

Report compiled for the Burren Geopark LIFE Project



LIFE II ENV/IE/922

Discussion of options for sanitary solutions for visitors to the Poul nabrone Dolmen, Co.Clare (including a brief review on existing sanitary services within the project area)



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Author: Tracey Duffy, Environmental Scientist, Environment Section,
Clare County Council

1.0 Executive Summary

This document discusses an issue that has been flagged under the Burren Geopark Life Project relating to sanitary issues at the Poulnabrone Dolmen National Monument site. Currently, there are no toilet/wastewater treatment facilities at the Poulnabrone site. Issues regarding outdoor fouling by visitors as well as littering and dumping of rubbish have been observed and reported by OPW and Council staff. There have also been reports of occasional overnight camping (campervans) at the site within the car parking area contributing to the issues just mentioned. This report deals only with the sanitary aspect and looks broadly at the various options that might be considered towards addressing sanitary needs for visitors to the site.

The report finds that toilet facilities need not be provided to visitors at the site but rather that existing facilities, within the visitor's range of access at other locations, can be used prior or subsequent to their visit at Poulnabrone. The issue of sanitary provision comes in under the scrutiny of viability and necessity, as discussed in the report and whether either is appropriate for the site. Viability is not considered solely in its own right but must be measured against a cost proportionate justification. Whether a monument like that of Poulnabrone warrants such expenditure for sanitary provision determines its necessity when there are other options available and within access to the visitor. In this regard it was found that providing toilets at the site would be the most costly and unnecessary option and may lead to further implications for the site in terms of potential expansion and development, likely be contrary to conservation objectives for the site.

The favourable option of using existing facilities is then open for further initiatives within the Burren GeoPark Life Project but it would essentially lean towards the dissemination of information regarding the location of existing facilities and the notion of the visitor being aware and therefore prepared before visiting Poulnabrone or indeed other sites with similar issues.

2.0 Background

Within the landscape, the Poulnabrone Dolmen National Monument is set against the backdrop of typical Burren topography. The site is located on the R480 approx. 7.7km to the south of Ballyvaughan, 6.8 km north of Lemaneah Castle and 4.5km northwest of Carran village. It consists of the Dolmen (National Monument) itself and Information/educational plinths which

are managed by the Office of Public Works (OPW). The adjacent car park for the site is managed by Clare County Council.

Figure 1.0 Location of Poul nabrone Dolmen



The monument sits on Limestone Pavement, a protected habitat under the Habitats Directive Annex I, 92/43/EEC. Soil cover in this part of the Burren tends to be in sparse pockets of Limestone Tills dispersed amongst the exposed limestone bedrock. The groundwater vulnerability here is rated as ¹Extreme within a ²regionally important karst limestone aquifer. There are no surface waters at or near to the Poul nabrone site whereby water travels downwards through soil or through the exposed bedrock. This sets the backdrop of an environment that is vulnerable to impacts of pollution which has the potential to travel distances away from the site and impact other resources downstream via routes below ground.

¹ Groundwater Vulnerability is rated from Low to Extreme and describes the likelihood of contaminants reaching groundwater from the ground surface. Bedrock and soil type/drainage capability, as well as depth is used in the rating.

² A regionally important karst aquifer is considered a high value resource due to large regional scale of the aquifer and its transmission capabilities of groundwater.

The land-use in this area is primarily agriculture – pasture and grazing of livestock cattle. The population density is at most, just below half of the average rural population density per square km (2014 population density for rural is just under 67). A tourist related business and visitor centre is located 755m to the southwest of Poul nabrone.

Current water quality status in the groundwater body is rated as Good (based on chemical quality and quantitative parameters). Pressures on groundwater quality pertain to land use and from groundwater sources through connectivity to other aquifers.

