Cavan County Council

Report on Drinking Water Contamination Incident

East Cavan Group Water Schemes - 2007

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1.0 Glossary of Terms

DBO Design Build and Operate

CITC Cavan Innovation and Technology Centre, Dublin Road, Cavan

Cognis Cognis Ireland Ltd., Little Island, Co. Cork

CCS Central Chemical Supplies, 44 Hall Road, Donaghcloney, Craigavon, BT667LJ, NI.

Clients Representative T.J.O'Connor Corrig House, Corrig Road, Sandyford, Dublin 18

ENVA Enva Water Treatment, Enva Ireland Ltd., Raffeen Industrial Estate, Ringaskiddy, Co. Cork

GWS Group Water Schemes

HSE Health Service Executive Dublin North East

IBC Intermediate Bulk Container

IPPC Integrated Pollution Prevention and Control

NFGWS National Federation of Group Water Schemes

LA Local Authority

LMC Liaison Monitoring Committee

PAC Poly Aluminium Chloride

PAH Polycyclic Aromatic Hydrocarbons

PSP Private Service Provider

Group Water Schemes

Bunnoe I.F.A., Group Water Scheme Limited, Lattycopple, Cootehill, Co. Cavan.

Kilsherdany Group Water Society Ltd. Known as Kill Group Water Scheme, Tonymnackleduff, Cootehill, Co. Cavan.

Glaslough-Tyholland Group Water Scheme Limited, Drumuck, Stranooden, Co. Monaghan.

Dernakesh Water Scheme Co-Operative Limited, St. Patrick's Hall, Maudabawn, Cootehill, Co. Cavan.

Crosserlough Co-Operative Agricultural Society Limited, Latnacronagh, Crosserlough, Co. Cavan.

2.0 Introduction

This report documents the actions taken by Cavan County Council following the reported contamination of a number of private water supply schemes which took place in East Cavan and Monaghan in early 2007. The Council was first informed of the contamination on 18th April 2007. The incident was dealt with over the following month and was formally concluded on 18th May 2007. Reports prepared by Monaghan County Council and the Health Service Executive on areas within their remit also refer.

3.0 Background

3.1 Regulations and Standards

The Regulations in force at the time of the incident were the European Communities (Drinking Water) Regulations 2007 (S.I. No. 106 of 2007).

Under these Regulations, each sanitary authority (now known as 'water services authority') is the supervisory authority for all drinking water supplies in its area, other than its own. Each water services authority (supervisory authority) is responsible for enforcement of compliance with the Regulations by the water suppliers under its remit, and is obliged to monitor all related drinking water supplies. It also has general powers of direction for the purposes of its functions under the Regulations.

The Environmental Protection Agency is the supervisory authority for the drinking water supplies of each water services authority, and is also required to supervise the performance by sanitary authorities of their monitoring functions under the Regulations. In addition, the Agency may issue directions to sanitary authorities to ensure that they are complying with their supervisory obligations.

The Regulations require all water suppliers to ensure that their water supply is wholesome and clean, and that it meets the requirements of these Regulations, i.e., the various water quality parameters set out in the Schedule. In addition, water suppliers are required to comply with any direction given to them by their supervisory authority for the purpose of preventing, limiting, eliminating or abating any risk to public health in their supply.

The relevant Irish standards were I.S. EN 883:2005 ‘Chemicals used for the treatment of water intended for human consumption – polyaluminium chloride hydroxide and polyaluminium chloride hydroxide sulphate’ and I.S. CR 14629:2001 ‘Chemicals used for the treatment of water intended for human consumption – guidelines for the purchase’.
Both of these standards are advisory.

3.2 Group Water Supply Schemes

Group Water Supply Schemes are private water supply schemes, generally constituted as co-operative societies with consumers also being members. Each scheme is considered a ‘water supplier’ for the purposes of the Regulations. The interests of the group scheme sector are represented nationally by the National Federation of Group Water Schemes of which most schemes are members.
In recent years significant monies have been invested in the group scheme sector in upgrading treatment plants and networks to meet the requirements of the Drinking Water Directive. These works were undertaken using Design, Build and Operate procedures with group schemes coming together to form ‘bundles’ and thus benefit from the economies of scale in securing a Private Service Provider. Each group scheme in the ‘bundle’ has a separate operating contract with the PSP.

4.0 Incident Details

Cavan County Council was first informed of quality issues in a number of group schemes in the East Cavan group scheme ‘bundle’ on the 18th April 2007. Four schemes in Cavan (Bunnoe, Crosserlough, Dernakesh and Kill) and one in Monaghan (Glaslough/Tyholland) were affected. In consultation with the HSE, Cavan and Monaghan County Councils issued a ‘DO NOT USE’ notice to each of the schemes. This notice was issued on 19th April 2007 and was communicated in writing to the five schemes. Details of the notice were also broadcast on local radio for the duration it was in place.
The Regulations enable the water services authority to provide such assistance and support as it considers would be helpful. Because of the involvement of a

number of statutory authorities, agencies and groups, Cavan and Monaghan County Councils (the supervisory authorities) decided that the incident would be best managed through the establishment of an Incident Management Team consisting of representatives from the two Local Authorities, the HSE, the NFGWS, the group water schemes and their technical advisers (See Appendix 1 for members). The first meeting of the Incident Management Team took place in Cavan on April 20th.

