

POOR DRINKING WATER QUALITY IN PRIVATE WELLS: THE EFFECTIVENESS OF A COMMUNICATION STRATEGY

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Significant improvements in the quality of drinking water supplied by public water supplies and community run group water schemes have been documented in successive EPA reports on the Provision and Quality of Drinking Water. These reports show a 90% reduction in incidents of E. coli contamination in public and group water schemes since 2005. These improvements have not been mirrored in private single house supplies. Studies indicate that around 30% of private wells are contaminated (EPA, 2010) and that the level of illness linked to private supplies has increased (e.g. there was a 100% increase in VTEC cases between 2011 and 2012 and a further 30% increase in 2013 (www.hpsc.ie)). VTEC patients were up to 4 times more likely to have consumed water from private wells. Private wells are unregulated in Ireland and well owners are largely unaware of the risks associated with their water supply and many are under the assumption that they are consuming "pure" water because it originates from groundwater. The EPA developed a communication strategy and communication tools to educate well owners - to make them aware of the risk and inform them of the actions they should take to reduce the risk. These tools included an animation, infographic, self-assessment web application and detailed website to communicate with the target audience. A comprehensive communication strategy involving many different stakeholders and communications methods was implemented to reach the widest possible audience. The effectiveness of this strategy was measured using a series of metrics measuring both awareness of the campaign and behavioural change to determine what worked and could be applied to other communications. The anticipated outcomes measured were as follows:

- *Increased awareness of the risks by well owners;*
- *Remedial works undertaken by well owners to protect public health;*
- *Reduced incidences of illness associated with private wells;*
- *Greater environmental protection (through reduction in polluting activities);*
- *Improved industry standards (well construction and treatment).*

This paper will provide an outline of the communication strategy and its effectiveness including the lessons learnt for future communications with stakeholders.

BACKGROUND

Environmental Protection Agency (EPA) publications on the *Provision and Quality of Drinking Water* have reported significant improvements in the quality of drinking water supplied by public water supplies and community run group water schemes in recent years. These reports show a 92% reduction in incidents of *E. coli* contamination in public and group water schemes since 2005 (EPA, 2013). These improvements have not been mirrored in private well supplies. A private well is a well that is privately owned and provides water to a single house and does not provide water to the public through a commercial or social activity.

Private well supplies are not regulated under the *European Communities (Drinking Water) Regulations 2014* and are currently classified as "exempted supplies". This means that there is no requirement to monitor such supplies nor is there any regulatory supervision of such supplies. In effect this means that the well owner is solely responsible for the quality of their well water.

RISKS TO HUMAN HEALTH

In Ireland, 30% of private wells are estimated to be contaminated by *E.coli*, this is based on an assessment of the national groundwater monitoring programme results (EPA, 2010) and is supported by findings of local spot surveys of private wells (Hynds, 2012). The Central Statistics Office (CSO) census figures indicate that there are approximately 170,000 private wells in Ireland and extrapolation would indicate that 50,000 private wells may be contaminated.

According to the Health Service Executive (HSE), Ireland has the highest rate of *Veritoxigenic E.coli* (VTEC) in Europe. VTEC are a particular group of the bacterium *E. coli*. VTEC infection often causes severe bloody diarrhea and abdominal cramps although. In some persons, particularly children under 5 years of age and the elderly, the infection can also cause a complication called haemolytic uraemic syndrome (HUS), in which the red blood cells are destroyed and the kidneys fail. VTEC is a notifiable disease and therefore data is available on its occurrence.



Figure 1: Microscopic image of *E.Coli* (Source: Sigma-Aldrich.com)

Figures from the Health Protection Surveillance Centre (HPSC) indicate that there is an increasing trend in the number of cases of VTEC in Ireland. In 2011, there were almost 300 cases but in 2013 that more than doubled to over 700 cases. Most cases in Ireland have affected children (60%) many of whom have been hospitalized. In some people, particularly children and the elderly, the infection can cause a complication called haemolytic uraemic syndrome (HUS), in which the red blood cells are destroyed and kidneys fail. This happens in up to 8 percent of VTEC cases. Some people are left with lifelong problems, which can, on rare occasions prove fatal.

