

Area		Impact			Specific Mitigation		
Site Name	Im- portance	Nature of Impact	Description of Impact	Impact Rating	Mitigation Measure	Residual Impact	Supporting Scientific Evidence
Polecat GWS Ch 17+750 - 32+750	High	Construction					
		Restriction and interception of subsurface flow resulting in groundwater flow and recharge	The proposed road and its construction site area is located inside the revised mapped recharge zone for the spring which the GSI have shown to extend some 10km west of Elphin. This area was not originally within the Polecat ZOC but was recently revised following tracer tests carried out as part of this assessment. The mapping revision which resulted in the extension of the recharge zone to include this area was solely due to a single known connection between Poleween Swallow Hole and therefore diffuse contributions across the entire revised ZOC are unlikely. The road is underlain by a Regionally Important bedrock aquifer with conduit flow at the location and is deemed of low vulnerability due to peat, clay and silt subsoil deposits.	Slight to Moderate	The implementation of the CESCOP will ensure no construction related impacts to the Poleween swallow hole (which is connected to the Polecat spring supply). This will include silt fences which will restrict construction activity in the vicinity of the zone of contribution. In addition, interception ditches (cut-off ditches) will be constructed in advance of the main ground works which will redirect overland flow into the swallow hole and maintain its current recharge regime.	Slight	The supporting scientific evidence includes the impact and mitigation assessments presented in this table in combination with the Hydrological Assessment presented in Chapter 9 Hydrogeology Section and Chapter 10 Hydrology. The ground investigation carried out by Priority Drilling Ltd Preliminary Ground Investigation report (2009), IGSL Geophysical Surveys (2015) and IGSL Ground Investigations Report (2016) provides geological and hydrogeological information pertaining to the overburden, aquifer and water table levels. Specific impact assessments are in EIAR at 8.4, 1.1 to 8.4, 1.9 and 10.4, 1.9 and 10.4, 1.5. Specific mitigation measures are presented in 9.4.3 and 10.5.4. Tracer surveys were carried out on two occasions of the Poleween Swallow Hole which has an active disappearing stream (the inflowing stream generally dries out in dry periods and has a loam bed in the vicinity of the swallow hole area. No positive traces to the Peak - Mantua or the Cloonyquin/Curracreegh sources on either tracer test with a positive result for the Polecat Source only. Geophysics and mapping of karst features including numerous collapse features in this area was carried out to inform the geotechnical design of the Road formation construction.
		Potential contaminated infiltration / discharge entering aquifer via karst feature construction site works construction runoff and potential spillages	In terms of construction impacts a reasonable buffer of some 150m is available between the potential site works and the source which is sufficient to minimise any potential construction impacts involving contaminated runoff water impacting the source and any potential well yield impacts arising from temporary dewatering of excavations and potential interference with ground-water flows.	Negligible / Slight	NA	Negligible / Slight	
		Operational					
		Direct encroachment of feature by proposed road development	The road alignment passes within 150m to the North of the spring source at Ch 15+850. At this location the road alignment is at grade, to the west it is in embankment and to the east it is slightly in cut. The local road near the spring is to be realigned forming an underpass under the mainline which will involve locally deep excavation into the subsoils. There is no direct encroachment of the spring source (Poleween Swallow Hole) and other identified collapse features in this area.	Negligible	NA	Negligible	All of the measures proposed in the CESCOP and the specific measures proposed in this table are accepted, proven and have been tried and tested with numerous examples throughout Ireland associated with road projects. Interceptor drains and infiltration fields are standard measures for maintaining recharge condition and disposing of drainage water. All specific locations the mainline will be constructed with a number of transverse impermeable barriers to ensure that the road does not act as a longitudinal drain that would drain and divert non-pavement flows elsewhere.
