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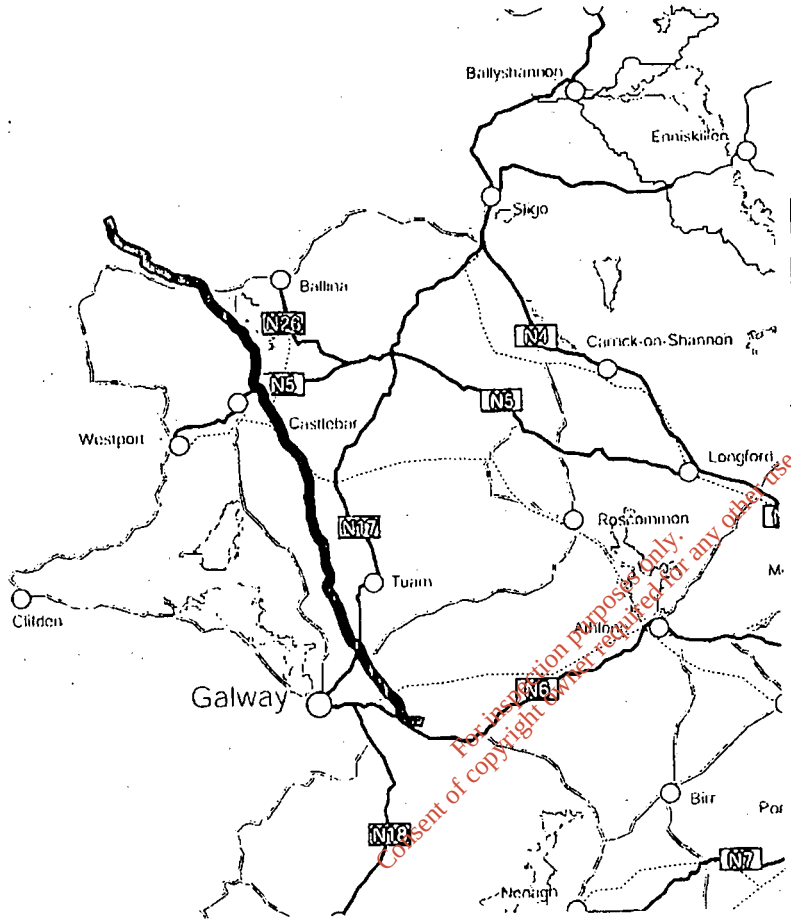
BORD GÁIS
TRANSMISSION BUSINESS UNIT

MAYO-GALWAY GAS PIPE LINE

EIS No 1633
PART 2 of 3



ENVIRONMENTAL IMPACT STATEMENT

Addendum Report

SEPTEMBER 2001

ARUP

Report Mayo to Galway Gas Pipeline EIS

Additional Information

4 September 2001

C689/10

Report Mayo to Galway Gas Pipeline EIS

Additional Information

Prepared By: Ria Lyden
Signed: Ria Lyden Date: 4 September 2001

Checked By: Ria Lyden
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ARUP
Consulting Engineers

Table of Contents

1 Introduction

The Mayo to Galway gas pipeline project comprises the construction of a circa 150km, 660mm (26inch) diameter, high pressure gas transmission pipeline from the Corrib Bellanaboy Bridge terminal in Co. Mayo to Craughwell, Co. Galway. Enterprise Energy Ireland Ltd., who initiated the project, signed a contract in late 2000 with Bord Gáis Éireann (BGE) whereby BGE would undertake detailed design and construction of the pipeline. Enterprise Energy Ireland Ltd. had commissioned an Environmental Impact Assessment and the preparation of an Environmental Impact Statement (EIS). When BGE took over the project Arup Consulting Engineers assumed responsibility for completion of the EIS.

The EIS was submitted to the Department of Public Enterprise in May 2001. The Department appointed consultants to review the EIS. This document is a response to queries raised by the consultants.

2 Safety and Risk Management

2.1 Non Routine Events

Chapter 22 of the EIS contains a summary of the environmental impacts of the Mayo to Galway gas pipeline. Section 22.4, 'Non Routine Events', describes the environmental risk assessment process and provides a risk assessment of potential hazards. For eight events the nature of the event, the control measures to prevent its occurrence and the likely environmental consequences are tabulated.

2.2 Risk Assessment

The event which would pose a risk to nearby residents from a gas pipeline or an associated above ground installation (AGI) is an escape of gas which subsequently ignites, causing a fire or explosion. For this to happen there must be both a gas leak and a source of ignition. A leak of gas on its own will not pose a risk as the gas, which is lighter than air, will dissipate into the atmosphere very quickly.

Natural gas is an asphyxiant. This can pose a risk to personnel and must be considered in the design of certain types of gas installation. A gas transmission pipeline does not pose a risk of asphyxiation to nearby residents. (Note: The Concise Oxford Dictionary defines asphyxia as 'defective aeration of blood through impaired respiration; suffocation'. An asphyxiant is a substance which causes this effect.)

2.3 Gas Leak Prevention

To prevent a gas leak, the pipeline has been designed and will be constructed, operated and maintained in accordance with IS328 Code of Practice for Design and Installation of Gas Transmission Pipelines, 1989. The pipe size, grade of steel, wall thickness and corrosion protection systems have been specified to ensure the pipeline is suitable for its purpose and to ensure that its integrity is maintained during its design life.

To be included in the pipeline construction tender list, contractors will have to pre-qualify, by demonstrating their competence and previous experience in pipeline construction. Construction method statements must be provided for each element of the work. The method statements will be scrutinised and only a contractor of proven competence will be appointed. The pipeline will be constructed to the highest standards. Material and workmanship will be inspected and tested and the entire pipeline will be pressure tested prior to commissioning.

BGE has developed a comprehensive set of procedures for pipeline operation and maintenance. These are contained in BGE's Field Operations and Maintenance - Works Instruction Manual. The manual specifies maintenance and inspection routines designed to ensure that the integrity of the pipeline is not compromised.

2.4 Prevention of an Ignition Source

Possible ignition sources are sparks arising from impact damage to the pipeline during operations or a spark from an electrical source at an AGI. The pipeline will be given a minimum of 1.2m of soil cover to prevent damage from routine events. The cover will be increased under the bed of rivers and streams. The most likely cause of damage to the pipeline would be excavations close to the pipeline. The pipeline wayleave will be monitored regularly to ensure that no unsupervised excavation occurs. If there is some requirement to excavate close to the pipeline, the method of working will be specified and BGE personnel will supervised the work. At the AGIs, any electrical equipment, which could come in contact with gas, will be specified to have the appropriate rating for use in a potentially explosive environment.

2.5 Gas Pipelines Safety Performance

BGE has operated high-pressure gas transmission pipelines in Ireland for more than 20 years. In this time no catastrophic failure has occurred which has resulted in the release of gas to the atmosphere. A report, published recently by European Gas Pipeline Incident Data Group (EGIG), presented data on pipeline safety performance of high pressure (>15bar) gas transmission pipelines. This group comprises nine operators in Denmark, Spain, France, Holland, Germany, Belgium, Italy, Switzerland and UK. The main results of analysing the safety performances of their pipeline systems are:

- Over the period 1970 to 1998 there has been no fatal accident involving inhabitants.
- The overall incident frequency with an unintentional gas release over the period 1970 to 1998 is 0.480 incidents per year per 1000km pipeline. However, the figure over the period 1993 to 1998 is significantly lower: 0.211 incidents per year per 1000km pipeline.
- External interference is the main cause of gas pipeline incidents involving gas leakage; an average of 0.239 incidents per year per 1000km pipeline for the period 1970 to 1998. However, an improvement in the incident frequency occurred over the period 1993 to 1998 where this statistic reduced to 0.087 incidents per year per 1000km pipeline.

These figures show an increase in the safety performance. It is considered that this is primarily due to an increasing integration of safety items during the phases of design, manufacturing, construction, maintenance and operation of pipelines.

The above data are based on failure incidents in pipelines outside of AGIs. The EGIG has also assessed the contribution to the above statistics of failure incidents within all elements of transmission pipeline systems including AGIs and concluded that the external safety for the "public at large" will only be affected by the cross country high pressure pipelines. The contribution of all the other elements such as block valves, pressure reducing stations, pigging stations etc. was found to be negligible. Therefore, to demonstrate the safety of high pressure gas transmission system it is sufficient to concentrate just on the pipelines.

2.6 Liaison and Emergency Procedures

BGE's existing liaison and emergency procedures will cover the Mayo to Galway pipeline. Central to BGE's procedures is the preparation of an emergency plan. This will contain a minimum of the requirements of IS328. As part of a Quality Management System, BGE has developed a *Control of Emergencies – Works Instruction Manual*. This manual sets out the action to be implemented by the Transmission Operational Response Team in the management of a crisis on the BGE Transmission Grid and details Emergency Procedures for the overall transmission network. It sets out procedures to be followed for the receipt, location, classification and control of emergencies. Emergencies are classified in the following categories:

- Line break (Major Leakage) Bord Gáis National Transmission System (NTS).
- Line damaged (sustainable level of gas leakage) Bord Gáis NTS.
- Line damaged (no gas leakage).
- Loss of gas supplies.
- Major emergency as declared by Local/Regional Authorities.

The manual sets out response procedures for each of these classes of emergency. It also provides contact details and details of the organisational structure that will be in place during an emergency. Central to this structure is the supply of information to the public through the Communications Team.

Major emergencies as defined by the BGE emergency procedures are 'any emergency which will require the implementation of the Regional Major Accident/National Emergency Plan and will normally involve a number of seriously injured casualties'. Emergencies can be classified as major if there are a number of human casualties involved, if the evacuation of a populated area is necessary or if there is a possibility that the emergency will escalate. Regional Emergency Plans and BGE emergency procedures identify the role of BGE as part of the Regional/National Emergency Plan. This role is generally to deal with and make safe any gas involvement and to liaise with Gardaí and other authorities in the overall operation as appropriate. In this regard, the BGE emergency procedures are integrated with the Regional/National Emergency Plans.

2.7 Air Emissions During Maintenance and Unforeseen Events

Any emissions to atmosphere during maintenance of the pipeline would be of natural gas. None of the routine maintenance activities will cause the release of a significant quantity of gas. An unforeseen event, which caused a rupture of the pipeline, would result in a leak of gas. It is difficult to quantify such a release. However BGE will operate a computerised leak detection system, continuously monitoring the pipeline. The leak detection system is described in Section 7.3.1 of the EIS. If a leak is detected the system will shut the block valves which are provided to allow each length of pipeline to be isolated. This will minimise the quantity of gas which is released.

If the leaking gas ignited, the emission to atmosphere would comprise the products of combustion of the gas such as carbon dioxide, water and nitrous oxides.

2.8 Outlet Valve from the Corrib Terminal at Bellanaboy Bridge

The operators of the Corrib Terminal at Bellanaboy Bridge will be able to shut the outlet valve from the terminal to the pipeline in the event of an emergency arising. The emergency could be a leak in the pipeline or an unforeseen situation in the terminal. An EIS has been submitted to Mayo County Council with the planning application for the Corrib terminal. Reference should be made to the EIS for the terminal for details of the terminal operations.

3 Difficulties Encountered in the Study.

3.1 Additional Studies

The scope and methodology of the ecological surveys to be undertaken during the Environmental Impact Assessment was agreed in advance with Dúchas and the Regional Fisheries Boards. All of this work was completed, and all of the areas, which required field inspections, were inspected. Completion of the EIS was delayed to allow this fieldwork to be undertaken when the Foot and Mouth Disease restrictions had been relaxed to allow visits to farmland. The field studies, which were undertaken, provided sufficient information to describe the receiving environment and assess the impacts of the pipeline, as required by Article 25, Second Schedule, of the Environmental Impact Assessment Regulations 1989 and subsequent amendments.

Following completion of the field studies, Dúchas was informed of the findings. Dúchas requested that some more detailed studies be undertaken in specific areas, prior to the commencement of construction. Dúchas did not require these additional studies to form part of the EIS.

Seven of the additional studies relate to vegetation. The purpose of six of these vegetation studies is to form a detailed baseline, in specific areas, in order to record the changes and monitor the recovery of the vegetation during and following construction of the pipeline. The baselines will also be used to monitor the impact of different construction techniques in bog areas.

The seventh vegetation study requires the recording of the dominant species composition in well developed hedgerows, in order to facilitate the reinstatement of the hedgerows on completion of construction.

Additional field surveys of badgers, otters and bats were also requested by Dúchas.

The badger survey will be undertaken to identify badger activity close to the pipeline route. If a badger sett is identified which will be affected by the pipeline construction, and it is not practicable to adjust the route of the pipeline to avoid the sett, Dúchas will be informed. The appropriate mitigation measures, which may include relocating the badgers, will be taken by suitably qualified persons in consultation with Dúchas.

Otter surveys will be undertaken at the river crossing points. If otter activity is identified, precautions will be taken to ensure that otter movement along the river banks is not hindered temporarily by construction of the river crossing.

In the limestone areas to the west of Caltragh and Knockdoe a survey will be undertaken to identify bat roosts close to the pipeline. This is a precautionary measure, requested by Dúchas. For geotechnical reasons the pipeline route has been chosen specifically to avoid areas of limestone cave formation, which might be suitable as bat roosts. The geophysical surveys, which were undertaken as part of the geotechnical site investigation, would have identified any unknown areas of this type. Nevertheless, the survey will be undertaken and if bat roosts are identified, Dúchas will be informed and the appropriate mitigation measures, which may involve adjusting the route of the pipeline, will be taken.

Dúchas requested additional hydrogeological studies in the sensitive wetland areas. The objective of the hydrogeological studies is to form a baseline against which to monitor the groundwater levels and groundwater movement during and after construction of the pipeline. The baselines will also facilitate monitoring of the impact of different construction techniques in bog areas.

The field surveys undertaken and reported in the EIS were very comprehensive. Given the scope of the additional surveys, detailed above, it is extremely unlikely that these surveys will uncover any matters which will have serious consequences for the potential environmental impact and eventual mitigation measures of the pipeline.

If completed as originally planned, these more detailed surveys would have been included in the EIS. However the EIS has sufficient detail to more than fulfil the statutory requirements in the descriptions of the existing habitats and the assessment of the impacts of the pipeline project. It is not intended to the delay the EIS process until the surveys have been completed.

The reports of the surveys will be submitted to Dúchas and copies will be made available to interested parties on request.

3.2 Fieldwork in Re-route Areas

Before the Foot and Mouth crises occurred, when a change to a section of pipeline route was proposed a desk study was undertaken by the ecologists, archaeologists and engineering geologists and the re-routed section was inspected on the ground. During the period in which the Foot and Mouth protocols were in place, the desk studies of proposed re-routes were undertaken and the need for a site visit assessed. In most cases the re-routes were quite minor and covered by existing fieldwork and it was concluded that a site visit was not essential. However there were some instances where a site visit was regarded as essential for the completion of the EIS.

In the initial phase of the Foot and Mouth protocols access to land was forbidden. This delayed completion of the EIS. The protocols were then relaxed to allow access to land under a strict regime of disinfectant use etc. BGE's policy was to enter onto land only where this was unavoidable. In compliance with the policy, only the areas, to which the EIS team considered that a site visit was essential, were inspected and the EIS was completed.

When all protocols have been relaxed, and there is no risk posed by moving from one land holding to another, the other re-route areas will be visited. With the continuing incidents of Foot and Mouth disease in the United Kingdom it may be several months before this may be possible. As visits to these areas are not regarded as essential, it is not intended to delay the EIS process until the visits take place.

4 Climate

4.1 General

The EIS addresses topics where there is the potential for a significance impact. The net effect of the project on the climate will be insignificant.

4.2 Construction Impact on Climate

Construction of the pipeline will require construction plant and vehicles, fuelled by hydrocarbons, the combustion of which will cause emissions of greenhouse gases. The quantity will not be significant in relation to the total amount of greenhouse gas emissions due to plant and vehicle traffic in Ireland. Commissioning of the pipeline will involve minor emissions of natural gas which is regarded as a greenhouse gas. The pipeline is routed through areas of forestry, and some trees will have to be felled. Trees cannot be replanted in the 14m width of the pipeline way-leave. Consequently the total amount of forestry will be marginally reduced. Forests are regarded as carbon sinks acting to reduce the amount of carbon dioxide, a greenhouse gas, in the atmosphere. The reduction in the total amount of forestry in Ireland, and the consequent reduction in the carbon sink capacity of Ireland, due to the construction of the pipeline will be insignificant. Thus the construction of the pipeline will have an insignificant direct negative impact on the climate.

4.3 Pipeline Operations Impact on Climate

Operation of the pipeline will have no significant direct impact on climate. Any release of natural gas during operations and maintenance will be negligible.

There will be indirect impacts on the climate due to operation of the pipeline. The pipeline will facilitate the construction of a gas distribution system in the areas of Counties Galway and Mayo, to the north of Galway City, which would not otherwise get it. The relative convenience and lower cost of natural gas will encourage households and businesses to switch from coal and oil for space heating. The climate change emissions from natural gas are far less than coal or oil and the switch will have a beneficial effect on the climate. However these areas of Mayo and Galway have a relatively low population density and any reduction in greenhouse gas emissions will not be significant in the context of Ireland as a whole.

There is the potential to develop a natural gas fired power station along the route of the Mayo to Galway gas pipeline. Generation of electricity from natural gas will result in reduced greenhouse gas emissions, if there is a resulting reduction in the use of coal or oil to generate electricity. However, with the construction of the second gas inter-connector to the UK gas transmission grid, there will be the possibility of siting a gas fired power station at many locations on the BGE grid. Siting one on the Mayo to Galway pipeline would just displace it from another location. A new gas-fired power station is not dependent on the Mayo - Galway gas pipeline being constructed.

Thus operation of the pipeline will have an insignificant beneficial effect on the climate.

5 Human Beings

Section 21.2.1 of the EIS lists the sections in which the impact of the project on Human Beings is addressed, as follows:

'Human Beings are addressed throughout the EIS, but not specifically in one section. The economic and social considerations are detailed in Section 19, Land Use issues are addressed in Section 5 and 12, and Health and Safety issues have been considered in Section 6 and 21. The effects of the development on human beings with regard to Landscape and Visual (Section 15), Traffic (Section 16), Noise (Section 17) and Environmental Emissions (Section 18) are also addressed.'

The impact on Human Beings can be summarised as follows: there will be localised impact on Human Beings along the pipeline route due to the activities undertaken during the course of the construction stage of the project. These will include disruption to traffic, loss of farming activities in the area fenced for construction, some noise and visual impact. On completion of the construction there will be no significant negative impacts and some positive economic impacts on Human Beings.

6 Waste

Chapter 18 of the EIS describes emissions from the construction and operation of the pipeline. Section 18.5 includes a table which describes the wastes arising from 15 construction activities, and the recommended disposal route. Sections 18.6.6 and 18.7.6 describe wastes arising from pipeline testing and commissioning and from pipeline operations.

The management of wastes generated during the construction of the pipeline will be the responsibility of the contractors. Management of wastes will be controlled under the Waste Management Act 1996 and the subsequent amendment. Each contractor will be required to prepare a waste management plan. The plans will have to adhere to the waste hierarchy, giving priority to waste prevention and minimisation, followed by reuse, recycling and recovery, with disposal as the least desirable option.

The EIS team is not aware of any studies which have been undertaken to record the waste generated by the construction of a natural gas pipeline in Ireland. The amount of waste, which will be generated by the construction of a natural gas pipeline, is difficult to quantify as it is dependent on a number of variables.

For example:

- The duration of the construction phase, and consequently the quantities of incidental waste such as office and canteen waste and sewage and also of stone for temporary roads, will be very dependent on weather conditions in the spring and summer of 2002 and 2003. With a long spell of dry weather, construction might proceed much more rapidly than currently expected and the quantities of these wastes would be reduced.

- The quantities of waste will also be very dependent on the construction methods and the effectiveness of waste minimisation programmes of the pipeline contractors.

- The quantity of crushed stone waste from temporary roads will be very dependent on whether the contractor opts to construct stone roads in soft ground areas or to used bog mats, which can be reused many times.

- Quantities of water pumped from excavations will be very dependent of weather conditions, amount of rainfall and height of the water table in the construction seasons.

- The construction methods used in peat areas will determine the quantity of water, if any, to be pumped from trench excavation in peat.

- Some contractors may opt to crush rock and boulders on site and reuse the material in the excavations. This would greatly reduce the volume of surplus spoil and rock to be removed from site.

- Some contractors may opt for trenchless crossings of some of the main roads, other contractors may do all road crossings as open cut.

- The quantity of office waste would be reduced if the contractor operates an effective paper and cardboard waste minimisation and recycling system.

In order to give an indication of the waste quantities to be expected, a preliminary estimate has been made. The estimate is based on pipeline construction experience and a two-season construction schedule. Refer to table 6.1 below.

Table 6.1: Potential Wastes Generated by the Construction of the Pipeline.

Activity	Waste Generation	Disposal Recommendation	Quantity
Pipeline Construction Base			
Site preparation	Likely to be negligible	-	
Operation	Office rubbish, paper, packaging, canteen refuse etc.	Recycle or send to licensed waste disposal site.	50 tonnes
	Rubbish from yard and site.	Collect in covered skips or tipper trucks and send to a licensed waste disposal site.	50 tonnes
	Scrap metal.	Sell as scrap.	
	Sewage.	Cesspit emptied regularly.	25 tonnes 3500m^3
Site reinstatement	Workshop waste, e.g. paints, oil etc.	Collect in covered skips or tipper trucks and send to a licensed waste disposal site.	10 tonnes
	Concrete foundations etc.	Send to a licensed waste disposal site.	100 tonnes
Pipeline Construction			
Working width preparation	Hedges, timber, brash, fence posts, wire etc.	In accordance with landowners requirements.	200 tonnes (note 1)
Pipe-stringing and bending	Pipe-bands, off cuts and end caps.	Collect in covered skips or tipper trucks and send for recycling or to licensed waste disposal site.	500 tonnes
Welding, testing and coating	Spent welding rods, grinding wheels, visors, and shot-blast.	Collect in covered skips or tipper trucks and send to licensed waste disposal site.	20 tonnes
Trenching, lowering and laying	Pumping discharge.	Pump into adjacent ditch using suitable filtration/ settlement techniques.	100m^3 (note 1)
Backfilling and grading	Surplus spoil and rock.	Subject to landowner/ occupier's agreement, take to licensed waste disposal site.	1000 tonnes (note 1)
Reinstatement	Temporary stone roads. Temporary fencing, gates, troughs etc.	Subject to agreement with the relevant County Council. Re-use elsewhere within land holding.	5,000 to 30,000 tonnes (note 1)
Construction through areas of peat	Pumping discharge.	Pump into adjacent ditch / field using suitable filtration/ settlement techniques.	100m^3 (note 1)

Activity	Waste Generation	Disposal Recommendation	Quantity
Microtunnelling	Slurry/Spoil.	Passed through de-sander, slurry recycled and ultimately disposed of using road truck tankers to licensed waste disposal site.	0 to 20 tonnes (note 1)
Auger-boring and pipe jacking	Spoil and rock cuttings.	Disposed of using road truck tankers to licensed waste disposal site.	0 to 20 tonnes (note 1)
Drill and Grout	Spoil grout and flush water.	Spoil disposal to licensed waste disposal site. Water used for flushing disposed of in accordance with the relevant County Council requirements either by filtration to land or off-site, if contaminated.	10 tonnes (note 1) $50m^3$ (note 1)
Mess huts, misc., etc.	Canteen refuse, safety equipment etc.	Collect in covered skips and send to licensed waste disposal site.	100 tonnes (note 1)
Mobile site toilets	Sewage.	Disposal by appointed waste management contractor.	$1000m^3$

Note 1: depends on construction method.

7 Consultations

The EIS team consulted with a very wide range of organisation and individuals in the course of the Environmental Assessment. The organisations and individuals consulted are listed in Section 2.4 of the EIS. The EIS team is satisfied that the full statutory requirements have been complied with, in terms both of the requirement for consultation and the information to be contained in the EIS.

8 Alternatives Considered and Routing of the Pipeline

8.1 Existing Planning and Licences

The route was chosen to avoid existing houses and gardens. Searches were undertaken of the Mayo and Galway County Council Planning Registers to identify sites for which planning permission had been obtained. The pipeline route was chosen to avoid these sites.

8.2 Concerns of Nearby Residents

All landowners along the route were consulted and their requests for changes of the route were considered in detail. The ecologists, archaeologists, pipeline design engineers and engineering geologists commented on each proposed route change. The change was implement if it did not conflict with environmental, archaeological or engineering constraints.

9 Other Remarks

9.1 Impacts due to Pipeline Construction

Section 6 describes the construction methods of the pipeline. The likely environmental impacts, mitigation measures and residual impacts from pipeline construction are comprehensively described in the EIS, in Section 9.5 for terrestrial habitats, and Sections 10.2 and 10.3 for aquatic habitats. Section 18 details emissions during construction and mitigation measures. Section 22.3 provides a summary of construction impacts, mitigation measures and residual impacts.

There are a number of construction methods and types of equipment which can be used to construct a gas pipeline at special locations such as through peat or at river crossings. The contractor will specify the construction methods. This will allow the contractor to utilise methods and equipment in which he has particular expertise and experience. Prior to commencement of construction the contractor must submit detailed method statements for construction of the pipeline in the ecologically sensitive areas, which are identified on the pipeline tender drawings. The tender documents give the required scope of the method statement for each type of special location, to ensure that the key issues are addressed by the contractor. These methods statements will be agreed with Dúchas, or the Regional Fisheries Board in the case of the river crossings, prior to construction commencing. This procedure will ensure that the mitigation measures listed in the EIS are implemented.

An extract from the pipeline tender documents giving the scope of the method statements is appended to this document, in Appendix 1.

9.2 Rahasane Turlough

Indirect impacts on the Rahasane Turlough SAC from the construction of the crossing of the River Dooyertha include possible changes to the hydrogeology of the area if a non-open cut crossing method was chosen or if extensive rock blasting were required for trench excavation. Diversion of the River to allow a dry crossing might also have an indirect impact on the Turlough, which is downstream. These possible indirect impacts will be avoided by ensuring that the contractor's proposed method for constructing this crossing is will avoid these construction techniques.

9.3 Mitigation Measures to Prevent Impact on Watercourses

Mitigation measures to prevent impact on watercourses are addressed in Section 10.2.

9.4 Terrestrial Habitats - Residual Impacts

The extent and nature of the residual impacts are described under the habitat types Dry Habitats, Wetlands and Fauna, in the subsections following the heading '9.5.10 Residual Impacts'. The subsections are incorrectly numbered.

9.5 Pipe Storage/Construction Facilities

The pipe storage and construction facilities are dealt with in a general way in the EIS. Each compound will be the subject of an application for planning permission to Mayo or Galway County Council. Drainage drawings will be submitted with the planning applications.

9.6 Noise

In Section 17 of the EIS, Table 17.2 gives typical noise levels for various construction activities. These noise levels are based on typical plant being operated during the activity. Thus where the use of compressors are a normal part of the activity, the noise for the compressor is included.

Currently BGE carry out helicopter monitoring of their entire transmission pipelines on a fortnightly basis, and have done so for many years. No difficulties have been experienced with noise impact on livestock.

It is not intended to carry out noise monitoring unless there is a specific complaint from a landowner.

9.7 Inert Plugs

The term 'inert plug' is used in Section 9.5.6.2 in the context of the need to ensure that the pipeline trench, when backfilled with the pipe in place, does not act as a longitudinal drain, changing the ground water flow regime. In this context an inert plug is a barrier of chemically inert material which will act as a dam to prevent movement of water.

9.8 Programme for River Crossings

On the pipeline route there are 22 significant river crossings, none of which are major rivers and most are less than 10m in width. A few small streams, which are tributaries of the streams feeding Carrowmore Lake and are ecologically sensitive, will also be crossed. It is planned to construct the Mayo to Galway gas pipeline over two seasons, 2002 and 2003. Two seasons will give 10 months to construct these crossings. This should be sufficient time.

9.9 Archaeological and Cultural Heritage - Unknown Sites

Any unknown archaeological sites will be uncovered in the topsoil stripping operation. As stated in the EIS, topsoil stripping along the pipeline route will be monitored by a licensed archaeologist. If a site is uncovered, the contractor will be instructed to stop work and move to a different part of the pipeline. Dúchas will be consulted and it will determine if the site should be archaeologically resolved or remain untouched. If the site cannot be archaeologically resolved the pipeline will be rerouted.

9.10 Storage of Construction Materials

Construction materials and chemicals, which could cause environmental damage if accidentally released, will be stored in the most appropriate manner. Liquid chemicals will be treated in a similar manner to oils.

9.11 Preliminary Design Aspects

The natural gas will comprise methane and a low concentration of an odourant (Butyl Mercaptan 80% and di-Methyl Sulphide 20%) added to the gas. BGE's quality specification for the gas sets upper limits to impurities. Refer to Table 1.

Table 1

Material	Concentration
Hydrogen Sulphide	5.6 mg/m^3
Total Sulphur Content	50 mg/m^3
Oxygen Content	0.5%
Non Combustibles Content	
(1) Carbon Dioxide	4%
(2) Nitrogen	6%
Water Content	112 mg/m^3
Mist, Dust, Liquid	Technically free

The design life of the pipeline will be 40 years.

APPENDIX 1

Extract from Pipeline Construction Tender Documents

Method Statements for Pipeline Construction in Environmentally Sensitive Areas

6.0 METHOD STATEMENTS FOR PIPELINE CONSTRUCTION IN ENVIRONMENTALLY SENSITIVE AREAS

6.1 Introduction

The pipeline route passes through some areas of major ecologically importance. The pipeline would not have been routed through these areas if there had been a feasible alternative. These sensitive areas are highlighted in Section 7.0 of the Special Locations Report. A more complete description of these areas is also included in the Environmental Impact Study report.

The Contractor is required to prepare a method statement for construction in these sensitive locations. The scope of the method statement required for each type of area is outline below.

6.2 Scope of Method Statement for Areas of Peat

6.2.1 *Characteristics of Peat*

There are a number of key features of peat and bog areas underlain by peat, which the construction method statement must address.

- The top layer of peat, which contains the growing vegetation (hereinafter referred to as Layer 1), is very susceptible to mechanical damage, by shear and compaction, which can destroy the vegetation and adversely change the water storage and transmission properties. Layer 1 may generally be taken to be 0.5m or less in thickness, depending on the depth of living root penetration. The peat below the top layer (hereinafer referred to as Layer 2) has an even more delicate soil structure and is very liable to erosion by rain, surface water flow, and foot and vehicle traffic. The thickness of this layer varies considerably and may be up to 5m or more locally.

- Layer 2 peat can consist of up to 98% by weight of water. Handling tends to break down its physical structure and alter the chemical properties, and can turn the material into a soupy liquid.

- Storage of materials on the surface of Layer 1 (i.e. the natural bog surface) for any length of time, besides causing compaction of the underlying peat, can reduce or eliminate the light and oxygen reaching the vegetation cover and damage it or cause it to die.

- The movement of water across the bog surface and within Layer 1, and the storage and retention of water in the lower layers of peat are very important features in the development and preservation of the body of peat.

- Digging a trench in peat may cause drainage and lowering of the moisture content causing the peat to shrink and crack, and thus leading to chemical changes in the peat. This in turn can lead to non-bog plant species spreading onto the peat.

- In areas of sloping ground underlain by peat, digging a trench can alter the surface water run-off pattern. The result can be erosion where the run off increases and drying out of the peat where the run-off is reduced or removed.

6.2.2 *Scope of Method Statement for Working in Areas of Peat Bog*

Items to be included in the method statement for each length of peat bog include:

1. Construction schedule including start date, finish date, allowance for inclement weather

2. Provision for liaison with Dúchas throughout the works

3. Type of inclement weather which, if it occurs, will cause work to be halted

4. Construction method and sequence including:

- working area width required
- method of setting out the working width and the centreline of the pipeline
- type of fencing to be used and method of fence installation, including types of vehicles to be used
- number of months fencing is to be left in place
- Width and depth of each of the soil layers to be removed and temporarily stockpiled
- method of removing the top layer of peat, containing living vegetation (Layer 1)
- method of storing Layer 1 material, to include means for keeping it separate from the underlying surface and preventing cross-contamination by extraneous soil and vegetation; location for storage, and means for protection from drying out.
- location and method of storing Layer 2 peat material, to include means for keeping it separate from the underlying surface and preventing cross-contamination by extraneous soil and vegetation; height and width of the stockpile, protection from drying out.
- location and method of storing subsoil (i.e. mineral soil) encountered beneath the peat, to include means for keeping it separate from the underlying surface, height and width of stockpile.
- method of creating the vehicle access road along the working width, including road width, materials for construction and method of removal of the road when construction is completed
- method and types of plant to be used for transporting pipe along the spread, stringing the pipe, forming the trench and supporting the sides, lowering in the pipe and back-filling the trench
- types of vehicles to be used to transport personnel along the wayleave
- method of de-watering the trench, including treatment and disposal of the water
- method to prevent the trench acting as a short term or long term drainage path
- method to ensure existing watercourses continue to function when temporary access roads are constructed and the trench is open, and in the long term, following completion of works
- method for back-filling the trench, including ensuring that the materials are replaced in the reverse sequence to which they were excavated, i.e. the material from the deepest parts of the trench being back-filled first,

- method of reinstating the surface layer of peat, including ensuring that there is not a long term hollow along the pipeline trench as the back-fill materials settles
- method for removing excess material from the wayleave and disposal location
- method to prevent liquid or solid contaminants (diesel, hydraulic oil, cement, etc.) from coming in contact with the in situ or stockpiled peat, or with surface water or ground water
- construction management plan to minimise traffic on the working width
- traffic management plan and haul routes on the surrounding road network
- proposal for the supervision by peatland ecologists of all construction and restoration work in peat areas and monitoring following completion, including name and CV of staff to be employed.

6.3 Scope of Method Statement for River Crossings

6.3.1 Rivers Crossings General

For each river crossing the special locations report identifies the features which require protection because of the importance or sensitivity of the habitat. These features include the use of the river for fish spawning or fish feeding, the presence of fauna such as salmonid species, freshwater crayfish or lampreys, and the importance of the river for angling.

To minimise the impact of the pipeline construction it will be important to reinstate the river bed and banks as closely as possible to their original condition including restoring the bed and bank material, gradient and vegetation. It will also be very important to prevent contaminants entering the river.

Notwithstanding the above, careful consideration must also be given to the possibility of erosion of the river bed and banks at times of flood. Where an armour layer of stones is present on the river bed or vegetation serves to protect the banks from erosion, the same conditions (or an acceptable environmental equivalent in terms of erosion protection) must be included as part of the reinstatement.

6.3 2 *Scope of method statement for river crossings*

Items to be included in the method statement for each river crossing include:

1. Construction schedule including start date, finish date, allowance for inclement weather

2. Provision for liaison with the relevant regional fisheries board and Dúchas on the work

3. Type of inclement weather which, if it occurs, will cause work to be halted

4. Construction method and sequence including:

- identify the working area required on either side of the crossing
- method of forming a temporary bridge
- identification and method of protecting trees and hedgerows on the two river banks
- method of removing and storing the bank-side vegetation and topsoil, including the height of the stockpile.

- location and method of recording, removing and storing the river bottom material include the height of the stockpile.
- location and method of storing subsoil
- method and types of plant to be used for stringing the pipe, forming the trench and supporting the sides, and lowering in the pipe
- method to minimise silt entering the river
- precautions to protect existing fish and other species if blasting is to be used
- method for back-filling the trench, including ensuring that the river bottom material is replaced so as to replicate the original river bottom material and lateral and longitudinal profile
- method of reinstating the river banks to the original profile and so as to prevent erosion
- method for ensuring long term stability of the river bed and banks
- method for removing excess material from the site and the disposal location
- method to prevent oil or other materials spilling or leaking from plant and contaminating the river, soil or ground water
- maintenance of access for anglers to and along the river bank
- traffic management plan and haul routes on the surrounding road network

6.4 Scope of Method Statement for Hazel scrub

6.4.1 *Hazel Scrub General*

The route passes through areas of hazel scrub which represent a semi-natural habitat of importance. To minimise impact it will be important to reduce the working width to a minimum, to fell the minimum quantity of trees, protect the remaining trees from damage and to reinstate the scrub after construction.

6.4.2 *Scope of Method Statement*

Items to be included in the method statement for where the route crosses hazel scrub include:

1. Construction schedule including start date, finish date, allowance for inclement weather

2. Provision for liaison with the Dúchas on the work

3. Type of inclement weather which, if it occurs, will cause work to be halted

4. Construction method and sequence including:

- Method for identifying hazel scrub
- Protection of topsoil to the extent of the edge of the tree canopy
- Method for identifying and marking trees for removal
- Reducing working width where possible
- Protection to be provided for branches of trees in working width
- Method for protection of thin soil cover from erosion
- Name, CV and outline of relevant experience of staff or sub-contractors to be employed to fell trees
- Method to reinstate the scrub including species to be used

- Aftercare method for scrub reinstatement – including provision for replacement of any dead stock for a minimum period of two years after planting and protection from rabbits and grazing animals

6.5 Scope of Method Statement for Areas of Karst, Turloughs, Vulnerable Hydrology

6.5.1 *General*

The route crosses extensive areas underlain by Pure Limestone Formation bedrock, which tends to be particularly prone to solution weathering, known as karst. Karst is associated with the occurrence of springs, underground water channels, caverns and swallow holes. Of these, swallow holes are the most widespread and obvious manifestation of karst. Sink holes may become enlarged to form turloughs, which are either shallow karst lake features or areas prone to seasonal flooding by high groundwater. Turlough may or may not be associated with surface stream drainage.

Due to their unique characteristics some of the karst areas on the route have ecologically important flora. These are identified in the Special Locations report. In addition many karst areas along the route are Regionally Important Aquifers, and where the overburden in thin, these can be very vulnerable to pollution. These are identified in the Special Locations report.

In karst areas it is essential to avoid unnecessary disturbance of the underlying soils or rock which might alter or interrupt the groundwater movement. It is also important to avoid changes to the surface and near surface drainage.

It is also imperative that usage and storage of potential contaminants be avoided or strictly controlled in karst/Regionally Important Aquifer areas because of the rapidity with which contaminant materials can enter the ground and be transported by groundwater.

