

1st Draft Spiddal GWB Description June .2004

Spiddal GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km ²)
31 Galway County Council	Rivers: An Sruthan Bui, Cashla, Crumlin Invermore, Knock, Lochinch, Owenboliska, Owenboliskey, Owengowla, Recess, Gowlabeg, Invermore, Knock, Knockadoagh, Owenriff, Polleen, Screeb. Lakes: See table 1	Rosroe Bog (000324), Murvey Machair (002129), Galway Bay Complex (000268), Furbogh Wood (001267), Cregduff Lough (001251), Connemara Bog Complex (002034), Dogs Bay (001257) (O'Riain, 2004).	774
Topography	The land surface is characterised by steep slopes and mountainous terrain along the northern boundary and in the southwestern part of the GWB, flattening toward the coastline. Elevations range from 10-420 mAOD. The GWB is bounded on the south by the coastline and to the north by surface water divides and the Precambrian Marbles present on a line from Clifden – Recess – Maam Cross.		
Geology and Aquifers	Aquifer categories	The main aquifer category in this GWB is: PI: Poor aquifer which is generally unproductive except for local zones.	
	Main aquifer lithologies	This GWB is composed primarily (92%) of Granites & other Igneous Intrusive rocks, namely the “Connemara Granite”, which extends from the coastline in the south as far north as a line linking Clifden and Maam Cross. Ordovician Volcanics, Precambrian Quartzites, Gneisses & Schists and Silurian Metasediments and Volcanics occur to a lesser extent and occupy the northern part of the GWB. Table 2 gives a full listing of the rock units.	
	Key structures	Granites are competent rocks that respond to strain by brittle fracturing. The degree of fracturing varies with depth and horizontally. There are almost 1000 mapped faults in the GWB, trending N-S, E-W, NW-SE and NE-SW. The fractures do not become in-filled because the granites have a low clay content. Tension joints, which are common in granites, are only found close to the surface. Regional joints become tight and impermeable at depth. Folding is seen in the northern part of the GWB where the non granitic rocks occur. The fold axes trend E-W; strata dip at right angles to the fold axes, generally at steep angles from 60-80°.	
	Key properties	The rocks are characterised by the absence of an intergranular permeability and the presence of low fissure permeability (Daly, 1985). Yield data are concentrated at the eastern end of the GWB, between Spiddal and Galway. There are three “good” wells in Spiddle which are located in a felsite dyke. A fourth well at Spiddle located in the main granite is a failed well. At Barna there is “poor” yielding well. One “good” well is located at Boleybeg. Transmissivity data available for the granites in the Leinster region is in the order of 20-30 m ² /d. In the vicinity of faults, transmissivity may be higher. Storativity is expected to be low (<0.5%). Resistivity surveys show areas of low resistivity in the vicinity of faults and this was interpreted as due to water in-filled fissures (Daly 1985). The data are inadequate to calculate groundwater gradients, however, are expected to be greater than 0.01.	
	Thickness	Most groundwater flux is likely to be in the uppermost part of the aquifer; comprising a broken and weathered zone typically less than 3 m thick; a zone of interconnected fissuring 10-15 m thick; and a zone of isolated poorly connected fissuring typically less than 150 m.	
Overlying Strata	Lithologies	Blanket Peat (“Connemara Bog”) covers 64% of the area, rock at the surface 23% and till 5.5%. A full list of subsoil types is given in Table 3.	
	Thickness	Subsoil thickness data are sparse. The available data indicate that the thickness are generally less than 3 m. The thickness of peat ranges from 0-6 m (Daly, 1985). Rock at surface is present in 25% of the area.	
	% area aquifer near surface	[Further Information to be added at a later date]	
	Vulnerability	[Further Information to be added at a later date]	
Recharge	Main recharge mechanisms	Diffuse recharge occurs via rainfall percolating through the subsoil and rock outcrops. Due to the low permeability of much of the subsoil (blanket peat) and the aquifers, a high proportion of the available recharge will discharge to the streams. In addition, the steep slopes in the mountainous areas promote surface runoff. Evidence for this is the stream density, which is greater than 1 km/km ² .	
	Est. recharge rates	[Further Information to be added at a later date]	
Discharge	Large springs and large known abstractions (m³/d)	Two ‘Good’ wells with reported yields of 118 m ³ /d and 164 m ³ /d.	
	Main discharge mechanisms	Shallow groundwater is likely to discharge to streams and lakes, but the limited bedrock transmissivity means that the baseflow component of the total streamflow will be low. Small springs and seeps are likely to issue at the stream heads and along their course. Seepages will develop on the coastal cliff faces.	

