LABORATÓRIO REGIONAL DE ENGENHARIA CIVIL

INSPIRE AÇORES

Sessões Técnicas 2016

3. ª Sessão Técnica

Harmonização de dados de Sondagens Geotécnicas com base no **Modelo de Dados**

INSPIRE RAA e no **HALE**

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Laboratório Regional de Engenharia Civil,

Ponta Delgada, 24 de maio de 2016

Tópicos da Comunicação

- ✓ **Enquadramento;**
- ✓ **Base de Dados em Sistemas de Informação Geográfica (SIG): Sondagens Geotécnicas – 26N;**
- ✓ **Harmonização com o Modelo de Dados RAA;**
- ✓ **Validação com Hale**
- ✓ **Considerações Finais e Perspetivas Futuras**

Enquadramento

- O LREC tem realizado serviços no âmbito Prospeção Geotécnica (Sondagens à Rotação), de modo a servir de apoio ao dimensionamento de obras de engenharia civil/geotécnica.

- Inserção em Base de dados (SIG) os conteúdos de Relatórios, Notas técnicas e Boletins de Ensaios em formato analógico e/ou digital.

  - Consulta e a exploração dos dados obtidos é um processo moroso.

Sondagens Geotécnicas

- Conteúdos gerais da base de dados:
  - Dados de carater geral dos Relatórios;
  - Informação sobre sondagens (métodos de perfuração, designação da sondagem);
  - Localização espacial;
  - Caraterização lito-estratigráfica em profundidade;
  - Índices de qualidade de maciços rochosos (RQD, Alterabilidade, Fraturação);
  - Resultados de ensaios de campo (SPT);
  - Resultados sobre a caracterização física e mecânica de solos e rochas, por ensaios laboratoriais.