At this meeting the PSP confirmed that a batch of PAC (Poly Aluminium Chloride, a coagulant used in the treatment process) supplied to these plants had been identified as the source of the contamination. The particular chemical used was supplied under the name PAC10 to the PSP by Central Chemical Supplies, Craigavon, Northern Ireland. (CCS stated that they did not supply this product, PAC 10, to any other water provider in Ireland at this time).

The meeting decided on the following actions:

- Each GWS to advise all consumers in writing of the requirements of the 'DO NOT USE' notice, in accordance with the Regulations,
- NFGWS to set up emergency/information phone number,
- HSE to advise on criteria for rescinding of 'DO NOT USE' notice,
- Agreed press release / information notice to be issued,
- Alternative water supplies to be made available to all affected consumers,
- Sampling programme to continue until HSE criteria met,
- Incident response team to be established to manage day-to-day issues.

4.1 Alternative Water Supplies

Arrangements were made by Cavan County Council to provide tankers of water for each of the affected group schemes and bottled water was supplied to all consumers free of charge by the PSP. Both these actions commenced on 20th April and lasted until the lifting of the 'DO NOT USE' notice.

4.2 Action Plan

The Regulations require the water services authority, inter alia, within 14 days of receiving an adverse monitoring result in a water supply for which it has

supervisory responsibility to direct the water supplier to prepare an action programme to secure compliance with the Regulations.

Action programmes were formally requested by Cavan County Council from each 'water supplier' (group scheme) on 27th April. These were submitted to Cavan County Council on 2nd May and were approved by letter on 3rd May.

4.3 Incident Response team

An incident response team was established consisting of representatives from the two Local Authorities, the HSE, the NFGWS, the group water schemes technical advisers and the PSP (See Appendix 1 for members). An incident room was set up in Cavan (CITC) from where the incident response team correlated all information and test results and decided on a daily course of action.

4.4 Action Programme Implementation

The core of the submitted action programmes was the replacement of suspect PAC (completed 3rd May) followed by a comprehensive scouring programme to ensure turnover of water at the ends of all the distribution systems.

This was followed by a sampling and analysis programme to confirm compliance with HSE criteria (Appendix 5), the basis of which was the requirement to achieve three clear analysis results for a number of parameters including phenols and Polycyclic Aromatic Hydrocarbons (included because of their association with phenols).

The variety and complexity of the parameters that were tested, the need for testing to low levels and the different matrices involved meant that the analytical process proved to be time consuming. Sourcing a single suitable laboratory within Ireland or the UK for all the analysis undertaken was not possible with the result that analysis was undertaken by a number of laboratories.

Cavan County Council took its first set of samples from the Group Water Schemes on 18th April 2007. A batch of samples taken on 23rd April returned significant levels of PAHs. This sample was sent again for analysis for PAHs on the 29th May 2007 to the same laboratory with no exceedences recorded. The laboratory could not give an explanation for these results. It is speculated that these samples may have been cross contaminated during automated analysis.

Cavan County Council took further samples on 30th April, 3rd May and 8th May. These three sets of samples returned clear results. On 16th May Cavan County Council advised the HSE in writing that all required criteria had been met and sought its agreement to the rescinding of the 'DO NOT USE' notice.
On 17th May the agreement of the HSE was received subject to a number of final precautionary measures. The Group Water Schemes were advised on the 17th May that the notice would be formally rescinded on 18th May. All affected consumers were informed in writing and via local radio.

An analysis of drinking water of other Group Water Schemes operated by the PSP using PAC 10 in the treatment process was undertaken at this time and indicated that there were no exceedences and that the water was fit for human consumption.
Appendix 2 contains a detailed chronology of events.

5.1 The Chemical Supply Chain

The batch of PAC supplied to these plants and identified as the source of the contamination was supplied under the name PAC10 to the PSP by Central Chemical Supplies, Craigavon, Northern Ireland.
It was established that this PAC product originated as a by-product of a treatment process carried out by Cognis Ireland Ltd. at its plant in Little Island, Co. Cork. This by-product is a poly aluminium chloride mixture which Cognis supplied to Enva Ireland who in turn packaged the product and marketed it as Envirofloc CL1000.
Enva then supplied its Envirofloc CL1000 product to Central Chemical Supplies in Northern Ireland. They in turn processed this material by diluting it with deionised water at a rate of 7 parts water to 18 parts Envirofloc CL1000, (280 litres deionised water + 720 litres Envirofloc CL1000 = PAC10) and ultimately supplied it to the PSP. Both Cognis and Enva operate their facilities under Integrated Pollution Prevention Control licences issued by the Environmental Protection Agency.
The PSP initially replaced this product with a new batch of PAC from the same supplier. However, when the origin of this PAC was identified, the PSP

replaced all PAC10 supplies sourced from Central Chemical Supplies with PAC from Albion Chemicals in the UK.

A batch of PAC supplied by CCS and sourced from Chemifloc in Shannon was used in Crosserlough Group Scheme between 23rd and 30th April 2007.