3.0 Discussion of sanitary options for visitors to the Poul nabrone Site

Visitor numbers to Poul nabrone each year currently stand in the region of up to 200,000, with up to 2,000 per day in peak times. Approximately 45% of these visitors are believed to be from bus tours. There are visitors to the site at all times of the year with higher numbers recorded over the six months from May to October, with particularly heavier numbers from June to August. In an effort to determine best approaches to address the sanitary situation, a number of considered options have been briefly scoped in terms of their viability, the works involved, implications that each option may have and the appropriateness of the option within the context of legal environmental frameworks. The scoping mentions assumed costs involved (based on an experienced knowledge base) although it doesn't extend to an actual cost analysis of options.

The following are discussed under the following section headings:

- Toilets located at the site with on-site treatment of wastewater – 3.1
- Toilets located at the site with treatment of wastewater off-site – 3.2
- Use of existing sewered facilities accessible to the visitor, not located at the site – 3.3
- Use of un-sewered, private wastewater treatment facilities – 3.4

3.1 Provision of toilets at the site with on-site treatment of wastewater

There are a number of elements to consider in scoping the viability and suitability of an in-situ system at Poul nabrone whereby treatment of effluent takes place at the site. The more obvious components are the construction of a toilet block, the requirement for electricity and a dependable water supply, designing the most appropriate system which will need to cope with

the level of visitors as well as seasonal variations in numbers, a most likely requirement to acquire land for locating the system and cater for the overall footprint of the system in terms of scale, sizing and design capacity, and, how that translates to the overall potential development or expansion of the site as a whole and indeed would that be acceptable. Costs involved would be significantly high. Previous experience with this type of wastewater stream (i.e. high seasonal flows, high ammonia) would necessitate some type of filtration and tertiary treatment system which typically have significant capital costs and a high level of management needs/costs.

Crucial to the integrity and long term reliability of any system is ensuring its continual management, maintenance and up-keep which requires a yearly budget (to include repair, replacements, upgrade works, monitoring, etc), experienced staff would be required to be on-site regularly and administrative structures put in place to ensure that immediate actions are authorised and taken where certain works are required. This element is of huge significance in wastewater treatment as, if the management and maintenance of a system is not addressed on a regular basis, the cost implications alone of remediating a plant failure can escalate beyond any budgetary contingencies that may have been set aside.

The viability of having a treatment plant in-situ starts with whether the ground conditions are suitable as well as whether there would be any significant impacts or effects to protected habitats. After that, the question of viability extends to whether it's possible in terms of cost and necessity. Essentially is sanitary provision at Poul nabrone monument necessary?

All proposed wastewater treatment systems require a site suitability assessment to determine if the ground conditions are appropriate to treat the wastewater effectively and allow its assimilation into the environment without impact or deterioration to that environment. This means that the soil and subsoil at the site must be of sufficient depth and be of a suitable (and predefined) permeability to enable the wastewaters from the initial treatment phases to be effectively cleaned and further polished to a required degree such that its discharge to the environment – in this case into groundwater - will not damage the quality of that groundwater. To determine impact to groundwater quality we measure against legislative standards that set out limits of parametric values as indicators of quality that must not be exceeded or allowed to trend towards deterioration. Effluent must be held long enough in the subsoil to achieve adequate biological treatment but also allow this 'final treated' effluent to percolate at an optimal rate through the subsoil layers and away from the area. With the presence of an underlying karst limestone aquifer, a hydrogeological assessment would be required to show

whether discharged final effluent to the groundwater aquifer would or would not impair groundwater quality. Some of the information needed for such an assessment would include: groundwater flow directions, bedrock gradients, seasonal variations in groundwater levels, aquifer capacities, the determination of suitable locations of down-gradient monitoring wells to test groundwater for compliance with water quality standards, etc. Such an assessment would also determine the likelihood of other target receptors of being impacted which may have consequences or issues for other groundwater users some of which may have potential implications to public health - such receptors are private drinking water wells, group water scheme abstractions, emerging springs, water sources used for agricultural purposes, down-gradient surface waters, etc. The basis of these information requirements are set out under the following accepted guidance, all of which are promoted by the EPA who is the regulatory agency for Local Authorities for environmental statutory compliance:

