ENVIRONMENT AGENCY
OF ICELAND

Water Framework Directive (2000/60/EC)

Article 5 (and 6), Summary Report

Characteristics and impact analyses

Environment Agency of Iceland

Creator: Environment Agency of Iceland

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TABLE OF CONTENTS

1. INTRODUCTION

1.1 Legal status

An act to implement the Water framework Directive was passed by the Icelandic parliament, Althingi, on April 15, 2011 (Lög nr. 36 / 2011 um stjórn vatnamála (http://www.althingi.is/lagas/nuna/2011036.html). The act states:

- In Iceland there is one River Basin District (RBD)
- There will be one River Basin Management Plan (RBMP)
- The Prime Competent Authority is The Environment Agency
- The main responsible body is a Water Council consisting of five members. Three nominated by Ministries and two by Municipalities
- There are four Regional Water District Committees;
- There are two Advisory Committees, one consisting of Stakeholders/users of water/NGOs and the other of State Agencies/Directorates/Environmental and Public Health Offices.
- Authorisation, supervision and enforcement provisions (Articles 21, 22 and 28) are implemented under existing environmental legislation and the role of the relevant authorities.
- (See: theMinistry for the Environment and natural resources report to ESA. Ref. UMH10050039, June 30, 2010)

Information on the RBD with statistics and Competent Authorities have been reported (http://cdr.eionet.europa.eu/is/eu/wfdart3) and resubmitted with corrections to ESA.

The ministry for the Environment have issued the following regulations for the implementation of the Water act:

(Reglugerð nr. 935/2011 um stjórn vatnamála
http://www.reglugerd.is/interpro/dkm/WebGuard.nsf/aa0d47377abc977400256a090053ff91/4b694ab605de532a0025792d003d9de5?OpenDocument&Highlight=0,sk%25C3%25B3gr%25C3%25A6kt)

(Reglugerð 535/2011 um flokkun vatnshlota, eiginleika þeirra, álagsgreiningu og vöktun
http://www.reglugerd.is/interpro/dkm/WebGuard.nsf/aa0d47377abc977400256a090053ff91/69903ff31187e92d002578a7003ff16a?OpenDocument&Highlight=0,535%2F2011)

1.2 National timetable until 2018

The implementation timetable for Iceland is delayed for nine years compared to EU member countries.

Regard is to be given to the Joint Statement attached to the Decision of the EEA Joint Committee No 125/2007.

Table 1.1 Water Framework Directive implementation timetable.

Year	Requirement
2009	
2011	*The Directive transposed into national law*
2012	*Identify river basin districts (RBDs) and Competent Authorities*
2013	*Characterisation and assessment of impacts on the RBD* • Economic analysis of water use • Establish a register of protected areas
2014	Establish criteria for: • assessment of good groundwater chemical status; and • identification of significant upward trends and starting points for trend reversal
2015	Establish water monitoring programmes • Publish a timetable and work programme for producing the first River Basin Management Plan (RBMPs) including consultation measures • Establish environmental quality standards for priority substances and controls on principal sources
2016	Publish, for consultation, interim overview of the significant water management issues
2017	Publish draft RBMP for consultation
2018	Publish first RBMP to include: • Environmental objectives • Programme of measures • Monitoring networks • Register of protected areas • - Heavily modified and artificial water designations

1.3 Characteristics and assessment of the River Basin District

The first round of characterisation and analysis according to Article 5 have been done (see Jóhanna Björk Weisshappel (ed), 2013).

The structure of this report is split into reporting tasks (Table of Contents) according to the WFD implementation guidelines.

National Overview

Geography

Iceland is an island lying between Greenland and Europe astride the Mid Atlantic Ridge. It is relatively isolated, as the shortest distances to the European continent are 970 km to Norway and 798 km to Scotland (Figure 1.1).

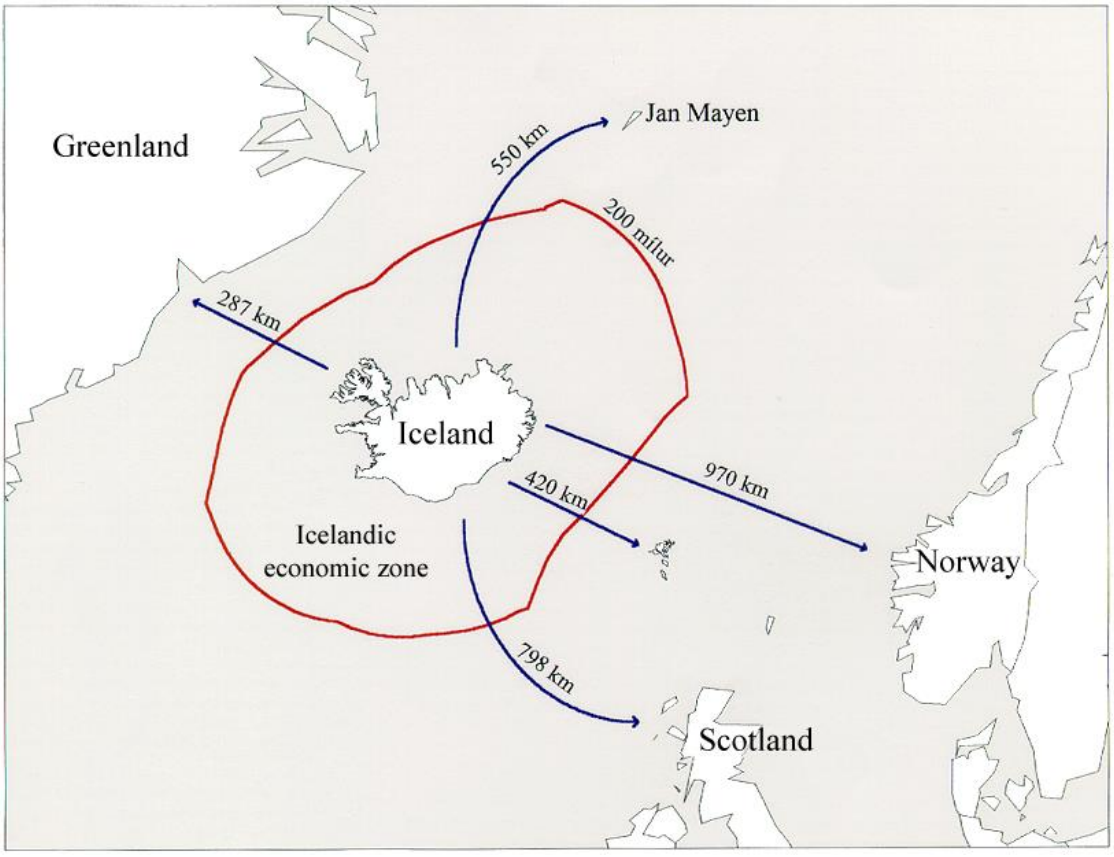

Figure 1.1 Distances between Iceland and other countries

Iceland is the second-largest island in Europe and the third largest in the Atlantic Ocean and its northernmost part is just south of the Arctic circle. It covers an area of approximately 103,000 km². The continental shelf up to a depth of 200 m is approximately 115,000 km², and the exclusive economic zone (EEZ) is approximately 758,000 km². This zone also constitutes Iceland's jurisdiction as regards pollution control. Land area below 200 m is 24 % and more than half the land area lies above 400 m above seas level. A vast part of Iceland is thus unpopulated central highlands. Almost 88 % of the total area is natural and semi- natural: heath lands 35 %, bare rocks 2 %, sparsely vegetated areas 13 % and glaciers just over 10 %.

Agricultural areas cover 2.4% of the country and of that 97 % is classified as pastures, the remainder being very small patches of non-irrigated arable land and land under complex cultivation patterns.

Climate

The climate of Iceland is maritime with cool summers and mild winters. The temperature decreases and becomes more arctic towards the interior, partly because of an increase in altitude and partly because temperature in winter decreases further from the shore. A large part of precipitation falls when wind is blowing from east to south. Accordingly, the highest precipitation is found in the south-eastern parts, with estimated maximum annual values of more than 4 000 mm on glaciers. In southwest and west Iceland the yearly precipitation is 1 000-1 600 mm in the lowlands at the coast, but only 700-1000 mm further inland. The precipitation is lowest in northern and north eastern districts being 400-600 mm in the lowland areas and less than 400 mm north of the glacier Vatnajökull.

