



A Review of Flood Prevention within the Highland Council Area

**HIGHLAND COUNCIL
ROADS AND TRANSPORT**

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within the
Highland Council Area

November 1997

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Summary

This report has been prepared in order to meet the Highland Council's responsibilities under the Flood Prevention and Land Drainage (Scotland) Act 1997. It summarises the historical and current situation with regard to certain aspects of Flood Prevention within the Highland Council area, and promotes a methodology based on Action Areas for assessing future problems. It highlights the sort of information that will be required in order to make objective investment decisions, and suggests ways of dealing with it.

It should however be emphasised that whilst the Council's responsibilities are commonly referred to as Flood Prevention, complete protection from flooding would be very difficult and extremely expensive to achieve. Despite the findings of future analyses consideration will have to be given to the degree of protection that can be provided in the light of particular site circumstances and the financial limitations pertaining. Flood prevention is therefore better considered as flood mitigation or alleviation.

Overview

Introduction

Under the Flood Prevention and Land Drainage (Scotland) Act 1997 the Highland Council must compile a report on its Flood Assessment Strategies and indicate the measures it considers necessary to prevent or mitigate flooding. It must also detail the preventive measures already taken, and report all flooding incidents that have taken place since 26/5/97. Thereafter it must update the report at intervals of no more than two years.

This first report attempts to collate the available relevant background information assembled to date, list the measures already taken, review possible means of meeting the statute's obligations, and set a framework for future research suitable for assessment purposes.

Obligations

The Highland Council must from time to time assess watercourses within its area to determine those likely to cause flooding to non-agricultural land. When it becomes apparent to the Council, whether as a result of assessment or not, that a watercourse is in a condition likely to cause flooding of non-agricultural land it has a duty to maintain that watercourse, and if carrying out such maintenance works would substantially reduce the risk of flooding, then the Council have a duty to act.

Where major works have been identified as necessary to mitigate flooding, then these have to be confirmed by the Secretary of State, and a formal Flood Prevention Scheme promoted.

These obligations do not apply where works would benefit only a single proprietor, the riparian owner, who is not the Highland Council.

If, as a result of assessment, flooding of non-agricultural land within an adjoining local authority's area is foreseen then the Highland Council must advise that authority.

Historical Information

Information to hand is as follows :-

(i) On transfer of the Flood Prevention role from the former Highland Regional Council's Water and Sewerage Department the following was intimated :-

(a) Flood Prevention Orders in place and maintained as necessary
Conon Valley
Dingwall - River Pefferey
Kinlochleven
River Ness

(b) Flood Prevention Orders being processed
Aviemore
Drumnadrochit - River Enrick
Fort Augustus - The Riggs (*completed 1996*)
Fort William - Caol
Garve (*now in maintenance*)
Glencoe
Inverness - Millburn
Inverness - Ness Bank
Kingussie - River Gynack

(c) Preventive works undertaken at times of flooding

Several locations (not detailed here) were indicated where sandbagging and clearance was required and undertaken on a regular basis.

(d) Miscellaneous Scheme Files

Numerous scheme files were made available. Some of these related to active schemes, whilst others dealt with superseded or archival matters. At the time of writing a full review of content is yet to be undertaken.

(e) Problems identified and highlighted

Inverness - Southern Distributor Catchment and Drainage Network

Fort William - Lochyside and Caol Spit

Muir of Ord - Drainage Network

(ii) Incidents

Several flooding incidents have occurred since 26th May 1997. These include the fairly major problems at Drumnadrochit and Invermoriston on 13th August 1997, and the Mill Burn (Inverness) on the 1st July 1997, as well as the widespread minor flooding experienced at certain locations in Nairnshire on 1st July 1997. Sometimes however only individual properties have been involved and the damage limited.

Incident details can be found in **Appendix A**.

(iii) Problem Areas by Repute and Record

Flooding within the Highlands is generally a result of natural phenomena; heavy rainfall, snow melt, tidal influences or a combination of these factors, although changes to catchment run-off characteristics resulting from increased development is becoming a significant cause in some locations. The inability of the natural watercourse to cope with the subsequent volumes of water may be compounded by artificial constraints, fly tipping or debris such as trees and boulders transported down river. Another contributory factor is the inadvertant removal of natural flood areas upstream which if left would provide effective safety valves when flooding takes place.

There are several locations within the Highland Council area where frequent or intermittent flooding is known to occur on a regular basis. Some of these have already been the subject of studies which may in certain instances have led to formal Flood Protection Schemes, but others still await detailed analysis. Accurate historical data is not generally easily available, and sometimes details can more readily be collected by research in the local newspaper archives than in official files. Several of the better known problem sites are listed in **Appendix B**.

Current Situation

Emergency Systems and Responses

In conjunction with SEPA and the Northern Constabulary the Council operate a Flood Warning System as part of their Emergency Planning role. Currently SEPA have some 24 of their many gauging and rainfall stations equipped with pre-set alarm levels, and these are linked telemetrically to their offices as well as those of the police and the Council. SEPA hydrologists review the information provided and contact the Police if conditions suggest that flooding is likely to be a problem and warnings need to be issued. The Council's Emergency Planning Unit receives all flood warnings issued, and after consultation with the police and SEPA's duty hydrologist will notify the Council's Area Roads and Transport Managers as necessary. Pre-planned preventive action is then taken to suit circumstances. This may involve protection, road closures and the like. In extreme

situations public warnings would be issued and people evacuated to identified reception centres.

There can be up to three stages of warning on the main catchment areas which include the Rivers Findhorn, Ness, Conon, Oykel, Nairn, Lochy, Blackwater, Meig, Glass, Bran, Spey, Truim, and Dulnain. Discussions are currently underway in respect of a new system for the River Enrick at Drumnadrochit and another in Thurso.

It is understood that in England police authorities are no longer undertaking an Emergency Planning co-ordination role due to financial constraints. In Scotland Dumfries and Galloway have already opted out, and other police authorities may follow. Northern Constabulary is yet to consider their role beyond winter 1998. Highland Council may need to establish a suitable alternative.

In conjunction with the Council's Emergency Planning Officer and SEPA, Northern Constabulary is currently reassessing flood warning emergency procedures in order to bring them up to date.

The Council responds to flooding incidents by providing men, materials, and machines, etc. to help emergency services and property owners deal with flooding events.

Finance

The resources needed to deal with flooding problems are significant, and therefore the financial cost is considerable.

Under section 155 of the Local Government and Housing Act 1989 the Council is able to claim for special financial assistance over and above a pre-determined threshold to deal with flood related or other disasters. (The Bellwin Scheme - Emergency Financial Assistance to Local Authorities.). Recent experience indicates that most flooding events would not be assisted.

In respect of the current Revenue Budget no finance is separately identified for drainage or flood prevention works, and any attention to flooding matters, even if as an emergency measure, means that another of the Council's activities suffers.

The Council's Capital Programme which contains formal flood prevention schemes is so constrained that it is unlikely that any new flood prevention schemes could be accommodated until perhaps 2004.

Normal road maintenance functions undertaken by the Roads and Transport Service include drainage works, and some costs attributable to flooding and / or its prevention are therefore sometimes included under a general maintenance heading unless a major incident occurs. It is therefore difficult to determine accurately the sums spent by the Council on flood related matters.

Flood Prevention Schemes

The status of outstanding Flood Prevention Schemes was presented to the Council's Transport Strategy Group on 17th September 1997 as part of a review of flood prevention within the Council's area. **Table 1** below shows the situation as reported :-

Table 1

SCHEME	EST COST	STATUS	REASON FOR NEED
AVIEMORE FLOOD PREVENTION	£450,000	Draft Flood Prevention Order (FPO) issued with outstanding objections NID and final FPO to be submitted.	Flooding of 3 houses and Old Bridge Pub
KINGUSSIE FLOOD PREVENTION	£450,000	Draft FPO issued but requires a temporary closure of main North railway line. Scheme being re-examined which will require a new order.	Flooding of school, road and houses.
DRUMNADROCHIT FLOOD PREVENTION	£ 40,000	Draft FPO prepared but not issued by HRC. Emergency works carried out following incident 1/3/97 at costs of over £120,000.	Flooding of properties in village
ACHARACLE FLOOD PREVENTION	£ 70,000	Scheme prepared but draft FPO not issued NID submitted with objections received. Environmental Scoping study undertaken.	Flooding of properties at Moss side
INVERNESS MILLBURN FLOOD PREVENTION	£200,000	Scheme prepared but draft FPO not issued.	Flooding of several properties, school, golf course and road.
GLENCOE	£ 70,000	Draft FPO prepared but not issued by HRC. No progress since 1991.	One cottage, garages, car park and gardens suffer from flooding.
FORT WILLIAM, CAOL	£500,000	Scheme prepared but draft FPO not issued. Partial implementation by NOSWA.	Flooding of Caol and Lochyside.
INVERNESS NESS BANK	£155,000	Objections to proposals. Draft FPO not issued.	Flooding of several properties and road

Links

The Council has established contacts with various bodies in respect of flood prevention or other associated works with watercourses. These have been both formal and informal and are as follows :-

External

British Waterways Board

In respect of the Caledonian Canal. Highland Council remain responsible for flooding under the terms of the Flood Prevention and Land Drainage (Scotland) Act 1997.

Consultants - with respect to specific flood related projects :-

Mott MacDonald

Conon Bridge Flood Prevention

Conon Valley Flood Prevention Scheme
Culloden Storm Water Strategy
Dingwall Flood Protection & Drainage Improvements
Fort Augustus Flood Prevention
Fort William Flood Study
Fort William Blair Mhor Drainage
Garve Flood Study
Great Glen / Loch Ness / River Ness
Inverness Flood Prevention Scheme
Inverness Millburn Storm Water Management
Southern Inverness Water Basin Management

R H Cuthbertson & Partners
Dalfaber Road Flood Protection
Flooding in Badenoch and Strathspey
Flooding of Craig-na-Gower Avenue Aviemore
Gynack Burn Flood Prevention Scheme

Sir William Halcrow and Partners
Rivers Enrick and Coiltie - Drumnadrochit

The Babtie Group
Business Park, West Seafield - Inverness
Acharacle

Flood Appraisal Group

This is composed of representatives from Highland Council's Planning and Roads and Transport Services, SEPA, and NOSWA. It met in November 1996 and was to reconvene following a study of the Inshes area of Inverness by NOSWA. At the time of writing this is still awaited.

Forestry Commission

No formal contacts regarding policies have been made as yet although dialogue in respect of specific problems such as deforestation which causes significant changes to run-off characteristics has taken place.

