

Environment and Engineering Department
Block 1, Floor 6, Civic Offices
Christchurch, Dublin 8

An Roinn Comhshaoil agus Innealtóireachta
Bloc 1, Urlár 6 Oifigí na Cathrach
Teampall Chríost, Baile Átha Cliath 8

To Each Member
of the Environment & Engineering
Strategic Policy Committee

Progress Report on Extreme Event Pluvial Flooding 24th October 2011

Report No. 338/2011 to the November Dublin City Council meeting gave an interim report on the extreme pluvial flooding event which affected the East Coast of Ireland and Dublin City on 24th October 2011. This report and accompanying presentation was considered by the Council at the Monthly Meeting held on 7th November 2011 (Report 338/2011 is appended as Appendix 1 of this report). It was agreed that Emergency Motions 1, 2, 3 (Amended), 8 and Motion 64 from the North Central Area Committee be referred to the Environment and Engineering Strategic Policy Committee for further consideration at a meeting of the SPC scheduled for 15th December 2011. This report is intended to :

- Brief the SPC on progress since Meeting of City Council on 7th November 2011.
- Brief SPC on meetings with OPW in relation to Capital Funding for Flood Relief Schemes
- Address motions referred by Council to SPC.

Introduction.

This report is to be read as a follow up report to the report No. 338/2011 made to the City Council Meeting on 7th November 2011 covering Dublin Flood Risk and interim report on extreme pluvial flooding event affecting the East Coast and Dublin City on 24th October 2011.

The cause of the flooding on 23rd and 24th November was extreme pluvial rainfall which exceeded the capacity of the Drainage system and in turn gave rise to fluvial flooding, which was particularly evident in the River Dodder and in the smaller Dublin Rivers especially in the Camac, Poddle, Wad, Bradog, Zoo Stream.

River Catchments do not align with political boundaries and most Dublin Rivers originate in other Local Authority Areas.

For this reason flood risk reduction schemes require generally full catchment studies before significant capital works can be constructed.

Any significant Capital works must have full regard to EU procurement (Consultants and Contractors), Statutory and Legal Requirements, National Regulations and Environmental compliance as well as meeting National funding requirements. Existing Local Authority staff resources are also significant (see reference in report 338/2011) and additional staff will retire before end February 2012 which will impact on Capital works programmes. All schemes must comply with Environmental Legislation and a full EIA is required for many requiring submission to An Bord Pleanála. For this reason the following timescales are referred to in the report:

- **Short Term works** – Works likely to be constructed in 0- 3 years (Subject to funding)

- **Medium Term works** – Works likely to be constructed in 3-7 years (Subject to Funding).
- **Long Term works** – Works likely to be constructed in 5-11 years (Subject to funding).

Progress and activity since 24th October 2011. Strategic issues.

1. Dublin Flood Initiative – Flood Resilient City Project

As outlined to Dublin City Council an EU funded Project Flood Resilient Cities is addressing how to adapt to extreme events. Dublin City Council as part of this project is examining the best strategy to protect against the threat of Pluvial flooding. This is the risk of flooding due to extreme event rainfall of an intensity which exceeds the capacity of the drainage system and in many cases results in overland flows of rainwater with consequent risk of flooding. The Dublin City study is due for completion in mid 2012 and will report on :

- Areas at particular risk of Pluvial Flooding
- Code of practice for new development to mitigate this risk
- Code of practice for making existing development more flood resilient.

In advance of completion of this study an interim report was commissioned and this interim report and accompanying presentation will brief the SPC in advance of completion of the study in 2012. It is expected that this interim Report will issue in January 2012.

In this regard a model has been developed in Scotland by the Scottish Flood Forum that has enabled over 200 Community Flood Groups to plan and prepare for flood events.

Recently the Flood Resilient City Office (FRCO) in conjunction with the Central Area Office invited the Scottish Flood Forum to meet with residents in the East Wall area with a view to establishing a Community Resilience Group to deal with floods. This type of model provides individuals and communities with an effective and efficient means of protecting properties from floods by:

- Establishing local area flood watch systems
- Establishing awareness of factors contributing to flood risks.
- Developing local community flood action
- Minimizing the danger of flooding within the local area.
- Assisting at times of flooding and supporting people who have experienced flooding to ensure effective support is available to assist recovery.
- Meeting regularly to ensure that flood preventive methods are being maintained and monitored.
- Monitoring and reporting to the City Council those areas which are at risk of flooding through lack of maintenance or repair.
- Raising the awareness of personal and collective actions to limit the occurrences of flooding.
- Engaging with the City Council and other organisations to reduce the risk of flooding.
- Developing a local community flood awareness training programme
- Promoting flood protection equipment and materials to prevent further flooding to property

- Arranging free surveys of properties and giving specific advice on the most appropriate means of flood protection.
- Providing advice on the type of protection and suitability of products that will minimize the risk of flooding to properties.
- Making recommendations on minor repairs to properties that may prevent entry of water.
- Facilitating substantial reductions in the cost of flood defence products such as flood gates through bulk buying.

The City Council will explore the possibility of establishing Flood Resilience Groups in the recently flooded areas as the most appropriate means of facilitating the protection of homes and businesses from flood events.

2. Catchment Flood Risk Assessment and Management Studies (CFRAMS)

The SPC has received briefings on works currently underway as part of the Catchment Flood Risk Assessment and Management Studies (CFRAMS). These studies are a key component of Ireland's response to the EU Floods Directive. The studies will:

- Identify areas at risk of flooding
- Propose strategies and works (where possible) to mitigate this risk.
- Identify flood capital projects
- Progress these to construction (Including meeting all relevant Statutory, legal and procurement requirements).

To date the flood protection scheme on the River Tolka has been completed and there were no flooding issues associated with the River Tolka on 24th October despite it having the fifth highest recorded flow on record.

The River Dodder CFRAM Study is at an advanced stage and will report in 2012 on flood risk and proposed schemes to address risks where possible. Following a meeting held with OPW to consider the flooding on 24th October the OPW are prepared as part of the River Liffey CFRAMS, which is at an early stage and due to report in December 2015 (earliest), to bring forward a study of the Camac River and the Poddle River in order to identify potential improvement schemes. Both these rivers experienced significant flooding and both involve works in more than one Local Authority. Officials are working to see what needs to be examined as part of studies on both rivers and a further report will issue in the new year.