Sea currents

The main currents are the Irminger, a branch of the Gulf Stream, which has a temperature of 6-8 °C and a flow of 2 million m^3/sec, and the East Greenland, originating in the Arctic, with a temperature of 0 °C and a flow of one to two million m^3/sec (Figure 1.2). On the continental shelf, a coastal current is created by the mixing of the ocean currents with fresh water from the land, that flows clockwise around the country at a rate of about one million m^3/sec. Average runoff from Iceland is estimated as approach. 5 000 m^3/sec. The magnitude of the coastal current is 180 times greater than the runoff from land.

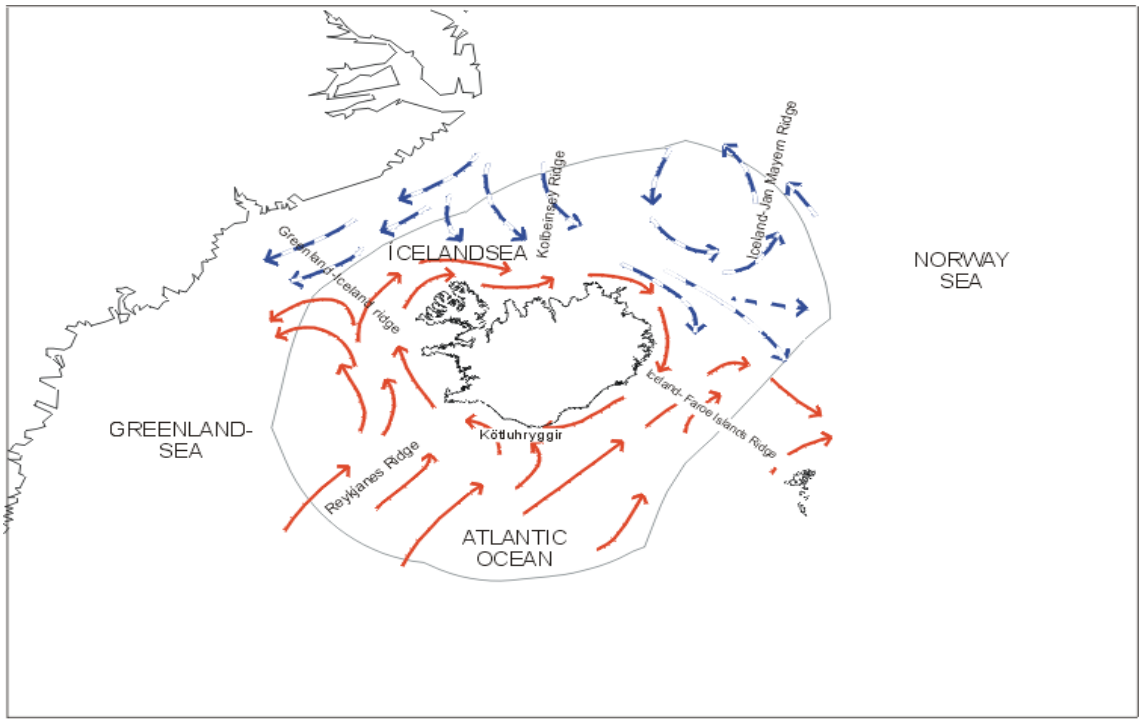

Figure 1.2 Sea currents around Iceland. Unbroken lines denote warm currents; broken lines denote cold currents.

Geology

Iceland is a volcanic island predominantly formed of basaltic rock of Quaternary and Tertiary Ages. The oldest basalt rocks – up to 16 million years old – are found in west-northwest and east-southeast Iceland. The neo-volcanic area is confined to an axial zone that runs through the country. Postglacial lava flows cover about 10 % of Iceland and the historical flows account for around one sixth of the lava. Between 30 and 40 volcanoes have erupted during historical times in Iceland and in recent centuries an eruption has started on average every fifth year. Iceland is very rich in natural heat – thermal areas are divided into two classes on the basis of the maximum subsurface temperature of the thermal water. Low themperature areas have temperatures below 150 °C at 1.000 m depth, while in high-temperature areas the temperature from the surface down to 1000 m is above 200 °C. Earthquakes are frequent in Iceland – ones larger than 6 on the Richter scale struck in the southern lowlands in both 2000 and 2008.

Population

The population of Iceland is 321 857 (1 January, 2013), consequently Iceland is sparsely populated with only about 3 inh./km^2. Approximately 90 % of the population lives on the coast and less than 1 000 live above 200 m. Icelanders base their economy largely on the utilisation of marine resources, industry and tourism. The most densely populated area in Iceland is the southwest corner, with around 70 % of the population living in the Reykjavík region at Faxaflói Bay. A large part of Iceland's industry is also located in this area.

2. RIVER BASIN DISTRICT

In Iceland there is one River Basin District (RBD), IS1. There will be one River Basin Management Plan and the prime Competent Authority is Environment Agency of Iceland. Other contextual data relating to the river basin district (Figure 2.1):

- Surface area of the RBD: 141.162 km^2
- Surface area of Iceland: 103.000 km^2
- Surface area of coastal area assigned to the RBD: 38.162 km^2
- Coastline: 6.090 km

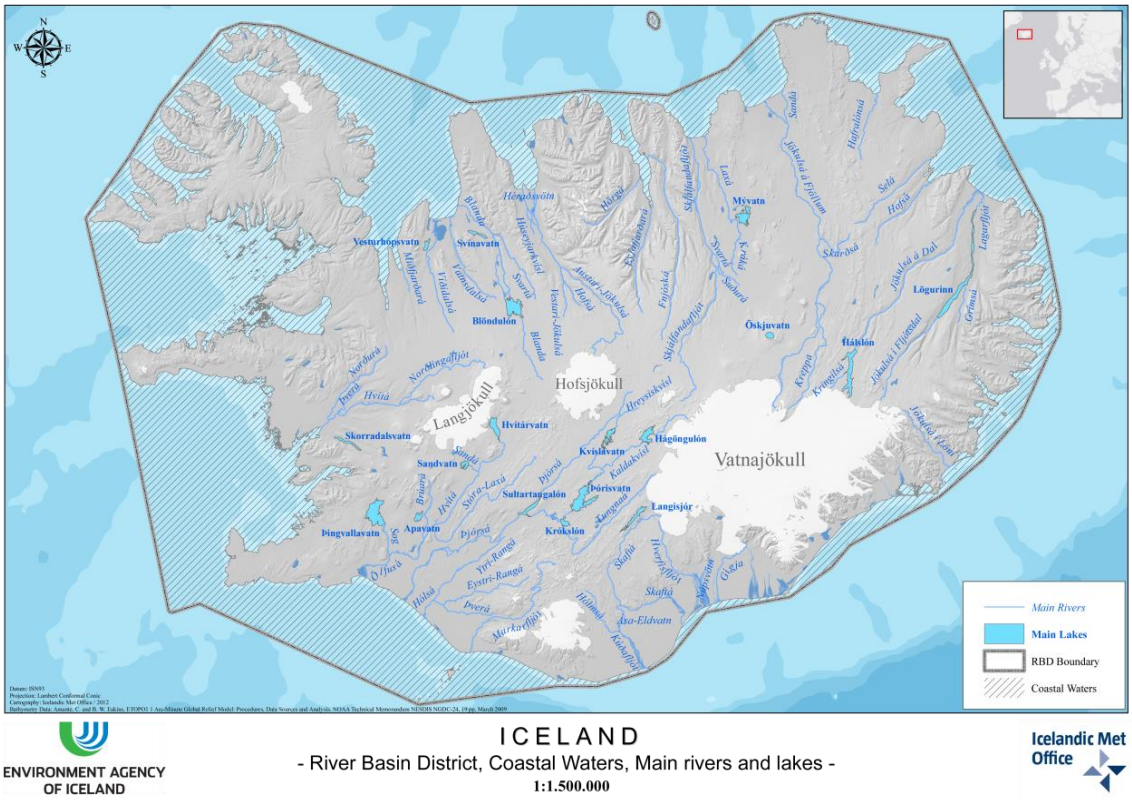

Figure 2.1 River Basin District, coastal water, main rivers and lakes. Digital data and statistics provided by Icelandic Meteorological Office (http://www.vedur.is)/Bogi Brynjar Björnsson (bbb@vedur.is).