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Hydrochemical Signature	Very little hydrochemical data are available, but the minerals present in granite are generally acidic, meaning that corrosion and leaching of metals such as iron and manganese may present a problem. Radon and Uranium are associated granitic bodies, and present a risk to water quality. From selected data [n=7] for the granitic rocks across the country that are not overlain by sand/gravel or limestone till: Alkalinities range from 43-135 mg/l (CaCO ₃) with a median of 122 mg/l (CaCO ₃); Total Hardness ranges from 103-201 mg/l with a median 136 mg/l; and, conductivity ranges from 317-462 μ S/cm with a median of 440 μ S/cm.
Groundwater Flow Paths	Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Flow paths are likely to be short – up to 100 m, with groundwater discharging rapidly to nearby streams and small springs. Overall, flow directions follow topography, generally to the south. The available water level data show that the water table is from 0-6 m below ground level.
Groundwater & Surface water interactions	Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low. Lakes comprise approximately 5% of the GWB.

Conceptual model	<ul style="list-style-type: none"> • The GWB is bounded to the west and south by the coast. The northern boundary is defined by the Precambrian Marbles, just south of Recess. The terrain is a mixture of low-lying and hilly areas. • The GWB is composed primarily of low transmissivity rocks. Most of the groundwater flux is in the uppermost part of the aquifer: comprising a broken and weathered zone typically less than 3m thick; a zone of interconnected fissuring typically less than 10m; and a zone of isolated fissuring typically less than 150m. • Recharge is limited by the peat and the low permeability bedrock. Recharge occurs diffusely through the subsoils and rock outcrops. • Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. The water table is from 0-6 m below ground level and follows topography. Flow paths are likely to be short – up to 100 m, with groundwater discharging rapidly to nearby streams and small springs and flow directions are expected to follow topography. Overall flow direction is to the south. • The rock units in GWB are generally of low permeability and baseflow to rivers and streams is likely to be relatively low.
Attachments	Table 1, 2, 3 and Figure 1
Instrumentation	Stream gauges: 31002, 31003, 31004, 31006, 31007, 31020, 31070, 31071, 31074, 31075. EPA Representative Monitoring points: None
Information Sources	Daly, D. (1985) <i>Groundwater in County Galway with particular reference to its Protection from Pollution</i> . Geological Survey of Ireland report for Galway County Council. 98pp. Pracht, M., Lees, A., Leake, B., Feely, M., Long, B., Morris, J., McConnell, B., (2003). <i>A geological description to accompany the Bedrock Geology 1:100,000 Scale Map Series, Sheet 14, Galway Bay</i> . Unpublished Geological Survey of Ireland Map Series Report. Geological Survey of Ireland. Aquifer Chapters: The Granite Aquifer. Unpublished. O’ Riain, G., (2004). <i>Water Dependent Ecosystems and Subtypes Draft Report</i> . WFD Support Projects. Compass Informatics in association with National Wildlife and Parks Service (DEHLG).
Disclaimer	Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae.