Meteorological Office

The Meteorological Office provide the Council with weather forecasts during the winter, and also give severe weather warnings.

Miscellaneous Fishery and River Boards and other Associations

In respect of river management or specific business or leisure interests.

Northern Constabulary

In respect of emergency situations.

NOSWA

In respect of a common interest in disposal of surface water drainage, especially from new and existing developments. NOSWA also have specialist expertise on certain aspects of flood prevention which is made available on request.

Other Parties

Miscellaneous contacts in respect of bridges and other private structures outside Highland Council control.

Railtrack

In respect of Railtrack structures.

SCOTS

SCOTS has established a Surface Water Best Management Practices Group in conjunction with SEPA and representatives from Scottish water authorities, and is, on a national basis, researching the production of a guideline document to assist in the design of drainage systems and outlet controls for new developments that would satisfy latest requirements.

Scottish Hydro Electric

In respect of Hydroelectric schemes. The availability of spare capacity and the control of discharges from reservoirs clearly influences downstream flows. It is understood that no direct formal liaison between Highland Council and Scottish Hydro Electric currently exists in respect of flood control measures.

SEPA

Under their powers to provide Flood Warning Systems, SEPA have a system of telemetry linked water level stations in place providing early indications of possible flooding problems (see above). They also have responsibilities to carry out formal assessments of flooding risk when asked by this authority, and employ hydrologists who are able to provide specialist advice relating to river catchment analysis. Co-operation will be encouraged to reduce duplication of effort.

SOAEFD

SOAEFD through the Scottish Office Environmental Affairs Group advises on flood prevention primarily for agricultural ground but any works they undertake can influence downstream river regimes. Closer liaison will be encouraged to prevent duplication of effort or works in isolation by either party.

SODD

In respect of trunk road structures and earthworks.

SNH

In respect of the environment. SNH have their own guideline document giving advice on environmentally friendly measures that could be implemented on watercourses.

The Public

The public, through their links with Council Members and Officials, are able to make their views and expectations known. Contact is made either on an individual basis, or through Council or public meetings where the problems of a particular area can be discussed.

Internal

As a corporate body the Highland Council has specialist expertise within its Services able to deal with flooding matters. These are :-

HC - Areas

All Highland Council Areas are required to have established procedures for emergency flood situations, detailing likely locations, proposed remedial measures, required materials, and related health and safety matters.

HC - Emergency Planning Units

Deal with emergency flood situations as above.

HC - Law and Administration

Deal with legal aspects including the creation of Flood Prevention Orders, claims, ownership, and access and other rights.

HC - Planning Service

The National Planning Policy Guideline NPPG 7 (Planning and Flooding) suggests the formation of Flood Appraisal Groups linking roads and planning authorities, together with SEPA, NOSWA and other interested parties. Such a group has been formed under Planning Service chairmanship.

The Planning Service by means of Strategic and Local Plans designates areas as suitable for development and follows the guidance given by NPPG 7 and the Roads and Transport Service.

Further controls on flood endangered areas are available to the Planning Authority, and dependent on local circumstances their use may sometimes be requested. The planning authority has powers under Article 4 of the General Permitted Development Order to bring under Planning Authority control any drainage works that may lead to an increased risk of flooding. Use of these powers will however require Secretary of State approval.

When advice suggests buildings may be flooded then the requirements of the building regulations to protect properties from flood waters will be called upon.

HC - Roads and Transport

The Roads and Transport Service is directly responsible for flooding matters. Policy and works programming in respect of flooding are determined by Members, and implemented in the Network Management Unit whilst day to day maintenance and emergency responses are handled by the relevant Area Roads and Transport Managers. The function of providing advice on flood related planning matters is handled in both Network and in the Areas.

(i) Areas

As a result of their activities on the drainage front the Area Roads and Transport Managers cite recurring problems in certain areas. Around 15-20% of the complaints they receive are drainage related and this ratio seems to be increasing. With severely restricted budgets and minimal design and supervisory staff they seek guidance on the extent of their legal duties and therefore their costs by the establishment of clearly defined policies and procedures. These are particularly important when the Highland Council has certain responsibilities for public safety.

So far as Development Control is concerned sufficient historical knowledge is normally available to provide advice to the Planning Service. One shortfall however is the lack of adequate records for existing pipe network systems that may need to be used as outlets, with several examples of overloaded systems being highlighted. Another is the marked deterioration of older networks in some locations. There also appears to be a mix of standards formerly used for new pipe systems throughout the Highland Council area but this should be resolved by the establishment of the procedures mentioned above.

Where there are known problems at features such as gullies, grids, and catchpits regular maintenance and assessment programmes have been implemented by Area Roads and Transport Managers. In some instances, where dynamic beds of loose material at steep grades create blockage problems, this involves undertaking checks on a weekly basis to ensure clear waterways.

(ii) Network Management

Under the auspices of its Planning and Transportation functions the Roads and Transport Service's Network Management advises the Planning Service on those

planning applications received for locations with known major flooding problems. It also acts as clearing house for general flooding matters.

The Network Management Unit also supervises the implementation of Coast Protection Schemes, and is the enforcement authority for the Reservoirs Act 1975.

Meteorological Data

Weather is clearly the dominant influence on flooding and adequate information needs to be available both before and after flooding events (as a warning and for analysis). Currently data is available as follows :-

Forecasts

During the winter months daily weather forecasts are received from the meteorological office specifically to assist in gritting and snow clearing. No forecasting is given in summer when more concentrated storms may occur.

Forecasts of severe weather are forwarded to the Council's Emergency Planning Unit throughout the year.

Records

Records are available from the Meteorological Office and SEPA and these assist in the assessment of past flooding events.

Long Term Climate Changes

Recent events have shown there to be a marked shift in weather patterns over the last few years and this is supported by long-term records.

Tides

Predictions of high tide levels are available from tables, and attempts are made to flag those situations when sustained high winds in combination with high tides endanger coastal areas.

Measures Taken

The measures taken since 26th May 1997 to prevent or mitigate flooding are as follows. These are considered as being in addition to immediate repair works which may in fact alleviate any problem.

(i) Drumnadrochit

- River training works on the River Enrick following flood damage on 1/3/97. These were fairly extensive and to some extent negate the need for the formal Flood Protection Scheme already proposed. The changed situation is yet to be evaluated.

(ii) Drumnadrochit

- River training works on the River Coiltie following flood damage on 13/8/97. These provided protection to a threatened property in Lewiston.

A Consultant Engineer was appointed to comment on possible improvement and / or clearance measures that could be taken, and a report was submitted in October 1997. This was limited to a 1.4km length of the River Coiltie upstream from Borlum Bridge (A82), and it recommended improvement strategies for the short and medium term, and is currently under consideration.

(iv) Invermoriston

- Cleaning and clearance of blocked culverts following the flooding on 13/8/97.

(v) Ongoing design work in relation to Flood Prevention Schemes at Aviemore and Kingussie.

Proposed Measures

Objectives

The Council proposes to satisfy the requirements of the Flood Prevention and Land Drainage (Scotland) Act 1997.

Means of meeting Objectives

The following areas have been identified as being relevant to achieving the objectives :-

Strategy

The Council has already established a policy of effecting flood prevention works in the following order :-

Those locations where :-

- (i) there is a risk to life
- (ii) there is a risk to property
 - (a) residential buildings
 - (b) commercial buildings
- (c) residential land
- (d) commercial land

(iii) Areas of denser population will be given a higher priority

In respect of immediate emergency flood protection the Council response will be based on similar criteria especially when incidents are wide spread.

Assessments will be based on a 1 in 100 year occurrence which is considered an accepted norm.

Since its flood prevention responsibilities are new duties, this strategy will be reviewed from time to time to ensure that the flooding problems within the Highland Council area are dealt with effectively.

Action Areas

In order to satisfactorily implement the above strategy the Council intends to :-

Adopt an ACTIVE role

The Council will attempt to predict where flooding problems are likely to occur and then take measures within its means to prevent or mitigate them.

Undertake Formal Assessments

Assessments of watercourses will be undertaken on a regular basis. These will concentrate on areas with known flooding problems, although other urban and rural locations will also be examined.

SEPA will be asked to exercise their responsibilities in respect of determining potential flood risk areas.

Undertake research and collect data

Further research is required to establish a sufficiently comprehensive picture of flooding problems within the Council area that will permit objective preparation of a programme of future flood protection works both major and minor. Details of the type of data to be collected is given in **Appendix C**.

Establish New and Reinforce Existing Links

(i) External

More formal contact needs to be made with those outside agencies whose actions have significant impacts on flows in watercourses to establish an understanding of the problems involved and how they may be handled to the benefit of the community at large.

The most significant will be with NOSWA and SEPA who both have their own particular responsibilities in relation to pipe networks, surface water run-off and flood risk. However, contacts with business, fishing and other recreational interests are also important to determine how management of watercourses may influence their activities, and how any action on the part of the Council may affect the Council's responsibilities in the long term.

The Council will need to agree with NOSWA responsibilities for existing and proposed pipe networks.

The situation with regard to future police involvement in Emergency Situations needs to be clarified so that if alternative arrangements are necessary they can be implemented.

(ii) Internal

In order to effectively manage flood related matters the existing cooperation between the Roads and Transport Service HQ staff, the Area Roads and Transport Managers, and the Planning Service will be improved. This extends to ensuring adequate maintenance and assessment programmes are instituted to keep watercourses clear, sharing roles in the collection and storage of information, and forming a common approach to flood related aspects of development control.

Review Areas Designated for Development

The Planning Service by means of Strategic and Local Plans designates areas as suitable for development (see above). Random checks on several existing Plans show a number of such areas susceptible to flooding and ALL plans require review as soon as possible to ensure problem areas are highlighted.

For a number of proposed developments, either in or above flood prone areas, it will be necessary to request hydrological reports at outline and detailed planning stages to ensure there are no detrimental changes to downstream flow regimes. These may indicate the need for on or off site controls to limit peak discharge levels from certain developments.

As part of the Council's Development Control role, it may be necessary to enter into formal Section 75 agreements with developers to ensure ongoing maintenance costs are covered.

Ensure Feedback

Feedback following incidents, to those parties requiring guidance as to potential flood risk areas, will increase awareness and limit flooding in the future. Susceptible areas will be shown in relation to known or perceived flooding risks.

Review Prediction Methods

The Council will develop contacts for predictions of storm conditions and sources of archival weather information.