3. SURFACE WATERS: TYPOLOGY, WATER BODIES AND REFERENCE CONDITIONS

Coding methodology

The Icelandic Meteorological Office handles a GIS water system database which contains the National Identification Numbers for lakes-, rivers-, groundwater-, transitional- and coastal waterbodies as well as relevant information (Bogi B. Björnsson et al. 2012). The two first characters of the waterbody coding, identify the country (IS) in accordance with ISO 3166 codes. The next three characters identify regional subdivisions of the country (001 to 004). The sixth character is a dash, followed by the waterbody ID within the region (the number of characters varies depending on number of waterbodies within the region), then a dash again and the last character characterizes the waterbody (L, R, G, T or C). As an example Lake Thingvallavatn WB has the code: IS004-2232-L.

Rivers and lakes

The topography and water characteristics in Iceland are modified by the geology. The oldest parts of Iceland are more than 16 million years old and bedrocks in other areas are more recent. In areas with bedrocks older than ca. 0,8 million years there are generally low permeability of water while areas with young rocks have high permeability. In the most recent and geologically active areas the precipitation percolates down into the ground creating large groundwater reservoirs and spring fed waters where the ground water surfaces. Glacial rivers are rivers fed by snow and ice melting. Their characteristics are among others low temperature, high transport of solids and high variation in flow. Rivers are modified by glacial effects to a different degree. Lakes, wetlands and vegetation cover are other descriptors with strong effects on water and water biology. Iceland is designated as a singular Ecoregion (Ecoregion 19, Annex XI) with regard to rivers and lakes.

3.1 Typology

System B was chosen for the typology of the rivers and lakes. The descriptors for System A were used, but descriptors for altitude, geology and depth were adapted to make a typology more suitable for Iceland. National altitude typology „High“ ≥600 m asl is used, because the accepted nominated line for vegetation cover is at 600 m and „Low“ <600 m asl. The siliceous geology types in Iceland are divided into „Younger age of bedrock“; <0,8 million, and „Older bedrock“ ≥0,8 million years old. Glacial descriptors are used to distinguish between „High glacial coverage” with glaciers covering ≥15% of catchment area and „Low glacial coverage” with glaciers covering <15% of catchment area. Lake and wetland coverage descriptors are used to divid between „Strong influence“ with lake and wetland ≥12% of the catchment area and „Weak influence“ with lake and wetland <12% of the catchment area. Only two depth descriptors for lakes are used; „Deep“ ≥3 m mean depth and „Shallow“ <3 m mean depth.

River waters typology; Altitude: High / Low, Bedrock: Younger / Older, Glacier coverage: High / Low and Wetland coverage: Strong / Weak influence(table 3.1).

Table 3.1. Types and descriptive factors for river WB**.**

WB types (Type codes)	Altitude Height over sea level	Glacial Influence	Age of rock (geology)	Lakes and wetlands (Influence)
RIL111	Low	Low	Younger	Weak
RIL112	Low	Low	Younger	Strong
RIL121	Low	Low	Older	Weak
RIL122	Low	Low	Older	Strong
RIH111	High	Low	Younger	Weak
RIH112	High	Low	Younger	Strong
RIH121	High	Low	Older	Weak
RIH122	High	Low	Older	Strong
Glacial	High/Low	High	Younger/Older	Strong/Weak
Explanations		**Low:** < 15% of catchment **High**: ≥15% of catchment	**Younger**: <0,8 mill. years **Older**: ≥0,8 mill. years	**Weak**: Lakes and wetlands < 12% of catchment **Strong**: Lakes and wetlands ≥12% of catchment

Lake waters typology; Altitude: High / Low, Bedrock: Younger / Older, Glacial coverage: High / Low and Mean depthepth: Deep / Shallow (Table 3.2).

Table 3.2. Types and descriptive factors for lake WB**.**

WB types (Type codes)	Altitude Height over sea level	Glacial Influence	Age of rock (geology)	Depth (mean)
LIL211	Low	Low	Younger	Shallow
LIL212	Low	Low	Younger	Deep
LIL221	Low	Low	Older	Shallow
LIL222	Low	Low	Older	Deep
LIH211	High	Low	Younger	Shallow
LIH212	High	Low	Younger	Deep
LIH221	High	Low	Older	Shallow
LIH122	High	Low	Older	Deep
Glacial	High/Low	High	Younger/Older	Strong/Weak
Explanations		**Low:** < 15% of catchment **High**: ≥15% of catchment	**Younger**: <0,8 mill. years **Older**: ≥0,8 mill. years	**Shallow**: Mean depth <3 m **Deep**: Mean depth ≥3 m.

Reference: Gerður Stefánsdóttir & Halla Margrét Jóhannesdóttir, eds. 2013.

Transitional waters typology. The transitional waters in Iceland are located within Ecoregion 1 (Atlantic Ocean). System B has been chosen for the typology of coastal waters. System B requires that the obligatory factors, latitude, longitude, tidal range and salinity, be used. The typology for transitional waters is not yet available but under preparation. A time frame of eight months is expected.

Coastal waters typology. According to the WFD, coastal waters in Iceland are located within Ecoregion 1 (Atlantic Ocean). System B was chosen for the typology of coastal waters. System B requires that the obligatory factors, latitude, longitude, tidal range and salinity, be used. In addition temperature and wave exposure are used as descriptive factors (The prevailing temperature is used to distinguish between two ecozones). For the obligatory factors, salinity is always euhaline (>30‰) and average tidal range is in all accounts 1- 5 m. Wave action (fetch) was used to divide into „sheltered“: 1, and „open“: 2 types, and expert judgement was used in mapping the coastline in respect to these descriptive factors. The main currents around Iceland are the Irminger current, a branch of the Gulf Stream, which has an average winter temperature of 4-7°C, and the East Greenland current, originating in the Arctic, having an average winter temperature of 1-4°C. In coastal waters within these different water types are different species compositions and therefore the temperature as an descriptive factor was divided into „coastal water 1“ (1-4°C) and “coastal water 2” (of 4-7°C).

Table 3.3 Types and descriptive factors for Coastal WB**.**

WB types (Type codes)	**Salinity**	**Tidal range**	**Winter temperature °C**	**Wave action**
CN1352	>30‰	1-5 m	1-4	Sheltered
CN1152	>30‰	1-5 m	1-4	Open
CS2352	>30‰	1-5 m	4-7	Sheltered
CS2152	>30‰	1-5 m	4-7	Open
Explanations			**1-4: 1** **4-7: 2**	**Sheltered: - 1** **Open: - 2**

Reference: Agnes Eydal, Sólveig Rósa Ólafsdóttir, Karl Gunnarsson og Héðinn Valdimarsson, 2013.

Types and geographical distribution of types of designated surface water bodies are shown in figure 3.1.