- The EPA Code of Practice Wastewater Treatment and Disposal Systems Serving Single Houses (EPA 2009, updated from 2000)
- The EPA Wastewater Treatment Manual Treatment for Systems for Small Communities, Business, Leisure Centres and Hotels (EPA 2000)
- Guidance and Procedures for the licensing of discharges to surface and groundwaters (EPA, Department of Environment, Community and Local Government 2011)

Meeting the requirements of this guidance would determine the viability of the site to treat wastewater in the first instance and ensure that the receiving environment is protected in terms of its water quality and in its status as a resource. In addition to this, the system may require licensing under the Local Government Water Pollution Acts 1977 – 1990 which is administered by the local authority. The requirement for licensing is based on the volume of wastewater generated and discharged to the environment on a daily basis. If this exceeds 5m³/day (e.g. domestic type effluent discharging to ground) a licence is required. A licence requires the system owner to be compliant with all aspects of the licence conditions including - monitoring of final effluent quality at a prescribed frequency and its compliance with prescribed parametric quality values; carryout actions where there are non-compliances; upgrade or improve treatment works where issues arise; and, be subject to auditing and check monitoring as carried out by local authorities at a yearly fee. The licensee is also prosecutable where there are regular or significantly serious non-compliances.

The requirement to protect water is a statutory function of local authorities and is legislated for under national legislation such as Local Government Water Pollution Act 1977 – 2007, European Communities Environmental Objectives (Surface Waters) Regulations 2009 – 2012, European Communities Environmental Objectives (Groundwater) Regulations 2010 – 2012. The overarching Water Framework Directive (2000) transposed into Irish law under the European Union (Water Policy) Regulations 2003 – 2014, establishes the basic principles of water quality protection and sustainable water policy in member states.

Also in this case, due to its close proximal location to a protected site, namely SAC 000054 Moneen Mountain, requirements under the European Communities (Birds and Habitats) Regulations, 2011 regarding appropriate assessment should be addressed by the planning authority under application. It would be probable that a full appropriate assessment would be required in this case involving a competent ecologist carrying out a Natura Impact Statement for the project. See Appendix 1, Fig. 4 for location of SAC 000054.

3.2 Provision of toilets at the site with treatment of wastewater off-site

Alternative options to treating effluent on-site, are chemical toilets and composting toilets. In the case of chemical, there is no treatment and no discharge to the site (not including accidental or malicious discharge scenarios). In the case of composting toilets, the options include the discharge to and treatment on-site of the liquid portion, with composting of solids off-site.

3.2.1 Chemical toilets

These would need to be able to cater for an expected usage which currently stands as up to 2,000 people daily at peak times (e.g. May – October) although only a certain % would avail of the facilities. Chemical toilets are usually only meant for short term use especially where there is a high expected rate of use. Costs would include: purchase or hire (purchase cost is very high); continual daily manual upkeep and cleaning; insurance – covering damage and vandalism; scheduled disposal of chemical/effluent mix to the hire company (capacity limitations determine regularity for emptying) including transportation which is most likely to be Limerick or Dublin for example. The chemicals used in such systems act as a bactericide, viricide and odour neutraliser. While there should be no release of these chemicals on-site, the chemicals used are often ammonia based compounds and will cause impacts down-gradient of a spill zone if that were to occur at the site. In essence the use of such toilets are meant for short term use only and if the

site is to demonstrate sustainable and environmentally sound solutions the use of chemical toilets seems contrary to this aim as well as the significant and on-going costs associated with hire, transportation, disposal/treating effluent.

3.2.2 Compost toilets

This section considers (1) composting method of both urine and solid material mixed and (2) the urine diverting dry toilet. Essentially both types require composting of the solids albeit using slightly varying techniques. The Composting system uses very little or no water, sometimes a minimal amount for infrequent flush down purposes. In Composting toilets, the composting process is an aerobic one and requires a balance of moisture, oxygen and heat within the system as well as an optimal balance of carbon to nitrogen ratio. Depending on the system opted for, composting systems can require electronic components such as fan and vent pipes, heaters, and mechanical mixers for homogenisation of the compost. Additives (e.g. wood chip, vegetation, peat, etc.) are also required to establish good solids percentage, to ensure efficient composting processes to take place.