Preliminary contacts with the Meteorological Office indicate that rainfall records are available, and that Return Periods can be predicted from these using special computer programs. It is also possible for warnings of storm and national severe weather conditions to be given. The threshold criteria to be used for warnings can be determined to suit specific catchment areas. At the time of writing cost estimates are being provided for trial study areas in which flooding incidents have recently occurred in order to establish the suitability of such information for gauging the significance of past events.

Review local Bye laws

Much flooding results from indiscriminate tipping of waste and other materials in watercourses, and the merits of local Bye-laws in relation to tipping or other damage to watercourses need to be assessed.

Reassess outstanding flood prevention schemes

In some instances the carry-over flood prevention schemes have been awaiting administrative approval or suitable funding for so long that their worth in their original form has been overtaken by events. All Flood Prevention Schemes will be reassessed in the light of current circumstances.

Research Finance Sources

Alternative sources of funding are available to the Council from national and European sources and it intends to actively pursue these. Formal Flood Prevention Schemes are eligible for grant aid of 50% of cost from the Scottish Office. Such grant does not increase the overall spending power of the Council.

The Council is empowered to seek contributions from and make payments to developers in respect of flood prevention works and where major infrastructure is required to permit developments to proceed then financial assistance will be sought.

The Council will allocate the cost of flood related works over and above general maintenance duties to a specific finance coding so that flood related expenditure can be readily identified.

It is intended to try and persuade the Council to include in their future years' budgets a realistic sum to deal with the maintenance of watercourses and flooding incidents.

Review Responsibilities

In attending incidents those responsible for immediate flood protection are facing increasing difficulties in deciding where the Council's responsibilities end. Assistance whether immediate, short or long term is extremely expensive to provide and the Council may find it increasingly hard to provide the necessary funding. Legislation is couched rather vaguely and whilst aware of a "general duty of care" incumbent on the Council it will seek clarification of its duties in respect of providing assistance to affected or threatened parties.

Analyse Data

(i) The Council will analyse each incident with a view to assessing its significance by :-

- Considering rainfall at times of incidents.
- Considering flow levels and relating these to the 100 year target.
- Considering patterns of incident occurrence.
- Considering the extent of resultant flooding and damage.

(ii) Using the data collected the Council will attempt to :-

- Establish capacities at constraints and relate these to the 100 year target.
- Identify watercourses with restricted containment or capacity.
- Identify flood risk areas with levels of safety, flood extent and likely damage.

(iii) Based on the above analyses the Council will develop and review a flexible Programme of Works which, in accordance with stated policies and strategy, takes into account :-

(a) Prioritisation on objective criteria based on suitable information allowing consideration of :-

- the immediacy of problems
- the long term implications of works
- risk assessment
- likely return periods
- flood magnitudes

(b) Funding levels available.

(c) Proposed maintenance and management operations short and medium term.

The Council is already a partner in a joint venture with Railtrack Scotland, Iarnod Eiraenn (Irish Railways), and The University of Strathclyde to assess flooding risks to transport infrastructure with a view to reducing them. An application for special funding from the European Commission is currently being sought.

Report Findings

The Council will report the findings of its analyses.

Timescale

Since the nature of the problem is dynamic some of the Action Areas listed above are ongoing. The timing of others is dependent on staffing levels committed and the resources and equipment available. The important thing is to obtain as comprehensive a picture as possible to enable full assessment to be made. Initially there will be an appreciable workload to garner an adequate store of suitable data, but thereafter only routine monitoring should be necessary. It is envisaged that sufficient information will be available by the time of the next report for firm proposals to be put forward.

01/07/97

Nairn - Brae Lodge Littlemill

Easting: 291500

Northing: 850300

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

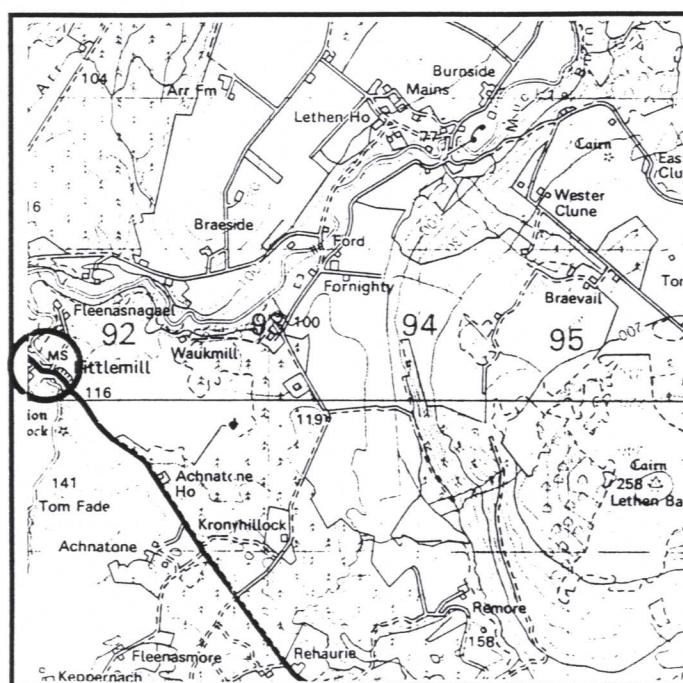
Hazard Rating: 1

Description:

Property nearly flooded.
Cf ARTM report dated 17/7/97

Comments:

House on natural flood plain.
See assessment.



01/07/97

Nairn - Fornightly Ford

Easting: 293400

Northing: 851000

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

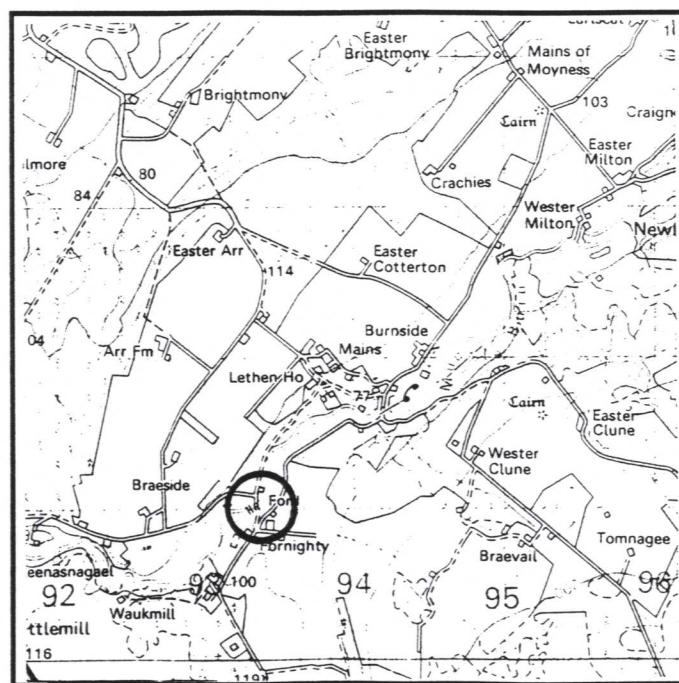
Hazard Rating: 3

Description:

Flood flows resulted in damage to trailing edge of structure of ford.

Cf ARTM report dated 17/7/97

Comments:



01/07/97

Nairn - Harbour Street

Easting: 288700

Northing: 856700

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

Hazard Rating:

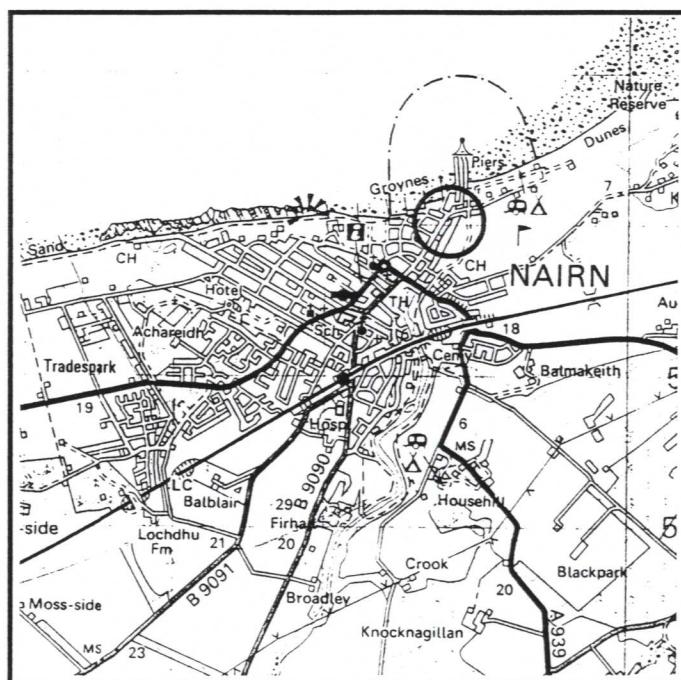
Description:

River Nairn threatened to flood Harbour Street at high tide due to build up of gravel deposits.

Cf ARTM report dated 17/7/97

Comments:

Recommend gravel be removed to increase waterway area.



01/07/97

Nairn - Keppernach Ford

Easting: 291300

Northing: 847900

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

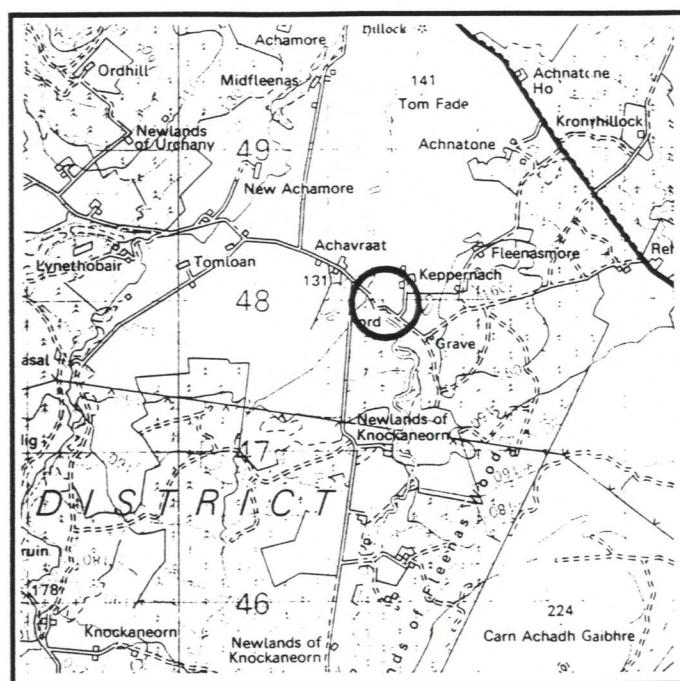
Residential

Hazard Rating: 3

Description:

Flood flows resulted in damage to abutments of ford.
Cf ARTM report dated 17/7/97