Table 1. List of lakes within GWB

List of lakes				
Aillebrack Lough	Loch na bhFaoilean	Lough Bola	Lough Nahillion	Loughyvangan
An Loch Dubh	Loch na bhFroachlai	Lough Bollard	Lough Nahoga	Manninmore Lough
An Loch Fadda	Loch na bhFreangcach	Lough Bonramush	Lough Nahoulartia	Maumeen Lough
An Loch Fhada	Loch na Cloiche Baine	Lough Bunnahask	Lough Nakee	Maumeenmaunragh Lough
Athry Lough	Loch na Craoibhe	Lough Callanatrush	Lough Nalawney	Mering Lough
Barrowen Lough	Loch na Creibhinne	Lough Cam	Lough Naleehoogan	Mill Lough
Beagha Lough	Loch na dTamnach	Lough Canagun	Lough Namanawaun	Muckanagh Lough
Beaghgiveren Lough	Loch na Faiche	Lough Carrafinla	Lough Namanoga	Needham's Lough
Big Island	Loch na gCaor	Lough Carrick	Lough Nambrackkeagh	Polladoory Loughs
Black Lough South	Loch na gCreagan	Lough Chaladh an Cnoic	Lough Nambracklauder	Rusroe Lough
Black Loughs	Loch na hAbhann Bige	Lough Chnocan	Lough Nambrackmore	Saineaghmore Lough
Black Pool	Loch na hAille	Lough Chriathraigh	Lough Nambroughania	Saints Lough
Bolisca Lough	Loch na Liathroide	Lough Cloonadoon	Lough Namoon	Seecon Lough
Bunnacliffa Lough	Loch na mBantracha	Lough Clurra	Lough Nanaghin	Shallow Lough
Cahereeshal Lough	Loch na mBreac Caoch	Lough Collantrave	Lough Nanaugh	Shanavara Lough
Clogheratinny Lough	Loch na Meacan	Lough Cong	Lough Naneever/ Saints Lough	Shannawona Lough
Clogherkinnalougha	Loch na nArd-doiriu	Lough Corraundahy	Lough Nasaun	Struffaconneelagh
Cloghernagun Lough	Loch na nEan	Lough Creggaun	Lough Nasheooge	Tawnaghbaun Lough
Coolhanigra Lough	Loch na nOilean	Lough Crockaillenalee South	Lough Nasilloge	Toombeola Lough South
Creenaghmore Lough	Loch na Scirin	Lough Curreel	Lough Naskeha	Truska Lough
Cregduff Lough	Loch na Tulai Bui	Lough Cuskeamatiny	Lough Natawneighter	Tullaghalaher Lough
Crockaillenalee	Loch Nuala	Lough Derracross North	Lough natawnymore	Tullagharone Lough
Deer Island	Loch Pheadai	Lough Derreen	Lough Natoran	Tully Lough
Doon Lough	Loch Ros an Mhil	Lough Derreenanearla	Lough Natully	Tullynaman Lough
Drum Lough West	Loch Sheanadh Dolachain	Lough Derrynaboha	Lough Navreaghoge	Uggool Lough
Eagles Lough	Loch Shliabh	Lough Dohola	Lough Naweelan	White Lough
Feaghroe Lough	Loch Tanai	Lough Down	Lough Oughter	Whitehillcock Lough
Glenaruidmore Lough	Loch Troscan	Lough Drama	Lough Oughteraglanna	Wood Lough
Glenicmurrin Lough	Loch Uachtair	Lough Duff	Lough Oughterpastia	Lough Nahavnygarriva
Glennaun Lough	Loch Ui Chadhan	Lough Ederaucruck	Lough Owran	Loughyvaneen
Glenturkan Lough	Loch an Ghleanna Mhoir	Lough Emilagh	Lough Pibrum	
Holy Island	Lough Acaringe	Lough Enoer	Lough Poll	
Illauunaskeagh	Lough Achuss	Lough Fadda	Lough Rana	