Sondagens Geotécnicas

✓ Inventariação da informação

Figura 1 : Relatório de Sondagens à Rotação

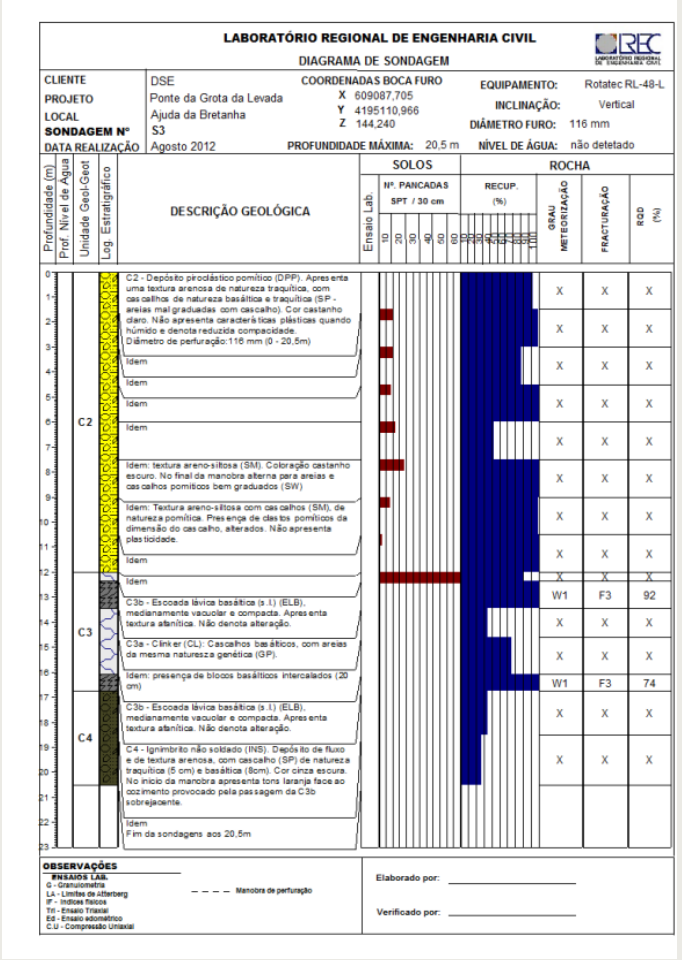


Figura 2: Diagrama de Sondagem

Sondagens Geotécnicas

✓ Preenchimento - Tabela de Atributos

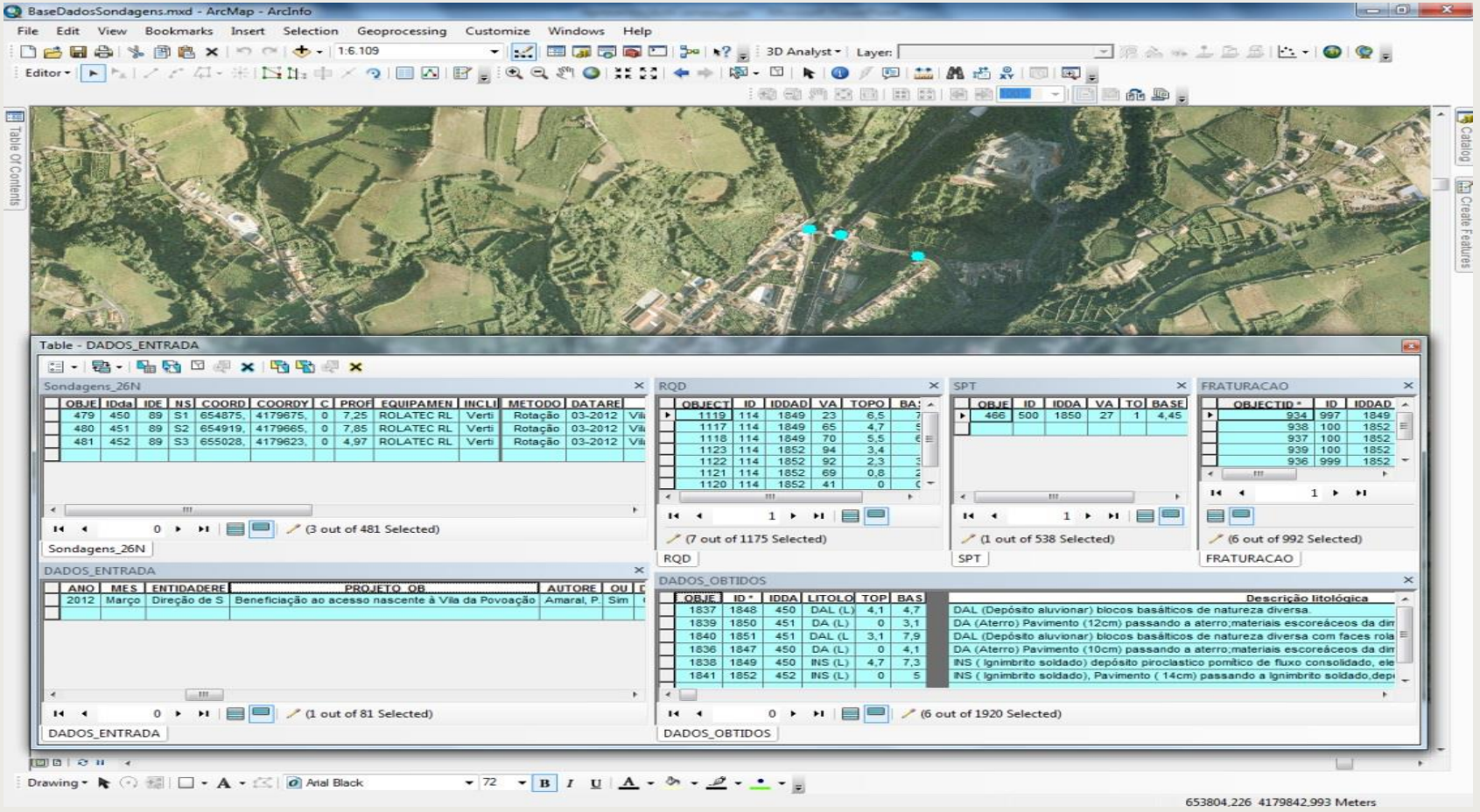


Figura 3: Tabela de Atributos

Sondagens Geotécnicas

- ✓ **Representação Geográfica**

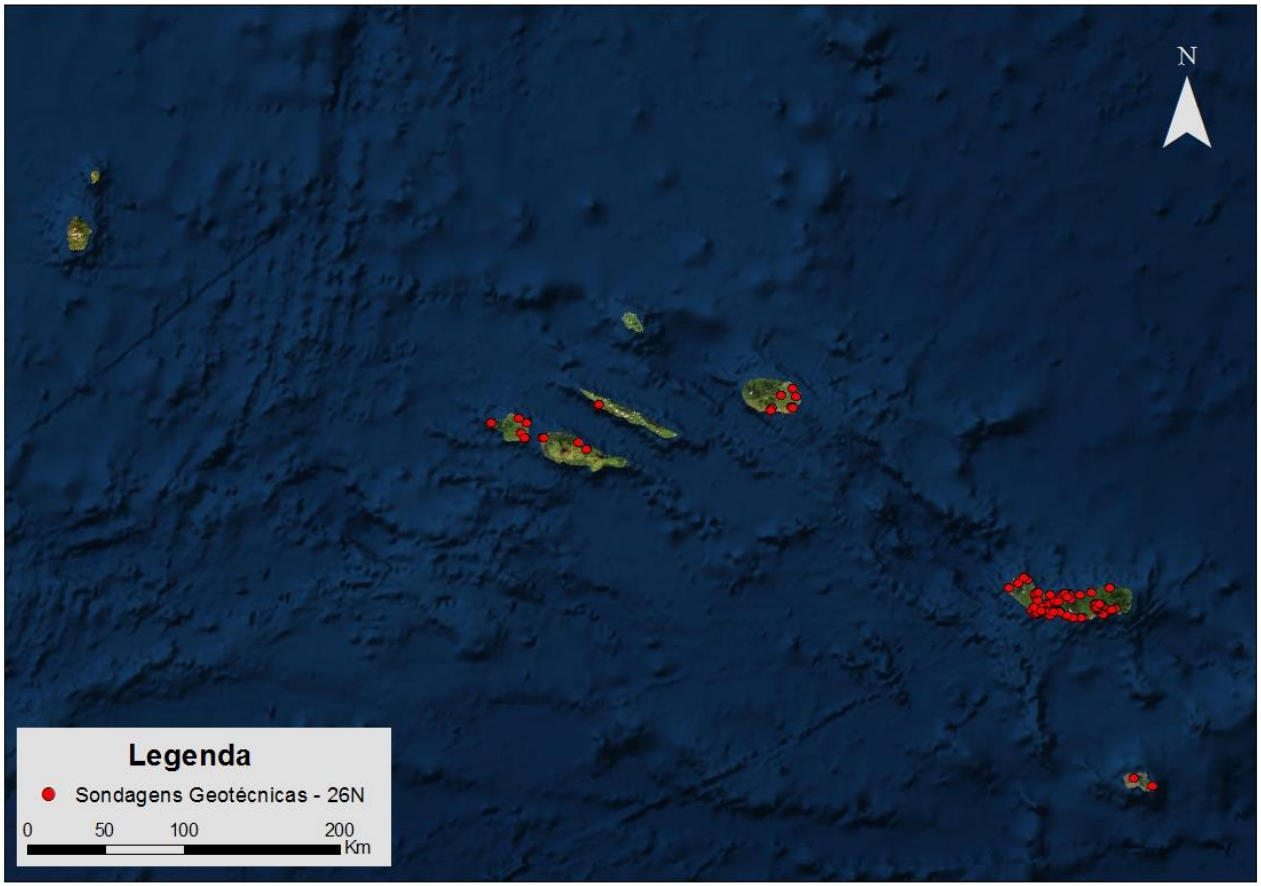


Figura 4: Distribuição das Sondagens no Arquipélago dos Açores.

Modelos de Dados INSPIRE

✓ GeologicCollection : Class diagram

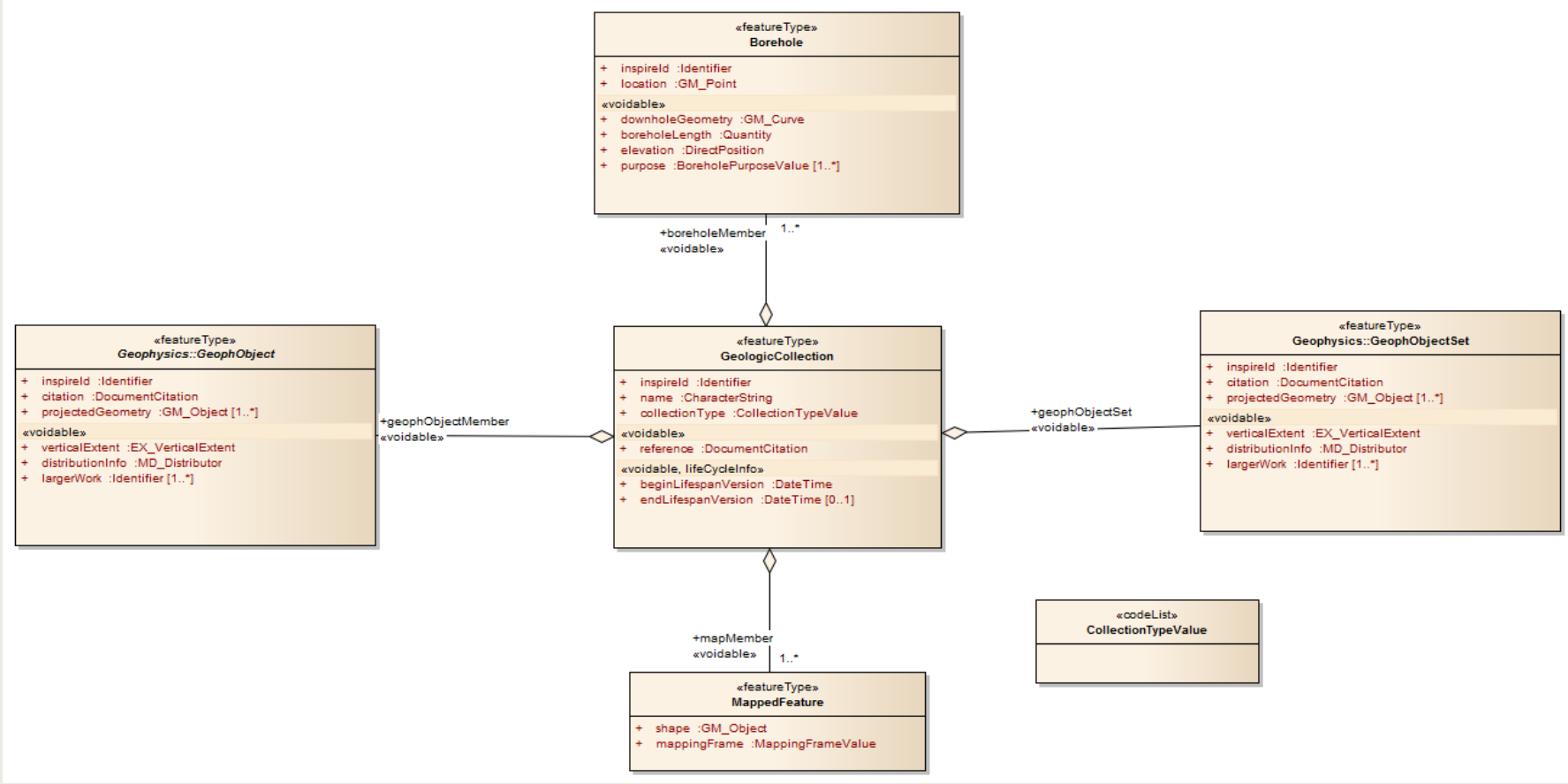
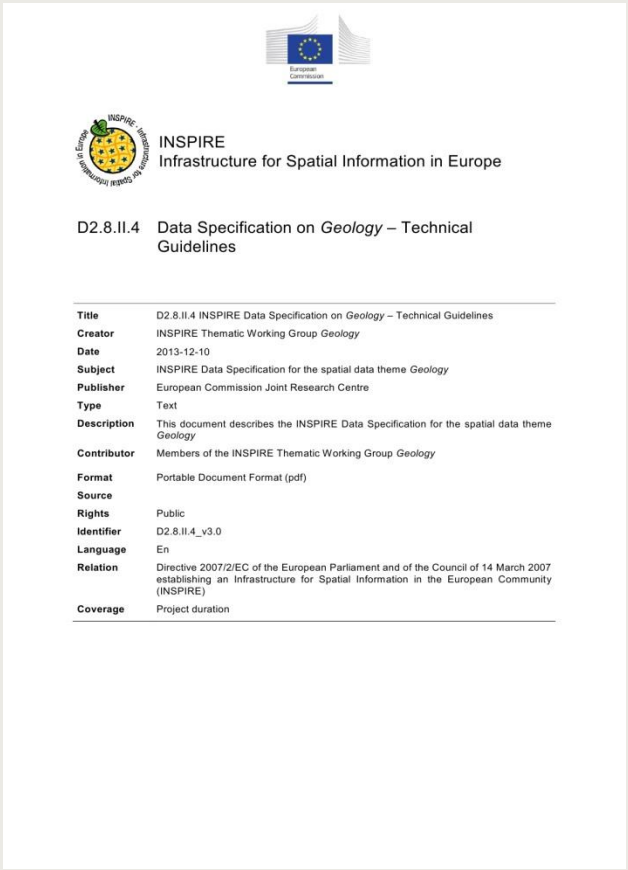


