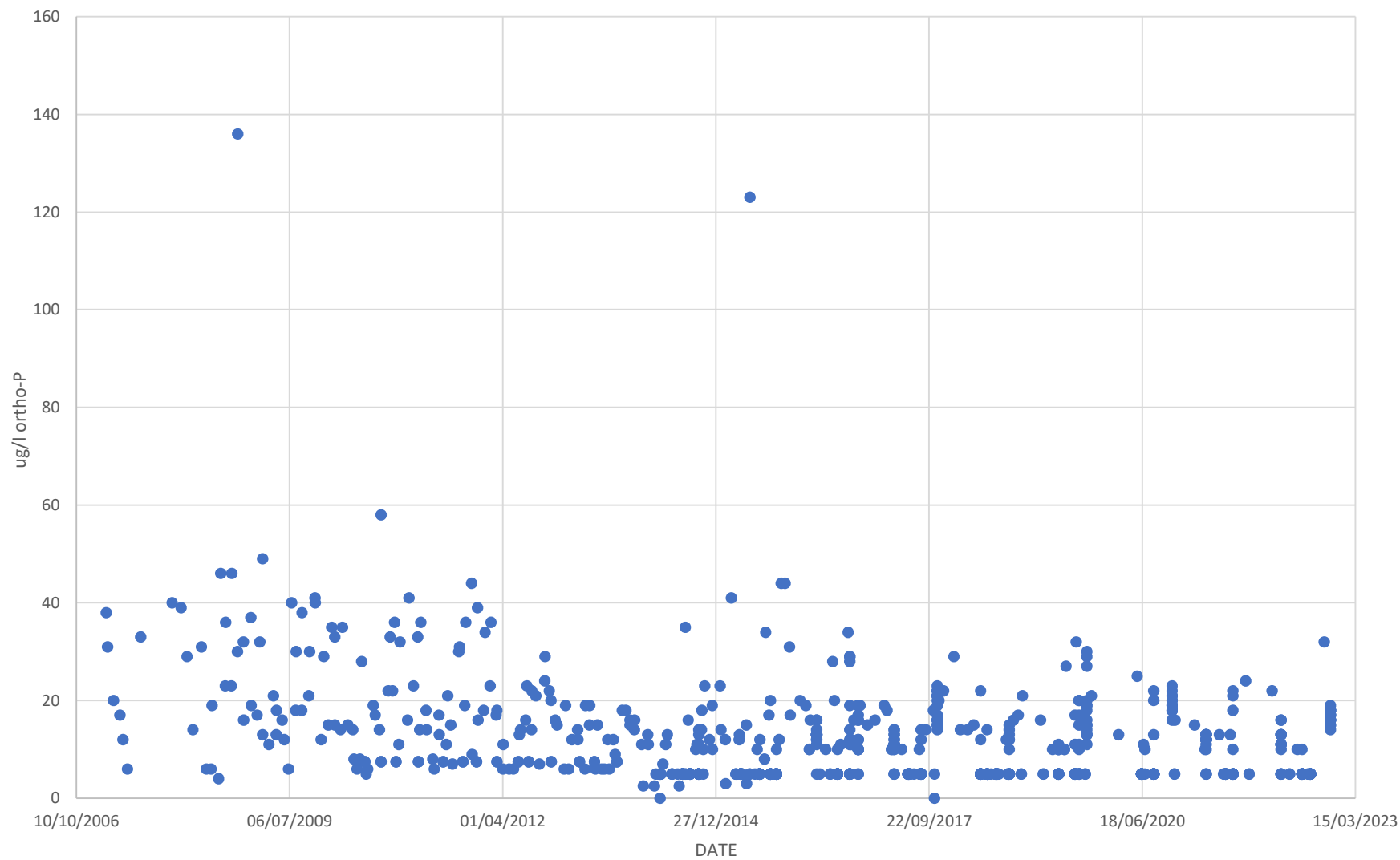


Ballyleague Bridge	
Year	Average of ug/l ortho-P
EQS threshold values	35.00
2007	22.43
2008	32.00
2009	24.21
2010	18.20
2011	18.03
2012	15.34
2013	11.40
2014	6.88
2015	9.64
2016	11.64
2017	10.31
2018	7.27
2019	10.49
2020	10.77
2021	8.65

Ballyleague Br

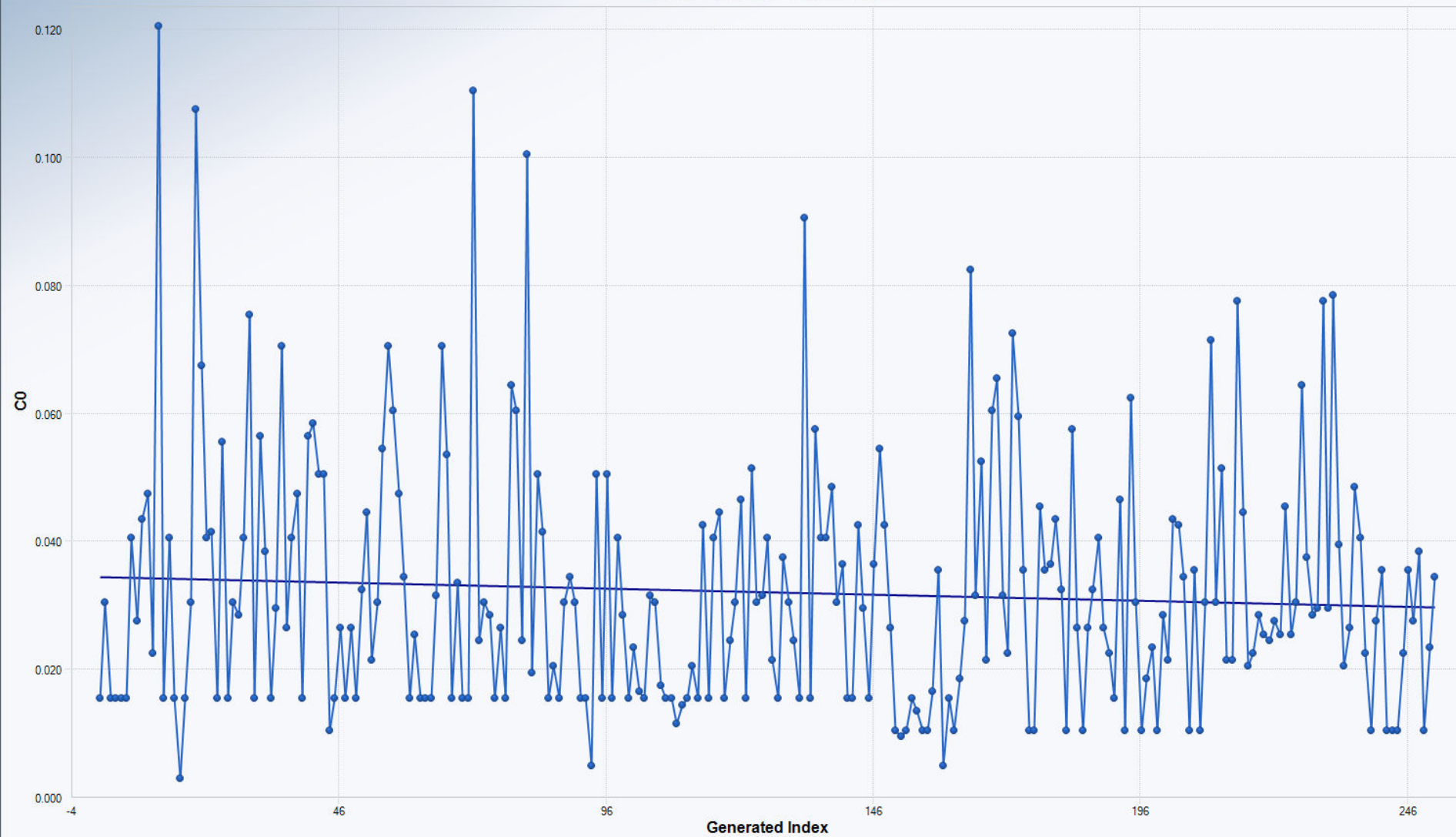


Appendix 9.2

Ammonium trends - Ballyleague Br

	A	B	C	D	E	F	G	H	I	J	K	L
1				Mann-Kendall Trend Test Analysis								
2	User Selected Options											
3	Date/Time of Computation			ProUCL 5.118/03/2025 11:15:30								
4	From File			Ballyleague.xls								
5	Full Precision			OFF								
6	Confidence Coefficient			0.95								
7	Level of Significance			0.05								
8												
9	C0											
10												
11	General Statistics											
12	Number or Reported Events Not Used			0								
13	Number of Generated Events			251								
14	Number Values Reported (n)			251								
15	Minimum			0.0025								
16	Maximum			0.12								
17	Mean			0.0316								
18	Geometric Mean			0.0263								
19	Median			0.028								
20	Standard Deviation			0.0198								
21	Coefficient of Variation			0.628								
22												
23	Mann-Kendall Test											
24	M-K Test Value (S)			-696								
25	Critical Value (0.05)			-1.645								
26	Standard Deviation of S			1324								
27	Standardized Value of S			-0.525								
28	Approximate p-value			0.3								
29												
30	Insufficient evidence to identify a significant											
31	trend at the specified level of significance.											