By the time the LA's had been notified the original contaminated product had been removed from the affected treatment works. Samples were taken by the PSP and by LA staff at the CCS depot in Craigavon but these cannot be relied on as representative of the original PAC 10 supplied to the affected plants (See Appendix 3 for analysis results).

5.2 Technical Data

The relevant Irish standards were I.S. EN 883:2005 'Chemicals used for the treatment of water intended for human consumption – polyaluminium chloride hydroxide and polyaluminium chloride hydroxide sulphate' and I.S. CR 14629:2001 'Chemicals used for the treatment of water intended for human consumption – guidelines for the purchase'.

Both of these standards are advisory.

It is normal water industry practice that products used in the production of potable water display an EN number or alternatively carry approval of the British Drinking Water Inspectorate. Although there is an obligation under the 2007 drinking water regulations for a water supplier to ensure that water is "wholesome and clean" there is no explicit requirement in law to comply with either an EN number or DWI list. Each product has its own technical data sheet which outlines the composition of the product and its uses. A technical data sheet for a product called ALUMET supplied by Cognis to Enva indicates that it contains a level of phenol and organics. The technical data sheet furnished by the PSP to Cavan County Council for Envirofloc CL 1000 states that the product is 'useful in the removal of colloidal material from waste streams' and is 'excellent for the coagulation of fine suspended matter both waste and potable water treatment plants'. There is no IS EN number on the data sheet. This data sheet is dated 05/07/04.

A current data sheet for Envirofloc CL 1000, dated 20/04/07, was provided by Enva Ireland. This data sheet specifically states that "this product is not suitable for use in potable water applications, CL 1000 is not Drinking Water

Inspectorate (DWI) approved". When asked for a technical data sheet for their product, CCS produced the technical data sheet for Envirofloc CL 1000 (05/07/04) with 'PAC 10' hand-written on it.

6.0 Public Health Issues

A separate report on the health issues raised by this incident has been prepared by the HSE. The HSE report states that

- No symptoms or illnesses relating to drinking water were reported to the HSE during or since this incident,
- Media reports of mouth irritation and nausea were not confirmed by HSE staff,
- The HSE received no reports of skin irritation or rashes arising from use of contaminated water,
- No unusual patterns of illness or symptoms were reported by General Practitioners in any of the affected GWS areas,
- There were no reports from veterinarians of animal ill health relating to drinking water during this period,

and concludes that the fact that water is unpalatable at very low levels of phenol makes consumption of water in harmful quantities extremely unlikely.

7.0 Conclusions

The contamination of the water supply in the four Group Water Schemes in East Cavan and the one in Monaghan was as a result of a contaminated coagulant (PAC 10) being used in the treatment process. This could have been avoided had the relevant standards, I.S. EN 883:2005 and I.S. CR 14629:2001 been followed.

The identification of the cause of the contamination took approximately two weeks and a further week elapsed before the relevant supervisory authorities were notified. The fact that each Group Water Scheme was not aware of problems in other Group Water Schemes contributed to this delay. This was the first incident of its type to be dealt with by the Local Authorities and the Group Water Scheme sector. Appropriate training of GWS staff could have reduced

this delay and such training is now available from the Water Services National Training Group.

Once notified, Cavan County Council, in consultation with the HSE, took immediate action to protect the health of consumers.

The trans-boundary nature of the incident required the two supervisory authorities to co-ordinate their response to the incident. This was achieved by the establishment of an 'Incident Management Team' consisting of the two Local Authorities, the HSE, the NFGWS, the group water schemes and their technical advisers. Liaison between those involved worked well at all stages of this incident.

This incident highlighted the lack of accredited laboratories in Ireland to test for the compounds causing the contamination in this case.

The HSE report comments that "it was fortunate that exposure to health risks from contaminated drinking water was minimised by low odour and taste threshold of the phenol compounds in the drinking water". Had this not been the case the health of a large number of consumers could potentially have been seriously compromised.

8.0 Recommendations

It is recommended that

- A binding direction should be issued under the Drinking Water Regulations 2007 to require that all chemicals used in the treatment of water intended for human consumption accord with an agreed standard.
- The need for a central laboratory to provide a comprehensive analytical service to water authorities be examined by the National Laboratories Review Group;
- Water service authority and group scheme sectors continue to avail of the incident management training currently available from the WSNTG.

APPENDIX 1

Incident Management Team

Group Water Schemes
Mary O' Reilly, Bunnoe GWS
Edmund McEntee, Bunnoe GWS
Michael Donohoe, Crosserlough GWS
Eamon O' Reilly, Dernakesh GWS
Barney Heery, Dernakesh GWS
Gerry McIntyre, Kill GWS

NFGWS
Sean Clerkin, National Co-Ordinator
Colm Brady, Assistant National Co-Ordinator
Jean Gibson, Quality Assurance Officer
Brian MacDomhnaill, Press Officer

T J O' Connor & Associates, Consulting Engineers
Paid Cassidy,
Niall McCaffrey,

HSE Dublin & North East
Dr. Imelda Lynskey, Senior Medical Officer, HSE
Fergus Barry, Senior Environmental Health Officer, HSE, Cavan