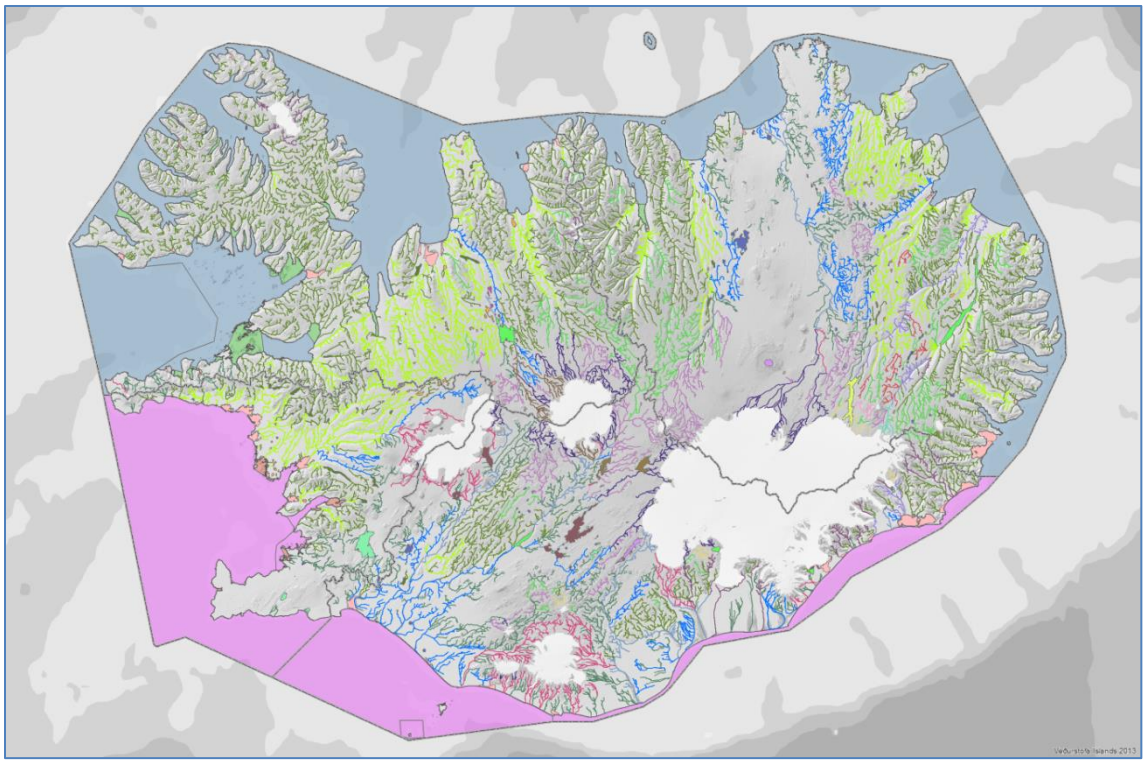

Figure 3.1 Types and geographical distribution of types of designated Surface Water Bodies within the River Basin District

3.2 Identification of surface water bodies

River Water Bodies

Table 3.4 shows number and length of designated River Water Bodies within each type using national designation for minimum size (see map of designated Surface Water Bodies in figure 3.2):

Minimum river water body catchment is 10 km^2. Exceptions to these criteria are rivers under significant pressure ("at risk"), rivers that are part of urban green areas, rivers used for recreational purposes and rivers under research programmes or monitoring. Other small rivers and tributaries are delegated to adjacent main RB (Bogi B. Björnsson, Kristinn Einarsson og Linda Georgsdóttir, 2013).

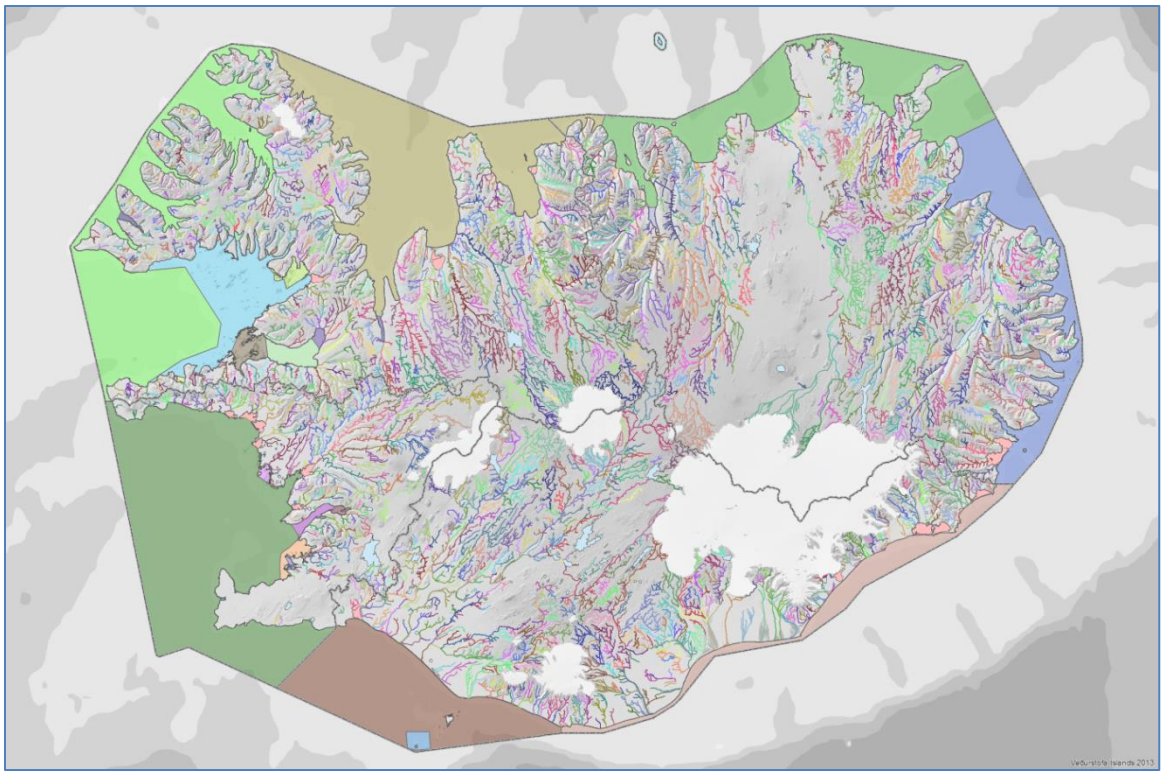

Figure 3.2 map showing all designated Surface Water Bodies within the River Basin District.

Table 3.4 Number and length of designated River Water Bodies within each type.

River WB type codes	Number of Water Bodies	Total lenght of Water Bodies km (for rivers)	Tota surface area within the RBD km^2 (for lakes)
RIL111	323	5100,0	N/A
RIL112	95	3659,5	N/A
RIL121	934	15428,7	N/A
RIL122	189	7411,0	N/A
RIH111	54	2231,5	N/A
RIH112	4	53,4	N/A
RIH121	91	2570,8	N/A
RIH122	8	252,1	N/A
Glacial*	168*	5973,9*	N/A
Total:	**1866**	**42681,1**	**N/A**

*Glacial consists of typecodes RIL2xx and RIH2xx river water bodies.

Lake Water Bodies

National designation criteria for minimum size: Minimum lake water body is 0,5 km^2. Exceptions to this criteria are lakes under significant pressure ("At risk"), lakes that are part of urban green areas, lakes used for recreational purposes and lakes under research programmes or monitoring. Other small lakes and ponds are delegated to adjacent RB (Bogi B. Björnsson, Kristinn Einarsson og Linda Georgsdóttir, 2013).

Table 3.5 Number and cumulative size of designated Lake Water Bodies within each type

Lake WB type codes	Number of Water Bodies	Total lenght of Water Bodies km (for rivers)	Tota surface area within the RBD km^2 (for lakes)
LIL211	50	N/A	113,5
LIL212	48	N/A	167,3
LIL221	109	N/A	116,2
LIL222	80	N/A	162,9
LIH211	9	N/A	12,6
LIH212	12	N/A	49,0
LIH221	21	N/A	20,9
LIH222	6	N/A	8,0
Glacial*	51*	N/A	489,5*
Total:	**386**	**N/A**	**1139,9**

*Glacial consists of type codes LIL1xx and LIH1xx lake water bodies.

Table 3.6 Total number of lakes within each size category, designated lake WBs and number of lake WBs within each size category that are part of a larger lake WB.

Lake size Criteria	Number of Lakes	Number of designated Lake Water Bodies	Number of Lake WBs that are part of larger lake WB within the RBD
<0,5 km^{2*}	8	8	0
0,5-100 km^2	378	378	0
>100	0	0	0
Total:	**386**	**386**	**0**

*This size category is not officially part of the size descriptor in Iceland.

Coastal Water Bodies

Table 3.7 Number and length of coastline of designated Coastal Water Bodies within each type

Coastal WB type codes	Number of Water Bodies	Total lenght of Water Bodies Coastline km	Tota surface area within the RBD km^2
Coastal 1-1 (CN1152)	10	4812,7	21911,6
Coastal 1-2 (CN1352)	28	1039,5	661,2
Coastal 2-1 (CS2152)	6	1805,5	15832,6
Coastal 2-2 (CS2352)	7	227,7	102,3
Total:	**51**	7885,4	38507,7**

**Total area for coastal areas slightly more than reported in chapter 2 due to inaccuracies of area estimates.

Transitional Water Bodies

Transitional Water Bodies are under preparation. Waterbodies have been assigned, but the typology is not yet available. Time frame of eight months is expected.

National designation minimum criteria: Minimum transitional water body is 0,5 km^2. The lines between transitional and coastal WBs are, as it is possible, based on clear geographical structures. The lines between fresh water WBs and transitional WBs are (in general) drawn as they are presented in the geographical database IS 50V (Agnes Eydal, Sólveig Rósa Ólafsdóttir, Karl Gunnarsson og Héðinn Valdimarsson, 2013, Bogi B. Björnsson, Kristinn Einarsson og Linda Georgsdóttir, 2013).