Mann-Kendall Trend Test



Mann-Kendall Trend Analysis

n	251
Confidence Coefficient	0.9500
Level of Significance	0.0500
Standard Deviation of S	1,323.6253
Standardized Value of S	-0.5251
M-K Test Value (S)	-696
Appx. Critical Value (0.05)	-1.6449
Approximate p-value	0.2998

OLS Regression Line (Blue)

OLS Regression Slope	0.0000
OLS Regression Intercept	0.0340

Insufficient statistical evidence
of a significant trend at the
specified level of significance.

Water Framework Directive Groundwater Monitoring Programme

Site Information

Lanesboro - ESB



Lanesboro ESB is a borehole that is part of the Lanesboro public water supply. The borehole is abstracting approximately 2000m³/day.



Longford

August 2011

SITE INFORMATION					
Site Name:	Lanesboro - ESB		County:	Longford	
RBD:	Shannon IRBD		EU Reporting Code:	---	
Easting:	200803		GWB Name:	Lanesborough	
Northing:	269526		GWB Code:	IE_SH_G_135	
Site Use:	Drinking Water (PWS)		Drinking Water Code:	2000PUB1009	
Hydrometric Area:	26		Water Level Monitoring Network:	Level	Flow
Townland:	RATHCLINE			N	N
Ownership:	Longford Co Co				
Water Quality Monitoring Network:	Surveillance		Operational (Point)		Operational (Diffuse)
	N		N		N
Site Comments:	Lanesboro PWS comprises a borehole at the ESB power station and a further two boreholes at Lisreevagh - See Lanesboro Lisreevagh.				
SITE DIRECTIONS					
Location and Access Information:	In Lanesborough, the ESB site is on the right hand side leaving the village before the river.				
Additional Comments:	---				
WELL INFORMATION					
Monitoring Point Type:	BH	Abstraction Rate (m³/d):	2000	Ground Elevation (m OD):	45
Borehole Log Available:	---	Total Drilled Depth (m bgl):	---	Depth to Bedrock (m bgl):	---
Top of Casing (m agl):	---	Upper Casing Diameter (mm):	---	Lower Casing Diameter (mm):	---
Final Borehole Depth (m):	---	Upper Casing Bottom Depth (m bgl) :	---	Lower Casing Bottom Depth (m bgl):	---
Screen Interval (m bgl):	---	Screen Type (PVC,Steel,other):	---	Screen Slot Size (mm):	---
Grout Type (cement,bentonite):	---	Grouted above (m bgl):	---	Grout Volume Injected (m³):	---
Gravel Pack Interval (m bgl):	---	Gravel Pack Volume (m³):	---	Open Hole Interval (m bgl):	---
Potential Yield (m³/day):	---	Comments on Monitoring Site:	PH Mc Carthy are engineers working on the scheme.		
Specific Capacity (m³/d/m):	---				
Static Water Level (m bgl):	---				
Scheme Name:	Lanesboro PWS	Number of Abstraction Points in the Scheme:	3	Source Report Available	N
Source Report Info:	---				
Scheme Summary:	Lanesboro consists of three boreholes (1 at ESB and 2 at Lisreevagh) abstracting approximately 4000m³/day. ESB BH provides approximately 2000m³/day. BH 1 at Lisreevagh abstracts 1100m³/day and BH 3 abstracts 800m³/day.				

HYDROGEOLOGY							
GEOLOGY	Soil:	Made/Built land (Made)				Subsoil Permeability:	Moderate
	Subsoil:	n.a. (Made)					
	Bedrock:	Dinantian Pure Bedded Limestones					
HYDROGEOLOGY	Aquifer Category:	Rkc	Vulnerability at Monitoring site:	High	Flow Regime:	Karstified	
ZONE OF CONTRIBUTION	Estimated ZOC Size (km ²):	5.85	ZOC Delineated By:	TOBIN (CK)	Recharge Estimate (mm/yr):	129	
	ZOC Delineation Comments:	ZOCs prepared for boreholes at Lisreevagh and ESB. Highly difficult to delineate ZOCs which are based on geology, topography, abstraction rate and assumed groundwater flow directions (SE-NW / E-W). ZOCs require considerable field mapping to define flow direction. The ZOC accounts for 100% of the abstraction rate; assumed that there is hydraulic connection with the Shannon.					
Groundwater Vulnerability within ZOC (% area):	Extreme (X)	Extreme (E)	High	Moderate	Low	High to Low	Unclassified
	3.08	3.65	31.95	19.67	41.22	0	0.43
HYDROCHEMISTRY							
Hydrochemical Signature:	Ca-HCO ₃		Additional Water Chemistry Information:	---			
Alkalinity (mg/l HCO ₃):	Average:	Range:		---			
	---	---					
Hardness (mg/l CaCO ₃):	Average:	Range:		---			
	---	---					
Conductivity (uS/cm):	Average:	Range:		---			
	550	690-741					
Monitoring Record Period:	From:	To:	---				
	2001	2007					
RISK ASSESSMENT							
Pressure (e.g., Nitrates, Phosphates, Abstractions):	Diffuse		Typical Contaminants:	Phosphate			
Risk Category:	At risk, high confidence		GWB Status:	Poor			
Impact Potential within ZOC (% area):	Extreme:	High:	Moderate:	Low:	Negligible:		
	0.00	2.84	20.94	33.50	42.72		
OTHER INFORMATION							



Boreholes



Boreholes



Sampling Tap

Data Summary Sheet - July 2011

Disclaimer: The data in this document are based on the best available information and understanding at time of writing. Neither the Environmental Protection Agency, nor the individual bodies supplying data for this document and accompanying maps will be responsible for any loss or damage from the use or interpretation of these data.

Rock Unit Geology Map: GSI, 2009

Aquifer Type Map: GSI, 2009

Groundwater Vulnerability Map: GSI, 2009

Soils & Subsoils Type: Teagasc, 2007

Recharge Map: GSI, 2009

Impact Potential Map: EPA, 2009

Risk Assessment Map: EPA WFD Risk Assessment, 2006

Groundwater Body Status: EPA WFD Status Assessment, 2008

Water Quality Data: EPA WFD Monitoring, 2008

Groundwater Threshold Values

Groundwater threshold values for selected parameters:

Nitrate - General Chemical Test/ Drinking Water Test (37.5 mg/l NO₃)

Ammonium - Drinking Water Test (0.175 mg/l N) / Surface Water Test (0.065 mg/l N)

Molybdate Reactive Phosphorus (MRP) - Surface Water Test (0.035 mg/l P)

Chloride -Saline/Intrusive Test (24 mg/l) / Drinking Water Test (175 mg/l Cl)

Electrical Conductivity -Saline/Intrusive Test (800 µS/cm) / Drinking Water Test (1,875 µS/cm)

Further information on groundwater threshold values is contained in the Groundwater Regulations (S.I. No.9 of 2010).

