State of PgHydro Project

PostgreSQL-PostGIS extension for Hydrographic Applications

Alexandre de Amorim Teixeira
GIS Specialist
National Water and Sanitation Agency of Brazil

ANA
AGÊNCIA NACIONAL DE ÁGUAS
E SANEAMENTO BÁSICO

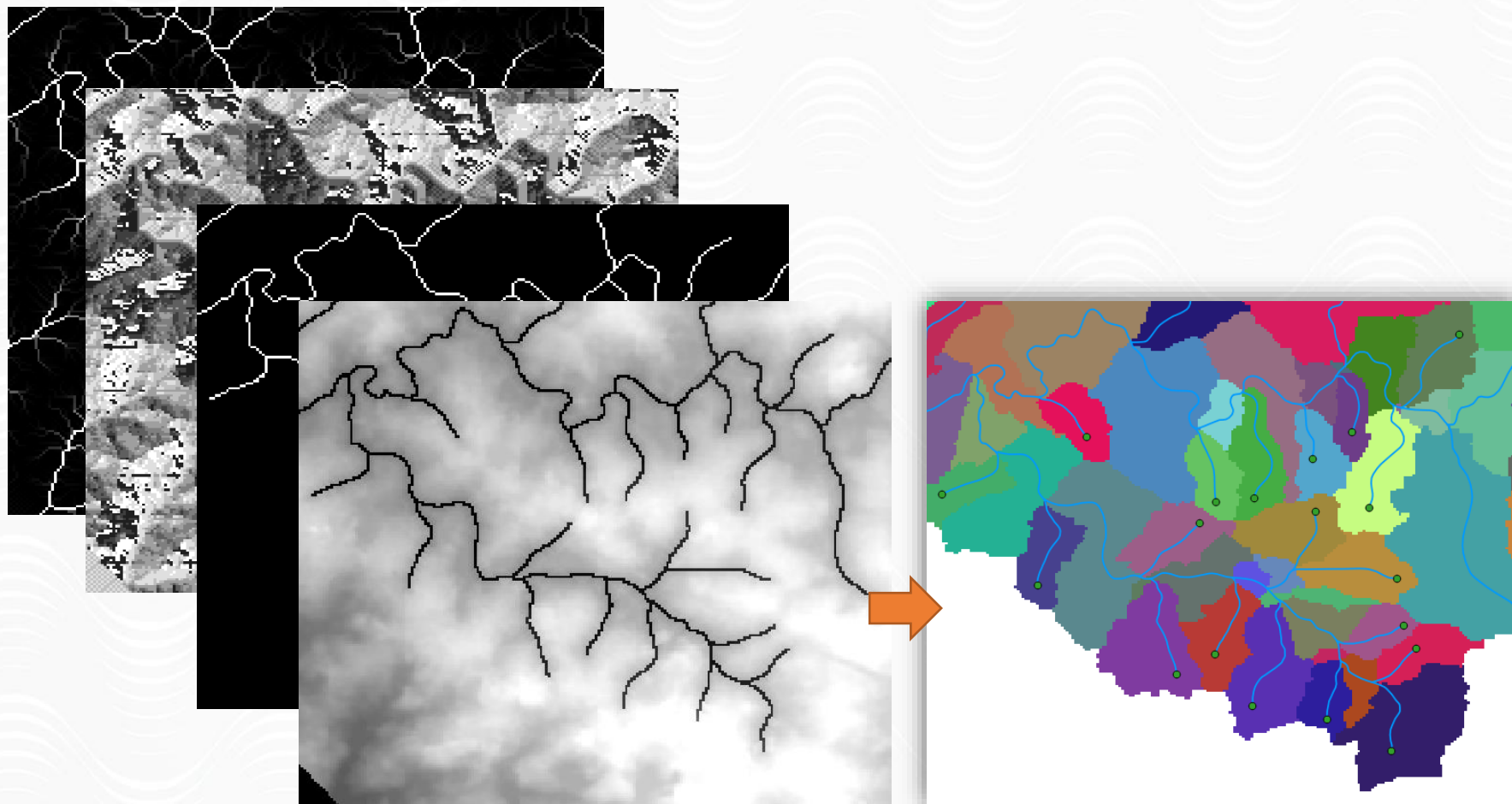Pghydro: Extension for PostgreSQL/PostGIS

Main Characteristics

- PostgreSQL/PostGIS Extension;

- Open-Source Code (Collaborative);

- Intelligence located in the Database System;

- You can edit your dataset using any GIS (since you are able to edit geometric features in PostGIS);

- 100% PLpgSQL.

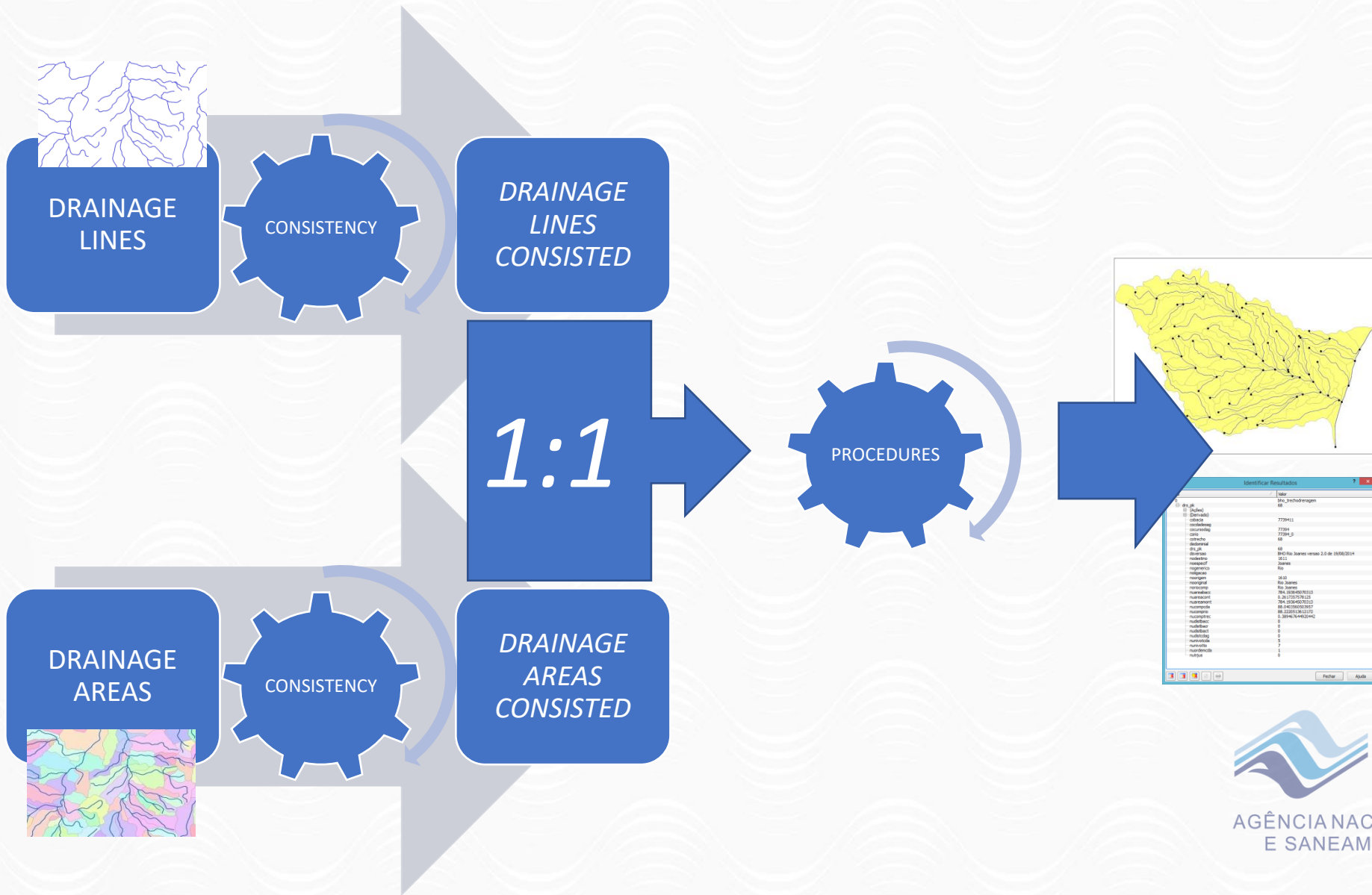AGÊNCIA NACIONAL DE ÁGUAS
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Requirements