Artificial and Heavily Modified Water Bodies

Provisional Identification

Preparation for the identification and designation of HMWB and AWB is ongoing. Guidelines and criteria are being developed to identify candidate waterbodies for HMWB and AWB. In the preparation work is e.g. based on Guidance document n. 4 and the result of the TAIEX expert mission on HMWB and AWB in Iceland 2012. The emphasis is on the main hydromorphological pressures in Iceland, related to harbours, landfills, flood defences, hydropower plants, reservoirs, road structures and bridges. Classification system of ecological status of waterbodies is in preparation as one of the project included in the first cycle of the implementation of the water framework directive. Ecological status classification is the prerequisite for the final designation of HMWB and AWB.

3.3 Reference conditions, maximum ecological potential and reference network

In Guidance document no 10, Section 3, Figure 5 is a flow-chart of suggested step-by-step approach for establishing reference conditions and boundaries between high, good and moderate ecological status classes. Of the steps suggested, database of water bodies is available, water body types are differentiated and screening of pressure has been made (Jóhanna Björk Weisshappel (ed), 2013). According to Guidance document 10, Section 3.4, the use of pressure criteria could be most cost-effective and convenient in order to avoid circularity. Water bodies at risk, possible at risk and not at risk are identified (however, not yet for HMWB and AWB). The next step is to identify potential reference sites. As limited ecological monitoring data is available, status class boundaries may not be established for all quality elements until Article 8 monitoring programmes have been operational for sufficient period of time. Expert judgment may be necessary. Regard is to be given to the Joint Statement attached to the Decision of the EEA Joint Committee No 125/2007. Water Bodies types having water bodies “at risk”, “possible at risk” or with “significant pressure” will most likely have priority when monitoring sites for operational monitoring will be selected.

Iceland is designated as Ecoregion for its self (Ecoregion 19, Annex XI) as regards to rivers and lakes. As no other country shares this ecoregion, an international intercalibration exercise is not mandatory. Owing to limited monitoring data and possibly no Costal Water Bodies at risk, Iceland is not ready to participate in an intercalibration exercise.

4. IDENTIFICATION/DELINEATION OF GROUNDWATER BODIES

4.1 Water bodies and characteristics

(Bogi B. Björnsson, Kristinn Einarsson og Linda Georgsdóttir, 2013).

Following general charcteristics of overlaying strata were used for initial identification of groundwater bodies:

A. Insignificant aquifers: limited groundwater. Basic, acid and intermediate effusives of Quartery and Tertiary age, mineralized and slightly altered.
B. Insignificant aquifers: local and limited groundwater but deeper and more productive aquifers not excluded. Moraines and valley fillings.
C. Fissured aquifers: moderately productive. Fresh basic, fresh acid and intermediate effusives of Quartery and Tertiary age.
D. Fissured aquifers: extensive and highly productive. Basic, acid and intermediate postglacial effusives.
E. Porous aquifers: Local or discontinuous or extensive but only moderately productive. Coastal sands, gravels, moraines, valley fillings, marine sediments, river deposits and soils.
F. Porous aquifers: extensive and highly productive. Coastal sands, aeolian sands of coastal origin, gravelly to sandy, fluviatile or glaciofluvial deposits.

Methodology for identification:

International hydrogeological map for Europe
(http://www.bgr.de/app/fishy/ihme1500/) was digitalized for the six main characters (listed above). More detailed delineation was made locally, as more detailed maps were available.

For glacier areas, Groundwater bodies were designated based on character in the surrounding areas.

National designation minimum criteria: Minimum groundwater body size is 10 km^2. Exceptions to this criteria are on islands

4.2 Terrestrial ecosystems and surface water bodies dependent on groundwater

- In the initial groundwater characterisation it is required to identify those groundwater bodies for which there are directly dependent surface water ecosystems or terrestrial ecosystems.

-An inventory of associated surface systems, including terrestrial ecosystems and bodies of surface water, with which the groundwater body is dynamically linked is only required for those groundwater bodies or groups of groundwater bodies which have been identified as being at risk.

CIS Guidance No. 12 gives practical guidelines for prioritising terrestrial ecosystems (section 3.3, pages 21 to 25), as: *"There are potentially very large numbers of terrestrial ecosystems that are directly dependent on groundwater within the Community. Whilst many support features of value (ecological or socioeconomic), a screening tool will be essential to focus action on the most important sites and areas, so that Member States do not face an impossible administrative burden. Member States may use their own,*

nationally developed criteria for identifying those dependent terrestrial systems which they believe are of sufficient importance that damage to them, as a result of anthropogenic groundwater alterations, could legitimately be described as 'significant'."

The focus in EU countries seems to be on (ground)water dependent habitats according to the Flora-Fauna- Habitats-Directive (FFH-D), the Birds-Directive , Natura 2000 sites and on those ecosystems which may be at risk. The requirement is directly related to those „nature" community acts that are not incorporated into the EEA Agreement.

A list of groundwater bodies with directly dependent surface water ecosystems or terrestrial ecosystems, using nationally developed criteria is not available.

Only one groundwater body is identified as „at risk" and this groundwater body has no directly dependent surface water ecosystems or terrestrial ecosystems.

4.3 Groundwater Bodies

Table 4.1 Number and size of designated Groundwater Bodies (see map of designated Ground Water Bodies in figure 4.1).

Geological formation	**Description**	**Number of Groundwater Bodies**	**Total size of Groundwater Bodies Km²**	**Number of GWB with dependent surface water ecosystems**
Insignificant Aquifers	local and limited groundwater	70	37525,2	(Not registered yet)
Fissured aquifers including karst	moderately productive	85	23822,5	(Not registered yet
Fissured aquifers including karst	highly productive	51	11808,3	(Not registered yet
Porous	moderately productive	80	12938,5	(Not registered yet
Porous	highly productive	23	5887,8	(Not registered yet
Total:		**312**	**91982,3***	

*Total area less than reported in chapter 2 because GWBs not delineated under glaciers.

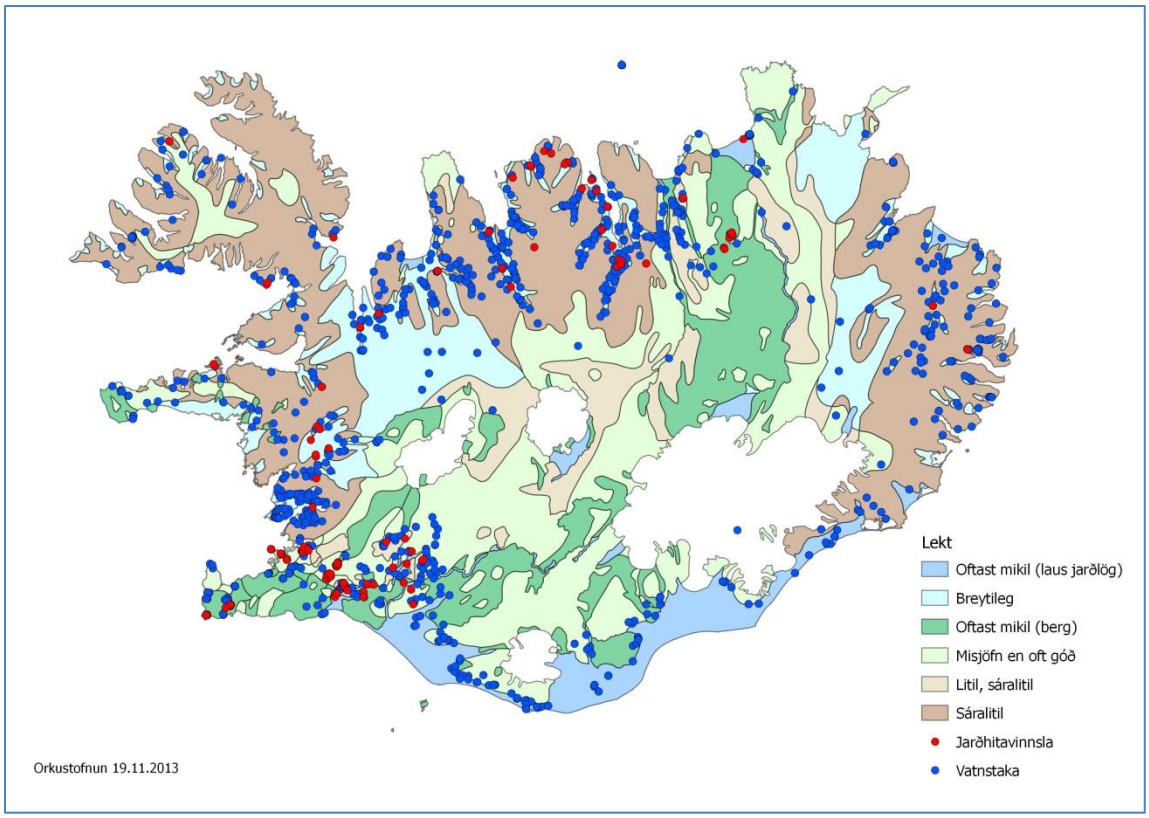

Figure 4.1 Map of all designated Ground Water Bodies within the River Basin District.