Comments:



01/07/97

Nairn - Lethen Sawmill

Easting: 294200

Northing: 851600

Lineal

Start: Extent:

Duration: 0 Areal

Properties affected: 0 Commercial

Residential

Hazard Rating: 2

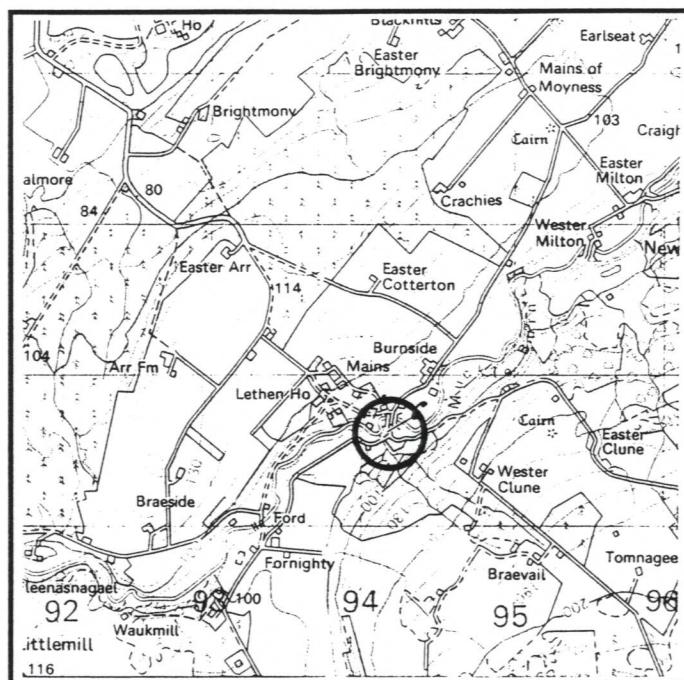
Description:

High flows upto one metre deep over road lifted areas of tarmac and necessitated repairs.

Cf ARTM report dated 17/7/97

Comments:

Low point on road subject to flooding. Temporary repairs implemented.



01/07/97

Nairn - Meikle Urchany

Easting: 288500

Northing: 850000

Start:

Extent:

Linical

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

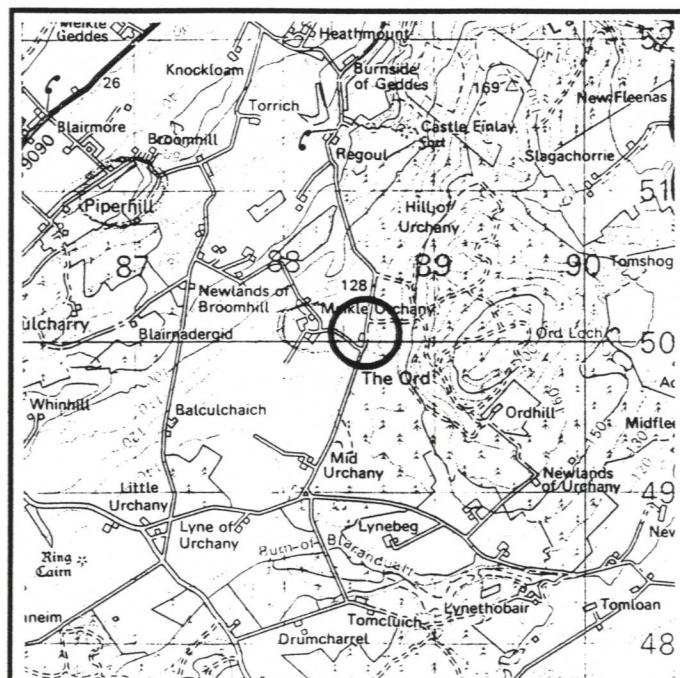
Hazard Rating: 1

Description:

Blocked culvert resulted in overflow from ditches which flooded road.
Cf ARTM report dated 17/7/97

Comments:

Natural hollow requires better drainage outlet.



01/07/97

Nairnside

Easting: 269937

Northing: 837409

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

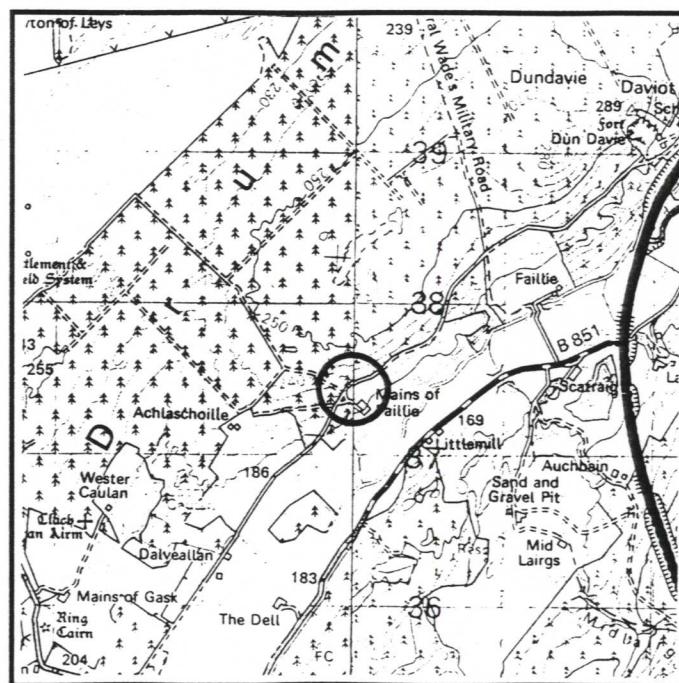
Residential

Hazard Rating: 2

Description:

Following flash floods the roads listed were closed
C17 at Faillie - road washed away at blocked culvert.
C17 at Tordarroch
For further details see ARTM report 18/7/97.

Comments:



16/07/97

Fearn - Rosehall Cottage School Street

Easting: 283173

Northing: 877803

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected:

Commercial

Residential

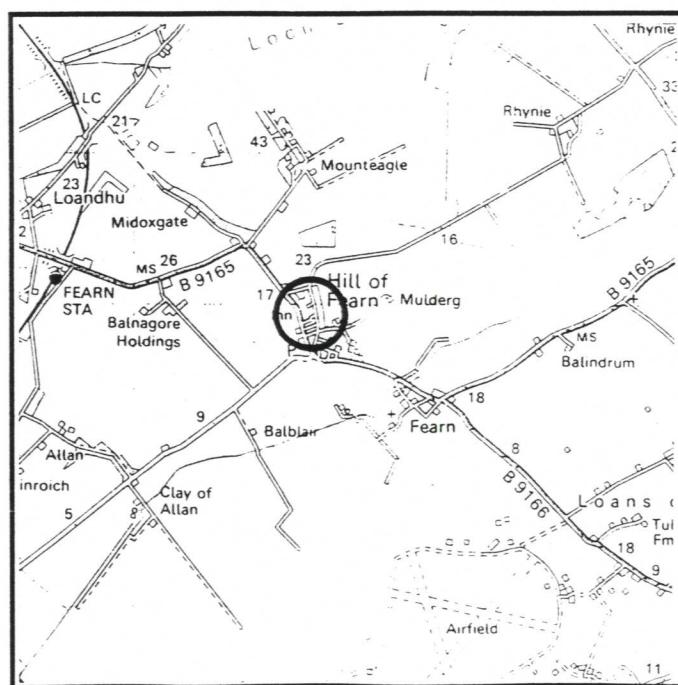
Hazard Rating: 1

Description:

Property lies below adjacent road level and concrete drainage channel has been installed previously in attempt to limit ingress of water from road. Despite this flooding apparently occurred Jan and Oct 1996 as well as on this occasion.(Date approx)

Comments:

Additional gullies to be installed and road surface to be reshaped to direct water away from problem. Works to be undertaken Aug/Sept 97 by ARTM.



23/07/97

Cromarty - 4 Shore Street

Easting: 278900

Northing: 867500

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

Hazard Rating: 1

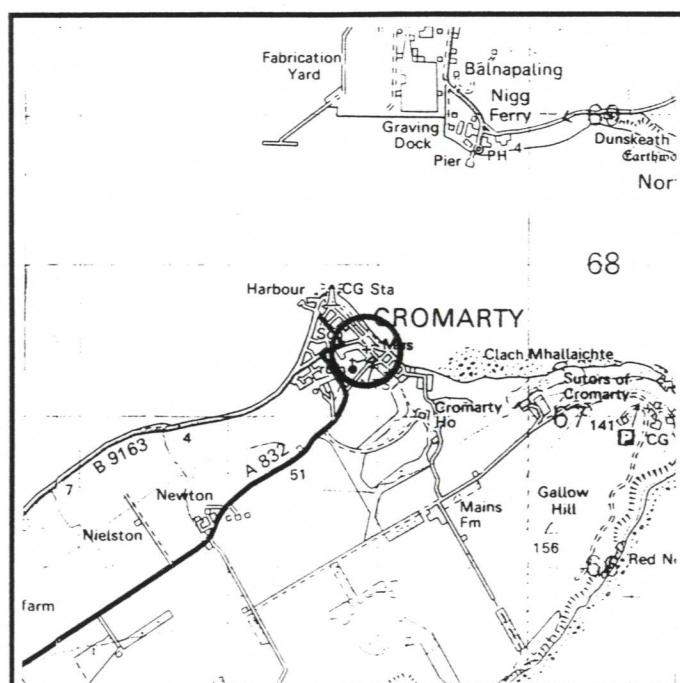
Description:

Surface water rose over lowered kerb and flooded house. Indications that excess water coming from overflowing drainage system. This apparently third such incident. Flooding of kitchen and living room allegedly due to inadequate road drainage. Ongoing problem that has occurred before.

Comments:

Dealt with by ARTM. As at 19/7/97 under discussion with NOSWA in order to determine responsibility and solution.

Understand possible result of poor design of surface levels when adjacent car park surfaced and associated with overflowing drains.