The OPW have responsibility for co-ordinating flood works by central Government Agencies and have agreed to discuss with Department of Environment, Community and Local Government (DECLG) how to address schemes which may not fall under OPW remit but which might be eligible for funding under DECLG Water Services Investment Programme (WSIP). This particularly refers to flooding associated with underground "rivers" many of which are fully culverted. In particular flooding associated with River Swan, River Bradog, River Naniken and the Clontarf drainage area have been referred to OPW to determine eligibility for capital funding from the appropriate Government Department.

3. Support from Department of Social Protection

A high level Inter Departmental and Inter Agency Working Group has been set up to review the October flood event. Dublin City Council has provided that Committee with full details of all known flooding locations. This information was provided to the Department of Social Protection (DSP) Community Welfare Officers (CWO's) in order that those affected might have direct access to support and funding provided by the State. Dublin City Area offices have also ensured that the Community welfare Officers are made aware of requests for assistance. Please note that eligibility criteria are attached to this scheme for assistance.

4. Major Emergency Plan

The flooding on 23/24 October affected the East Region and included Wicklow, South Dublin County, Dublin City and Monaghan in particular. Dun Laoghaire, Kildare and Fingal were less severely impacted. In accordance with National Framework for Emergency Management HSE, Garda Síochána and Local Authorities worked together in accordance with the Plan and in the case of South Dublin and Dublin City the formal declaration of a major Emergency was made. However, the three Principal Response Agencies were working together before, during and after this declaration. The Major Emergency Plan is published on the City Council website and addresses the strategic response of the three Principal Response Agencies only. Operational responses are in accordance with the operational plans of Principal Emergency services. Meetings have taken place with Garda and HSE to review at Strategic level the Major Emergency Plan response. In addition an intra Departmental workshop is taking place on 13th December to review operational level responses to pluvial flood risk. Both of these are intended to identify actions for the City and Local Communities and will be reported to future meeting of SPC.

5. Advance forecasting of Pluvial Flooding by MET EIREANN

Ireland has a National Weather Forecasting service provided by MET Eireann. Weather warnings are provided to the public through RTE which is the National Public Service Broadcaster. It is not possible in advance to predict when, where and to what extent flooding will occur. MET Eireann, in a post event analysis, have stated that:

The limits on the available forecasting/ modelling systems do not permit the fine detail on the locations of the intense bursts of heavy rain that actually fell on 24 October in Dublin to be predicted by MET Eireann.

The primary computer model used by Met Éireann for shorter-term forecasts (within 48hrs) is the HirLAM model, developed and maintained by a consortium of ten European Met Services. The HirLAM model at Met Éireann runs on a grid of 10km spacing; that is, the atmospheric calculations performed by the model are at points 10km apart. Thus the model cannot provide any fine detail below 10km; indeed the nature of weather models is that the effective ability to resolve detail in the weather is greater than the 10km grid spacing; 20km would be more realistic. Further, when forecasting for extreme events, while forecasters can identify that an event is likely to produce extreme rain, the complexity of the processes that can occur in the interaction between atmosphere, land (particularly hilly land) and sea is considerable and can result in specific phenomenon occurring which affect the impact of the predicted event.

It appears that in the period between 16.00 hrs and 22.00 hours on Monday 24 October 2011, when the worst of the rain ceased, cumulative amounts of typically between 60 and 90 mm of rain fell, indicating an average rainfall intensity of 15mm per hour sustained for between a four and six hour period.

Rainfall of 60 to 90 mm over a four to six hour period is a very unusual occurrence.

Most rainfall events in Ireland will give typically 5mm-10mm of rain in total, perhaps up to 20mm for the heavier events.

6. Progress and activity since 24th October 2011. Operational issues.

Much of Dublin City Council's resources have been put into flood investigations.

In most cases these investigations have confirmed that the drainage network was overloaded and often surcharged with resultant flooding.

In addition the following works and investigation works have been carried out or are about to be put in place.

- Removal of Damaged Wall at and provision of sandbags at Gandon Close, Harolds Cross
- Screen works at Gandon Hall
- Repositioning of screen at Ravensdale.
- New Gullies and Surface Water Connection at Carnlough Road, Cabra.
- New Combined Sewer at Annamoe Road, Cabra, to relieve the 375mm Sewer on Cabra Road.
- Provision of sandbags at LadysLane
- Gully work at West Road, East Wall
- CCTV surveys have been carried out a number of locations as a condition survey on various sewers at locations including:
 - Strandville Avenue, East Wall
 - West Road, East Wall
 - Foxfield Grove, Raheny
 - Cremore Crescent, Glasnevin.
- Naniken and Blackbanks streams are currently in the process of having CCTV surveys carried out.
- CCTV of Wolfe Tone Quay
- Siphon works at Brookwood Avenue
- Villa Park Gardens. Installation of pressure plate.
- Protocol reviewed and put in place for tidal gates on River Dodder
- Extensive investigate works at various flooding locations.

7. Flooding Reports

The urban drainage system of culverts, pipes and road drainage gullies has been constructed over the last 200 + years. Drainage networks will all flow full in a 1-5 year rainfall event. In a more extreme event these will be surcharged up to road level where no more flow can enter through road gullies. In a 10-30 year rainfall event and events higher than these severe road flooding and property flooding will result. During the extreme event on 24th several thousand reports of minor road flooding were reported and the current figures stand at 1,008 reports of property flooding and 318 reports of significant road flooding. On the night in question there was a two weekly hightide with a level of 2.13m Malin recorded at Alexandra Basin at virtually the same time as the peak river flow. This raised the estuary levels of the river and caused local surcharging with discharges to them from the drainage network. No tidal flooding was reported.

8. Response priorities

The response to flooding by Local Authorities has, in general, two strategic priorities namely:

- Rescue of those at risk – Lead by Dublin Fire Brigade.
- Maximising capacity of Drainage System to accept floodwaters – Lead By Drainage Division.

All other actions are in support of those two primary objectives. As advised to City Council it is hazardous to enter floodwaters and the City Council are conscious of their obligations as employers under Health & Safety.

9. Overview

In general the open rivers in the city have flood defences, which can accommodate approximately all 1 in 25 year flood events. The Tolka river and the Lower Tidal region of the River Dodder on completion of the works currently under construction and planned for 2012 can now cope with 100 year river events and 200 year tidal events.