Inverbeg Lough	Lough Aclagher	Lough Faddacrussan	Lough Rannaghaun	
Invermore Lough	Lough Aconeera	Lough Faddanagrav	Lough Sallagh	
Is Inland	Lough Adav	Lough Fermoye	Lough Sallaghaclogher	
Kane's Lough	Lough Adereen	Lough Fiddaunnavreaghlee	Lough Scalpdonnell	
Keeraunduff Lough	Lough Aderreen	Lough Glenn	Lough Scannive	
Knockafee Lough	Lough Adoorau	Lough Hagauwoo	Lough Seanadh Mhac Donail	
Knockalough	Lough Agaddy	Lough Inch	Lough Shannawinnia	
L. Chnos an Champa	Lough Agay	Lough Invernagleragh	Lough Sheedagh	
L. Beg	Lough Aghara	Lough Kankoge	Lough Shemus	
L.Thulaigh	Lough Agilky	Lough Keamnacally	Lough Skannive	
Lewtershask Lough	Lough Aglanna	Lough Keeraun	Lough Termiska	
Loch an Bhric Mhoir	Lough Aheeran	Lough Killauncrom	Lough Truska	
Loch an Chaolaigh	Lough Aill an Duillir	Lough Knockaunawaddy	Lough Truskeena	
Loch an Chaorain	Lough Ailtarra	Lough Lawna	Lough Uggabeg	
Loch an Chriathraigh	Lough Aknockaunglass	Lough Lerin	Lough Uggamore	
Loch an Damba	Lough Aleckin	Lough Minnaun	Lough Wheelaun	
Loch an Doirin	Lough Aliggan	Lough Mongaun	Loughanillaun	
Loch an Iolra	Lough Aluggaun	Lough More	Loughanillaunmore	
Loch an Mhianaigh	Lough Alurgan	Lough na bhFaoilean	Loughaunalyer	
Loch an Oileainin	Lough an Ghiolcaigh	Lough na bhFaoilean Bheag	Loughaunanillaun	
Loch an Phuca	Lough Anaserd	Lough na Calgai	Loughaunanny	
Loch an Roisin	Lough Anillaunlughy	Lough na Circe Fraoigh	Loughaunayella	
Loch an Sainneach	Lough Aphastia	Lough na mBrobhach	Loughaunbeg	
Loch an tSeanbhaile	Lough Apheebera	Lough na Meannan	Loughauneala	
Loch an tSeangharrai	Lough Aroolagh	Lough Naboreeny	Loughauneeghaun	
Loch an tSruthain Dherg	Lough Arusheen	Lough Nabrocky	Loughaunemlagh	
Loch Aughaghadaí	Lough Astickeen	Lough Nabrough	Loughaunemlagheask	
Loch Barr anGhiobin	Lough Atawny	Lough Nabroughdoo	Loughaunfree	
Loch Beag	Lough Ateesky	Lough Nabrucka	Loughaunieran	
Loch Bharr an Sruthain	Lough Ateriff	Lough Nacalaga	Loughaunierin	
Loch Chaladh an Chnoic	Lough Atooreen	Lough Naclogh	Loughaunletry	
Loch Charraig	Lough Atrista	Lough Nacorrossaunbeg	Loughaunnacrossy	
Loch Chiochar Bo Bairtimeid	Lough Aturtaun	Lough Nacreeva	Loughaunnagun	
Loch Chloichrigh	Lough Aughawoolia	Lough Nacrogy	Loughaunnashingaun	
Loch Chnoc na Brocai	Lough Avally	Lough Nadullagh	Loughaunoocary	
Loch Chroc na Luachra	Lough Awaddra	Lough Nafurnace	Loughaunore	
Loch Cluais Ghorria	Lough Barrcostello	Lough Nagappul	Loughaunultera	
Loch Dhuleitir	Lough Barnahask	Lough Nagarrivhan	Loughaunweeny	
Loch Dhuleitir Beg	Lough Bealacooan	Lough Nagraigue	Loughaunwillan	
Loch Doire an Fheich	Lough Bealanambrack	Lough Nagravin	Loughawee	
Loch Fhada	Lough Beg	Lough Nagrove	Loughbeg	