6.5.2 *Scope of Method Statement for Working in Karst Areas*

Items to be included in the method statement for working in each length of karst:

1. Construction schedule including start date, finish date, allowance for inclement weather

2. Provision for liaison with Dúchas throughout the works

3. Type of inclement weather which, if it occurs, will cause work to be halted

4. Construction method and sequence including:

- working area width required
- method and types of plant to be used for forming any trench in rock
- if blasting is to be employed, name, CV and outline of relevant experience of staff or sub-contractors to carry out the blasting
- method of monitoring vibrations creating during trench excavation
- method of monitoring the trench and surrounding area to detect instability or settlement
- method of de-watering the trench, including disposal of the water
- method to prevent the trench acting as a short term or long term drainage path

- method to ensure existing watercourses continue to function when temporary access roads are constructed and the trench is open, and in the long term, following completion of works
- method for back-filling the trench, including ensuring that the materials are replaced in the reverse sequence to which they were excavated
- method of reinstating the topsoil, including ensuring that there is not a long term hollow along the pipeline trench if the back-fill materials settles
- method for removing excess material from the site and disposal location
- method to prevent oil or other materials spilling or leaking and contaminating the soil or rock, surface water or ground water
- method for full containment storage of oil, diesel, and other liquid/solid contaminants
- construction management plan
- traffic management plan and haul routes on the surrounding road network

v

Mayo - Galway Gas Pipeline

Environmental Impact Statement
Volume 11 - Figures

May2001

Job No. C689/10

Mayo - Galway Gas Pipeline

Environmental Impact Statement
Volume 11 - Figures

Prepared By: Daniel Garvey
Signed: Dan Garvey Date: 11 05 01

Checked By: Ria Lyden
Signed: Ria Lyden Date: 11-05-01

Passed By: Eoghan Lynch
Signed: Eoghan Lynch Date: 11 May 2001

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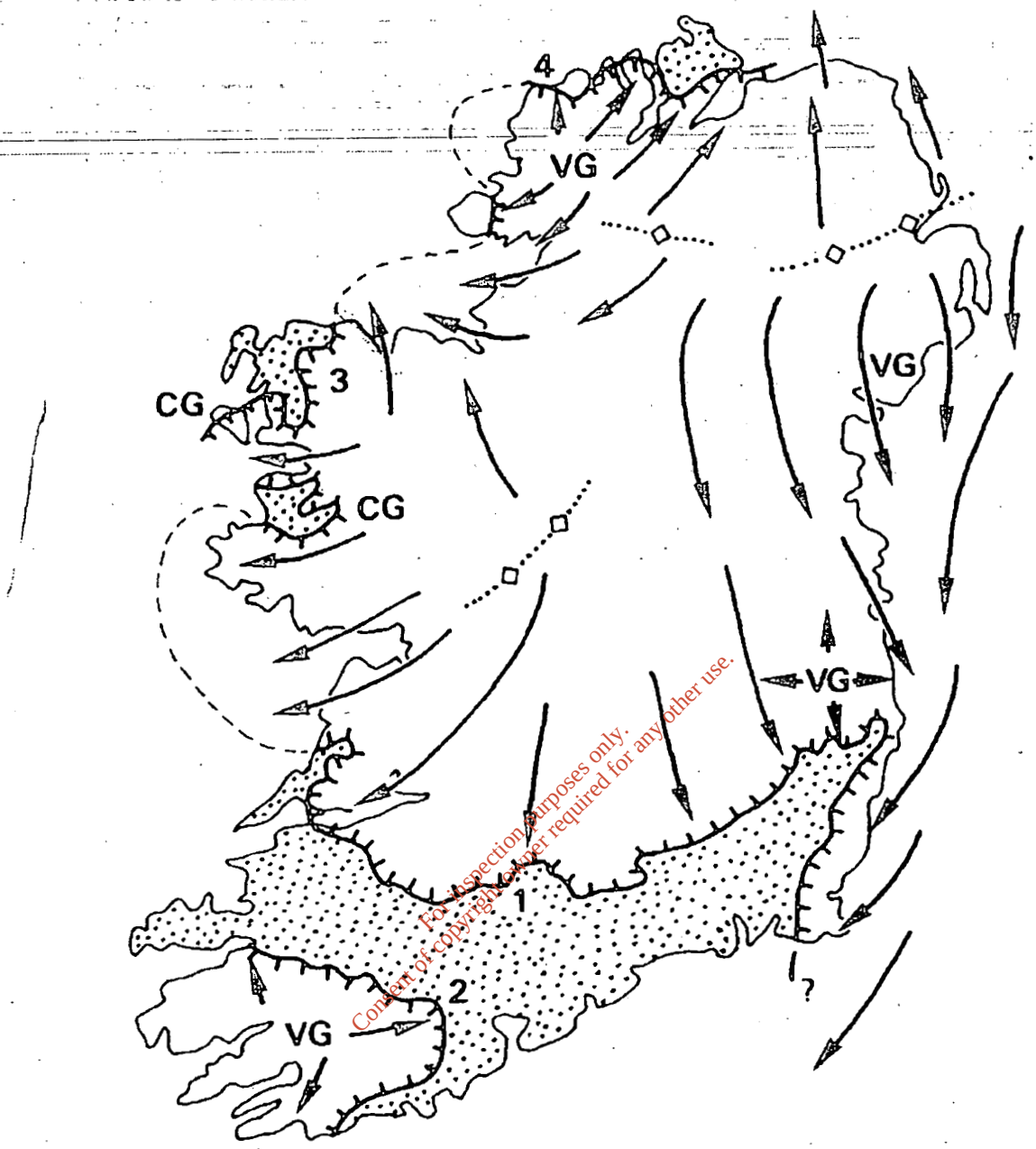
Issue No.	Date	Status	Prepared	Checked	Passed
1	1 May 2001	Draft	DG	RL	EJL
2	11 May 2001	Final Issue	DG DG	RL	EJL EJL

ARUP
Consulting Engineers

LIST OF FIGURES (VOLUME II)



Ice axes or domes

Irish inland ice

Irish Sea and North Channel Ice

VG Valley glaciers & mountain ice caps

CG Corrie glaciers

Largely unglaciated during the Midlandian Cold

GENERALIZED ICE LIMITS

1. Southern Irish End-Moraine
2. Killumney moraine
3. Ballycastle-Mulrany moraine
4. Bloody Foreland moraine

Taken from Edwards (1985)

BORD GÁIS

ARUP

MAYO TO GALWAY PIPELINE

Title: ICE LIMITS & GENERAL DIRECTIONS OF ICE MOVEMENT DURING THE LATE MIDLANDIAN COLD STAGE

Scale: N.T.S.	Date: 25.04.01	Drawn By: EG
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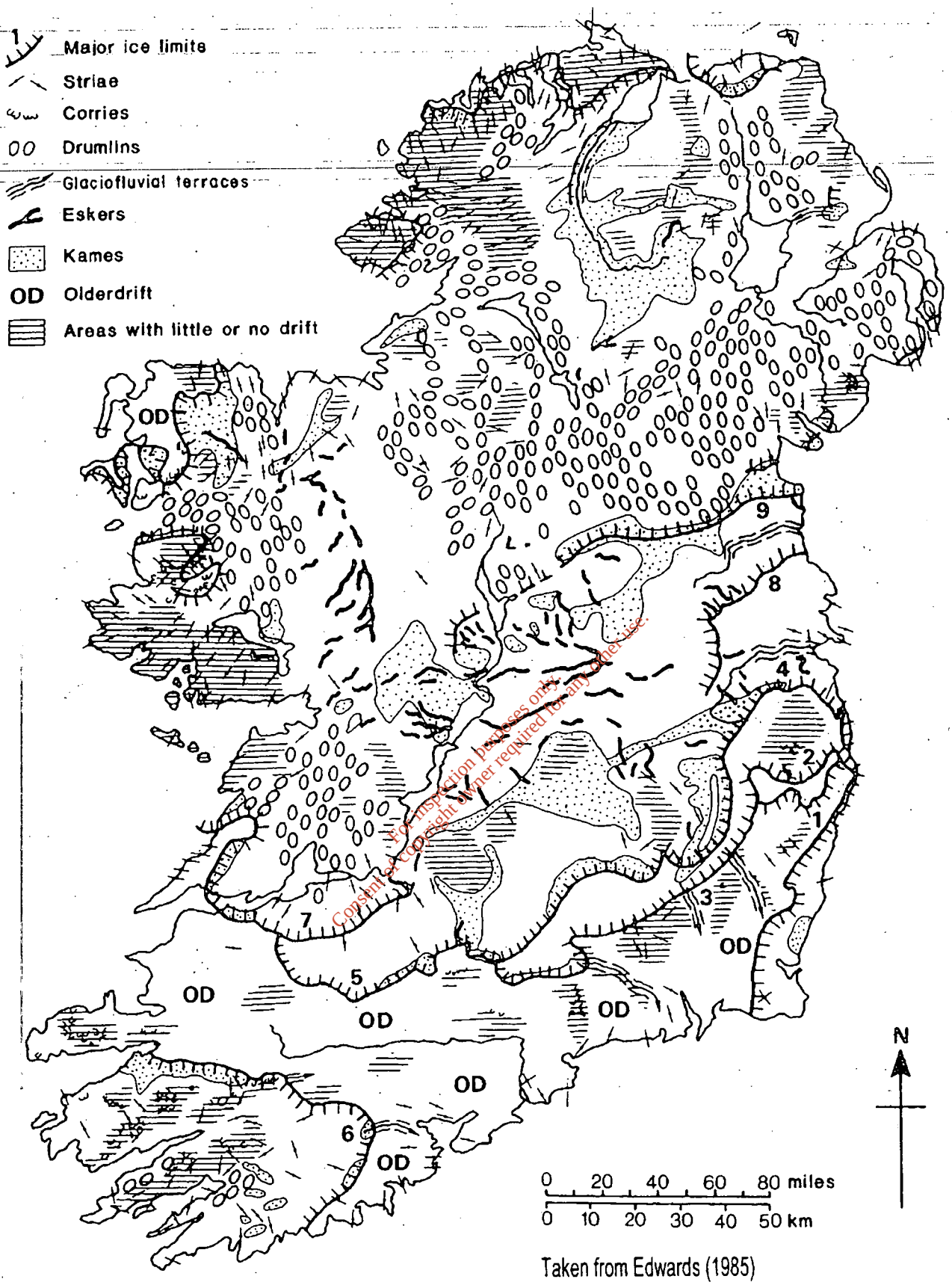

Taken from Edwards (1985)

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MAYO TO GALWAY PIPELINE

Title:

GLACIAL GEOMORPHOLOGICAL FEATURES

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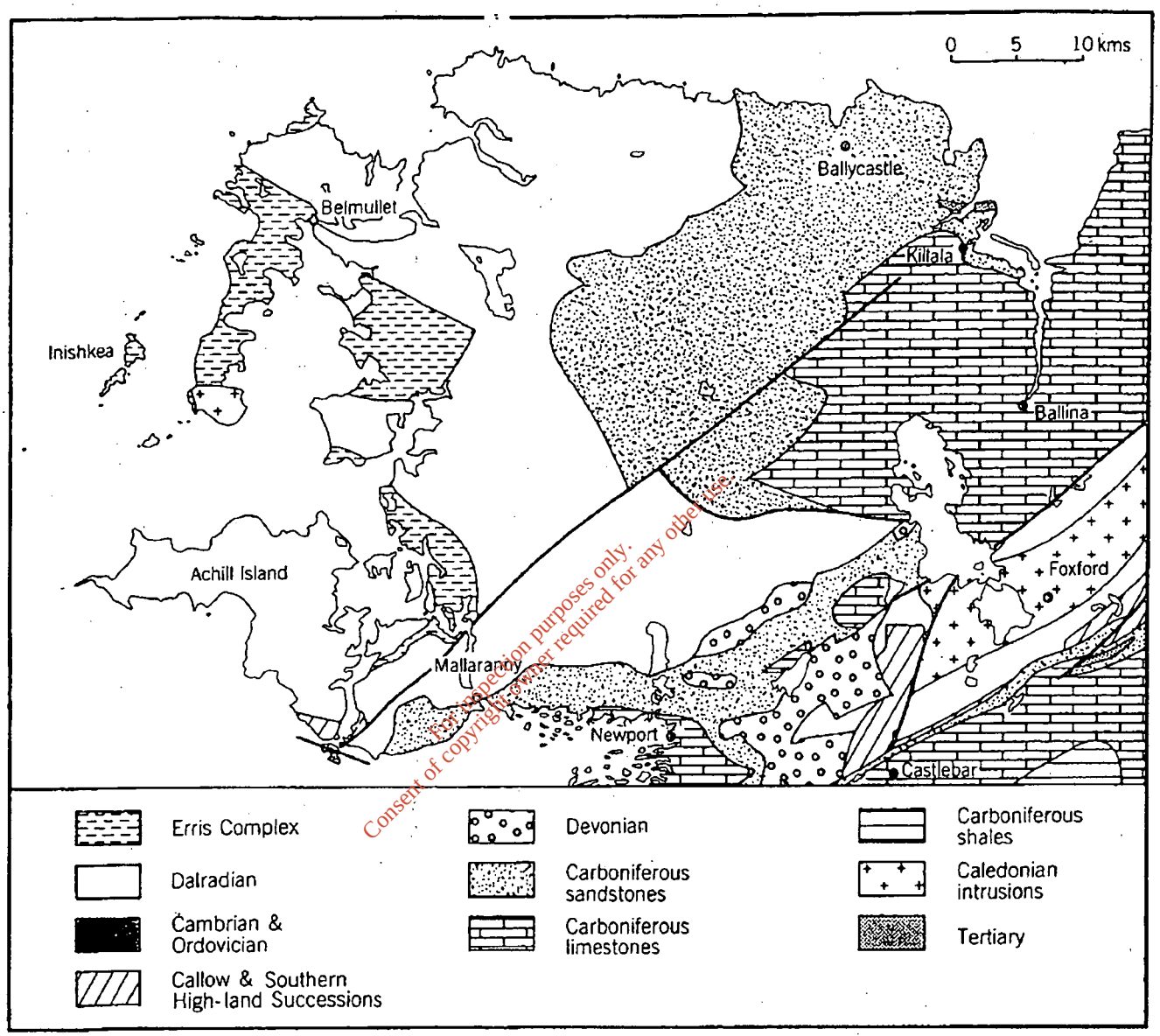

Taken from: Geology of North Mayo (GSI 1992)

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MAYO TO GALWAY PIPELINE

Title:
SIMPLIFIED BEDROCK GEOLOGY FOR SECTION OF PIPELINE ROUTE NORTH OF CASTLEBAR

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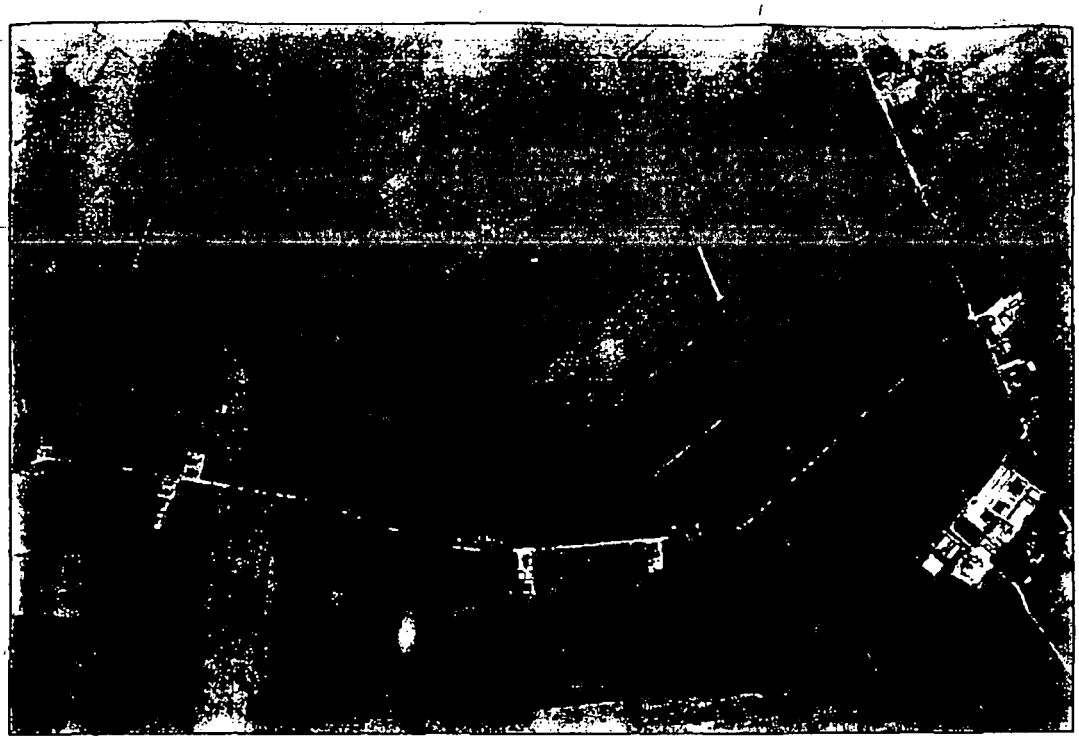
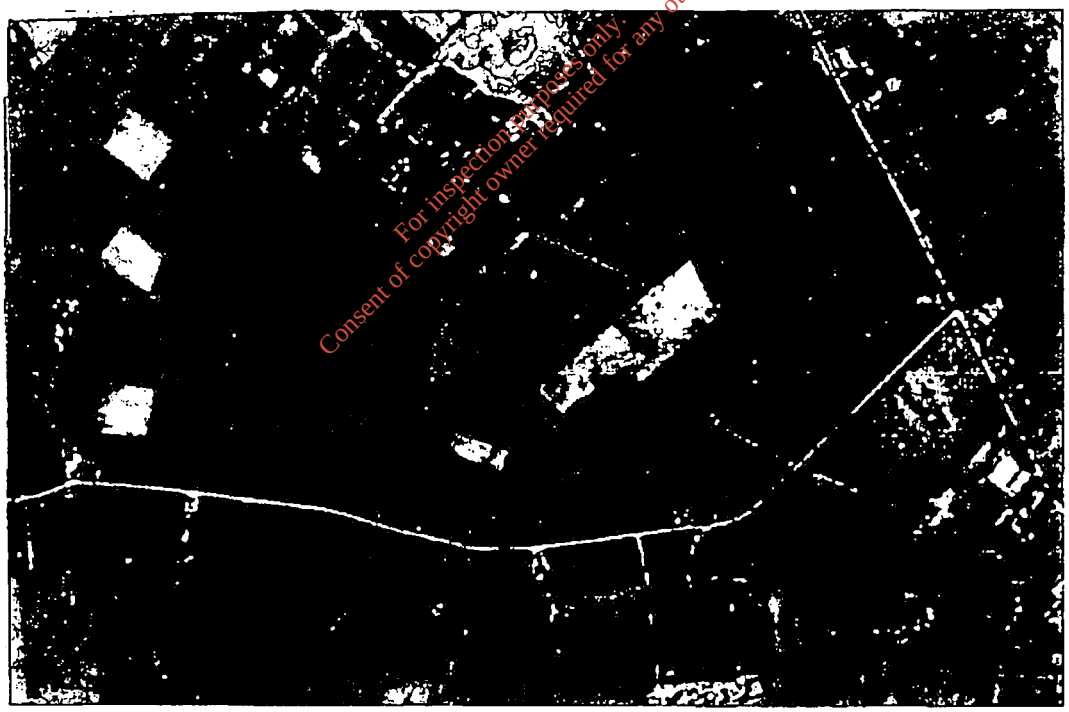


August 2000 Photograph



May 1973 Photograph

BORD GÁIS

ARUP

MAYO TO GALWAY PIPELINE

Title:

CHANGES IN SURFACE MORPHOLOGY
SOUTH OF CASTLEHACKET

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Rev. A

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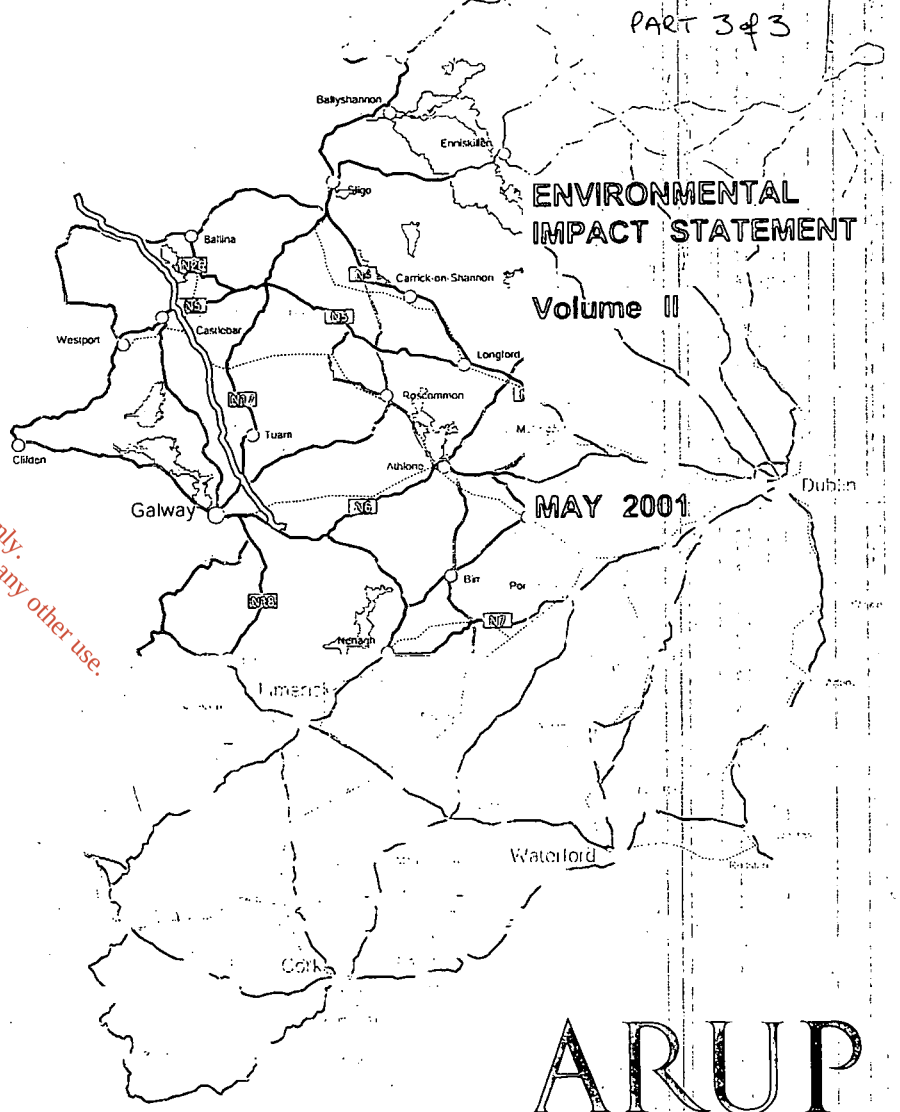
TRANSMISSION BUSINESS UNIT

MAYO-GALWAY GAS PIPE LINE

EIS No 1633
PART 3 of 3

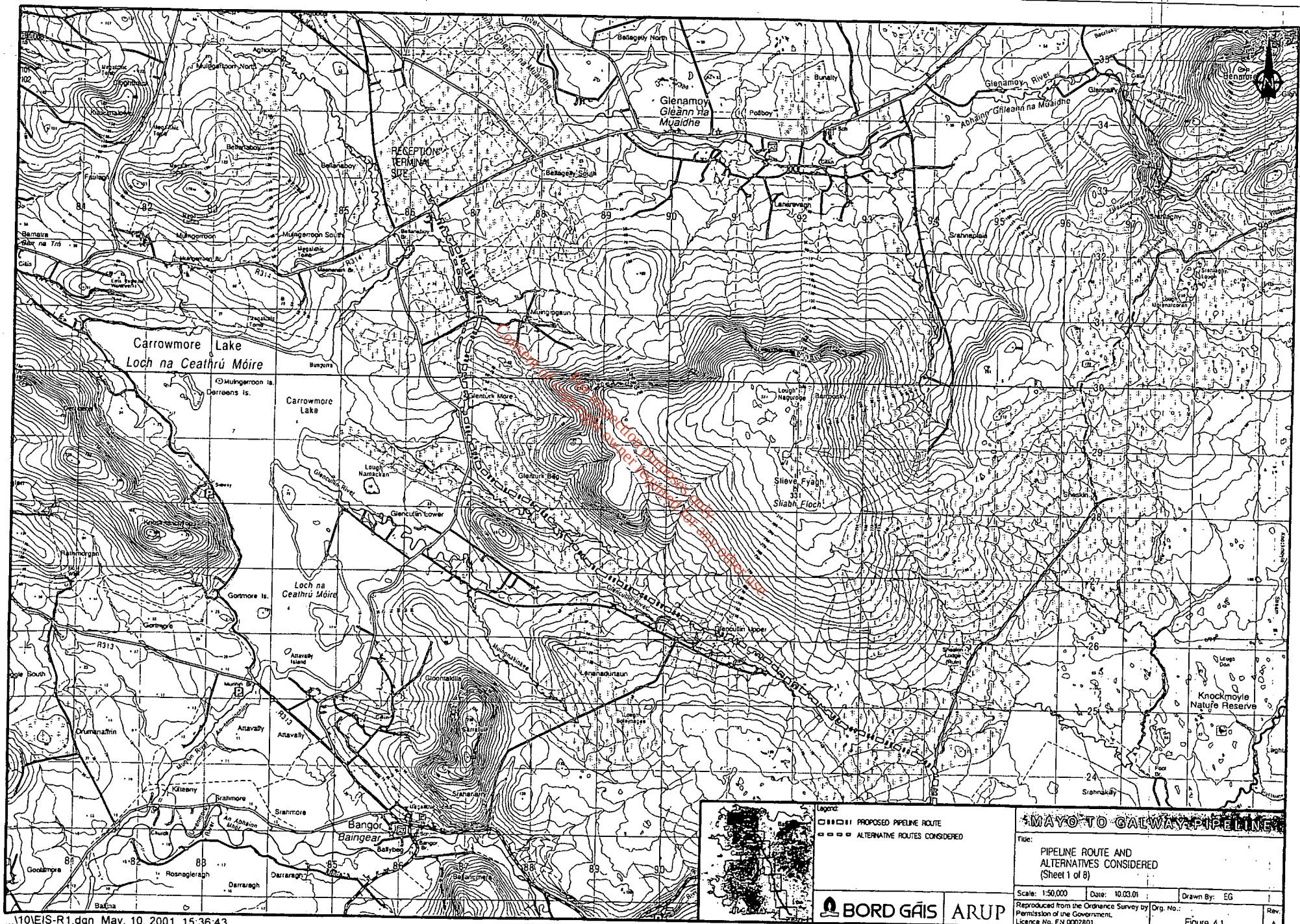


ENVIRONMENTAL IMPACT STATEMENT

Volume II

MAY 2001

ARUP



Legend:
PROPOSED PIPELINE ROUTE
ALTERNATIVE ROUTES CONSIDERED

MAYO TO GALWAY PIPELINE

Title:
PIPELINE ROUTE AND ALTERNATIVES CONSIDERED (Sheet 1 of 8)

Scale: 1:50,000 | Date: 10.03.01 | Drawn By: EG

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Figure 4.1

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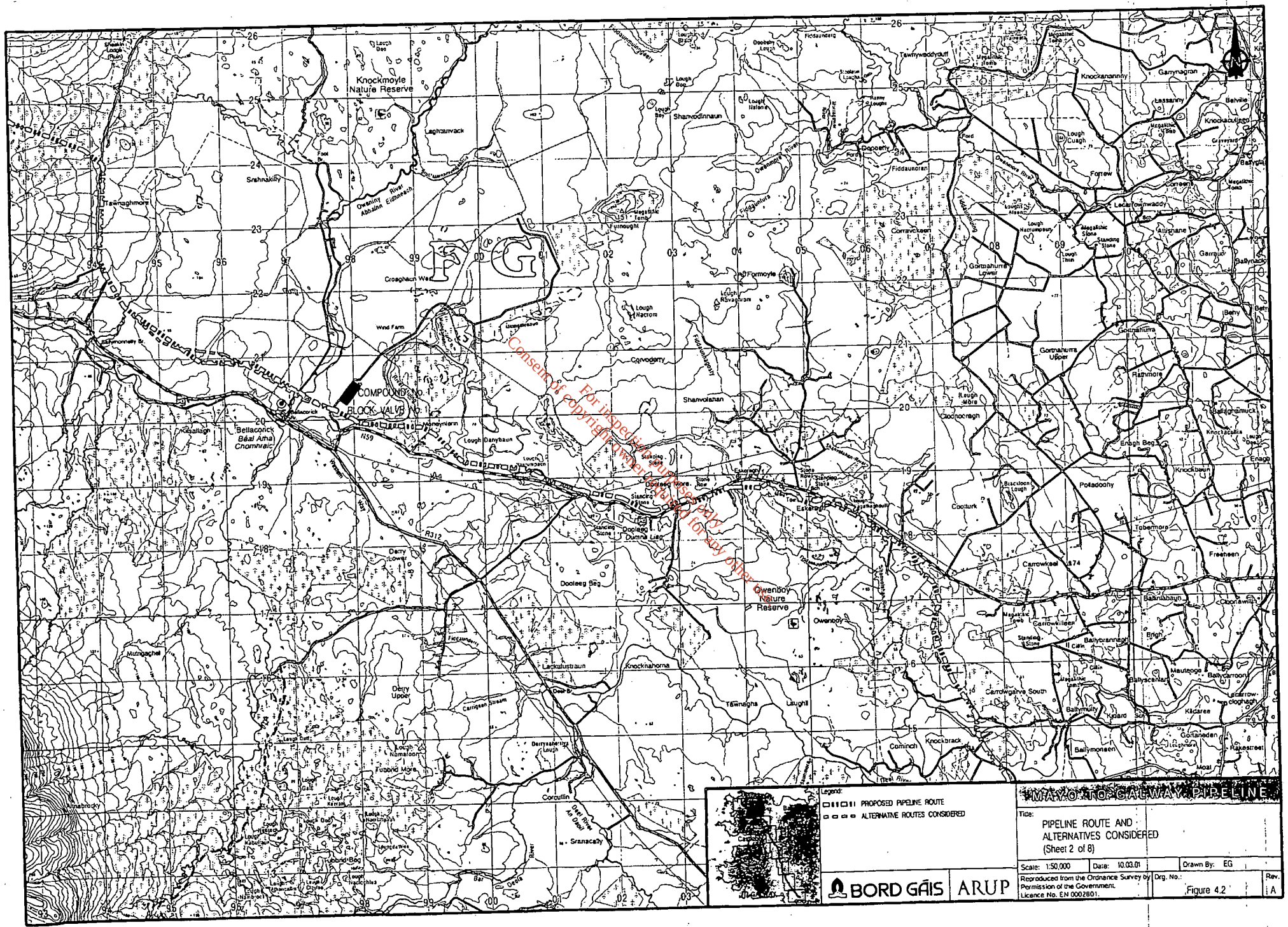