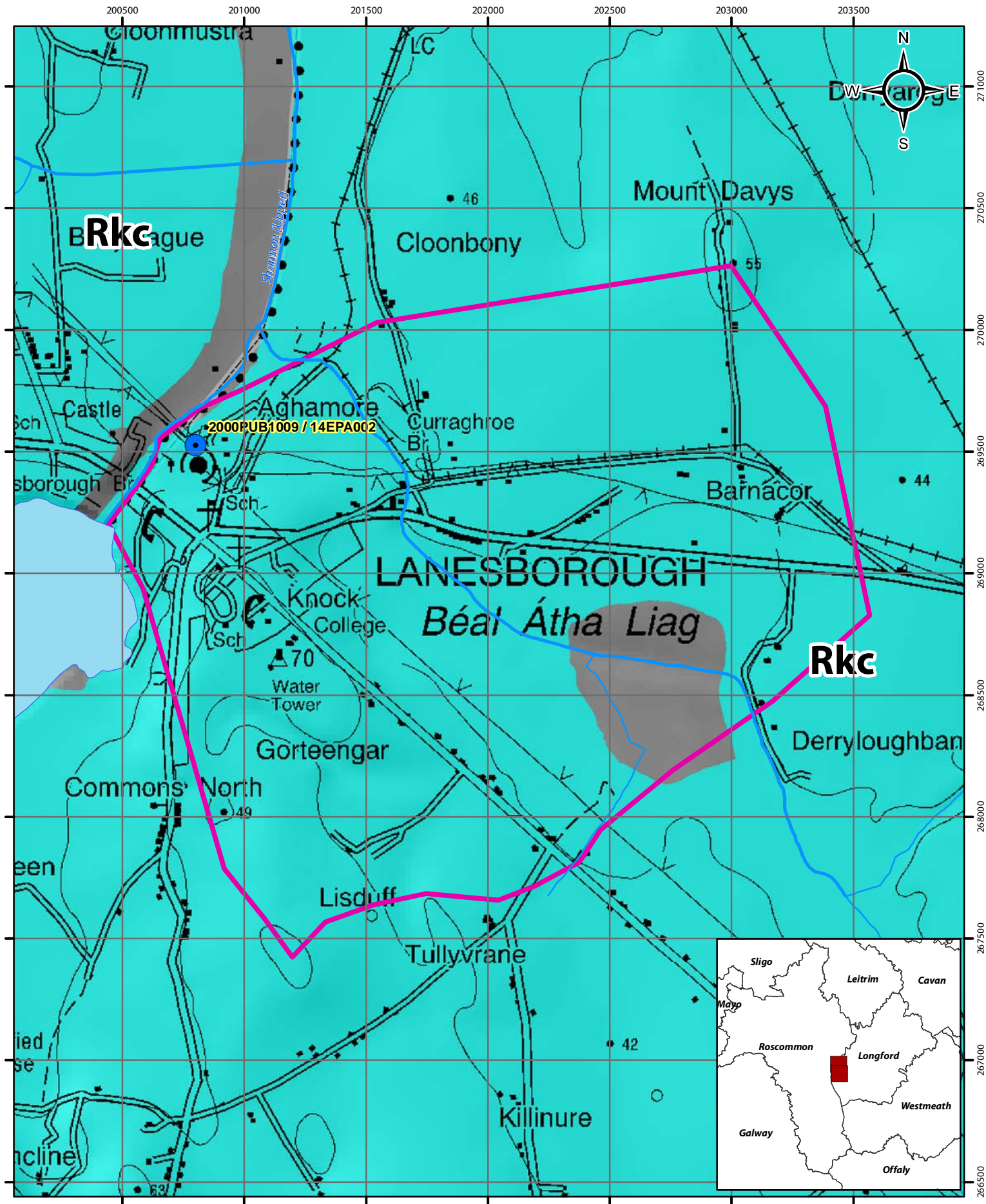
General Downgradient Distances

General Downgradient Distances (XL) applied to boreholes sourced in bedrock aquifers are constrained to estimate approximate limits based on data at the GSI. In some cases they may be higher or lower depending on local conditions.

Rk, Rkd, Lk	225 m
Lm	150 m
LI, PI	60 m

It is assumed that groundwater downgradient of a spring cannot flow back up to the spring, however a precautionary 30m buffer is generally applied which allows for instances where pumping under dry weather periods may induce a drawdown or where the ground may be sloping toward the spring from the downgradient side.

Version 0:	Prepared by		Date:	
Version 1:	Prepared by	Tobin (CK)	Date:	Apr 2011
Version 2:	Prepared by		Date:	
Version 3:	Prepared by		Date:	
Version 4:	Prepared by		Date:	