Animals, particularly cattle are the main source of VTEC and infection is spread from direct animal contact or through contaminated food and water. The cases in Ireland are predominantly associated with rural families and private domestic wells; however, visitors from urban areas have also been affected.

What is not generally known is that there is a greater risk of illness associated with private well supplies. VTEC patients are 3 or 4 times more likely to consume untreated well or other private water than people who do not develop VTEC (HSPC website).

Many well owners do not seem to be aware of the risks posed to their health from private well water. A study by Hynds (2012) showed that 24% of 215 respondents were unaware of the potential threat of adjacent septic tank systems; this is worrying as the majority of private well supplies are located in rural areas where the property is also connected to a septic tank.

It appears that little consideration has been given to the proper location or construction of private domestic wells. Most wells do not have any form of treatment; in a recent study only 32% of private well supplies had some form of treatment. Also, in 40% cases the well water was not regularly tested (Hynds, 2012). A common misconception is that if the well owner has had no health problems the well water is fit for purpose, this may not be the case as the well owner may have built up immunity to the contamination. Friends, family and children may become ill as a result of consuming the well water. By taking simple steps to protect private wells this disease is preventable.

ENVIRONMENTAL PROTECTION AGENCY ACTION

No national body has responsibility for protection of private wells under legislation in Ireland. The EPA however has an advocacy role to work with others to advocate for a clean, productive and well protected environment. The EPA delivered effective change in the drinking water supply sector since becoming the regulator in 2007 and in the interest of improving public health (and environmental protection), decided to take the lead on this issue.

In order to reach the widest possible audience, it was decided that a comprehensive communication strategy involving many different stakeholders and communications methods should be developed (Figure 2) and implemented.

The strategy as developed is in line with guidance provided by the Democracy Center Advocacy Strategy guidelines (Schultz, 2011), where they pose the following questions:

1. What do we want to achieve?
2. Who can make it happen?
3. What do they need to hear?
4. Who do they need to hear it from?
5. How can we make sure they hear it?
6. What do we have?
7. What do we need?
8. How do we begin to take action?
9. How can we tell if it is working?

The first step in the process was to agree the goal of the strategy; it is *'to ensure that owners of private wells become aware of the risks to their water supplies'*.

The next step was to review the scientific evidence from the HPSC, research and EPA monitoring linking the risks to private wells and illness and to ensure that it would be readily understood by our audiences.

<p>Goal</p>	<ul style="list-style-type: none"> • The goal of the strategy is to ensure that well owners • Become aware of the risks to their private well water • Check whether their water is safe to drink • Take any necessary action to ensure their supply is safe and secure
<p>Scientific Evidence</p>	<ul style="list-style-type: none"> • Health Protection Surveillance Center provided evidence of the increasing rate of VTEC illness in Ireland. • VTEC patients were four times more likely to have consumed untreated well water. • EPA reported that 30% of groundwater monitoring locations contaminated by <i>E.coli</i>. • A study by Hynds 2012 found that <i>E.coli</i> was found in 29% of private wells, that only 40% of well owners had the well water tested and that 68% of the supplies had no form of treatment.
<p>Stakeholders/ Audiences</p>	<ul style="list-style-type: none"> • Local authorities • National/International Bodies • Other key Departments and Agencies • Service Providers • Environmental NGOs • Public • Media
<p>Key Messages</p>	<ul style="list-style-type: none"> • Private wells in Ireland are at risk of contamination. • Just because your water looks safe does not mean it is safe to drink. • Drinking contaminated water can cause serious illness. • It is important that your well is constructed and sealed properly. • Many private wells do not have any form of treatment, if contaminated then treatment may be necessary. • Visually check your well to make sure there are no sources of contamination nearby. • Test your well water once a year for microbial contamination, ideally after heavy rain.
<p>Channels</p>	<ul style="list-style-type: none"> • Meetings with stakeholder groups • Presentations at national and EU meetings • Dissemination of information to all stakeholders • National, Regional and Newsletter articles • Website re-development • Web application • Animations • Press releases and regional articles • National and Local radio interviews and national TV programmes
<p>Metrics</p>	<ul style="list-style-type: none"> • Web Application usage • Animation views • Website hits • Grant uptake • Media interest • Water Testing Rates • Illness associated with water supplies