Capacity of the City's Drainage network:-

- (1) Each storm is unique and brings with it slightly different flooding threats to any previous event or any computer modelled event.
- (2) During these storms significant amounts of silt/debris, etc. get into the drainage network which reduces its capacity to operate at maximum efficiency.
- (3) The drainage network is designed broadly to International best practice, however some of it is very old. It is taking both foul and surface water sewage within the Canal areas which has reduced the possibilities for its upgrading.

River Dodder Flooding.

The peak flow in the Dodder at Orwell Bridge weir was estimated by the EPA at 213m³/s which is around 80% of that of Hurricane Charlie. The peak flow in the Dundrum Slang at the Frankfort river gauge was however estimated above that of Hurricane Charlie. The Dundrum Slang joins the main Dodder below the Orwell weir and therefore from previous events the flow in the tidal region of the Dodder is estimated at greater than 250m³/s.

The three tidal flood gates located at Londonbridge Road, Lansdowne Village and Newbridge Avenue were closed at approximately 10PM on the evening of 24th October. The two demountable flood barriers located on the Aviva Stadium side of the river were erected approximately half an hour later.

There was a delay in closing the tidal flood gates as difficulties were encountered in retrieving the locking pins which were stored in a kiosk adjacent to the Aviva Stadium. The Drainage Division has reviewed its protocol for closure of these gates and will in future be closing the gates on foot of both tidal and pluvial adverse weather forecasts subject to staff availability.

Between Newbridge and the Railwaybridge water got into the swimming pool in Marian College and the residential building which normally has 6 inhabitants. The school was not flooded. In Canon Place all of the lower apartments estimated at 12 were flooded together with No.1 Herbert Road. 15 residential buildings on Railway Cottages were also reported flooded to a low level. Flood water got out onto Lansdowne Road from the pedestrian way beside the railway bridge and travelled into the AVIVA stadium car park and grounds.

Between the Railway Bridge and Ballsbridge floodwater is reported as getting into the ground floors of the sweepstakes site, which was recognised in the Planning Permission as a flood plain and flooded approximately 130 of these some to a depth of 2.5m to 3m. The car parks of the three apartment blocks on Ballsbridge Park were flooded to estimate depths of 1.2m. Herbert Cottages, 26 residential dwellings were reported flooded to a significant depth.

Ballsbridge Avenue, 18 residential dwellings were reported flooded to a significant depth, Dodder View Cottages, 43 residential dwellings were reported flooded to a significant depth. Beatty's Avenue, 8 residential dwellings were reported flooded to a significant depth. Granite Place, No.7 was reported as flooded. There was significant road flooding in this area with over 200 vehicles reported as being severely damaged. There are to date no reports of river flooding on the Estate Cottages side.

From Ballsbridge to Donnybrook bridge, flood waters got onto Anglesea Road and into the RDS entrance flooding around 15% of the main RDS building. Flood waters came out of the river over the floodwall north of the Licensed Vintners. 54 residential dwellings along Anglesea Road as well as Dunluce and Somerset and the cricket club pavilion were flooded. A 25m section of grounds wall at the edge of the Licensed Vintners land and at the rear of the Hazeldene development collapsed where flood waters were reported to reach 1.5m in depth. The non-residential basement/ground floor of the LVA was also flooded. The Church of Ireland near the junction of Anglesea Road and Simmonscourt Road was also flooded. On the opposite side of the river the Leinster Rugby Ground, Bective Rangers, Grounds, Old Wesley Ground and Bective Tennis Courts were all flooded with various buildings including a large ESB sub-station surrounded by flood waters. Again in this area there was significant vehicle damage.

Between Donnybrook and Clonskeagh bridges. 4,6,8 Eglinton Road flooded back gardens to houses, water may have made its way out to Brookvale Road. Road and footpath flooding in Simmonscourt Terrace.

Between Clonskeagh Bridge and Dundrum Road bridge. Clonskeagh Public House flooded. Strand Terrace No.1,4,5,6 and 7 reported flooded.

Between Classon's Bridge and Orwell Bridge. The Dropping Well Public House was reported as flooded and four houses on Dartry Cottages, No. 5,4,3 and 2.

This gives a current estimated total of 192 Dwellings and 136 other buildings/non-residential ground floors flooded from the river during this event.

Camac River

There are no reports of building flooding in the tidal region of the Camac River below Bowbridge to date from the 24th October event.

Between Bow Bridge and the Bridge at Kern's Place Bowbridge Dock and Bowbridge House Apartments are reported as flooding. The carpark of 60 apartments downstream of Faulkner's Terrace in Mount Brown. 3 houses on Faulkner's Terrace probably from road flooding. Building upstream of No.1 Faulkner's Terrace. Carpark below St.John's Well Way apartments. Old Cammock Bridge Apartment Block carpark.

Between Kern's Place Bridge and South Circular Road. 11 dwellings on Kern's Place were reported flooded. 12 apartments just upstream of Kern's Place. Motor Repair Shop downstream of Millbrook Terrace. 28 dwellings on Millbrook Terrace, Lady's Lane and Carrickfoyle Terrace. Reports of 2 buildings flooded on Rowserstown Lane are not confirmed as yet.

Between SCR and Turvey Avenue. 13 dwellings, No.1 to 25 Emmet Road reported as flooded from river.

Three dwellings on Tyrconnell Street to be confirmed. There was also considerable vehicular damage reported due to this flooding event. 64 residential dwellings reported as flooded to date.

River Poddle

The flow of water from the Tymon Stream splits upstream of the housing development at Kimmage Manor into 2 sections:

- River Poddle
- Lakelands overflow.

On October 24th. the bulk of the flow in the River Poddle coming from South Dublin County Council flowed directly into the City Council area. River screens were blocked with debris carried down during the flood at the Lakelands overflow. The river burst its banks resulting in the flow making its way overland. In turn the screen at Gandon Hall became blocked by debris brought down during the floods giving extensive downstream flooding.

Flooding took place at the following locations:

- Between Sundrive Road and Kimmage Road West (boundary). 12 riverside apartments adjacent to Poddle Park were flooded.
- Russian Orthodox Church on Mount Argus Road.
- 17 apartments and one dwelling on Mount Argus Road.
- Flower shop on Harold's Cross Road.
- One factory adjacent to Gandon Close. Gandon Close car park.
- 13 dwellings on Harold's Cross Road.
- 21 dwellings on St. Clare's Avenue.
- 12 dwellings on Greenmount Avenue.
- 13 apartments on Boyle Court.
- 11 dwellings on Limekiln Lane.
- Four houses on Parnell Road with one fatality.