4.4 Waters used for the abstraction of drinking water

All Bodies of Water used for the abstraction of water intended for human consumption providing more than 10 m^3 a day as an average or serving more than 50 persons and those bodies of water intended for such future use. A map with data information of water bodies used for the abstraction of water, intended for human consumption and providing more than 10 m^3 a day as an average or serving more than 50 persons and those bodies of water intended for such future use are shown figure 4.2 and in a list (Annex I).

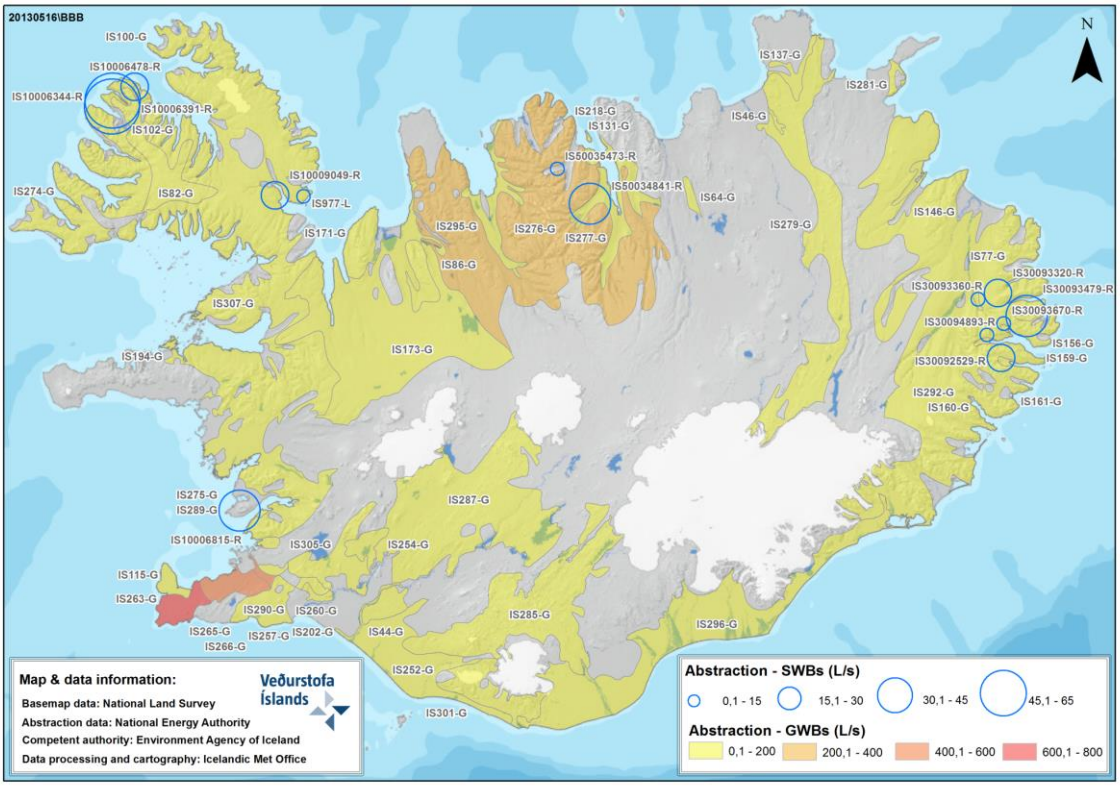

Figure 4.2 Water Bodies used for water abstraction for human consumption. WB and abstraction >0,1 l/s shown.

5. REGISTER OF PROTECTED AREAS

5.1 Waters used for the abstraction of drinking water

Waters protected under Article 7 of the directive are listed in Annex I and shown on map in figure 5.1.

5.2 Nutrient sensitive areas

Nutrient sensitive areas under EB legislation definitions have not been designated in Iceland

5.3 Areas designated under national legislation

On this list (and map in figure 5.1) are areas with bodies of water designated under national legislation in order to protect species or ecosystems in water or unique water areas.

Table 5.1 Number and name of designated Protected Water Areas.

Protected Area code	Water Body or Area Name	Area km^2
IS2232-P	Þingvallavatn	
IS346568-P	Myvatn	15289
IS102192-P	Grunnafjordur	1393
IS4435-P	Vestmannsvatn	563
IS4436-P	Miklavatn	1485
IS102193-P	Oddaflod	568
IS102194-P	Pollengi og Tunguey	658
IS346547-P	Vifilsstadavatn	188
IS346550-P	Blautos og Innstavogsnes	295
IS394685-P	Skerjafjordur innan Gardabaejar	428
IS555514073-P	Tjarnir a Innri - Halsum	146
Total:		

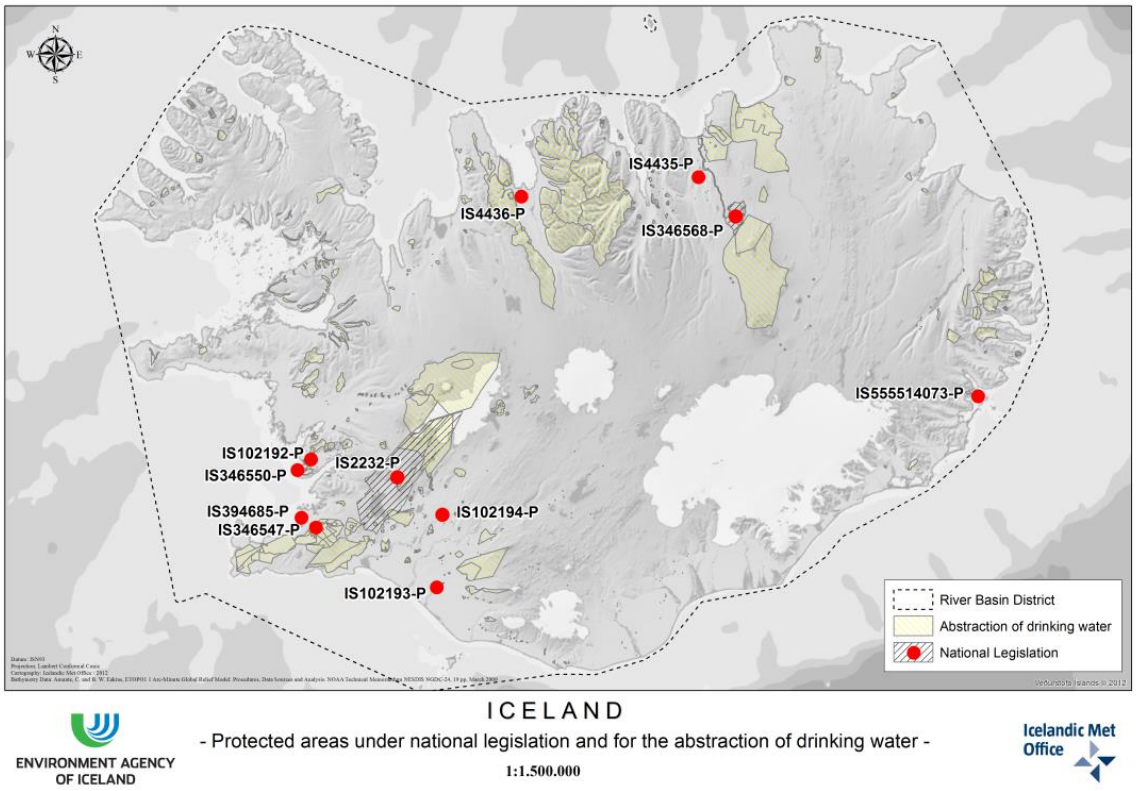

Figure 5.1 Designated protected areas. Provided by Icelandic Meteorological Office (http://www.vedur.is) / Bogi Brynjar Björnsson (bbb@vedur.is).