Figure 2: EPA Private Wells Communications Strategy

Then the key stakeholders/audiences who could assist us in achieving our goal were identified. The communication messages were developed and tailored for each of the key stakeholders. Existing and new communication channels were pinpointed and contacts made. An assessment of the available information was undertaken and a number of new communication tools (animation, infographic, web app and website) were developed to make well owners aware of the risk and inform them of the actions they should take, they include:

- A new section on the EPA website for householders on “Protecting Your Private Well” (Figure 3). It explains the risks to private wells; advises well owners to check the location and construction of the well. It also recommends annual well water testing for microbial contamination. Well owners can find a list of testing laboratories that are offering a discount for those wishing to have their water tested – see <http://www.epa.ie/water/dw/hhinfo/>

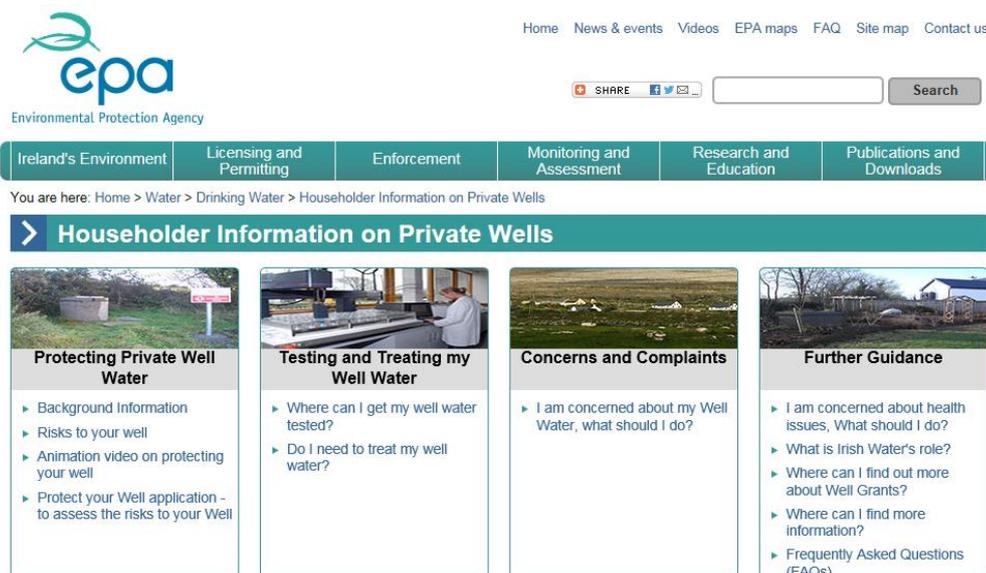


Figure 3: Householder Information on Private Well Page <http://www.epa.ie/water/dw/hhinfo/>

- An infographic illustrating the risk and actions to protect private wells (in Irish and English) was developed (Figure 4). It was printed as A5 leaflets and A3 posters, which were then disseminated to all local authorities, health centres and numerous stakeholder groups.
- A web application, which allows private well owners self-assess their well, was developed in-house by the EPA. The web app asks well owners a series of simple questions which then produces tailored advice that, if implemented, will improve their well water. Aggregated statistics from the app can be gathered by the EPA and used to prioritize future work and determine what the key risk factors are nationally and locally (by county) and to influence policy and research in this area.
- An animation “Protecting Your Private Well” (in Irish and English) which explains the risks to private wells and advises on the simple steps to take to protect the supply can be viewed from the EPA website and the web app.