This gives a total of 113 dwellings to date. A large amount of vehicular damage was also reported.

Options for flow management and attenuation in the catchment will have to be examined. South Dublin is examining extra storage in Tymon Park to reduce the significant flooding in their area which will also benefit the city.

The design of river screens is currently being examined and minor alterations have been made to the Gandon Hall screen. The operation of all screens and the installation of screens that allow for overtopping, is currently being examined.

East Wall Road Area

Extensive flooding occurred in the East Wall area. Among the areas badly affected were:

- Seaview Avenue
- St. Muras Terrace
- Hawthorn Terrace
- Oxford Terrace
- Church Road

- St. Mary's Road
- Irvine Terrace
- Bessborough Avenue
- Shamrock Cottages
- Strandville Avenue
- East Road

The volume and intensity of the rainfall caused the drainage infrastructure in the area to surcharge causing widespread flooding at the above areas.

River Swan / Ballsbridge / Pearse St. / Sandymount areas.

Extensive flooding, including basement flooding took place in local areas covering

- Lansdowne Road
- Pearse Square
- Grosvenor Place
- Effra Road area
- Ringsend
- Ballsbridge
- Havelock Square
- Sandymount, St. John's Road

Surcharging sewers caused by pluvial rain caused serious road and basement flooding in the Pearse Square area. The Swan River, which is culverted, has been referred to OPW as a candidate scheme for central funding.

Santry River

The basements at seven business premises opposite the Catholic Church in Raheny were flooded on the 24th October from the river. In addition a number of business premises in the shopping centre beside the church were also flooded. The OPW have agreed to consider application for a minor works scheme to increase the flood protection of these properties and others along the Santry.

Wad River

Reports of flooding included:

- 10 dwellings on Clanmoyle Road
- 4 on Collins Avenue East,
- 12 dwellings on Castle Court/Auburn and one underground carpark were flooded.
- Severe road flooding on Collins Park provided 13 under floor water and one near miss.
- Elm Mount Avenue 3 under floor and 1 near miss.
- St. Kevin's soccer club,
- Larkhills west of M1 was flooded.

This gives a current total 26 dwellings with a very large number of under floor flooding and near misses.

A €20m scheme is being developed with the OPW to alleviate this flooding. The Clanmoyle portion of this is due to start construction subject to finance and planning permission.

Naniken River

Reports of flooding included:

- 5 dwellings on Maryfield Crescent.
- 5 dwellings on Brookwood Rise.
- Maryfield Crescent suffered severe road and garden flooding.

Glendhu Park.

The two swales at Glendhu Park and Park Road appear to have operated well for the 60-90 minute thunder storm event they were designed for, however the event of the 24th October was of much longer duration than this.

6 dwellings on Glendhu park were flooded to a low level compared to 8 in August 2008 to a deeper level. There was severe road flooding elsewhere in this sub-catchment. Plans are in train to extend the swale in Glendhu park to cater for such an event in the future. It is not recommended to reduce the storage capacity of the swale in Park Road at this time.

Carnlough, Dingle and Drumcliffe Roads, Cabra West.

29 dwellings reported flooding on Dingle Road (11 in August 2008), 8 on Drumcliffe Drive (5 in August 2008) and one on Carnlough Road (6 in August 2008). Works carried out by Drainage division, Designed by Flood Defence Unit and availability of sandbags to residents significantly reduced house flooding on Carnlough Road.

Two flood retention swales and associated pipework, planned for construction at Drumcliffe Road and Killala Road in 2012, will further reduce the risk of house flooding to these properties. Planning for these was passed by the City Council on 7th November 2011.

Leix, Offaly, Imaal Roads Cabra East.

Reports of flooding included:

- 10 dwellings on Leix Road, the same number as in August 2008.
- 19 dwellings were reported as flooded on Cuala Road (one in August 2008).
- 6 dwellings on Offaly Road (1 in August 2008).
- 2 dwellings on Imaal Road (none in August 2008).

The drainage network in this area is mainly combined so the construction of flood retention swales is not an option.

A small diversion from one combined drainage sub-catchment is currently under construction from the New Cabra Road to the junction of Annamoe Terrace and Annamoe Drive. This will slightly alleviate flooding in the area.

Ballygall Crescent and Fairways, Finglas.

Reports of flooding included:

- Approximately 7 houses were flooded in Ballygall Crescent.

- 4 in Fairways Estate on 24th October. This compares with 20 in total in August 2008.

Improvements to the drainage network in the area and downstream are probably accountable for this reduction.

A large flood retention pond which will contain 2,300 cubic metres of flood water in such event is being developed with Parks and Landscape Services Division of DCC. Four possible locations for this are currently being analysed . With budgetary and planning constraints construction is currently programmed for 2013.

Total Buildings reported in river and pluvial flooded areas are 640 to date.

Following the flooding which took place on 24/10/2011 a number of queries have been received with regard to the City Council's gully cleaning programme and the use of sandbags as a flood prevention measure throughout the city.

10. Gully Cleaning.

Dublin City Council radically revised its gully cleaning programme in 2004. A new database was introduced which records the date and location of every single gully cleaning operation. All of the city's 54,000 gullies are cleaned on average once per annum. Gullies on the main thoroughfares are cleaned more frequently, in some cases once every six to eight weeks. In addition, during adverse weather conditions and in particular on receipt of severe weather forecasts, normal gully cleaning work is suspended and the crews travel to areas which have historically flooded in the past to deal with any visible flooding and also carry out precautionary gully cleaning.

Current resources include one Supervising Inspector and ten General Operatives , four Gully Sucker heavy duty machines, five light duty vans which are used for manual gully cleaning and two jetting machines. Two days a week the crews commence work at 4am which facilitates gully cleaning in traffic sensitive areas.

This gully cleaning programme has proved to be very successful in dealing with varying amounts of rain right up to the close on 60 mm of rain that fell on 2/10/2011.

The events of the 24/10/2011 and in particular the quantity of rain that fell in the short space from 4 to 8pm of time meant that the drainage network filled, became surcharged and didn't allow further flows into the drainage system.