Table 2. Rock units in the GWB

Unit name	Code	Description	Rock Unit	% Area
Callowfinish Granite	GaCf	Monzogranite, small megacrysts	Granites & other Igneous Intrusive rocks	4.9%
Carna Granite	GaCn	Granodiorite; grey	Granites & other Igneous Intrusive rocks	1.2%
Carna-type	GaCn	Granodiorite; grey	Granites & other Igneous Intrusive rocks	0.7%
Cloghmore Granodiorite	GaCl	Hornblende granodiorite, medium - coarse	Granites & other Igneous Intrusive rocks	0.4%
Costello Murvey Granite	GaCt	Med-coarse leucocratic syenogranite	Granites & other Igneous Intrusive rocks	2.4%
Cuilleen Granite	GaCu	Monzogranite; pink	Granites & other Igneous Intrusive rocks	0.2%
Cuilleen-type	GaCu	Monzogranite; pink	Granites & other Igneous Intrusive rocks	0.4%
Dolerite and Gabbro	D	Dolerite & gabbro, commonly silica poor	Granites & other Igneous Intrusive rocks	0.0%
Errisbeg Townland Granite	GaEb	Megacrystic pink/grey monzogranite	Granites & other Igneous Intrusive rocks	17.2%
Fine-grained foliated granite	Gf		Granites & other Igneous Intrusive rocks	0.0%
Granodiorite and diorite	Gd		Granites & other Igneous Intrusive rocks	0.2%
Knock Granite	GaKk	Pinkish medium to coarse grained granite	Granites & other Igneous Intrusive rocks	2.1%
Lough Fadda Granodiorite	GaFd	Hornblende granodiorite, medium grained	Granites & other Igneous Intrusive rocks	0.1%
Lough Lurgan Granite	GaLl	Pink-grey leucocratic granite	Granites & other Igneous Intrusive rocks	1.6%
Magma Mixing-Mingling Zone	GaBz	Complex zone with dioritic enclaves	Granites & other Igneous Intrusive rocks	4.5%
Marginal Porphyritic Granite	GaMm	Monzogranite, mafic, foliated	Granites & other Igneous Intrusive rocks	0.8%
Metagabbro & orthogneiss suite	Om	Undifferentiated	Granites & other Igneous Intrusive rocks	0.1%
Metagabbro and Related Lithologies	Mg	Hornblende metagabbros & metanorites	Granites & other Igneous Intrusive rocks	9.2%
Murvey Granite	GaMu	Non-porphyritic syenogranite; pink	Granites & other Igneous Intrusive rocks	2.8%
Oughterard Granite	OuGr	Medium/coarse non-porphyritic granite	Granites & other Igneous Intrusive rocks	0.0%
Porphyritic-Megacrystic Granite	GaMp	Monzogranite, mafic, megacrystic	Granites & other Igneous Intrusive rocks	24.7%
Quartz Diorite Gneiss	Qd	Quartz diorite orthogneiss	Granites & other Igneous Intrusive rocks	6.9%
Quartz Diorite Gneiss & Granitic Gneiss	Qg	Quartz diorite & granitic orthogneisses	Granites & other Igneous Intrusive rocks	1.2%
Quartz porphyry and Felsite	P		Granites & other Igneous Intrusive rocks	0.0%
Roundstone Granite	RoGr	Coarse non-porphyritic monzogranite	Granites & other Igneous Intrusive rocks	2.5%
Shannapheasteen Granite	GaSs	Aphyric fine grained granite	Granites & other Igneous Intrusive rocks	7.3%
Delaney Dome Meta-rhyolite Formation	DF	Mylonitized acid igneous rocks	Ordovician Volcanics	0.4%
Lakes Marble Formation	LM	Marbles, metavolcanics, schists, grits	Precambrian Marbles	0.0%
Ballyconneely Amphibolite	BaAm	Mylonitized metagabbro & related rocks	Precambrian Quartzites, Gneisses & Schists	1.1%
Cashel Schist Formation	CL	Paragneiss, migmatite, pebble beds	Precambrian Quartzites, Gneisses & Schists	3.9%
Lough Nacorussaun Metabasites	LnMb	Amphibolite, sometimes mylonitic	Precambrian Quartzites, Gneisses & Schists	0.1%
Metadolerite	Md	Intrusive metadolerite, often schistose	Precambrian Quartzites, Gneisses & Schists	0.0%
Mixed highly metamorphosed sediments	Pg	Mixed highly metamorphosed sediments	Precambrian Quartzites, Gneisses & Schists	2.5%
Paragneiss, Migmatite and Hornfels	Pg	Mixed highly metamorphosed sediments	Precambrian Quartzites, Gneisses & Schists	0.4%
Streamstown Schist Formation	ST	Psammitic pelitic & semi-pelitic schists	Precambrian Quartzites, Gneisses & Schists	0.0%

Table 3. Subsoils in the GWB.

Parent Material	Code	%Area
Alluvium	A	0.05%
Blanket Peat	BkPt	0.01%
Blanket Peat	BktPt	64.15%
Cutover Peat	Cut	0.03%
Lake	Lake	4.79%
Lake islands	Lk isle	0.09%
Made ground	Made	0.81%
Raised Beach Sand	Mbs	0.03%
Rock at surface	Rck	22.50%
Granitic Till	TGr	5.20%
Metamorphic Till	TMp	0.42%
Aeolian Sand	Ws	0.17%
Nodata	nodata	1.77%

Figure 1. Location and boundaries of Spiddal GWB