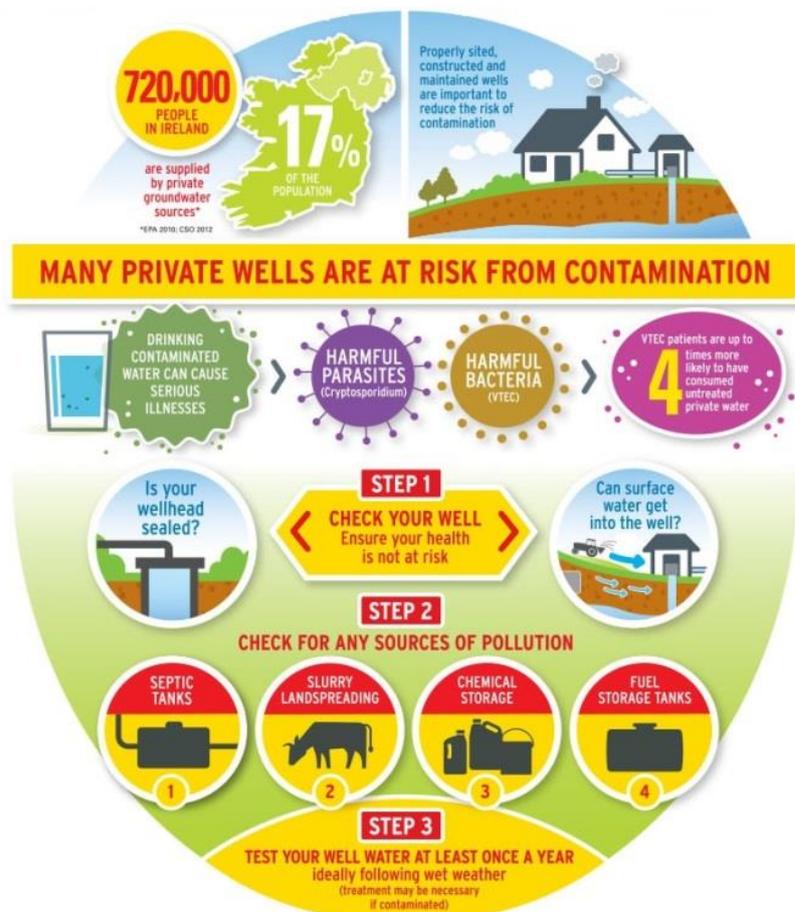


Figure 4: Private Well Infographic leaflet

IMPLEMENTATION OF THE STRATEGY

In advance of the national launch of the campaign, face to face meetings were held with a number of stakeholders including Public Health Consultants from the Health Service Executive (HSE), An Taisce, Irish Countrywomen's Association (ICA), Irish Creamery Milk Suppliers Association (ICMSA), Food Safety Authority of Ireland (FSAI), Sustainable Water Network (SWAN), Geological Survey of Ireland (GSI) and professional organisations such as the Institute of Geologists of Ireland (IGI), Engineer's Ireland (EI) and International Association of Hydrogeologists (IAH). During the meetings the key communication messages were discussed and requests for help to disseminate the leaflets and to highlight the risks to private wells to their members.

A mail shot, which included a cover letter outlining the issues associated with poor construction of wells; a copy of EPA Advice Note 14 (EPA, 2013) and a number of leaflets, was issued to all well drillers listed in the telephone directory. Drillers are unregulated in Ireland and therefore difficult to contact directly.