Figura 5 : UML class diagram: GeologicCollection
http://inspire.ec.europa.eu/data-model/approved/r4618-ir/html/

Modelos de Dados INSPIRE

- ✓ D2.8.II.4 Data Specification on *Geology* – Technical Guidelines



INSPIRE
Infrastructure for Spatial Information in Europe

D2.8.II.4 Data Specification on *Geology* – Technical Guidelines

Title	D2.8.II.4 INSPIRE Data Specification on *Geology* – Technical Guidelines
Creator	INSPIRE Thematic Working Group *Geology*
Date	2013-12-10
Subject	INSPIRE Data Specification for the spatial data theme *Geology*
Publisher	European Commission Joint Research Centre
Type	Text
Description	This document describes the INSPIRE Data Specification for the spatial data theme *Geology*
Contributor	Members of the INSPIRE Thematic Working Group *Geology*
Format	Portable Document Format (pdf)
Source	
Rights	Public
Identifier	D2.8.II.4_v3.0
Language	En
Relation	Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)
Coverage	Project duration

- ✓ 5.3.2.1.2. Borehole

AnthropogenicGeomorphologicFeature

Value type: AnthropogenicGeomorphologicFeatureTypeValue
Definition: Terms describing the type of a geomorphologic feature.
Multiplicity: 1

5.3.2.1.2. Borehole

Borehole

Definition: A borehole is the generalized term for any narrow shaft drilled in the ground.
Stereotypes: «featureType»

Attribute: inspireId

Value type: Identifier
Definition: External object identifier of the spatial object.
Multiplicity: 1

Attribute: downholeGeometry

Name: The downhole geometry of the borehole
Value type: GM_Curve
Multiplicity: 1
Stereotypes: «voidable»

Attribute: boreholeLength

Value type: Quantity
Definition: The distance along a borehole.
Description: This will be determined by the data provider (ie, "length" can have different sources, like drillers measurement, loggers measurement, survey).
Multiplicity: 1
Stereotypes: «voidable»

Attribute: elevation

Value type: DirectPosition
Definition: The vertical height above datum of the borehole collar.
Description: This is a compromise approach to supply elevation explictly for location; this is to allow for software that cannot process 3-D GM_Point. Use null if elevation is unknown. Direct position shall have a dimension of 1, and CRS will be a "vertical" CRS (e.g. EPSG CRSs in the range 5600-5799).
Multiplicity: 1
Stereotypes: «voidable»

Attribute: location

Value type: GM_Point
Definition: The location of the borehole collar.
Multiplicity: 1

Attribute: purpose

Value type: BoreholePurposeValue
Definition: The purpose for which the borehole was drilled.
Description: EXAMPLE: site investigation, mineral exploration, hydrocarbon exploration, water resources.
Multiplicity: 1..*
Stereotypes: «voidable»

Association role: logElement

Value type: MappedInterval
Definition: 1-D MappedFeature instances that are logged (interpreted) intervals within a

Figura 6 : Especificações Técnicas de Geologia
http://www.ideia.azores.gov.pt/projetos/inspire/Paginas/modelos-dados.aspx

Modelos de Dados INSPIRE

- ✓ 5.3.2.1.4. GeologicCollection

5.3.2.1.4. GeologicCollection

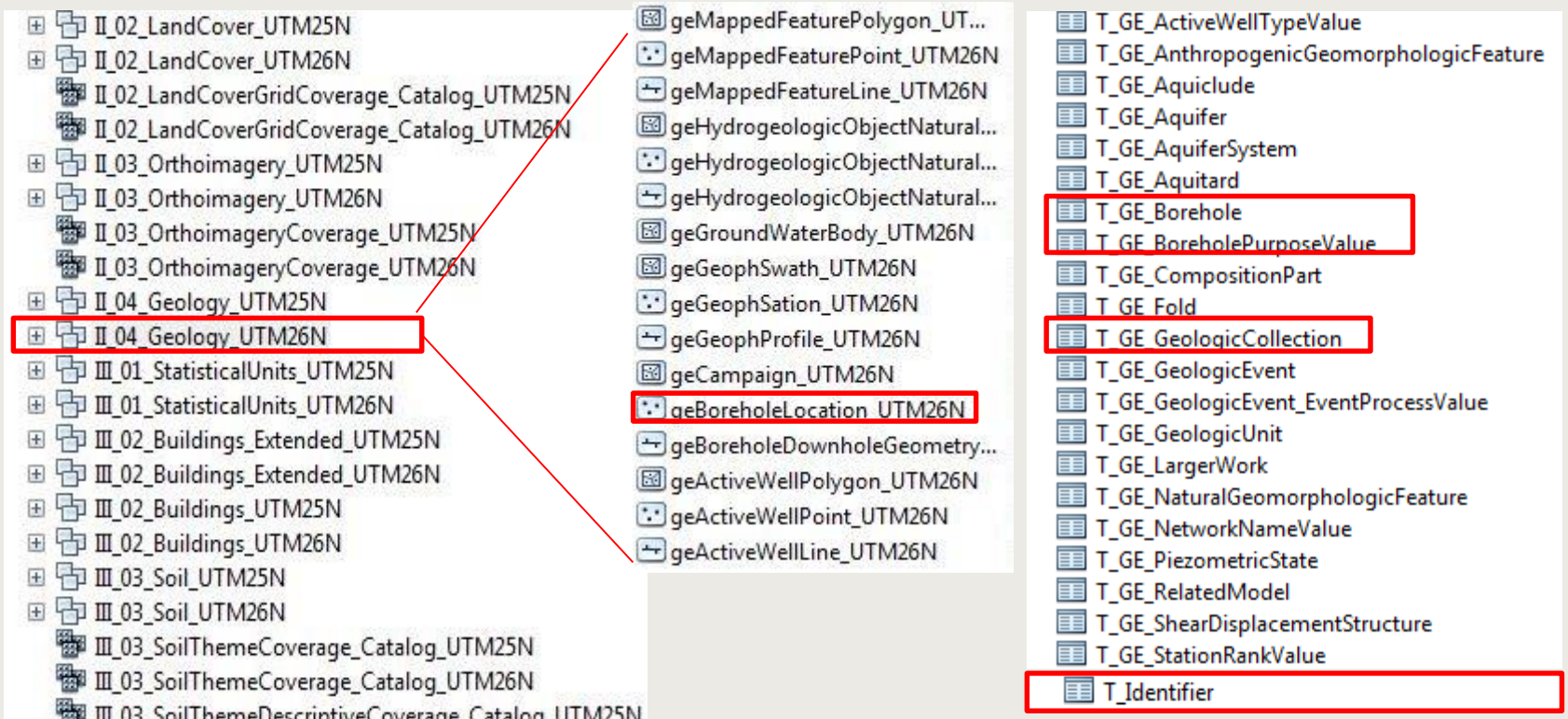
GeologicCollection	
Definition:	A collection of geological or geophysical objects.
Description:	Geologic objects are commonly grouped into collections such as geological maps, thematic maps, or the required input to a geological model.
Stereotypes:	«featureType»
Attribute: inspireId	
Value type:	Identifier
Definition:	External object identifier of the spatial object.
Multiplicity:	1
Attribute: name	
Value type:	CharacterString
Definition:	The name of the collection.
Multiplicity:	1
Attribute: collectionType	
Value type:	CollectionTypeValue
Definition:	The type of the collection.
Description:	Refers to a vocabulary of types. EXAMPLE: geological map, thematic map etc.
Multiplicity:	1
Attribute: reference	
Value type:	DocumentCitation
Definition:	A reference for the collection.
Multiplicity:	1
Stereotypes:	«voidable»