27/07/97

Whaligoe - The Old Mill

Easting: 332140

Northing: 940480

Start: 16:00:00

Extent:

Lineal

Duration: 1

Areal

Properties affected:

Commercial

Residential

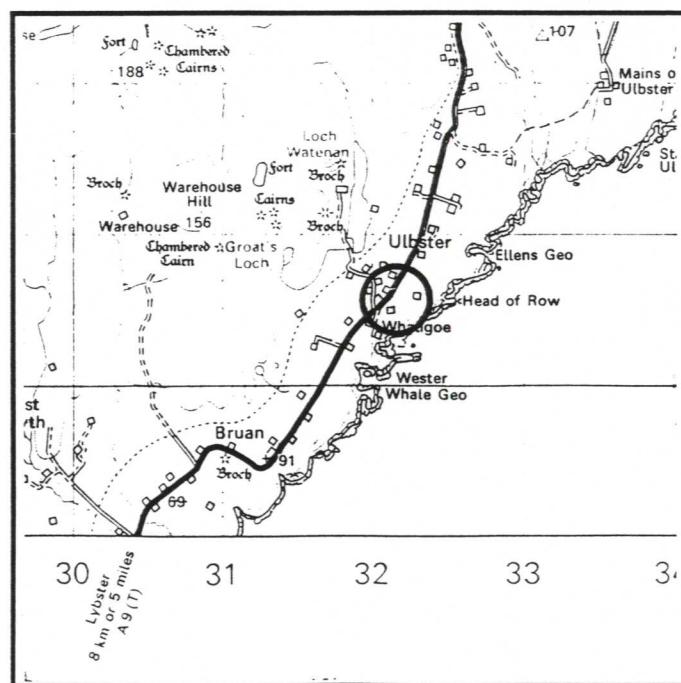
Hazard Rating: 1

Description:

Water from drive entered underneath a door and flooded the kitchen and breakfast room which are below ground level. Water on the drive allegedly came off the A99(T).

Comments:

Cause not established. Drive on high side of superelevated bend so road water unlikely. Drain at 332090 - 940550 suspected.
Drain outlets to be investigated.
Likely to be a land drainage problem.



13/08/97

Allt Sigh

Easting: 245619

Northing: 818947

Start: Extent: Lineal

Duration: 0 Areal

Properties affected: 0 Commercial

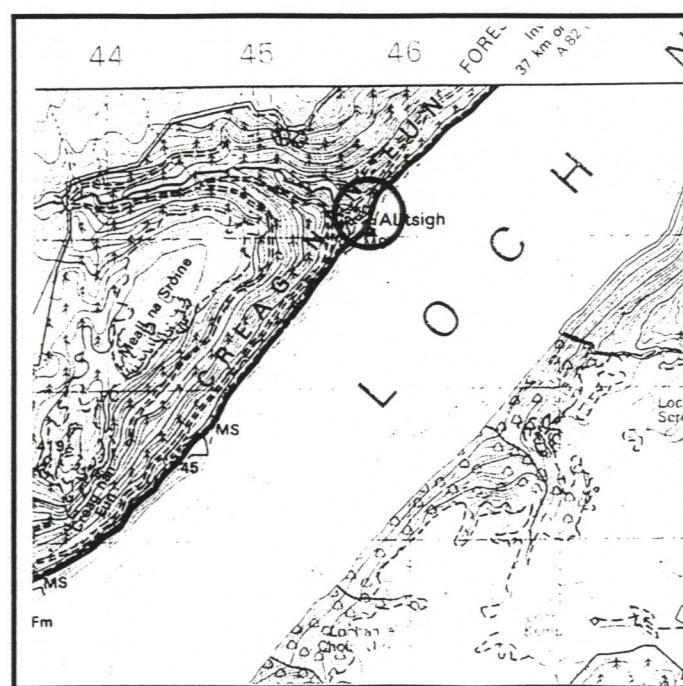
Residential

Hazard Rating: 1

Description:

Bank beneath TR A82 bridge abutment scoured as result of high flows. Some damage to revetment.

Comments:



13/08/97

Drumnadrochit - Lewiston

Easting: 250532

Northing: 828720

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

Hazard Rating: 4

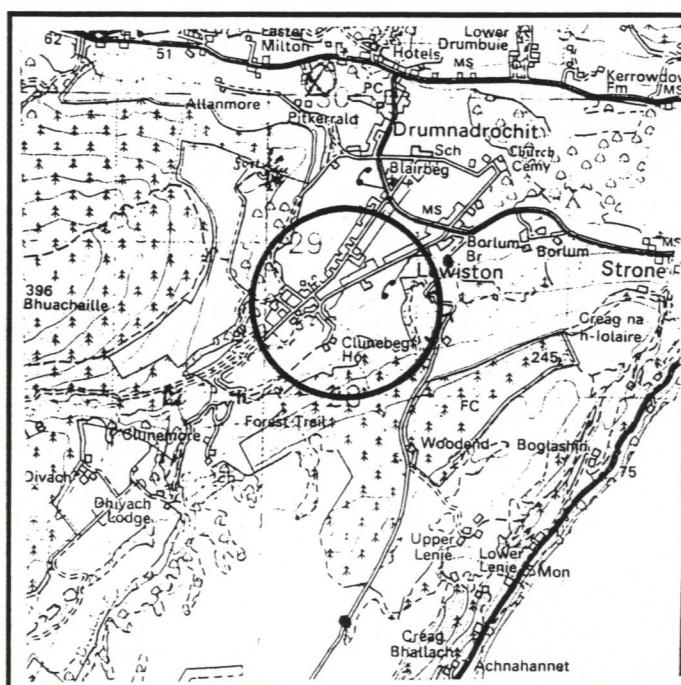
Description:

Flash flood following heavy overnight rain. Garden to rear of Mingulay eroded by force of water. Garden shed lost. Approximately 3.5 metres of garden left between house and straight vertical face of 2.1m forming river bank. Other problem upstream of holiday cottages where bridge over river to Clunebeg. Substantial area of river bank eroded. Holiday cottages now threatened. Bridge to Clunebeg undermined and part collapsed.

Comments:

Future problems to be addressed include tree trunks lying on river bed and large volumes of newly deposited boulders and other debris occupying waterway and thereby lessening its capacity.

Following incident consultant engaged to assess remedial options in short and medium term. Report available October 1997 suggested clearance measures and further study to evaluate the merit of more permanent works.



13/08/97

Invermoriston

Easting: 242010

Northing: 816814

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

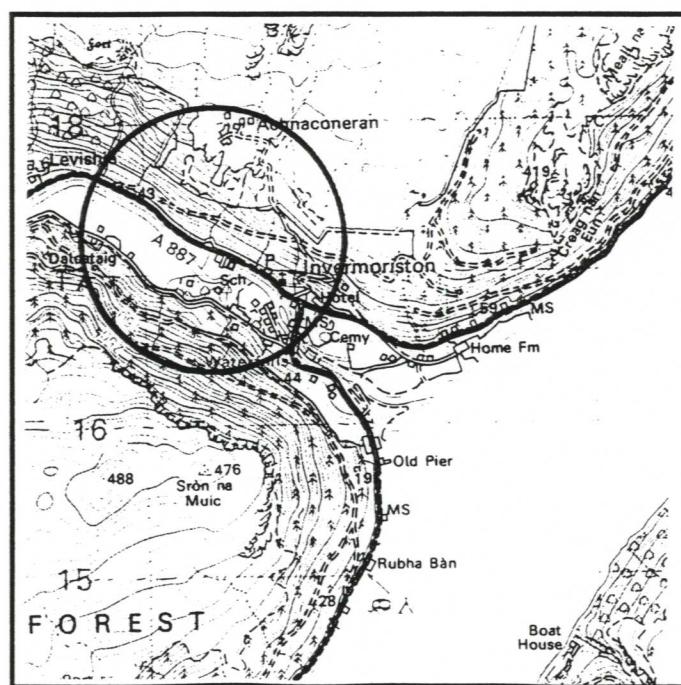
Hazard Rating: 3

Description:

Flash flood brought debris down minor stream beds which blocked culverts under A887 over a 2km length which resulted in debris spilling onto road and blocking it. There was also flood damage to several properties in Invermoriston village including the hotel.

Comments:

Following the incident culverts have been cleared.



Appendix A

Incidents

This Appendix contains details of incidents reported since 26/5/97.

Incidents since 26th May 1997

(as reported upto 15th Nov 1997)

01/07/97

Auldearn - Mill of Boath

Easting: 291800

Northing: 856200

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 1 Commercial

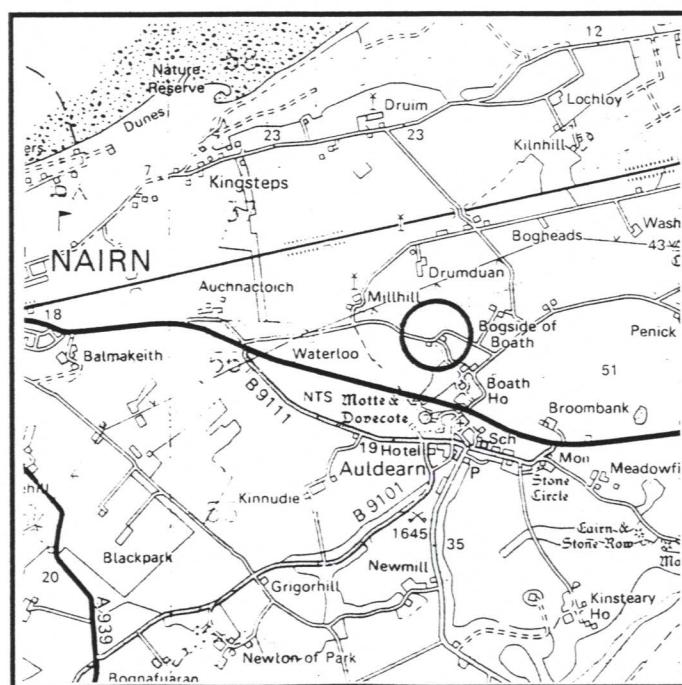
✓ Residential

Hazard Rating: 2

Description:

Property flooded as a result of burn overflowing.
Cf ARTM report dated 17/7/97

Comments:



01/07/97

Auldearn - Newmill

Easting: 291700

Northing: 854500

Lineal

Start:

Extent:

Areal

Duration: 0

Properties affected: 0

Commercial

Residential

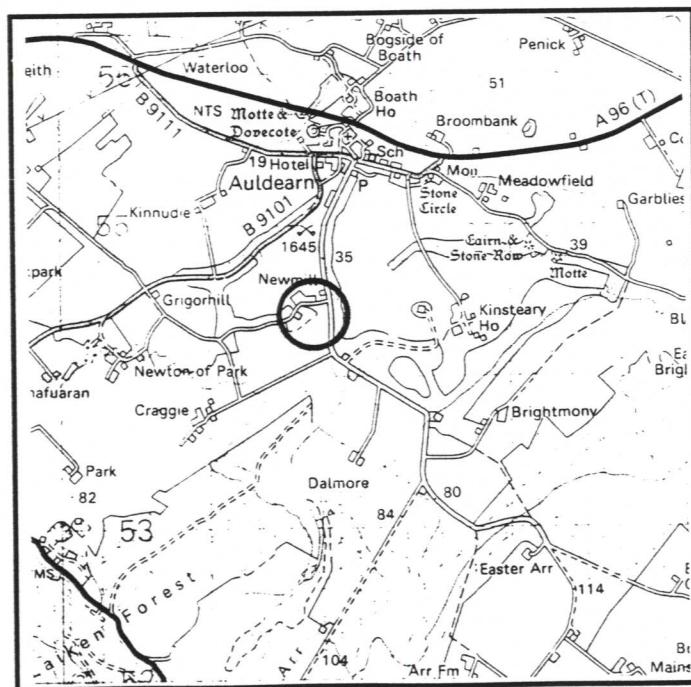
Hazard Rating: 1

Description:

Flooding of fields, road, and property when Auldearn Burn overflowed.
Cf ARTM report dated 17/7/97

Comments:

Overspill culvert which presumably alleviated flooding in the past has been filled in and replaced by smaller pipe. Owner in question to be advised.