The strategy was launched with the HSE in June 2014, by means of national TV and radio interviews by both EPA and HSE staff and a joint press release. The national launch coincided with dissemination of information by the stakeholder groups to their membership. More than 80,000 leaflets were distributed to all local authorities, rural General Practitioners, Pharmacies, Environmental Health Officers, private laboratories, rural community groups, professional bodies, environmental NGOs, other state agencies and departments. Most groups also placed articles in their newsletters or E-zines and made leaflets available to members either directly or indirectly through mailshots or at AGMs and other meetings.

A number of private water testing laboratories participated in a discount scheme for private well water testing; the contact details for these labs are available on the EPA website.

There was significant interest in the subject at national and local level; eleven local radio stations conducted one to one interviews with EPA staff. An advertisement was placed in a well-known farming paper just before the ploughing championship where the EPA had a stand with information and staff available to deal with queries. Technical and non-technical articles were placed in professional newsletters, the National Federation of Group Water Schemes and the EPA newsletters as well as in Sherkin Comment, a well-known natural resource quarterly publication in Ireland, which has a circulation figure of 24,000.

EPA staff took opportunities to explain the risks and what actions well owners can take on two national TV programs - 'Ear to the Ground' and 'EcoEye' (400,000 viewers). Presentations were given at the annual Water Event; Environmental Awareness Officers; International Association of Hydrogeologists (Irish Group) conference; European Network of Drinking Water Regulators (ENDWARE) and UK Private Water Supplies Group meetings.

The launch in June was followed up at the end of August with a number of regional articles in local newspapers and local radio interviews.

ASSESSMENT OF EFFECTIVENESS

It was intended that the implementation of the communication strategy would lead to a number of long term beneficial outcomes in public health and environmental protection. The anticipated outcomes are as follows:

- Increased awareness of the risks by well owners;
- Remedial works undertaken by well owners to protect public health;
- Reduced incidences of illness associated with private wells;
- Greater environmental protection (through reduction in polluting activities);
- Improved industry standards (well construction and treatment).

A series of metrics have been used to track the effectiveness of the plan both in terms of reaching the target audience and effecting change. The initial effectiveness of the implementation of the strategy was measured after seven months and is presented here. It is recognized that this is a very short period for assessment as behavioural change takes sustained campaigns and time to be effective.

Awareness of the campaign/risks to private wells

The level of awareness of the risks to private wells can be determined by the extent of exposure to the messages in the media and the activity on information platforms such as the EPA website and the web application.

Media interest

The HSE and EPA released a joint press release at the time of the launch in June 2014; this was followed up at the end of August with regional articles, which were tailored for the local and regional newspapers. A review of the print media indicates that there were at least 47 articles in seven months with national and regional coverage.

The launch included TV coverage with a piece on the News at One, Six One News and TG4. The launch attracted around 10 radio interviews including a couple with Radio na Gaeltacht and this was followed by at least 11 one to one local radio interviews at the time of the release of the regional articles.

The risks to private wells were also highlighted during TV programs, 'Ear to the Ground' and 'EcoEye' which aired in November 2014 and February 2015 respectively. The initial viewer figures for EcoEye are 400,000.

Social Media

The launch information was tweeted on Twitter by the EPA and HSE and then re-tweeted by other stakeholder groups such as An Taisce. Articles about the campaign were posted on Facebook.

Views of animation

The animation, which can be viewed through the EPA website (in Irish and English) and the well application, had more than 850 views in YouTube after seven months.

Hits on EPA website

The householder page for private wells has had over 10,000 unique page views on the main EPA website in the review period. This does not include hits on the new EPA mobile platform. There was a noticeable increase in hits directly associated with our press releases.

Web Application Usage

There has been 435 response and 6692 hits overall on this survey application, which counts the number of times the survey page has been viewed and recommendations given (or reviewed). The relatively low numbers of responses to the survey do not allow an in-depth analysis at this stage of the regional differences in usage but this will be re-evaluated as time goes by. Further efforts will be made to improve on the response rate in the 2015 campaign.