The Composting toilets also require tanks or compartments to allow for composting. Depending upon the level of use, multiple components may be required to enable the composting material time to cure and eventually decompose as designed. Other factors to take into account for systems such as these are space requirement, building of housing/toilet cubicles for the system, climatic conditions of where the system is sited (related to the balance of heat, ventilation, moisture and evaporation rates etc), expert management and maintenance to ensure optimal composting process, etc. A Composting toilet for a site like Poul nabrone would need to take account of the type of waste being treated, i.e. the ratio of urine to faecal matter - typically in tourist centres there would be a higher liquid portion in the wastewater being generated and also the seasonal variation in loading to the system and how that affects the composting processes. Health hazards can be created if the system is not managed and maintained properly such as odours, flies, vermin and pathogens (disease causing bacteria).

The urine diverting dry toilet diverts the wet from solid waste streams at source. In this case composting of the material must be managed appropriately but also the urine element must be handled separately. Information suggests that this can be disposed of onto vegetation (gardens etc) as a source of nitrogen or be discharged on-site to a soakaway. It is highly unlikely that disposal would be by either method at this site (fyi: urine can contain some disease causing

bacteria and viruses). In this case the wet waste stream would also still need to be transported and disposed off-site.

Essentially any of the composting related systems would require planning permission as well as assessment under the Habitats Directive. A system such as this may escalate in costs where management to achieve a good working balance would require expertise on a daily on-going basis (certainly for a prolonged period of establishment phase). The system would have to be safe for public health and not cause any nuisance odours or other issues. The final product would then require management in terms of where the waste would compost and the disposal of the resulting waste stream(s) which also includes transportation costs.

3.3 Existing sanitary services available within the project area

The use of toilet facilities that are existing within the Burren Geopark Life Project bounds are a viable option to explore but would essentially depend on an information and awareness campaign/scheme for all visitors, bus and tour companies, etc. to advise them on where the facilities are, how to access them and the distance they are from the Poul nabrone site. This allows visitors to be prepared as such and to basically 'go before you visit' the site. The information provided to them should explain the sensitivity of the area that they are visiting to encourage a respectful adherence to the request to come prepared.

Within the project area there are several towns and villages that are serviced by a sewer network whereby effluent is treated in a wastewater treatment plant serving the population for those connected to the sewer network. These wastewater treatment plants are now owned and operated by Irish Water and are regulated by the EPA Licensing system under the Authorisation Regulations 2007. Figure 2.0 in Appendix 1 shows a map of where these are located and within which ¹zone.

Zones 1 and 2 carry higher numbers of tourist traffic and are also the zones where sewered networks and services exist. There are no sewered networks in Zone 3. To understand the viability of using these existing services the distances between Poul nabrone and these sewered areas are set out below in table 1.0. There would potentially be a higher demand on services in Ballyvaughan, Kilfenora and Corofin, being the last stops before Poul nabrone Dolmen (highlighted in blue in Table 1.0). The farthest distance from a sewered area to Poul nabrone is from Corofin at 14.5km which would take approx. 15mins travel time (travelling at 60km/hr without stops in between) The nearest sewered area is Ballyvaughan at 8.8km, which would

take less than 10 minutes travel time to the site. If a nominal estimation is assumed of how long an average visitor would spend at the site, say 30 minutes, then there is maximum of 60mins where a visitor is not in a sewer network area.

Table 1.0 Approx. distances (km) between Poul nabrone and sewer areas

Town/Village Sewer	Distance (by road) Km	Project ¹ Zone	Route taken/via
Ballyvaughan	8.8	1	R480
Lisdoonvarna	20.4 (via Ballyvaughan) 21.1 (via Kilfenora)	1	N67 and R480 R476 and R480
Kilfenora	12.8	2	R476 and R480
Ennistymon	20.6 (via Kilfenora)	2	R481, R476, R480
Lahinch	23.8 (via Kilfenora)	1	N67, R481, R476, R480
Liscannor	28.4 (via Kilfenora)	1	R478, N67, R481, R476, R480
Corofin	14.5	2	R476 and R480

¹ zone relates to the Burren Geopark Life Project zones based upon visitor pattern characteristics and estimated tourist numbers. The zones are depicted in Figure 2.0 Appendix 1.