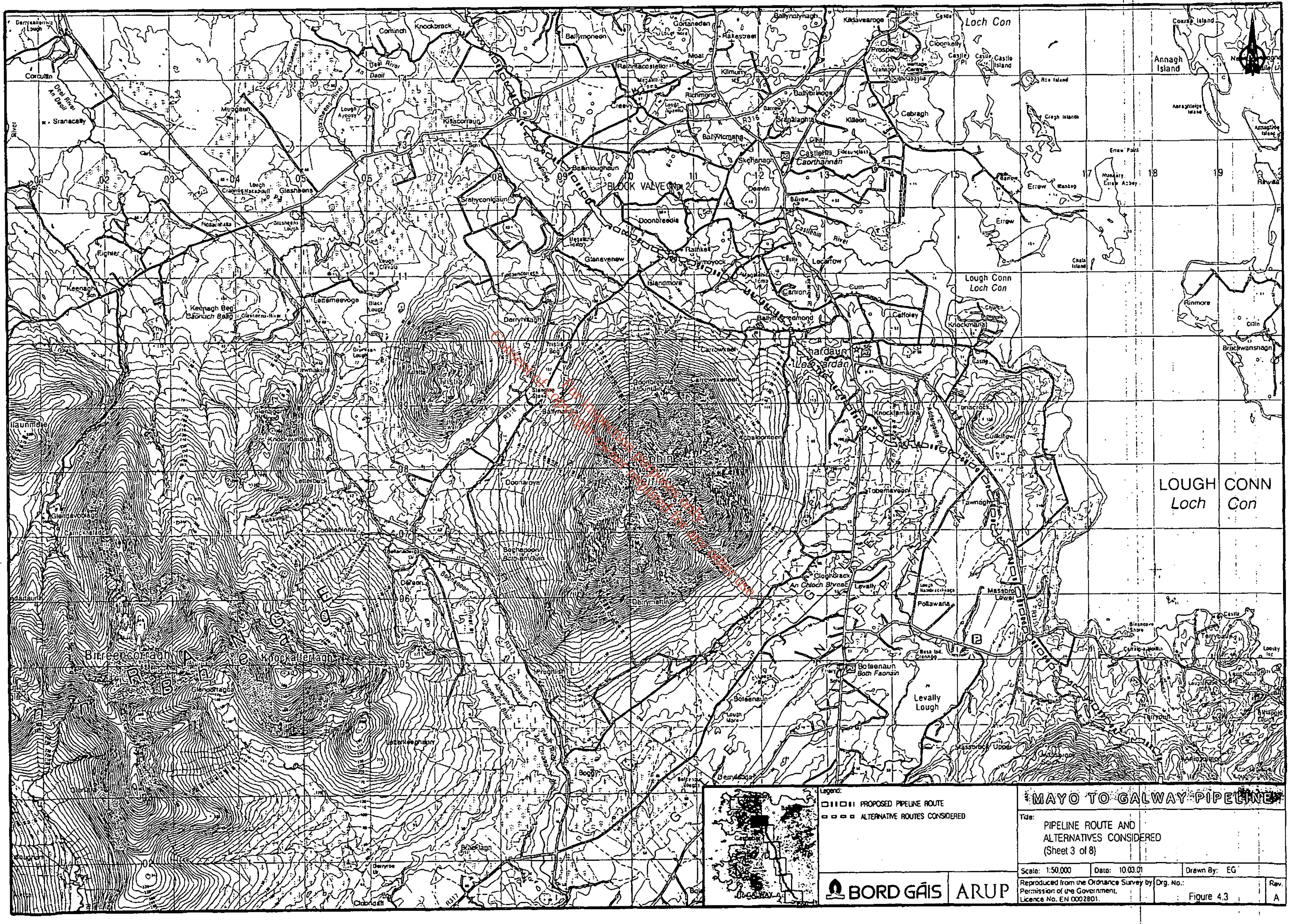

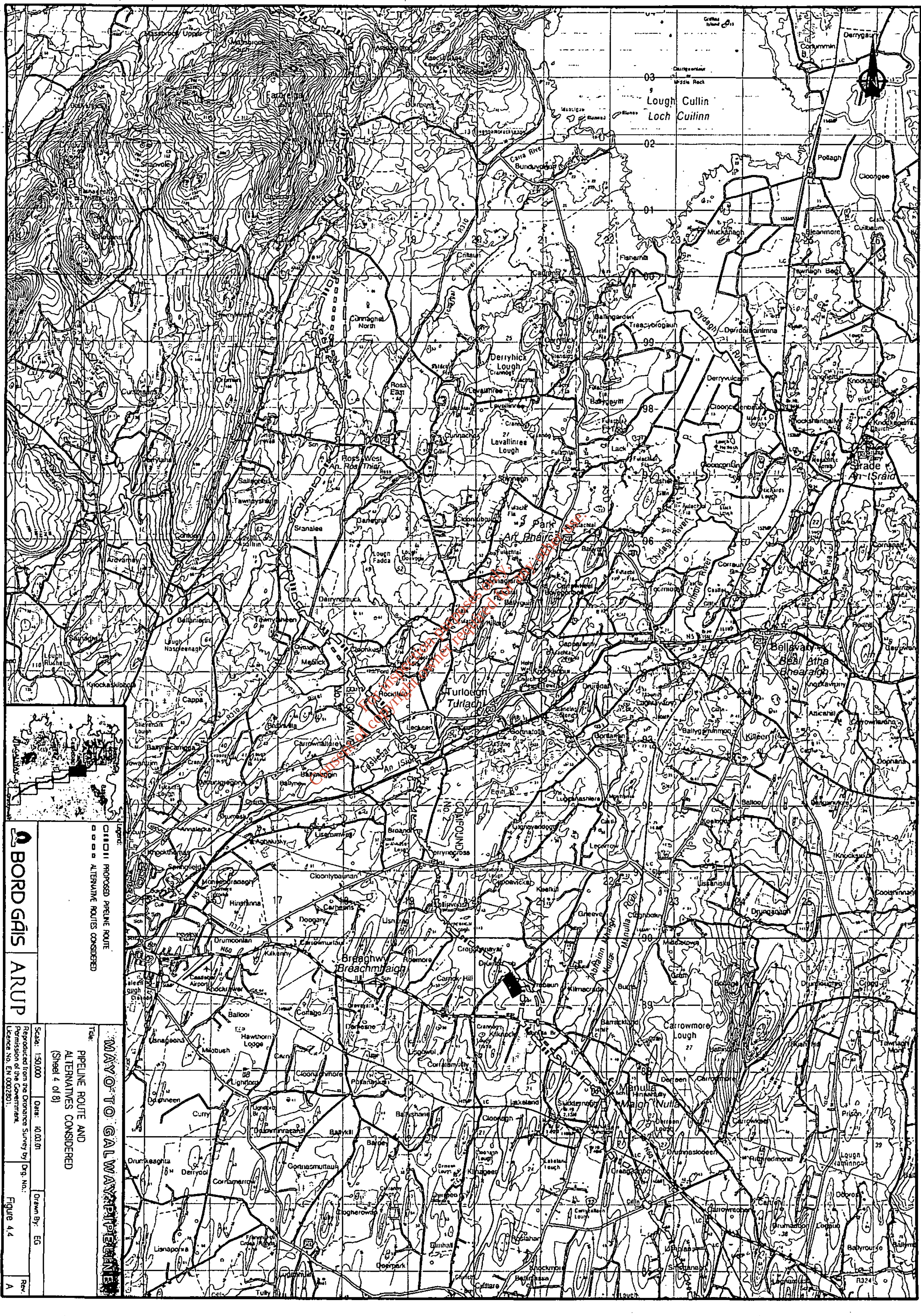

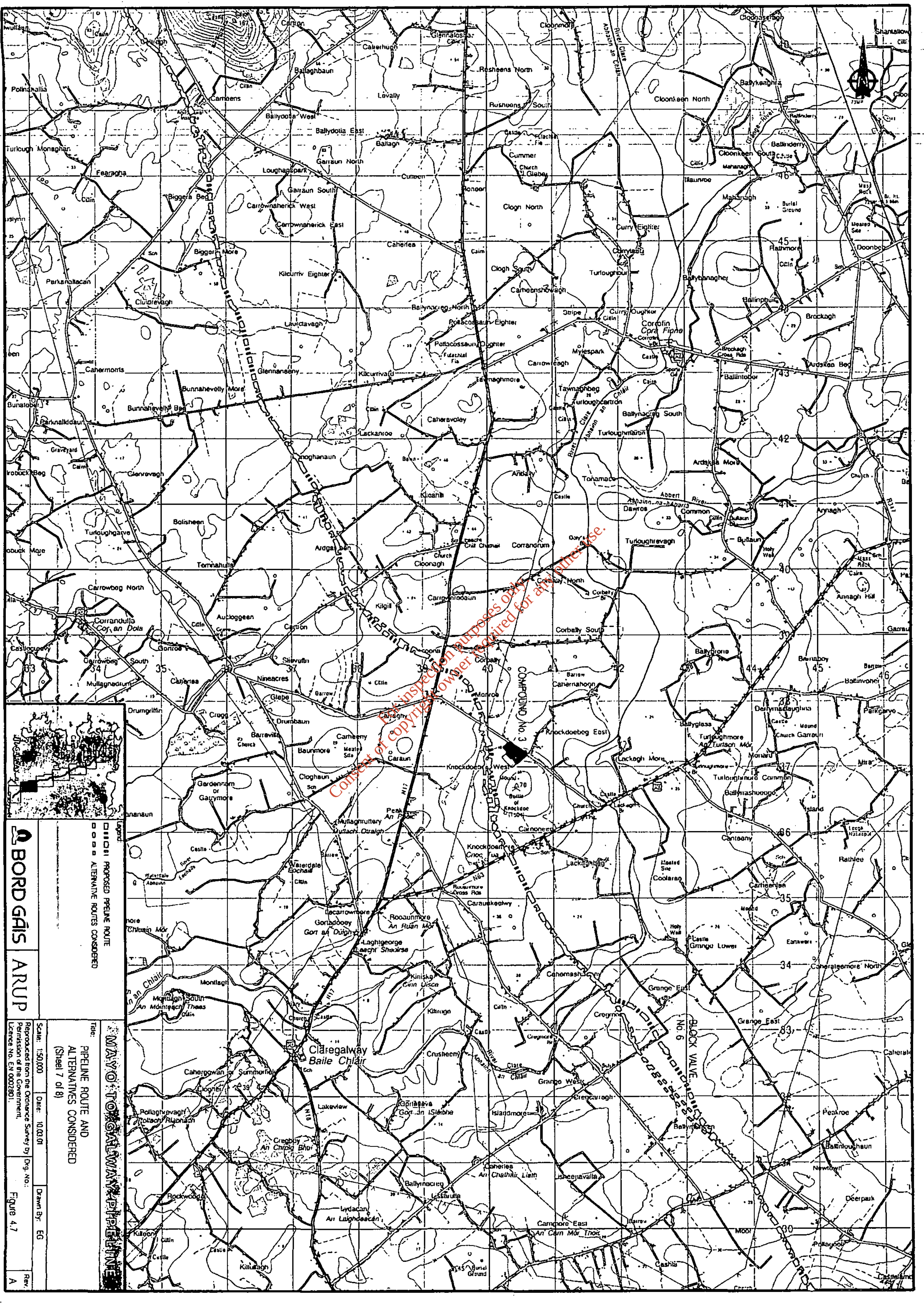

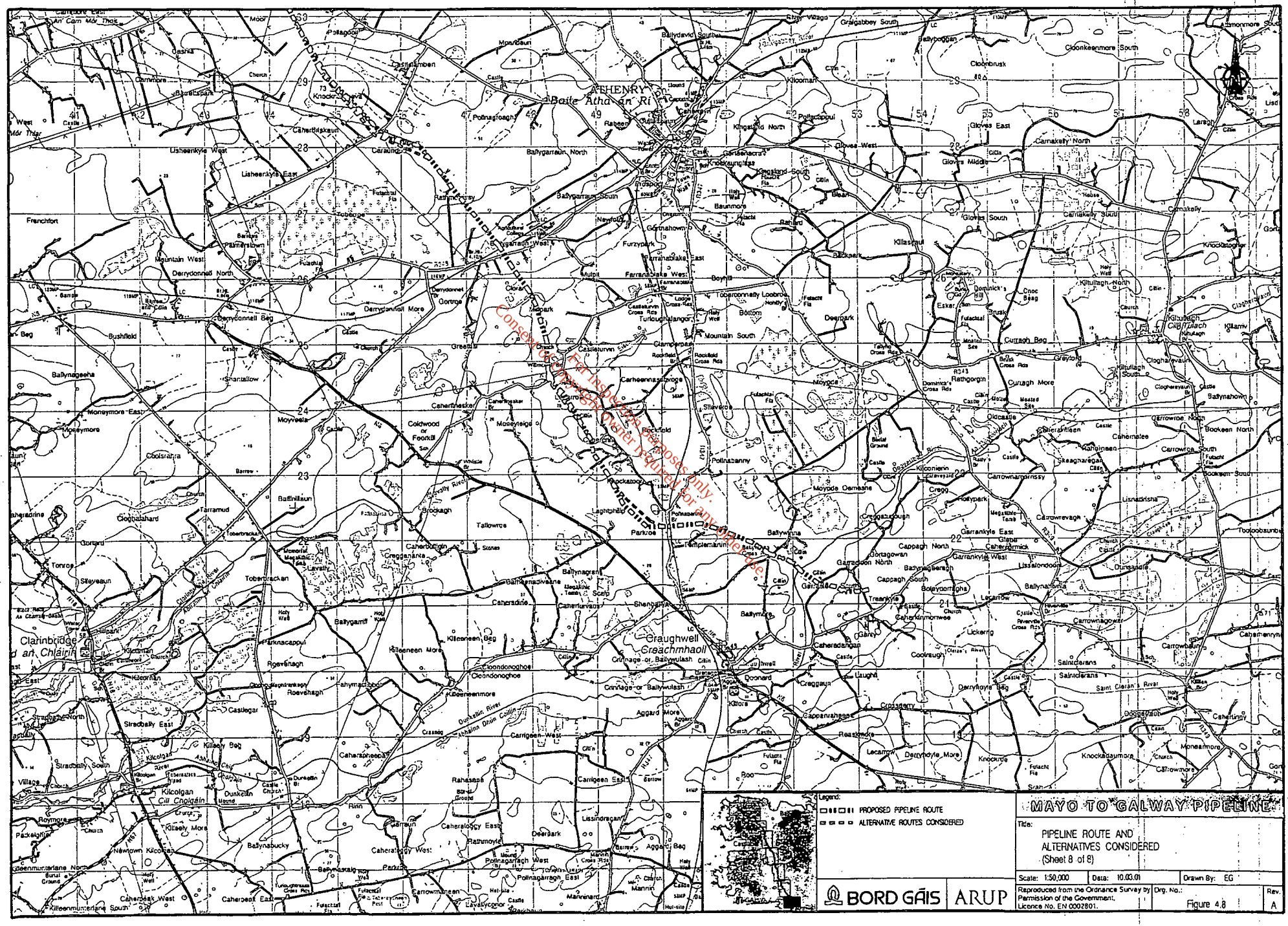

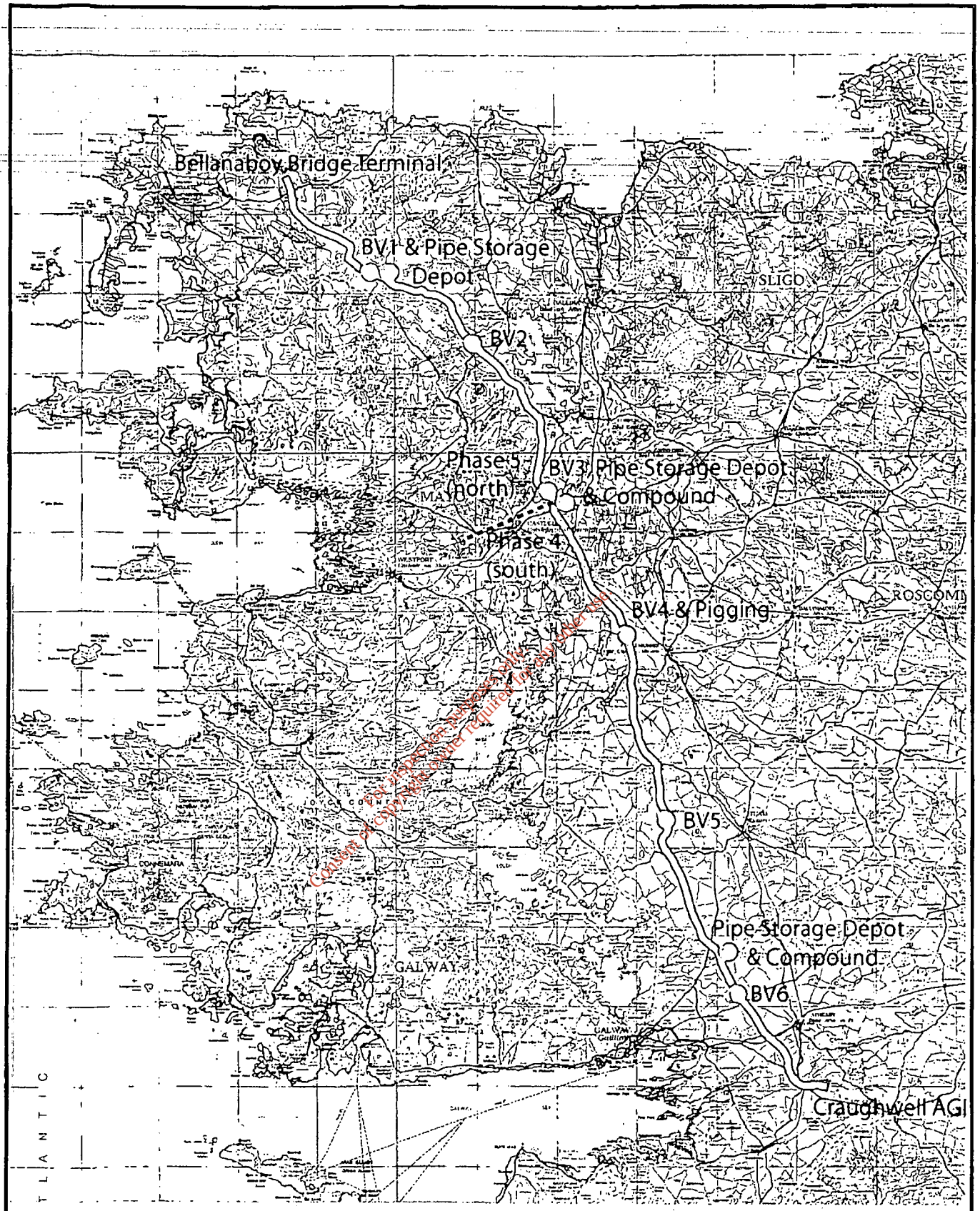

MAYO TO GALWAY PIPELINE

Title: LOCATION OF BLOCK VALVE STATIONS, PIPE STORAGE DEPOTS AND CONSTRUCTION COMPOUNDS

Scale: N.T.S.	Date: 20.04.01	Drawn By: EG

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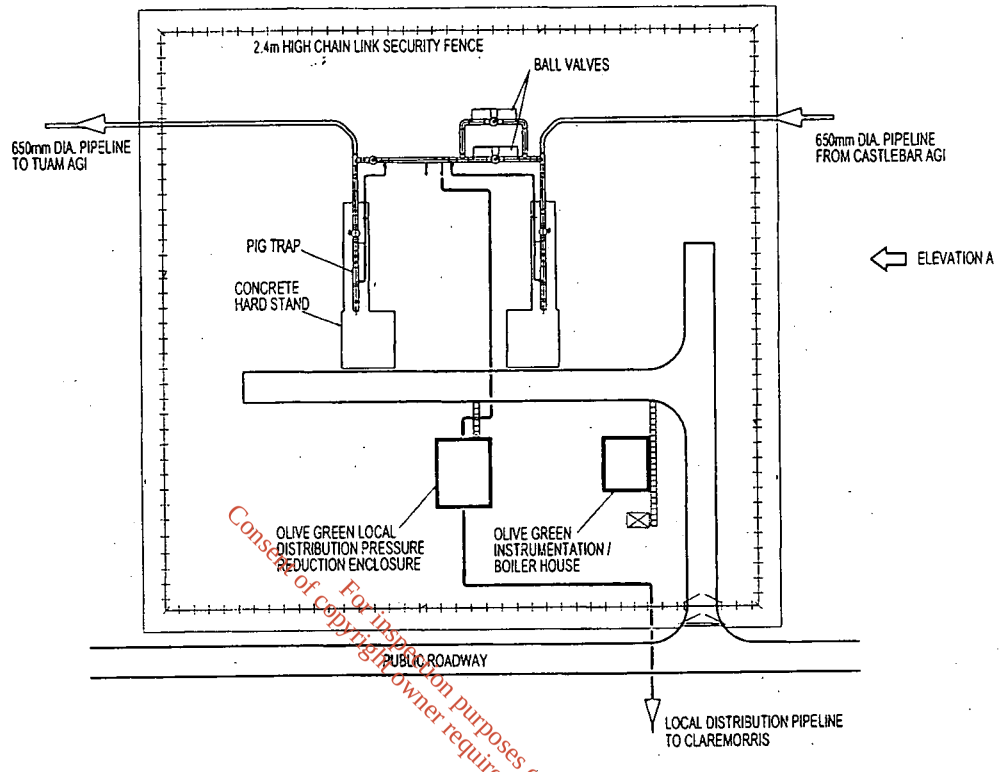
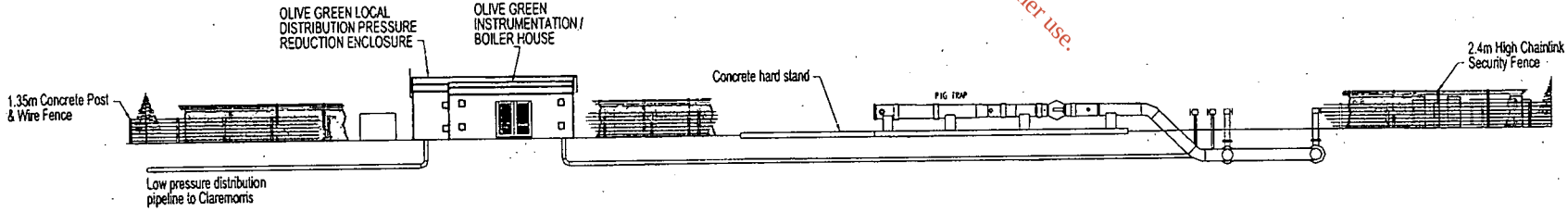
Figure 5.1

Rev. A



PLAN



ELEVATION A

BORD GÁIS

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MAYO TO GALWAY PIPELINE

Title: TYPICAL LAYOUT OF A BLOCK VALVE STATION WITH PIG TRAP

Scale: N.T.S.	Date: 25.04.01	Drawn By: EG
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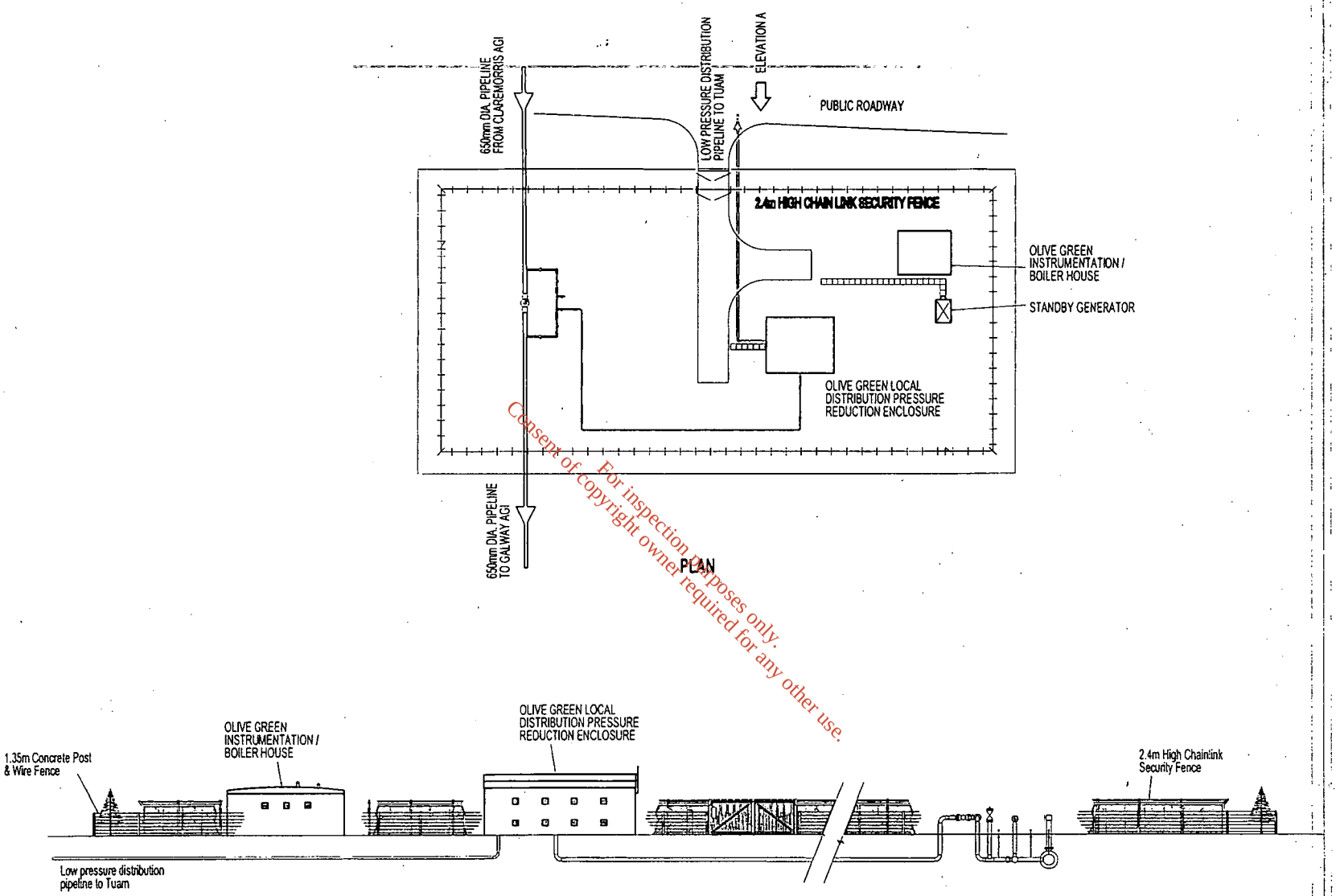

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MAYO TO GALWAY PIPELINE

Title: TYPICAL LAYOUT OF A BLOCK VALVE STATION

Scale: N.T.S. | Date: 25.04.01 | Drawn By: EG

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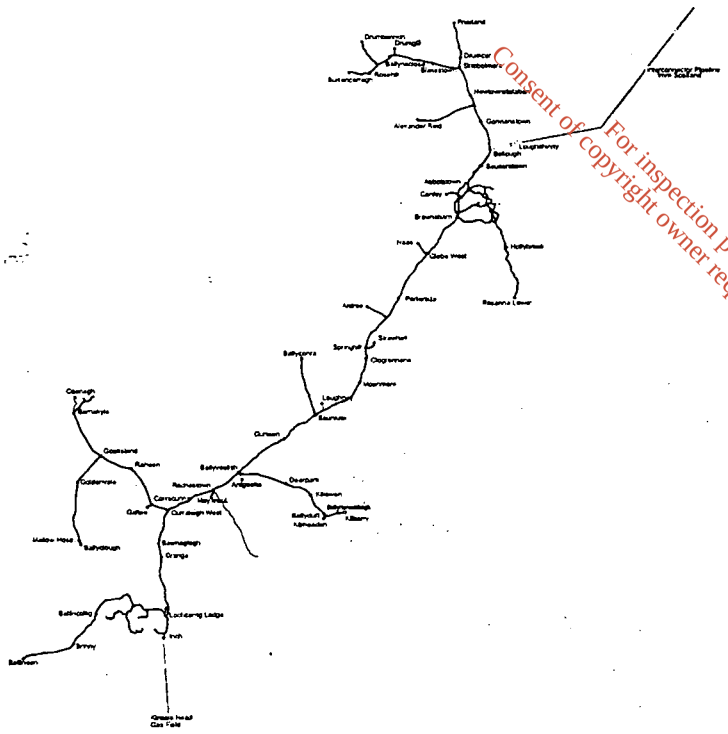
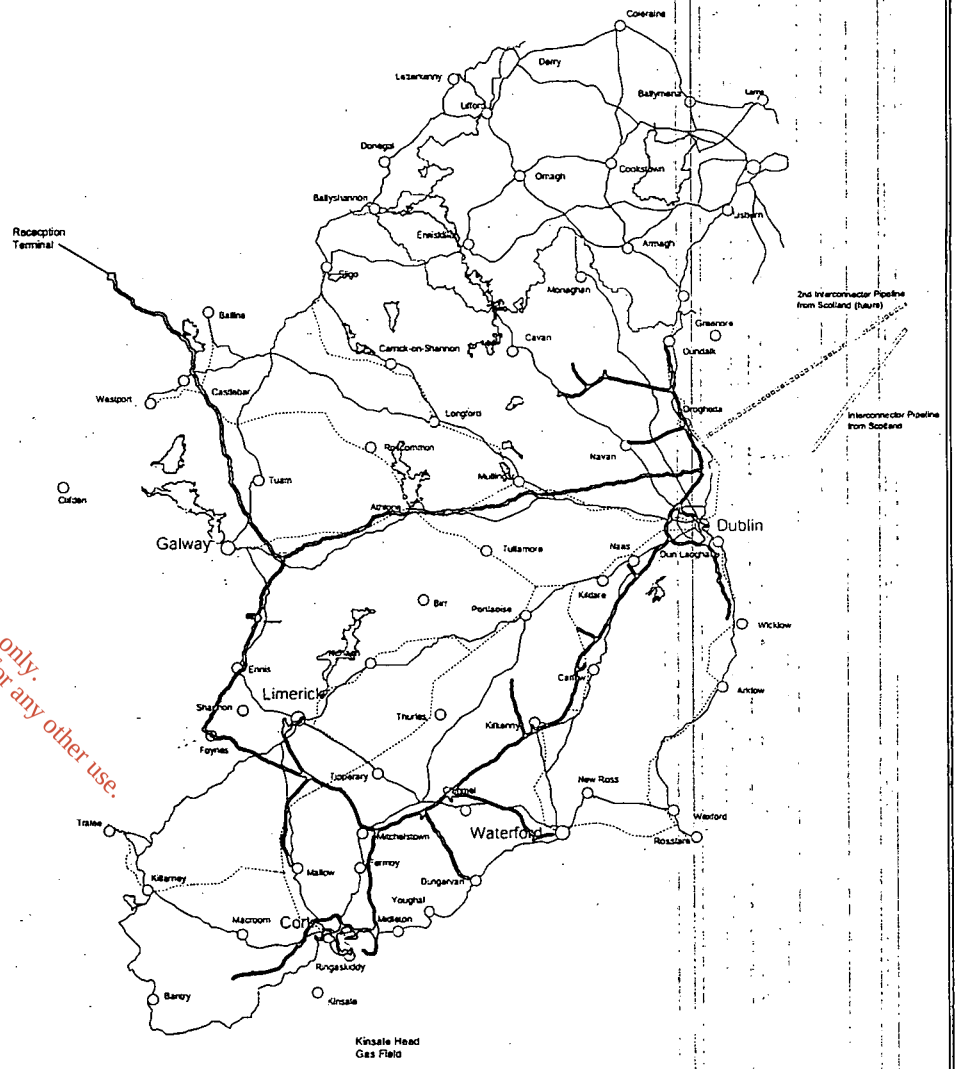
Rev. A





Proposed Bord Gais Eireann Network

Legend:

- Proposed Broadhaven to Galway Pipeline
- Proposed Galway to Dublin Pipeline
- Existing / Committed Pipelines
- Subsea Pipelines
- Possible Future Subsea Pipeline

MAYO TO GALWAY PIPELINE

Title:

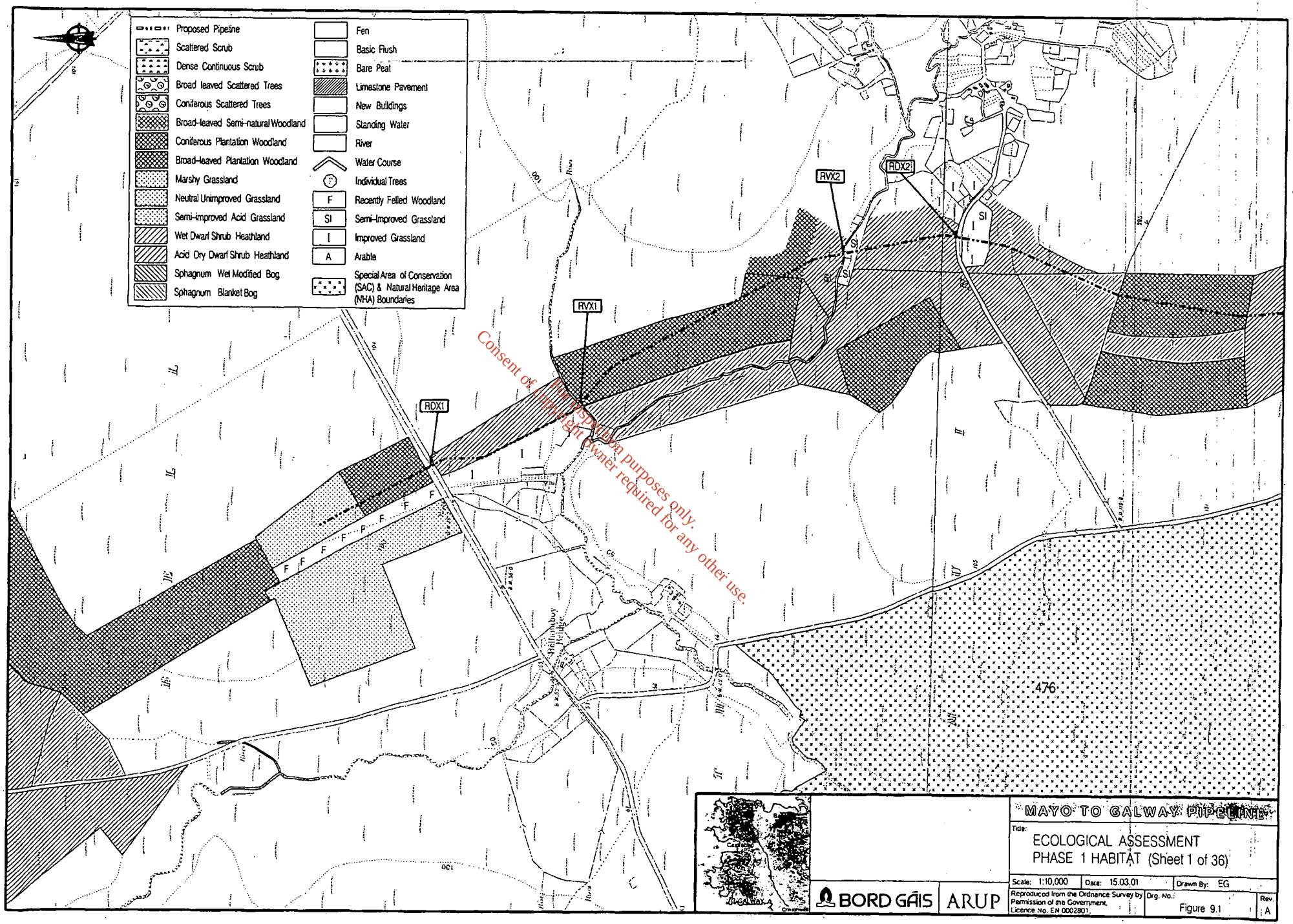
EXISTING & PROPOSED
BORD GAIS EIREANN NETWORK

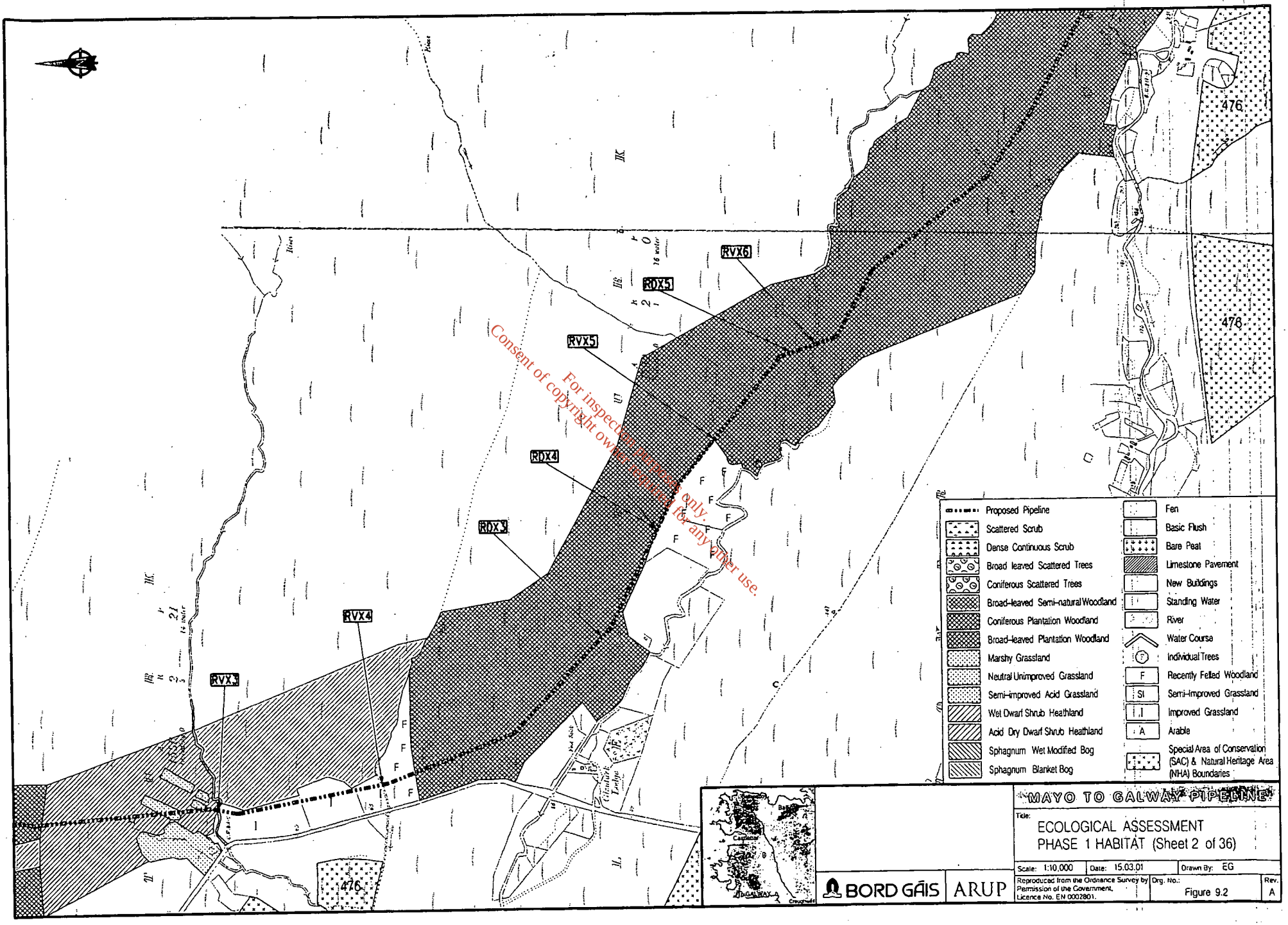
Scale: N.T.S.	Date: N.T.S.	Drawn By: N.T.S.

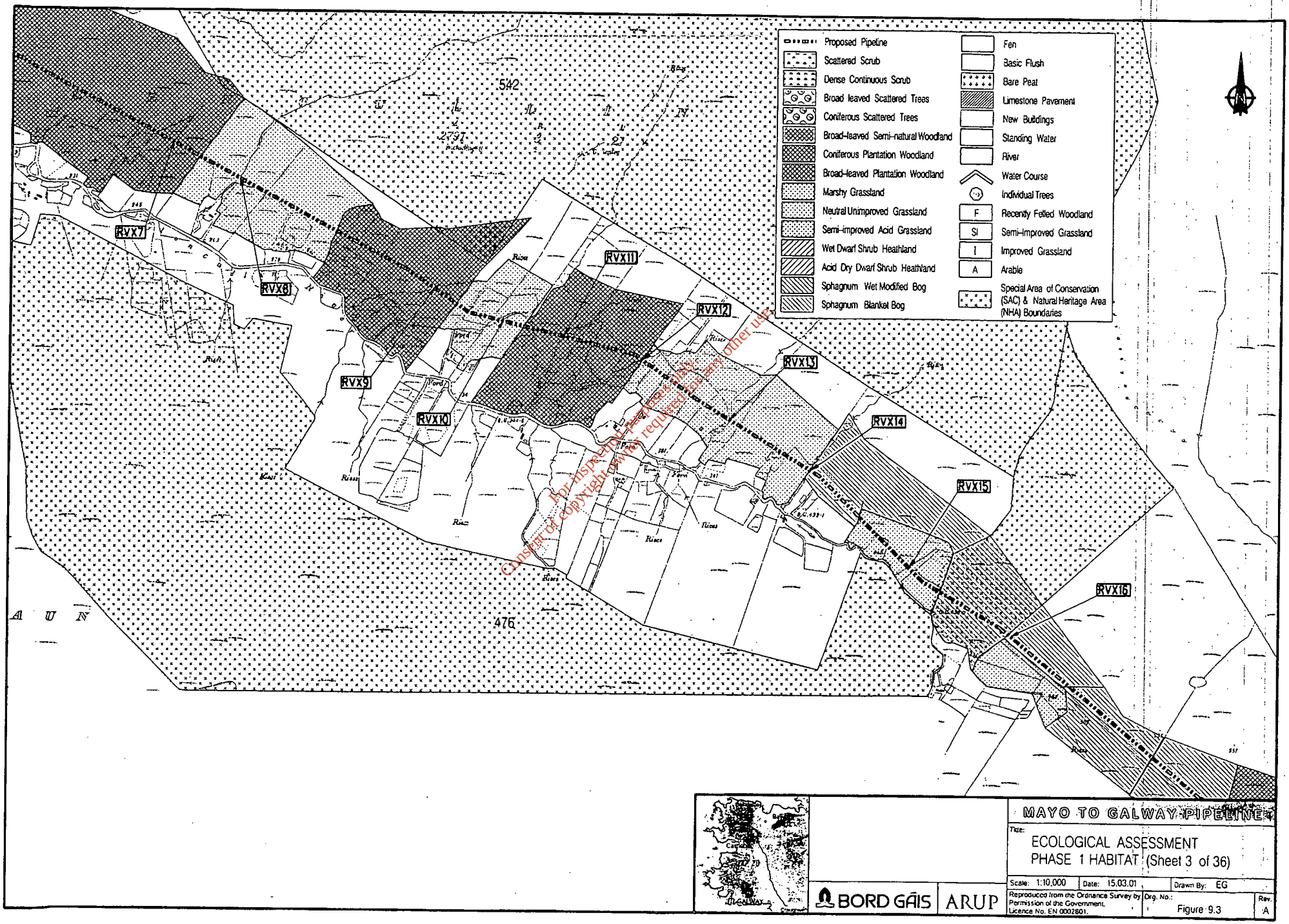
BORD GÁIS | ARUP

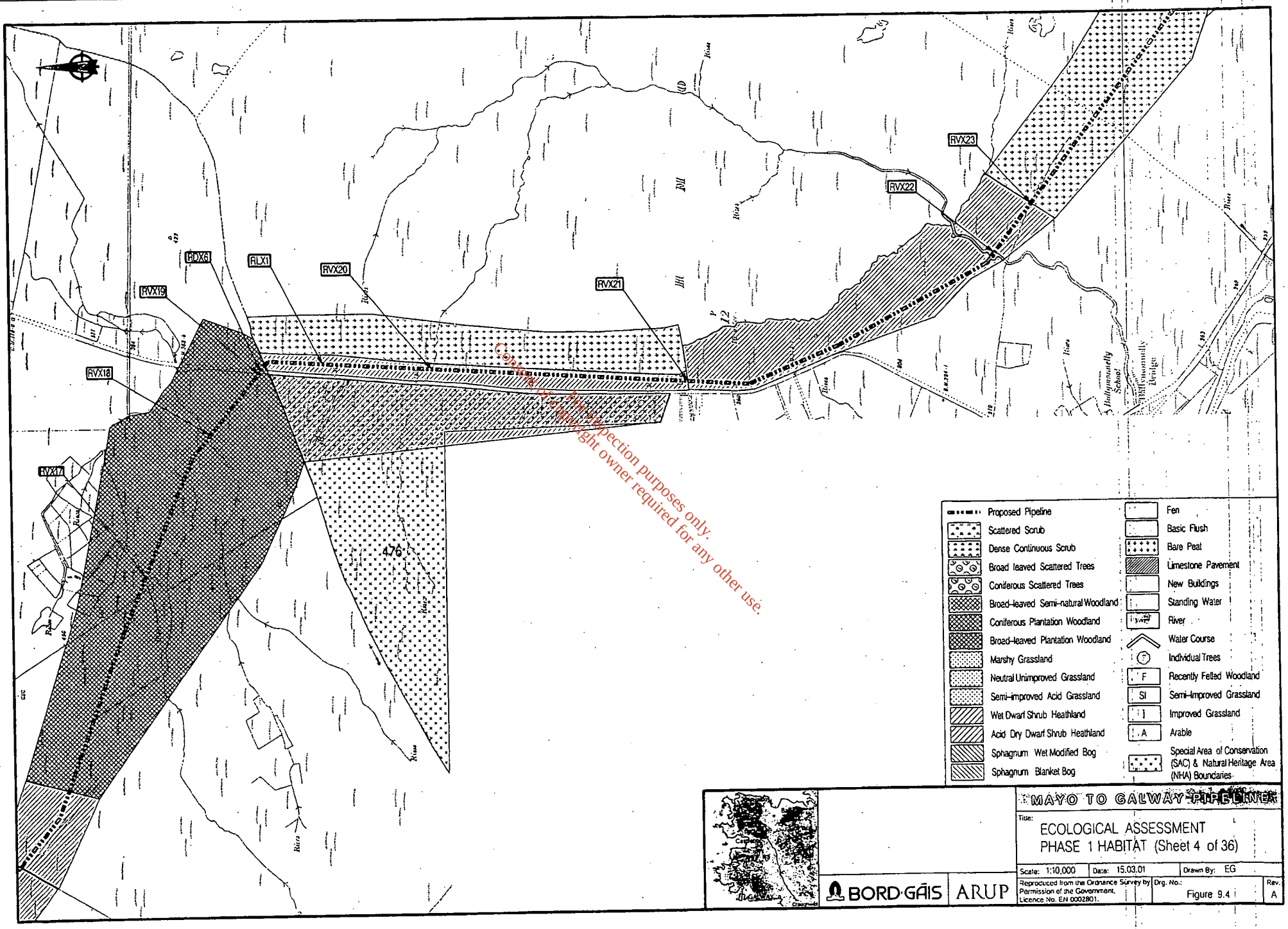
Drg. No.: Figure 8.1

Rev. A









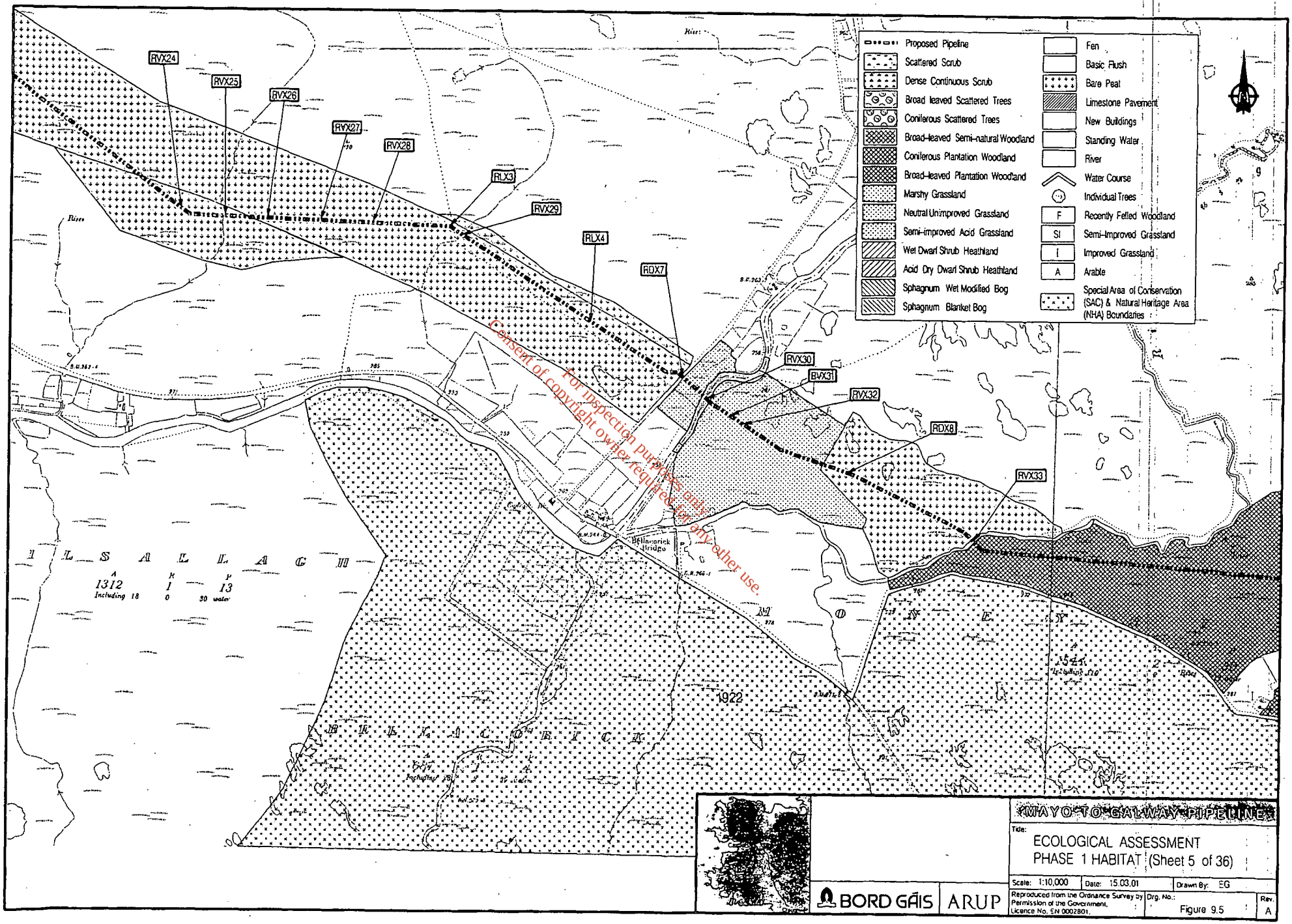
MAYO TO GALWAY PIPELINE

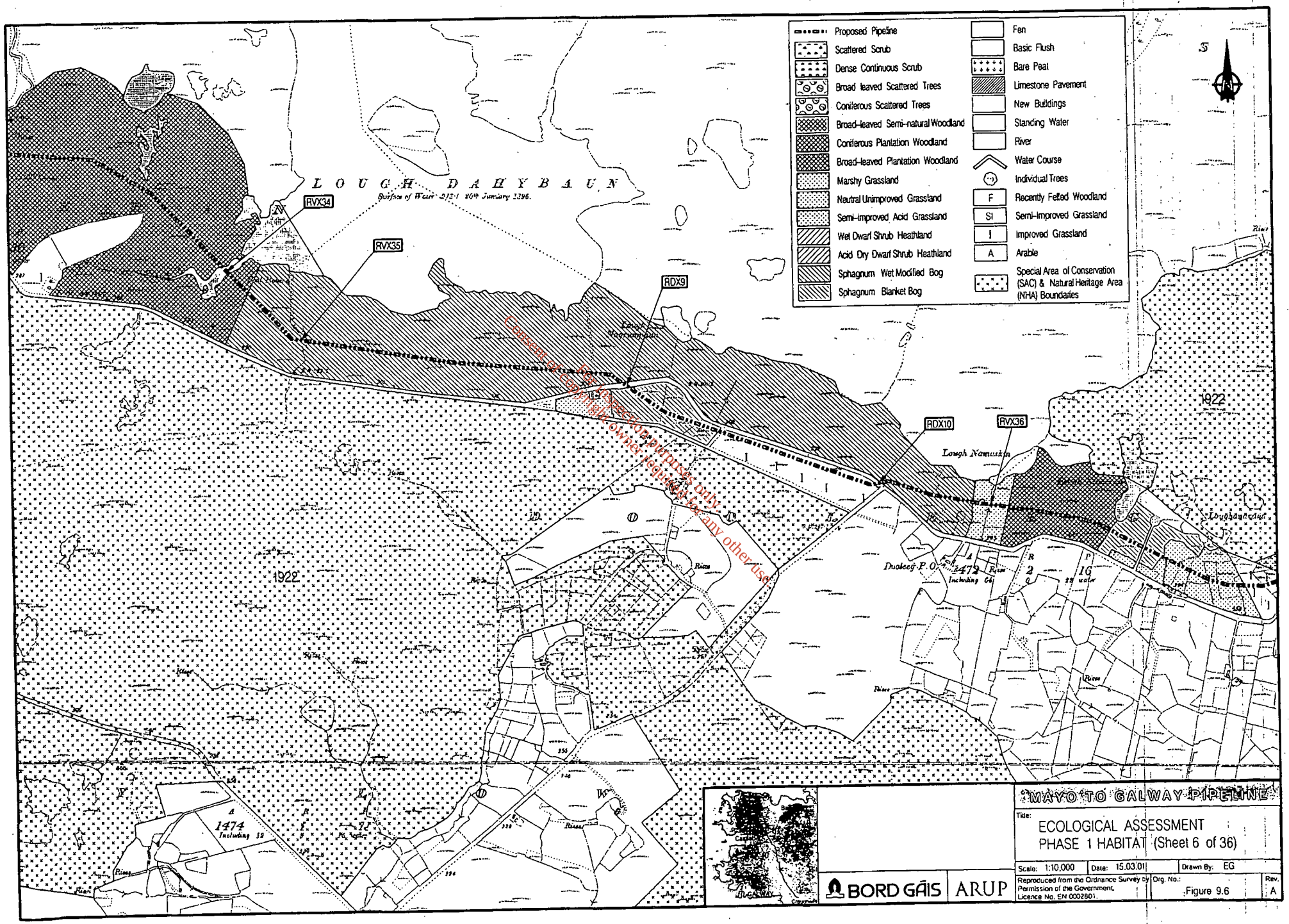
Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 4 of 36)