Web Application Data

The limited responses have been analyzed and some statistics are shown below in Figure 5. A worrying figure is that 59% of the supplies have not had their water tested. The well app gives tailored recommendations to the respondents and in these cases they have been advised to have their well tested as a priority. As more data becomes available it will be re-assessed and used to identify priorities (e.g. counties with higher proportion of contaminated wells, key issues identified) and to inform future communications. The data may also be used to inform policy developments in this area.

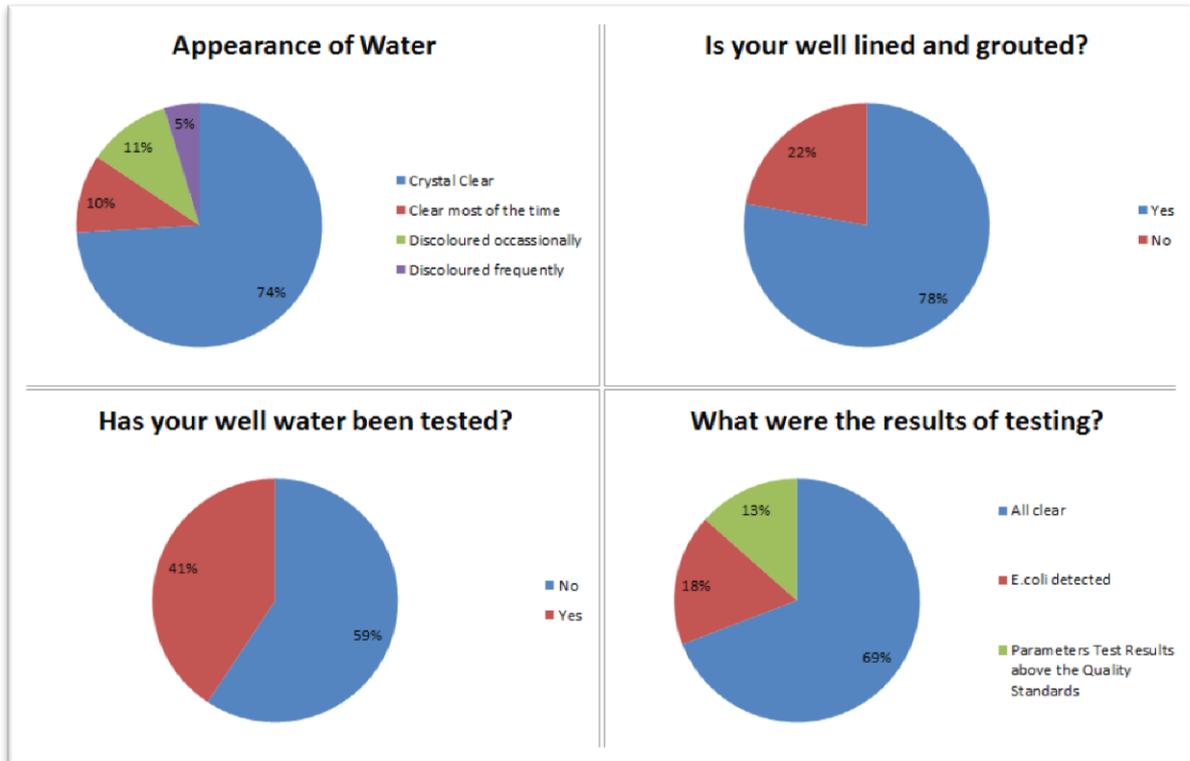


Figure 5: National statistics from the web application for a seven month period.

Behavioural Changes

Two metrics have been identified, which may give an indication of change in behaviour as a result of the campaign. They relate to the rate of grant uptake and well water testing.