Note: Only Primary and Regional routes were used for measuring distance from the site to sewer locations.

Below, Table 2.0 sets out some particulars of wastewater treatment plants in sewer networks. All plants are licenced by the EPA and are operated and owned by Irish Water. Some plants are in need of additional works to comply with their licences including in some cases upgrading to provide improved treatment.

Table 2.0 Capacities and status of sewer networks for towns/villages

Wastewater treatment plant	Plant Design capacity	Current Capacity Status	Treatment type	Issues with Licence compliance
Ballyvaughan	1500	650	none	Yes
Lisdoonvarna	5000	2500	Secondary	No
Kilfenora	350	414	Secondary	Yes
Ennistymon	2100	1550	Secondary	No
Lahinch	8400	2316	Secondary	No

Liscannor	800	1200	Primary	Yes
Corofin	1725	878	Secondary and nutrient removal	No

*P.E. is the population equivalent which describes the unit per capita of loading on a treatment plant (refers to number of people) calculated on basis of how much hydraulic and organic loading is produced. Increases in loadings (i.e. additional effluent) to these plants must be considered in the long term for sustainable use and compliance to the licence and to meeting statutory environmental standards.

3.4 Use of un-sewered, private wastewater treatment facilities

Un-sewered areas refer to places where there is the absence of a sewerage collection network and associated treatment system. The treatment of wastewater in these instances is via privately owned and managed systems – see Table 3.0 below which sets out a general idea of these systems within the three zones. The reason why they are considered an option is because visitors, more than likely, will be visiting or staying in such a place before their visit to Poul nabrone. It is important to point out that these private systems are designed to treat a certain volume of wastewater i.e. they can only effectively manage a certain volume or load of wastewater on a daily basis which was calculated based on existing use (i.e. applied for under planning). If this volume becomes continually exceeded due to increasing numbers using the facility, the plant operational capability will become compromised and will result in poorly treated effluent discharging to the environment or indeed could potentially result in an overflow of untreated effluent which will cause pollution. Under the Local Government (Water Pollution) Act 1977 – 2007 it is an offence to discharge polluting matter to the environment which is a prosecutable offence. Therefore, the option of using these establishments is from the perspective of advising/informing existing visitors already at these locations that if they intend to visit Poul nabrone, then they may need to use the facilities before they leave as there are none at Poul nabrone rather than re-routing visitors to these locations for the sole purpose of using their toilet facilities and risking overload.

Private wastewater treatment systems are regulated under either the Septic Tank Regulations 2012 which the owner should have registered or if the treatment system is receiving volumes of wastewater over a certain threshold, a licence under Section 4 of the Local Government (Water Pollution) Act 1977 would be required which is regulated by the local authority. The legal onus is

on the owner of a wastewater treatment system to comply with either of these pieces of legislation, depending on which applies to them. In the case of a discharge licence, it is the legal responsibility of the treatment plant owner to know that they require a licence (depends on how it is discharged and volume discharged per day) and apply for one from the local authority. Implications of directing large numbers of visitors to private systems, is discussed further below under section 3.4.1 by means of a theoretical case study.

Table 3.0 General overview of private facilities across the three Zones

Area	Other details	Zone
Cliffs of Moher	Private system (business), licensed	1
Doolin	Private systems (e.g. B&Bs, hotels, hostels, pub restaurants, other tourist related businesses), some licensed, some not currently licensed	1
Fanore	Private systems (B&Bs, other tourist related businesses), currently no licensed facilities Clare County Council toilets at Fanore Beach - owned and managed but not always opened, barrier restriction to the car park	1
Kilshanny	Private systems (e.g. B&Bs, other tourist related businesses), currently no licensed facilities	2
Carron	Private systems (e.g. B&Bs), currently no licensed facilities	2
Slieve Carron	Private systems (e.g. B&Bs), currently no licensed facilities	3

3.4.1. Hypothetical Case study: Developing services of an existing business with a private wastewater treatment plant to accommodate sanitary needs of visitors to Poul nabrone