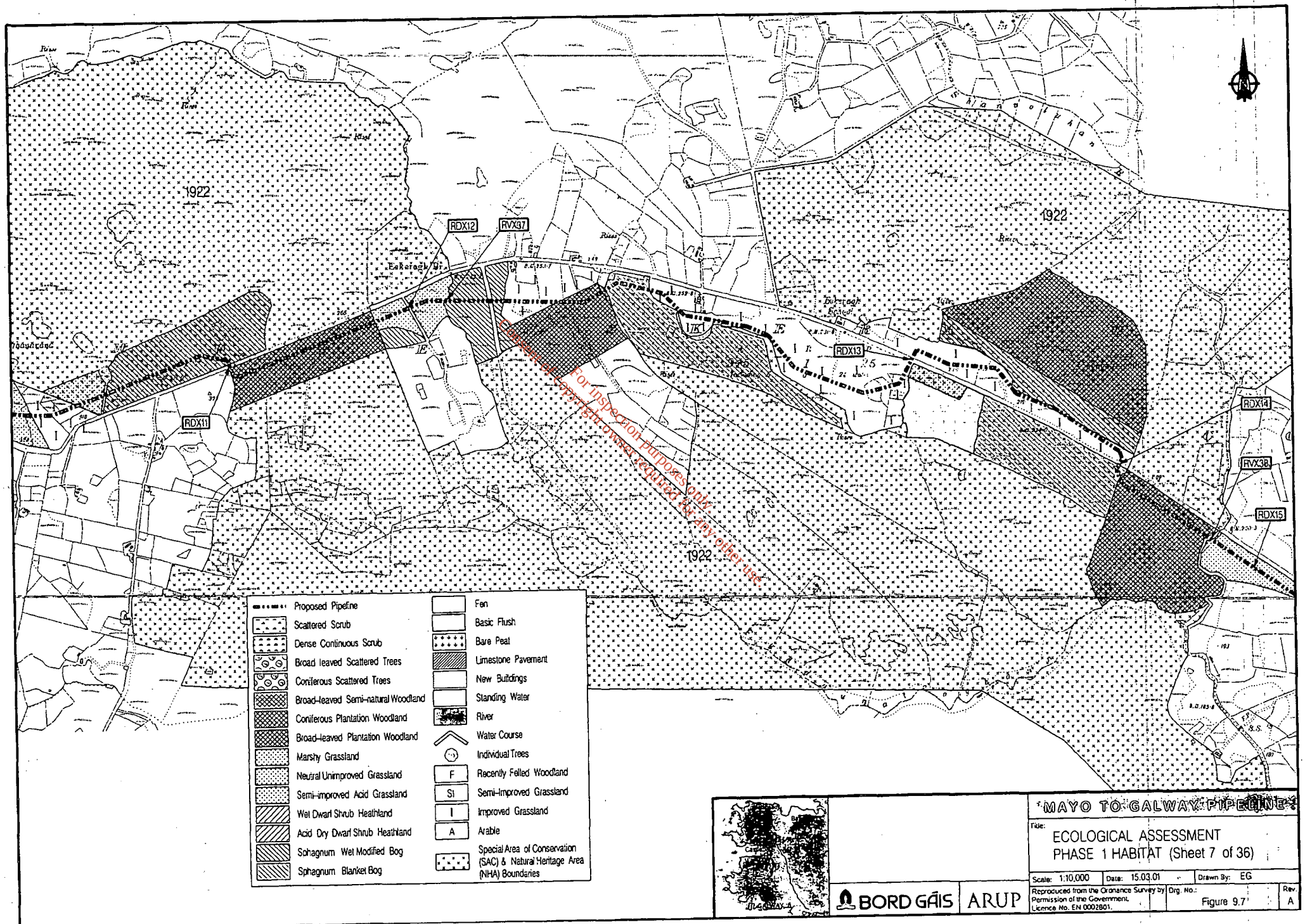
Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

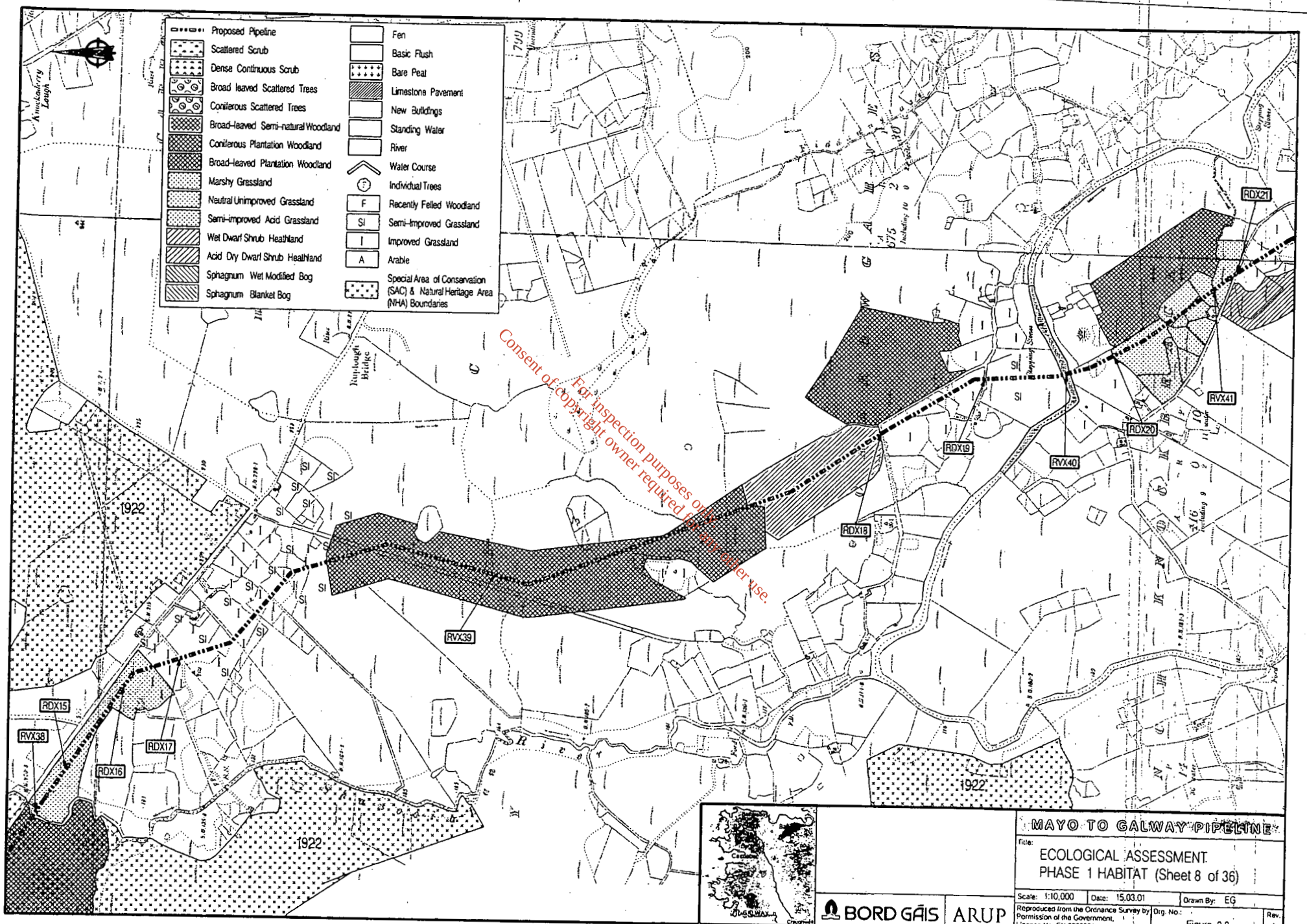
BORD GÁIS | ARUP

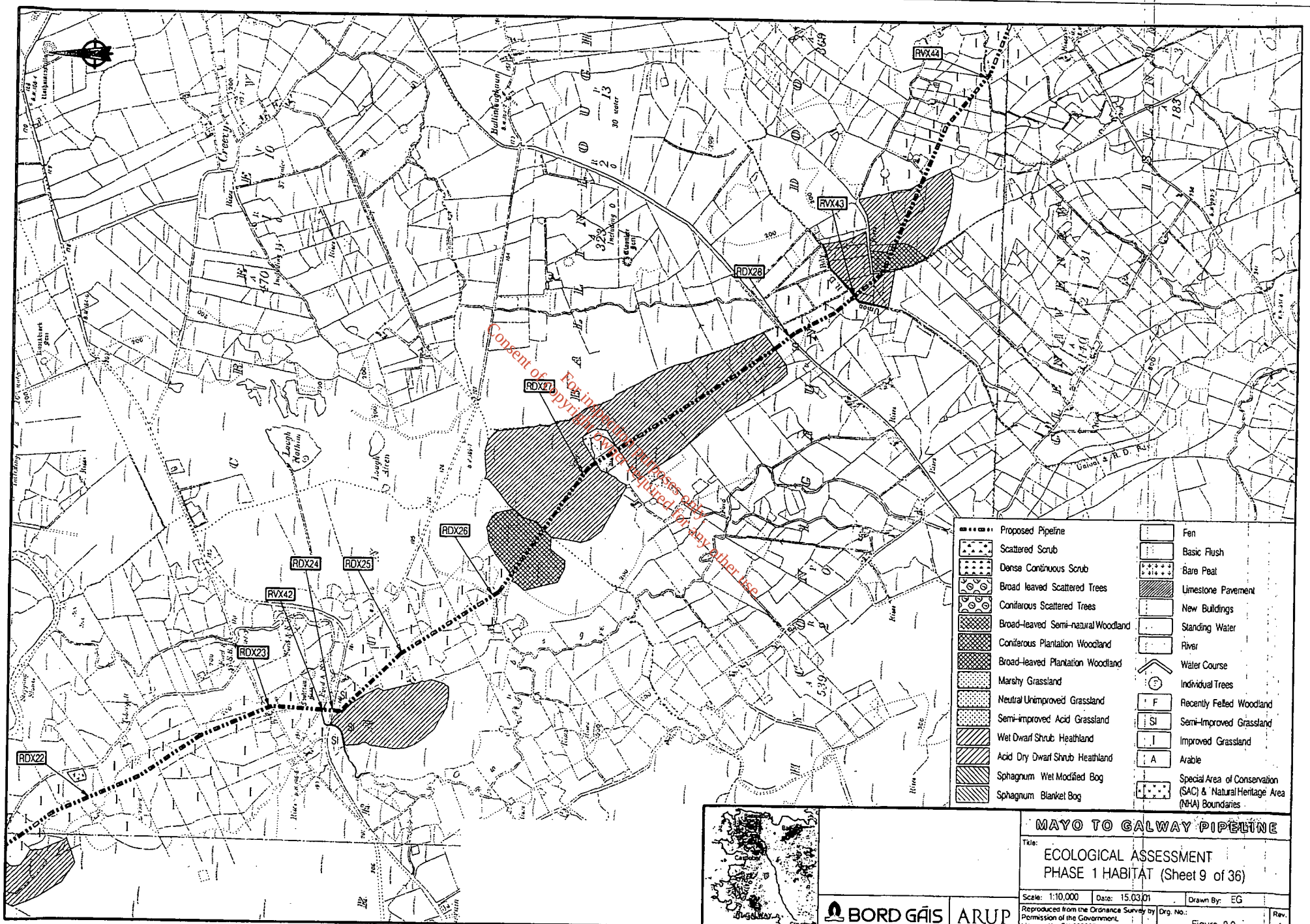
Drg. No.: Figure 9.4 | Rev. A











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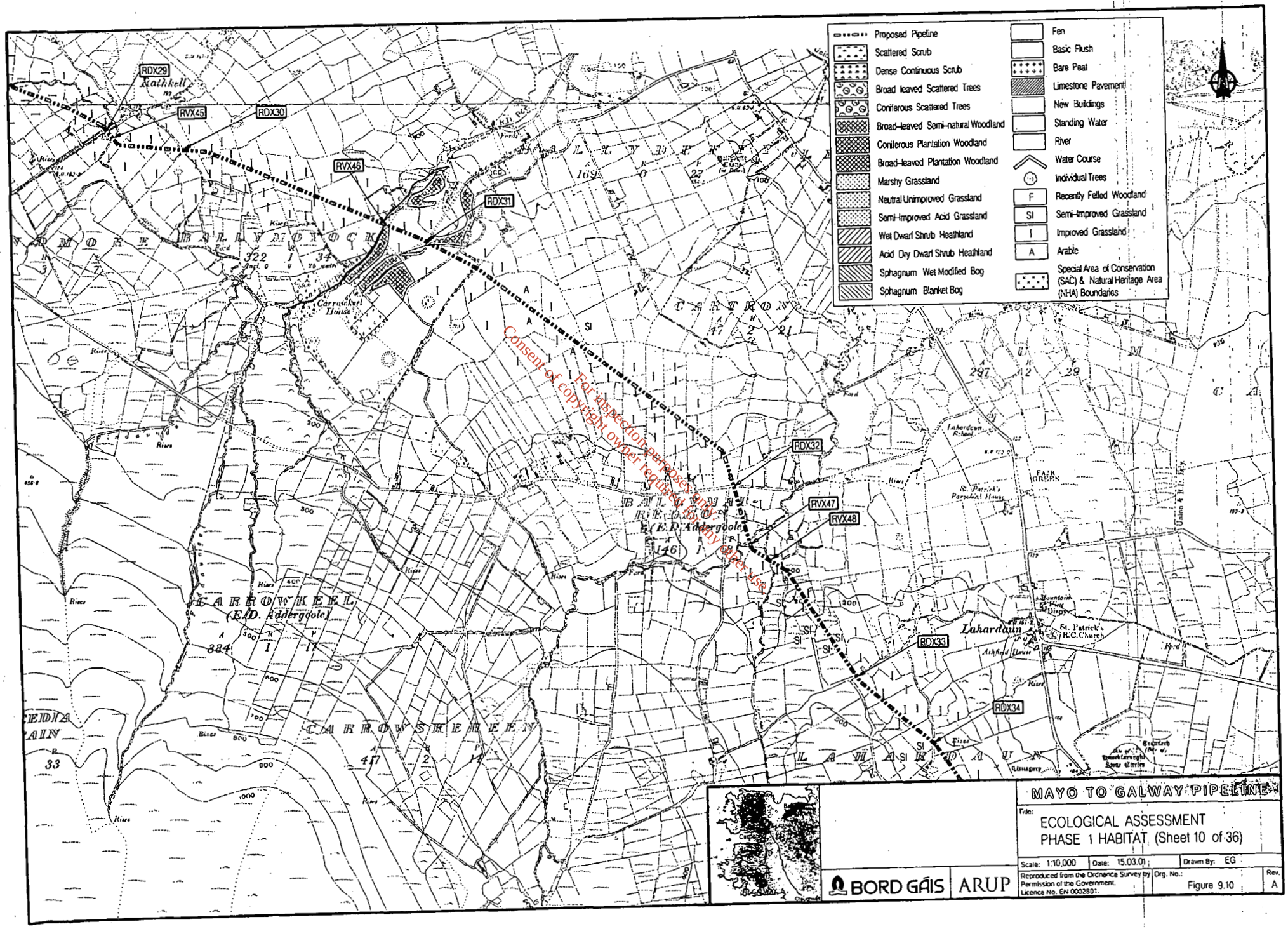
MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 9 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

Drg. No.: Figure 9.9

Rev. A



MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 10 of 36)

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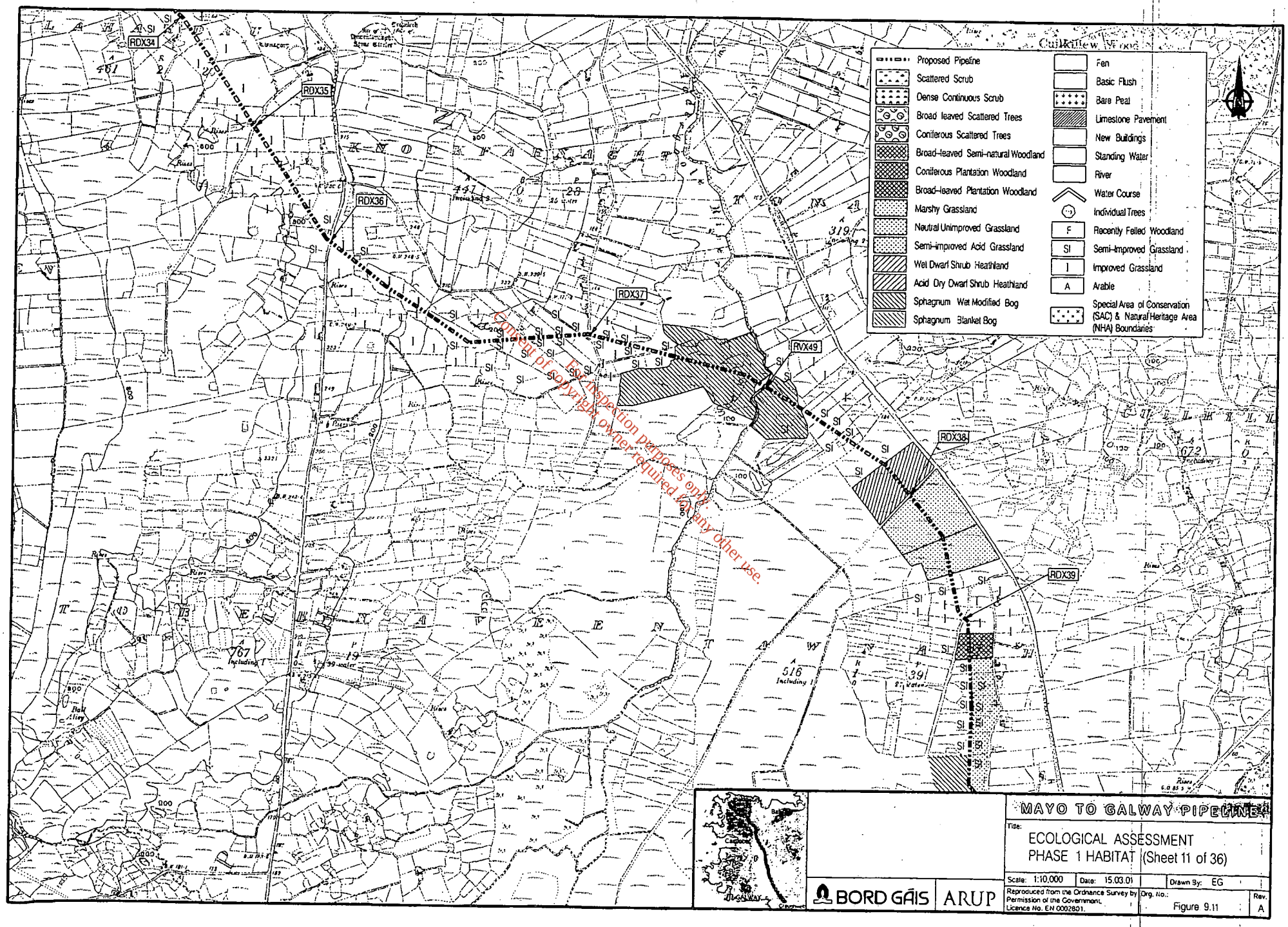
Drg. No.: Figure 9.10 | Rev. A



MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 11 of 36)

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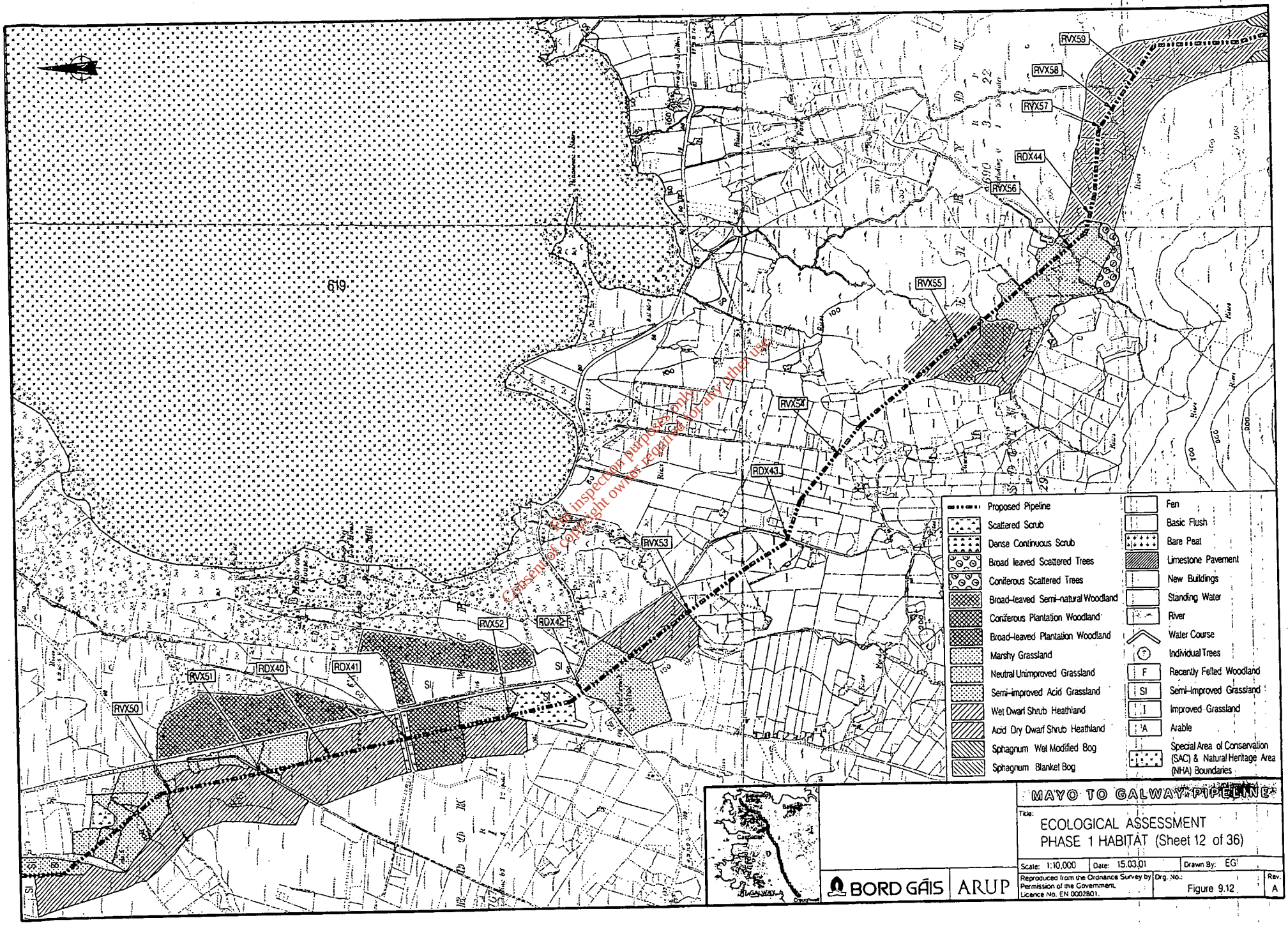
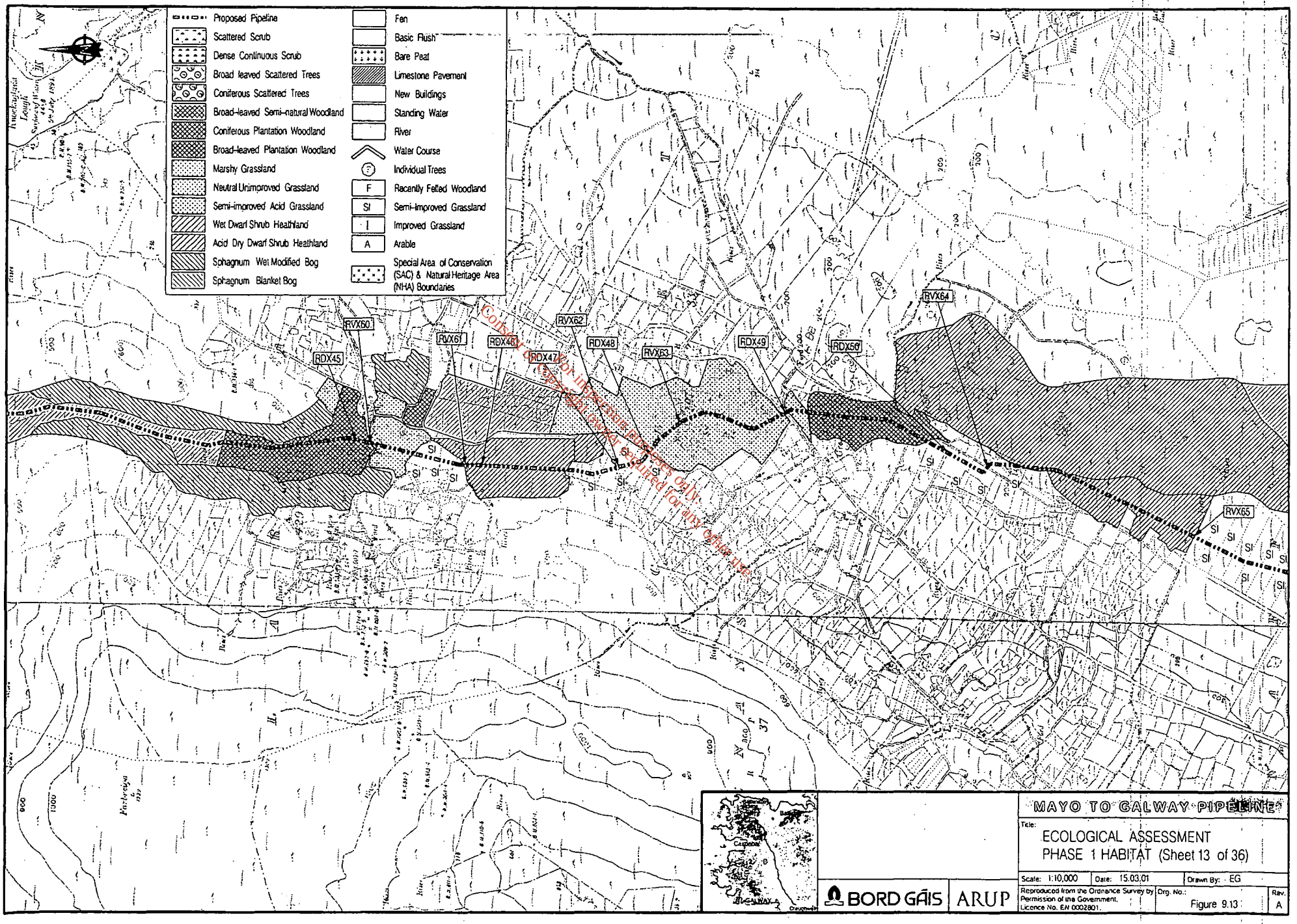
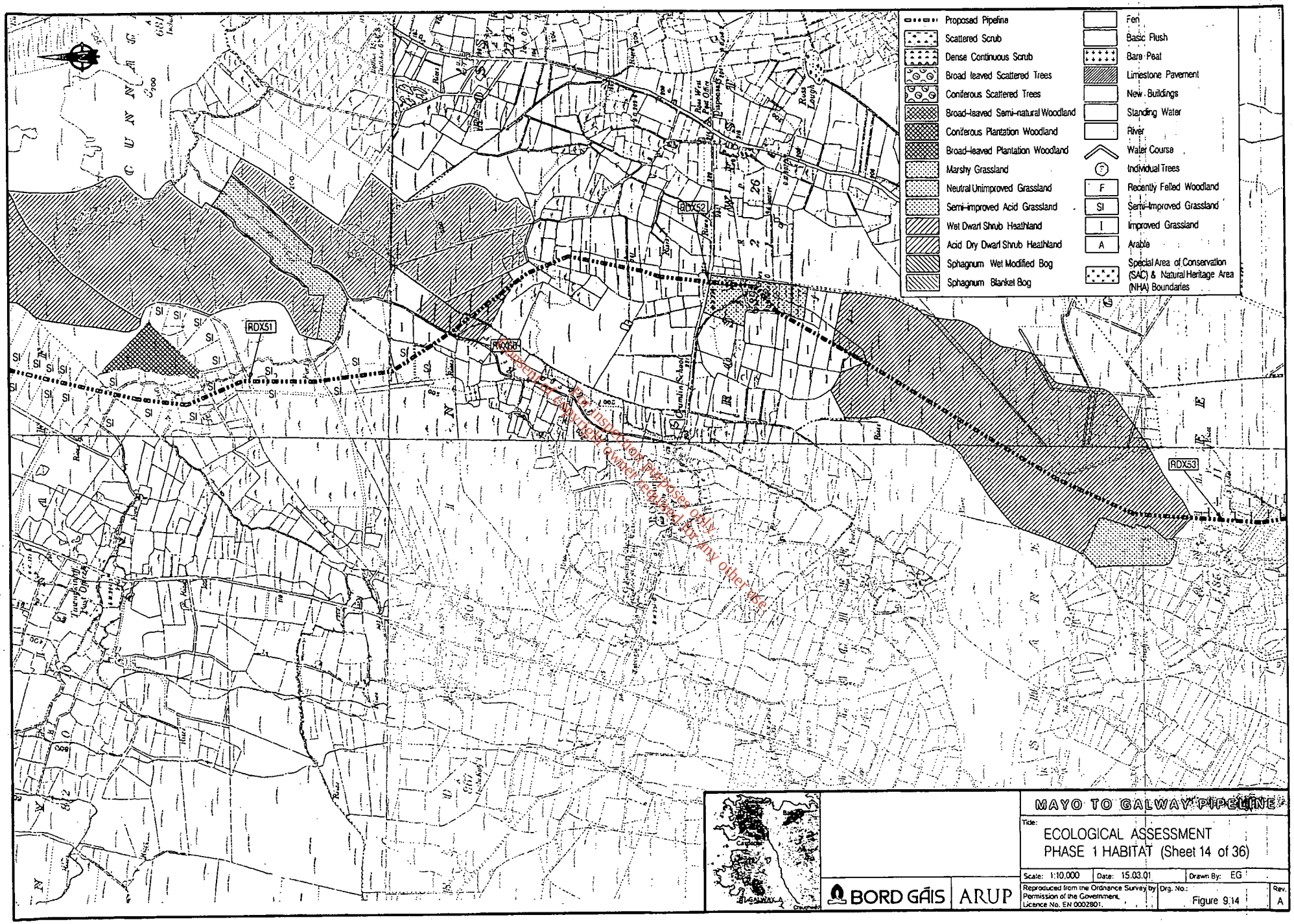
Org. No.:

Figure 9.11

Rev. A







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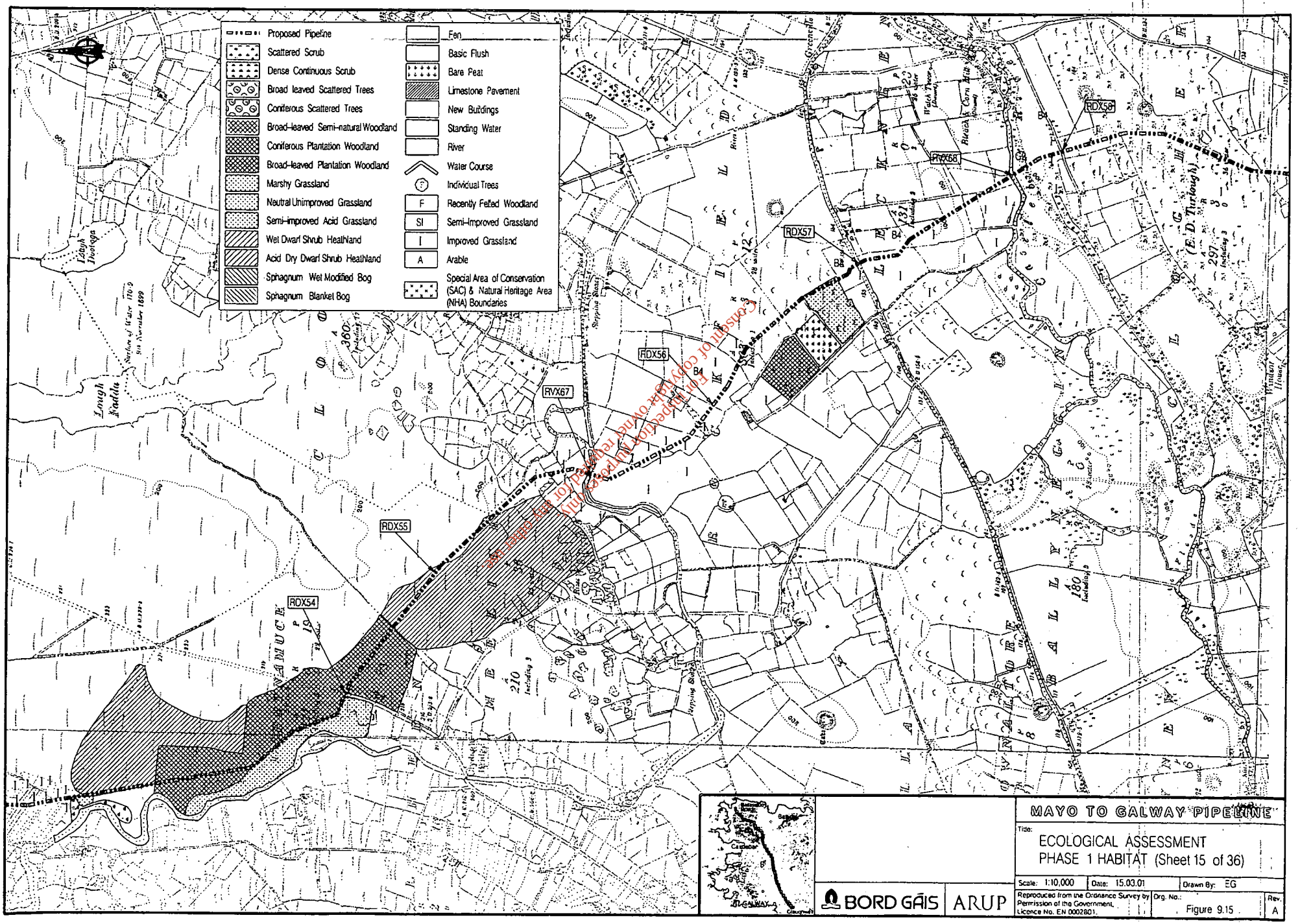
MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 14 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

Drg. No.: Figure 9.14

Rev. A



MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 15 of 36)

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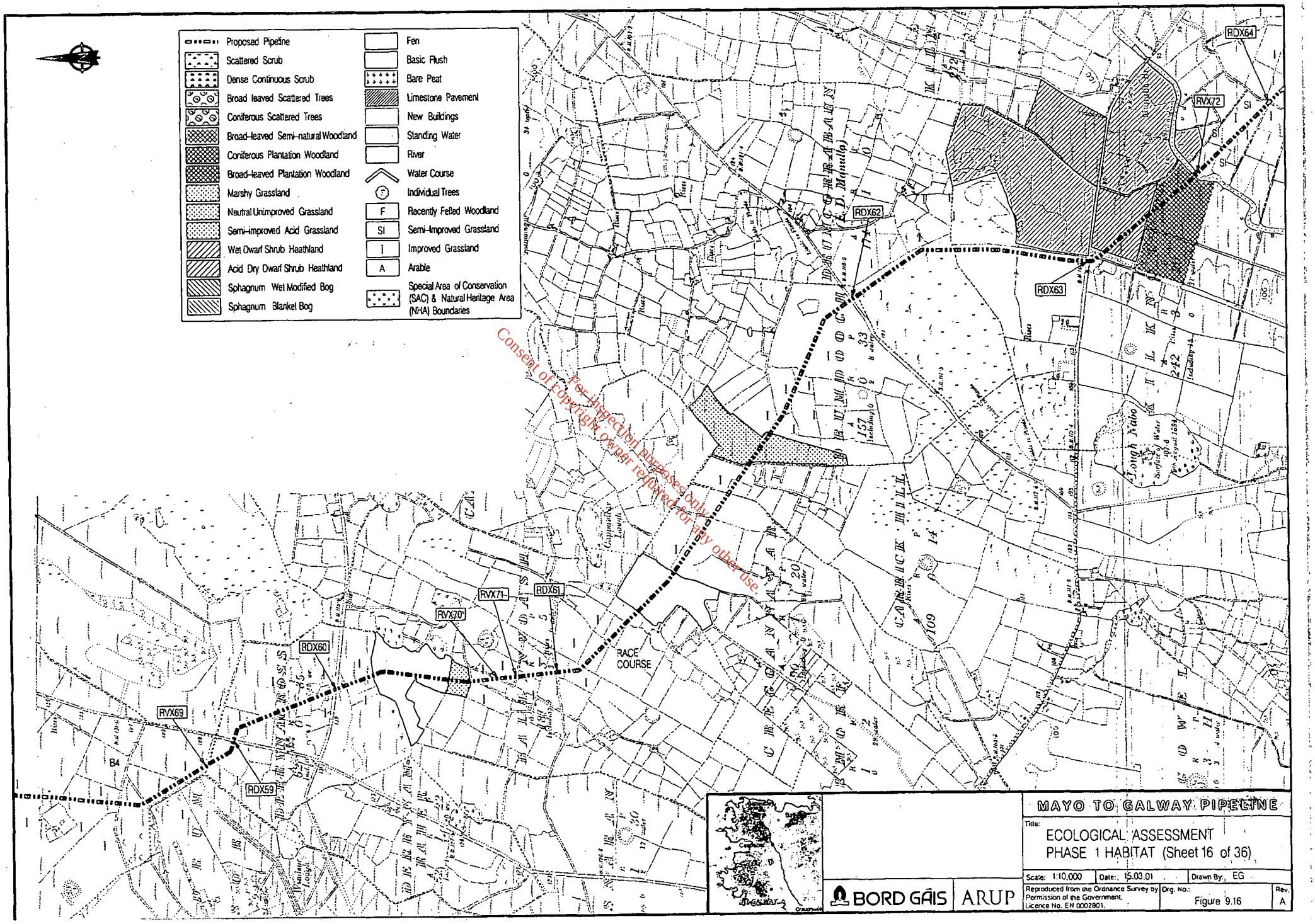
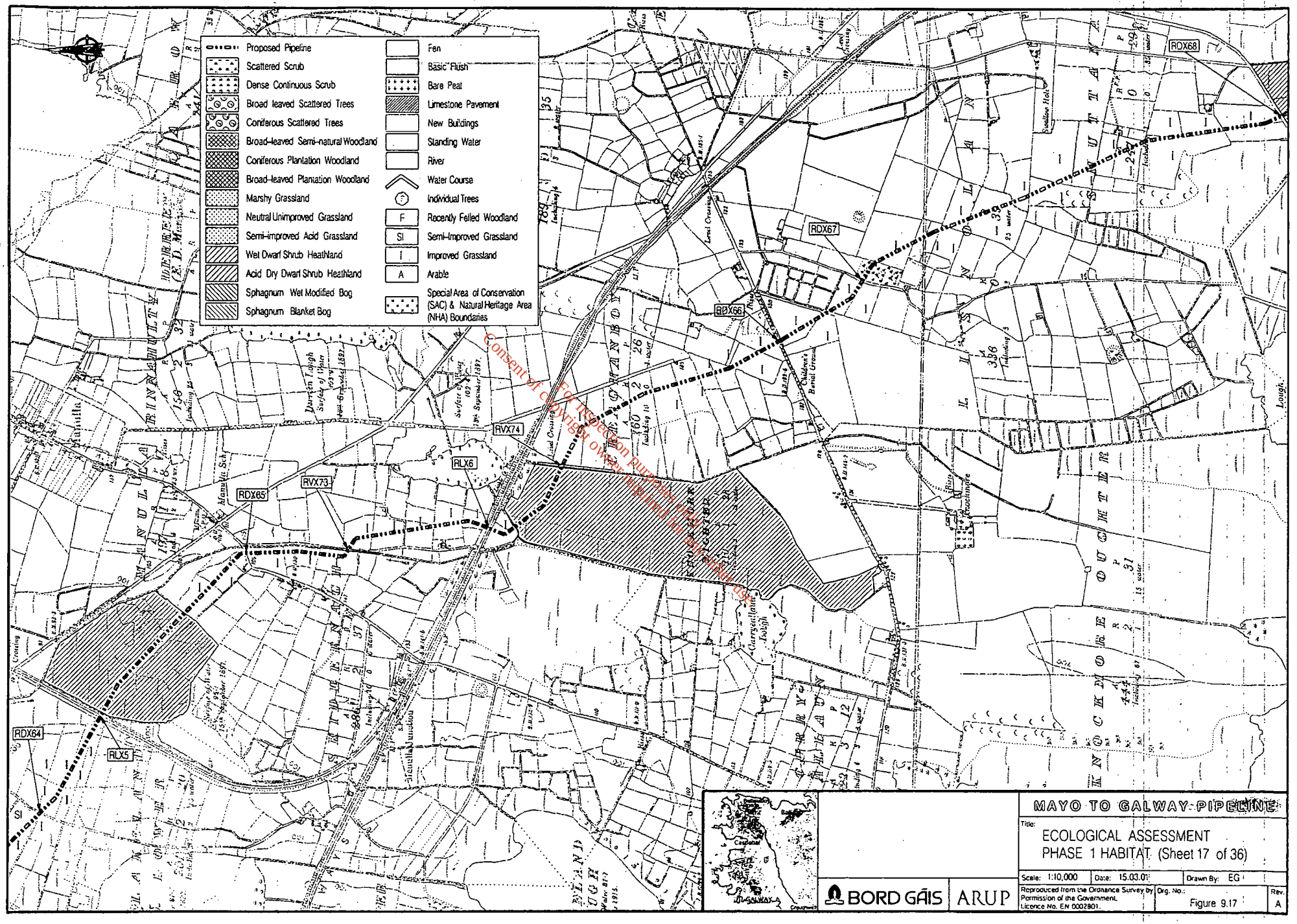
Drg. No.: Figure 9.15

Rev. A





MAYO TO GALWAY PIPELINE

Title: ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 17 of 36)