01/07/97

Cawdor - Cottage in Piperhill

Easting: 286800

Northing: 851100

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

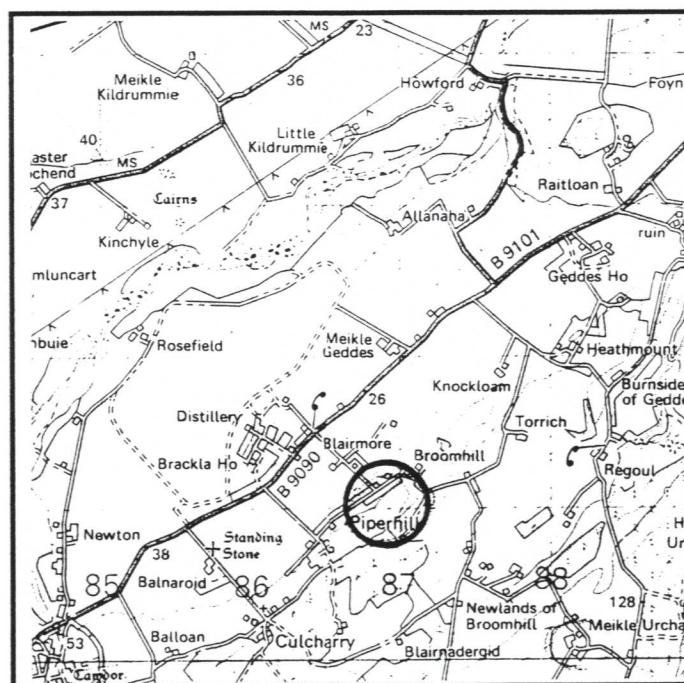
Hazard Rating: 1

Description:

Water flowing off fields opposite cottage crossed road and entered cottage.
Cf ARTM report dated 17/7/97

Comments:

Adjacent gully and soakaway unable to cope with flows; requires improved local drainage.



01/07/97

Cawdor - Kilravock Footbridge

Easting: 281500

Northing: 848800

Lineal

Start: Extent:

Duration: 0 Areal

Properties affected: 0 Commercial

Residential

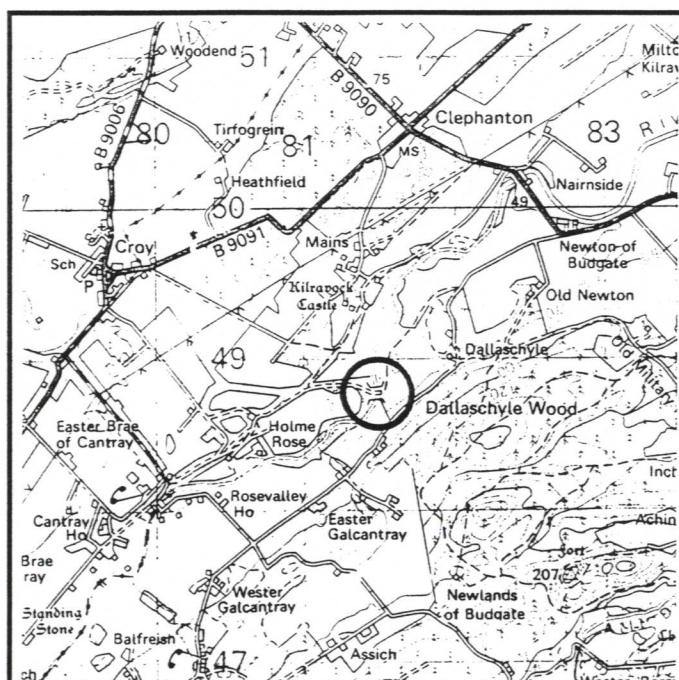
Hazard Rating:

Description:

Bridge washed away by flood waters.
Cf ARTM report dated 17/7/97

Comments:

Private structure which has never been adopted.



01/07/97

Cawdor - Old Pots road

Easting: 297000

Northing: 852000

Start: Extent: Lineal

Duration: 0 Areal

Properties affected: 0 Commercial

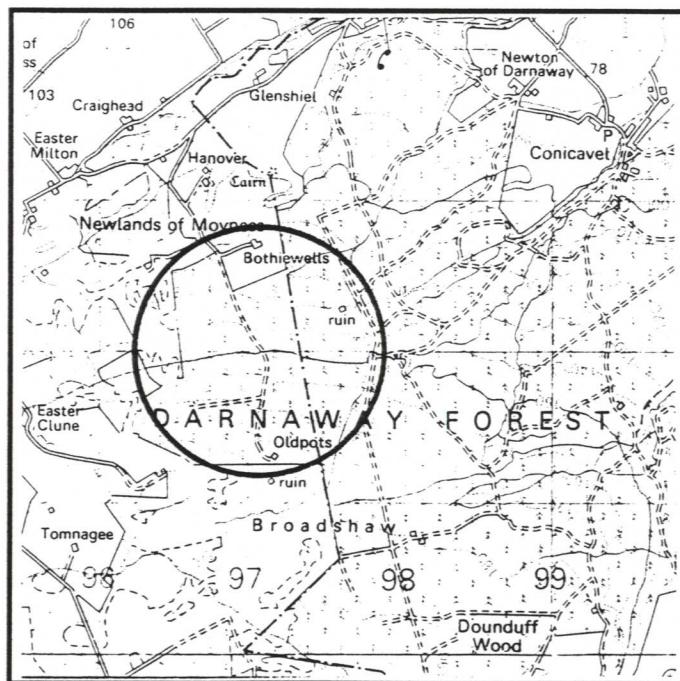
Residential

Hazard Rating:

Description:

Road badly eroded by flood waters since surfaced by unbound material.
Cf ARTM report dated 17/7/97

Comments:



01/07/97

Cawdor - Whitebridge Cottage

Easting: 282500

Northing: 850200

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

✓ Residential

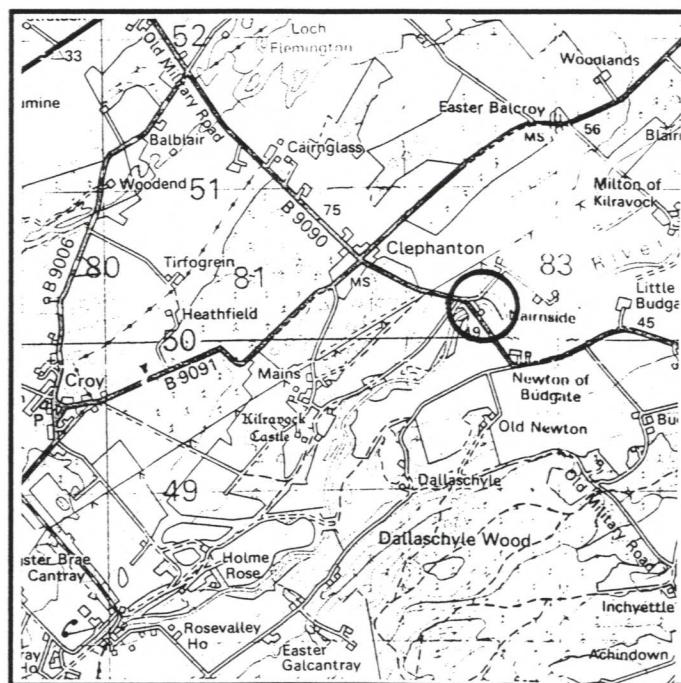
Hazard Rating: 1

Description:

Flooding isolated property following overtopping of adjacent river banks.
Cf ARTM report dated 17/7/97

Comments:

House on river flood plain and bed being built up with gravel thereby reducing waterway.



01/07/97

Drynachan - bridge over Carnoch Burn

Easting: 287100

Northing: 840100

Lineal

Start: Extent:

Duration: 0 Areal

Properties affected: 0 Commercial

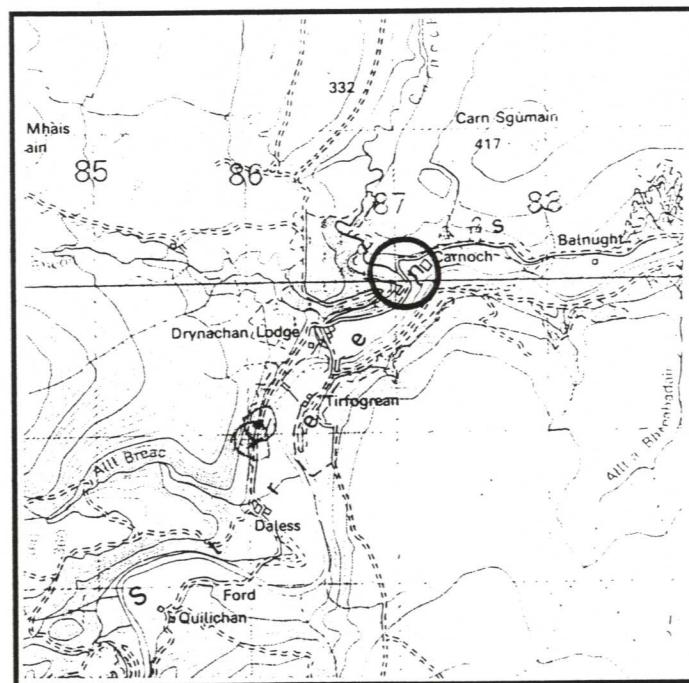
Residential

Hazard Rating: 1

Description:

Invert below bridge pitched with large stones held in place by timber framework and this damaged. Bridge abutments being undermined
Cf ARTM report dated 17/7/97

Comments:



01/07/97

Drynachan - Daless Road

Easting: 286000

Northing: 839000

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

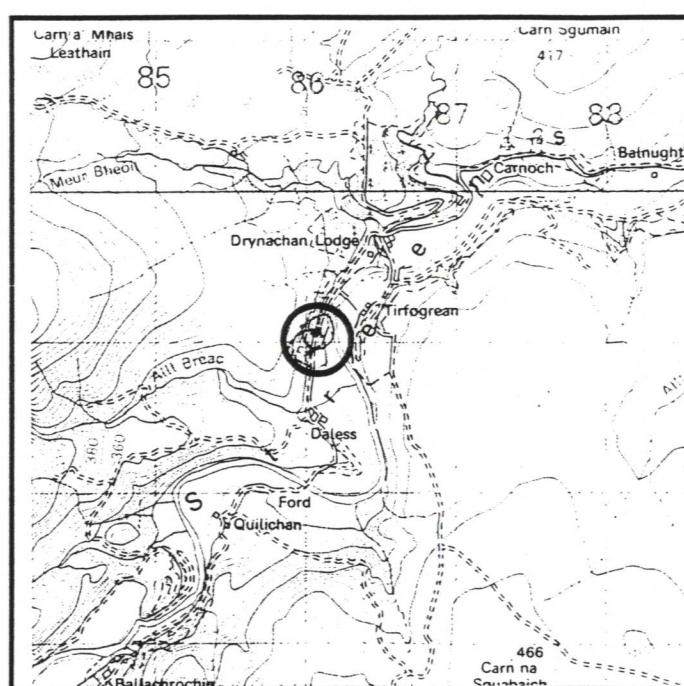
Residential

Hazard Rating: 3

Description:

Landslide in two locations due to flash flood conditions.
Cf ARTM report dated 17/7/97

Comments:



01/07/97

Inverness - Culloden Area

Easting: 270040

Northing: 843854

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected: 0

Commercial

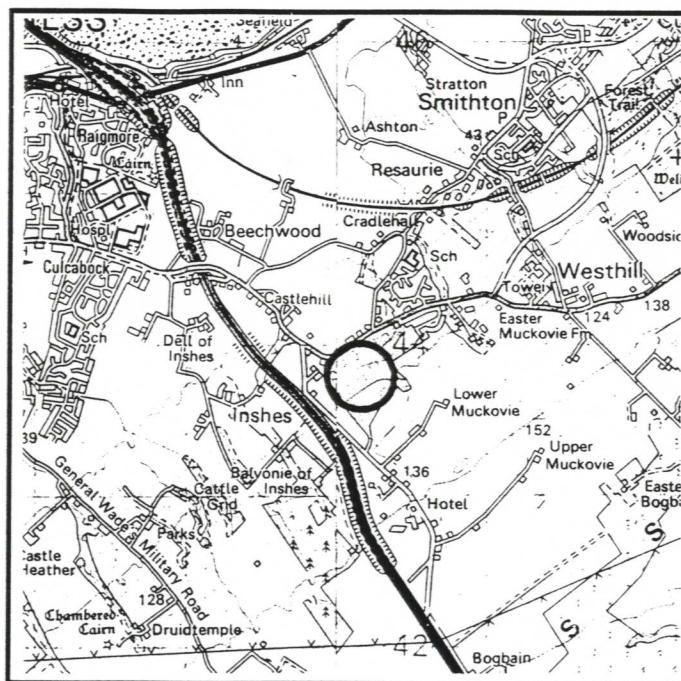
Residential

Hazard Rating: 1

Description:

Flooding occurred at Birchwood Road.
For further details see ARTM report 18/7/97.

Comments:



01/07/97

Inverness - Drumdevan Road

Easting: 266336

Northing: 842378

Lineal

Start: Extent:

Duration: 0 Areal

Properties affected: 0 Commercial

Residential

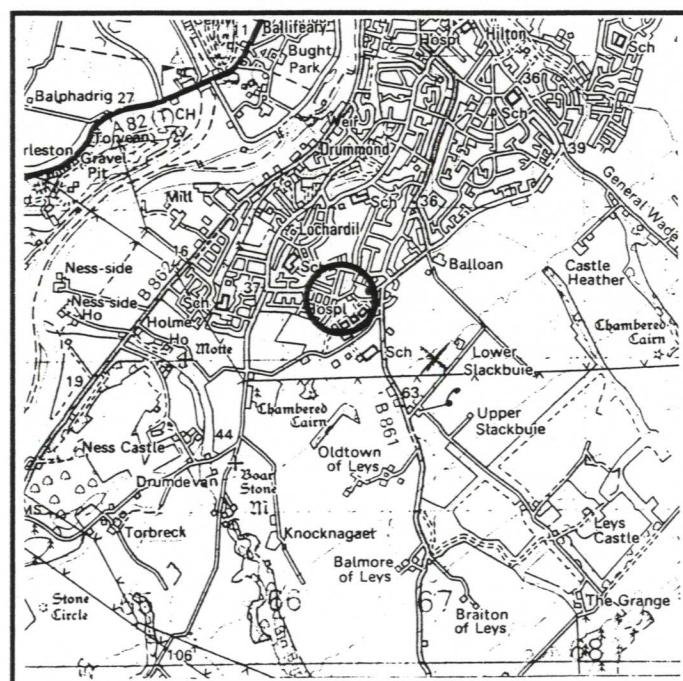
Hazard Rating: 2

Description:

Water overflowed from the Ault na Skiach burn and affected Nos 3 - 33. It crossed gardens and then entered the road drainage system.
For further details see ARTM report 18/7/97.

Comments:

Recurring problem.



01/07/97

Inverness - Falcon Avenue

Easting: 268192

Northing: 843519

Lineal

Start:

Extent:

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

Hazard Rating: 1

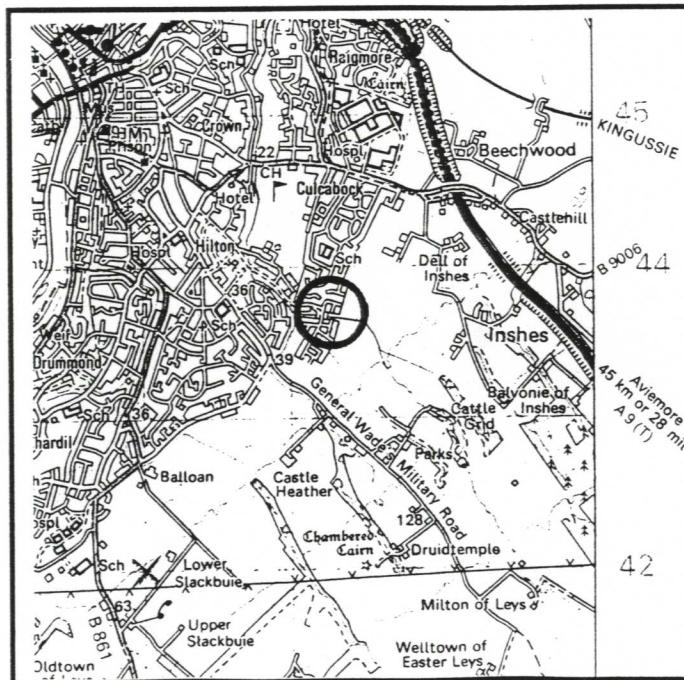
Description:

Culvert grid blocked waterway and there was flooding of adjacent roads.

Volume of water such that despite being cleared grid became blocked again later.

For further details see ARTM report 18/7/97.

Comments:



01/07/97

Inverness - Millburn

Easting: 267736

Northing: 845297

Start:

Extent:

Lineal

Duration: 0

Areal

Properties affected:

Commercial

Residential

Hazard Rating: 5

Description:

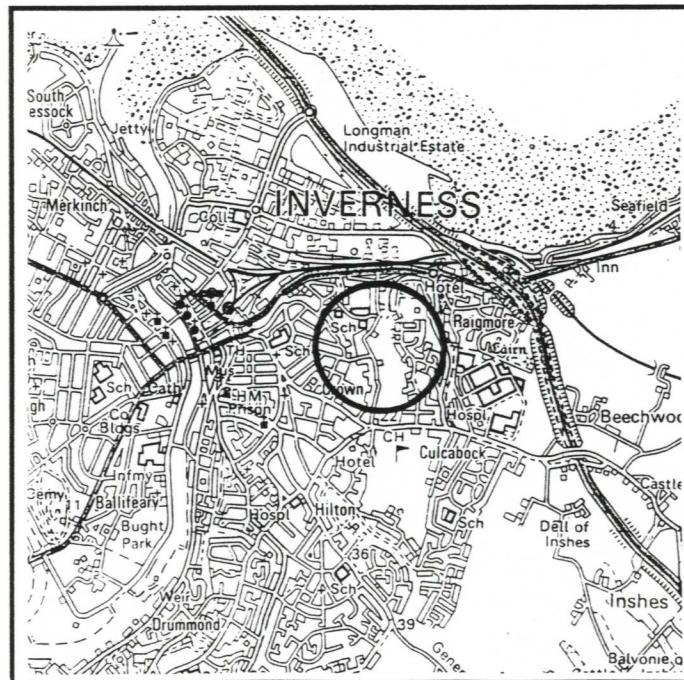
Flash floods resulted in high flows in the Millburn which caused flooding of the golf course and adjacent roads.

There were also problems at the house between Harris Road and Old Mill Road which was flooded; at the houses below the Kingsmill Hotel; at Diriebught Cottage; at Millburn Academy; at the cottages at the lower end of Diriebught Road; and at the recent new houses on Diriebught Road. All being inundated.

For further details see ARTM report 18/7/97.

Comments:

- The burns running through Inverness are all recognised as problematic and
- have been the subject of several studies. Until such time that measures are taken there will be problems.



01/07/97

Inverness - Old Edinburgh Road

Easting: 268157

Northing: 843112

Lineal

Start:

Extent:

Duration: 0

Areal

Properties affected: 0

Commercial

Residential

Hazard Rating: 1

Description:

Ditch became blocked by debris and water flooded Old Edinburgh Road and the surrounding area with the result that the Glasgow Distributor Road was closed.