Level of grant uptake

In some cases where improvements are necessary to a private well a grant may be obtained from the local authority. The local authority administers the grant scheme on behalf of the Department of Environment, Community and Local Government (DECLG). These payments are only made upon completion of the work and therefore there is a time lag between the improvement and the payments made by the DECLG to the local authority.

Figures from the DECLG indicate an increase of 13% in the amount of money re-cooped to local authorities arising from well grants from 2013 to 2014 indicating an increase in the number of well grants issued.

Well water testing rates

The EPA negotiated a reduced rate for private well water testing with a number of private laboratories. A list of the laboratories participated in the scheme is published on the EPA website.

The private laboratories that have participated in the scheme have overall indicated a 23% increase in testing numbers for private wells. One laboratory noted a three-fold increase in January 2015, which they have contributed to an awareness piece on the risks to private wells on the 'Ear to the Ground' TV program.

Illness associated with water supplies

The most important metric is the number of cases of VTEC particularly those associated with private wells. This is to determine if the strategy has been effective in reducing illness in the population and therefore improved public health.

The number of VTEC cases has increased very slightly in 2014 from 702 to 713 (Figure 6). It is an encouraging note that the rate of increase has been significantly reduced compared to 100% increase in VTEC cases between 2011 and 2012. It will be important to analyze the data in more detail with the HPSC in order to determine the trend for the number of cases associated with untreated well water.

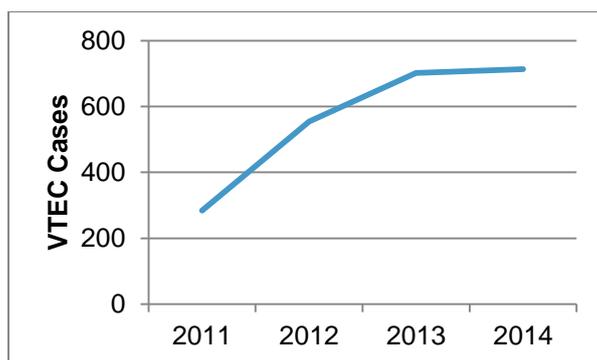


Figure 6: No. of VTEC cases as reported by the Health Protection Surveillance Centre (HPSC)

An EPA funded research project *Communicating Risk Based Enforcement (Relay_Risk)* (2013-W-DS-12) is currently examining ways to deliver risk based messages effectively to target audiences in order to improve knowledge and promote behavioural change. This project is also investigating appropriate metrics in order to determine the effectiveness of engagement strategies. The findings of this project will be published in 2015 and will be of value in further assessing the effectiveness of the private wells strategy and in the development of a new strategy later in the year.

LESSONS LEARNT

There has been considerable support from all stakeholder groups during the roll out of the information campaign. There has been significant coverage and dissemination of the information through the media and stakeholders. It is acknowledged that implementing such a strategy is time consuming for all stakeholders and therefore resource efficient methods and greater use of social media will be investigated.

Press releases are an effective means of getting media attention and also encouraging people to look for information on the website. However, a sustained campaign is needed. In terms of behavioural change there are early indications of a small increase in well testing and grant awards from the previous year. Tracking changes is difficult due to the lack of available structured data. The data gathered through the web app may be used to inform policy developments in relation to well construction and water testing.

This assessment has been carried out at a very early stage in the implementation of the campaign and further actions and time is needed to really assess its effectiveness on the behaviour of well owners.

Nonetheless this it is encouraging to note that the number of VTEC illness cases in Ireland seems to have levelled off but it is still at an unacceptable level.

The findings of the *Communicating Risk Based Enforcement (Relay_Risk)* project will be used to further assess the effectiveness of the campaign and in the development of a new strategy later in the year. In the meantime, every opportunity will be taken to disseminate the message and links are being made with inspection regime for domestic wastewater treatment systems.

All information can be found at <http://www.epa.ie/water/dw/hhinfo/> and copies of leaflets are available from the EPA upon request. Any suggestions or support from organisations or groups are welcome.

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