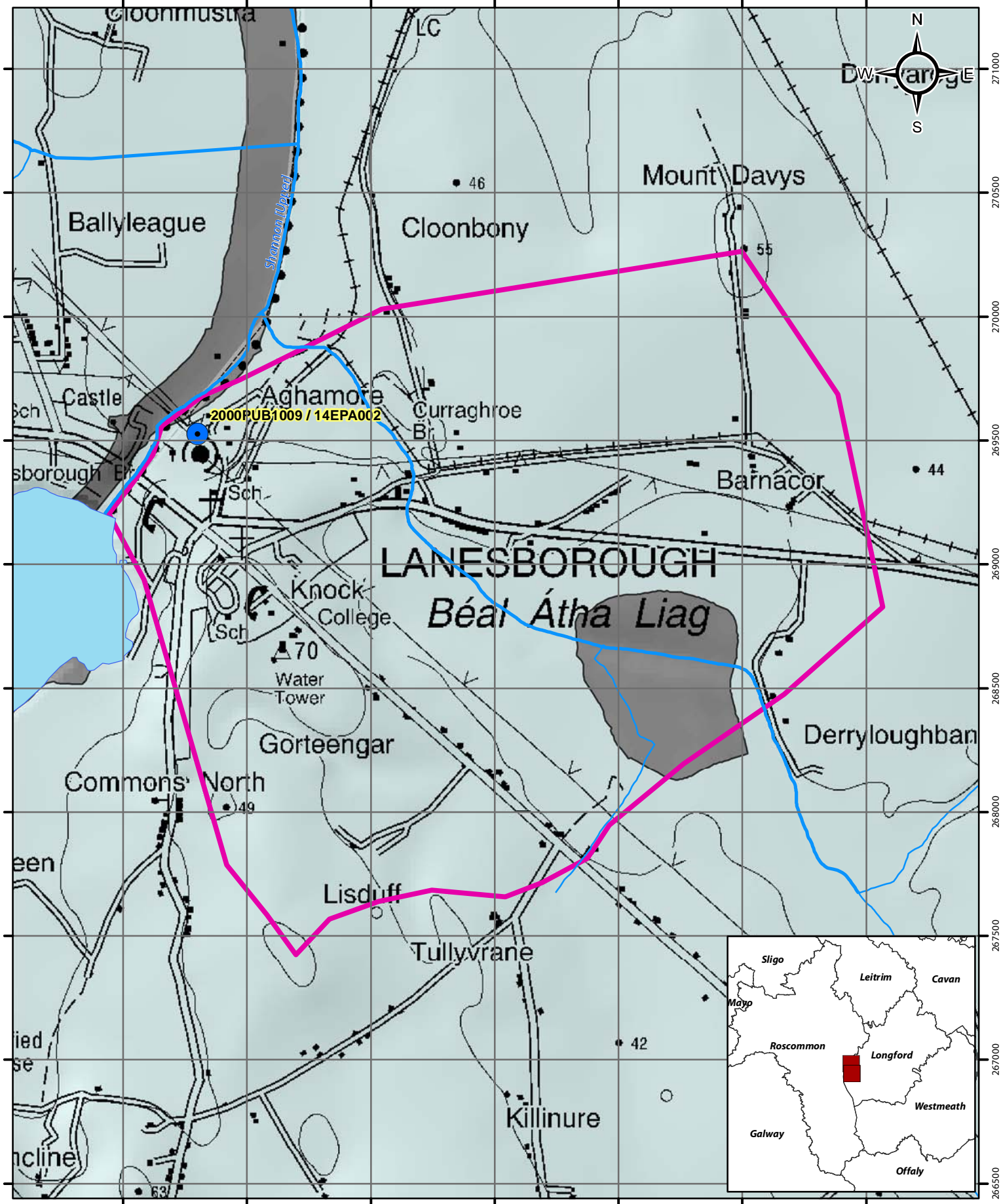
Aquifer Category Map for Lanesboro-ESB

- Abstractions
- Lakes
- River
- RkC
- Zone of Contribution



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0 0.25 0.5 1 km

200500 201000 201500 202000 202500 203000 203500

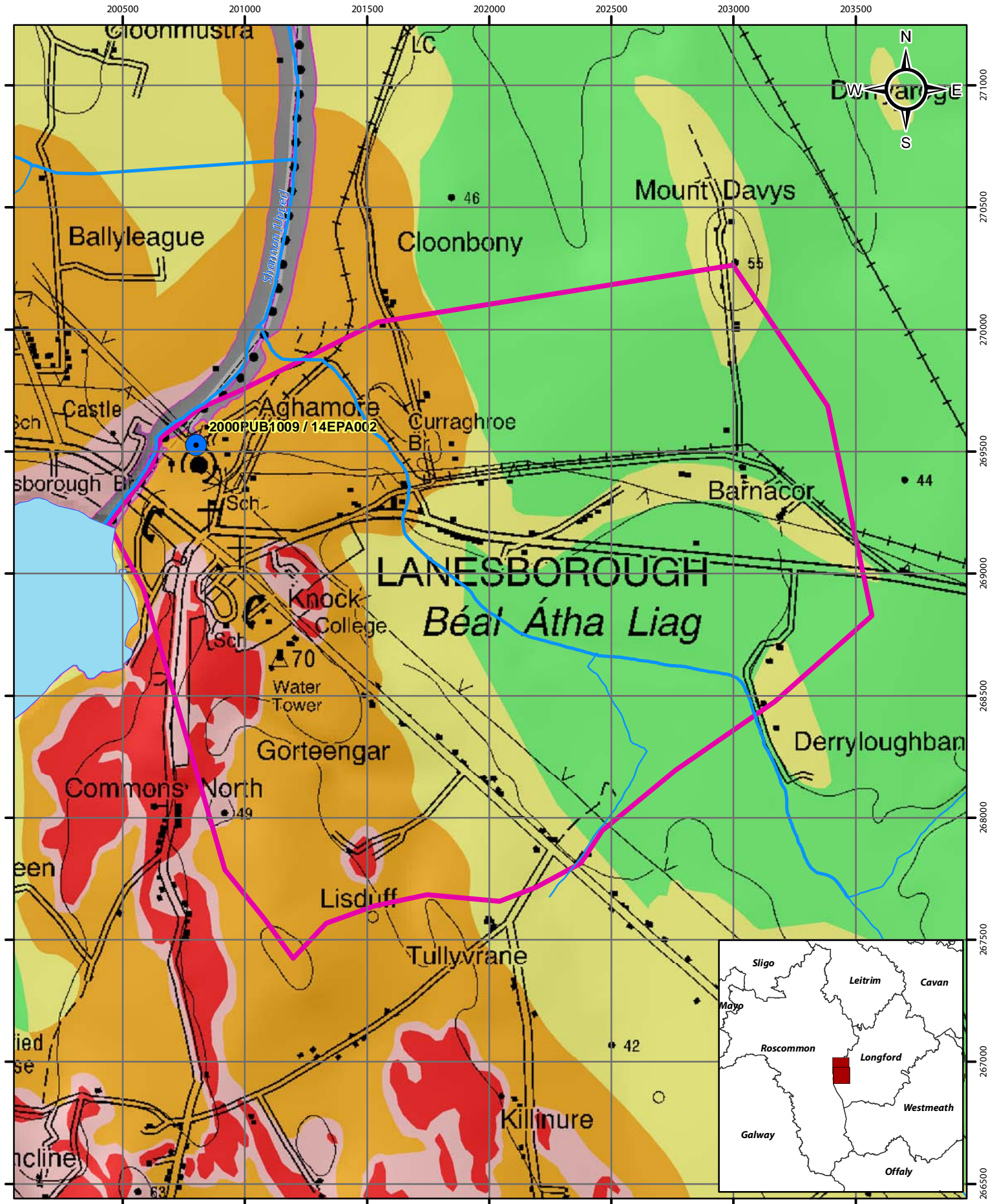


Bedrock Map for Lanesboro-ESB

-  Abstractions
-  River
-  Zone of Contribution
-  Lakes
-  Dinantian Pure Bedded Limestones

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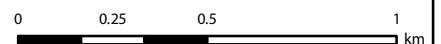
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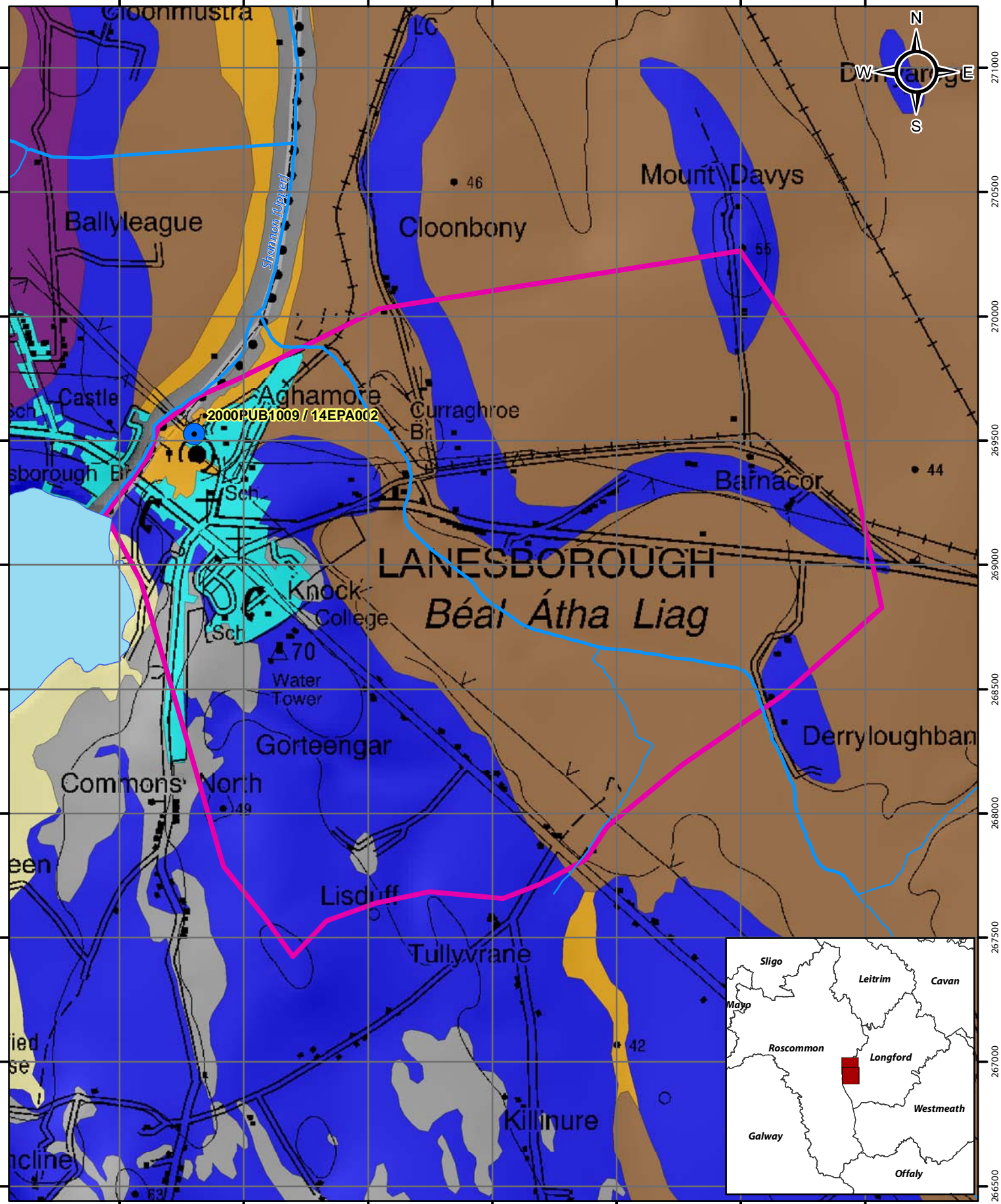
Groundwater Vulnerability Map for Lanesboro-ESB

- | | | | |
|----------------------|--------------------------------|--------------|-------|
| Abstractions | Lakes | H (High) | Water |
| River | E (Rock near surface or Karst) | M (Moderate) | |
| Zone of Contribution | E (Extreme) | L (Low) | |

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200500 201000 201500 202000 202500 203000 203500