- PgHydro 6.4 (2019)
  - PostgreSQL 9-11
  - PostGIS 2.x

- PgHydro 6.6 (2022)
  - PostgreSQL 9+
  - PostGIS 3.x

- Both versions works with Pghydro Tools Plugin 3.2 for QGIS

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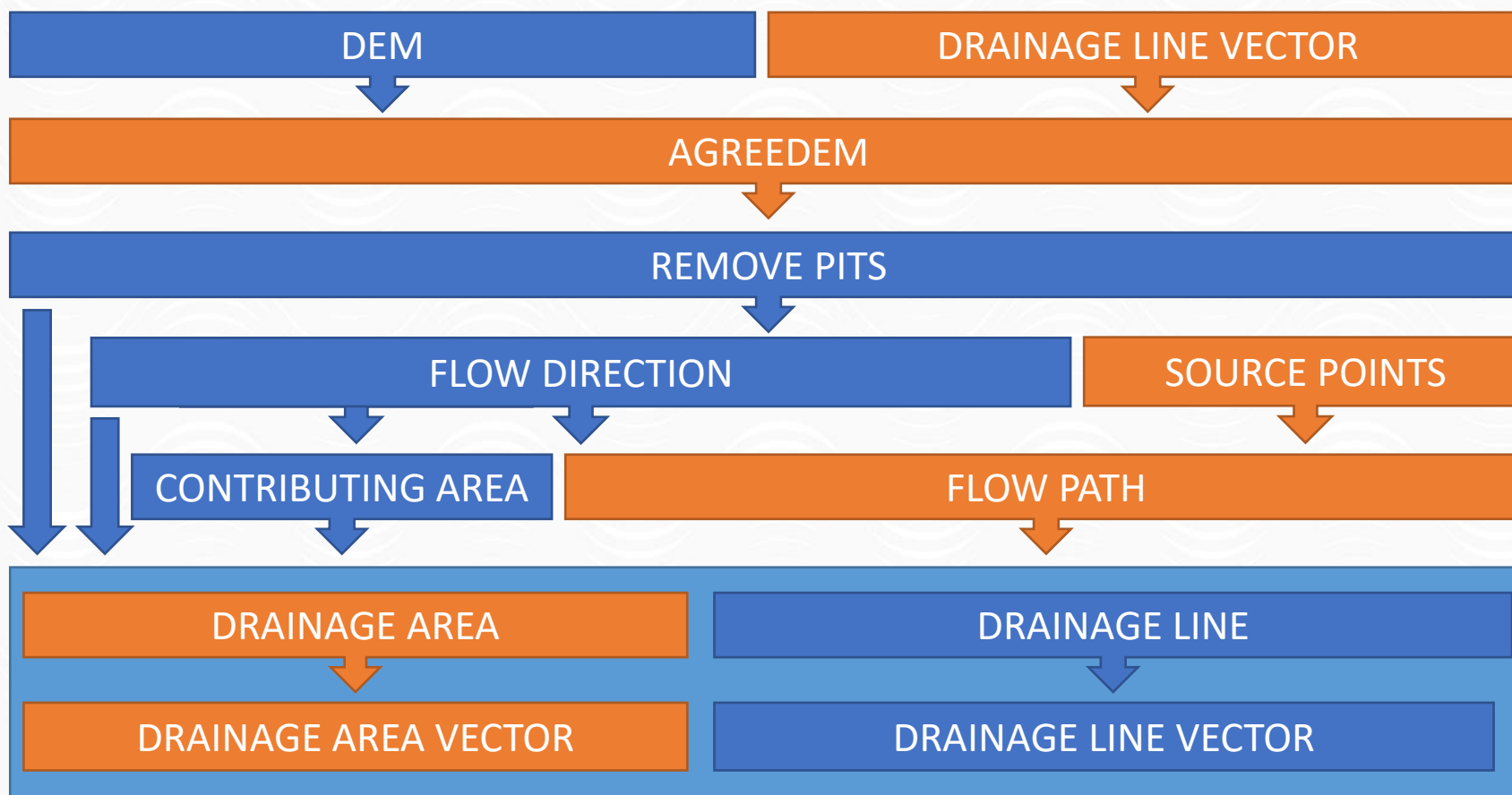
Workflow

PgHydro

- Database Extension for PostgreSQL/PostGIS
  - Schemes
  - Tables
  - Queries
  - Functions
  - Developed using PLPGSQL

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PgHydro Project

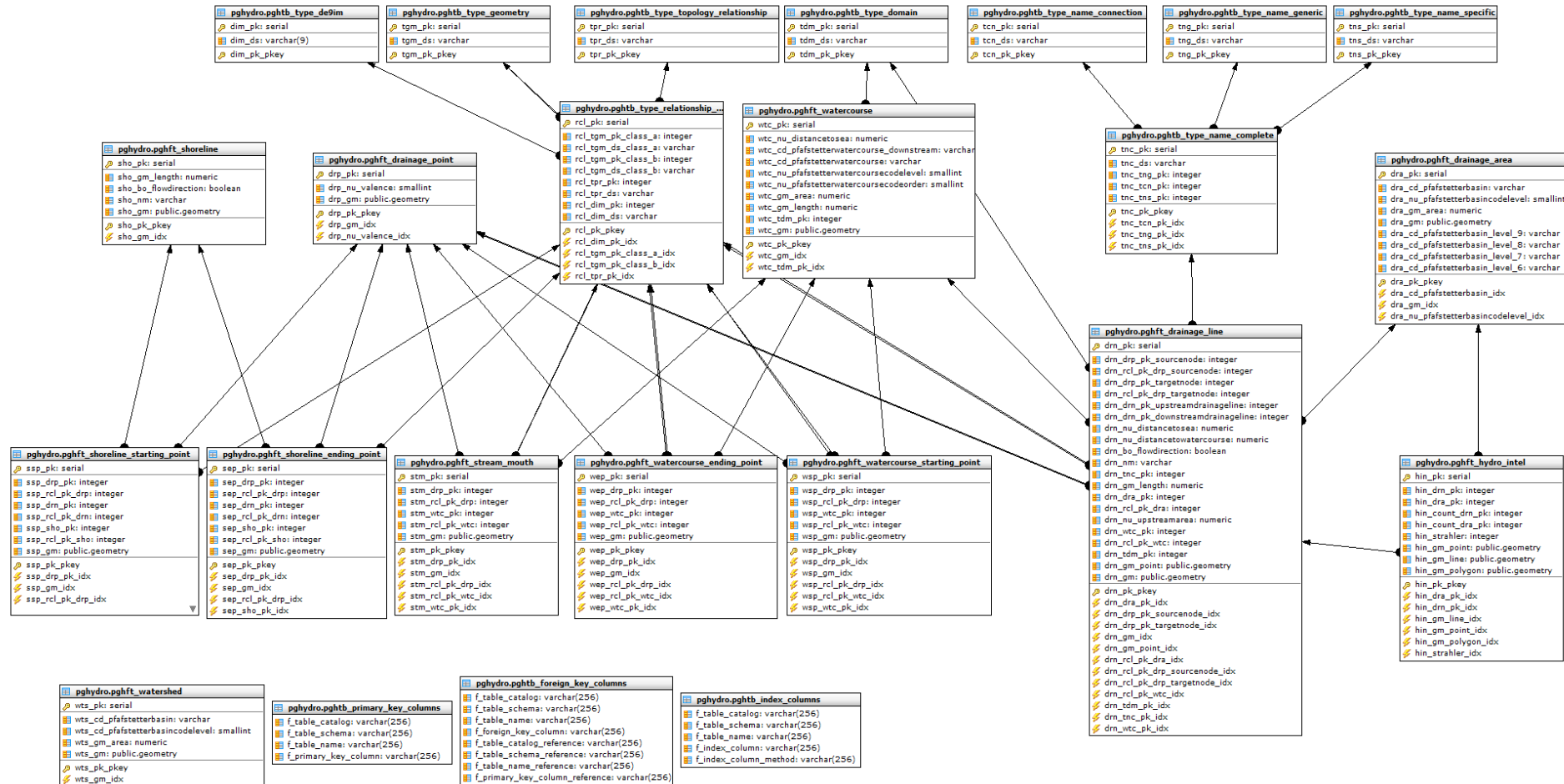# Database Scheme

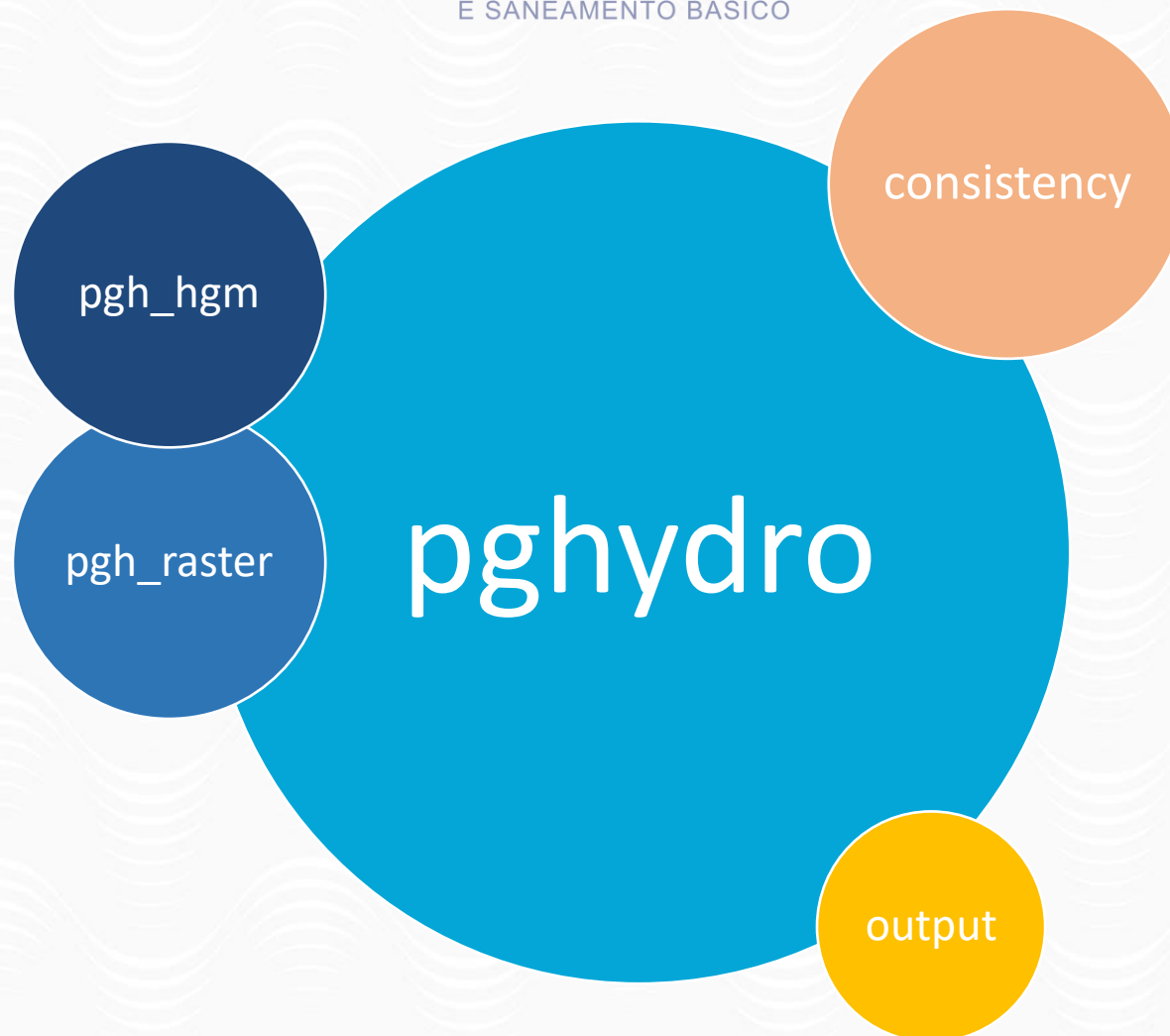# Database Scheme
Physical Scheme

Database Tools

- Queries;

- Functions;

- Triggers;

- Indexes;

Database Tools

- Query Functions
    - Geometry Consistency;
    - Topological Consistency
    - User Consistency;

- Procedure Functions

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Browser

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  > pghft_stream_mouth
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  > pghft_watercourse_starting_point
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  > pghtb_primary_key_columns
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  > pghtb_type_domain
  > pghtb_type_geometry
  > pghtb_type_name_complete
  > pghtb_type_name_connection
  > pghtb_type_name_generic
  > pghtb_type_name_specific
  > pghtb_type_relationship_class
  > pghtb_type_topology_relationship
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ℹ No dependency information is available for the selecte

You are currently running version 6.12 of pgAdmin 4, however the current version is 8.12.