GeologicCollection	
Attribute: beginLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was inserted or changed in the spatial data set.
Multiplicity:	1
Stereotypes:	«voidable,lifeCycleInfo»
Attribute: endLifespanVersion	
Value type:	DateTime
Definition:	Date and time at which this version of the spatial object was superseded or retired in the spatial data set.
Multiplicity:	0..1
Stereotypes:	«voidable,lifeCycleInfo»
Association role: geophObjectSet	
Value type:	GeophObjectSet
Definition:	A GeophObjectSet member of a Geologic Collection.
Multiplicity:	
Stereotypes:	«voidable»
Association role: geophObjectMember	
Value type:	GeophObject
Definition:	A GeophObject member of a Geologic Collection.
Multiplicity:	
Stereotypes:	«voidable»
Association role: boreholeMember	
Value type:	Borehole
Definition:	A Borehole member of a Geologic Collection.
Description:	Association that allows Borehole objects to be included as members in a GML Collection, through the use of the GeologicCollection class.
Multiplicity:	1..*
Stereotypes:	«voidable»
Association role: mapMember	
Value type:	MappedFeature
Definition:	A Mapped Feature member of a Geologic Collection.
Description:	Association that allows MappedFeature objects to be included as members in a GML Collection, through the use of the GeologicCollection class.
Multiplicity:	1..*
Stereotypes:	«voidable»

Figura 7: Especificações Técnicas de Geologia
http://www.ideia.azores.gov.pt/projetos/inspire/Paginas/modelos-dados.aspx

Modelos de Dados RAA - INSPIRE

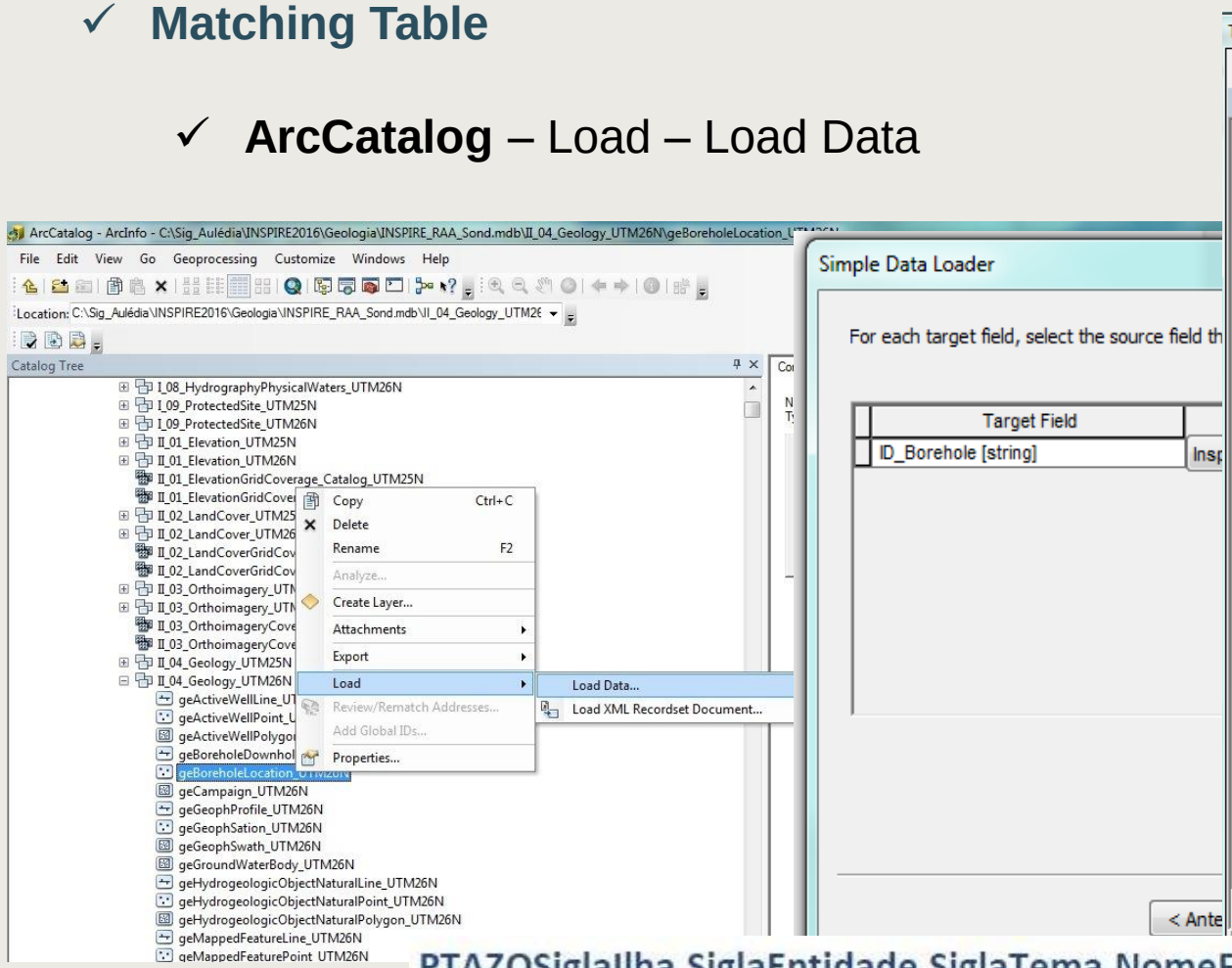
- ✓ **ModeloDados_INSPIRE_RAA_20150407**