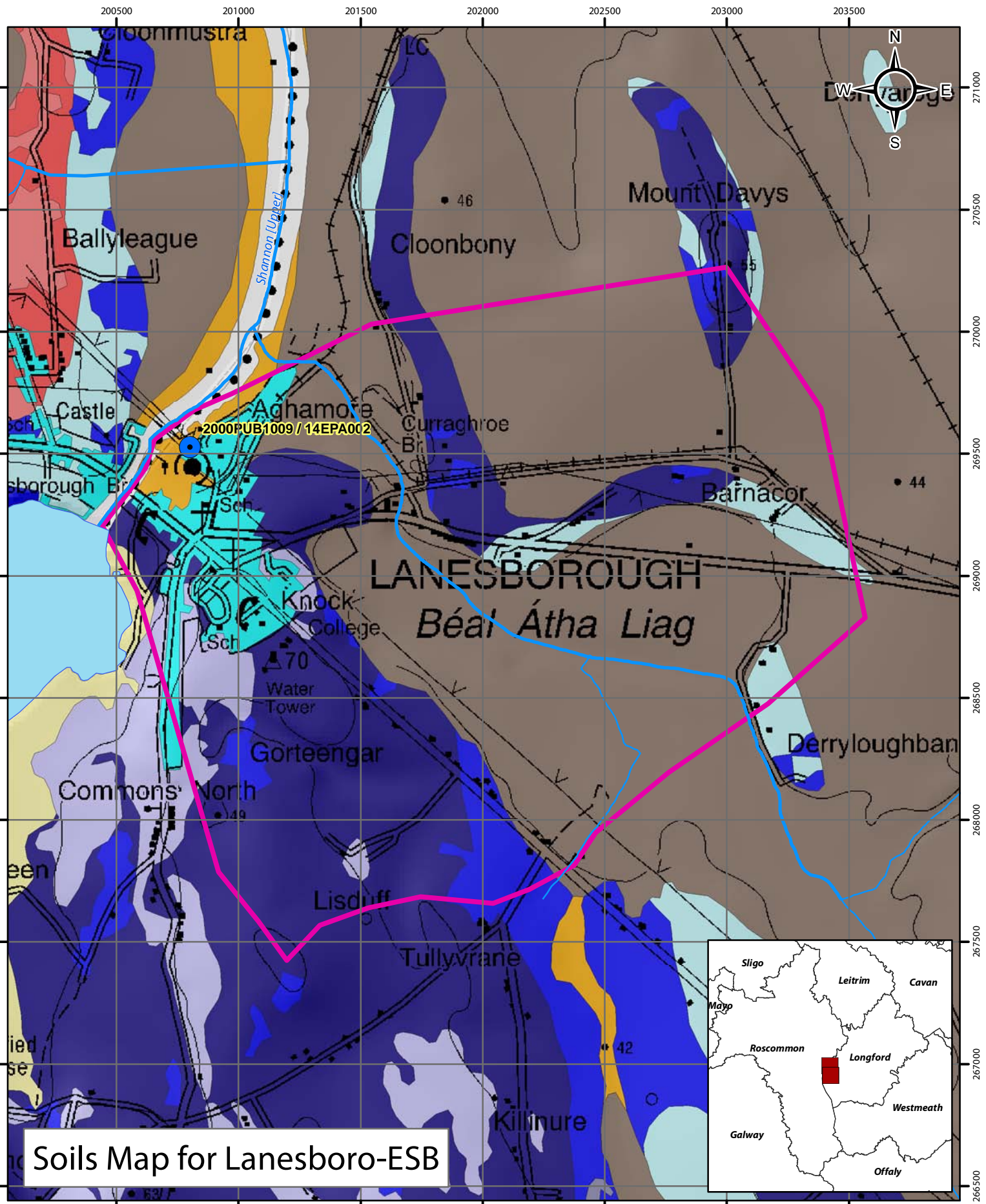


Subsoils Map for Lanesboro-ESB

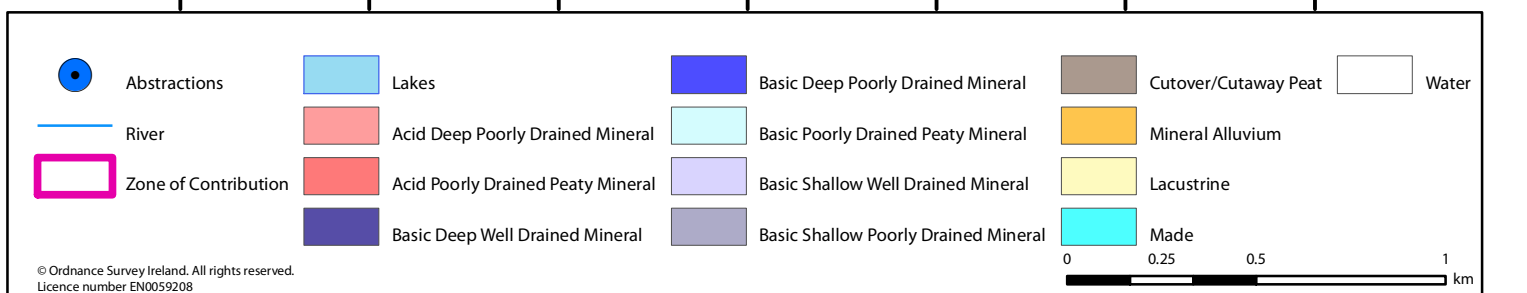
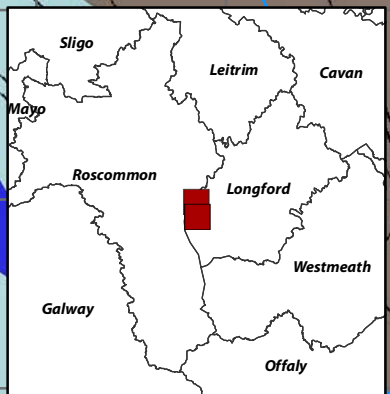
- | | | | |
|----------------------|----------|----------------------|---|
| Abstractions | Lakes | Made ground | Till derived from limestones |
| River | Water | Cutover raised peat | Till derived from Lower Palaeozoic sanstones and shales |
| Zone of Contribution | Alluvium | Lacustrine sediments | Karstified bedrock outcrop or subcrop |

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0 0.25 0.5 1 km



Soils Map for Lanesboro-ESB



Water Framework Directive
Groundwater Monitoring Programme

Site Information
Lanesboro - Lisreevagh BHs

Lanesboro - Lisreevagh comprises two boreholes abstracting approximately 1900m³/day. There is also a site folder for Lanesboro - ESB.



Longford

August 2011

SITE INFORMATION					
Site Name:	Lanesboro - Lisreevagh BHs		County:	Longford	
RBD:	Shannon IRBD		EU Reporting Code:	---	
Easting:	201066		GWB Name:	Lanesborough	
Northing:	265549		GWB Code:	IE_SH_G_135	
Site Use:	Drinking Water (PWS)		Drinking Water Code:	2000PUB1009	
Hydrometric Area:	26		Water Level Monitoring Network:	Level	Flow
Townland:	LISREEVAGH			N	N
Ownership:	Longford Co. Co.				
Water Quality Monitoring Network:	Surveillance		Operational (Point)		Operational (Diffuse)
	N		N		N
Site Comments:	Lanesboro PWS comprises a borehole at the ESB power station and a further two boreholes at Lisreevagh - See Lanesboro Lisreevagh.				

SITE DIRECTIONS	
Location and Access Information:	In Lanesborough, take a last left before the river Shannon and approximately 3.8km south take another left and the boreholes are approximately 500m along the narrow road.
Additional Comments:	---

WELL INFORMATION					
Monitoring Point Type:	BH	Abstraction Rate (m³/d):	1900	Ground Elevation (m OD):	60
Borehole Log Available:	---	Total Drilled Depth (m bgl):	---	Depth to Bedrock (m bgl):	---
Top of Casing (m agl):	---	Upper Casing Diameter (mm):	---	Lower Casing Diameter (mm):	---
Final Borehole Depth (m):	---	Upper Casing Bottom Depth (m bgl) :	---	Lower Casing Bottom Depth (m bgl):	---
Screen Interval (m bgl):	---	Screen Type (PVC,Steel,other):	---	Screen Slot Size (mm):	---
Grout Type (cement,bentonite):	---	Grouted above (m bgl):	---	Grout Volume Injected (m³):	---
Gravel Pack Interval (m bgl):	---	Gravel Pack Volume (m³):	---	Open Hole Interval (m bgl):	---
Potential Yield (m³/day):	---	Comments on Monitoring Site:	PH Mc Carthy are engineers working on the scheme.		
Specific Capacity (m³/d/m):	---				
Static Water Level (m bgl):	---				
Scheme Name:	Lanesborough PWS	Number of Abstraction Points in the Scheme:	3	Source Report Available	N
Source Report Info:	---				
Scheme Summary:	Lanesboro consists of three boreholes (1 at ESB and 2 at Lisreevagh) abstracting approximately 4000m³/day. ESB BH provides approximately 2000m³/day. BH 1 at Lisreevagh abstracts 1100m³/day and BH 3 abstracts 800m³/day.				