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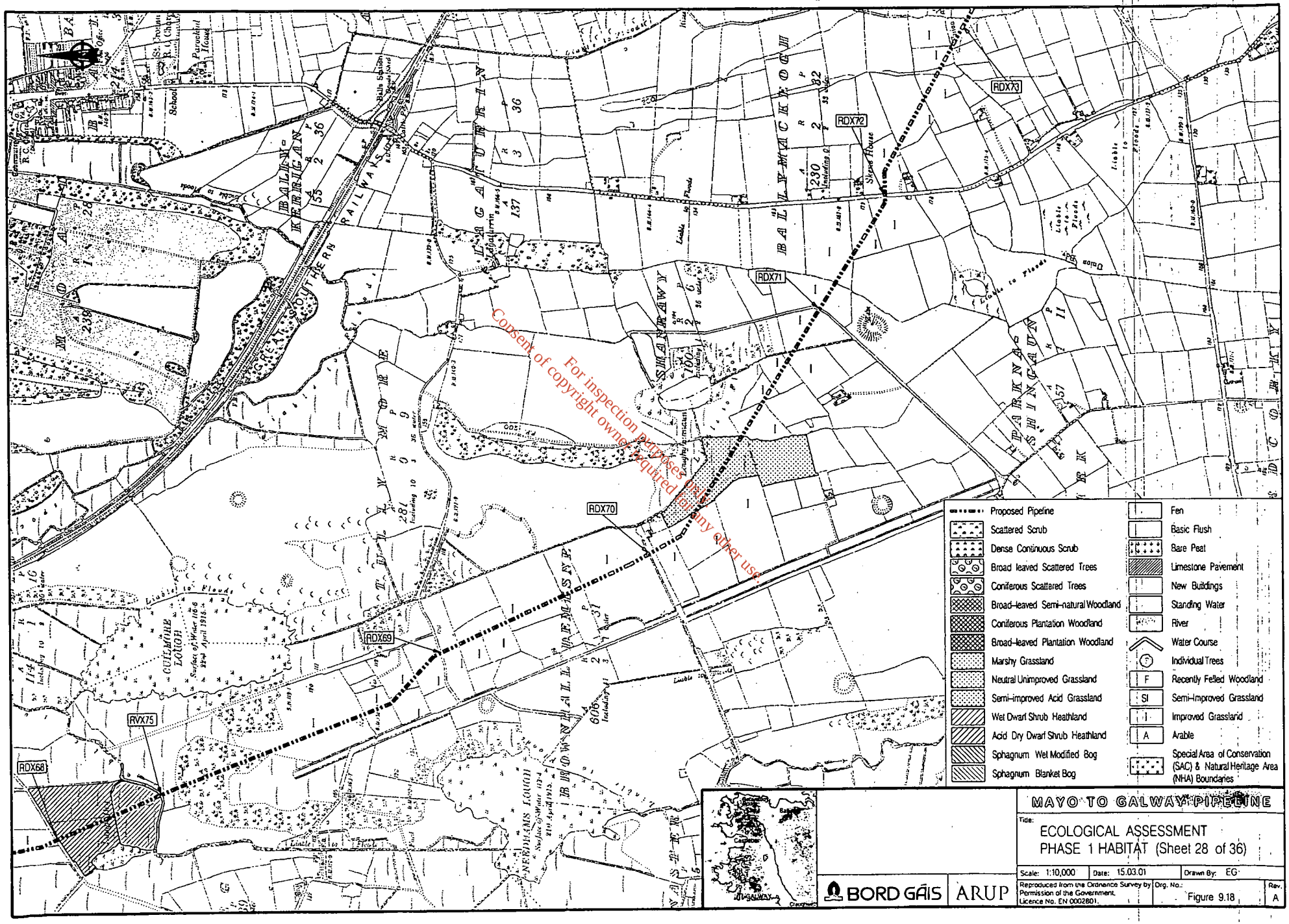
Org. No.: Figure 9.17

Rev. A



MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 28 of 36)

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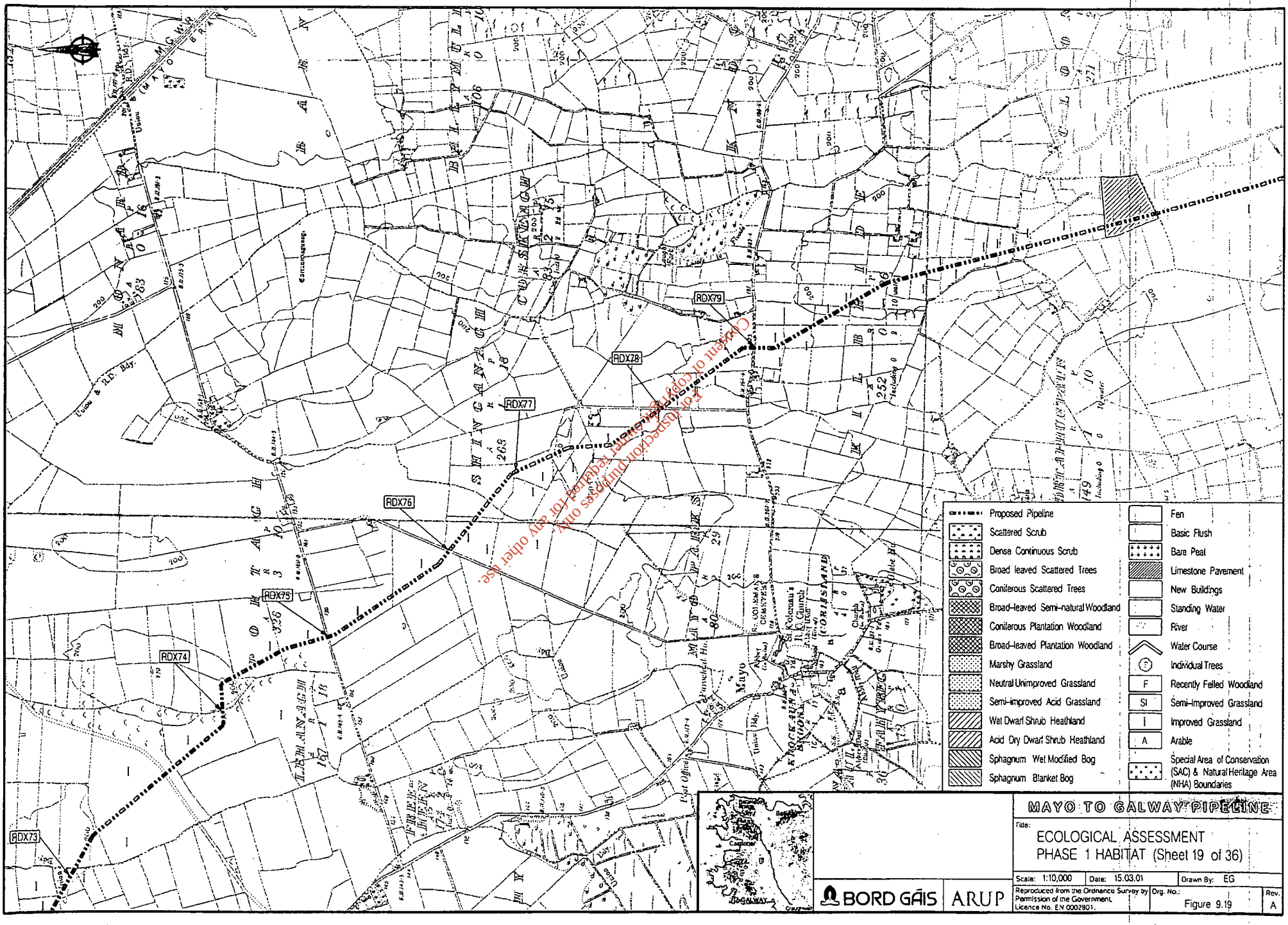
Org. No.:

Figure 9.18

Rev. A



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MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 19 of 36)

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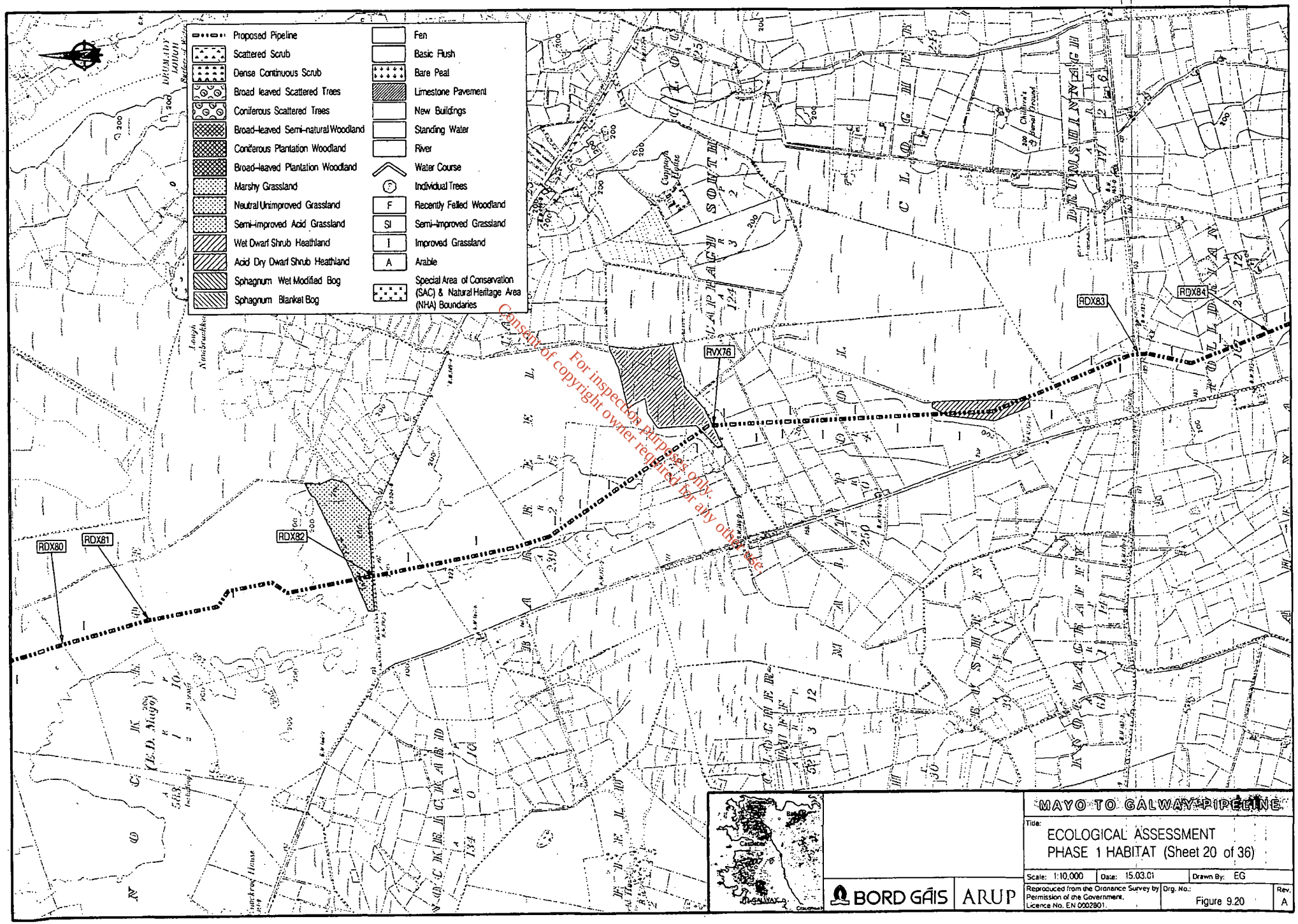
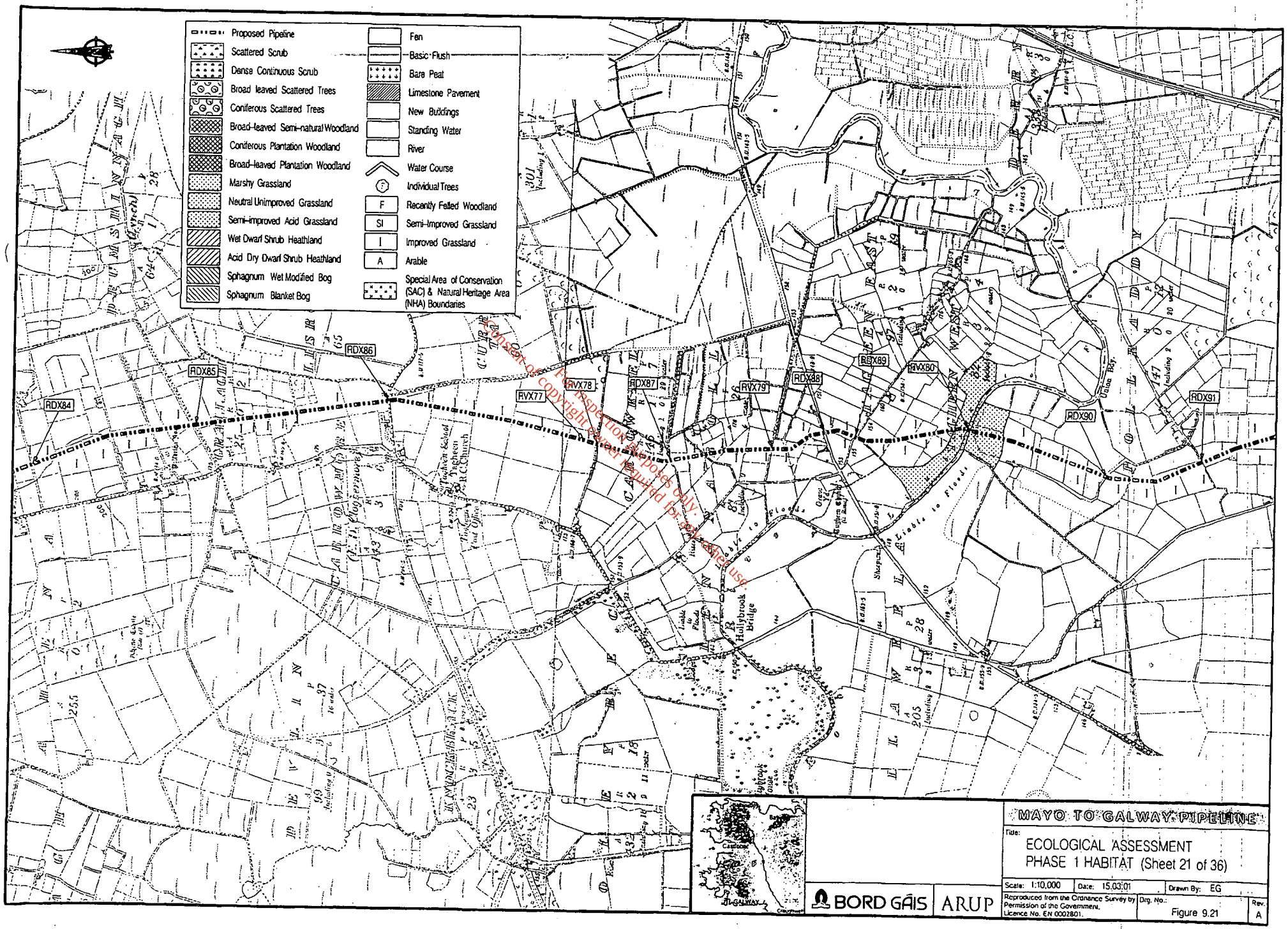
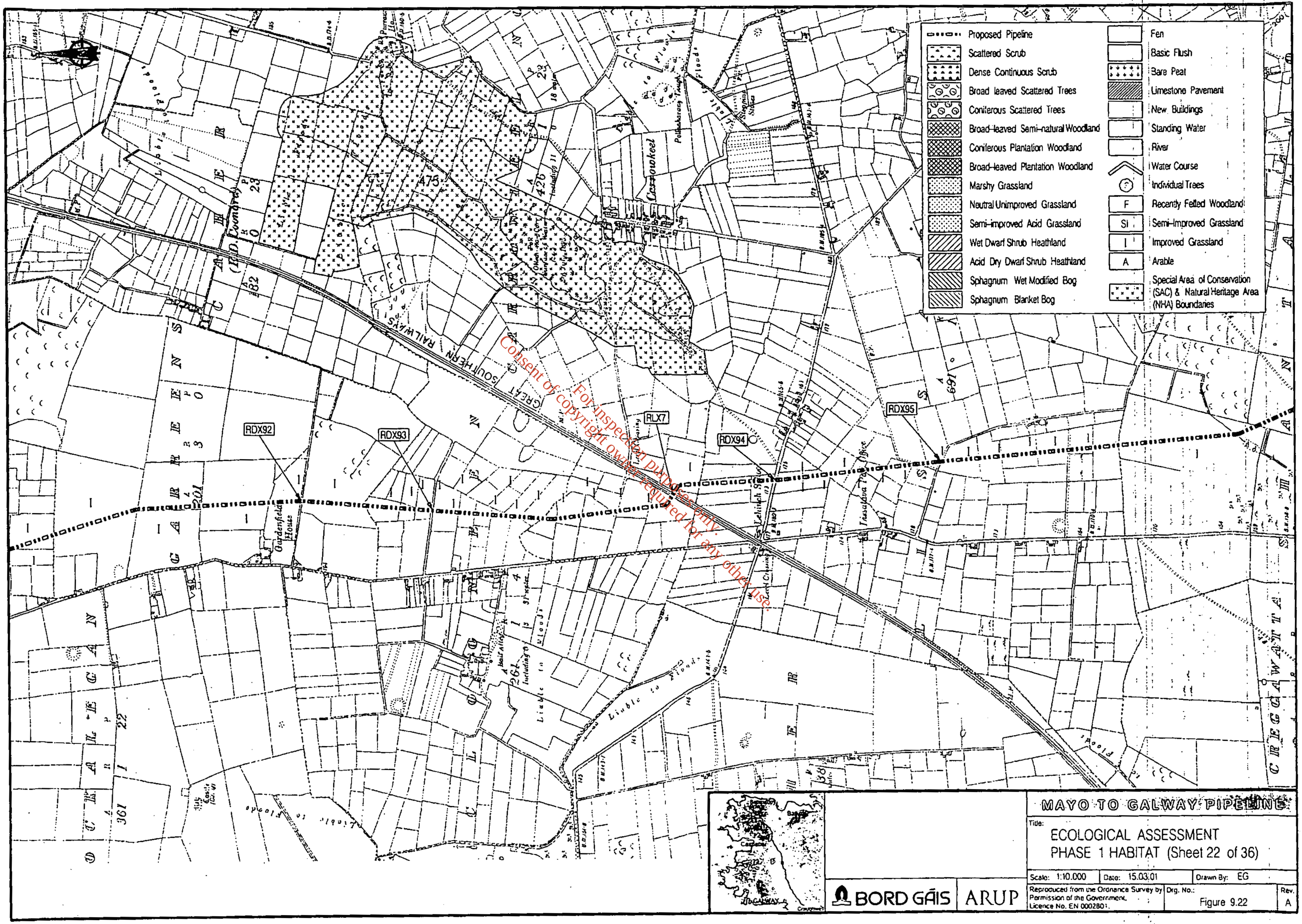
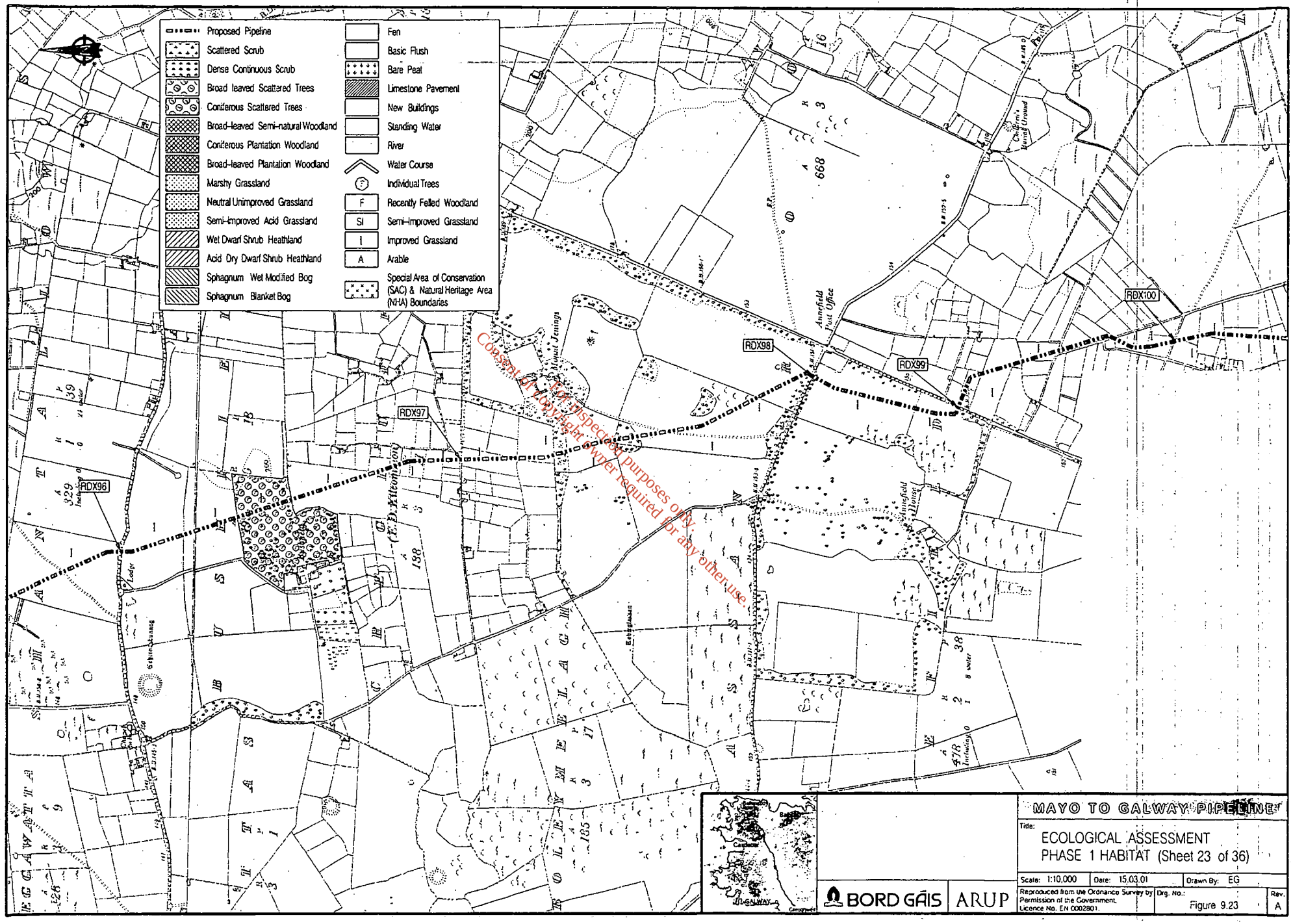
Org. No.: Figure 9.19

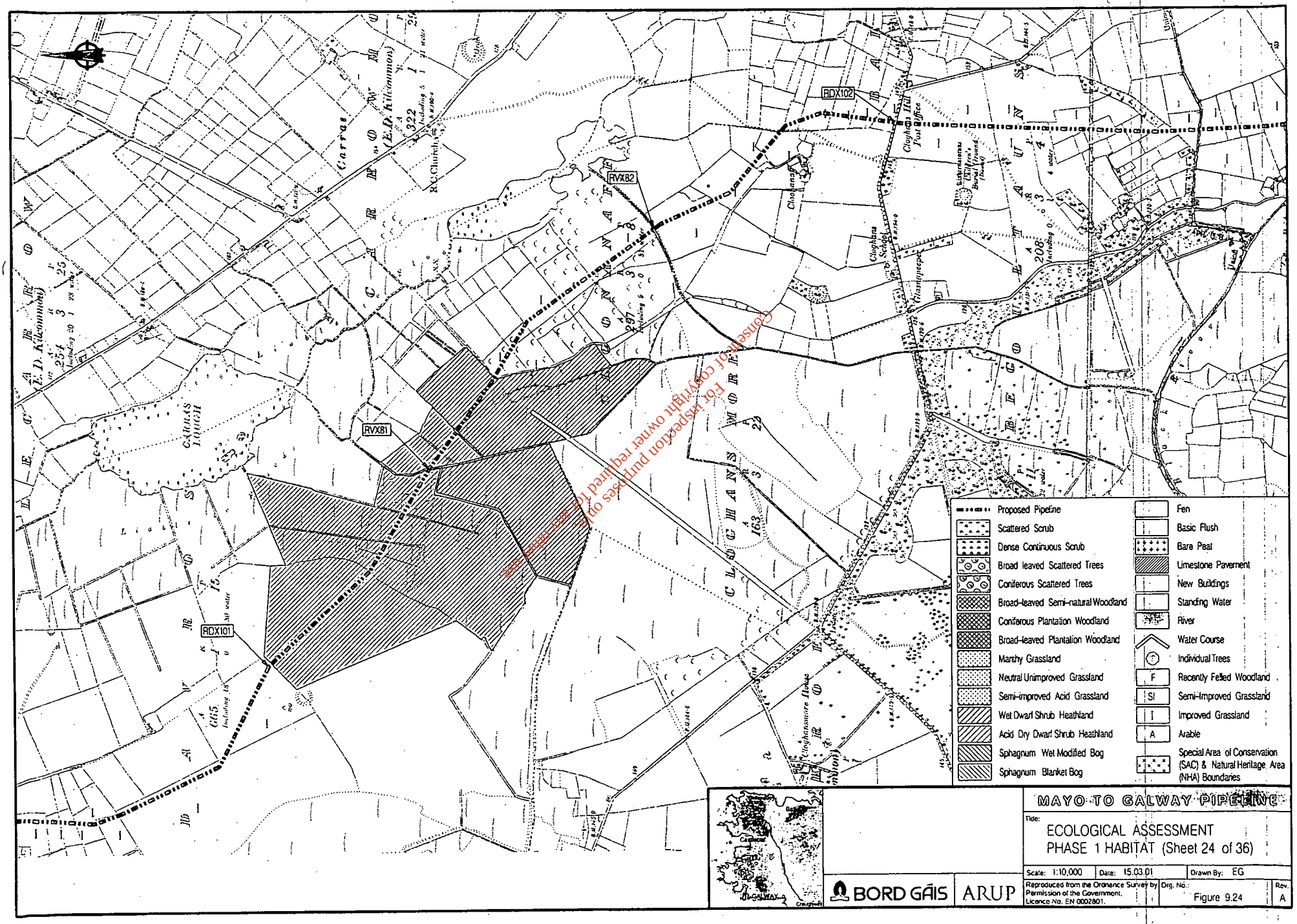
Rev. A

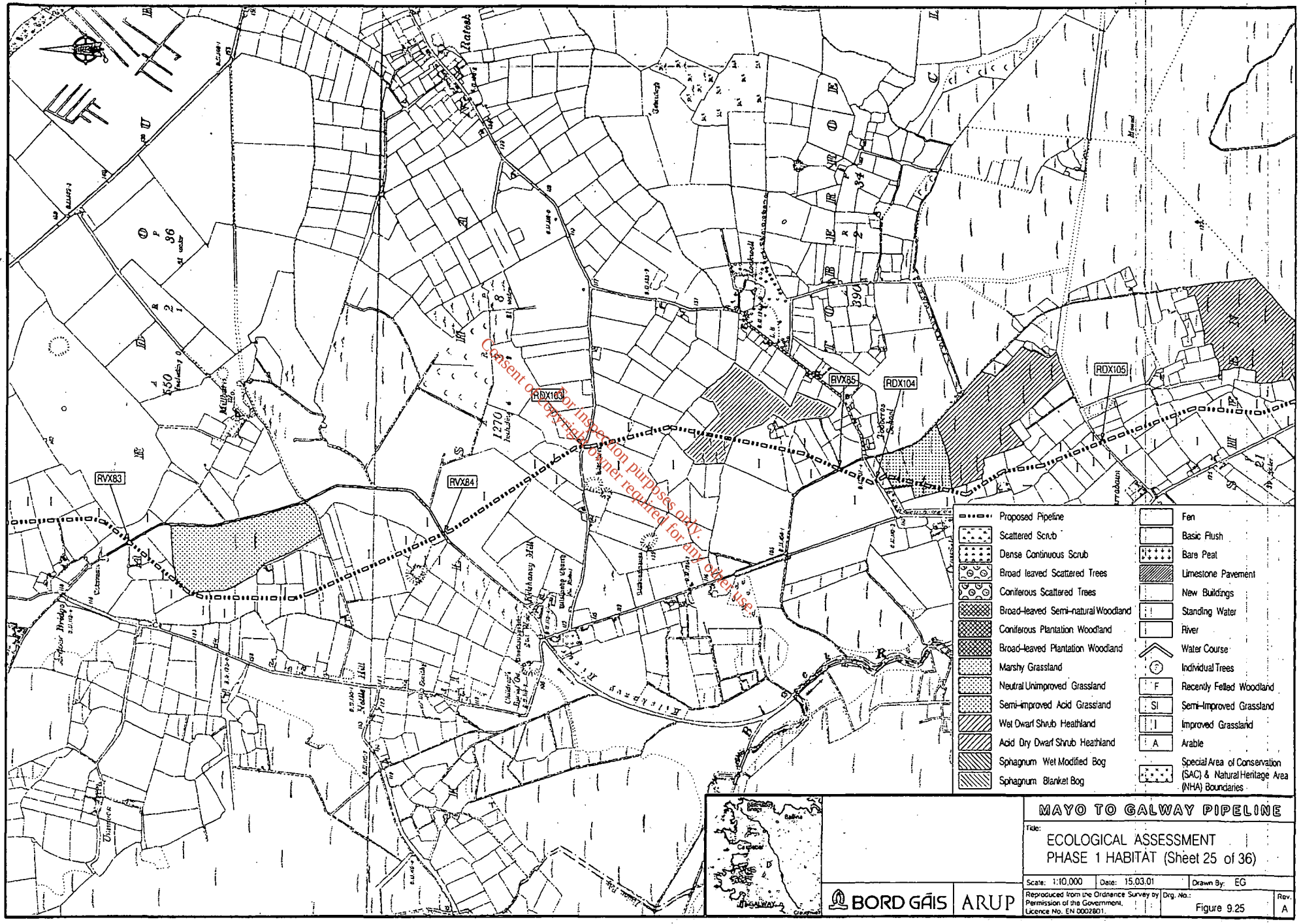


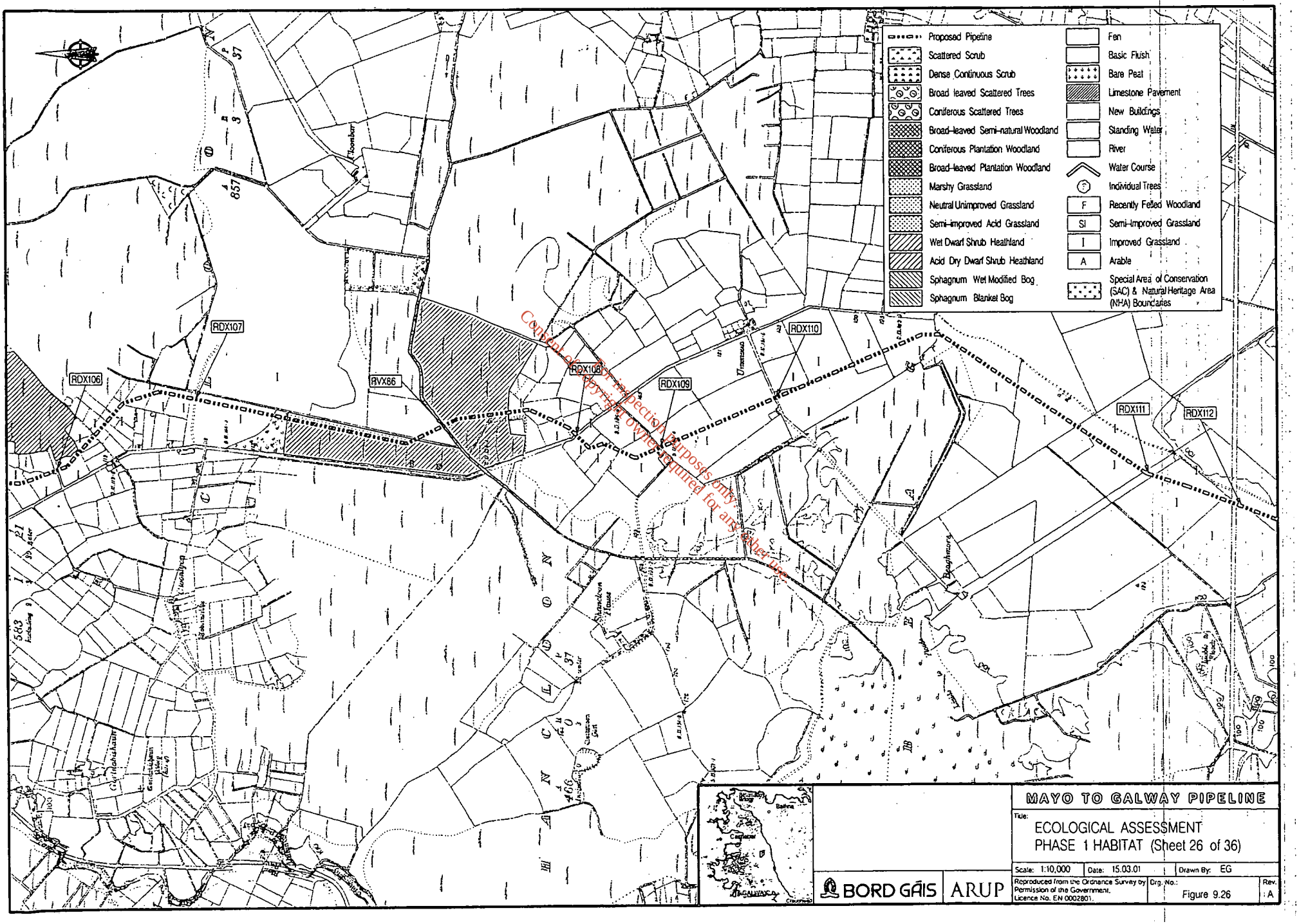


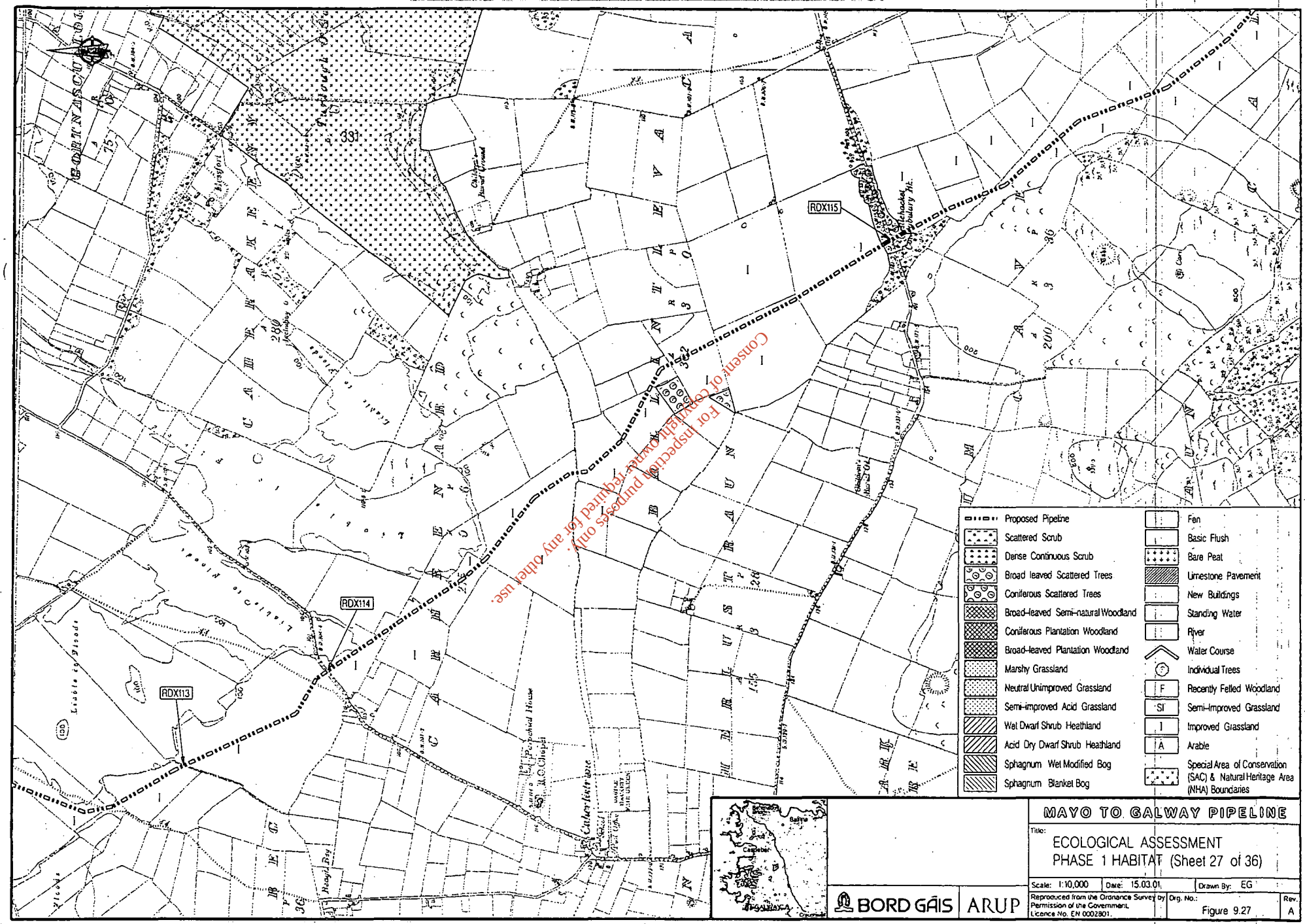












MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 27 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

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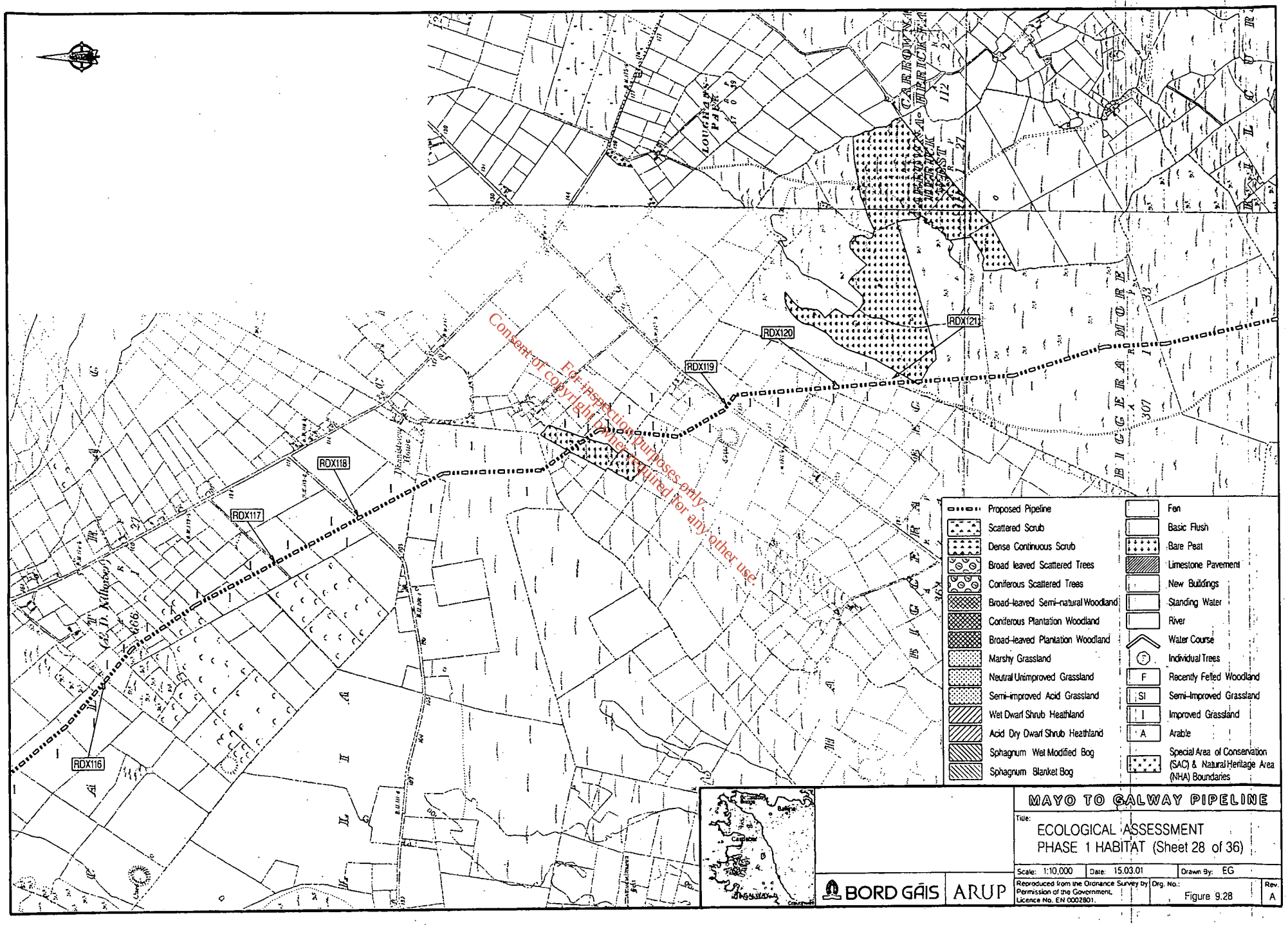
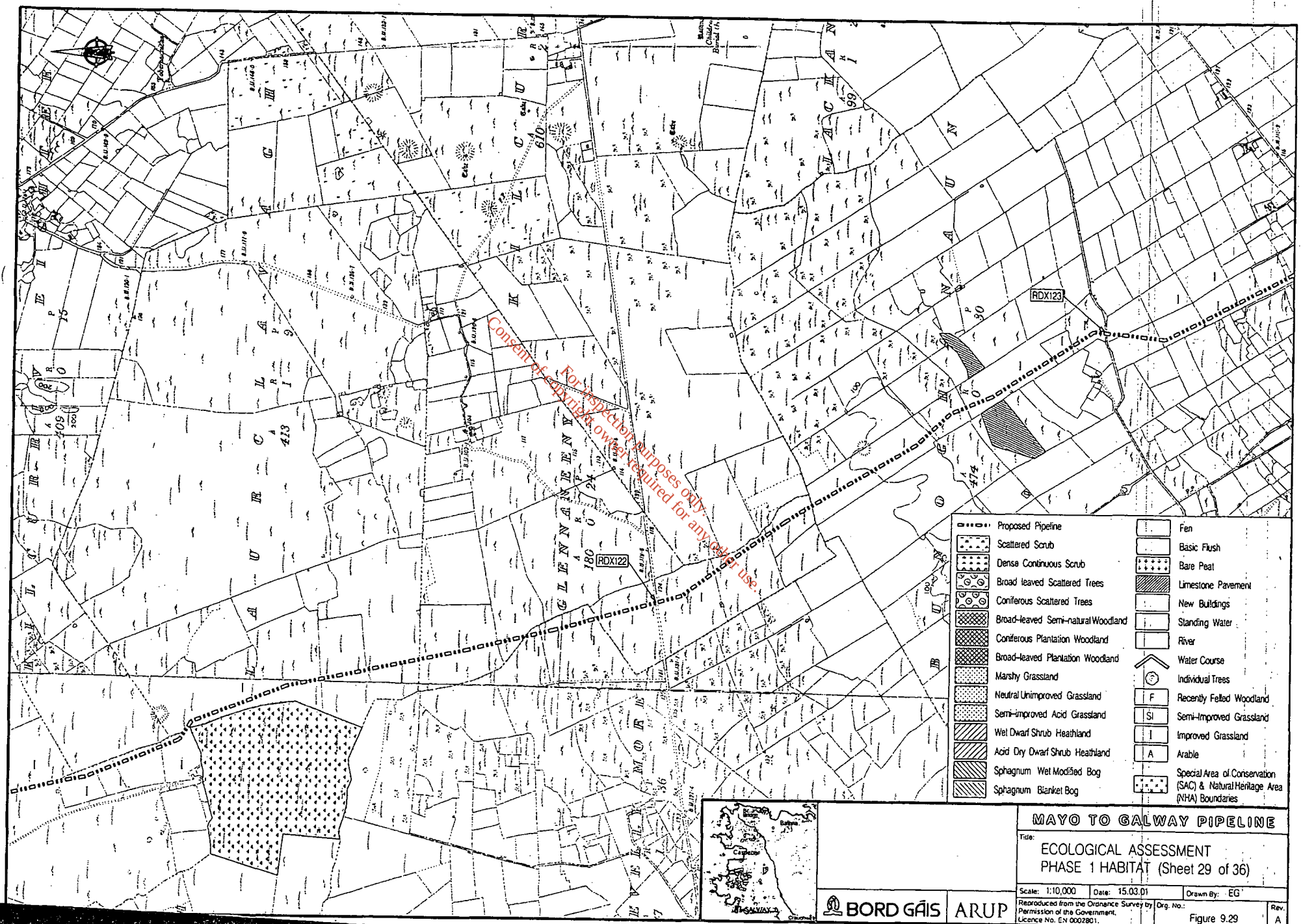
Drg. No.: Figure 9.27

