passes under Bridge Street..

Opportunity

As a result of climate change, there is an expected increase risk of longer dryer periods in the summer, and an increase in rainfall events through autumn to spring. The pressures expected on combined storm and sewer systems for volume and also the number of pollution incidents expected from the lower rainfall events after dry periods are expected to rise. There is an increased need to slow the flow of water, and clean road run off water prior to entering the drainage system or indeed the watercourses. Green spaces may in the future be required to consider the introduction of Sustainable urban Drainage schemes (SuDS) to slow and clean run off from hard surfaces prior to entering water courses, in order to manage potential future incidents.

There is a potential opportunity to provide SuDS from Bridge Street into this area to slow the flow of water and clean the highway water prior to it entering the storm drains or Finham Brook. This area is within Flood Zone 3 and will not provide additional capacity but would manage every day rainfall events. This is subject to further survey work and Historic England approval.

Hedgerow

The existing mature hedgerow to the west of Hillside appears to have a ditch network associated with the hedgerow. Where recent clearance work has been undertaken this is clearly apparent.

Some of these locations are marshy particularly near to Castle Road at the base of Forrest Road embankment. The vast majority appear dry, although it is difficult to assess considering the extent of bramble vegetation to the boundary of the hedgerow. The meadow landscape on Hillside and the bramble vegetation will slow the flow of water towards the ditch. There is water collection within the hedgerow ditch nearer to the wet area at the base of Hillside at the historic Mill. Due to path infrastructure, movement of water to Finham Brook is impeded.

Opportunity

Monitor the water levels within the ditch to determine whether there is a requirement for provision of pipe network under the footpaths to allow for natural drainage into Finham Brook via a series of swales or additional ditches.

South Brook

Luzley Brook and Castle Road

A damp area of tall ruderals is located along the margins of Luzley Brook, near to Borrowell Lane secondary entrance. Historical information suggests that this area has been formed as a result of drainage issues from nearby dwellings. It is also possible that there is overspill from Borrowell Lane during periods of heavy rainfall. Water also collects at the base of the informal secondary entrance. This entire area is generally muddy, soft underfoot and has been known to be difficult to pass as well as causing issues for maintenance machinery.

Opportunity

1. **Consider the process of moving the water away from the base of the entrance area, via a series of swales leading to the existing wet area. The existing wet ground could be broadened and smaller ponds created that allow for ponding and directing water away from more problematic areas. This is subject to permission from Historic England and would require further design and detailed investigation.**

2. **Alternatively should drainage continue to be an issue, French drains could be installed. All works are subject to Historic England approval.**

Drainage ditches

Within the South Brook zone there appear to be a number of historical drainage ditch depressions that traverse the lower fields from the gardens of dwellings from west to east. One of these follows the line of an historic field boundary that no longer exists. The remainder may have been used to drain the land effectively following flooding. Silting and marginal vegetation along the brook has blocked the exit of the ditches into the brook and may cause ponding during seasonally wet periods.

Opportunity

Should the need arise to drain this area of land, reconnecting the drainage ditches to Luzley Brook would reduce ponding.

Primary Entrance off Castle Road

Further west at the primary entrance off Castle Road and south of Finham Brook, water puddles and collects during rainfall creating major avoidance erosion along the access to the Fields. Although a primary entrance it is set out informally, with no defined footway. The erosion expands across the entire width of this access with no visible grass. The entrance area off Castle Road also floods from Finham Brook and once flooding has subsided this area is known to be extremely muddy and wet, holding water and causing further issues.

Opportunity

Despite the potential for new pathways and fencing as detailed in the Access Audit, drainage is also of importance with the consideration of small swales that collect rainwater, prevent access in their design and allow for slow drainage into Finham Brook. These would be subject to Historic England approval.

Timber Bridges

The timber bridges that cross the brooks all have water puddling issues in relation to the paths that lead up to the bridges. These are all informal paths and in some instances have been laid to hardcore around the immediate curtilage of the bridges, but the extent of wear extends much further. This is also a problem at the crossing between Hillside and Play & Leisure zone. Erosion management has been undertaken for many years, but the volume of footfall has continued to erode these areas.

Opportunity

Further extending the hardcore or provision of tarmac paths may help to reduce the erosion issue and prevent puddling. The water holding is generally caused by wear of the grass and subsequently mud underneath. Introducing repair work including raising the surface and ensuring there is enough fall to allow for free drainage may reduce this issue over time.

Play & Leisure

Play area drainage

Towards the leisure centre, there are drainage issues in front of the public toilets. The water has created wet and muddy areas that are also apparent during drier weather as the only form of drainage is evaporation. The camber of the footpath is such that the water pools at the base of the grass embankment.

Opportunity

With the Leisure Centre redevelopment there may be opportunity to recamber the ground to allow it to free drain along the footpath into the lake.

Alternatively provision of an aco-drain and pipe connection into existing drainage network or towards the lake.

Rain garden

Further east there have been historical issues with rainwater coming off the high ground of the church and abbey zone causing flooding of the fenced play area in the valley. A fenced rain garden has been installed with a drain that channels the water from the main drive into

the rain garden. This has been effective in most low rainfall situations. However, during periods of high rainfall it often overspills and floods part of the play area.

Opportunity

Option 1: Connect the rain garden into Finham Brook by a series of swales with boardwalk crossings into the children's meadow. For example Hollickwood School swales:

Option 2: In addition, consider opportunities for additional rain gardens along the line of the play area to take rainwater run off from the higher ground. These could be introduced as part of the leisure centre development.

Tennis courts drainage

Wetter ground is noted to the east of the playground meadow boundary and also the tennis courts boundary. It is possible that this is caused by rainwater run off from the tennis courts and it is also a naturally low lying area where water collects. The ground is soft and appears difficult to mow at certain times of year, but there are no signs of marshland species. This area is used fully during events and is earthquale drained to keep it dry.

Opportunity

Due to the events that occur on this land, it is not practical to introduce swales and rain gardens to assist with the drainage of the tennis courts. It is considered that the tennis courts to continue to free drain onto existing green surfaces and that earthquake drainage to continue in this location for the purpose of events.

Informal path

The informal path to the south of the play area is wet and boggy in places. This appears to be a well used path and looks to become muddy.

Opportunity

1. **Retaining as an informal path may require some consideration for drainage channels into Finham Brook.**

Bridge Street underpass

The underpass to Bridge Street, provides limited access under the bridge via steps and ramps. Water appears to collect and has lead to boggy wet ground. There is a drain alongside the path under the bridge however it is located above the wettest area. This area is managed by Warwickshire County Council Highways.

Opportunity

1. **Regular removal of silt from the existing drains would assist with drainage in this location.**

2. **Consideration of stoning the areas either side of the concrete path to reduce the muddy surface under the bridge.**

Car Park & Main Drive

The car park is a large area of hard standing, which currently collects rainwater in a wide slot drain channel at the entrance as well as an additional gully drain located to the base of Church Walk.

However, these drainage points are known to overflow particularly in high rainfall and water collects at the entrance driveway causing soft spots and ruts to the entrance area where vehicles enter the Fields. This also continues along Main Drive to the Leisure Centre as water collects along the length, again causing ruts due to vehicles passing along the driveway.

Opportunity

Potential to create occasional passing places that also combine as water egress points, where water is encouraged to flow over these into the soft landscape beyond. Ensuring that the grass is graded below the level of the roadway, allows it to run off to the lower ground beyond and not collect on the hardstanding. Additionally provision of an area of long grass 1m from the edge of the hard standing would slow the flow and clean the water runoff.