HYDROGEOLOGY								
GEOLOGY	Soil:	Deep well drained mineral (BminDW)					Subsoil Permeability:	Moderate
	Subsoil:	Tills (diamictos) (TLs)						
	Bedrock:	Dinantian Pure Bedded Limestones						
HYDROGEOLOGY	Aquifer Category:	Rkc	Vulnerability at Monitoring site:	High	Flow Regime:	Karstified		
ZONE OF CONTRIBUTION	Estimated ZOC Size (km ²):	9.64	ZOC Delineated By:	TOBIN (CK)	Recharge Estimate (mm/yr):	295		
	ZOC Delineation Comments:	ZOCs prepared for boreholes at Lisreevagh and ESB. Highly difficult to delineate ZOCs which are based on geology, topography, abstraction rates and assumed groundwater flow directions (SE-NW / E-W). ZOCs require considerable field mapping to define flow direction. ZOC accommodates >150% abstraction rate.						
Groundwater Vulnerability within ZOC (% area):	Extreme (X)	Extreme (E)	High	Moderate	Low	High to Low	Unclassified	
	7.12	14.56	71.22	2.79	3.24	0	1.07	
HYDROCHEMISTRY								
Hydrochemical Signature:	Ca-HCO ₃		Additional Water Chemistry Information:	---				
Alkalinity (mg/l HCO ₃):	Average:	Range:		---				
	---	---						
Hardness (mg/l CaCO ₃):	Average:	Range:		---				
	---	---						
Conductivity (uS/cm):	Average:	Range:		---				
	550	690-741						
Monitoring Record Period:	From:	To:	---					
	2001	2007						
RISK ASSESSMENT								
Pressure (e.g., Nitrates, Phosphates, Abstractions):	Diffuse		Typical Contaminants:	Phosphate				
Risk Category:	At risk, high confidence		GWB Status:	Poor				
Impact Potential within ZOC (% area):	Extreme:	High:	Moderate:	Low:	Negligible:			
	0.00	20.42	71.32	4.26	4.00			
OTHER INFORMATION								



Data Summary Sheet - July 2011

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Rock Unit Geology Map: GSI, 2009

Aquifer Type Map: GSI, 2009

Groundwater Vulnerability Map: GSI, 2009

Soils & Subsoils Type: Teagasc, 2007

Recharge Map: GSI, 2009

Impact Potential Map: EPA, 2009

Risk Assessment Map: EPA WFD Risk Assessment, 2006

Groundwater Body Status: EPA WFD Status Assessment, 2008

Water Quality Data: EPA WFD Monitoring, 2008

Groundwater Threshold Values

Groundwater threshold values for selected parameters:

Nitrate - General Chemical Test/ Drinking Water Test (37.5 mg/l NO₃)

Ammonium - Drinking Water Test (0.175 mg/l N) / Surface Water Test (0.065 mg/l N)

Molybdate Reactive Phosphorus (MRP) - Surface Water Test (0.035 mg/l P)

Chloride -Saline/Intrusive Test (24 mg/l) / Drinking Water Test (175 mg/l Cl)

Electrical Conductivity -Saline/Intrusive Test (800 µS/cm) / Drinking Water Test (1,875 µS/cm)

Further information on groundwater threshold values is contained in the Groundwater Regulations (S.I. No.9 of 2010).

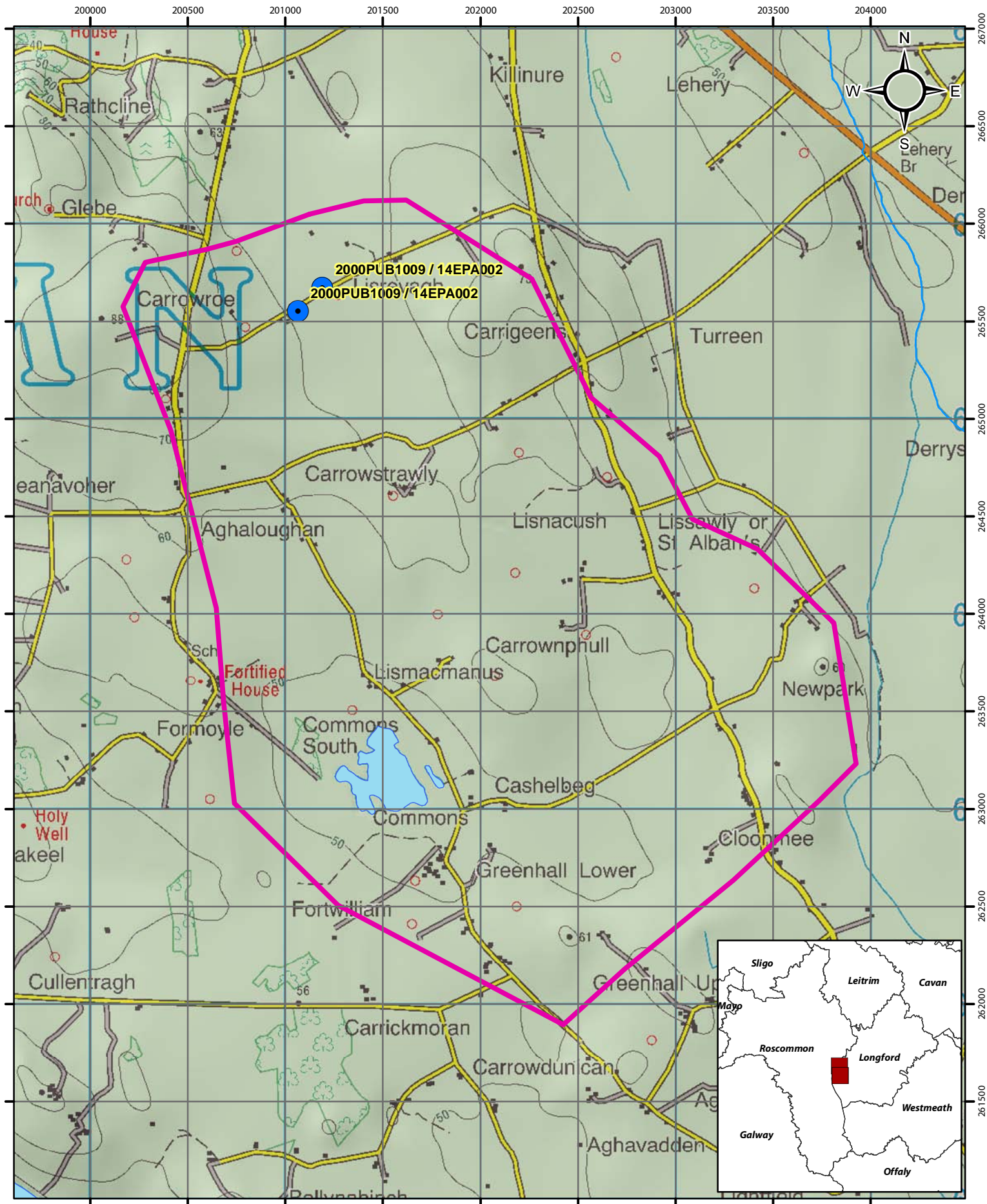
General Downgradient Distances

General Downgradient Distances (XL) applied to boreholes sourced in bedrock aquifers are constrained to estimate approximate limits based on data at the GSI. In some cases they may be higher or lower depending on local conditions.





Rk, Rkd, Lk	225 m
Lm	150 m
LI, PI	60 m

It is assumed that groundwater downgradient of a spring cannot flow back up to the spring, however a precautionary 30m buffer is generally applied which allows for instances where pumping under dry weather periods may induce a drawdown or where the ground may be sloping toward the spring from the downgradient side.