The evidence of this could be seen by the number of manhole covers which were lifted from their frames under the pressure of water from underneath. The sheer volume of rainwater falling on paved areas swept all debris including leaves into the roadways and in turn into the gullies. These gullies acted in a similar manner to drain holes in sinks that became blocked after a period of time by the debris. In turn the flow of water rushed past these blocked gullies and causing further flooding problems downstream. The flows into the network were so high that any easing of the road flooding could only come about when the flows in the sewers fell. The successful deployment of Drainage Division staff on the night to cope with such surcharging sewers only became successful after the drop in flows in the main sewers. With a total number of 54,000 gullies to be maintained and with such volumes of rainfall, it is not possible for Dublin City Council to clear debris from the grating of each individual gully.

11. Dublin City Council's Sandbag Policy

The City Council does not provide or distribute sandbags to individual premises at risk of flooding. The prime responsibility for the protection of such premises rests with the owners of those properties.

The primary role of the City Council during pluvial events is to manage the drainage network in order to minimise the extent of flooding to the general public. The supply and distribution of sandbags would present a considerable impediment to this task. In addition the inevitable increase in telephone requests for sandbags to emergency call centres would seriously interfere with the ability of those centres to cope with major flooding events.

The use of sandbags has become established in the public's mind as an effective flood protection measure. This is reflected in demands for the City Council to make sandbags available to householders and businesses at risk of flooding.

The Council maintains strategic stocks of sandbags at a small number of locations. These amount to around 9,000 at various locations including Clontarf, Sandymount, Glendhu Park, and the drainage depots at Marrowbone Lane and Bannow Road. The stocks at these sites are maintained for strategic purposes and play a useful role in areas when dealing with flood events which have sufficient advance warning.

General advice to property owners on dealing with floods is provided by the OPW in booklet format and on the website www.flooding.ie. The OPW advice recommends property owners at risk of flooding to have a supply of sandbags close at hand. The advice notes also acknowledge that sandbags can be difficult to deploy during flood events and can also pose health risks if contaminated with sewage.

A major report on of the serious pluvial flooding that occurred in the UK in 2007, known as The Pitt Review, concluded the following with regard to the role of sandbags as a means of protecting individual properties during flood events:

- *While it is clear that sandbags have a useful role in certain types of floods when used strategically, their benefits are less clear when they are used by householders to protect individual properties. This weakness is further heightened by their relative inefficiency when compared with alternative dedicated flood defence products that have been developed in recent years, such as floodgates and airbrick covers.*
- *Extensive evidence of public over-reliance on sandbags which often proved of little value in protecting against flooding.*
- *Many householders and business owners put time and energy into obtaining and installing sandbags which would have been better spent on other activity such as moving possessions to safety and deploying door boards.*
- *Sandbags can be effective when it is marginal, as to whether water enters a house or not, but in relation to large volumes of water they are largely ineffective, contrary to public perception.*

To supply sandbags to all properties at risk of flood during sudden rainfall events would require a level of resources that is much greater than is currently available to the City Council. Even if such resources were provided the deployment of sandbags in sufficient time

to prevent significant flooding of properties, particularly during monster rainfall events, would be logistically impossible. During a flood event, invariably the transport network is very busy, which means that DCC crews have great difficulty in reaching certain areas to deploy pumps, close flood gates, or deliver sandbags. If there is little notification that an event will occur, delivering sandbags would not be possible.

The provision of sandbag stores at specific locations around the City that could be accessed locally by residents on foot of flood warnings would require considerable investment by the City Council to manage and maintain. The unpredictable nature of flood warnings which can average 4-5 a year would result in sandbags being deployed more often than required, leading to the unnecessary expense of maintaining the required stock of bags at each location. The transportation and placement of sandbags from local containers would still require a considerable effort by local residents and they would be unlikely to be in position in time to prevent flooding to most properties subject to sudden rainfall events. Furthermore, if sandbags were deployed at certain locations, there is no guarantee that the people who need them will get them. During a flood, panic generally sets in, and those who are not in risk of flood could easily exhaust the supply of bags at the expense of those in need.

Owners of properties that are at risk of flooding are encouraged to keep where possible, their own stock of empty sandbags together with sufficient stocks of sand to fill bags at times of potential flooding. Preferably owners should invest in the provision of suitable proprietary flood gates and covers to protect openings such as doors, windows and vents. Dublin City Council does not have financial provision in the 2012 budget for purchase of any additional sandbags.

12. Basements

The 2005 Greater Dublin Strategic Drainage Study highlighted a number of issues with regard to basements and their flooding risks. Throughout the city many properties have basements with connections to old sewers and culverts. When these sewers become surcharged the flows often enter basements as these basements are built below the surcharge levels. These basements can be protected by backflows from surcharged by the installation of small pumping stations or anti flooding devices. There was extensive basement flooding throughout the city on 24/10/2011.

13. Limited City Council Resources

Dublin City Council has a very limited Engineering Staff resource to respond to requests for meetings. Existing engineering resources are prioritised to meet operational and legislative requirements.

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| While every effort is being made to address the flood investigations required it will not be possible to divert limited resources to multiple individual meetings. |
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The SPC report will be provided to Area Committees at which Engineering Staff will attend in order to provide the maximum response capability consistent with limited resources..