http://www.ideia.azores.gov.pt/projetos/inspire/Paginas/modelos-dados.aspx

Modelos de Dados RAA - INSPIRE

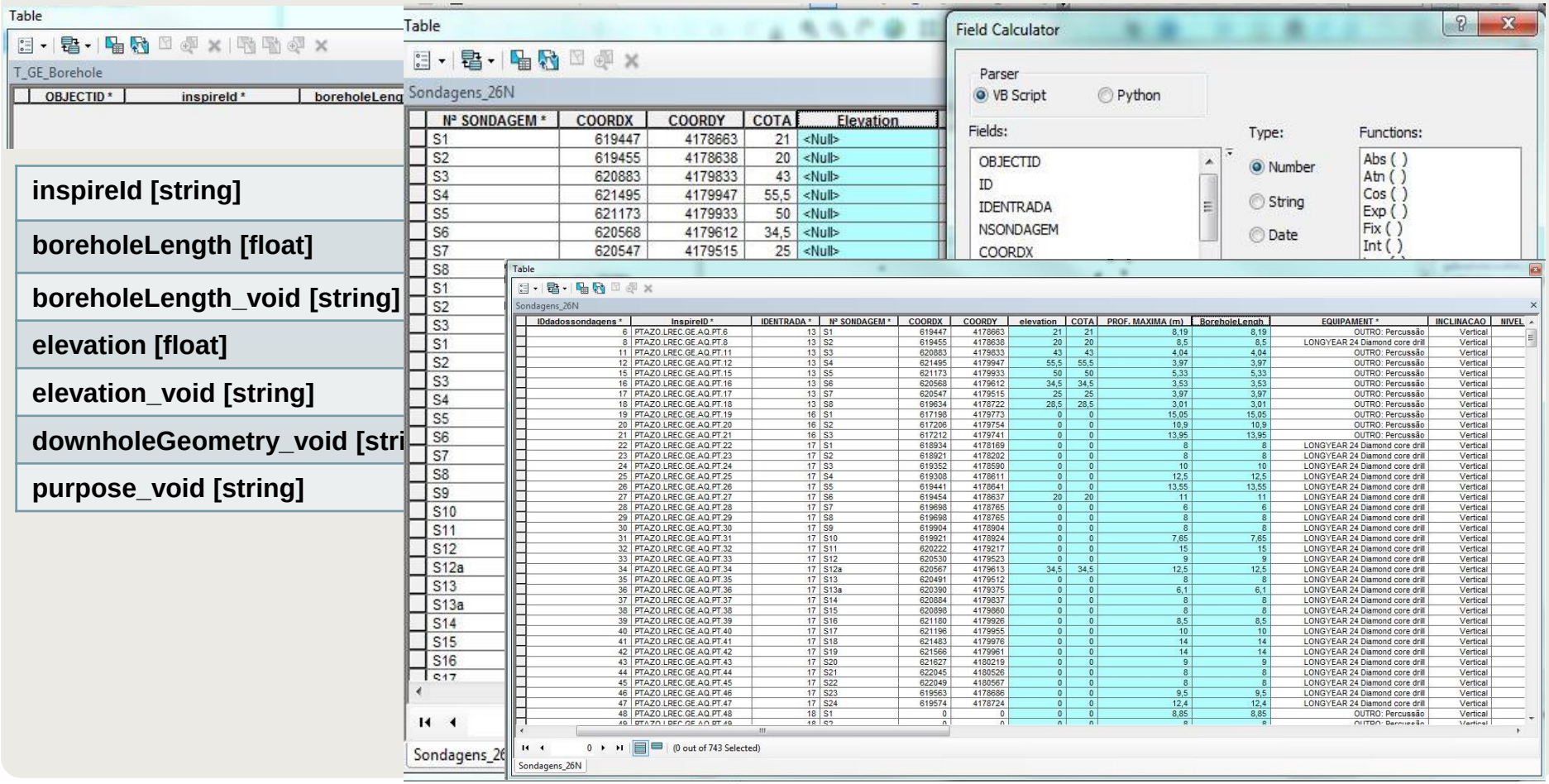
- ✓ **Matching Table**
  - ✓ **ArcCatalog** – Load – Load Data



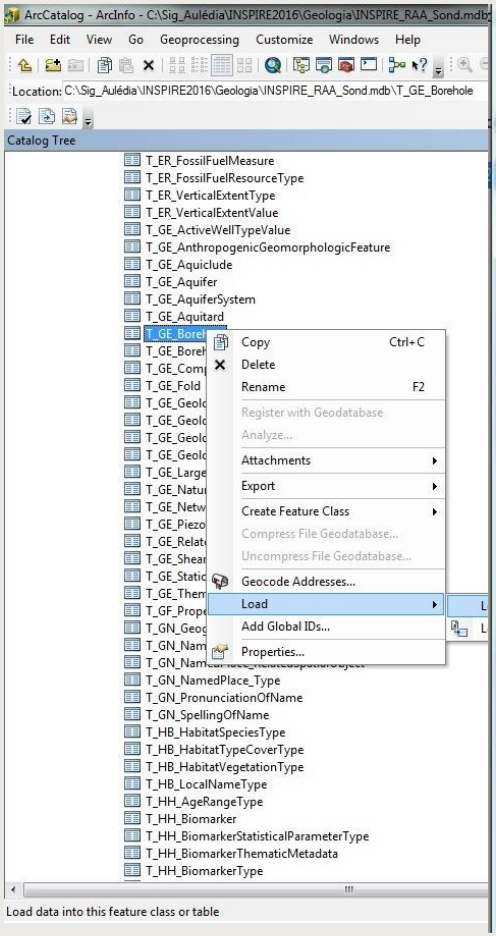
PTAZOSiglaIlha.SiglaEntidade.SiglaTema.NomeFeatureOriginal.Geometria.LocalID

Modelos de Dados RAA - INSPIRE

- ✓ **Matching Table**
  - ✓ **ArcMap** – Field Calculator



Modelos de Dados RAA - INSPIRE



Table

T_GE_Borehole

OBJECTID *	inspireId *	boreholeLength	boreholeLength_void	elevation	elevation_void	downholeGeometry_void	purpose_void
1	PTAZO.LREC.GE.AQ.PT.6	8,19	<Null>	21	<Null>	unknown	<Null>
2	PTAZO.LREC.GE.AQ.PT.8	8,5	<Null>	20	<Null>	unknown	<Null>
3	PTAZO.LREC.GE.AQ.PT.11	4,04	<Null>	43	<Null>	unknown	<Null>
4	PTAZO.LREC.GE.AQ.PT.12	3,97	<Null>	55,5	<Null>	unknown	<Null>
5	PTAZO.LREC.GE.AQ.PT.15	5,33	<Null>	50	<Null>	unknown	<Null>
6	PTAZO.LREC.GE.AQ.PT.16	3,53	<Null>	34,5	<Null>	unknown	<Null>
7	PTAZO.LREC.GE.AQ.PT.17	3,97	<Null>	25	<Null>	unknown	<Null>
8	PTAZO.LREC.GE.AQ.PT.18	3,01	<Null>	28,5	<Null>	unknown	<Null>
9	PTAZO.LREC.GE.AQ.PT.19	15,05	<Null>	0	unknown	unknown	<Null>
10	PTAZO.LREC.GE.AQ.PT.20	10,9	<Null>	0	unknown	unknown	<Null>
11	PTAZO.LREC.GE.AQ.PT.21	13,95	<Null>	0	unknown	unknown	<Null>
12	PTAZO.LREC.GE.AQ.PT.22	8	<Null>	0	unknown	unknown	<Null>
13	PTAZO.LREC.GE.AQ.PT.23	8	<Null>	0	unknown	unknown	<Null>
14	PTAZO.LREC.GE.AQ.PT.24	10	<Null>	0	unknown	unknown	<Null>
15	PTAZO.LREC.GE.AQ.PT.25	12,5	<Null>	0	unknown	unknown	<Null>
16	PTAZO.LREC.GE.AQ.PT.26	13,55	<Null>	0	unknown	unknown	<Null>
17	PTAZO.LREC.GE.AQ.PT.27	11	<Null>	20	<Null>	unknown	<Null>
18	PTAZO.LREC.GE.AQ.PT.28	6	<Null>	0	unknown	unknown	<Null>
19	PTAZO.LREC.GE.AQ.PT.29	8	<Null>	0	unknown	unknown	<Null>
20	PTAZO.LREC.GE.AQ.PT.30	8	<Null>	0	unknown	unknown	<Null>
21	PTAZO.LREC.GE.AQ.PT.31	7,65	<Null>	0	unknown	unknown	<Null>
22	PTAZO.LREC.GE.AQ.PT.32	15	<Null>	0	unknown	unknown	<Null>
23	PTAZO.LREC.GE.AQ.PT.33	9	<Null>	0	unknown	unknown	<Null>
24	PTAZO.LREC.GE.AQ.PT.34	12,5	<Null>	34,5	<Null>	unknown	<Null>
25	PTAZO.LREC.GE.AQ.PT.35	8	<Null>	0	unknown	unknown	<Null>
26	PTAZO.LREC.GE.AQ.PT.36	6,1	<Null>	0	unknown	unknown	<Null>
27	PTAZO.LREC.GE.AQ.PT.37	8	<Null>	0	unknown	unknown	<Null>
28	PTAZO.LREC.GE.AQ.PT.38	8	<Null>	0	unknown	unknown	<Null>
29	PTAZO.LREC.GE.AQ.PT.39	8,5	<Null>	0	unknown	unknown	<Null>
30	PTAZO.LREC.GE.AQ.PT.40	10	<Null>	0	unknown	unknown	<Null>
31	PTAZO.LREC.GE.AQ.PT.41	14	<Null>	0	unknown	unknown	<Null>
32	PTAZO.LREC.GE.AQ.PT.42	14	<Null>	0	unknown	unknown	<Null>
33	PTAZO.LREC.GE.AQ.PT.43	9	<Null>	0	unknown	unknown	<Null>
34	PTAZO.LREC.GE.AQ.PT.44	8	<Null>	0	unknown	unknown	<Null>
35	PTAZO.LREC.GE.AQ.PT.45	8	<Null>	0	unknown	unknown	<Null>