Please click here for more information.

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Dashboard | Properties | SQL | Statistics | Dependencies | Dependents

Search

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	Name	Owner	Comment
	pghfn_addforeignkeys()	postgres	create the pghydro schema foreign keys constrains.
	pghfn_addprimarykeys()	postgres	create the pghydro schema primary keys constrains.
	pghfn_assign_vertex_id(off_set bigint)	postgres	update the arc-node data.
	pghfn_associatedrainageline_drainagearea()	postgres	associate the spatial relation between the drainage lines and drainage area values.
	pghfn_calculate_pfafstetter_codification(integer, in...	postgres	calculate the Pfafstetter basin code for each drainage area value where id1 is the drainage line identifier...
	pghfn_calculate_pfafstetter_codification()	postgres	calculate the Pfafstetter basin code for each drainage area value.
	pghfn_calculatedistancetosea(numeric)	postgres	update the distance to the basin mouth for each drainage line adding an offset value.
	pghfn_calculatedownstreamdrainageline()	postgres	update the downstream drainage line id for each drainage line.
	pghfn_calculatedrainageareaarea(integer, integer)	postgres	update the drainage line area for each drainage area using the spatial reference identifier (srid) input an...
	pghfn_calculatedrainagelinelength(integer, integer)	postgres	update the drainage line length for each drainage line using a spatial reference identifier (srid) input and ...
	pghfn_calculateflowdirection()	postgres	update the drainage line flow direction for each drainage line, true if its geometry towards downstream a...
	pghfn_calculatestrahlernumber()	postgres	update the strahler number code for each drainage line.
	pghfn_calculateupstreamarea()	postgres	update the upstream area for each drainage line.
	pghfn_calculateupstreamdrainageline()	postgres	update the upstream drainage line id for each drainage line.
	pghfn_calculatevalence()	postgres	update the drainage point valence value that is the count of drainage lines that touch the drainage point.
	pghfn_calculatevariabletosea(offset_value numeric...	postgres	update the accumulated downstream variable attribute variable_attribute) given a drainage line identifier...
	pghfn_calculatevariableupstream(offset_value nu...	postgres	update the accumulated upstream variable attribute (variable_attribute) given a drainage line identifier (...
	pghfn_creategeometryindex()	postgres	create the pghydro schema spatial index.
	pghfn_createindex()	postgres	create the pghydro schema non-spatial index.
	pghfn_distance_to_mouth(integer, OUT distance_to...	postgres	returns the distance to the mouth of the basin.
	pghfn_downstream_drainageline_strahler(integer)	postgres	returns all downstream drainage lines id from drainage lines having the Strahler number S as input.
	pghfn_downstream_drainagelines(integer, integer)	postgres	returns all downstream drainage lines ids between two drainage lines having id1 located upstream from ...
	pghfn_downstream_drainagelines(integer)	postgres	returns all downstream drainage lines ids.
	pghfn_downstreamdrainageline(integer)	postgres	returns the downstream drainage line id.

Browser

Dashboard Properties SQL Statistics Dependencies Dependents

pghfn_pfafstetter_codifications(integer, integer)
pghfn_pfafstetterbasincodelevel()
pghfn_pfafstetterbasincodeleveln(integer)
pghfn_reversedrainageline()
pghfn_turnoffkeysindex()
pghfn_turnonkeysindex()
pghfn_updatedomaincolumn()
pghfn_updategeometrysrid()
pghfn_updatepfafstetterbasincode(character varying)
pghfn_updatepfafstetterwatercoursecode()
pghfn_updateshoreline()
pghfn_updateshorelineendingpoint(integer)
pghfn_updateshorelinestartingpoint(integer)
pghfn_updatestream_mouth()
pghfn_updatewatercourse(integer)
pghfn_updatewatercourse_ending_point()
pghfn_updatewatercourse_starting_point()
pghfn_updatewatershed(integer)
pghfn_updatewatersheddrainagearea(integer)
pghfn_upstreamdrainageline(integer)
pghfn_upstreamdrainagelines(integer)
pghfn_upstreamdrainagelines(integer, integer)
pghfn_upstreamdrainagelinesarea(integer, OUT upstream_area numeric
pghfn_upstreamdrainagelinesn(integer, integer)
pghfn_valence(integer)
pghfn_variabletosea(id integer, variable_table character varying, variabl
pghfn_variableupstream(id integer, variable_table character varying, var

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Return type   SETOF integer

Language   plpgsql

Code

```
1
2   DECLARE
3     r record;
4   BEGIN
5     FOR r IN
6       WITH RECURSIVE upstream(drn_pk, drn_drp_pk_targetnode, drn_drp_pk_sourcenode) AS (
7         SELECT drn_pk, drn_drp_pk_targetnode, drn_drp_pk_sourcenode
8           FROM pghydro.pghft_drainage_line
9          WHERE drn_pk = $1
10      UNION ALL
11        SELECT a.drn_pk, a.drn_drp_pk_targetnode, a.drn_drp_pk_sourcenode
12          FROM pghydro.pghft_drainage_line a, upstream c
13         WHERE a.drn_drp_pk_targetnode = c.drn_drp_pk_sourcenode
14      )
15      SELECT drn_pk
16        FROM upstream
17      LOOP
18        RETURN NEXT r.drn_pk;
19      END LOOP;
20      RETURN;
21    END;
22
```

Options

Volatility   VOLATILE

Returns a set?   ⬤

Strict?   ○

Security of definer?   ○

Window?   ○

Parallel   UNSAFE

File   Object   Tools   Help

Browser

Dashboard   Properties   SQL   Statistics   Dependencies   Dependents

pghfn_pfafstetter_codifications(integer, integer)
pghfn_pfafstetterbasincodelevel()
pghfn_pfafstetterbasincodeleveln(integer)
pghfn_reversedrainageline()
pghfn_turnoffkeysindex()
pghfn_turnonkeysindex()
pghfn_updatedomaincolumn()
pghfn_updategeometrysrid()
pghfn_updatepfafstetterbasincode(character varying)
pghfn_updatepfafstetterwatercoursecode()
pghfn_updateshoreline()
pghfn_updateshorelineendingpoint(integer)
pghfn_updateshorelinestartingpoint(integer)
pghfn_updatestream_mouth()
pghfn_updatewatercourse(integer)
pghfn_updatewatercourse_ending_point()
pghfn_updatewatercourse_starting_point()
pghfn_updatewatershed(integer)
pghfn_updatewatersheddrainagearea(integer)
pghfn_upstreamdrainageline(integer)
pghfn_upstreamdrainagelines(integer)
pghfn_upstreamdrainagelines(integer, integer)
pghfn_upstreamdrainagelinesarea(integer, OUT upstream_area numeric
pghfn_upstreamdrainagelinesn(integer, integer)
pghfn_valence(integer)
pghfn_variabletosea(id integer, variable_table character varying, variabl
pghfn_variableupstream(id integer, variable_table character varying, va

Materialized Views
Operators
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General

Name   pghfn_variableupstream

OID   78316

Owner   postgres

System function?   [toggle off]

Comment   returns the accumulated upstream variable attribute given a drainage line identifier (variable_fk) in a spatial join relation between the drainage area and a given object.

Definition

Argument count   4

Arguments   IN id integer, IN variable_table character varying, IN variable_fk character varying, IN variable_attribute character varying

Signature arguments   integer, character varying, character varying, character varying

Return type   numeric

Language   plpgsql

Code

```
 1
 2
 3  DECLARE
 4  variable numeric;
 5
 6  BEGIN
 7
 8  EXECUTE '
 9  SELECT COALESCE(sum(c.'||variable_attribute||'),0)
10  FROM
11  (
12  SELECT a.drn_pk, vat.'||variable_attribute||'::numeric
```

pgAdmin 4

File | Object | Tools | Help

Browser

Dashboard   Properties   SQL   Statistics   Dependencies   Dependents

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        > geoft_bho_drainage_area
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	Name	Owner	Partitioned table?	Comment
☐	geoft_bho_drainage_area	postgres		vector representation of drainage catchment areas for each drainage line according to the …
☐	geoft_bho_drainage_line	postgres		vector representation of the rivers derived from a systematic cartographic mapping in the f…
☐	geoft_bho_drainage_point	postgres		vector representation of the drainage network nodes derived from the drainage lines that ca…
☐	geoft_bho_shoreline	postgres		representation of the coastline.
☐	geoft_bho_watercourse	postgres		vector representation of the logical element watercourse basin. The watercourse is the geo…

Advantages

- Fast processing of large volumes of data or complex queries using spatial and non-spatial data (compared to GIS);

- Division of data processing using native DBMS tools;

- Open-source code for optimizations and implementations;

- User-defined data output with no need for partial or total duplication of data.