Version 0:	Prepared by		Date:	
Version 1:	Prepared by	Tobin (CK)	Date:	Apr 2011
Version 2:	Prepared by		Date:	
Version 3:	Prepared by		Date:	
Version 4:	Prepared by		Date:	



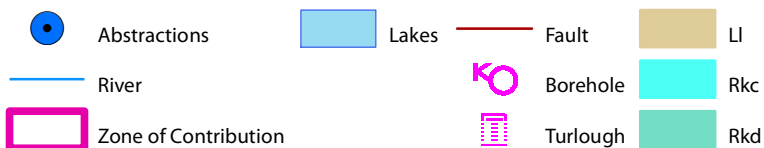
Location Map for Lanesboro-Lisreevagh

-  Abstractions
-  Lakes
-  River
-  Zone of Contribution

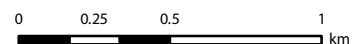
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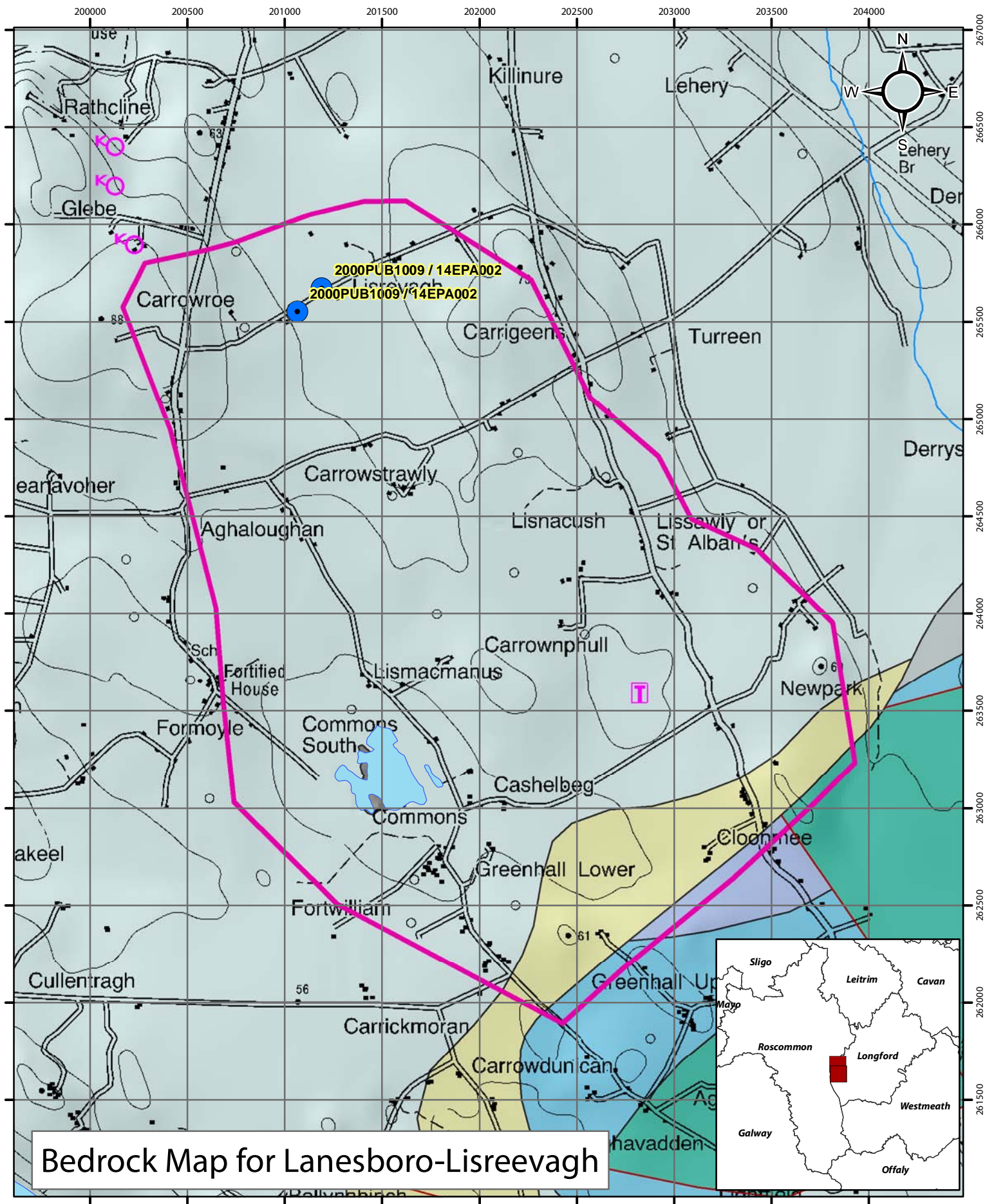
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Aquifer Category Map for Lanesboro-Lisreevagh



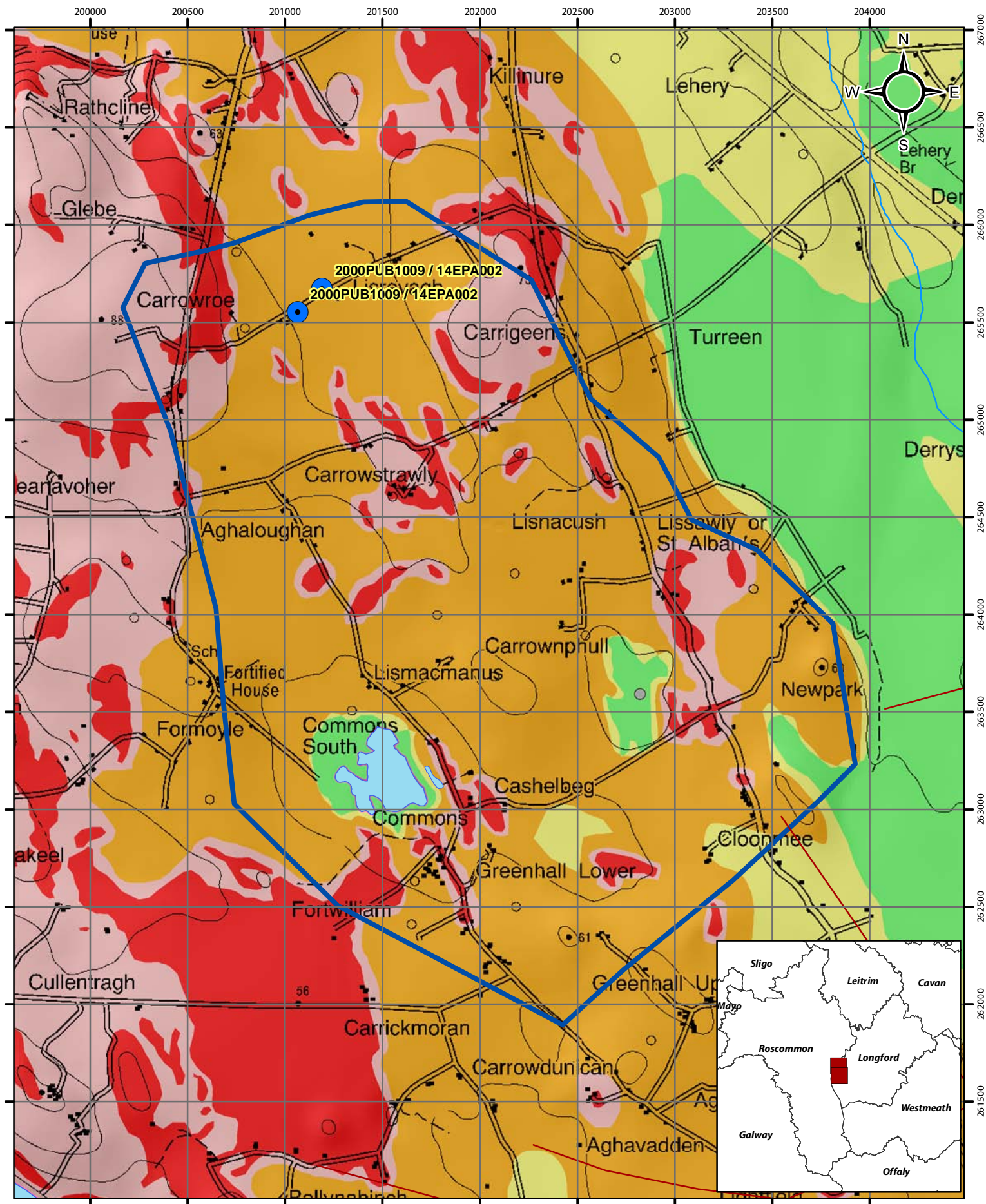
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Bedrock Map for Lanesboro-Lisreevagh

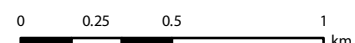
- | | | | |
|----------------------|----------|---|------------------------------------|
| Abstractions | Lakes | Dinantian (early) Sandstones, Shales and Limestones | Dinantian Pure Bedded Limestones |
| River | Fault | Dinantian Dolomitised Limestones | Dinantian Pure Unbedded Limestones |
| Zone of Contribution | Borehole | Dinantian Lower Impure Limestones | Dinantian Upper Impure Limestones |
| | Turlough | | |