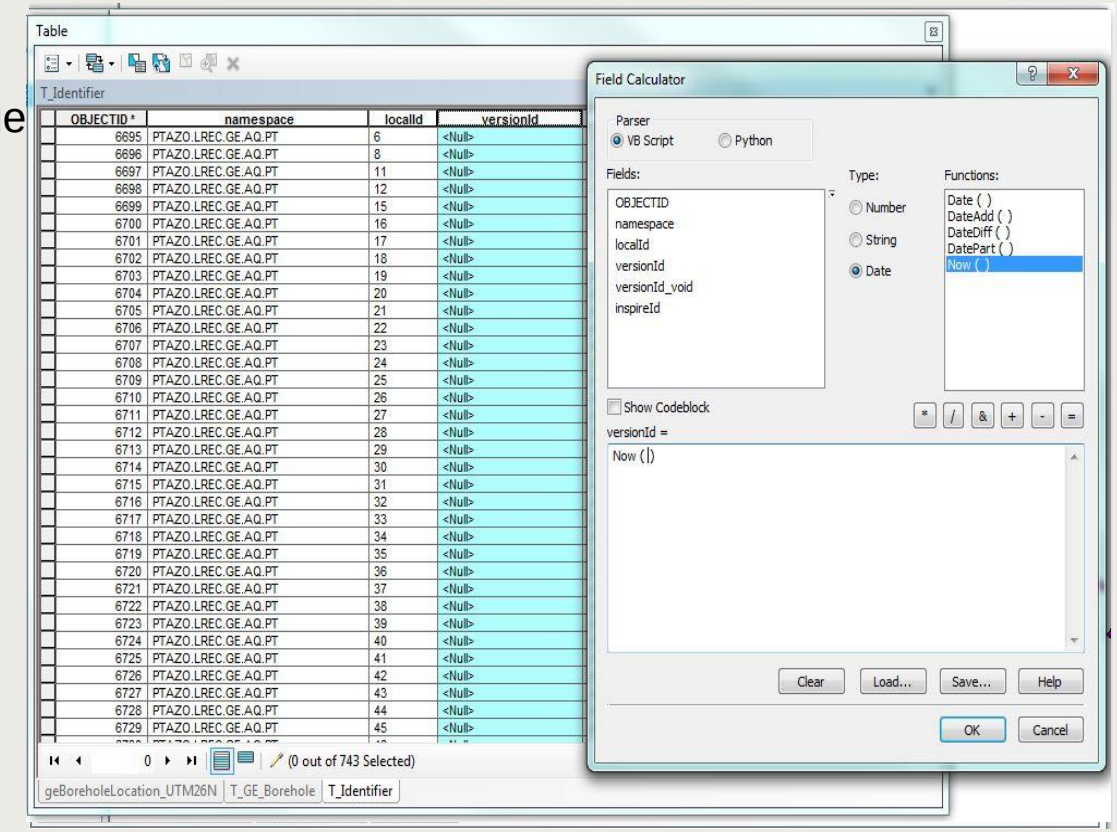
0 (0 out of 743 Selected)

T_GE_Borehole

Modelo de Dados RAA - Harmonização

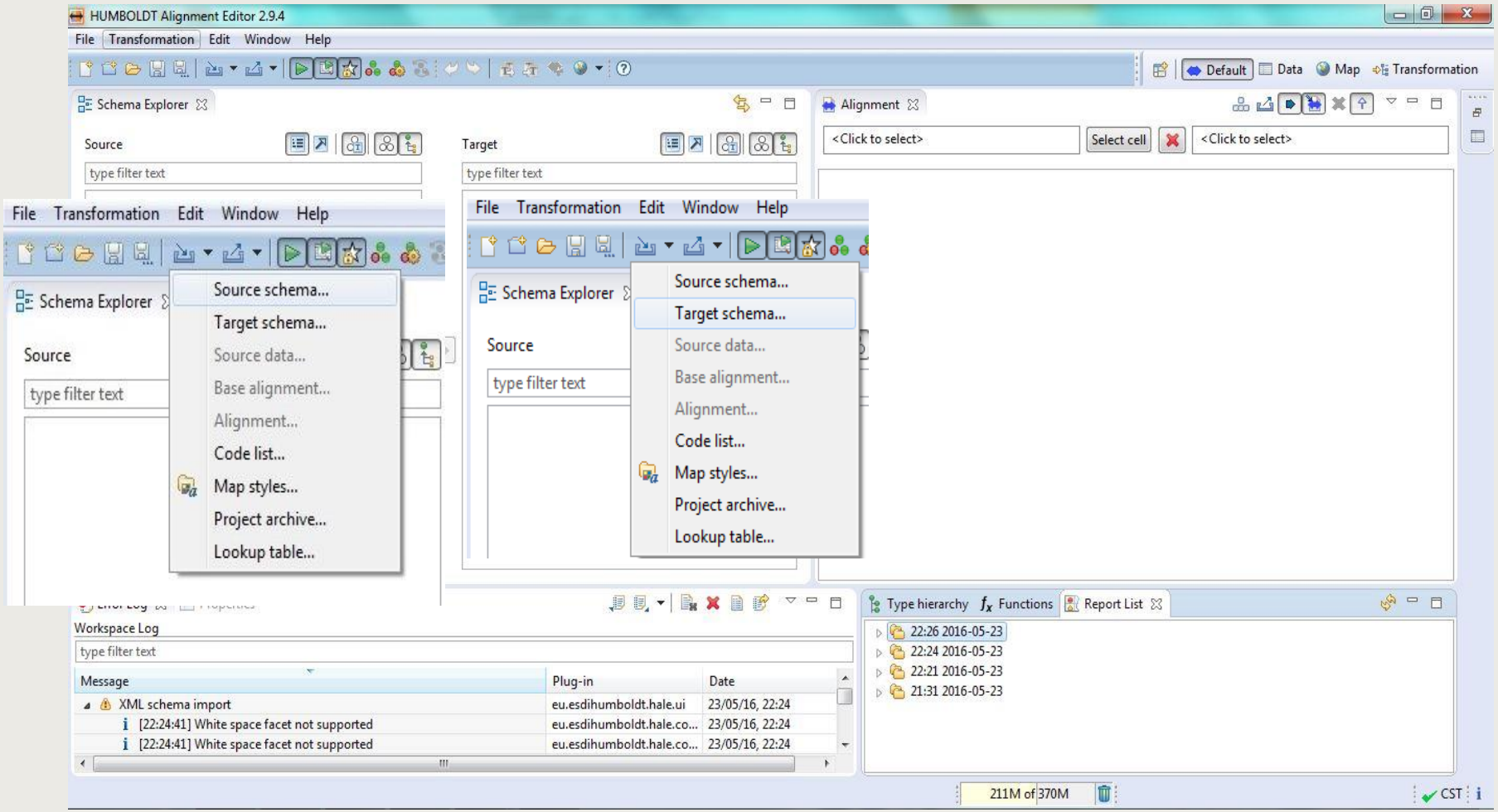
✓ Continuação da Harmonização

- T_GE_Borehole
- T_GE_BoreholePurposeValue
- T_Ge_GeologicCollection
- T_Identifier