Cavan County Council
Frank Gibbons Director of Services
Peter Gallagher, Senior Engineer, Water Services
John Denning, Senior Executive Engineer, Water Services
Colm O' Callaghan, Senior Executive Chemist, Environment
Tommy Costello, Administrative Officer, Rural Water Liaison Manager

Monaghan County Council
Paul Clifford, Director of Services
Dan Doody, Senior Engineer
Vincent McKenna, Assistant Engineer
John D. Quinn, Environmental Health Officer

Incident Response Team

Cavan County Council
John Denning, Senior Executive Engineer, Water Services
Colm O' Callaghan, Senior Executive Chemist, Environment
Tommy Costello, Administrative Officer, Rural Water Liaison Manager

Monaghan County Council
Dan Doody, Senior Engineer
Vincent McKenna, Assistant Engineer
John D. Quinn, Environmental Health Officer

T J O' Connor & Associates, Consulting Engineers
Paid Cassidy,

Veolia Water Ireland
Helen Clay–Chapman, Response Team Leader, Veolia
Matt Kelly, Veolia Water Ireland
Neasa Harmon, Veolia Water Ireland

HSE Dublin & North East
Fergus Barry, Senior Environmental Health Officer, HSE, Cavan

NFGWS
Colm Brady, Assistant National Co-Ordinator

APPENDIX 2

Chronology

Date	Detail
17/04/07	Liaison Monitoring Committee meeting in Errigal House, Cooteill attended by representatives of Dernakesh, Crosserlough, Bunnoe, Kill and Glasslough GWS, also representatives of NFGWS, representatives of Veolia and TJ O' Connor & Associates (client reps). Issue of Taste & Odour problems was discussed at this meeting.
18/04/07	Cavan County Council became aware of issues re Taste & Odour and possible chemical contamination of supplies. Cavan County Council took samples.
19/04/07	Following consultation with HSE Cavan County Council issued a DO NOT USE notice to Bunnoe, Crosserlough, Dernakesh and Kill GWS. Letters to this effect were delivered by hand to each GWS (letter faxed to Kill GWS). Monaghan County Council issued a similar notice in relation to Glaslough GWS. Notices were broadcast on local radio (Northern Sound).
20/04/07	Removal of Suspected PAC10 (PAC1) and replacement with new batch of PAC10 (PAC2) (ex. CCS NI) at Drumkeery GWS
20/04/07	Meeting in Council Chamber of Incident Management Team involving representatives of Cavan & Monaghan County Councils, HSE, NFGWS, Dept. of Env., TJ O' Connor & Associates, Bunnoe GWS, Crosserlough GWS and Kill GWS. Draft Press Release / Information Notice Drawn Up. Arrangements for alternative water supplies made (tankers and bottles). Emergency/Information Phone Number provided by NFGWS. 3 Clear test protocol discussed. GWS to write to all consumers.
23/04/07	Samples taken by Cavan County Council.
24/04/07	Samples taken by Cavan County Council.
24/04/07	Results of samples taken by CCC 18/04/07 received – clear.
25/04/07	Incident Management Team Meeting - Presentation by Veolia.
27/04/07	HSE issue criteria for rescinding of DO NOT USE notice.
27/04/07	Cavan County Council write to each GWS requesting that an action plan be drawn up outlining programme of works to ensure necessary remedial action is taken to restore quality of water to meet required standards. Records of incident to be maintained.
27/04/07	Incident Management Team meeting. Veolia Water had set up meetings with each individual GWS over weekend to work on action plans.
27/04/07	Results of samples taken by CCC 23/04/07 received – Not clear

	(elevated PAH levels). All schemes contacted by phone and informed of this as were NFGWS.
30/04/07	Meeting of Incident Response team CITC. Veolia's Results circulated.
30/04/07	Visit by CCC personnel to CCS NI
30/04/07	Replacement of PAC10 (PAC2) with new batch of PAC (PAC3) (ex. Albion Chemicals UK) at Billis-Lavey, Bunnoe, Crosserlough, Dernakesh and Kill GWS
01/05/07	Meeting of Incident Response Team in CITC. Draft Action Plans discussed. Update on sampling and results.
01/05/07	Questions & Answers Sheet issued by Veolia Water to GWS.
03/05/07	Replacement of PAC10 (PAC2) with new batch of PAC (PAC3) (ex. Albion Chemicals UK) at Drumkeery, Glasslough and Mountain Lodge GWS
02/05/07	Meeting of Incident ResponseTeam in CITC. Draft Action Plans submitted to Cavan County Council. Update on sampling and results.
02/05/07	Incident Management Team meeting. Approval to initiate action plans given.
03/05/07	Results of samples taken by CCC 24/04/07 received – clear.
08/05/07	Third sample taken by Cavan County Council jointly with Veolia.
11/05/07	Meeting of Incident Response Team. Update on sampling and results.
16/05/07	Meeting of Incident Response Team. Three clear samples criteria met. CCC to correspond with HSE with a request to have DO NO USE notice rescinded.
16/05/07	Letter issued by Cavan County Council to HSE outlining three clear samples and advising that CCC proposed to rescind DO NOT USE notice.
17/05/07	HSE issue response to CCC agreeing to rescinding of DO NOT USE notice subject to final precautionary measures. GWS notified by phone that CCC would be rescinding notice on 18/05/07.
18/05/07	Notice sent to each of 4 affected Cavan GWS by CCC advising them that DO NOT USE notice had been rescinded. Notice also broadcast on local radio.
23/05/07	Meeting of Incident Response Team. Update on Glaslough GWS and discussion on residual alum situation.