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Output Data

- PgHydro normalized Tables

- Otto-codified Hydrographic Dataset (BHO)

Otto-codified Hydrographic Dataset (BHO)
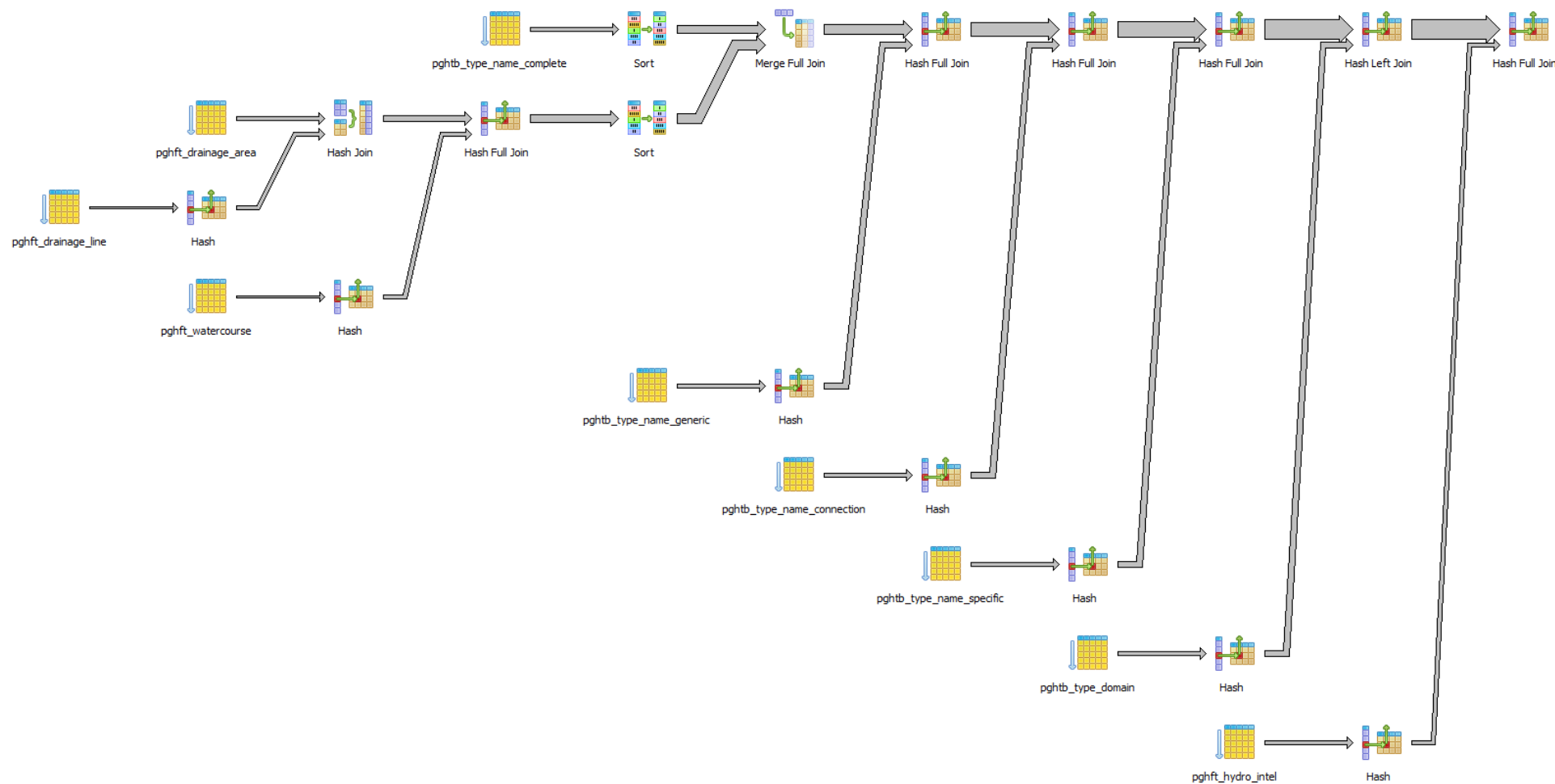
Otto-codified Hydrographic Dataset (BHO)

- ✓ Pfafstetter basin coding;
- ✓ Pfafstetter watercourse coding;
- ✓ Reach Length;
- ✓ Watercourse Length;
- ✓ Drainage Area;
- ✓ Upstream Drainage Area;
- ✓ Distance to the sea;
- ✓ Distance to the basin outlet;
- ✓ Drainage Line Flow Direction;

- ✓ Upstream Reach;
- ✓ Downstream Reach;
- ✓ Converging Reach;
- ✓ Watercourse order;
- ✓ Strahler Order;
- ✓ Pfafstetter Basin Level;
- ✓ Pfafstetter Watercourse Level;

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Agência Nacional de Águas e Saneamento Básico
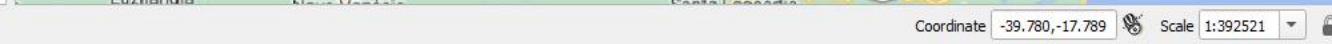
Spatial Layers

pgh_output.geoft_bho_drainage_line attribute table fields:

v001 – (drainage line identifier) a single number that characterizes a stretch (primary key).

v002 – (origin node) the origin node of drainage stretches. It is associated with the single identifier of drainage points.

v003 – (destination node) the destination node of drainage stretches. It is associated with the single identifier of drainage points.

v004 – (watercourse code) code created by Otto Pfafstetter for the watercourse where the stretch is inserted.

v005– (basin code) Pfafstetter basin code system for the hydrographic catchment area relative to the stretch.

v006 – (stretch length) length of the drainage stretch, in kilometres.

v007– (distance to the basin mouth in relation to the drainage stretch) the distance, in kilometres, throughout the watercourses, from the downstream point of the stretch to the reference shoreline, with the drainage stretch as reference.
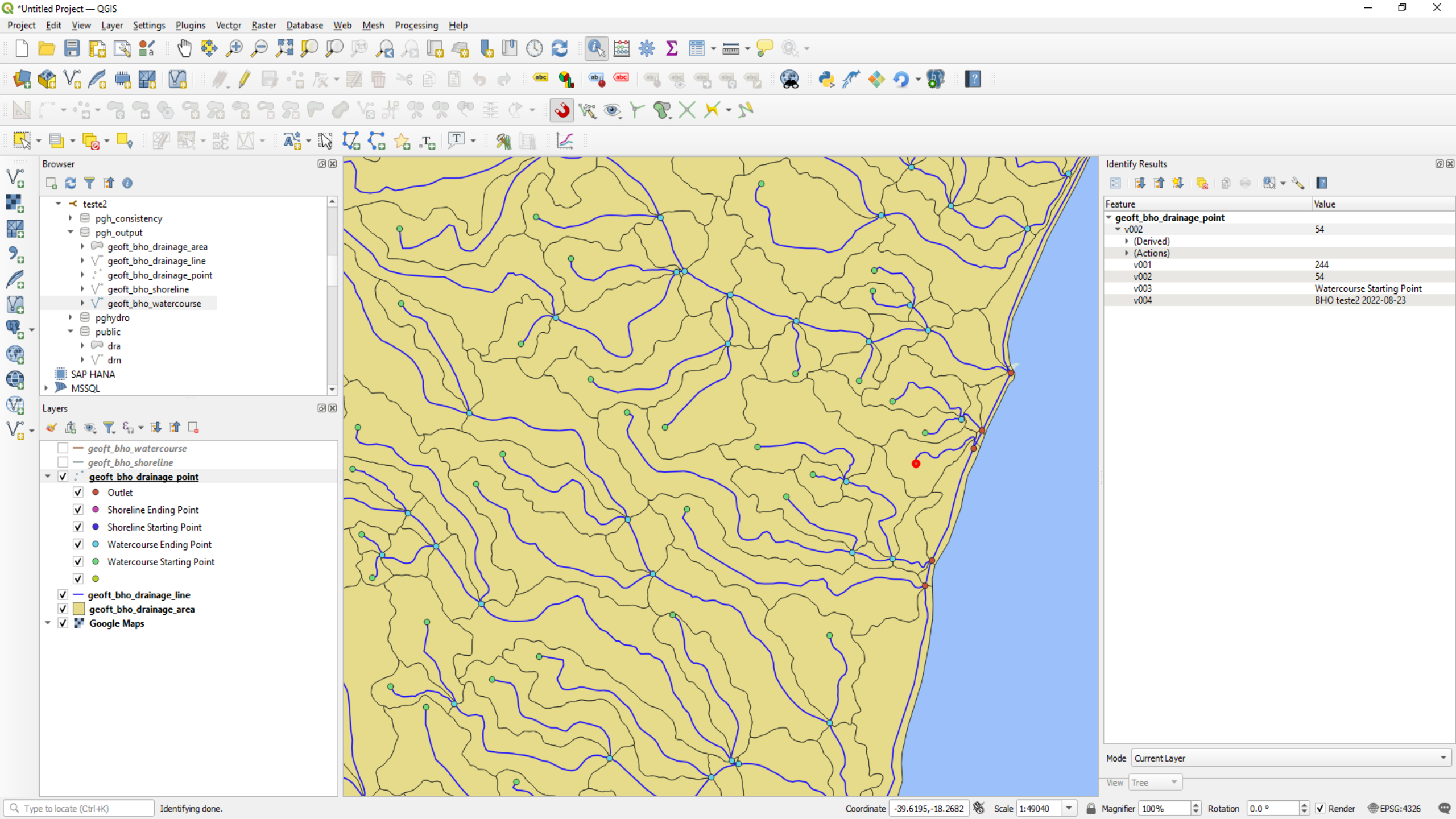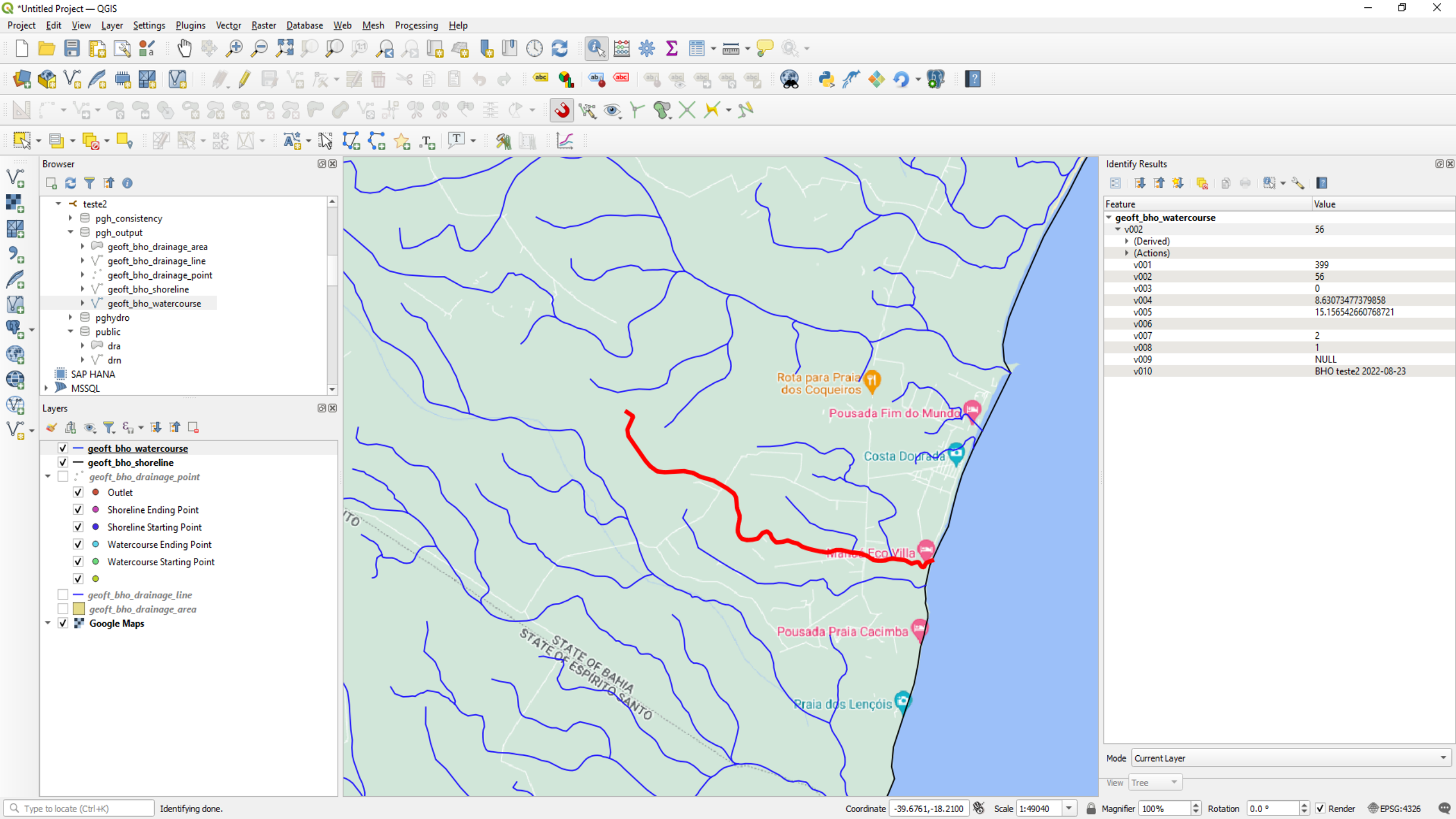
SELECT *
FROM geoft_bho_drainage_line
WHERE v005 >= '7597883'
AND v004 like '759788%'
ORDER by v005;