Seamus Lyons
Assistant City Manager

Central Area - Reported Flood Locations

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|-----------------------------------|--------------------------------|------------------------------------|---------------------------------------|---|
| Abbey Street Upper | Capel Street | Dunne Street | James's Street North | Portland Street North |
| Abbey Street Lower | Camlough Road | Dutch Dams Boardwalks, City Centre | Jone's Road ,D 3 | Quarry Road |
| Annaly Road | Castleforbes Road | Eden Quay | Killarney Street, | Rathdown Road |
| Annamoe road | Cathal Brugha Street | Erne Street Upper | King Street North | Ratoath road/Fiver road |
| Ashington Avenue | Charleville Avenue | Essex Street East | Kings Avenue, Ballybough | Ravensdale Road, Eastwall |
| Ashington Close | Charleville Road | Finn street, Arbour Hill | Lagan Road, Industrial Estate | Richmond Cottages |
| Ashington Dale | Church Place | First Avenue | Leinster Avenue | Saint Brigid's Avenue, North Strand |
| Ashington Grove | Church Road , East Wall | Fitzgibbon Court | Leix Road, Cabra | Saint James Avenue, Clonliffe Road |
| Bachelors walk | Churchgate Avenue, Clontarf | Galmoy Road | Lotts Lane | Saint Marys Road North, East Wall |
| Ballybough House | City Quay | George's Place, Off Hardwick Place | Lucan Road, Chaplizod | Sean MacDermott Street |
| Ballybough Court | Clare Park Villas | Glasnevin Hill | Mary Street Little, Smithfield | Seaview Avenue, East Wall |
| Ballybough Road | Clonliffe Road, Drumcondra | Glendhu Park | Mayor Street Upper | Seville Place, Oriel Street Jcn |
| Bayview Avenue, Ballybough | Coburg Place | Grafton St | Millmount Avenue, Drumcondra | Shamrock Cottages North Strand |
| Belvidere Road, Ballybough | Coleraine Street | Granville Place North Strand | Mountjoy Street Middle | Shandon Road, Phibsborough |
| Beresford Place | College Green | Great Western Square | Navan Road | Sherrard Street Lower |
| Bessborough Avenue, North Strand | Connaught Parade | Greek Street | Nephin Road | Sir John Rogersons Quay |
| Blackhall Place | Constitution Hill | Griffith Avenue | New Cabra Road | St. Mura Terrace @ bottom of Strangford Road East |
| Blackhorse Avenue | Conyngnam Road | Hanover Quay | North Circular Road | Strandville Avenue, North Strand |
| Blackhorse Avenue, Martin's Grove | Conyngnam Road | Hawthorn Terrace, East Wall | North Strand | Strangford Gardens, East Wall |
| Blessington Street | Crescent Gardens | Hibernian Avenue | North Wall Quay | Thor Place, Arbour Hill |
| Blythe Avenue | Ballybough, Sackville Avenue, | Holles Row | Northbrook Avenue Lower, North Strand | Villa Park Gardens , Navan Rd |
| Bolton Street | Cuala Road, Cabra | Hollybank Road Drumcondra | O'Connell Street Lower | Villa Park Road, Navan Road |
| Botanic Avenue | Dawson Street | Home Farm Road | Offaly Road, Cabra | West Road, East Wall |
| Botanic Avenue at Mannix Road | Dingle Rd Cabra West | Imaal Road | Old Cabra Road | Whitworth Road |
| Broadstone | Dominick Court | Imaal Road | Oriel St Upper | William Street North, Rendu Apartments |
| Broombridge Industrial Estate | Dominick Street Lower | Infirmary Road @ Parkgate | Oxford Terrace, East Wall | Wolfe Tone Quay |
| Broombridge Road | Doreen House Blackhorse Avenue | Irvine Terrace East Wall | Parkgate Street | |
| Buckingham Street Lower | Dowth Avenue | Island Key Apartments East Wall | Phibsborough Road, Saint Peters Court | |
| Cabra Road | Drumcliffe Drive | Islandbridge | Portland Place | |

Total 142 Locations

North Central Area - Reported Flood Locations

| | | | | |
|--|--|---|--|-----------------------------------|
| Addison Avenue Fairview | Celtic Park Road | Foxfield Grove | Maryfield Crecent, Artane | Seafield Avenue, Clontarf |
| Addison Road, Fairview | Chestnut Court | Foxfield Park | Maypark, Malahide Rd | Seafield Road |
| All Saints Road, Rahery | Church Avenue, Grace Park Road, Drumcondra | Glin Road | Maywood Grove | Shanard Road |
| Amesley Bridge Road, Fairview | Clanmoyle Road | Grace Park Terrace | Middle Third, Killester | Shantalla Rd Beaumont |
| Ardbeg Park | Clontarf Road | Grange Park Crescent | Mount Prospect Avenue, Clontarf | Slademoore Drive, Artane |
| Ardlea Road, Artane | Collins Ave West/Malahide Rd Junction | Grange Park Rise | Newtown Cottages, Malahide Road, | Snowdrop Walk |
| Ardmore Park | Collins Avenue East | Grange Park Road | Philipsburgh Avenue, Fairview | Swords Road @ Whitehall Church |
| Ayrfield Court | Collins Park | Griffith Avenue Junction with Swords Road | Primrose Grove, Damdale | The Hole In The Wall Road |
| Beechbrook Grove | Conquer Hill, Clontarf | Griffith Walk | Rahery Cottages | Thornville Avenue |
| Belcamp Avenue | Coolock Village | Hampstead Avenue | Rahery Village, RHS Howth Road @ Fast Fit | Thornville Drive |
| Belton Park Avenue | Courtlands, Griffith Ave | Hazelwood Drive , Artane | Richmond Road | Thornville Road |
| Belton Park Gardens | Crestfield Rd | Hazelwood Park, Junction Ardlea Road, Artane | Riverside Park, Clonshaugh | Tonlegee Road, Rahery |
| Blackheath Grove/Blackheath Park, Clontarf | East Wall Rd Dublin 3 | Howth Road | Saint Aiden's Park Avenue | Vernon Avenue, Clontarf |
| Briarfield Road | Elm Mount Avenue | Iveragh Road, Whitehall | Saint Annes Park James Larkin Rd Dublin 3 | Vernon Avenue, Clontarf |
| Brockwood Avenue, Rahery | Elm Mount Road, Donrycarney | Kilbarrack Rd, under bridge | Saint Brendan's Avenue, Artane | Vernon Gardens, Clontarf |
| Brockwood Rise | Ennafort Park | Kilbarrack Road | Saint David's Wood, Malahide Road. | Vernon Heath/ Vernon Ave |
| Calderwood Avenue, | Fairview | Kilmore Road | Saint John's Court | Vernon Park, Clontarf |
| Carndonagh Park, Donaghmede | Fairview Ave | Kincora Rd/Kincora Court Clontarf | Saint Johns Court, Artane | Victoria Road Clontarf |
| Carndonagh Road | Fairview Green, Marino | Kincora Road at Vernon Ave | Saint Lawrence Road, Clontarf | |
| Casino Road near Croydon Park end | Fairview Passage, Fairview | Marino Crescent | Saint Lawrence Road, St Lawrence's Court | |
| Castle Ave Clontarf | Fairview Strand | Marino Mart, Fairview | Saint Margarets Ave | |
| Castlekevin Road | Foxfield Green | Maryfield Avenue, Artane | Santry Village opp comet pub | |