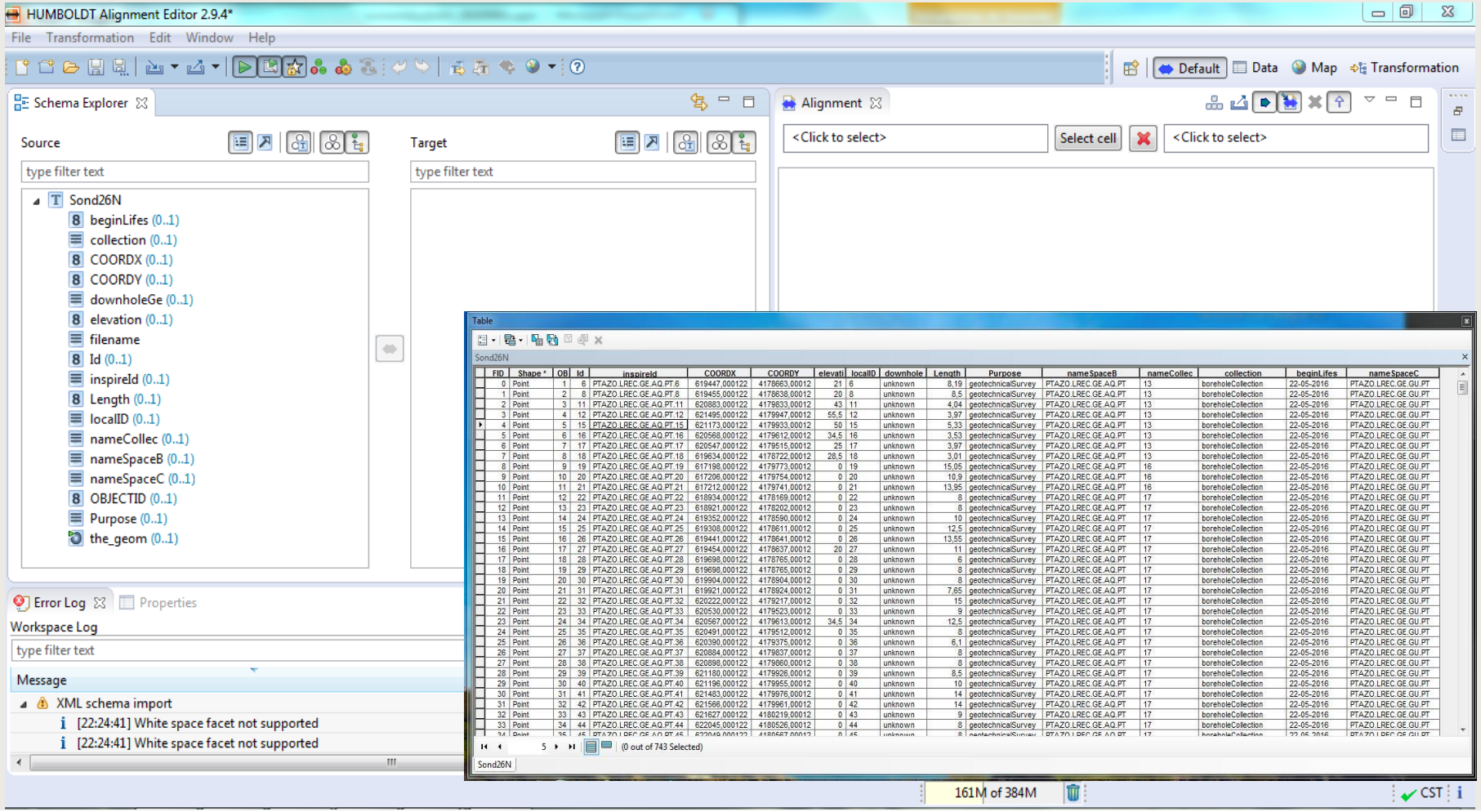
The HUMBOLDT Alignment Editor - HALE

- ✓ Source Schema e Target schema



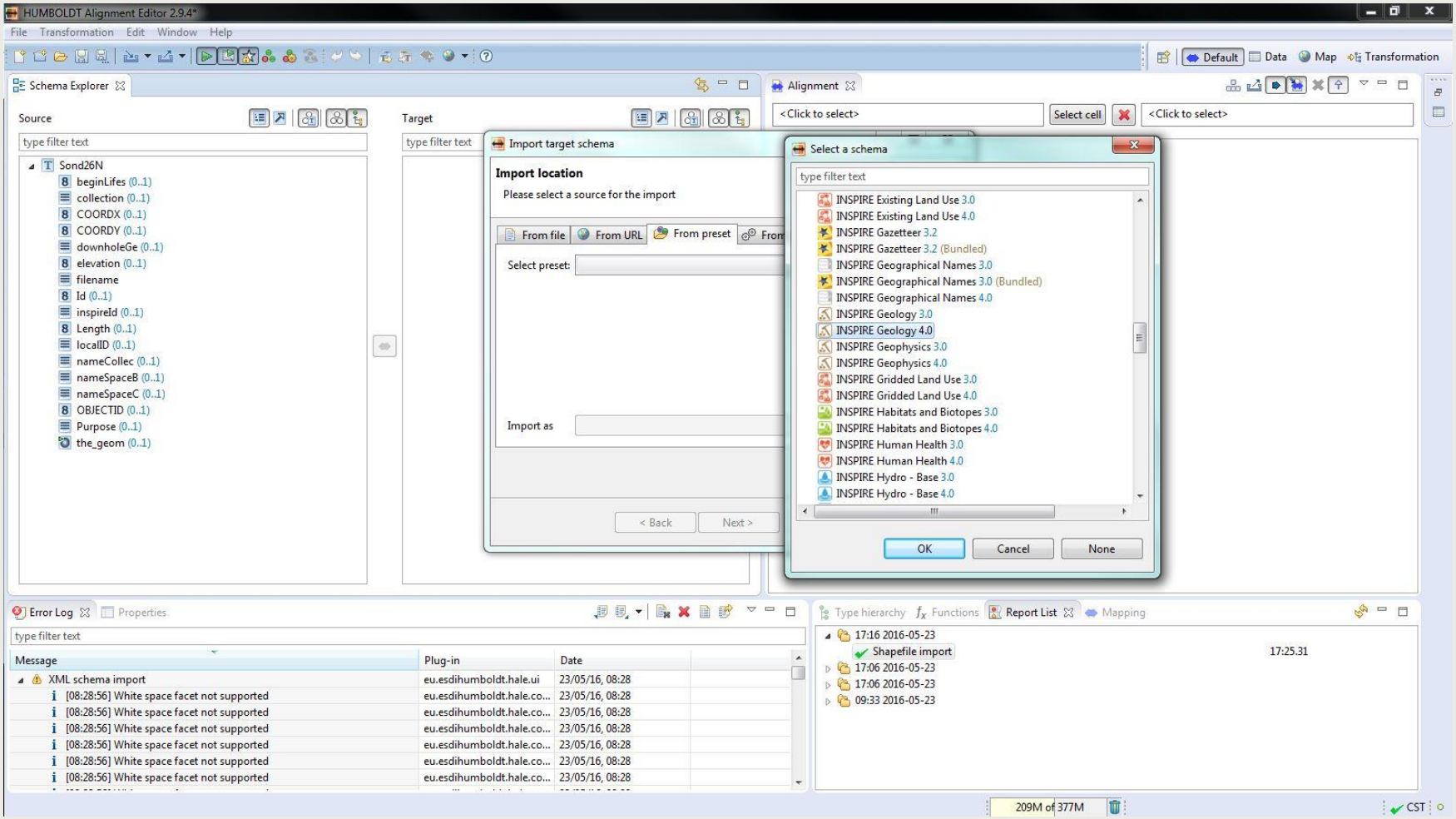
The HUMBOLDT Alignment Editor - HALE

- ✓ Source Schema e tabela de atributos (apoio)



