JH Groundwater Ltd
Hydrogeological Solutions

Groundwater Flooding – Scoping and Assessing the Risk

WHAT'S THE ISSUE?

Recent heavy rainfall and surface water flooding have once again focused minds on the risks to property and possessions from flood waters. Flooding can come from a number of sources, some of which are not always discernible but all of which can result in expensive damage and difficult clean up. Groundwater flooding is an increasingly common culprit and the risk needs to be understood to ensure that this can be mitigated.

Groundwater flooding has had some press over recent years, particularly in areas of Chalk geology where 'Clearwater' flooding results in the emergence of groundwater at the surface from large annual changes in groundwater levels. However, groundwater flooding can also be a risk where there have been changes in groundwater levels due to a variation of abstraction regime or the turning off of historic mine dewatering resulting in water rebound. It is also potentially an issue where development is undertaken above areas of shallow groundwater and where the groundwater regime is changed due to SuDS or placement or structural design altering groundwater flows.

Simple and inexpensive assessment can usually identify the risk of groundwater flooding quickly and easily and, whilst it may not be shown to be an issue, where a risk is identified such assessment can potentially save time and expense in the future. To help understand more on this subject further detail of the background on groundwater flooding and an outline framework for assessing the risk is described below.

WHO COULD BE IMPACTED?

Groundwater flooding is an issue for Regulators, Infrastructure operators, Local Authorities, Developers and Land and Property owners alike.

The Flood & Water Management Act 2010 sets out which bodies are responsible for managing flood risk and, whilst the Environment Agency has a strategic overview role, Local Authorities have a new leadership role in local flood risk management. In future, where a SuDS Approving Body (SAB) adopt SuDS infrastructure which does not function as designed or increases the risk of flooding elsewhere they may well have a future liability for any resulting damage.

In terms of planning policy and development it is our interpretation that the assessment of development specific groundwater flooding is likely to be increasingly required as part of the National Planning Policy Framework and the need for groundwater flooding assessment may be incorporated into Local Plans currently being formulated. Developers will therefore need to ensure that flooding from all sources is sufficiently assessed and mitigated and new guidance produced by the Association of British Insurers and the National Flood Forum further supports and complements this view.

WHAT ARE THE POSSIBLE IMPACTS?

In recent times groundwater has been increasingly recognised as a more significant factor in flooding but remains the least understood and the hardest risk to determine. As a result, it can often be seen as a low priority and, except in areas of Chalk geology where "Clearwater" flooding occurs on a semi-regular basis, groundwater flooding in other areas can be the subject of cursory consideration during Strategic and Preliminary Flood Risk Assessments and at site specific level. However, groundwater flooding can, and does, also occur where there is "Persistant Shallow Groundwater" or changes in the abstraction or mine dewatering regimes have occured.

Flooding from these sources can result in a variety of problems and in some cases cause a significant nuisance, damage to possessions or crops and cause major structural damage as well as social and economic disruption including:

- Flooding of basements, underground car parks, other subsurface structures and buried services;
- Flooding of drainage and sewerage systems causing inundation, loss of capacity and the potential for contaminant migration;
- Flooding of above ground structures, road networks, land and property;
- Changes to groundwater flow patterns causing additional surface water flooding or loss of flows.

THE NEED FOR A SIMPLE SCREENING AND ASSESSMENT METHODOLOGY

Groundwater flooding is a complex issue and ground and groundwater conditions can vary over short distances. As such, pragmatic assessment is likely to require a staged approach and complex assessment is likely to be required only in a very small number of cases.

Establishing the risk of groundwater flooding may be required because of seasonal variation in groundwater levels, development construction methods or the location of developments in relation to geology, aquifers and springs. In areas of development using Sustainable Drainage Systems (SuDS) specific risks may exist.

In relation to SuDS, when establishing whether an assessment is required, it is important to distinguish between the **feasibility** of using SuDS and the **susceptibility and risk** of flooding. Whilst a site may be seen to be technically feasible for the installation of infiltration SuDS based on feasibility reports and/or infiltration testing *and* show a relatively low susceptibility of flooding based on mapping, a site specific screening of the **flooding risk** may still be required.

To assist in this process a simple methodology has been developed which considers the possible impact resulting from a variety of development activites in combination with groundwater and ground conditions whether in isolation or as a result of combined effects. This allows a screening of proposals and provides a framework for those submitting planning applications and the Local Authority, together with their advisors, for establishing the risk of groundwater flooding from development. The methodology is designed to be simple to apply, cost effective and can be adapted to local conditions whilst providing a framework for considering more robust assessment if required. Like all technical assessments the assessment will require some specialist knowledge at times.

THE BENEFITS AND KEY FEATURES

The methodology assumes that a short evaluation using published data and data that should be ordinarily collected as part of other assessments during design and feasibility studies is used to help identify whether a high or low risk of groundwater flooding exists. On the basis of this initial assessment, it can be determined whether additional in-depth assessment is required. A proportionate approach has been specifically designed to ensure that there should not be undue impediment to development due to onorous assessment whilst ensuring that due consideration of the potential risk is given depending on circumastances. Where a low risk is identified then the assessment will be simple and inexpensive but where there is a potentially high risk, further assessment will be required to evaluate the more complex issues and help to mitigate risks for the longer term.

To ensure that the most appropriate level of evaluation is completed, a combination of three stages needs to be considered. This has been provided previously for a Local Authority but such a framework could easily be established for developers with portfolios of land or buildings. The three main provisions of the methodology are as follows:

1. A procedure for planning management with advice on the appropriate level and stages of technical submission and review of groundwater flooding risk;

2. Details of local ground and groundwater conditions and the ranking of them to establish which will present a potential risk of increasing groundwater flooding for given scenarios;
3. A procedure for undertaking the assessment of groundwater risk based on flooding susceptibility, development proposals and local ground conditions.

The onus throughout the process is on early engagement, robust consultation and the use of data that should generally be collected during assessment of the wider development constraints. To be successful it is important that the approach is widely accepted by all parties.

WHO SHOULD BE CONSIDERING THIS?

It is recommended that an assessment of the groundwater flooding risk and, where appropriate, development of mitigation measures should be adopted by all those involved in the field of design, construction and assessment of flood risk and drainage. Adoption of a simple screening methodology can help address issues of groundwater flooding in a cost effective and pragmatic manner at a local or site scale and can be used as a basis for wider studies.

As such this issue and the use of such a methodology should be of interest to all stakeholders where groundwater flooding is potentially an issue including:

- Local Authorities;
- Regulators;
- Developers;
- Flood Risk Assessors;
- Hydrogeologists; and
- Drainage Designers.

MORE INFORMATION

For further information on this note, to discuss specific issues on groundwater flooding or other groundwater/hydrogeological issues please feel free to contact me.

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