Rev. A





MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 29 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

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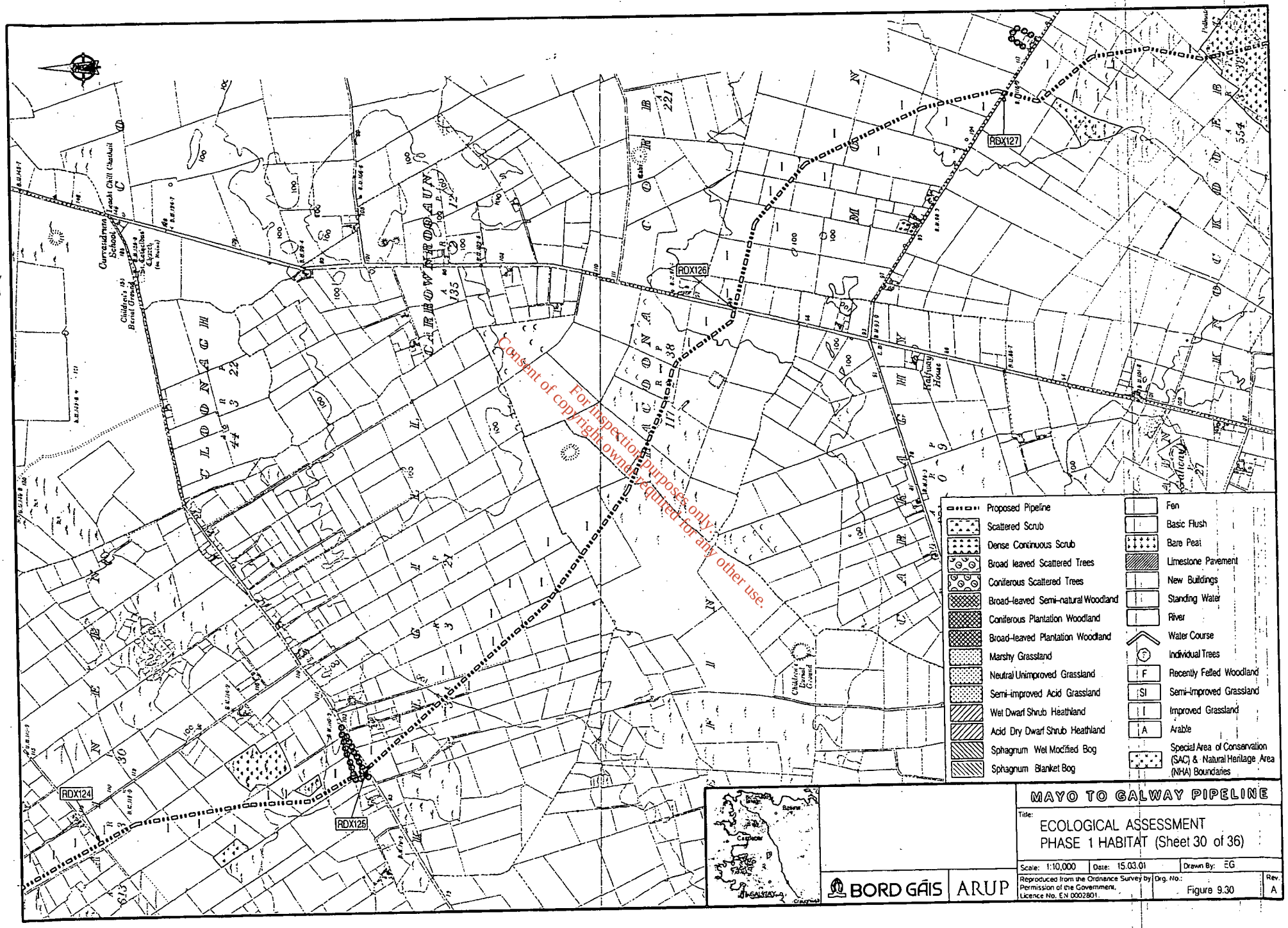
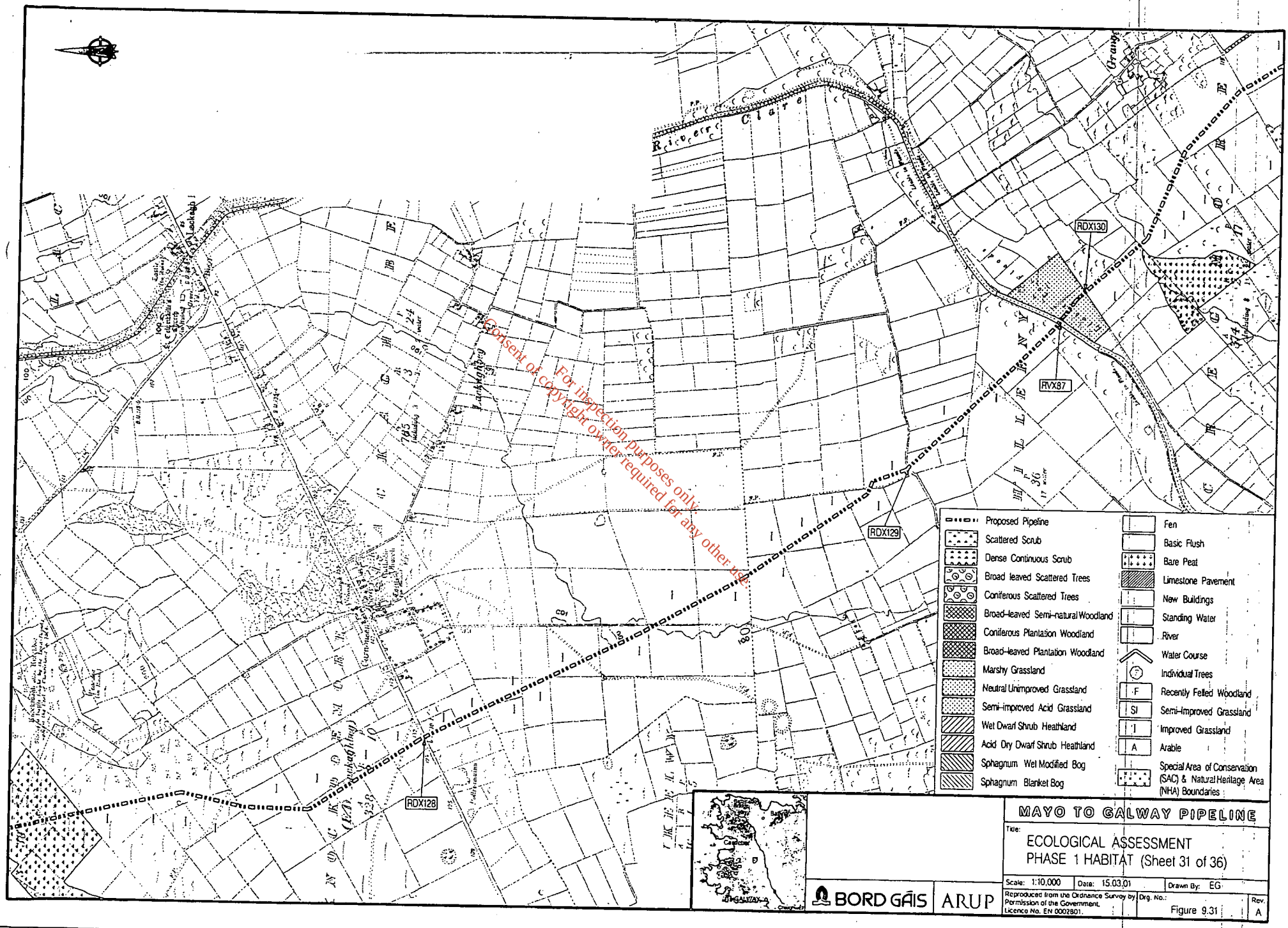
Org. No.:

Figure 9.29

Rev. A





MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 31 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

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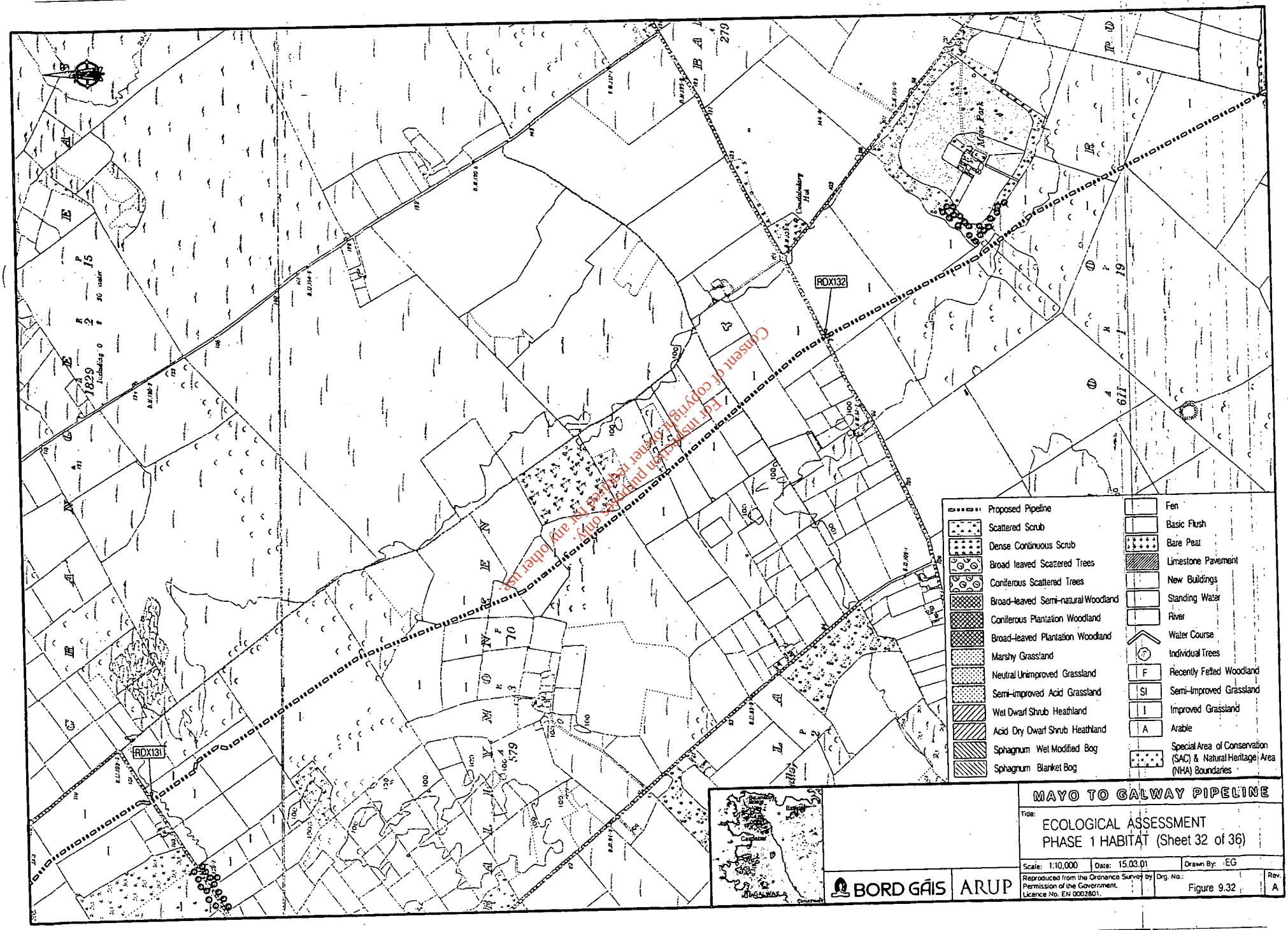
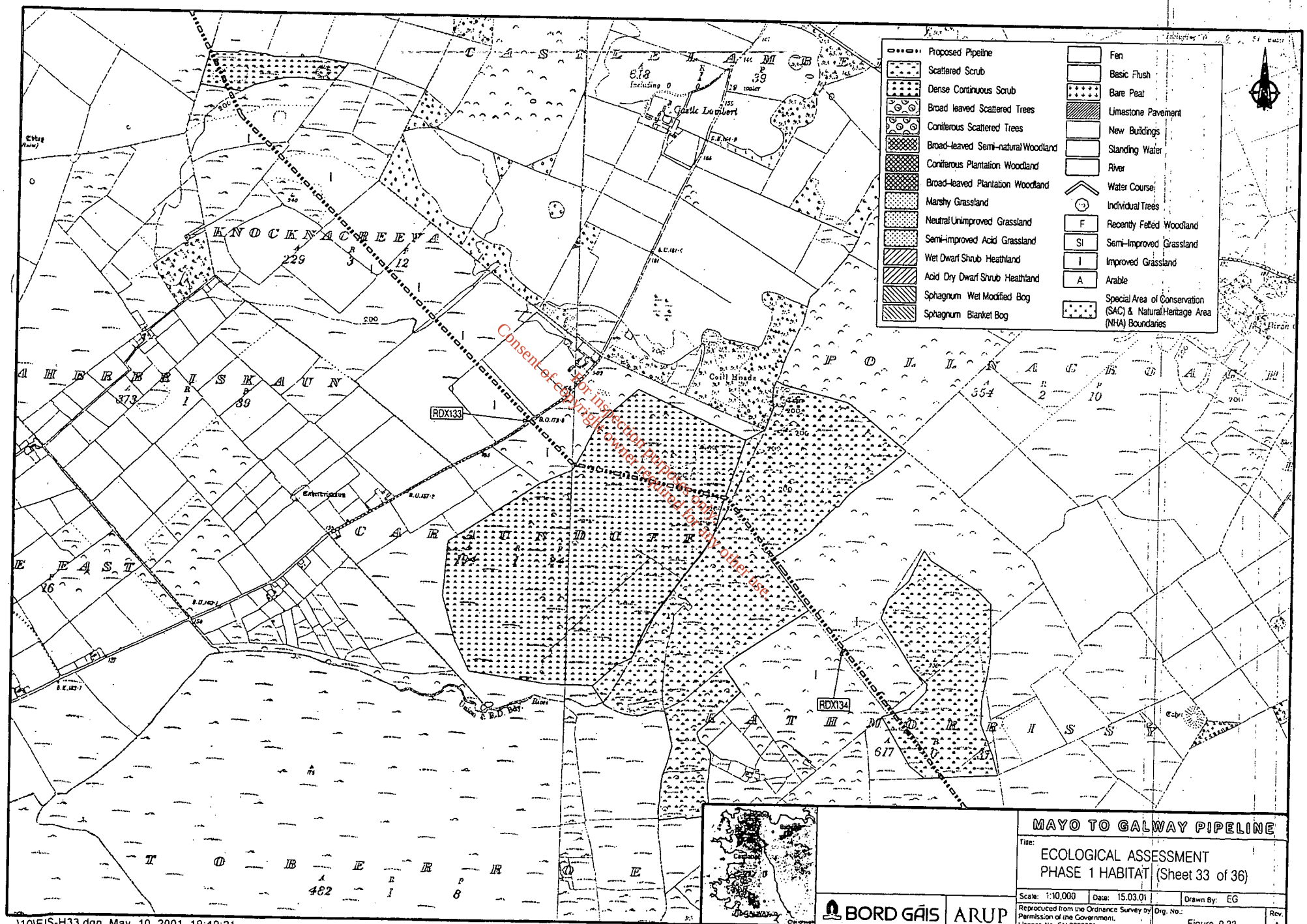
Drg. No.: Figure 9.31

Rev. A





...\10\EIS-H33.dgn May. 10, 2001 19:49:21

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MAYO TO GALWAY PIPELINE

Title: ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 33 of 36)

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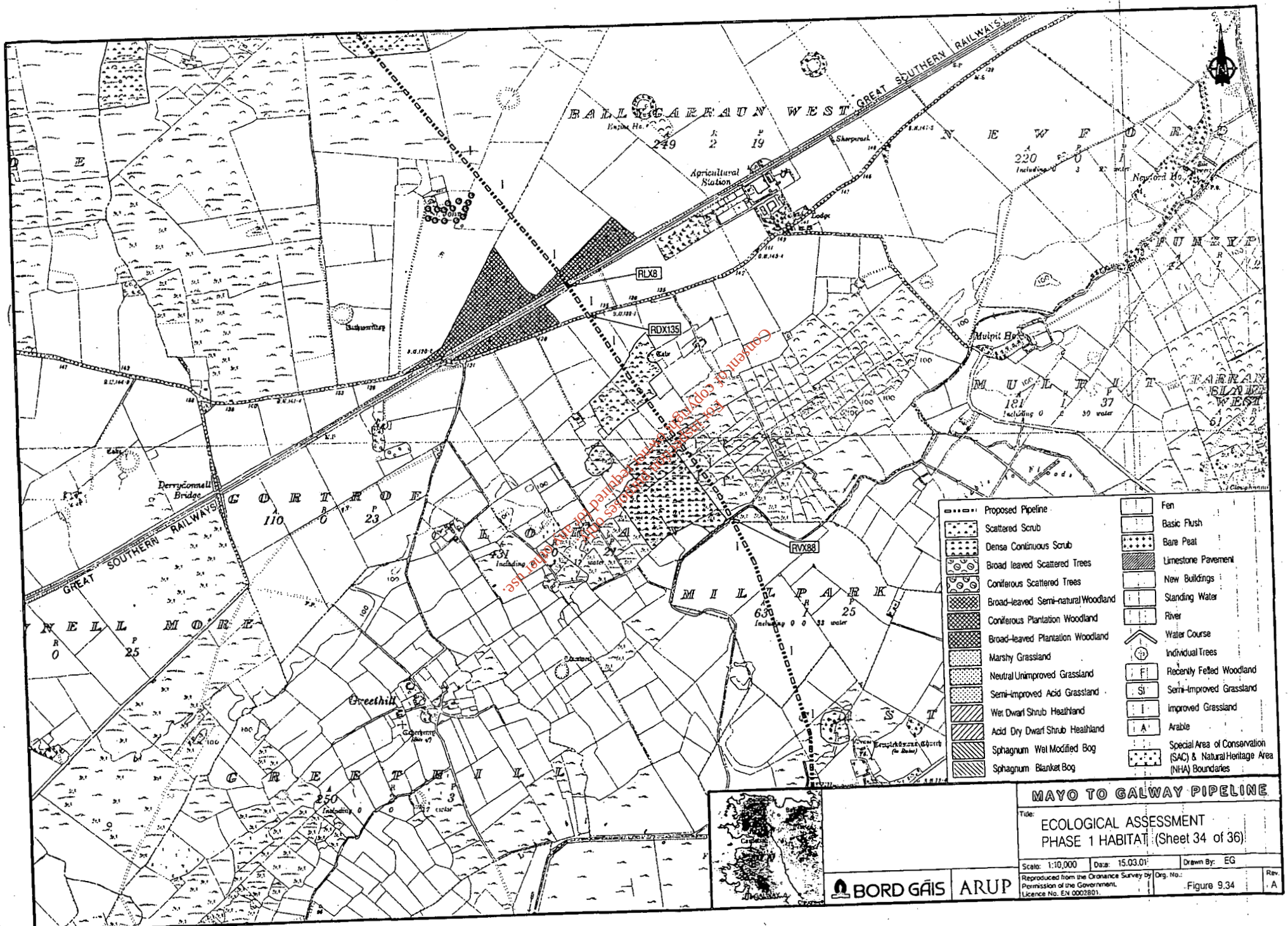
Drg. No.: Figure 9.33

Rev. A



MAYO TO GALWAY PIPELINE

Title: ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 34 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

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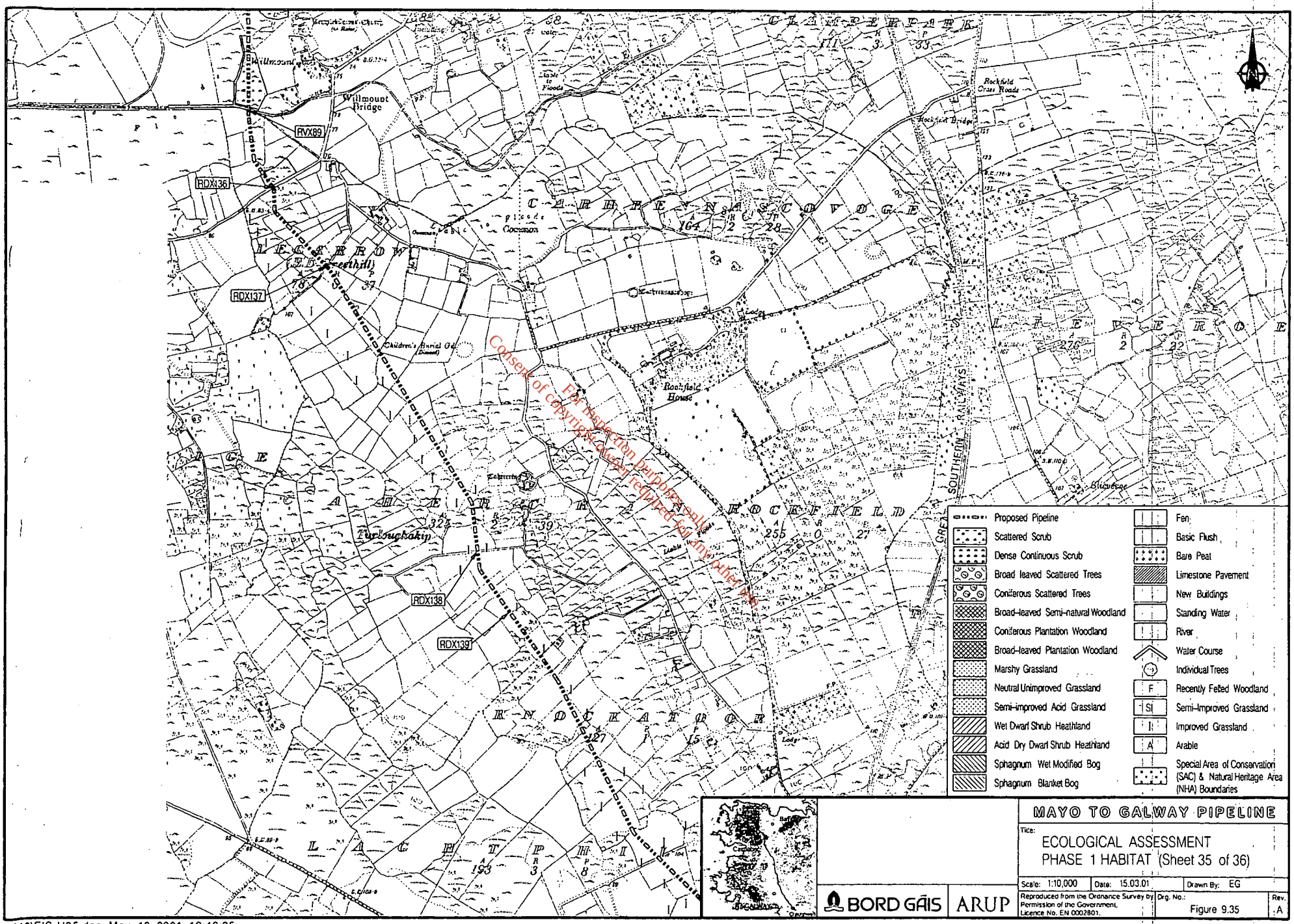
Org. No.: Figure 9.34 | Rev. A

...\10\EIS-H34.dgn May. 10, 2001 19:47:55



MAYO TO GALWAY PIPELINE

Title:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 35 of 36)

Scale: 1:10,000 | Date: 15.03.01 | Drawn By: EG

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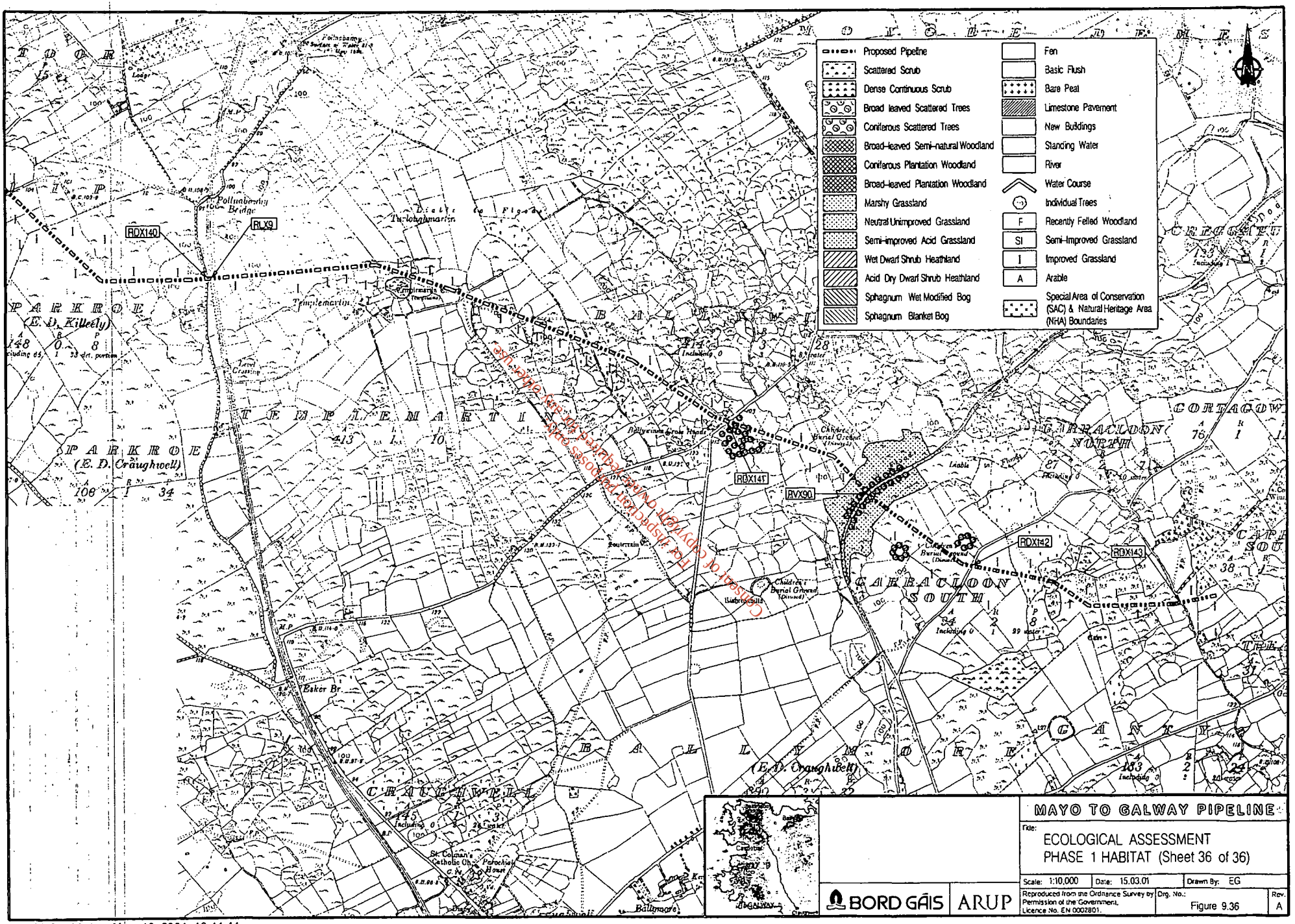
Drg. No.: Figure 9.35 | Rev. A

\10\EIS-H35.dgn May. 10, 2001 19:46:25



MAYO TO GALWAY PIPELINE

File:
ECOLOGICAL ASSESSMENT
PHASE 1 HABITAT (Sheet 36 of 36)