This brief case study uses the hypothetical example of using an existing business situated relatively close by which might be considered as a surrogate for sanitary provision for visitors to Poul nabrone. In this case the premise is that the existing business is tourist related and already has a discharge licence in place. A licence to discharge is conditioned with a number of requirements including a limit on the amount of treated effluent that can be discharged each

day. Limits are derived from a process that is based on and informed through the submission of details from the business owner, covering all aspects including calculations on the projected amount of wastewater to be treated and how the discharge is assimilated into the environment adequately. If the number of users increases, as discussed previously in this document, it could exceed the design capability and will result in poor or partially treated effluent being discharged. The quality of final effluent is then monitored through the monitoring programme attached to the licence whereby the licensee is required, legally and under the conditions of the licence, to sample and analyse final effluent for a number of parameters. If the measured parameters exceed the limits set on the licence for that parameter, the system is deemed as being non-compliant and the licensee is open to prosecution. In effect exceedence of plant capacity and non-compliance with licence parametric limits indicates pollution to the environment.

In the case of this hypothetical business, if it were to be officially regarded as a toilet option for visitors to Poul nabrone Dolmen, it would require a review of its licence in terms of the expected increase of users of the facility, how that translates to increases in volume and loading to the existing plant, whether the existing plant could cater for that increase, i.e. can the facility comply with its discharge licence limits and other conditions on the licence? To do this, the business would have to request a review of their licence which would be conducted by the local authority under a fee. The licence review would include adherence to Department of Environment, Community and Local Government 2011 guidance for assessing groundwater discharge impacts. In this regard the level of assessment involved is dependent upon the overall discharge volume, the groundwater vulnerability of the site, nearby sensitive receptors, the presence of Karst features and the potential for a higher risk of impact to groundwater, etc. In this case, due to location characteristics, a more onerous assessment would certainly be required. This involves the owner of the business/licence holder, submitting information from competent expert contractors, detailed investigative site assessments to determine if the site is suitable, the risk of impact to waters and whether the existing system requires upgrading to ensure that groundwater is not impacted. This level of assessment must involve a Karst specialist and would include the following: hydrogeological survey, a detailed conceptual model of the groundwater aquifer and pathway of effluent discharge, dye tracing in various seasonal conditions to determine pathways and the installation of groundwater wells for the purpose of monitoring impacts to groundwater.

Contributions to additional wastewater at the hypothetical facility would be from those using just the toilet facility only but also those who decide to avail of restaurant services. Consequently there indeed may be a knock on effect towards an expansion in the business overall and should be prudently factored-in and addressed.

Regardless, a proposal to route visitors specifically to use existing facilities, would most likely require additional structural works to provide additional toilet cubicles as well as possibly an upgrade of the existing wastewater treatment system. Planning permission and Habitats Direct Assessment are required. An Environmental Impact Assessment (EIA) might also be considered if the business is likely to expand substantially.

To conclude, a proposal to direct visitors to existing private systems while theoretically viable is up to the business owner in the first instance to pursue but does involve detailed expert assessment to determine site suitability, environmental sustainability and assurance that the emissions to the environment meet and comply fully with permitted standards, on a continual basis, that satisfy statutory obligations. This option is not regarded as easy or a straightforward solution.

4.0 Conclusion

The implications of installing toilets at Poul nabrone with on-site wastewater treatment are significant at the very least, in terms of the costs and management involved. It is the potential impacts on the local environment and the potential far reaching implications in terms of commercial expansion of the site which are of concern and would conflict with conservation objectives of the monument itself and with the natural sensitivity of the location generally.

The most favourable option in dealing with the sanitary issue at this time is to aim visitor awareness towards using facilities in serviced areas (i.e. those with a sewered network) and using privately serviced facilities when appropriate, prior to visiting Poul nabrone. The provision of information to the tourist in this respect can be at the very least through word of mouth, by those engaging with tourists such as the accommodation providers, bus and tour operators, websites and through other appropriate means. It is envisaged that this will abate the present conditions of fouling at the site to some significant degree over time, together with other site management initiatives.