APPENDIX 3

East Cavan Water Scheme

Date Sampled: 18/04/07

Number of samples: 4

Location of samples:

Scheme	Location	Sample Number
Dernakesh	Maudabawn reservoir	0721/0542
Kill	Kill national school	0721/0543
Bunnoe	Bunnoe school	0721/0544
Crosserlough	Post office	0721/0545

Parameters Analysed:

- PAH
- Total Phenols by HPLC
- Antimony
- Arsenic
- Chromium
- Copper
- Formaldehyde
- Phenols by MS
- Semi Volatile Organics plus TICS

Results: 1 exceedence

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Dernakesh	Maudabawn reservoir	0721/0542	**Antimony**	**11ug/l**	**10ug/l**

Dernakesh GWS was sampled again on the 14/05/2007. Antimony was below the MAC the result was <1ug/l.

East Cavan Water Scheme

Date Sampled: 31/03/07 This sample was taken by the group scheme. The sample was given to Cavan County Council and sent for analysis on receipt of the sample, on the 23rd April 2007.

Number of samples: 1

Location of samples:

Scheme	Location	Sample Number
Dernakesh	Reservoir	0721/0555

Parameters Analysed:

- PAH
- Formaldehyde
- Semi Volatile Organics plus TICS

Results:

Exceedences

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Dernakesh	reservoir	0721/0555	**Benzo(a) pyrene**	**97ng/l**	**10ng/l**
Dernakesh	reservoir	0721/0555	**PAHs**	**286ng/l**	**100ng/l**

There were also high levels of other PAHs found, but these do not have MAC values.

- **This sample was sent again for analysis for PAHs on the 29th May 2007 to the same laboratory, Alcontrol, and there were no exceedences recorded. The laboratory could not give an explanation for these results**

- **A final portion of this sample was sent for analysis to Mountainheath laboratories in England. The limit of detection for the individual PAHs was higher at 20ng/l, and though no exceedences for the 4 specified compounds were recorded there was 100ng/l level of Naphthalene recorded, indicating the presence of PAHs.**

REPEAT ANALYSIS

East Cavan Water Scheme

Date Sampled: 31/03/07

Number of samples: 1

Location of samples:

Scheme	Location	Sample Number
Dernakesh Reservoir	Reservoir **(Test Repeated)**	0721/0696(actually 0721/0555)

Parameters Analysed:

- PAH EPA

Results:
No exceedences

REPEAT ANALYSIS

East Cavan Water Scheme

Date Sampled: 31/03/07

Number of samples: 1

Location of samples:

Scheme	Location	Sample Number
Dernakesh Reservoir	Reservoir **(Test Repeated)**	0721/0555 Sent to Mountainheath labs

Parameters Analysed:

- PAH EPA

Results:

- **A final portion of this sample was sent for analysis to Mountainheath laboratories in England. The limit of detection for the individual PAHs was higher at 20ng/l, and though no exceedences for the 4 specified compounds were recorded there was 100ng/l level of Naphthalene recorded indicating the presences of PAHs.**

East Cavan Water Scheme

Date Sampled: 23/04/07

Number of samples: 5

Location of samples:

Scheme	Location	Sample Number
Bunnoe	Reservoir	0721/0556
Bunnoe	Drum (Farmhouse)	0721/0557
Kill	kill church	0721/0558
Dernakesh	Maudabawn (Gallonray House)	0721/0559
Crosserlough	House in Drumcassidy	0721/0560

Parameters Analysed:

- PAH EPA
- Formaldehyde
- Semi Volatile Organics plus TICS

Results:

Exceedences

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Bunnoe*	Drum (Farmhouse)	0721/0557	**Benzo(a) pyrene**	**11ng/l**	**10ng/l**
Kill*	kill church	0721/0558	**PAHs**	**276ng/l**	**100ng/l**

- **Both these samples were identified as having decanes present**
- **All samples with the exception of 07210556 had high levels of particular PAHs, but these particular PAHs do not have MAC values**

REPEAT ANALYSIS

East Cavan Water Scheme

Date Sampled: 23/04/07 See note on originals samples

Number of samples: 4

Location of samples:

Scheme	Location	Sample Number
Bunnoe	Reservoir **(Test Repeated)**	0721/0695
Bunnoe	Drum Farmhouse **(Test Repeated)**	0721/0694
Kill	kill church **(Test Repeated)**	0721/0693
Crosserlough	House in Drumcassidy **(Test Repeated)**	0721/0692

Parameters Analysed:

- PAH EPA

Results:
No exceedences

East Cavan Water Scheme

Date Sampled: 24/04/07

Number of samples: 5

Location of samples:

Scheme	Location	Sample Number
Kill	Drumhurt	0721/0569
Dernakesh	Maudabawn (Post office)	0721/0570
Bunnoe	Lisbree	0721/0571
Crosserlough	Aughnagegra	0721/0572
Mountain lodge	Knocknashammer	0721/0573

Parameters Analysed:

- Volatile Fatty Acids
- Alcohols/Acetates
- PAH
- Phenols by MS
- Semi Volatile Organics plus TICS
- Volatile Organic Compounds plus TICS
- Aluminium Low level
- Acetone

Results:

Exceedences

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Crosserlough	Aughnagegra	0721/0572	**Aluminium**	**1127ug/l**	**200ug/l**

East Cavan Water Scheme

Date Sampled: 15/04/07 - This sample was taken by the group scheme and sent for analysis on receipt on the 26th April 2007.