pfafstetter = '7597883'
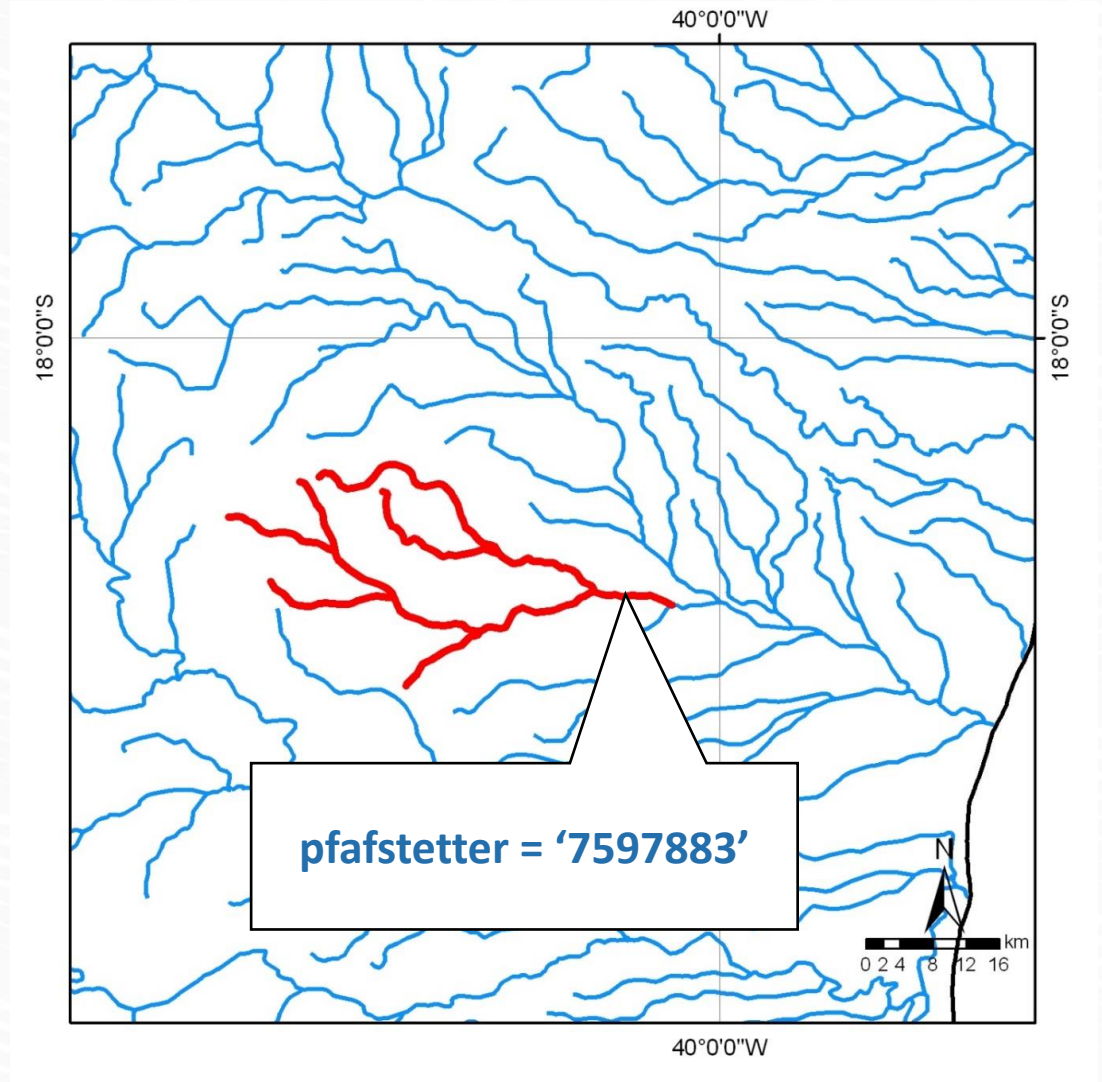
Main Advantages of Pfafstetter System

- Use of a natural and hierarchical method;

- Based on the topography of the drained area;

- Drainage system topology can be identified through the digits code;

- Easily implemented by a computer program, as well as the Geographic Information System (GIS).

Main Disadvantages of Pfafstetter System

- Related to the representation of the river system by means of an anti-arborescence binary graph:

- Requires that all arcs are connected and do not present cycles nor loops;

- Appropriate only for drainage systems composed of single channels that are straight, sinuous, meandering or tortuous;

- Not appropriate in regions where the multiple channels are branched, anastomosing, reticulated, deltaic or labyrinthine in rocky areas.

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PgHydro

Main Characteristics
Visualization in GIS
Complex SQL Queries
Very Large SQL Queries
Domain Tables
Normalized Tables
Indexed columns (spatial and non-spatial data)
Hydrographic Functions
Multi-user editing
Data Security
Data Backup

Otto-Codified Hydrographic Dataset (BHO)

Main Characteristics
Visualization in GIS
Simple Queries using GIS SQL
Easy Manipulation and dissemination
Redundant Information

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BHO 2004 (123.660)