6. PRESSURE AND IMPACT ANALYSIS

6.1 Summary of significant pressure on surface waters

6.1.1 An assessment of the relative importance of the pressure

Article 5 of the Water Framework Directive (WFD) requires the identification of the significant pressures present in the River Basin District (RBD). This compliance indicator is used to record the most likely impacts leading to the failure of water bodies to reach good status/potential as a result of the sum of those pressures. In this first assessment, this is used to identify water bodies as "at risk", "possibly at risk" or "not as risk" with the help of available impact data. More detailed supporting document with methodologies and criteria to assess "significance" is available (Jóhanna Björk Weisshappel (ed), 2013).

6.2 Identification of Surface Water Bodies at Risk

Table 6.1 Risk assessment categories and subsequent future action plan.

IS-Reporting category	**Future action plans**
At risk	Appropriate measures to be proposed
Possibly at risk	Risk assessment /data quality evaluation/monitoring
Not at risk	No action needed

River Water Bodies "at risk" and "possibly at risk".

Table 6.2 List of River Water Bodies identified "**at risk**" within the RBD.

River WB type code	**WB Name**	**Water Body ID**	**Length of WB km (for rivers)**	**Significant pressure for "at risk" assessment**
No River Water Bodies identified "at risk"				
Total:			**0**	

Table 6.3 List of River Water Bodies identified as "**possibly at risk**"within the RBD.

River WB type code	WB Name	Water Body ID	Length of WB km	Pressure for possible "at risk" assessment
RIL111	Seljadalsá	IS104-703-R	16,9	Agriculture
RIL112	Selgil	IS103-750-R	3,5	Agriculture
RIL112	Eyjafljót	IS103-728-R	21,2	Agriculture
RIL111	Hryggjarkvísl	IS103-625-R	12,6	Agriculture
RIL122	Torfalækur	IS101-1644-R	20,2	Agriculture
RIL112	Þórunúpsgil	IS103-740-R	10,7	Agriculture
RIL122	Farvegur og smálækir	IS104-201-R	10,6	Agriculture
RIL122	Langholtsós	IS103-845-R	12,2	Agriculture
RIL112	Skipaós?	IS103-917-R	11,5	Agriculture
RIL122	Lækur úr Vatnshamravatni	IS104-193-R	2,1	Agriculture
RIL122	Súluá/Austurlækur	IS104-134-R	4,2	Agriculture
RIL112	Flókastaðaá	IS103-736-R	8,1	Agriculture
RIL122	Kalmansá	IS104-185-R	3,6	Agriculture
RIL112	Móeiðarhvolsalda	IS103-738-R	6,6	Agriculture
RIL121	Reykjakvísl	IS104-824-R	9,6	Agriculture
RIL121	Glerá 1	IS102-1684-R	8,9	
	Hlíðardalslækur	ID not available		Point source
RIL121	Eyvindará 2	IS102-1142-R	2,2	Point source
RIL121	Þverá 2	IS101-272-R	15,8	Point source
RIL111	Ytri-Rangá 1	IS103-629-R	13,7	Point source
RIL111	Ölfusá 1	IS103-975-R	23,2	Point source
Total:			**217,4**	

Lake Water Bodies "at risk" and "possibly at risk".

Table 6.4 List of Lake Water Bodies identified as "**at risk**" within the RBD.

Lake WB type code	WB Name	Water Body ID	Surface area within the RBD km^2	Significant pressure for "at risk" assessment
LIL211	Tjörnin	IS104-2386-L	0,1	Diffuse source
Total:			**0,1**	

Table 6.5 List of Lake Water Bodies identified as "**possibly at risk**" within the RBD.

Lake WB type code	WB Name	Water Body ID	Surface area within the RBD km^2	Pressure for "possibly at risk" assessment
LIL212	Þingvallavatn	IS104-2232-L	83,4	Diffuse pressure
LIL211	Mývatn	IS102-1448-L	39,4	Diffuse pressure
	Bakkatjörn	No id	<0,1	Diffuse pressure
LIL221	Eiðsvatn	IS102-1654-L	1,7	Point source
Total:			**125**	

Coastal Water Bodies "at risk" or "possibly at risk".

Table 6.6a List of Coastal Water Bodies identified "**at risk**" within the RBD.

Coastal WB type code	WB Name	Water Body ID	Total length of Water Bodies Coastline km	Significant pressure for "at risk" assessment
No Coastal Water Bodies identified "at risk"				
Total:			**0**	

Table 6.6b List of Coastal Water Bodies identified "**possibly at risk**" within the RBD.

Coastal WB type code	WB Name	Water Body ID	Total length of Water Bodies Coastline km	Pressure for "possibly at risk" assessment
CS2352	*Blikastaðakró/Leirárvogur	IS104-1303-C	1,6	Diffuse source
CN1352	Eyjafjarðarbotn	IS102-1321-C	58,7	Point source
CN1352	Skutulsfjörður innri	IS101-1282-C	14,5	Point source
Total:				

*The name of the Water Body will be corrected in the future as the name refers to another geographical area, but the GIS data are correct.

Table 6.6c List of Transitional Water Bodies identified as "**possibly at risk**" within the RBD.

Coastal WB type code	WB Name	Water Body ID	Total length of Water Bodies Coastline km	Pressure for "possibly at risk" assessment
	Lón	IS102-1470-T	13,1	Point source
	Skarðsfjörður	IS103-66-T	53,8	Point source
Total:			**67**	

No transitional Water Bodies have been identified as "at risk".

6.3 Significant point source pollution on surface water

Article 5 of the Water Framework Directive (WFD) requires an identification of the significant pressures present in the River Basin District (RBD). This compliance indicator is used to record the most likely impact leading to the failure of water bodies to reach good status/potential.

One surface water body is identified as “at risk”. It is the Capital city central pond. The most probable significant point source pressure is run off water from impermeable surfaces as well as accumulation of nutrients in sediments from past wastewater discharges.

More detailed supporting document with methodologies and criteria to assess “significance” is available (Jóhanna Björk Weisshappel (ed), 2013).

6.4 Significant diffuse source pollution on surface waters

Article 5 of the Water Framework Directive (WFD) requires an identification of the significant pressures present in the River Basin District (RBD). This compliance indicator is used to record the most likely pressures leading to the impacts of Water Bodies failing to reach good status/potential.

One Surface Water Body is identified as “at risk”. It is the Capital city central pond. The possible significant diffuse source pressure is due to the urbanising of the surroundings and the catchment.

More detailed supporting document with methodologies and criteria to assess “significance” is available (Jóhanna Björk Weisshappel (ed), 2013).

6.5 Significant water abstractions from surface water

Water abstraction from surface water is not considered having a significant impact on the surface water bodies leading to failure to reach good status (Expert judgement, Energy Authority).

6.6 Significant water flow regulations and morphological alterations

There has been no official assessment of significant water flow regulations and morphological alterations in Iceland (Expert judgement, Energy Authority).

6.7 Summary assessment of the impact on surface water bodies

Detailed supporting document with methodologies and criteria to assess “significance” is available (Jóhanna Björk Weisshappel (ed), 2013).

7. GROUNDWATER BODIES

7.1 Initial characterisation - Summary of pressures on groundwater in the RBD

Article 5 of the Water Framework Directive (WFD) requires an identification of the significant pressures present in the River Basin District (RBD). This compliance indicator is used to record the most likely pressure leading to the impacts of water bodies failing to reach good status/potential.

More detailed supporting document with methodologies and criteria to assess "significance" is available (Jóhanna Björk Weisshappel (ed), 2013). In the document the impact from pollution on groundwater is assessed.

7.2 Identification of groundwater bodies at risk

Table 7.1 List of Groundwater Bodies identified as "**at risk**"within the RBD.

Groundwater body ID	GWB Name	GWB Size km^2	Significant pressure for "at risk" assessment
IS104-115-G	Rosmhvalanes	133,8	Diffuse /point source pressure
Total:			

Table 7.2 List of Groundwater Bodies identified as "**possibly at risk**"within the RBD.