Number of samples: 1

Location of samples:

Scheme	Location	Sample Number
Dernakesh	Shalveys	0721/0579

Parameters Analysed:

- Phenols by MS
- Aluminium

Results:
No exceedences

East Cavan Water Scheme

Date Sampled: 30/04/07

Number of samples: 5

Location of samples:

Scheme	Location	Sample Number
Bunnoe	M.Fitzpatrick,No 7 Miltbroe Crescent	0721/0591
Kill	T.Brady, Carnabeagh	0721/0592
Dernakesh	P.O. Maudabawn	0721/0593
Mountain lodge	Canningstown P.O.	0721/0594
Crosserlough	Belans Graddum	0721/0595

Parameters Analysed:

- DRO + Mineral oil by GC
- DRO Interpretation
- PAH EPA
- Phenols by MS
- Semi Volatile Organics plus TICS
- Speciated Phenols by HPLC
- Aluminium

Results:

Exceedences

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Kill	T.Brady, Carnabeagh	0721/0592	**Aluminium**	**270ug/l**	**200ug/l**

East Cavan Water Scheme

Date Sampled: 03/05/07

Number of samples: 10

Location of samples:

Scheme	Location	Sample Number
Bunnoe	No 7 Miltbroe Crescent	0721/0610
Bunnoe	Reservoir	0721/0611
Kill	M. Gogerty	0721/0612
Kill	Reservoir	0721/0613
Dernakesh	P.O. Maudabawn	0721/0614
Dernakesh	Reservoir	0721/0615
Drumkeery	Cannaragh P.O.	0721/0616
Crosserlough	Noel McCabe, Latnadronagh	0721/0617
Crosserlough	Reservoir	0721/0618
Billis/Lavey	J.P.Bishop Latnadronagh	0721/0619

Parameters Analysed:

- BTEX
- PAH EPA
- Semi Volatile Organics plus TICS
- THM Suite Potable
- Speciated Phenols by HPLC
- Total Phenols by HPLC
- Dissolved Aluminium Low Level

Results:

No exceedences

East Cavan Water Scheme

Date Sampled: 08/05/07

Number of samples: 12

Location of samples:

Scheme	Location	Sample Number
Crosserlough	Fosters Aughadronag	0721/0631
Crosserlough	Kilnacrott	0721/0632
Crosserlough	Boylans Derrylahan	0721/0633
Kill	Mr Lynch Drumerkillew	0721/0634
Kill	Mr Cooney, Drumsernney	0721/0635
Kill	Mr T Farrell, Annalee	0721/0636
Bunnoe	Gillesphys	0721/0637
Bunnoe	T. Slowley, Eanagh	0721/0638
Bunnoe	E.Mc. Entee, Lisbree	0721/0639
Dernakesh	Gallonaray house	0721/0640
Dernakesh	J.Mc Dermot Mullan	0721/0641
Dernakesh	N,Shalvey, Corranurnuey	0721/0642

Parameters Analysed:

- BTEX
- PAH EPA
- Semi Volatile Organics plus TICS
- THM Suite Potable
- Speciated Phenols by HPLC
- Total Phenols by HPLC
- Dissolved Aluminium Low Level

Results:

Exceedences

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Crosserlough	Fosters Aughadronag	0721/0631	**Aluminium**	**249ug/l**	**200ug/l**
Crosserlough	Kilnacrott	0721/0632	**Aluminium**	**906**	**200**
Crosserlough	Boylans Derrylahan	0721/0633	**Aluminium**	**214**	**200**
Dernakesh	N,Shalvey, Corranurnuey	0721/0642	**Aluminium**	**326**	**200**

Note: Phenol was found in one sample (0721/0635) but this was not above the MAC

East Cavan Water Scheme

Date Sampled: 14th May 2007

Number of samples: 1

Location of samples:

Scheme	Location	Sample Number
Dernakesh	Gallonray House	

Aluminium exceedence 209ug/l
Parameters Analysed:

Aluminium
Iron
Manganese
Lead
Antimony

Results:

Exceedences

Scheme	Location	Sample Number	Exceedence Parameter	Concentration	Maximum Admissable Concentration
Dernakesh	Gallonray House		**Aluminium**	**209**	**200**

Treatment chemicals PAC samples

East Cavan Water Scheme

Date Sampled: 24/07/07

Number of samples: 7

Location of samples:

Scheme	Location	Sample Number
Dernakesh GWS	PAC sample IBC	0721/0879
Crosserlough GWS	PAC sample IBC 15	0721/0880
	PAC sample Unused IBC 22	0721/0881
	PAC sample Unused IBC 26	0721/0882
Mountain Lodge GWS	PAC sample IBC 43	0721/0883
Billis/Lavey GWS	PAC sample IBC 53	0721/0884
Drumkerry GWS	PAC sample IBC 57	0721/0885