BHO 2004	Scale
Resto do Brasil	1:1.000.000
Bacia Rio Amazonas	1:2.500.000
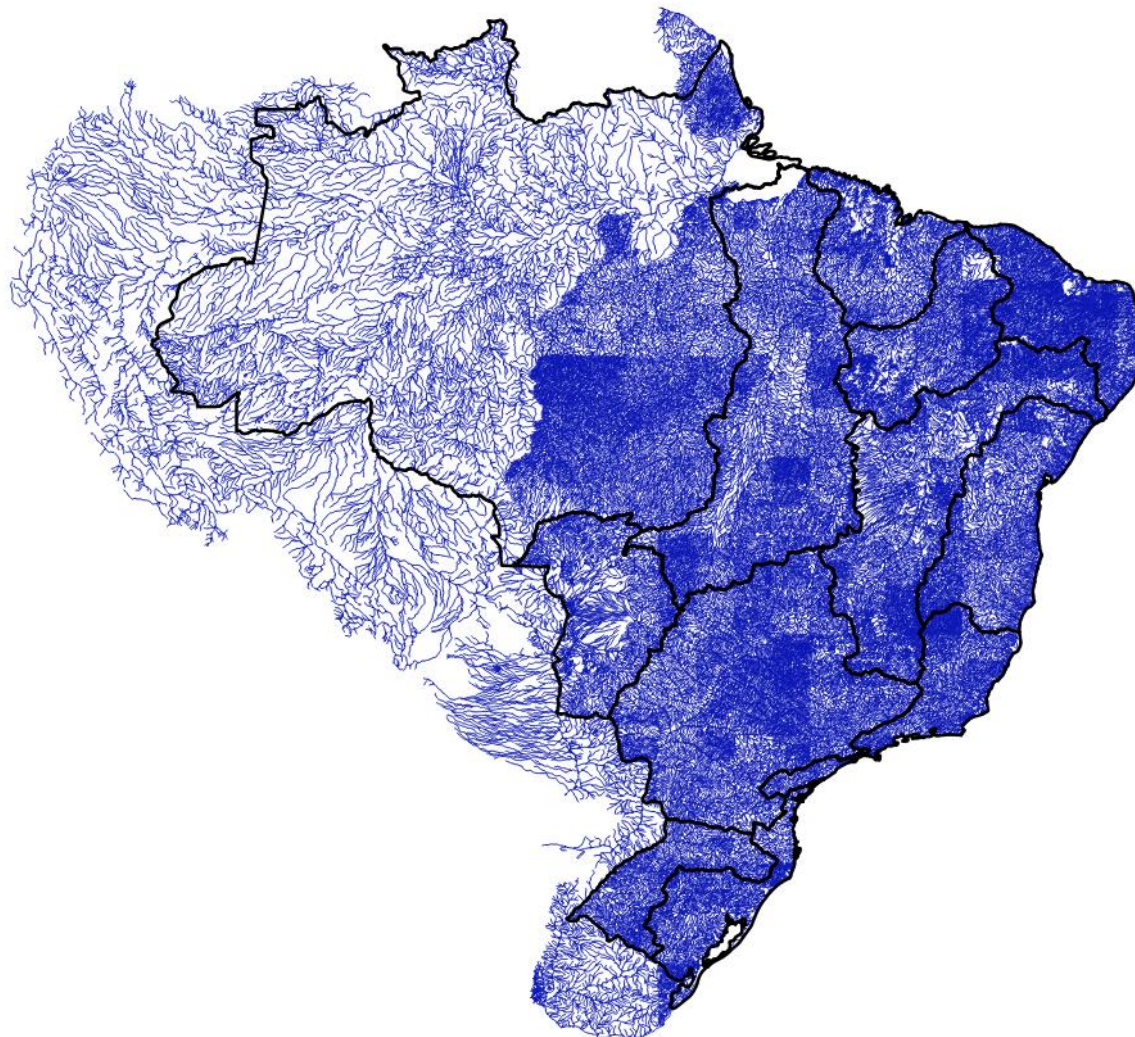
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BHO 6.2 (5.483.633)

BHO 2022	Scale
Região Amazônica	1:250.000
Região do Tocatins-Araguaia	1:100.000
Região do Atlântico Nordeste Ocidental	1:250.000
Região do Parnaíba	1:100.000
Região do Atlântico Nordeste Oriental	1:100.000
Região do São Francisco	1:100.000
Região do Atlântico Leste	1:100.000
Região do Atlântico Sudeste	1:25.000/1:50.000/1:100.000
Região do Atlântico Sul	1:25.000/1:50.000
Região do Paraguai	1:250.000
Resto da Região do Paraná	1:25.000/1:50.000/1:100.000
Países Sulamericanos não lusofonos	1:5.000.000

Catálogo de Metadados da ANA ×

metadados.snirh.gov.br/geonetwork/srv/por/catalog.search:jsessionid=4A13FFD1E6851D3FB9DA41551F8DE6A0#/search?any=BHO

Apps   Favoritos   intranetANA — AG...   Google Calendar -...   Outlook.com - Micr...   Email – Alexandre d...   JACK 96.9 - playing...   89FM A Rádio Rock...   Outros favoritos   Lista de leitura

ANA   Catálogo de Metadados da ANA   Pesquisar   Mapa   Entrar   Portuguesa

BHO

Nada na cesta

1 - 20 em 33   Ordenado por relevância

Filtro

Expandir   Colapso

TIPOS DE RECURSOS
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AÇÕES DISPONÍVEIS
Transferível (32)
Visível (4)

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all (15)

CONTATO PARA O RECURSO
Agência Nacional de Águas (33)
Ministério do Meio Ambiente (1)

FORNECIDO POR
Catálogo de Metadados da ANA (33)

Categorias   ANA

Base Hidrográfica Ottocodificada Multiescalas 2017 (BHO 2017)

A Base Hidrográfica Ottocodificada (BHO) utilizada pela ANA na gestão de recursos hídricos é obtida a partir do Mapeamento Sistemático Brasileiro. A BHO é gerada a partir da cartografia digital da hidrografia do país e organizada de modo a gerar informações hidrologicamente consistentes. Para tanto, .a

Superintendência de Planejamento de Recursos Hídricos

Concluído

Categorias   ANA

Base Hidrográfica Ottocodificada Multiescalas 2017 50k (BHO50k)

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Superintendência de Planejamento de Recursos Hídricos

Concluído

Categorias   ANA

Base Hidrográfica Ottocodificada Multiescalas 2017 5k (BHO5k)

A Base Hidrográfica Ottocodificada (BHO) utilizada pela ANA na gestão de recursos hídricos é obtida a partir do Mapeamento Sistemático Brasileiro. A BHO é gerada a partir da cartografia digital da hidrografia do país e organizada de modo a gerar informações hidrologicamente consistentes. Para tanto, .a

Superintendência de Planejamento de Recursos Hídricos

Categorias   ANA

Base Hidrográfica Ottocodificada da Bacia do Rio Uruguai

A Base Hidrográfica Ottocodificada (BHO) utilizada pela ANA na gestão de recursos hídricos é obtida a partir do Mapeamento Sistemático Brasileiro. A BHO é gerada a partir da cartografia digital da hidrografia do país e organizada de modo a gerar informações hidrologicamente consistentes. Para tanto, .a

Superintendência de Planejamento de Recursos Hídricos

MAPA

Pghydro Tools

| rea | Final Hydrographic Information | Update Output Geometry Tables | Hydronymia | Multi-User Editing | Version | ◀ ▶ |

PgHydro Tools Version 3.2

www.pghydro.org

REQUIREMENTS:
-Postgresql version 9.1+
-PostGIS version 2.0+
-PgHydro version 6.4: https://github.com/pghydro/pghydro/tree/master

Console

User Successfully Granted:
natalia

23.08.2022 - 13:33:54
Revoking User. Please, wait...

User Successfully Revoked:
natalia

23.08.2022 - 13:33:55
Granting Users. Please, wait...

User Successfully Granted:
natalia

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PgHydro Project
pghydro

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PgHydro Project

Brasília, Federal District, Brazil

http://www.pghydro.org

Achievements
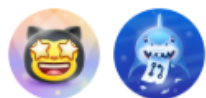
Block or Report

Popular repositories

pghydro   Public

PgHydro extends the PostGIS/PostgreSQL geospatial database to provide drainage network analysis functionality to help on water resources decision making.

● PLpgSQL   ☆ 37   ⑂ 4

pghydrotools   Public

QGIS PgHydroTools Plugin is an interface used in QGIS to activate all functionality of PgHydro Extension for PostgreSQL/PostGIS.

● Python   ☆ 8   ⑂ 4

1 contribution in the last year

	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Mon												
Wed												
Fri												

Learn how we count contributions   Less ☐☐☐☐☐ More
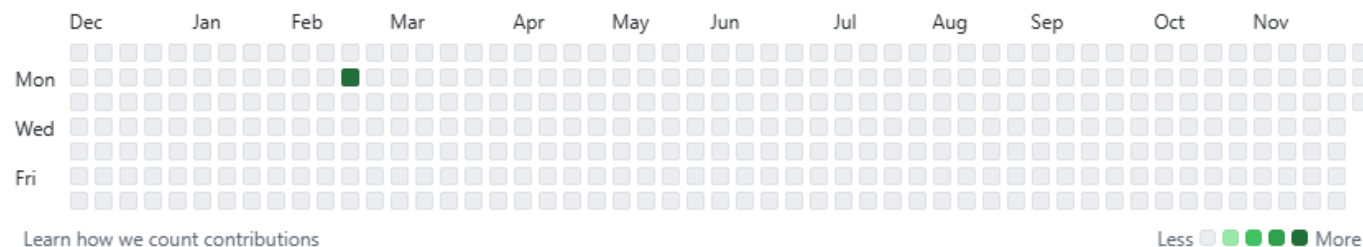
Contribution activity

2024
2023
2022
2021
2020
2019
2018

December 2024

pghydro has no activity yet for this period.

Show more activity

Seeing something unexpected? Take a look at the GitHub profile guide.

REQUIREMENTS

Postgresql version 9.1+

PostGIS version 3.x

PostGIS Raster

INSTALLATION (v.6.6)

1 - Download the last pghydro stable release file Source code (zip) from the site
https://github.com/pghydro/pghydro/releases

2 - Unzip, copy and paste *.sql and *.control files to \PostgreSQL\x.x\share\extension

Postgresql 9.1+

```
createdb mydatabase
psql mydatabase -c "CREATE EXTENSION postgis"
psql mydatabase -c "CREATE EXTENSION postgis_raster"
psql mydatabase -c "CREATE EXTENSION pghydro"
psql mydatabase -c "CREATE EXTENSION pgh_raster"
psql mydatabase -c "CREATE EXTENSION pgh_hgm"
psql mydatabase -c "CREATE EXTENSION pgh_consistency"
psql mydatabase -c "CREATE EXTENSION pgh_output"
```

Tutorial (v.6.6) - Also can be used for versions 6.2 or 6.4

Youtube: https://www.youtube.com/channel/UCgkCUQ-i72bBY41a1bhVWyw

Version 6.6 Latest

Compare ▾

🖼️ **pghydro** released this Aug 23, 2022 · **11 commits** to master since this release 🏷️ v.6.6 ⦿ 1410768 ✅

Last stable release that works with PostgreSQL 9+ and PostGIS 3.x

▼ **Assets** 2

📦 **Source code** (zip)	Aug 23, 2022
📦 **Source code** (tar.gz)	Aug 23, 2022

☺

PgHydro is Open Source, available under the GPLv2 license and is supported by a growing community of individuals, companies and organizations with an interest in management and decision making in water resources.