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Drg. No.: Figure 9.36

Rev. A

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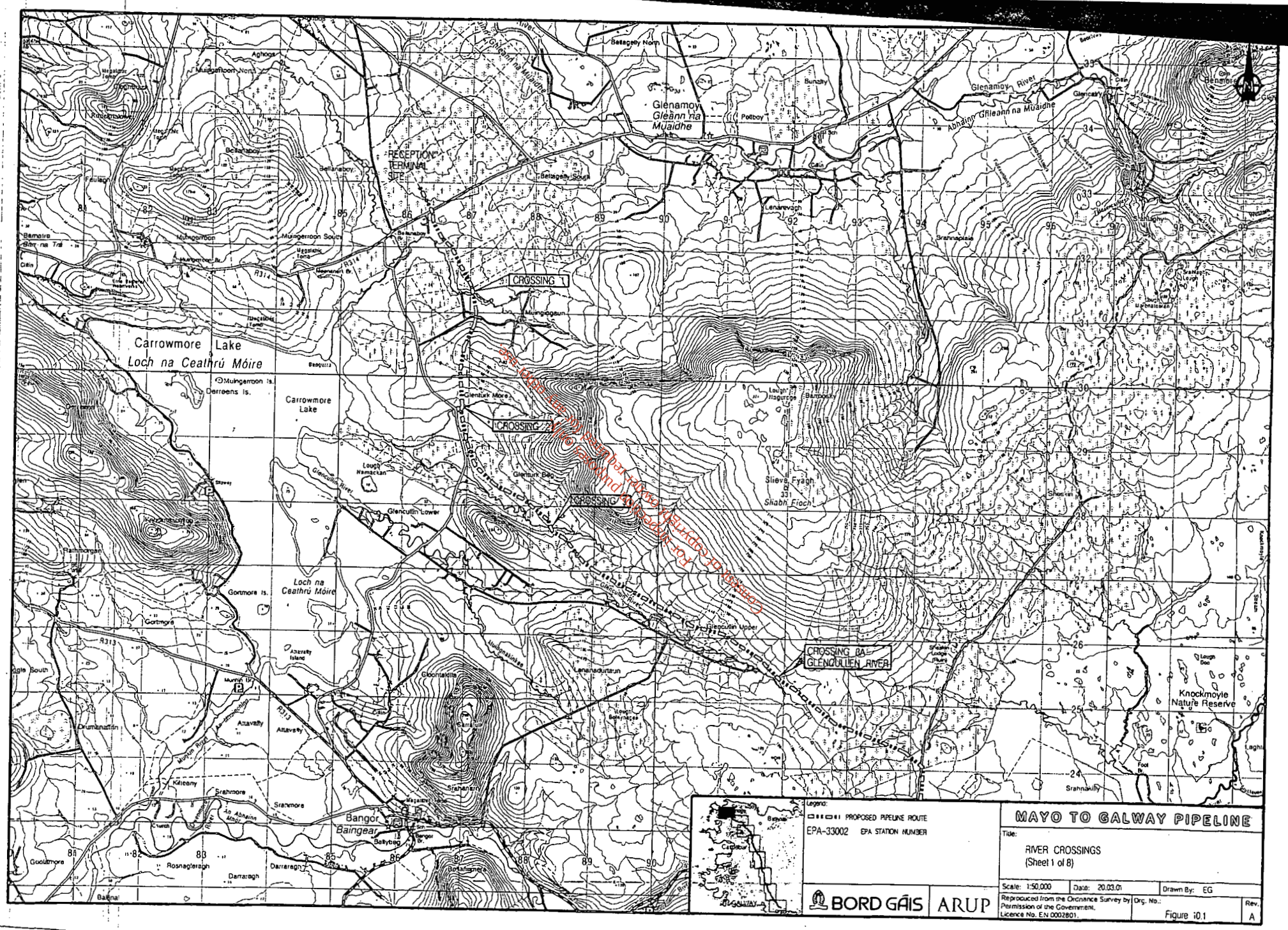
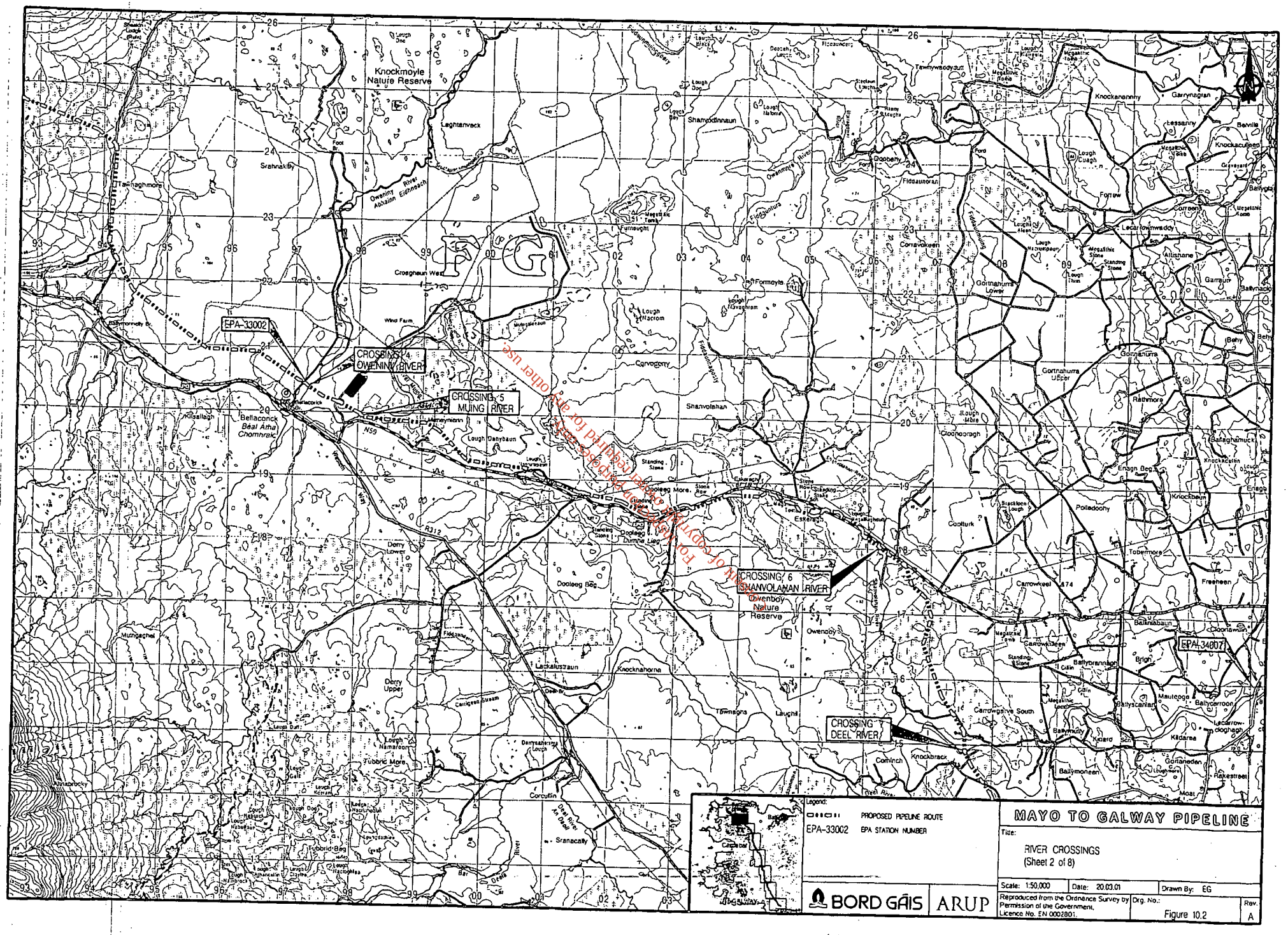
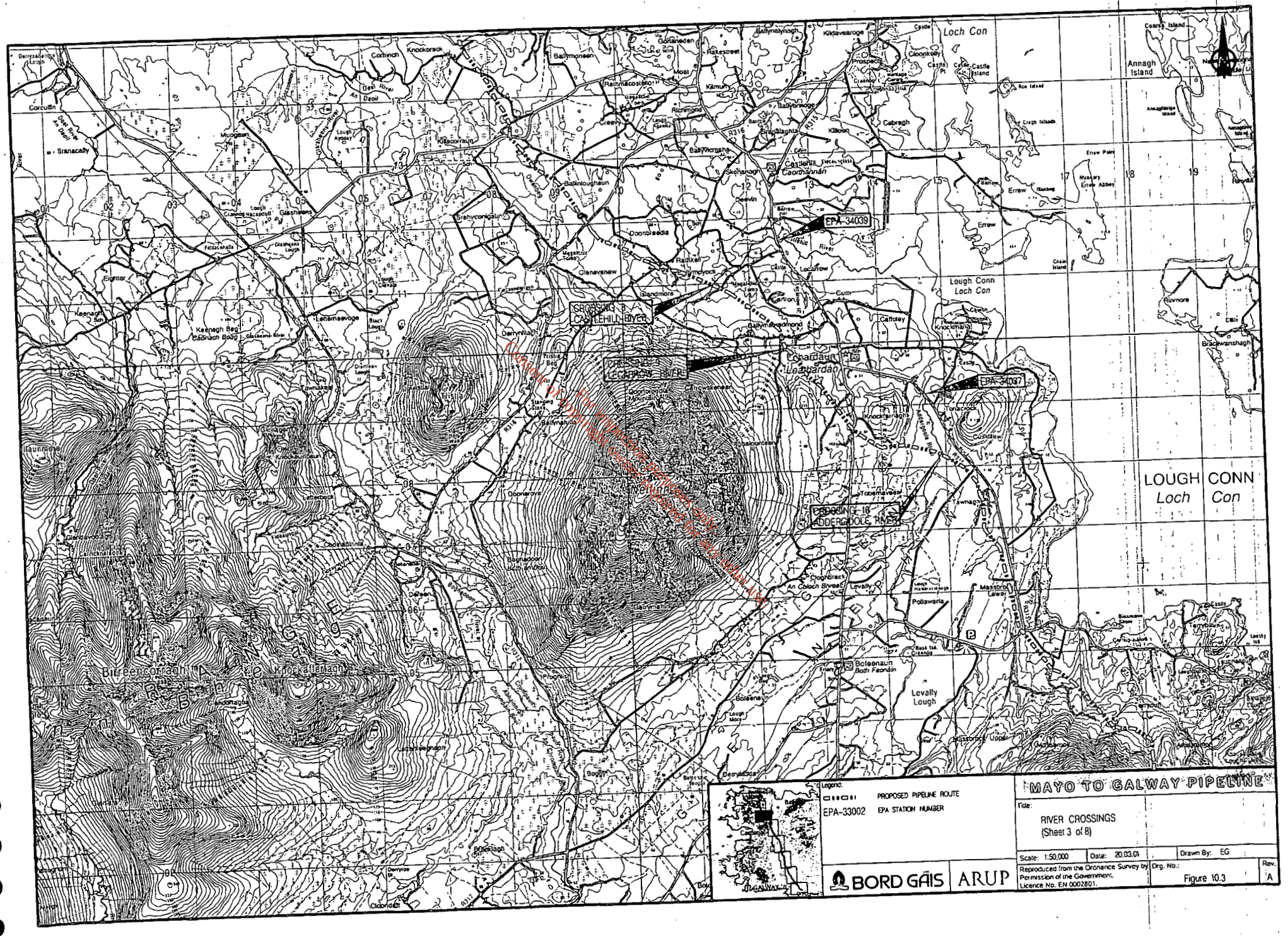
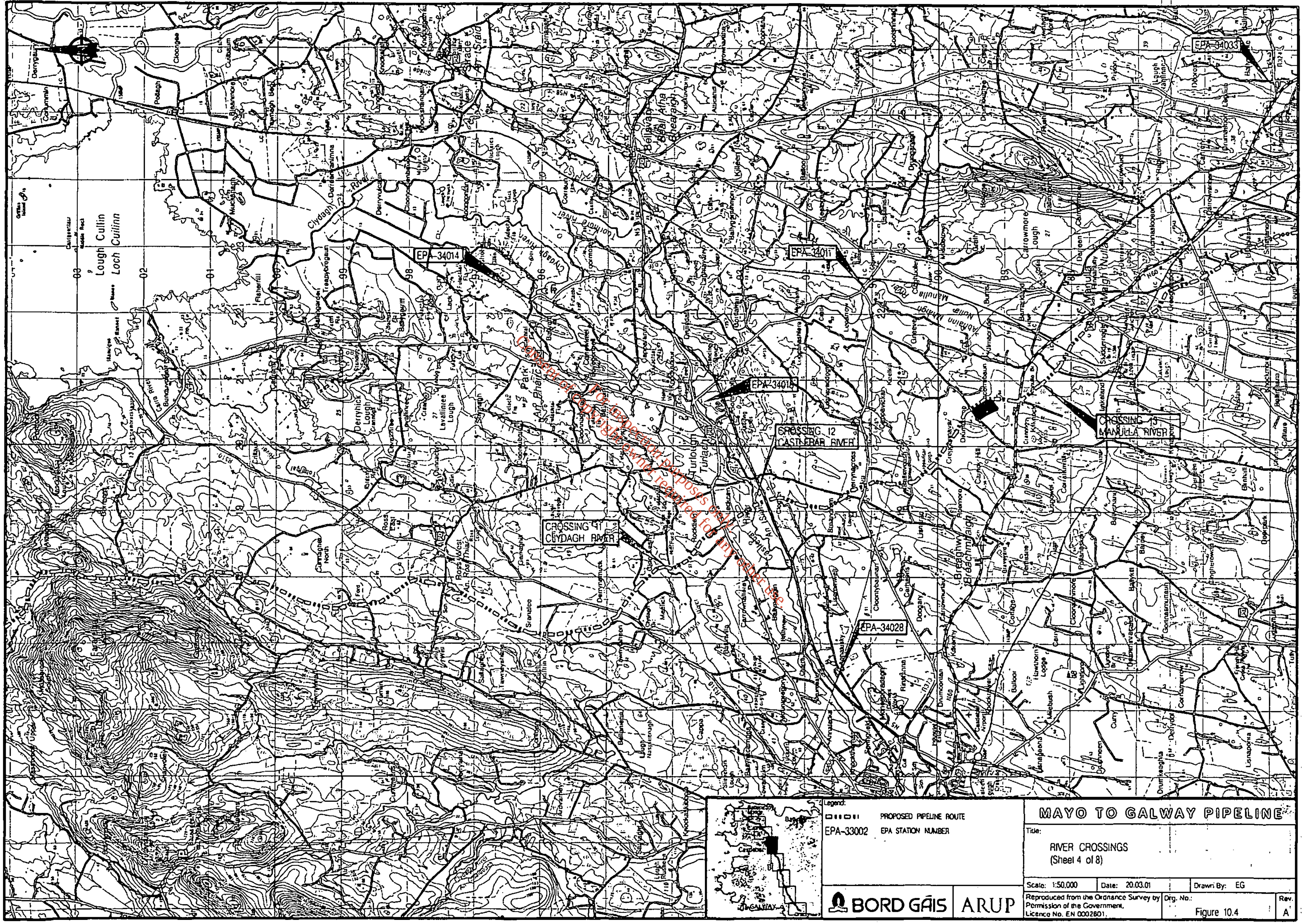
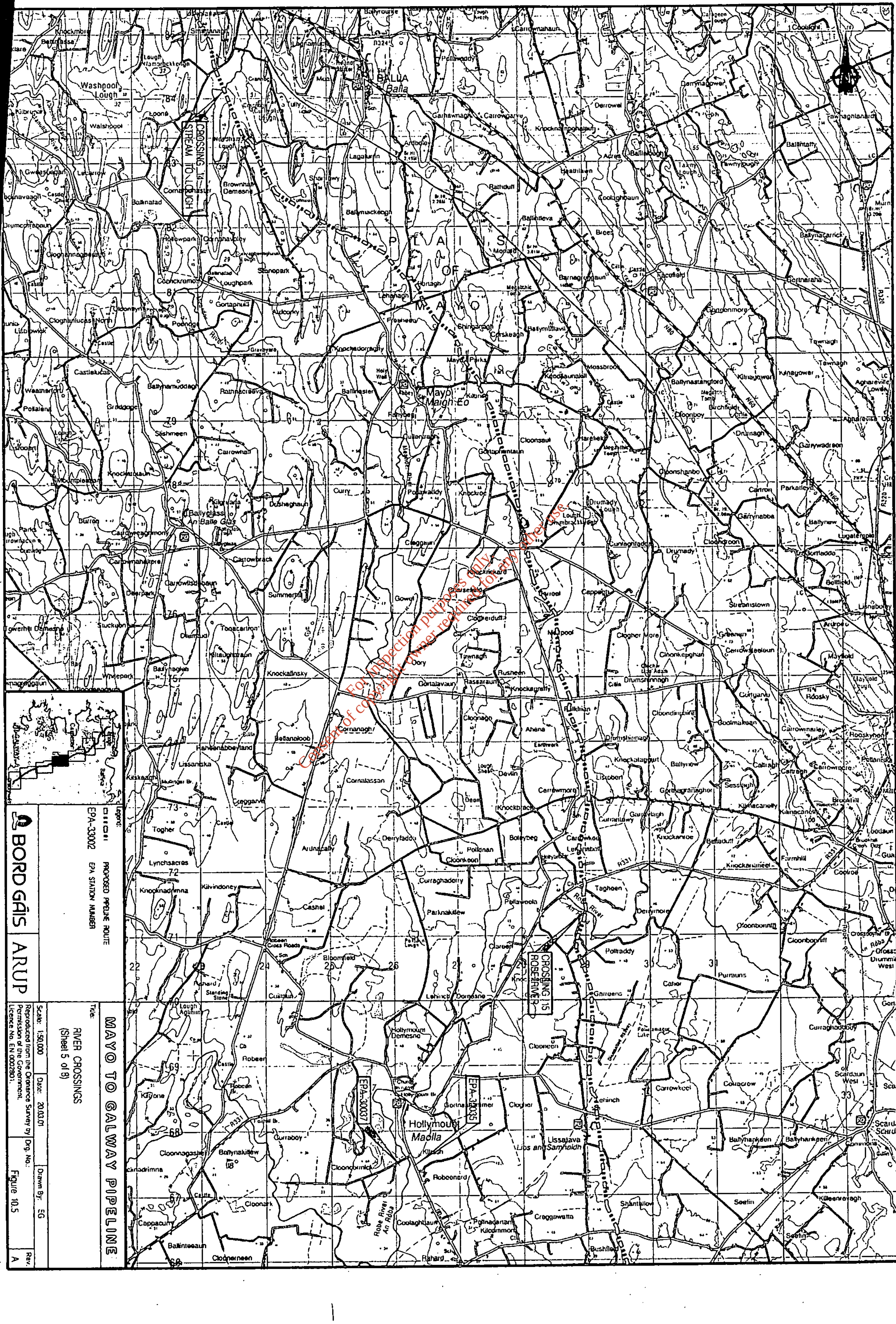
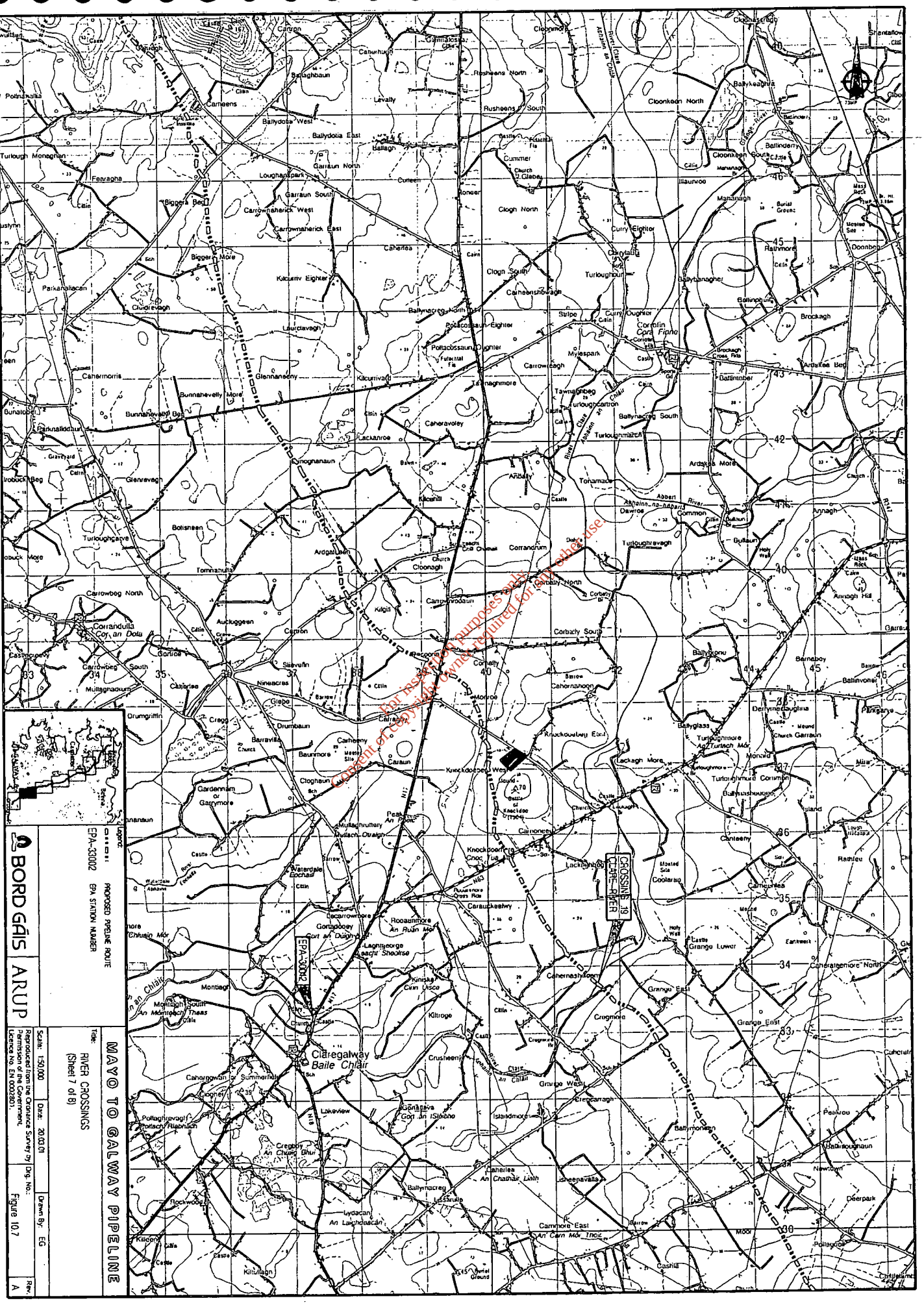


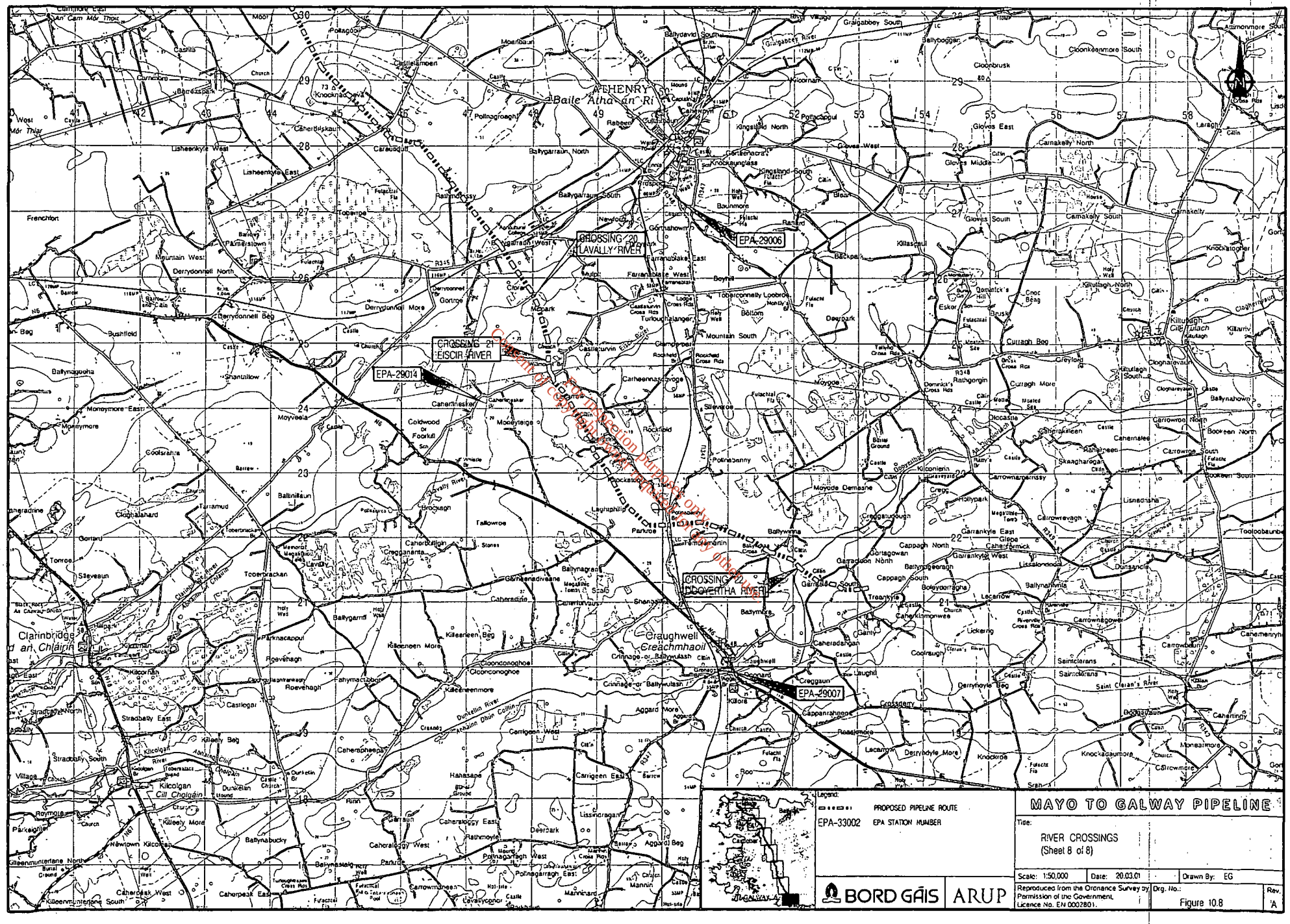


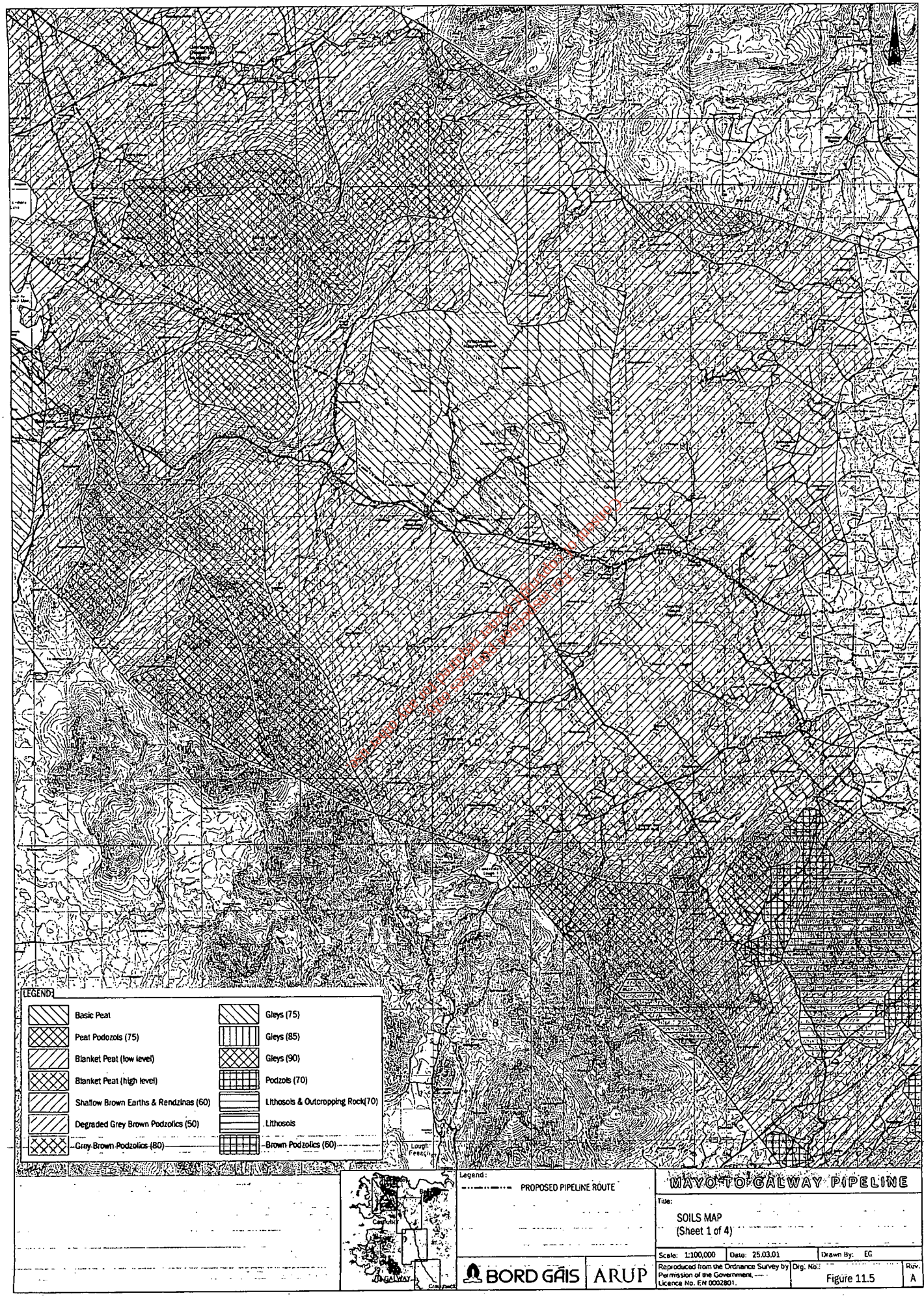


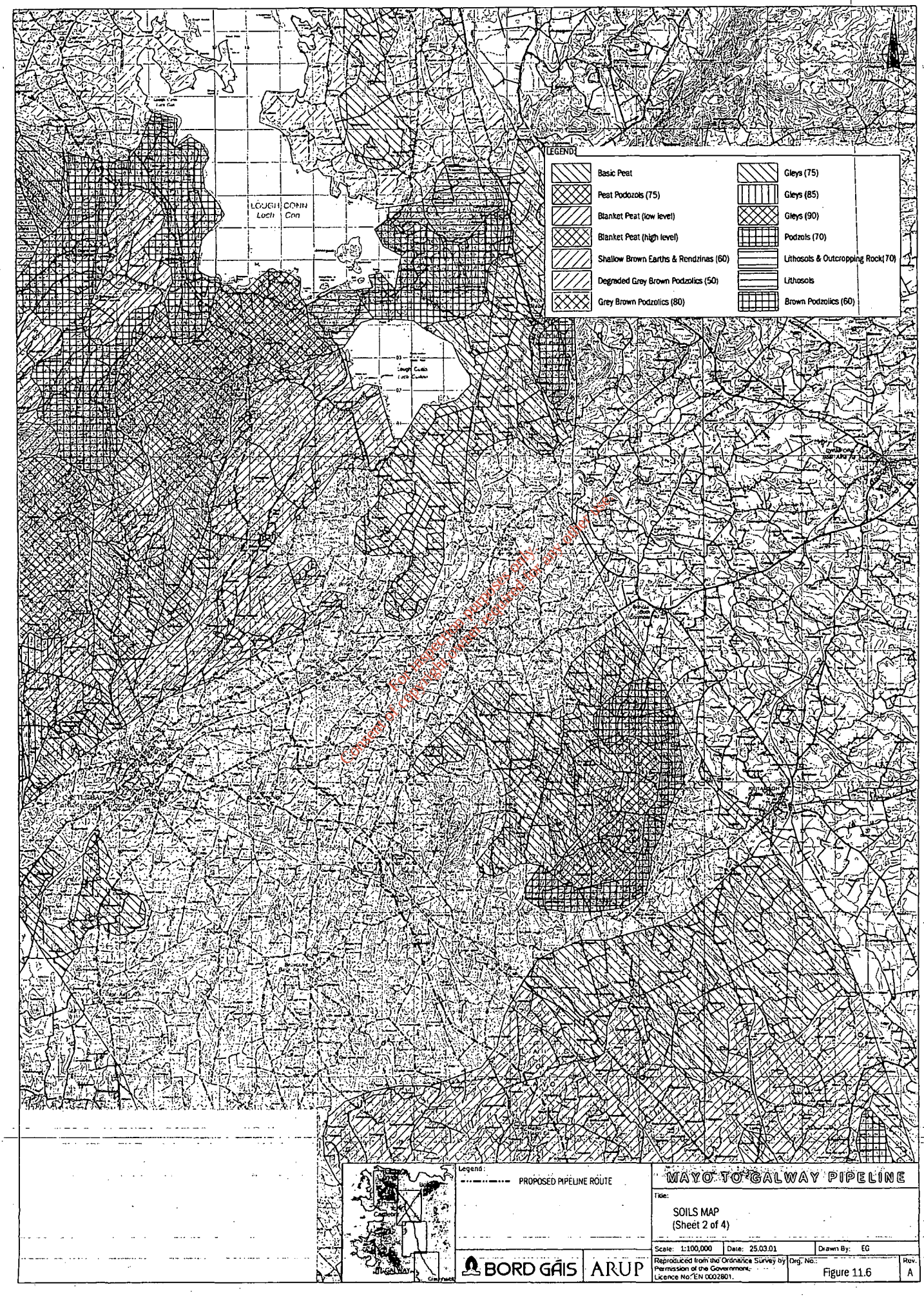


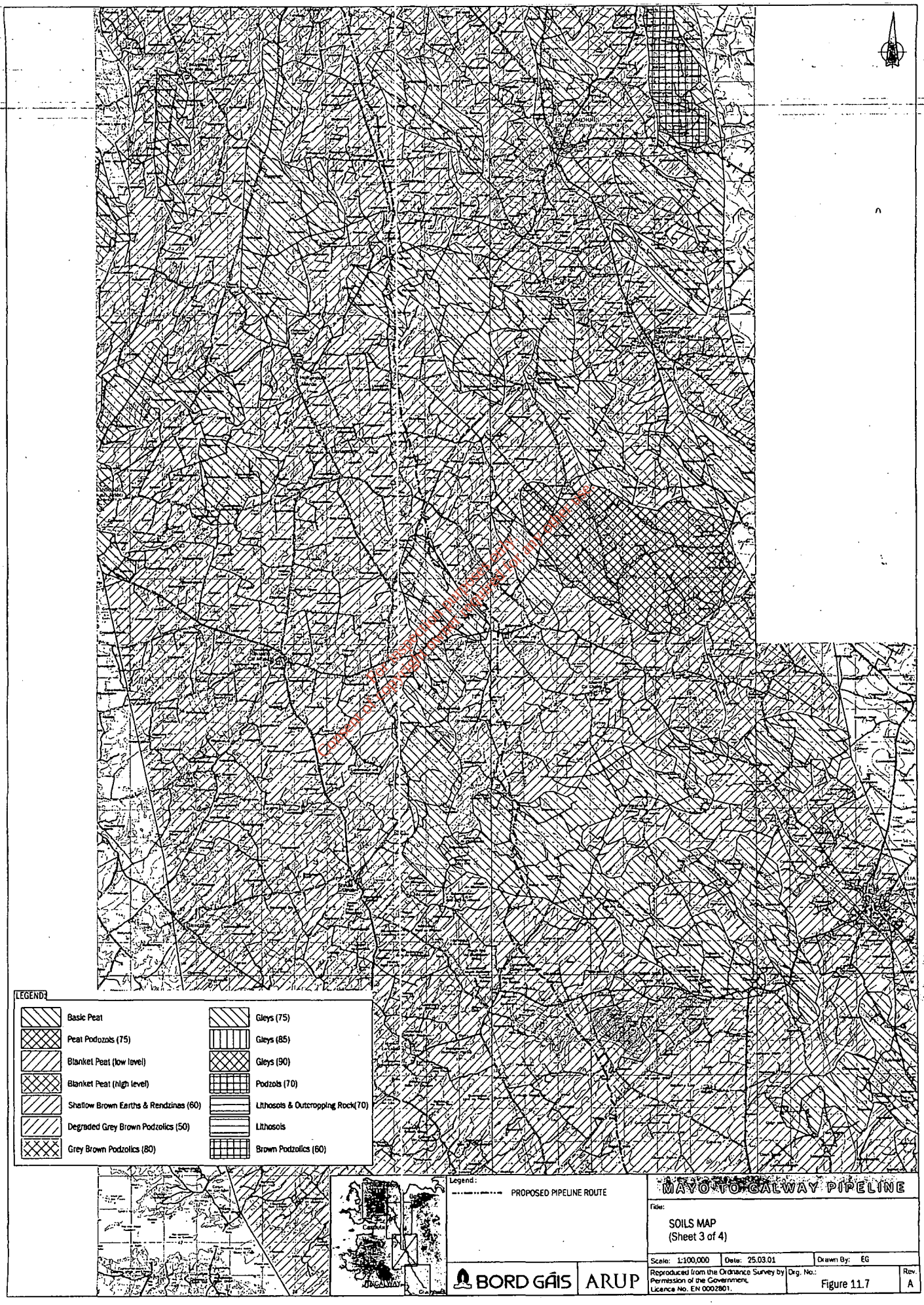


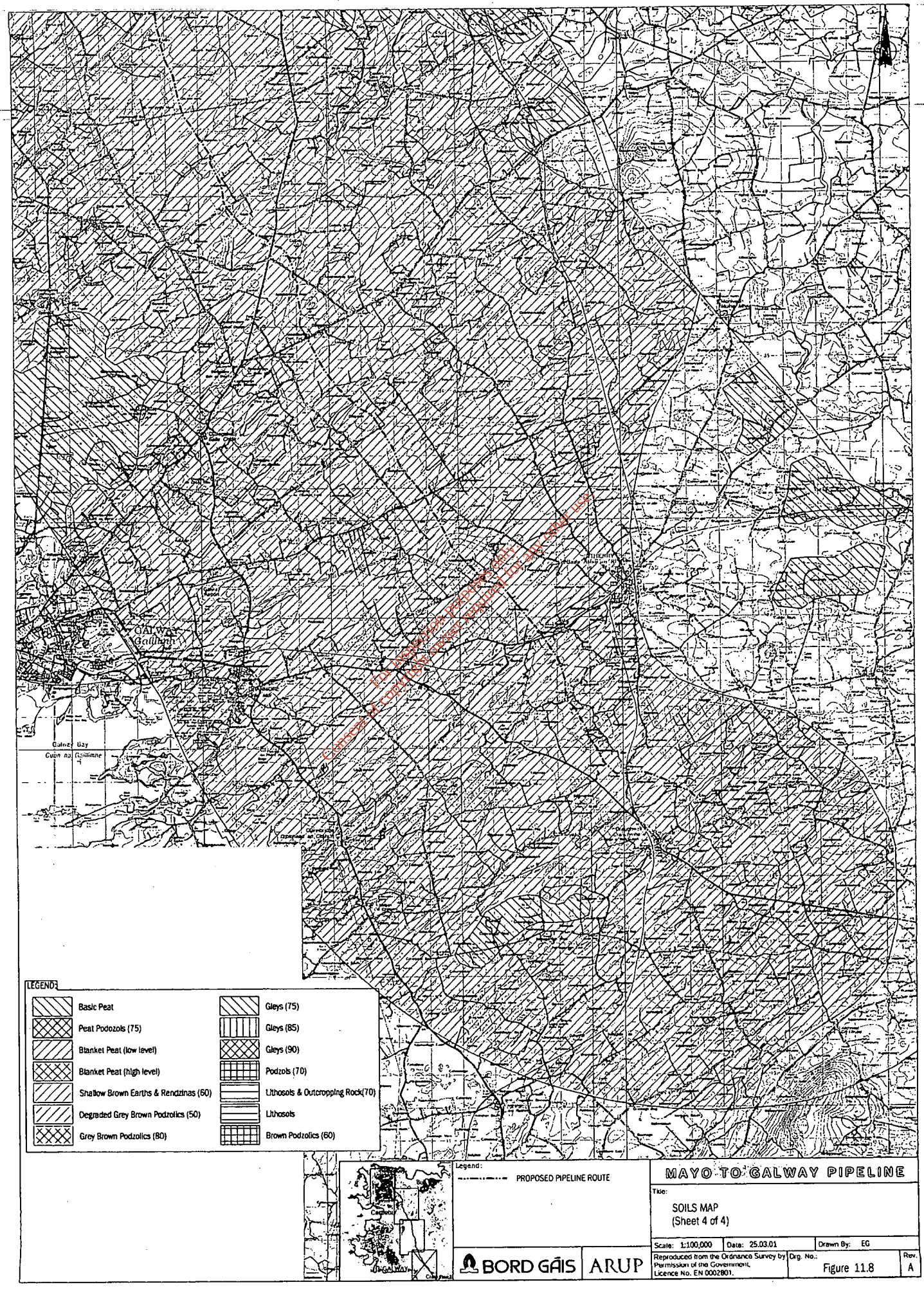


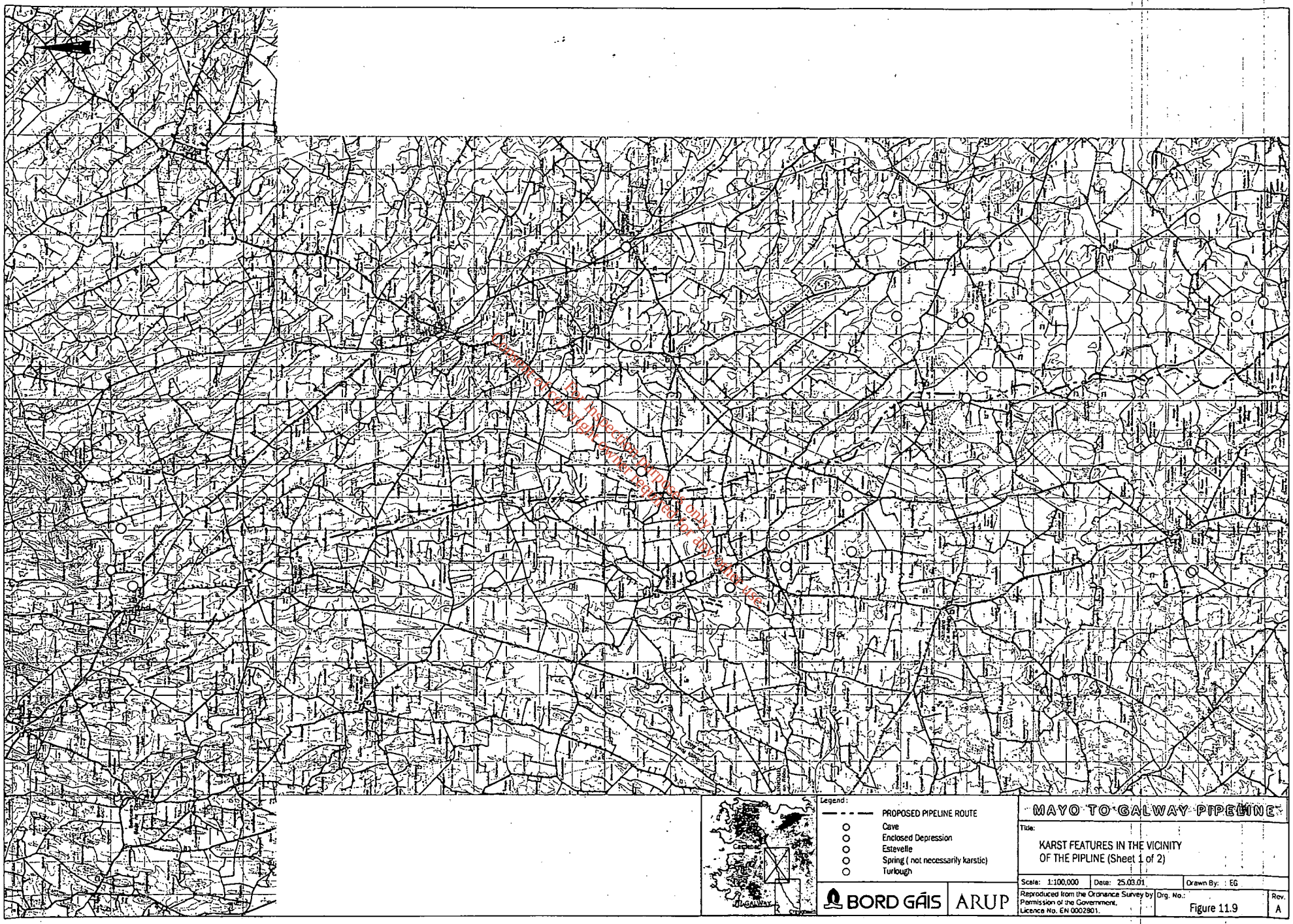


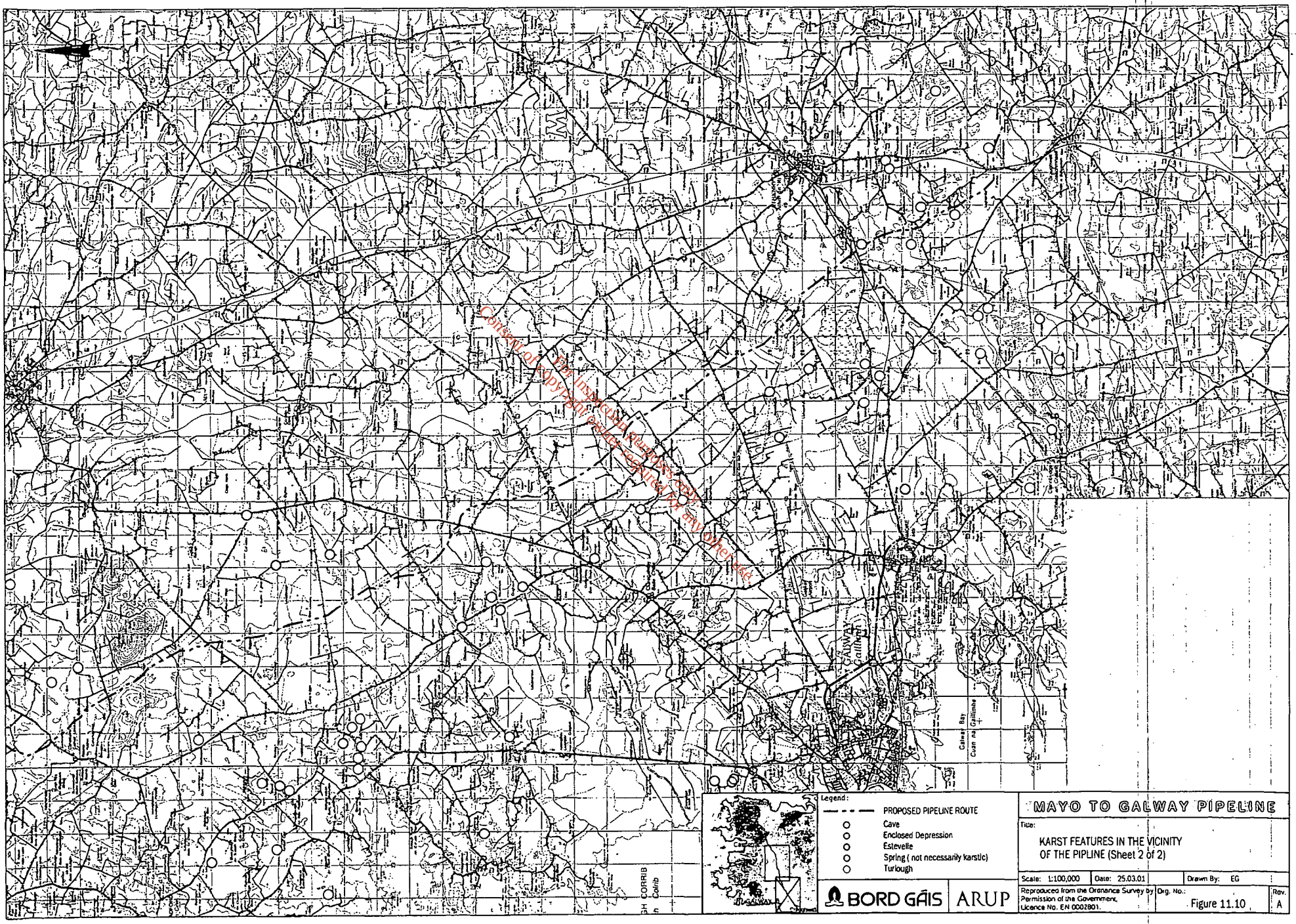


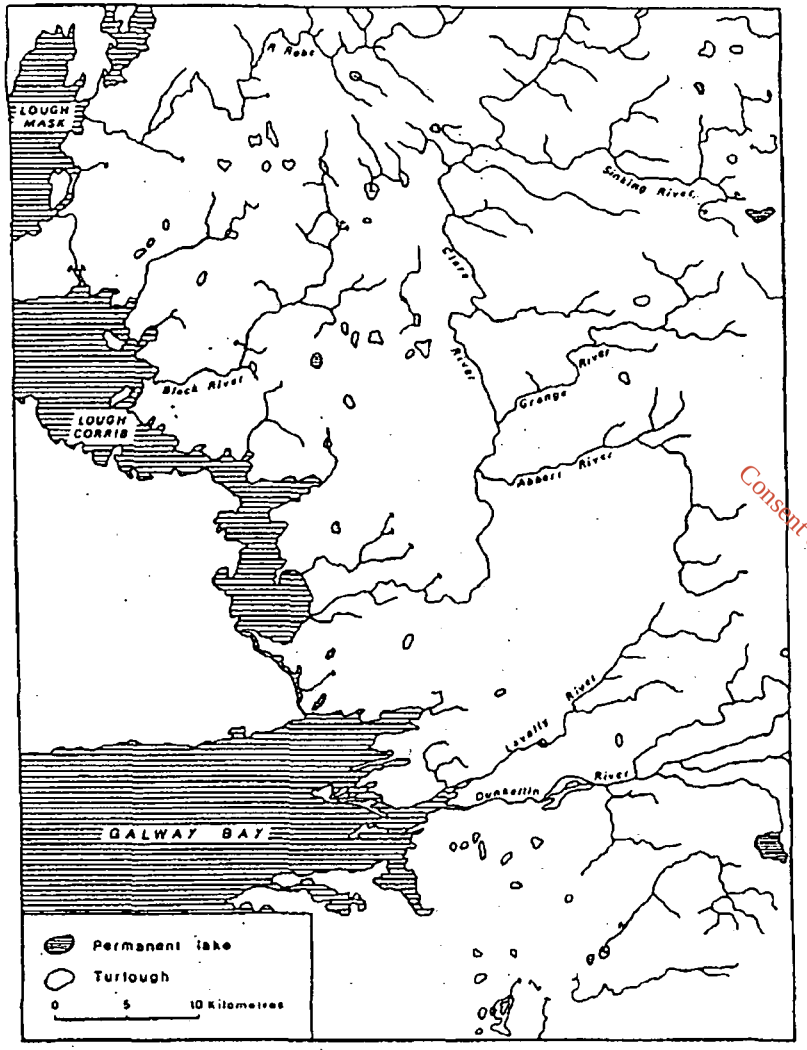






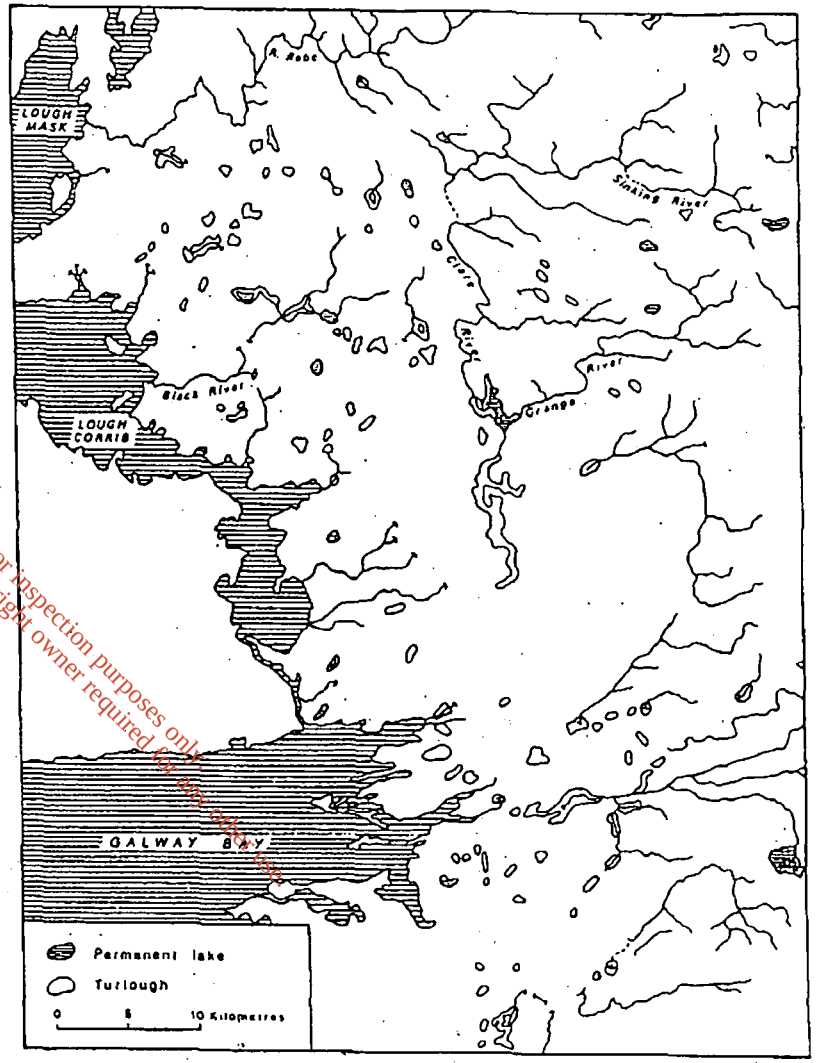






Present Day Surface Drainage

Taken from Drew & Daly (1993)