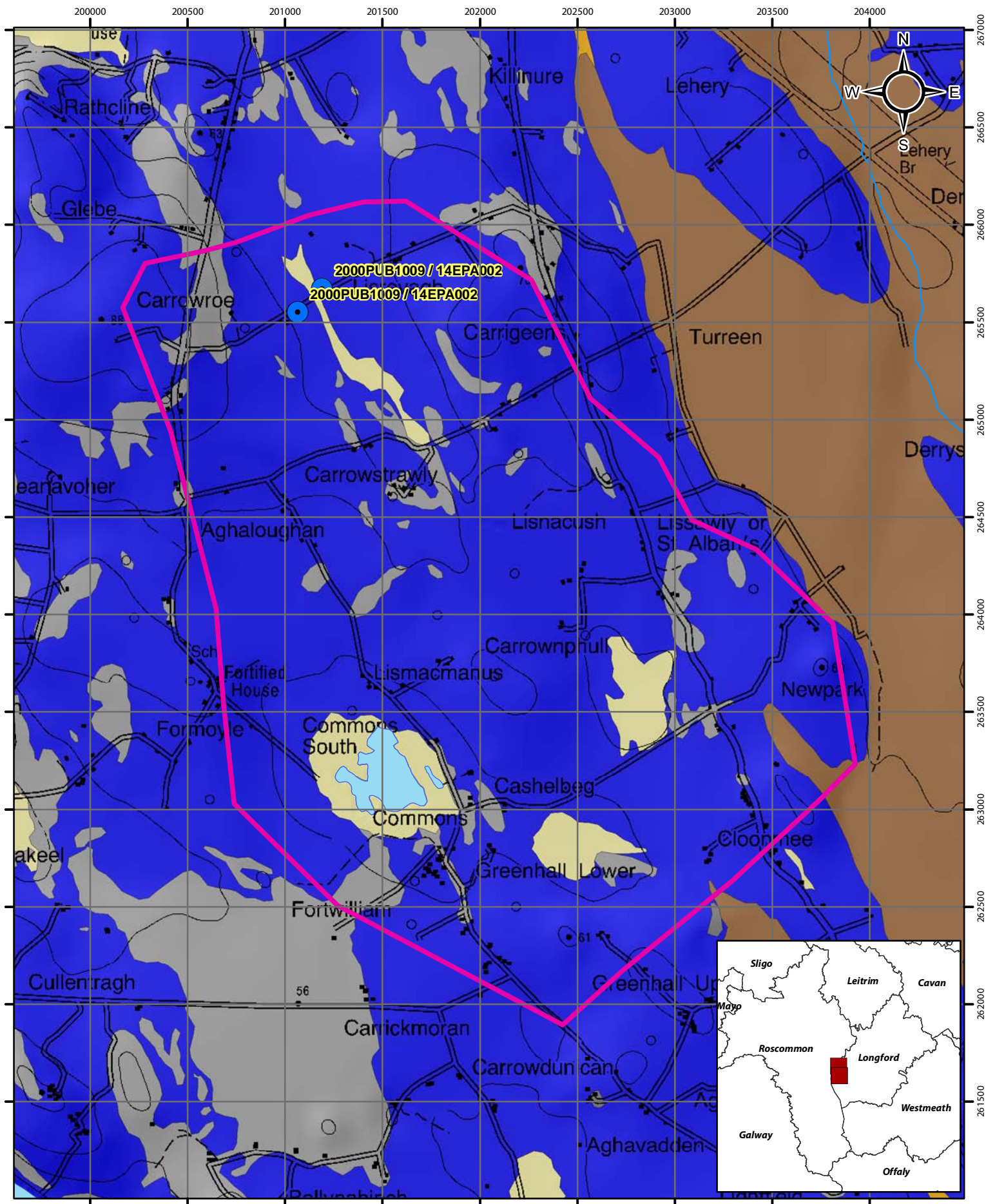


Groundwater Vulnerability Map for Lanesboro-Lisreevagh














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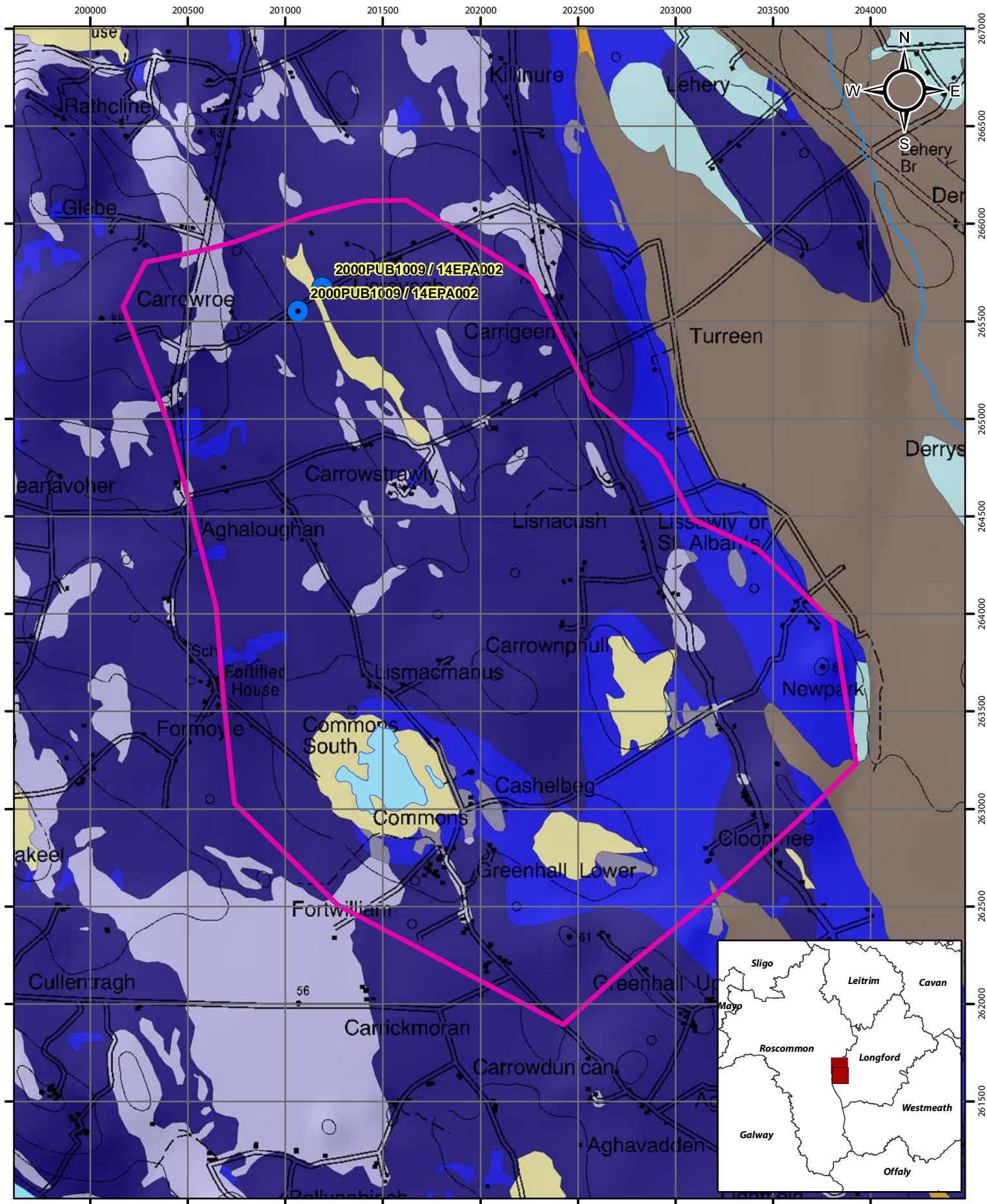


Subsoils Map for Lanesboro-Lisreevagh

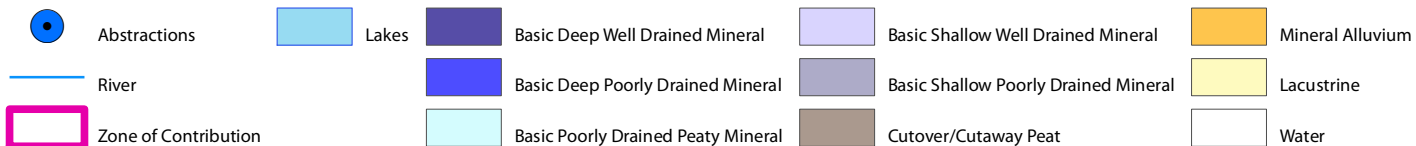
- | | | | |
|---|---|---|--|
|  Abstractions |  Lakes |  Bedrock outcrop or subcrop |  Till derived from limestones |
|  River |  Alluvium |  Karstified bedrock outcrop or subcrop |  Water |
|  Zone of Contribution |  Cutover raised peat |  Lacustrine sediments | |

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0 0.25 0.5 1 km



Soils Map for Lanesboro-Lisreevagh



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0 0.25 0.5 1 km