REQUIREMENTS

Postgresql version 9.1+

PostGIS version 2.0+

QGIS version 3.10+

Pghydro 6.4+

Pghydro Consistency 6.4+

Pghydro Output 6.4+

INSTALLATION

The plugin was developed in python and the latest stable release is available for download by QGIS or by the link https://plugins.qgis.org/plugins/PghydroTools/

Notes

IMPORTANT : the changes are made in the current project, and will be saved only if you save the project.

Authors

Alexandre de Amorim Teixeira

Licence

GPL V2

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Pghydro Tools

Plugin ID: 1047   ⧉

⭐⭐⭐⭐⭐ (18) votes

PgHydro Tools Interface for PgHydro Extension for PostgreSQL/PostGIS

About   Details   **Versions**

| Version	Experimental	Min QGIS version	Max QGIS version	Downloads	Uploaded by	Date
3.2	no	3.0.0	3.99.0	5236	pghydro	1 de abr. de 2021, 22:47 BRT
3.0	no	3.0.0	3.99.0	368	pghydro	1 de mar. de 2021, 14:05 BRT
2.4	no	2.0.0	2.99.0	782	pghydro	27 de fev. de 2020, 15:25 BRT
2.2	no	2.0.0	2.99.0	3082	pghydro	17 de jan. de 2018, 14:32 BRST
2.0.2	yes	2.0.0	2.99.0	1741	pghydro	3 de ago. de 2017, 16:46 BRT

All

Installed
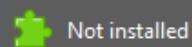
Not installed
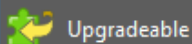
Upgradeable
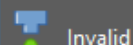
Invalid
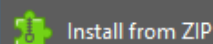
Install from ZIP
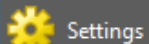
Settings

Search...

- Path Sorting
- pathfinder
- PCA4CD - PCA for change de
- PCRaster Tools
- PDALtools
- PDOK BAG Geocoder
- PDOK Locatieserver Locator F
- PDOK services plugin
- Peel Orange Scale Distortion
- Pelias Geocoding
- pgChainage
- ✓ Pghydro Tools
- PgMetadata
- pgRoutingLayer
- PgVersion
- Physiocap3
- PIBC
- Pic2Map
- pickLayer
- Picterra
- PintMap
- PipelineML GeoPackager
- PisteCreator
- Place Marker
- Placekey - Address Matching
- Plain Geometry Editor
- Planet_Explorer
- Plot Boundary
- ☐ Plugin Builder 3
- Plugin Load Times
- Plugin QGIS SPT
- ✓ **Plugin Reloader**
- Pobieracz danych GUGiK
- POI Exporter
- POI Visibility Network
- Point Cadastre
- Point sampling tool

Pghydro Tools

PgHydro Tools Interface for PgHydro Extension for PostgreSQL/PostGIS

QGIS PgHydroTools Plugin is an interface used in QGIS to activate all functionality of PgHydro Extension for PostgreSQL/PostGIS

⭐⭐⭐⭐⭐ 11 rating vote(s), 8690 downloads

Category	Database
Tags	spatial database system, otto pfafstetter, drainage, hydrology, hydrography, hydro
More info	homepage bug tracker code repository
Author	PgHydro Team
Installed version	3.2
Available version (stable)	3.2 updated at Thu Apr 1 20:47:42 2021
Changelog	2.0.1 - "No module named resources_rc" fixed.

2.0.2 - Execute and Return Queries update.
2.1 - Translate to English
- Creation of Print_Message_Console Function
- Rename function
pgh_consistency.pghft_drainageareahaveselfintersection and associated objects to
pgh_consistency.pghft_drainageareaoverlapdrainagearea
- Rename function def Check_DrainageTouchDrainageLine to def Check_DrainageLineTouchDrainageLine
- Insertion of function self.Turn_OFF_Audit() before the each main procedure
- Disable_role bug fixed
- Insert of new version logo
- Resource_rc bug fixed including and not more deleting codes.
- ...
2.4 - Rename "Connect" label button to "Test Connection"
- Update Version labels to version 2.4

Upgrade All

Uninstall Plugin   Reinstall Plugin

Close   Help

pghydro project - YouTube

youtube.com/channel/UCgkCUQ-i72bBY41a1bhVWyw

Premium BR

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76 inscritos

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Envios ▶ REPRODUZIR TODOS

40:43

Alternative Steps 3/4/5 -
Create/Import/Process Dat...
443 visualizações • há 3 anos

14:05

Step 5 - Process Data Using
Pghydro Tools v2.2/Pghydr...
572 visualizações • há 3 anos

9:02

Step 4 - Import Data Using
Pghydro Tools v2.2/Pghydr...
575 visualizações • há 3 anos

2:05

Step 3 - Create Pghydro
Schema v6.2 Using Pghydro...
557 visualizações • há 3 anos

1:01

Step 2 - Install pghydro tools
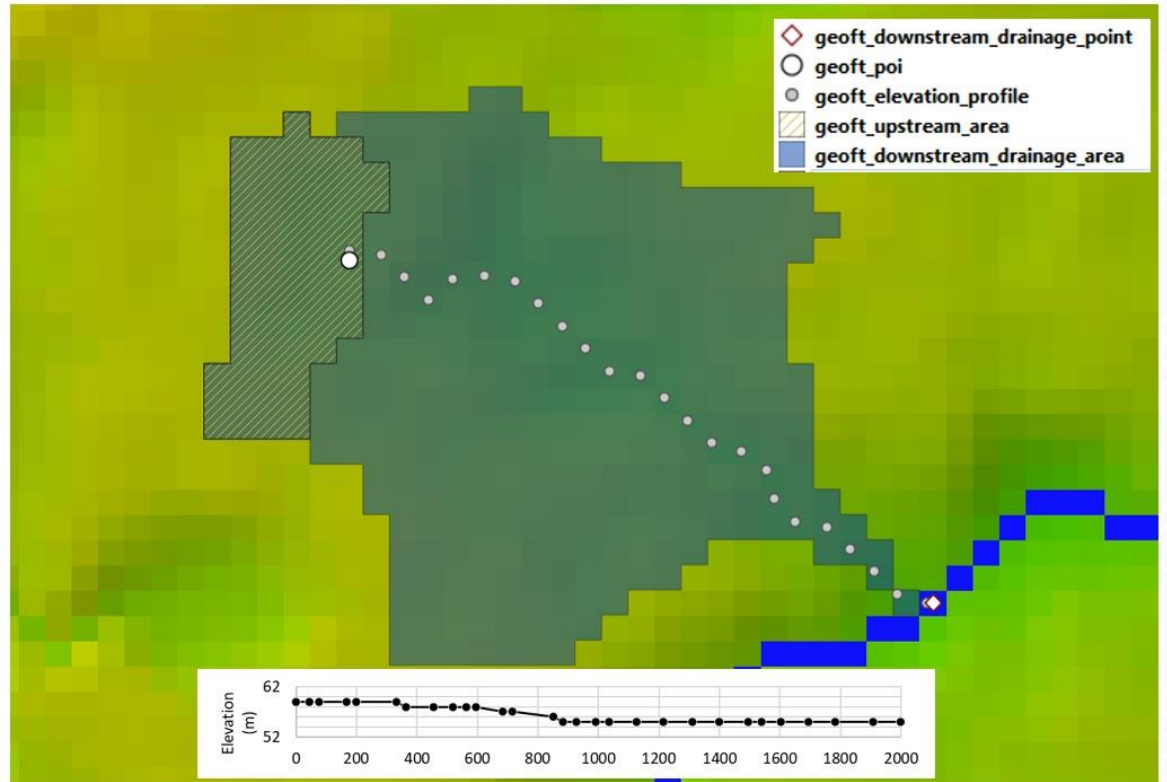v2.2 (QGIS Plugin) pghydro...
590 visualizações • há 3 anos

New Features: pgh_raster

- pgh_raster extension
  - Pgraster;
  - Based on DEM;
  - Synthetic drainage;
  - Elevation profile;
  - Hydro geomorphological information;
  - Raster data per drainage area and accumulated upstream;
  - Expand Object Comments to Schemas, Tables and Attributes.

New Features: pgh_hgm

- ## pgh_hgm extension
  - ### Pgraster;
  - ### Based on DEM;
  - ### Hydrogeomorphometric information;

Tempo de propagação de onda de cheia (h) (m/s)
Velocidade de onda dinâmica (m/s)
Tempo de propagação de onda dinâmica (segundos)

Tempos de concentração
Tempo de concentração pela equação de Kirpich
Tempo de concentração pela equação de U.S. Army Corps
Tempo de concentração pela equação de Watt & Chow
Tempo de concentração pela equação de Carter
Tempo de concentração pela equação de Dooge

Modelo de Jobson (dispersão de poluentes)
Velocidade de pico (Eq. 12) - modelo completo: F(A',Q',S,Q,A)
Velocidade Máxima provável (Eq. 13) - modelo completo: F(A',Q',S,Q,A)
Tempo de pico (horas)
Tempo de chegada – "Leading edge" (horas)

Tabela 1. Listagem final das variáveis definidas a serem programadas na primeira versão da extensão pgh_hgm. O esquema de cores de fundo adotado na tabela serve para identificar mais facilmente o tipo de variável.