Pre-arterial Drainage

BORD GÁIS

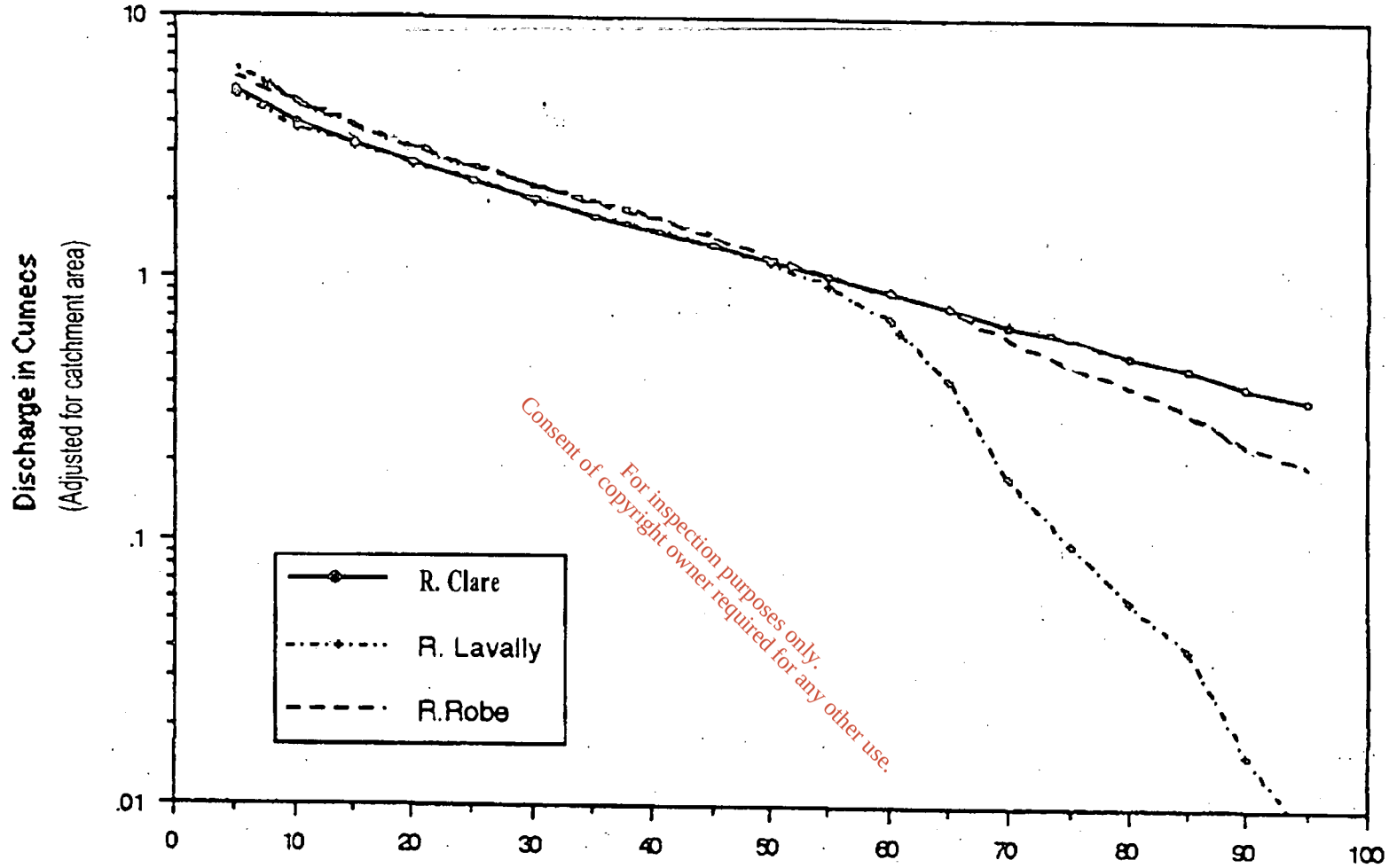
ARUP

MAYO TO GALWAY PIPELINE

Title:

PRESENT & FORMER DRAINAGE PATTERNS IN NORTH-EAST GALWAY

Scale: N.T.S.	Date: 25.04.01	Drawn By: EG
Reproduced from the Ordnance Survey by Permission of the Government, Licence No. EN 0002801.	Drg. No.: Figure 13.1	Rev. A



Modified from Drew & Daly (1993)

BORD GÁIS

ARUP

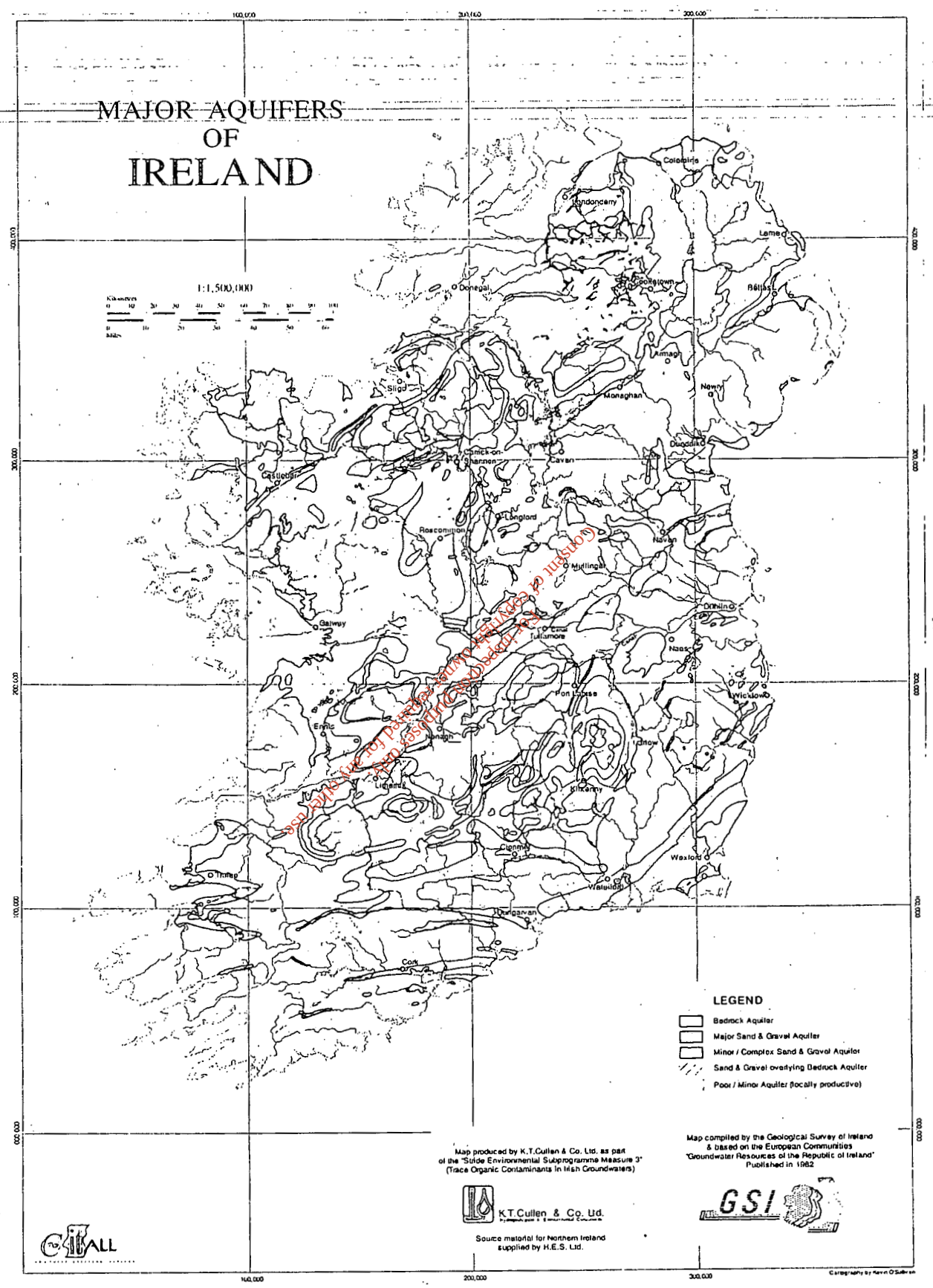
MAYO TO GALWAY PIPELINE

Title: DISCHARGE VERSUS EXCEEDANCE DURATION FOR THREE NAMED RIVERS CROSSED BY PIPELINE

Scale: N.T.S. | Date: 25.04.01 | Drawn By: EG

Drg. No.: Figure 13.2

Rev A



BORD GÁIS

ARUP

MAYO TO GALWAY PIPELINE

Title: MAJOR AQUIFERS OF IRELAND

Scale: N.T.S.	Date: 25.04.01	Drawn By: EG
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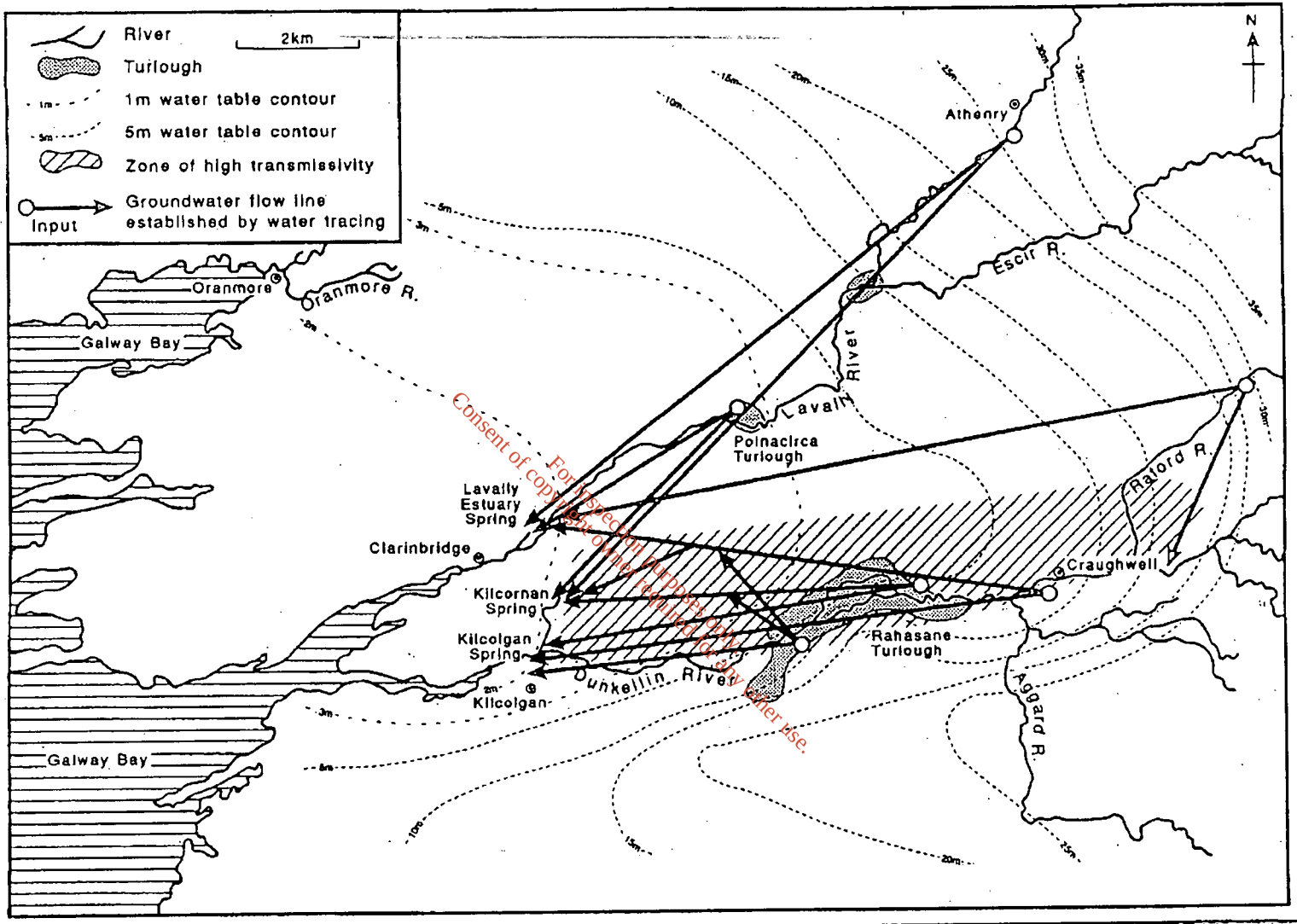

Taken from Drew & Daly (1993)

BORD GÁIS

ARUP

MAYO TO GALWAY PIPELINE

Title:

ESTABLISHED GROUNDWATER FLOW PATHS IN DUNKELLIN-LAVALLY CATCHMENT

Scale: N.T.S.	Date: 25.04.01	Drawn By: EG
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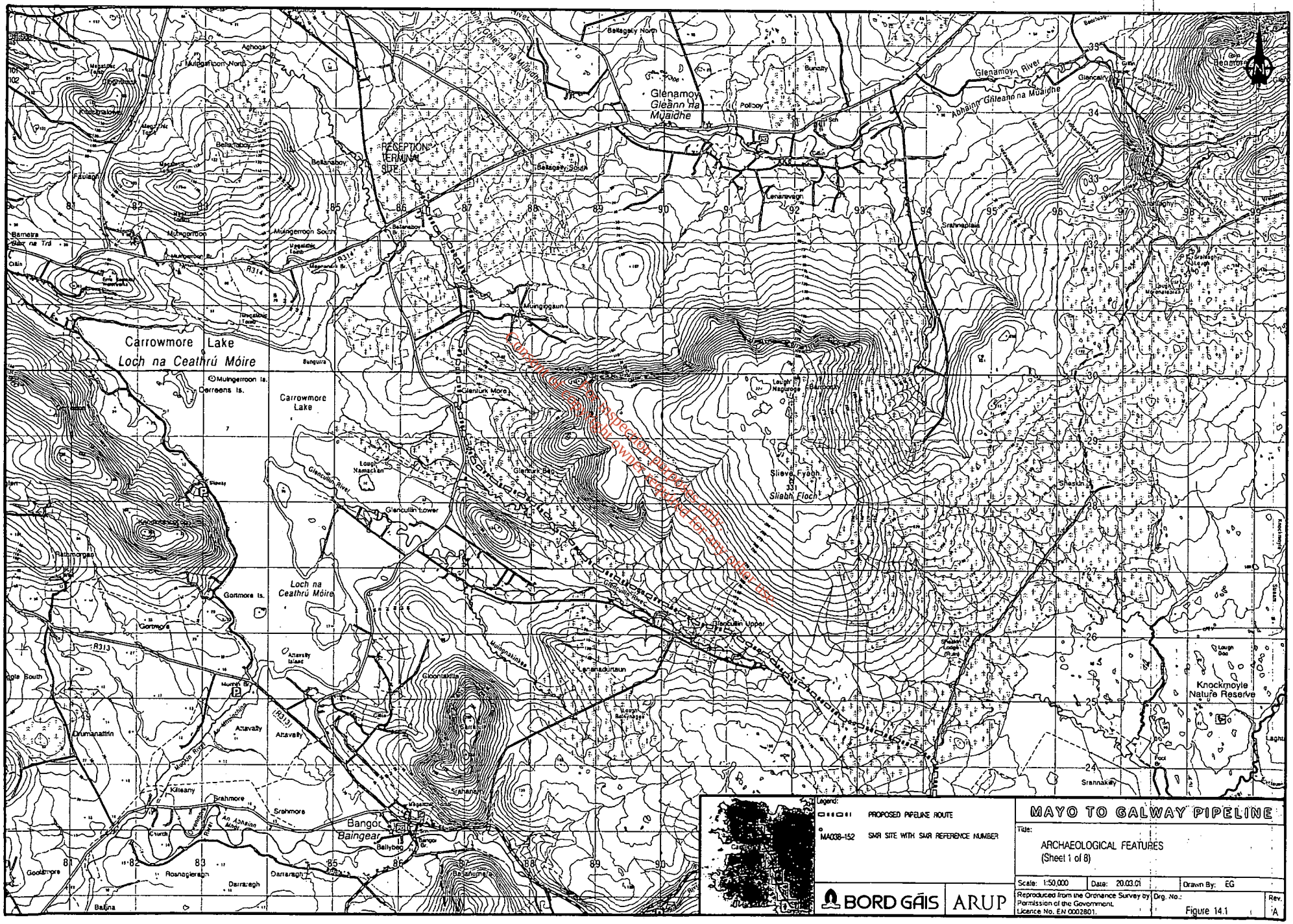

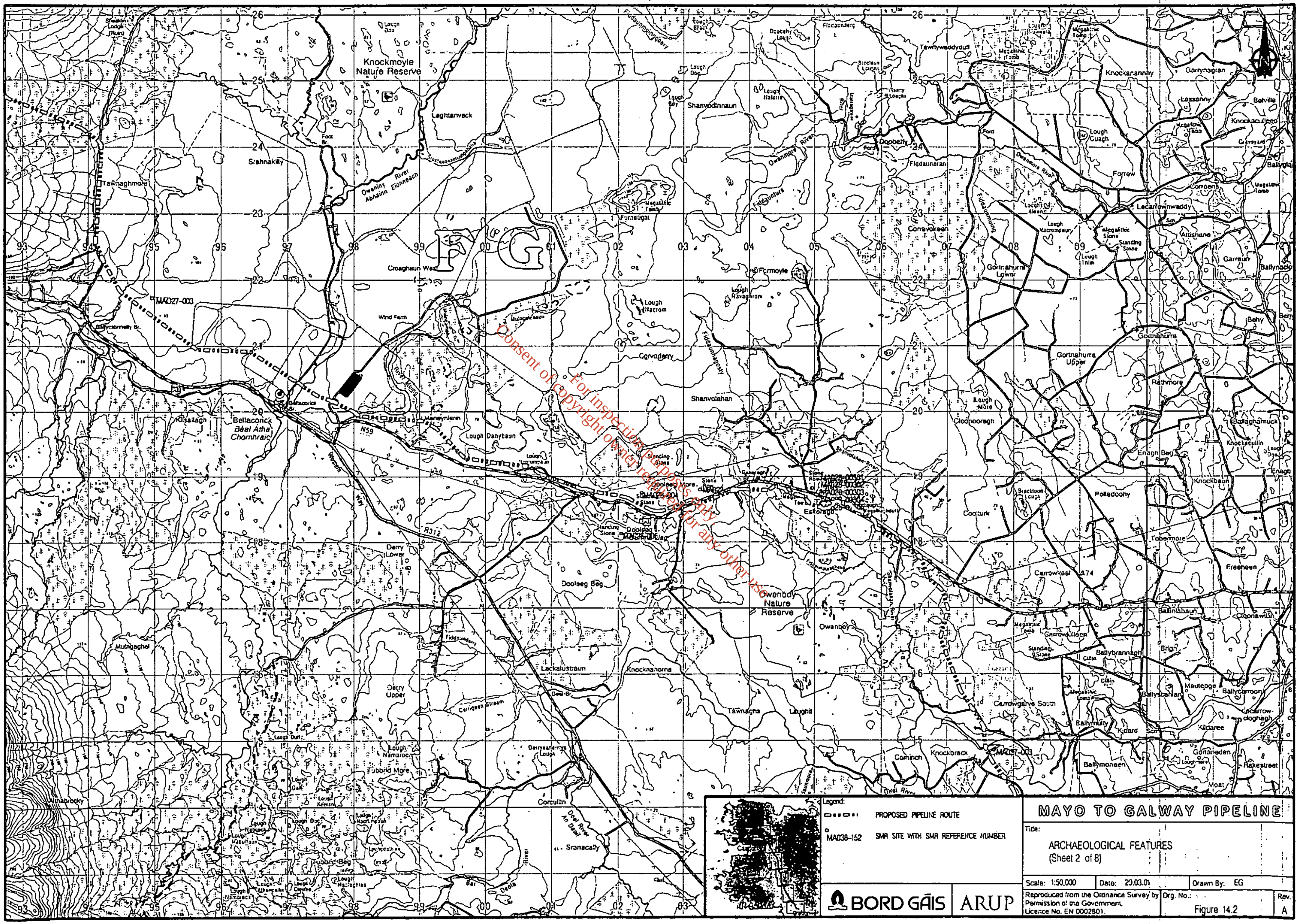

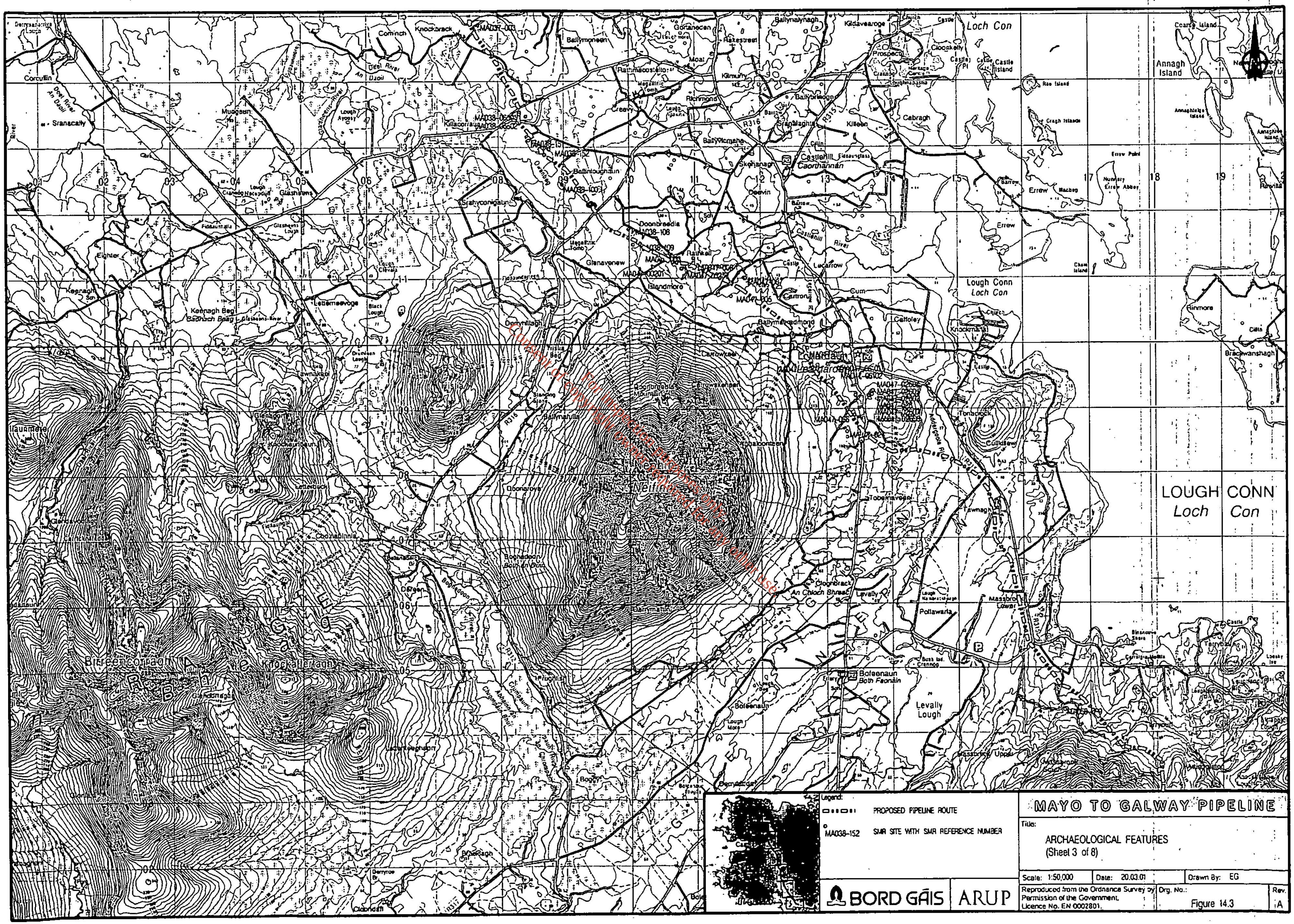

Legend:	
▭▯▭▯	PROPOSED PIPELINE ROUTE
° MA038-152	SMR SITE WITH SMR REFERENCE NUMBER

BORD GÁIS ARUP

MAYO TO GALWAY PIPELINE

Title:

ARCHAEOLOGICAL FEATURES
(Sheet 3 of 8)

Scale: 1:50,000	Date: 20.03.01	Drawn By: EG

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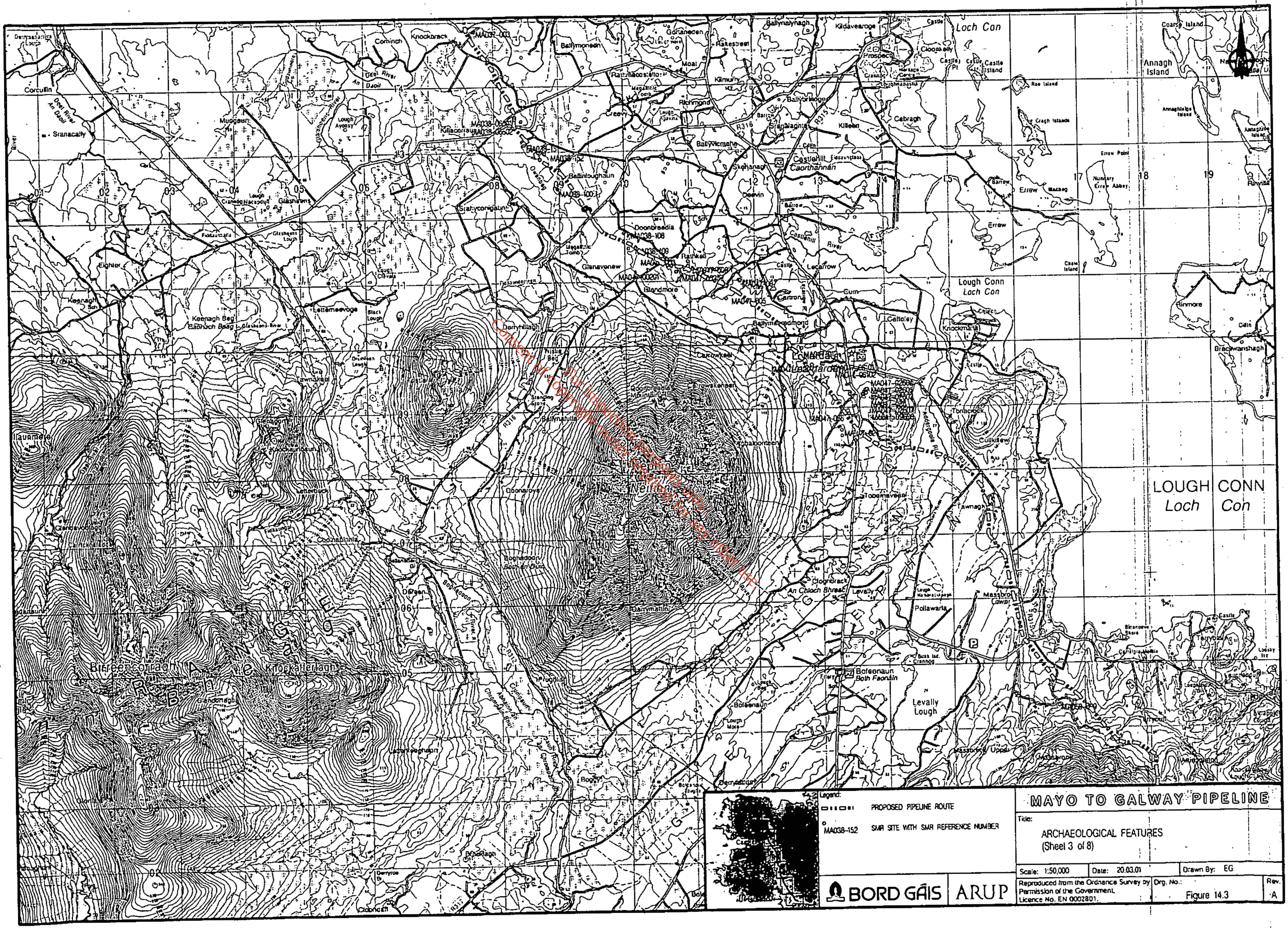
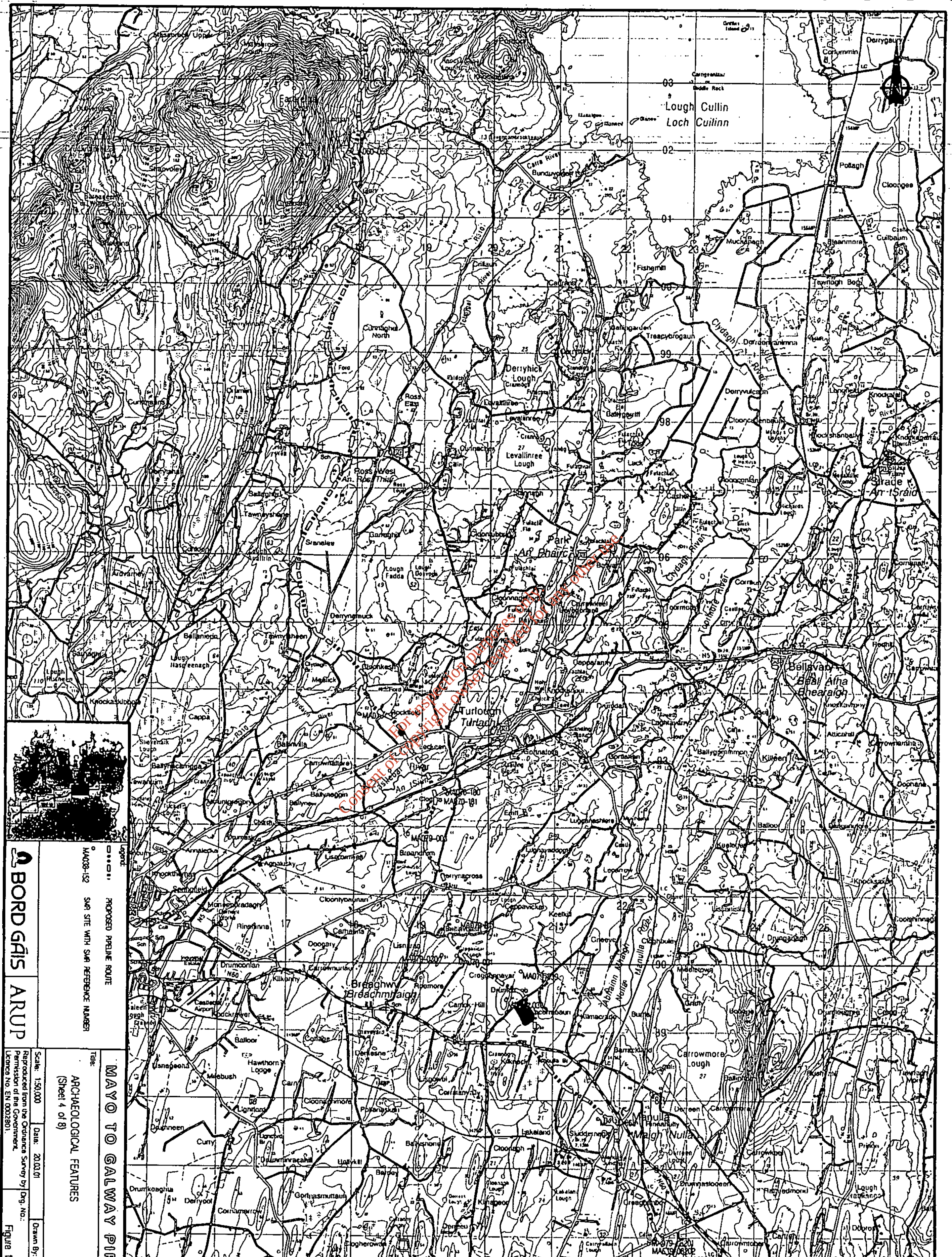
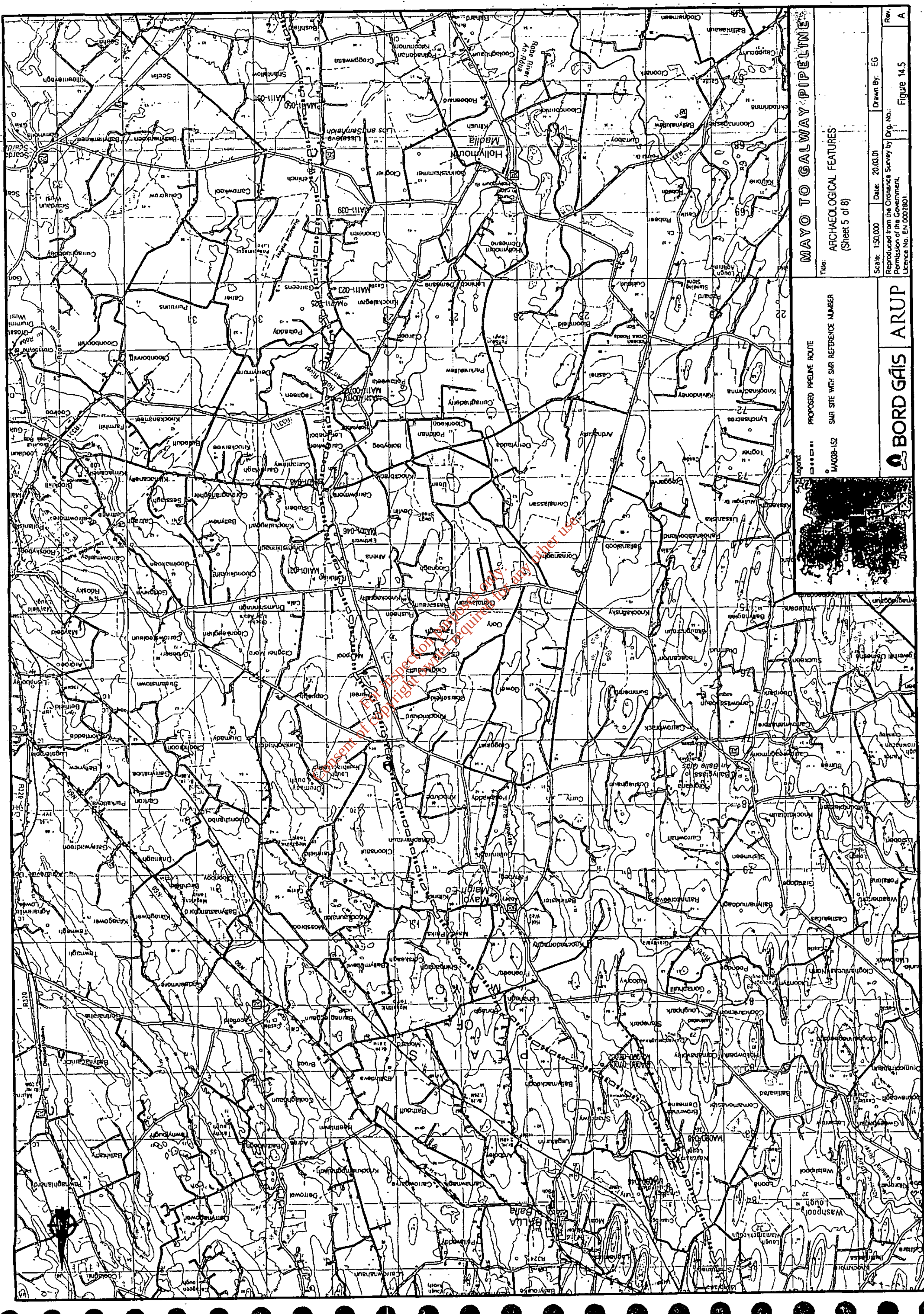
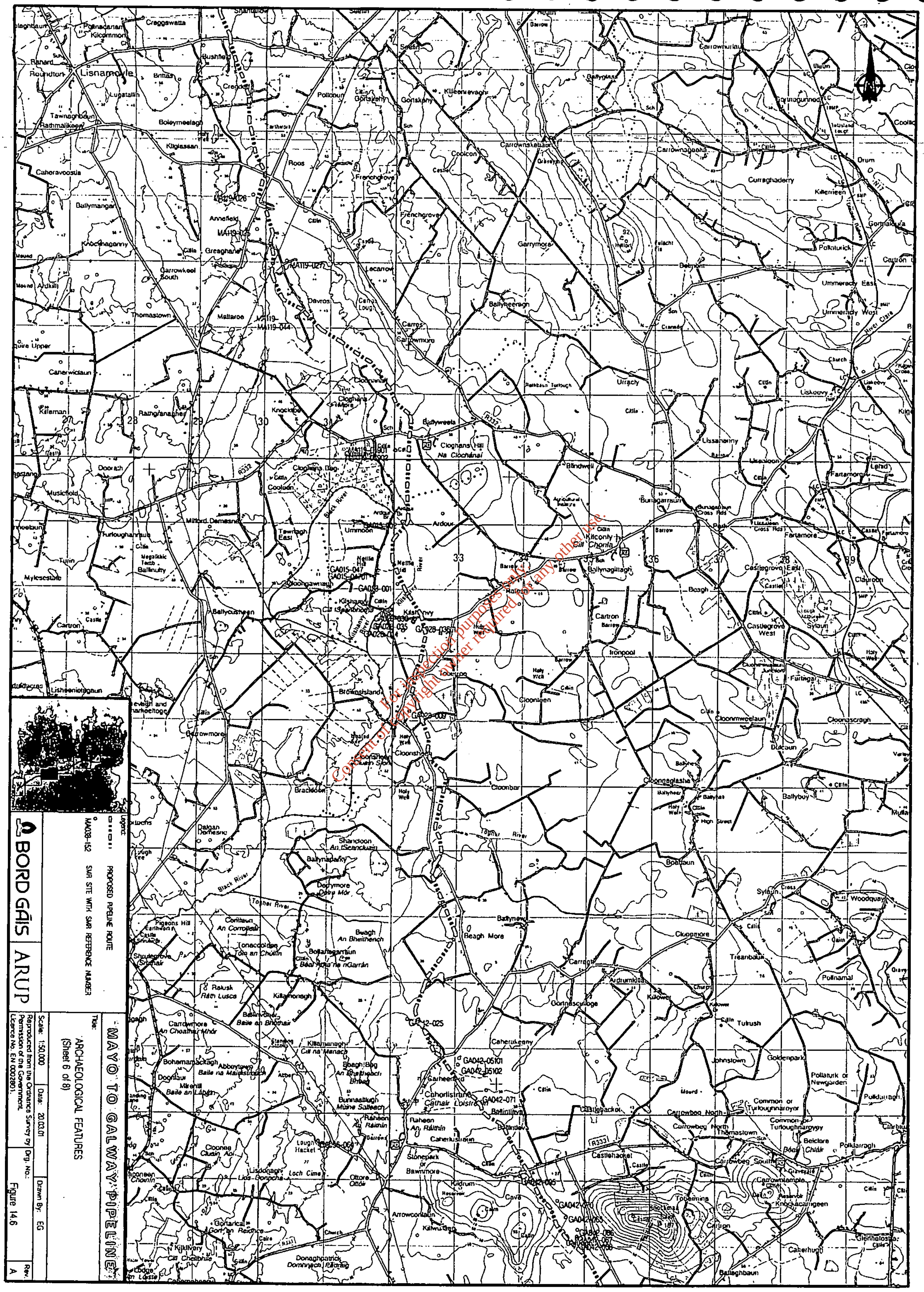
Drg. No.: Figure 14.3 Rev. A









MAYO TO GALWAY PIPELINE

Title: ARCHAEOLOGICAL FEATURES (Sheet 6 of 8)

Legend:
PROPOSED PIPELINE ROUTE
MA038-152 SMR SITE WITH SMR REFERENCE NUMBER

Scale: 1:50,000	Date: 20.03.01	Drawn By: EG
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