Total 107 Locations

North West Area - Reported Flood Locations

| | | |
|------------------------------------|---|--|
| Addison Avenue Fairview | Dunsink Park | Knowth Court, Ballymun |
| Balbutcher Lane | Dunsink Road, Finglas West | McKee Road |
| Ballygall Crescent, Finglas | Fairlawn Road | McKelvey Avenue, Finglas East |
| Ballygall Parade, Finglas | Fairways Avenue | Old Finglas Road, Facefield |
| Ballygall Road East | Fairways Green | Poppintree Terrace |
| Ballymun Rd/Mobhi Rd intersection | Ferndale Avenue, Finglas | Rathwilly Park, Finglas |
| Ballymun Road | Finglas Place | Saint Canice's Road |
| Barry Avenue, Finglas | Finglas Road, @ Bottom of the Hill Pub | Sandyhill Gardens |
| Carrigallen Park, Finglas | Glasanaon Road | Sandyhill Way Ballymun |
| Casement Close | Glasaree Road | Santry Cross |
| Casemount Drive, Finglas | Glasilawn Road, Glasnevin | Santry Cross Apartments, Ballymun |
| Clonmore Court, Ballymun Road | Glasnevin Avenue | Seamus Ennis Road |
| Clune Road | Glasnevin Drive @ corner of Glasnevin Park | Silloge Gardens Ballymun |
| Collins Drive | Griffith Avenue | Tolka Cottages |
| Coultry Gardens | Griffith Avenue Ext between Ballygall Road East | Tolka Valley Road, Finglas South @ Lakeglen Estate |
| Deanstown Park | Griffith Road | Valeview Drive |
| Deanstown Road | Grove Park Road, Finglas | Wadelai Green, |
| Drogheda Mall, Main Street Finglas | Jamestown Rd, Finglas | Wellmount Crescent, Finglas |
| Druid Court Ballymun | Kippure park | Wellmount Rd, Finglas |
| Dunsink Drive | Knowth Court, Ballymun | Westpark Drive, Finglas |

Total 60 Locations

South Central Area - Reported Flood Locations

| | | | | |
|----------------------------------|--|---|--|--|
| Balfe Avenue | Darvitt Rd/Kilworth Rd junction | John McCormack Avenue, Walkinstown | O'Donoghue Street, Inchicore | Slievebloom Park, Walkinstown |
| Balfe Road East, Walkinstown | Decies Road, Ballyfermot | John Street South | Old Kilmainham | Slievenamon Road, Drimmagh |
| Blarney Park Kimmage | Dery Drive | KCR | Cranmore Road, Ballyfermot | South Circular Road |
| Bluebell Avenue | Donnellan Avenue | Kearns Place, Kilmainham | Parkmore Drive, Terenure | Spa Road Inchicore |
| Bow Lane West | Dowland Road, Walkinstown | Kenilworth Park, Kimmage Road | Parnell Road, Harold's cross | Stanford Green, Walkinstown |
| Burling Road | Dunard road | Kildare Road, Crumlin | Poddle Park Rd | Summer Street South, Summer Street Flats |
| Camac Crescent Apartments | Elmdale Drive, Ballyfermot | Kilmainham Orchard Apartment | Poddle Park, Kimmage | Sundrive Road, - Stanaway & Clogher Road |
| Carrickfoyle Terrace, Kilmainham | Emmet Rd Inchicore | Kimmage Manor | Havensdale Park | Sundrive Road, Kimmage |
| Ceannt Fort Kilmainham | Faulkners Terrace, Kilmainham | Kimmage Road Lower | Reuben Street, Dolphins Barn | The Cloisters, Terenure |
| Cedar Court, Terenure | Fortfield Road, Terenure | Kimmage Road West | Rialto Cottages | The Tramyard, Spa Road, Eurospar |
| Claddagh Green, Ballyfermot | Gallymore Road, Slievenamon Road Suir Bridge | Kylemore Road, Ballyfermot | Ring Terrace, Inchicore | Thomas Moore Road, Walkinstown |
| Clanbrassil Street | Grattan Court Inchicore, Inchicore Terrace South | Labre Park | Riverside Apartments, Kimmage | Turvey Avenue, Inchicore |
| Clareville Road, Harold's Cross | Greenlea road, terenure | Lady's Lane Kilmainham | Rowserstown Lane, The Old Mill | Tyrconnell Park |
| Clogher Road | Greenmount Avenue, Harold's Cross | Lakelands Park Terenure | Saint John's Well Way Apartments, Kilmainham | Tyrconnell Road |
| Clonard Court, Kimmage | Greenmount Lane Harold's Cross | Le Fanu Road | Saint Agnes Road, Crumlin. | Tyrconnell Street, Inchicore |
| Clonard Road | Harold's Cross Road | Limekiln Lane, Harold's Cross | Saint Albans Road | Victoria Quay |
| Cloyne Rd, Kimmage | Harty Avenue, Walkinstown | Limekiln Road | Saint Clare's Avenue | Walkinstown Crescent |
| Con Colbert Road | Hazel Park Kimmage Cul de Sac | Millbrook Terrace | Saint John's Road West | Walkinstown Green |
| Crotty Avenue, Walkinstown | Herberton Bridge/Dolphin Road. | Mount Argus Road | Saint Laurence's Road | Walkinstown Road |
| Crumlin Road | Huband Road | Mount Tallant Avenue, Terenure | Saint Patrick's Terrace, Inchicore | Windmill Avenue Crumlin |
| Curlew Road | Iveagh Gardens | Mourne Road, Drimmagh, (at bottom of Mourne Road, between Errigal Road and Dromard Road | Saint Vincent Street West, Inchicore | Windmill Road, Crumlin |
| Dartmouth Square West | John Dillon Street - Powers Square | Myra Close | Sarsfield Road, Ballyfermot | |