Appendix 1

Figure 2.0 Burren Geopark Life Project Zones

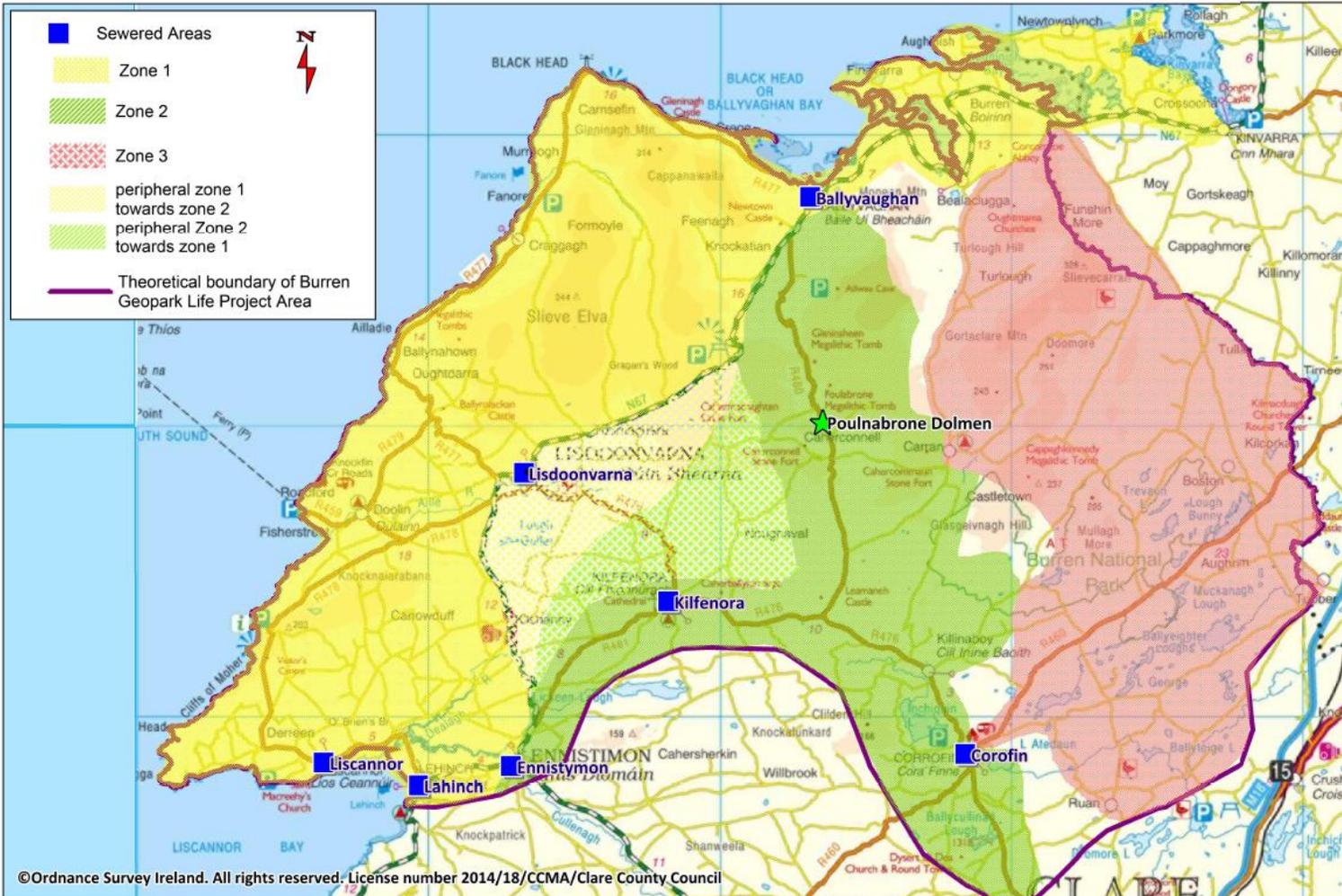


Figure 3.0 Routes from Sewered Areas to Poul nabrone Dolmen