		Contamination of feature by road drainage outfalls and by the drainage system - Routine	There are no proposed road drainage outfalls discharging to this feature and the aquifer vulnerability along the road alignment in the contribution zone is typically moderate to low vulnerability.	Slight	NA	Slight	
		Accidental road spillage					
		Impact of road alignment on recharge to or discharge from hydro feature	The road alignment is located within the mapped recharge zone due to a single known karst connection between Poleween Swallow Hole and the supply spring. It is proposed to redirect cut-off drains to the swallow hole which will maintain the recharge regime of the feature. Given the impermeable nature and depth of overburden (Low aquifer vulnerability) it is highly unlikely that a preferential flow path would be encountered that would significantly impact the yield and water quality of the spring source as a result of the road development.	Slight to Moderate	The implementation of the CESCOP and EOP will be required by the contractor. The design will ensure surface and groundwater flows in the area are maintained largely intact. Interception ditches will be constructed in advance of the main ground works which will redirect overland flow into the swallow hole and maintain its current recharge regime. This will ensure that there is no appreciable change in recharge/discharge to the spring supply.	Slight	The impact magnitudes presented and the mitigation measures proposed have taken into account the level of uncertainty associated with a specific feature and generally err on the conservative.

Annual Average Water Balance Surface & Ground Water				
Area 1(ii) & (iii) - Cloonyefffer (East) & Tullyoyd / Cloonullaugh Lough				
Existing Conditions				
Surface Water				
River Basin Catchment	River Sub-basin Catchment & Area	Portion of road alignment within sub-basin catchment	Receiving Watercourse	
Upper Shannon	Owenur_010	Ch. 30+000 - 36+100	Owenur River	
Area: 675km <sup>2</sup>	Area: 36.14km <sup>2</sup>	Total Length: 4.55km	Ovaun River	
Recharge Proportion across catchment (avg.)	Catchment losses and storages (avg.)	Runoff Proportion	Annual Avg. Discharge from catchment	
14%	12%	74%	21.4 x 10 <sup>3</sup> m <sup>3</sup>	
Groundwater				
Groundwater Body (GWB)*	Portion of road alignment within GWB (AT THIS AREA ONLY)	Annual Average Recharge (mm/yr)		
Carrick on Shannon	19+750 - 24+150	28 - 172		
Area: 915km <sup>2</sup>				
ZOC Polecat	Portion of road alignment within GWB (AT THIS AREA ONLY)	ZOC Cloonyquin	Portion of road alignment within GWB (AT THIS AREA ONLY)	
52.3km <sup>2</sup>	Ch. 30+000 - 36+100	25.6km <sup>2</sup>	None	
Catchment Conditions				
Annual Average Recharge (mm)	Soil Type	SAAR (mm)	Effective Rainfall (mm)	
106	Peat/Cut Peat <30%	1120	800	
	Tills >70%			
Proposed Alterations - Ground Water				
Existing Average Recharge Across GWB	Impermeable Area of Road	Reduction in recharge (max)	Proportional Reduction in recharge to GWB	
96.99 x 10 <sup>3</sup> m <sup>3</sup>	0.148km <sup>2</sup>	15.69 x 10 <sup>3</sup> m <sup>3</sup>	-0.016%*	
Existing Average Recharge Across Polecat ZOC	Reduction in recharge (max) to Polecat ZOC	Proportional Reduction in recharge to Polecat ZOC		
5.54 x 10 <sup>3</sup> m <sup>3</sup>	15.69 x 10 <sup>3</sup> m <sup>3</sup>	-0.28%*		
*Note: this water is being diverted to the Ovaun River; some portion of this water may be returned to the aquifer as portions of the river are losing through karst areas. Additionally the majority of recharge to the Polecat ZOC occurs as point recharge through swallow holes and therefore the reduction shown above is likely not applicable				
Proposed Alterations - Surface Water				
Portion of road drainage draining to sub-basin catchment	Drainage Outfalls	Impermeable Area of Road	Outfall Catchment	
22+950 - 38+975	OUT30.01, 30.02, 24.01, 33.01, 10.225km	0.148km <sup>2</sup>	Owenur_010	
Portion of additional road drainage diverted from adjacent sub-basin catchment		Impermeable Area of Road	Annual Runoff Volume Increase	
Ch. 22+950 - 30+000		0.05705km <sup>2</sup>	45.64 x 10 <sup>3</sup> m <sup>3</sup>	
Ch. 36+100 - 38+975			Additional runoff not infiltrating as groundwater recharge	
			15.69 x 10 <sup>3</sup> m <sup>3</sup>	
		Total Net change in discharge to Sub-basin	Total Net Proportional change in discharge to Sub-basin	
		61.33 x 10 <sup>3</sup> m <sup>3</sup>	+ 0.29%	