Parameters Analysed:

DRO
BTEX
PAH EPA (16)
Semi Volatile Organics plus TICS
Speciated Phenols
Nonyl phenol
Acetic acid

Results:

Levels of the following compounds were found in this sample

	0721/0879 ug/l	0721/0880 ug/l	0721/0881 ug/l	0721/0882 ug/l	0721/0883 ug/l	0721/0884 ug/l	0721/0885 ug/l
Diesel range organics	13000	12000	35000		8400	3900	19000
Benzene	0.2		0.5				
M- &p-xylene		0.3	0.3				
2,3,4,6,-tetrachlorophenol	0.8						
2,3,4 trichlorophenol	0.42						
2,3,5,6 tetrachlorophenol	2.1						
2,4,5 trichlorophenol	0.77						
2,4,6 trichlorophenol	0.88	0.45			2.4	0.68	1.8
toluene	5.2	111	2.9	14.9	13.8	14.3	22
Nonylphenol	13	14	16	660	11	19.0	9.5
Naphthalene							
2, chlorophenol	1.5	0.99	1.20	0.34	2.90	3.00	1.9
o-cresol (2-methylphenol)	0.73	0.61	1.10	0.45	1.10	1.90	0.58
p-cresol (4-methylphenol)	3.4	2.4	6.6	1.30	4.40	13.0	2.3
phenol	6400	5400	6400	3900	5400	5000	4300
bis(2-chloroethoxy)methan							
di-n-butyl phthalate	0.37	0.29	0.71	0.65	0.7	0.31	0.27
acetic acid	5600	5200	5200	6400	5900	5900	5600
Bis(2-ethylhexyl) phthalat	1.00	0.62	13.0	2.6	3.5	0.56	0.5

Findings

- The PAC samples physically examined by Cavan County Council were not uniform in appearance or odour suggesting a variety of different contaminants.

- The PAC (Poly Aluminium Chloride) samples analysed had levels of Phenols, Nonyl phenol and its derivatives, Toluene and Acetic acid.

- The PAC was contaminated with Diesel Range Organics and a variety of other organic compounds suggesting secondary contamination, possibly as a result of contaminated IBCs which may have been used previously for the disposal of petrol, oil, diesel, creosote or other organic substances.

- Drinking water results are inconclusive. By the time the majority of samples were taken the contaminated PAC was no longer being used, however, one set of samples did show significant levels of PAHs (Poly Cyclic Aromatic Hydrocarbons) present.

- It is concluded that there were levels of Phenol, nonyl phenol and its derivatives, Toluene and Acetic acid and their chlorinated products in the drinking water arising from the use of contaminated PAC.

- It is also possible that there were Diesel Range Organics and PAHs in the drinking water arising from secondary contamination.

APPENDIX 4

Water Treatment Process:

The treatment process at each of the four plants in Cavan comprises of coagulation and flocculation, dissolved air flotation (DAF), biological active filtration (BAF) and disinfection. The following paragraphs describe the process in more detail.

Firstly the raw water is dosed with Poly Aluminium Chloride (PAC) to enhance coagulation, with the dosed water then entering the flocculation tank. The PAC dosing adjusts automatically according to the flow rate with the actual dose rate per unit of flow manually set by the operator.

Flocculated water then gravitates to the DAF where it enters the bubble contact zone. Here, microscopic air bubbles are introduced which attach themselves to the flocs, floating them to the surface for subsequent removal. The floated scum is scraped over a beach located at the top water level of the DAF unit into a collection launder.

The clarified water is then dosed with Caustic Soda which raises the pH before it gravitates to the BAF. The Caustic Soda adjusts automatically according to the flow rate with the actual dose rate per unit of flow manually set by the operator. The BAF comprises of a tank with a media bed, with approximately 20% of the media formed from manganese dioxide.

Filtered water is then disinfected by dosing with Sodium Hypochlorite. The Sodium Hypochlorite dosing adjusts automatically according to the flow rate with the actual dose rate per unit of flow manually set by the operator.

Sludge at all treatment works is collected by tanker from the sludge holding tank. Remote outstations are connected via low powered radio to the Plant PLC's. A dial-up facility on the public system telecom network connects the individual PLC's with Veolia's central control station. The hours of operation of all plants are less than the minimum requirement to meet the design flow within 22 hours of operation.

A brief description of each of the affected plants in Cavan, including photos of each plant, is provided below.

BUNNOE GWS SOCIETY LTD.

Bunnoe Treatment Plant

Number of Houses: 160
Type of Source: Surface
Type of Treatment: Coagulation, Flocculation, Dissolved Air Flotation, Biological Active Filtration, Chlorination
Design output: 400m³/day
Current Status: Commissioned
Final Completion Date: 21/10/05

The raw water supply for this scheme is drawn from Killynenagh Lough. The treatment works site is located on the banks of the Lough in the townland of Killynenagh. A completely new treatment works site and building was constructed and comprehensive treatment plant installed within the building. The site was developed at the location of the old intake. The various processes of the plant installed are coagulation/flocculation, Dissolved Air Flotation, Biological Active Filtration and Chlorination. The treated water is pumped to the schemes service reservoir also located in Killnenagh a distance of 1100m away. The existing old rising main to this reservoir was replaced as part of this contract. The structurally unsafe existing reservoir was also demolished and a new one constructed as part of this contract. The treatment plant has a capacity of 400m³/day.