Groundwater body ID	GWB Name	GWB Size km^2	Pressure for "possibly at risk" assessment
IS102--G	Krafla/Bjarnarflag		Point source pressure
IS102-199-G	Héðinshöfði	14,9	Point source pressure
IS104--G	Nesjahraun		Point source pressure
IS104-261-G	Stór-Reykjavíkursvæðið	198,5	Diffuse /point source
Total:			

7.3 Significant Diffuse source pollution in groundwaters

Article 5 of the Water Framework Directive (WFD) requires an identification of the significant pressures present in the River Basin District (RBD). This compliance indicator is used to record the most likely pressure leading to the impacts of water bodies failing to reach good status/potential.

One Groundwater body is identified as "at risk". It is the Rosmhvalanes WB. The significant diffuse source pressure is due to the Infrastructure of the surrondings as an International airfield and former NATO military base.

More detailed supporting document with methodologies and criteria to assess "significance" is available (Jóhanna Björk Weisshappel (ed), 2013).

7.4 Significant Point source pollution to groundwater

Article 5 of the Water Framework Directive (WFD) requires an identification of the significant pressures present in the River Basin District (RBD). This compliance indicator is used to record the most likely pressure leading to the impacts of water bodies failing to reach good status/potential.

One surface water body is identified as “at risk”. It is the Rosmhvalanes WB. The possible significant point source pressure is due to the Infrastructure of the surroundings as an International airfield and former NATO military base, oil and chemical spill accidents and old landfills.

More detailed supporting document with methodologies and criteria to assess “significance” is available (Jóhanna Björk Weisshappel (ed), 2013).

7.5 Significant Groundwater abstraction

Groundwater abstraction in Iceland is not considered having a significant impact on the groundwater bodies leading to failure to reach good status (Expert judgement, Energy Authority).

7.6 Significant Artificial groundwater recharge

Artificial groundwater recharge is practiced in the geothermal heating and electricity production industry but the recharge is only injected into the geothermal reservoir range. The artificial groundwater recharge does not have a significant impact on the groundwater bodies in Iceland leading to failure to reach good status (Expert judgement, Energy Authority).

7.7 Significant Saltwater intrusion

Saltwater intrusion is not considered having a significant impact on the grounwater bodies leading to failure to reach good status (Expert judgement, Energy Authority).

7.8 Review of the impact of human activity on GW

Detailed supporting document with methodologies and criteria to assess “significance” is available (Jóhanna Björk Weisshappel (ed), 2013).

7.9 Further characterisation of groundwater bodies at risk

Further characterisation has not yet been implemented. For the implementation, reports with detailed information and suggested measures are available (Jóhanna Björk Weisshappel (ed), 2013 and Kadeco og Almenna Verkfræðistofan, 2009).

8. ECONOMIC ANALYSIS OF WATER USE

Economic analysis of water use was made by The Institute of Economic Studies, University of Iceland (Hagfræðistofnun Háskóla Íslands, 2011), http://hhi.hi.is/sites/hhi.hi.is/files/C-Series/C11_04_Vatnatilskipun.pdf.

A reference is made to the original report (Hagfræðistofnun Háskóla Íslands, 2011), but in the following text, there are some statistics copied from the English summary of the report:

„Total usage of cold water in Iceland was estimated at 200 million tonnes in 2003. Public utilities distributed most of the cold water to consumers, or 80 million tonnes, while the

consumption of aquaculture amounted to about 70 million tonnes in 2003. Heat converters, used by hot water distribution services, utilised 25 million tonnes and the power intensive industries 16 million tonnes for its operations in 2003.

Hot water (geothermal energy) distribution services distributed about 140 thousand tonnes of hot water in 2008 to approximately 295 thousand users. Annual usage of hot water has been estimated 300-350 tonnes per person but varies between regions. This corresponds to annual energy utilization for space heating of 60-70 GJ per capita.

In Iceland, electricity is mainly generated with hydropower plants. Total production amounted to about 12 thousand GWh in 2009, while about 4,500 GWh of electricity were generated with geothermal plants. A rough estimate indicates that Landsvirkjun (state owned electricity generation company) uses about 42 billion tonnes of water, mainly glacial rivers, to generate electricity per year.

The income of cold water distribution services amounted at least to 5.5 billion ISK in 2009, with revenues for hot water distribution services corresponding to at least 9 billion ISK. Further, income from sewerage services was at least 5 billion ISK in 2009. Electricity production generated though by far the highest revenue, or 46 billion ISK, in 2009.“ (C.f. Hagfræðistofnun Háskóla Íslands, 2011).

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10.ANNEX I

List of water bodies used for the abstraction of water intended for human consumption

List of water bodies used for the abstraction of water intended for human consumption providing more than 10 m^3 a day or serving more than 50 persons, according to Art 7(1) of directive 200/60/EC. **Data (for 2011) is provided by the Icelandic Meteorologicaal Office.**			
EU-WBCode	**Name of water body**	**No. of extraction points**	**Sum abstraction, m^3/day**
IS263-G	Reykjanes	3	68.023
IS265-G	Straumsvíkurstraumur	4	44.617
IS266-G	Elliðaárstraumur 3	2	41.170
IS276-G	Mið-Norðurland	14	23.477
IS82-G	Gláma	1	17.280
IS274-G	Vestfirðir	5	15.034
IS307-G	Mið-Vesturland og Strandir	13	8.925
IS202-G	Ölfusstraumur Forir	5	8.251
IS287-G	Kerlingarfjöll-Hreppar	3	7.802
IS257-G	Elliðaárstraumur 2	1	7.180
IS292-G	Austfirðir	14	5.443
IS156-G	Fannardalur	2	4.044
IS290-G	Selvogsstraumur 3	2	3.974
IS277-G	Eyjafjörður	4	3.920
IS252-G	Landeyjar	5	3.871
IS102-G	Seljalandshlíð	1	3.456
IS260-G	Ölfusstraumur Ingólfsfjall	1	3.370
IS295-G	Skagafjörður	1	2.696
IS160-G	Reyðarfjörður	2	2.160
IS281-G	Gunnólfsvíkurfjall	1	2.074
IS100-G	Bolungarvík	1	1.901
IS171-G	Vatnsnes	3	1.642
IS285-G	Tindfjallajökull-Torfajökull	2	1.633
IS115-G	Rosmhvalanes	1	1.616
IS194-G	Stykkishólmur	1	1.391
IS44-G	Gíslholtsvötn	4	1.106
IS161-G	Fáskrúðsfjörður	1	795
IS289-G	Leirvogsá	1	778
IS296-G	Suðursandar	3	691

IS146-G	Vesturárdalur	2	613
IS254-G	Laugardalur	1	432
IS77-G	Eyvindardalur	1	432
IS137-G	Rauðhólahraun	2	346
IS305-G	Lyngdalsheiði	2	346
IS159-G	Eskifjörður	1	173
IS301-G	Eyjafjallajökull	1	173
IS131-G	Árskógssandur	1	104
IS173-G	Stórisandur	1	86
IS279-G	Krepputunga-Slétta	1	86
IS64-G	Þorgerðarfjall	1	86
IS86-G	Vatnsdalsfjall	1	86
IS275-G	Kjalarnes Hvalfjörður	1	43
IS218-G	Hrísey	1	28
IS46-G	Smjörhólsá	1	9
IS10006391-R	Þverá	1	4.320
IS10006344-R	Klofningsdalur	1	4.320
IS30093479-R	Norðfjarðará	1	3.871
IS10006815-R	Berjadalsá	1	3.681
IS50034841-R	Hörgá 2	1	2.979
IS30093320-R	Fjarðará 2	1	2.160
IS10006478-R	Hlíðará	1	1.901
IS30092529-R	Dalsá	1	1.797
IS10009049-R	Ósá	1	1.469
IS30094893-R	Norðurá	1	1.296
IS30093670-R	Eskifjarðará	1	1.296
IS50035473-R	Svarfaðardalsá 3	1	1.140
IS30094893-R	Norðurá	1	864
IS30093360-R	Eyvindará	1	432
IS977-L	Bæjarvatn	1	302
Sum		134	323.187

Abstractions points intended for future use are for the most part within these water bodies.

No water bodies where the extraction of water intended for human consumption is less than 10 m^3 serve more than 50 persons. Therefor the same list applies for both conditions (>10 m^3/day and >50 person served).