Total 109 Locations

South East Area - Reported Flood Locations

| | | | | |
|---------------------------------|---|---------------------------------------|---|--|
| Ailsbury Park | Celestine ave, Irishtown | Granite place | Merrion Road | Saint John's Road East, Sandymount |
| Ailsbury Road | Chaeleville Road | Grantham Street | Military Road, Rathmines | Saint Stephen's Green |
| Anglesea Road @ Stillorgan Road | Charlemont Mall | Greenwich Court, Rathmines Road Lower | Military Road, The Park Apartments, Rathmines | Sandymount Avenue, Dart Station |
| Arnott Street | Charleston Road | Grosvenor Place | Morehampton Road | Serpentine Avenue |
| Baggot Street Lower | Chelmsford Avenue | Gullistan Cottages, Rathmines | Mount Drummond Ave @ Harolds Cross Bridge | Shelbourne Road |
| Ballsbridge | Chelmsford Road Ranelagh | Harolds Cross Road | Newbridge Avenue | Simmons Court Terrace, Donnybrook |
| Ballsbridge Avenue | Claremont Park, Sandymount | Havelock Square | Newgrove Avenue, Sandymount | South Lotts |
| Ballsbridge Court | Claremont Road | Herbert Cottages | O'Connell Gardens | Stella Gardens |
| Ballsbridge Park | Clarence Place Great | Herbert Park Ballsbridge End | Ovoca Road | Strand Terrace |
| Ballsbridge, Sweepstakes Site | Clonskeagh Road | Herbert Road | Palmerstown Villas, Rathmines | Suffolk Street |
| Barrow Street | Clyde Lane, Ballsbridge Park Lodge | Highfield Grove | Park Ave Sandymount | Sydney parade Avenue, Sandymount |
| Bath Ave Gardens | Clyde Road | Highfield Road, Rathgar | Park Avenue Sandymount | Tara Street |
| Bath Avenue @ Grand Canal St | Creighton Street | Hope Street | Pearse Grove | Thorncliffe Street, Whelan House, Ringsend |
| Beattys Avenue | Cuffe Street | Howard Street | Pearse House | Townsend Street |
| Beaver Row, Donnybrook | Cullenswood Road, Ranelagh | Irishtown Road | Pearse Square | Trinity Street |
| Beech Hill Road | Dartmouth Square West | Keegan's Cottages | Pearse Street | Trilowille Road, Sandymount |
| Beechwood Avenue, Lower | Dartry Cottages, Dodder Walk | Kenilworth Square | Pembroke Cottages, Ringsend | Wellington Lane , |
| Beechwood Avenue, Lower | Dermot O'Hurley Avenue | Lansdowne Rd & Shelbourne Rd Jnct | Pembroke Lane | Wellington Quay |
| Belgrave Square, Rathmines | Derrynane Gardens | Leeson Park, Ranelagh | Raglan Road | Wexford Street |
| Belgrave Villas, Ranelagh | Dodder View Cottage, Ballsbridge | Leinster Road, Rathmines | Railway Cottages | Willfield Park |
| Belmont Gardens, Donnybrook | Erlra Road, Rathgar | Leinster Square, Rathmines | Ranelagh Road | Willowfield, Sandymount |
| Boyle Court, Harolds Cross | Eglington Road, Jefferson House, Donnybrook | Lombard Street | Ranelagh Triangle | Wilton Place |
| Bremen Road, Ringsend | Elgin Road, Ballsbridge | Macken Street | Rathgar Road, Rathgar | Windmill Lane |
| Brighton Square | Flemmings Place | Magennis Place | Rathmines Road Lower | Zion Rd, Rathgar |
| Brookvale Court, Donnybrook | Garville Lane | Malone Gardens | Redmond's Hill, Aungler Street D8 | |
| Burlington Road, Ballsbridge | Gilford Road | Margaret Place | Richmond Place, Rathmines | |
| Cannon place | Gordon Street | Maxwell Road, Rathgar Road | Richmond Road, Fairview | |
| Castle Court | Grand Canal Street Upper, Ballsbridge | Meryn Park | Saint Ailben's Park, Sandymount | |

Total 108 Locations

Areas raised by Councillor in questions received by Drainage Division.

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|---------------------------------------|
| Ardlea Road, Artane, D 5 |
| Ardmore Drive, Artane, D 5 |
| Ardmore Park, Artane, D 5 |
| Ashington Rise, Navan Road, D 7 |
| Ballybough Road, Ballybough, D 3 |
| Ballygall Crescent, Finglas, D 11 |
| Ballygall Parade, Finglas, D 7 |
| Bath Avenue, Sandymount, D 4 |
| Bayview Avenue, North Strand, D 3 |
| Bessborough Avenue, North Strand, D 3 |
| Blackheath Park, Clontarf, D 3 |
| Cabra Road, Cabra, D 7 |
| Carndonagh Road, Donaghmede, D 13 |
| Carrickfoyle Terrace, Kilmainham, D 8 |
| Charleville Road, Rathmines, D 6 |
| Chelmsford Road, Ranelagh, D 6 |
| Chelmsford Road, Ranelagh, D 6. |
| Clanmoyle Road, Donnycarney, D 5 |
| Cloverhill Road, Ballyfermot, D 10 |
| Collins Avenue, D 5 |
| Coultry Road, Ballymun, D 9 |
| Crumlin Road, Crumlin, D 12 |
| Cuala Road, Cabra, D 7 |
| Effra Rd, Rathmines, D 6 |
| Elm Mount Avenue, Beaumont, D 5 |
| Fairways Estate, Finglas, D 11 |
| Faulkner's Terrace, Kilmainham, D 8 |
| Foxfield Green, Raheny, D 5 |
| Foxfield Grove, Raheny, D 5 |
| Foxfield Grove, Raheny, D 5 |
| Gandon Hall, Gardiner Street, D 1 |
| Glasilawn Road, Glasnevin, D 11 |
| Glendhu Park, Ashtown, D 7 |
| Grosvenor Place, Rathmines, D 6 |
| Havelock Square, Sandymount, D 4 |
| Imaal Road, Cabra, D 7 |
| Johnstown Gardens, Finglas, D 11 |
| Kearn's Place, Kilmainham, D 8 |
| Kincora Avenue, Clontarf, D 5 |
| Kincora Court, Clontarf, D 3 |
| Kincora Road, Clontarf, D 3 |
| Kylemore Road, Ballyfermot, D 10 |
| Lady's Lane, Kilmainham, D 8 |
| Lansdowne Road, Ballsbridge, D 4 |
| Leix Road, Cabra, D 7 |
| Millbrook Terrace, Kilmainham, D 8 |
| Swan Place, Rathmines, D 6 |
| Thornville Avenue, Kilbarrack, D 5. |
| Tyrconnell Street, Inchicore, D 8 |
| Villa Park Gardens, Navan Road, D 7 |