Atributo
Hidrogeomorfométricos
Compacidade de bacias hidrográficas
Fator de forma de bacias hidrográficas
Circularidade de bacias hidrográficas
Relação de relevo de bacias hidrográficas
Sinuosidade dos trechos de drenagem
Gradiente dos trechos de drenagem
Densidade de drenagem
Hidrodensidade (número de trechos)
Distância média do escoamento superficial
Desníveis e declividades
Desnível de máx-min do trecho, entre elevações máxima e mínimo
Desnível de extremos do trecho, entre elevações no ponto inicial e final
Desnível s15-85 do trecho, entre elevações nos percentis 15 e 85% do comprimento
Desnível p15-p85 do trecho, entre percentis 15 e 85% das elevações
Declividade de máx-min do trecho
Declividade de extremos do trecho
Declividade s15-85 do trecho
Declividade p15-p85 do trecho
Declividade ponderada
Declividade por regressão linear
Declividade harmônica ou equivalente
Relações Geomorfológicas
w = Largura (m) com base em relações Geomorfológicas para o Brasil
h = Profundidade (m) com base em relações Geomorfológicas para o Brasil
Velocidades e Propagação de onda de cheia
Velocidade pela eq. de Manning (seção transversal) (m/s)
Celeridade pela eq. de Manning (seção transversal) (m/s)

New Features: pgh_hgm

- pgh_hgm extension
  - Pgraster;
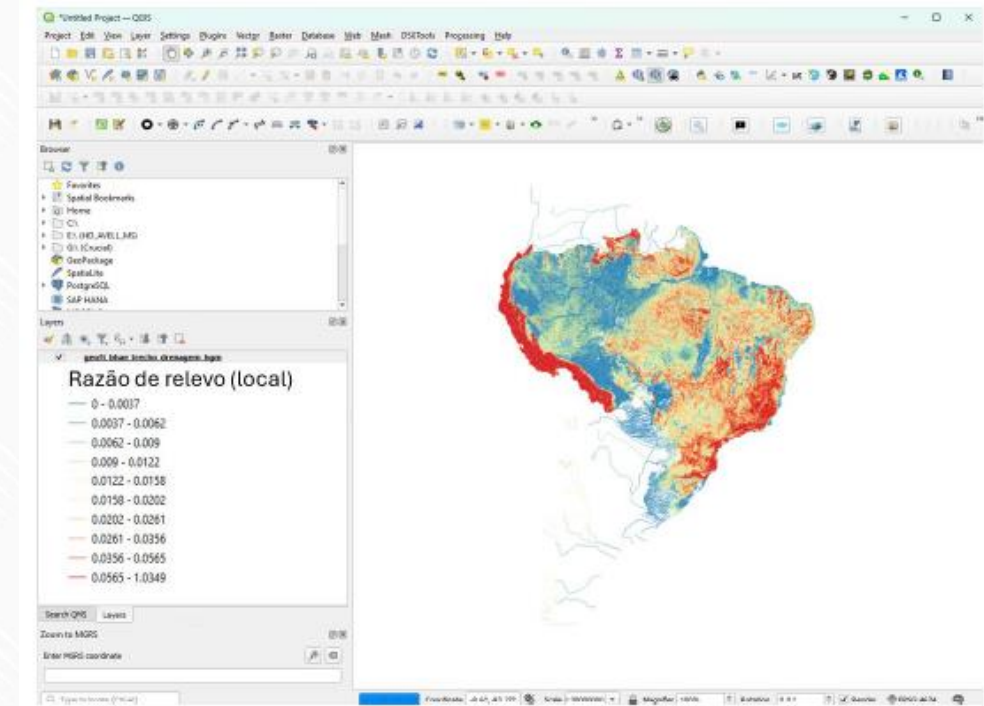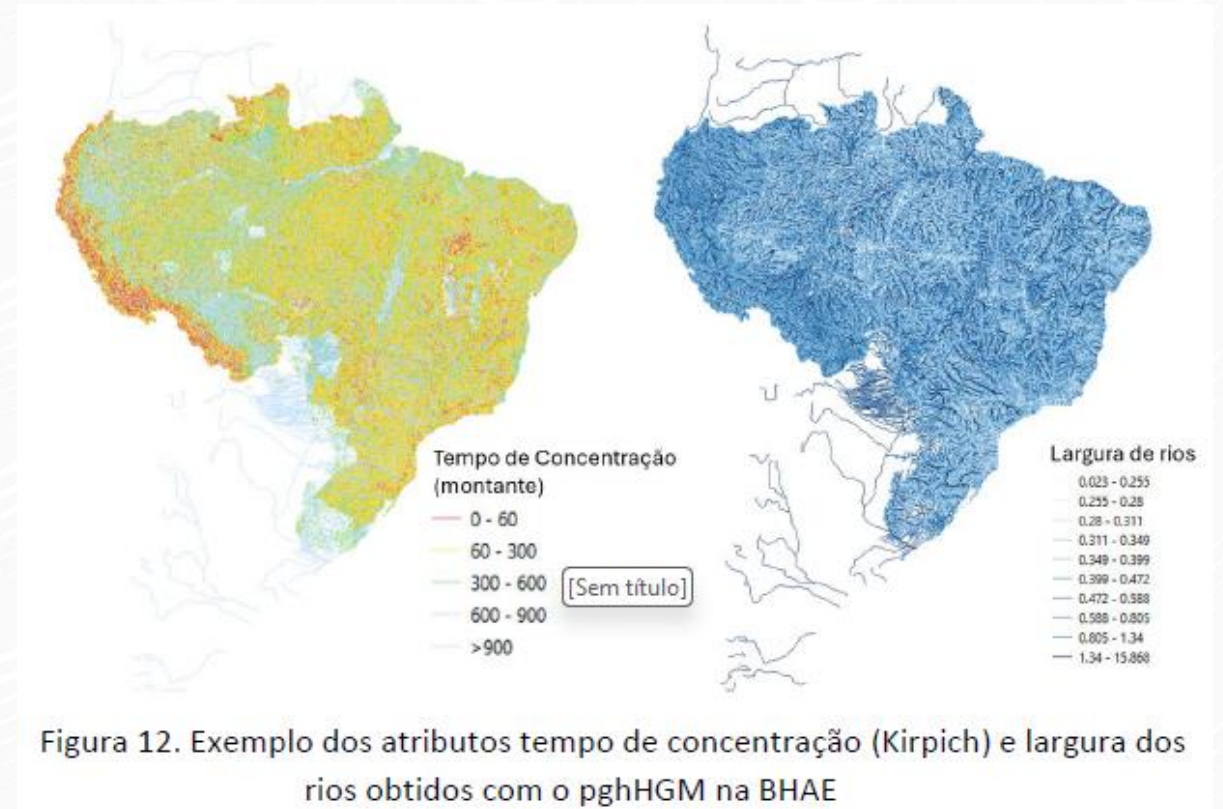 - Based on DEM;
  - Hydrogeomorphometric information;

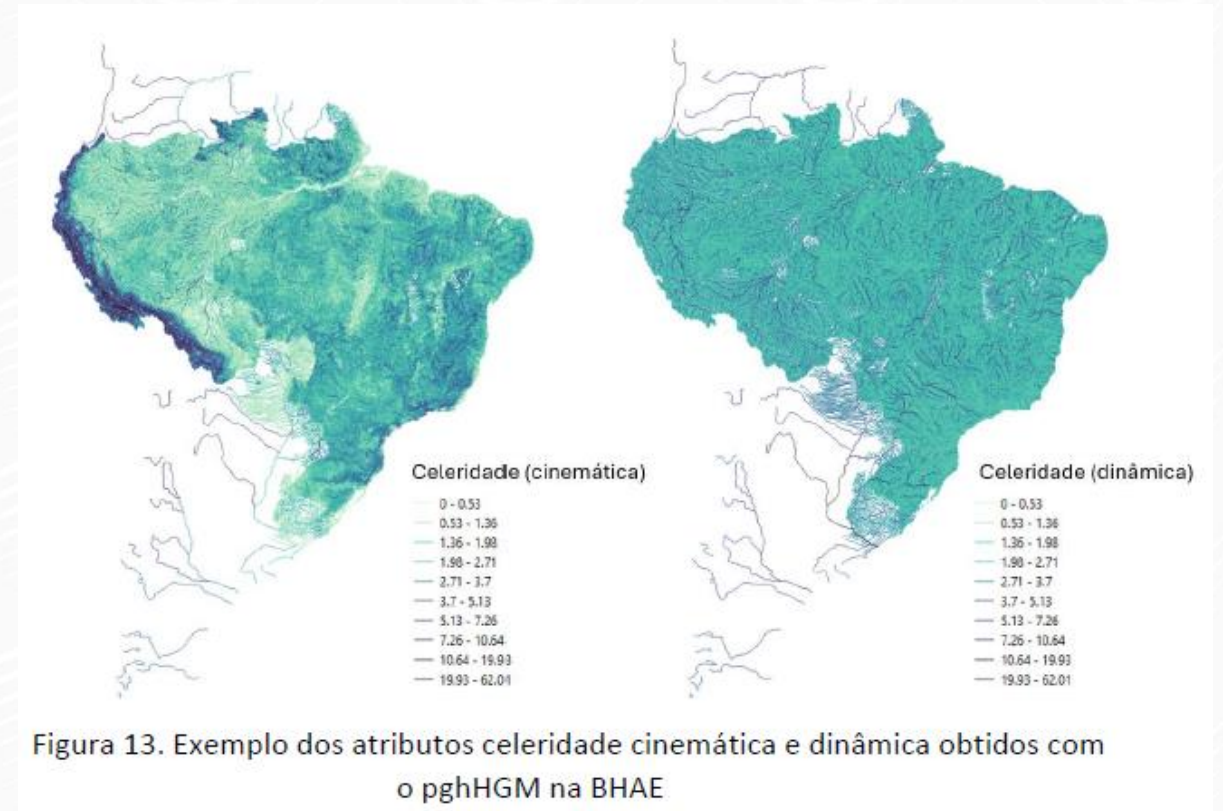Figura 11. Exemplo do atributo Razão de Relevo, em área de contribuição local, obtido com o pghHGM na BHAE

New Features: pgh_hgm

- pgh_hgm extension
  - Pgraster;
  - Based on DEM;
  - Hydrogeomorphometric information;

Figura 12. Exemplo dos atributos tempo de concentração (Kirpich) e largura dos rios obtidos com o pghHGM na BHAE

New Features: pgh_hgm

- pgh_hgm extension
  - Pgraster;
  - Based on DEM;
  - Hydrogeomorphometric information;

Figura 13. Exemplo dos atributos celeridade cinemática e dinâmica obtidos com o pghHGM na BHAE

#AÁguaÉUmaSó

Thank
You!
see you soon

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