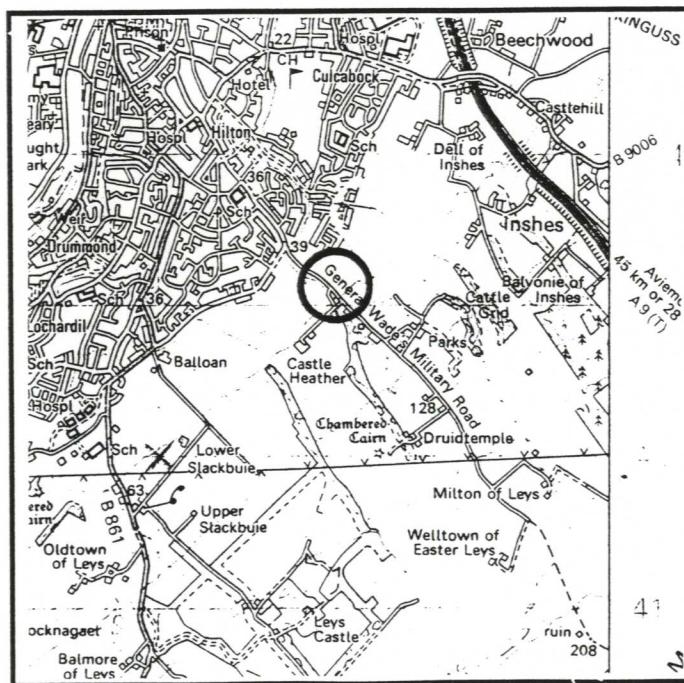
also caused problems at the roundabout on the Inverness Distributor.

In the same area Mason Road and Teal Avenue were also affected by flood

water.

For further details see ARTM report 18/7/97.

Comments:



01/07/97

Nairn - Balmakeith Park Housing Estate

Easting: 289200

Northing: 855900

Lineal

Start: Extent:

Duration: 0 Areal

Properties affected: 0 Commercial

✓ Residential

Hazard Rating: 3

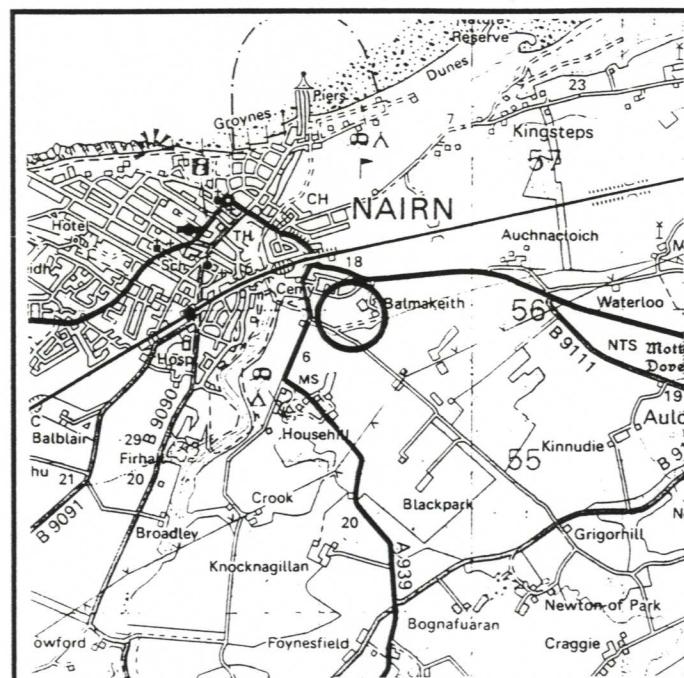
Description:

High levels in Auldearn Burn resulted in flooding of adjacent road and underfloor area of nearby houses.

Cf ARTM report dated 17/7/97

Comments:

Houses built on flood plain of Auldearn Burn and liable to be flooded again in future. See assessment.



Appendix B

Problem areas

This Appendix lists by area those locations regarded as problem sites.

Skye

Broadford
Waterloo Road - flooding at high tides
Dornie
flooding at high tides
Elgol
head of Loch Slapin - road floods at high tide
Glenelg
Moyle - river floods road
Kyle
railway sleepers collapsing on covered watercourse
Portree
Balmoral Road - piped watercourse causing problems
Somerled Square - surcharge flows from manholes
Raasay
formal flood protection scheme required
Sconser area
culverts block with gravel

Ross & Cromarty

Avoch
restricted waterway area combined with tide causing problems
Conon Bridge
School Road - run-off from field floods road
Eel Burn
Dingwall
Police Station area - impermeable ground holding water
Burns Crescent - river floods adjoining properties
Craig Road - tidal problem
Ferry Road
Bridge End / Luncarty Road to Peters Bridge
Fortrose
Watergate - surcharging of pipe network
St Andrews Walk - tidal problem
Kildary
Tarbert Cottages
Muir of Ord
Chapelton Place
Road up from new housing at distillery causing problem
Munlochy
Burn Place - grating regularly blocks causing problem
Strathpeffer
station yard
main culvert in village not big enough
Kinellan Drive - ponding at inlet
Tain
Aldie Burn - flooding garden

Rosemount - new development upstream causing problems
Strathconon
road floods near Scatwell, Little Scatwell, and on back road to Achility
Moy and Orrin Bridges

Caithness

Lybster
problems on northern road associated with new properties
Thurso
flooding at high tides in river mouth
Wick
Hospital Road
flooding at high tides in river mouth

Sutherland

Strath Oykel
A837 road floods at high tide
Bonar Bridge
road floods at high tide
Dornoch
Fleuchary - flooding caused by inadequate ditches to burn outlet
Strath Fleet - agricultural land floods as far as Rogart

Inverness

Ardersier
Beauly
Drumnadrochit
River Coiltie
River Enrick
Fort Augustus
Inverness
Altnaskiach Burn
Cavell Gardens
Clachnaharry Village - flooding at high tides
Diriebught Burn
Douglas Row
Drumdevan Road
Falcon Avenue
Huntly Street
Inshes Burn
Loch Ard Burn
Lochardil Burn
Millburn
Ness Walk
Ness Islands
Smithton
Surcharging of culverts
Tomich

The Rivers Beauly / Ness / Affric / Glass / Nairn / Findhorn also have locations where flooding occurs on a regular basis.

Nairn

Auldearn
Auldearn Burn floods adjoining properties
Cawdor
Littlemill
Nairn

Balmakeith Park Housing Scheme - burn floods adjoining road and properties

Badenoch

The Spey floods throughout its length, but causes especial problems at Aviemore and Kingussie. At Aviemore there is periodic inundation of properties on Dalfaber Road. There are also problems with the drainage system serving the Aviemore Centre. At Kingussie in addition to the problems associated with the Spey affecting the Council yard, waterway restrictions on the Gynack Burn particularly at the railway bridge, give rise to serious problems for the nearby school and the railway track itself.

Lochaber

Acharacle

flooding at Moss and Dorlin subject of consultant's study

Ballachulish

tidal problems,

Caol

Problems when high tide combines with flood flows in River Lochy. Flooding of adjacent roads and properties.

Fort William

swimming pool and leisure centre, Plantation and Achintore all require frequent bed maintenance of hill burns

Bank Street - culvert failing

Glencoe

tidal problems

insufficient capacity in existing drainage system creates surcharges

Glen Nevis

road flooded when river is high

Inverlochy

tidal problems

Kinlochleven

Frequent bed maintenance required to prevent blockages and subsequent flooding

Foyers Road

Mallaig

minor problems

Being exposed to the west Lochaber also experiences problems when wind acting over long fetches creates high amplitude waves which overtop coastal roads in some locations.

Appendix C

Data to be Recorded

In order to keep a realistic yet simple overview of flood related matters within the extensive Council area large amounts of information will need to be collected, collated, and referenced. A certain amount of information has already been collected and is stored within a geo-coded database to aid retrieval and analysis. The types of information thought to be required relate to :-

Catchments

Catchments dictate water quantities and are required to enable flow predictions.
Need to be determined.

Coastal protection schemes

The location and extent of all coastal protection schemes likely to influence flooding need to be recorded.

Constraints

Many incidents occur due to restrictions in available waterway area primarily at culvert and pipe intakes. Details of all constraints to flow need to be recorded and their capacity determined. These may be under Council, other public body, or private control.

Developments

Ongoing completion of developments changes catchment characteristics, and therefore the situation requires predictive research into agreed final layouts, particularly when proposed developments are significant in size, to ensure flow regimes are better rather than worse than existing. Existing, new, and proposed developments will need to be recorded.

Incidents

The Council is obliged to record all flooding incidents and report on these in the biannual reports but they are clearly pertinent to decisions on programming work and need to be recorded.

Land ownership

The Flood Prevention and Land Drainage (Scotland) Act 1997 does not empower Council with rights of access to undertake surveys or assessments. Access arrangements will need to be agreed with adjoining landowners and ownership therefore needs to be recorded.

Land use

Land use patterns require to be established in order to realistically estimate run-off characteristics. Land use changes rapidly and it needs to be monitored.

Photographic records

Photographs both terrestrial and aerial, and possibly those based on satellite imagery are an important aid to visualisation of past events or current situations and need to be suitably archived.

Pipe networks

The location, sizing and condition of pipe networks in urban areas is particularly important and adequate records need to be created and stored.

Prevention schemes

The location and extent of those flood prevention schemes already constructed together with those works undertaken by other parties need to be recorded.

Watercourses

- In open areas the location of watercourses is readily seen, but where these have been enclosed, more likely in urban areas with piped and culverted systems, then locations will need to be mapped and recorded.
- Bank levels for those watercourses with known flood problems will require detailed survey work.

Weather

The Council are discussing the possibility of using Meteorological Office records to determine the significance of storm events. Provision of suitable weather forecasts giving severe weather warnings for especially sensitive areas is also being considered. The information provided will be recorded.

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R H Cuthbertson for HRC Department of Water and Sewerage

Nov 1990

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HMSO

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HMSO

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Dec 1990

Mott MacDonald for HRC Department of Water and Sewerage

NPPG 7 National Planning Policy Guideline

Planning and Flooding

Scottish Office Environment Department

1995

Fort William Study

Review of 1992 Flood

Mott MacDonald for HRC Department of Water and Sewerage

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Local Government and Housing Act 1989

HMSO

Reservoirs Act 1975

HMSO

Southern Inverness Water Basin Management Study

Mott MacDonald for HRC Department of Water and Sewerage

Sep 1990

Glossary

FPO	- Flood Prevention Order
HC	- Highland Council
HMSO	- Her Majesty's Stationery Office
HRC	- Highland Regional Council
NID	- Notice of Intention to Develop
NOSWA	- North of Scotland Water Authority
NPPG	- National Planning Policy Guideline
SCOTS	- Society of Chief Officers of Transportation in Scotland
SEPA	- Scottish Environmental Protection Agency
SNH	- Scottish Natural Heritage
SOAEFD	- Scottish Office Agriculture Environment and Fisheries Department
SODD	- Scottish Office Development Department