KILSHERDANY GWS SOCIETY LTD.

Kill Treatment Plant with service reservoirs just visible on hill to the right of building

Number of Houses: 95
Type of Source: Surface
Type of Treatment: Coagulation, Flocculation, Dissolved Air Flotation, Biological Active Filtration, Chlorination
Design output: 500m³/day
Current Status: Commissioned
Final Completion Date: 21/10/05

The raw water supply for this scheme is drawn from Black Lough. The treatment works site is located on the banks of the Lough in the townland of Drumhurt. A completely new treatment works site and building was constructed and comprehensive treatment plant installed within the building. The site was developed at the location of the old intake. The various processes of the plant installed are coagulation/ flocculation, Dissolved Air Flotation, Biological Active Filtration and Chlorination. The treated water is pumped to the schemes service reservoir also located in Drumhurt a distance of 350m away. A new reservoir was constructed alongside the existing as part of this contract. The treatment plant has a capacity of 500m³/day.

CROSSERLOUGH GWS CO-OPERATIVE SOCIETY LTD.

Crosserlough Treatment Plant

Mobile Treatment Plant

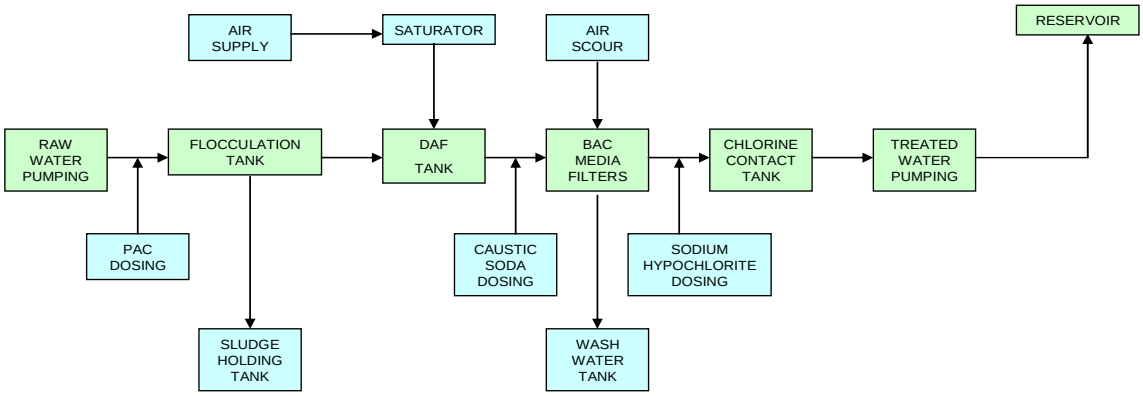
Number of Houses: 546
Type of Source: Surface
Type of Treatment: Coagulation, Flocculation, Dissolved Air Flotation, Biological Active Filtration, Chlorination
Design output: 1,700m³/day
Current Status: Commissioned
Final Completion Date: 01/09/05

The raw water supply for this scheme is drawn from Graddum Lough. Raw water is pumped from the lake to the treatment works site located a distance of 900m away in the townland of Graddum. The existing treatment plant at this site was not capable of supplying treated water complying with the Drinking Water Regulations. A new treatment plant consisting of flocculation, Dissolved Air Flotation, Biological Active Filtration and Chlorination was therefore installed. A mobile treatment plant was used while the treatment process at the plant was changed over. The treated water is pumped to the schemes service reservoirs located in Latnadronagh a distance of 500m. The treatment plant has a capacity of 1700m³/day.

DERNAKESH GWS CO-OPERATIVE SOCIETY LTD.

Number of Houses: 187
Type of Source: Surface
Type of Treatment: Coagulation, Flocculation, Dissolved Air Flotation, Biological Active Filtration, Chlorination
Design output: 375m³/day
Current Status: Commissioned
Final Completion Date: 01/09/05

The raw water supply for this scheme is drawn from Barnagrow Lough. An existing treatment building and plant already existed on the banks of the Lough located in the townland of Moylett. The existing treatment plant at this site was not capable of supplying treated water complying with the Drinking Water Regulations. A new treatment plant consisting of flocculation, Dissolved Air Flotation, Biological Active Filtration and Chlorination was therefore installed. A mobile treatment plant was used while the treatment process at the plant was changed over. The treated water is pumped to the schemes service reservoirs also located in Latnadronagh a distance of 500m. The treatment plant has a capacity of 375m³/day.



EAST CAVAN PROCESS FLOW DIAGRAM

APPENDIX 5

HSE Criteria for rescinding of DO NOT USE notice:

It was agreed that only when 3 successive samples of drinking water were proven to be clear of contaminants would the water be cleared for normal use. The samples must be:

- Taken at least 24 hours apart
- Taken from suitable sampling points and
- Tested by an accredited laboratory to confirm the absence of any products arising directly or indirectly from the possible contaminants