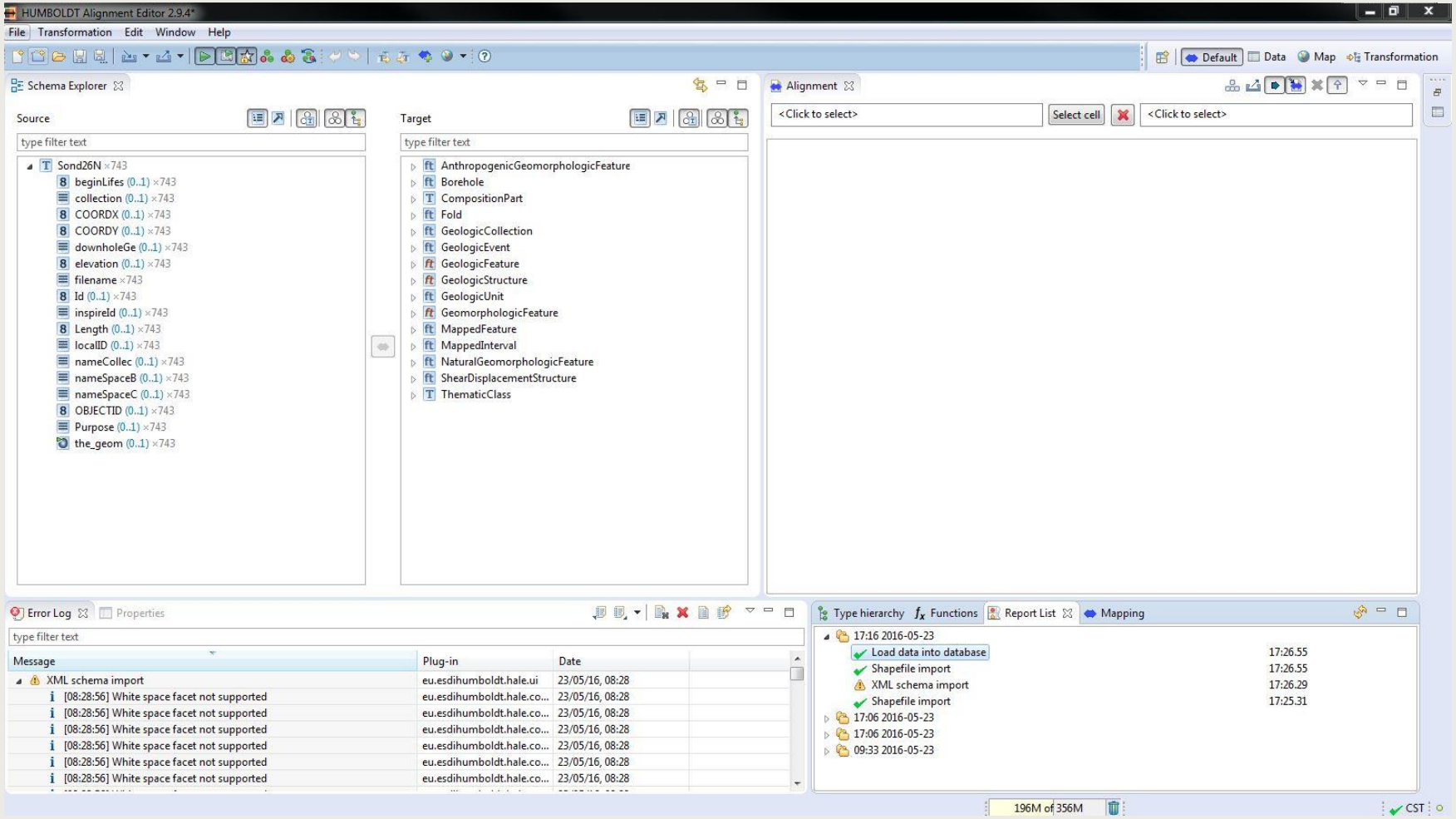
The HUMBOLDT Alignment Editor - HALE

- ✓ Target schema INSPIRE Geology 4.0



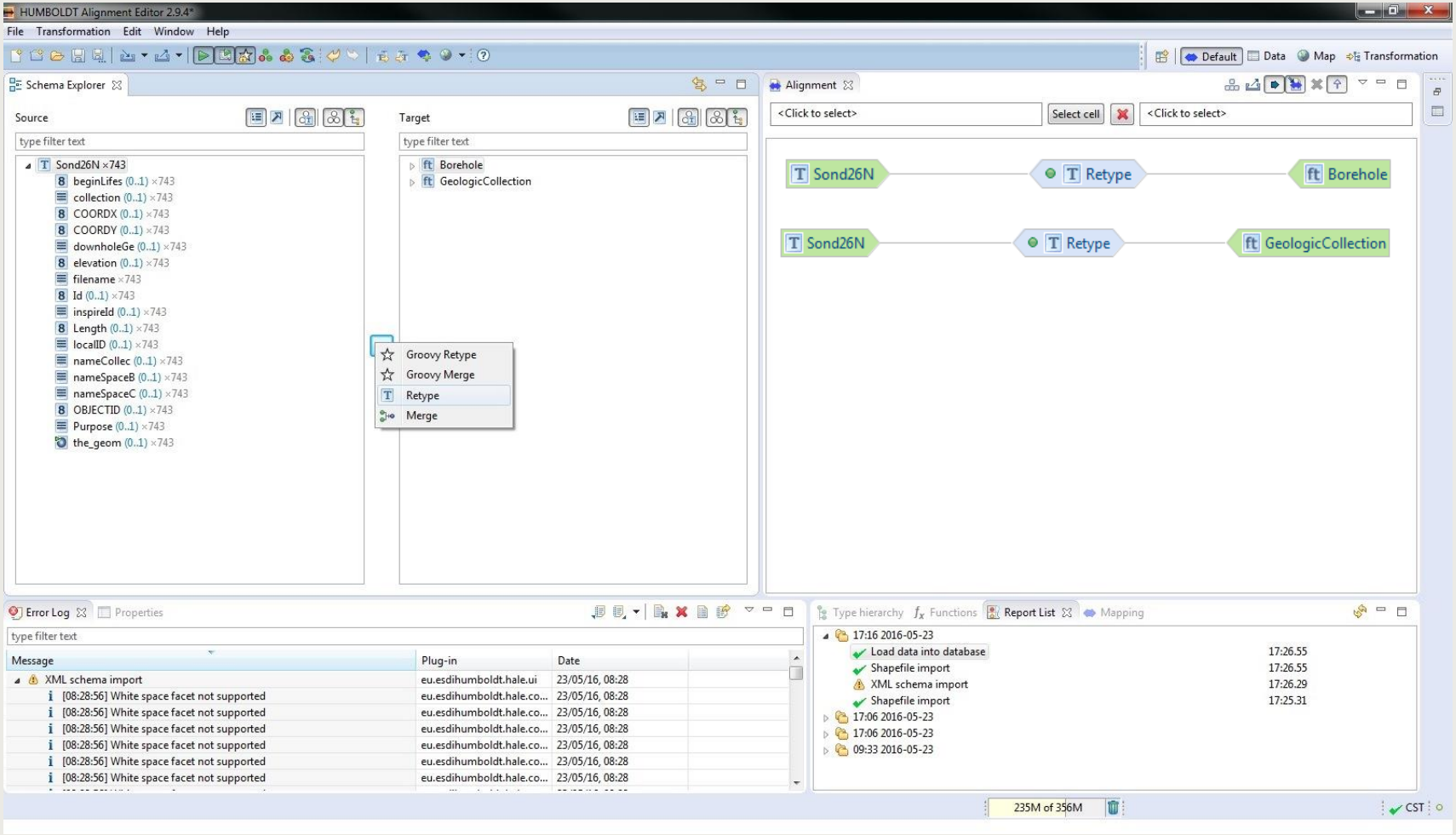
The HUMBOLDT Alignment Editor - HALE

- ✓ Source data



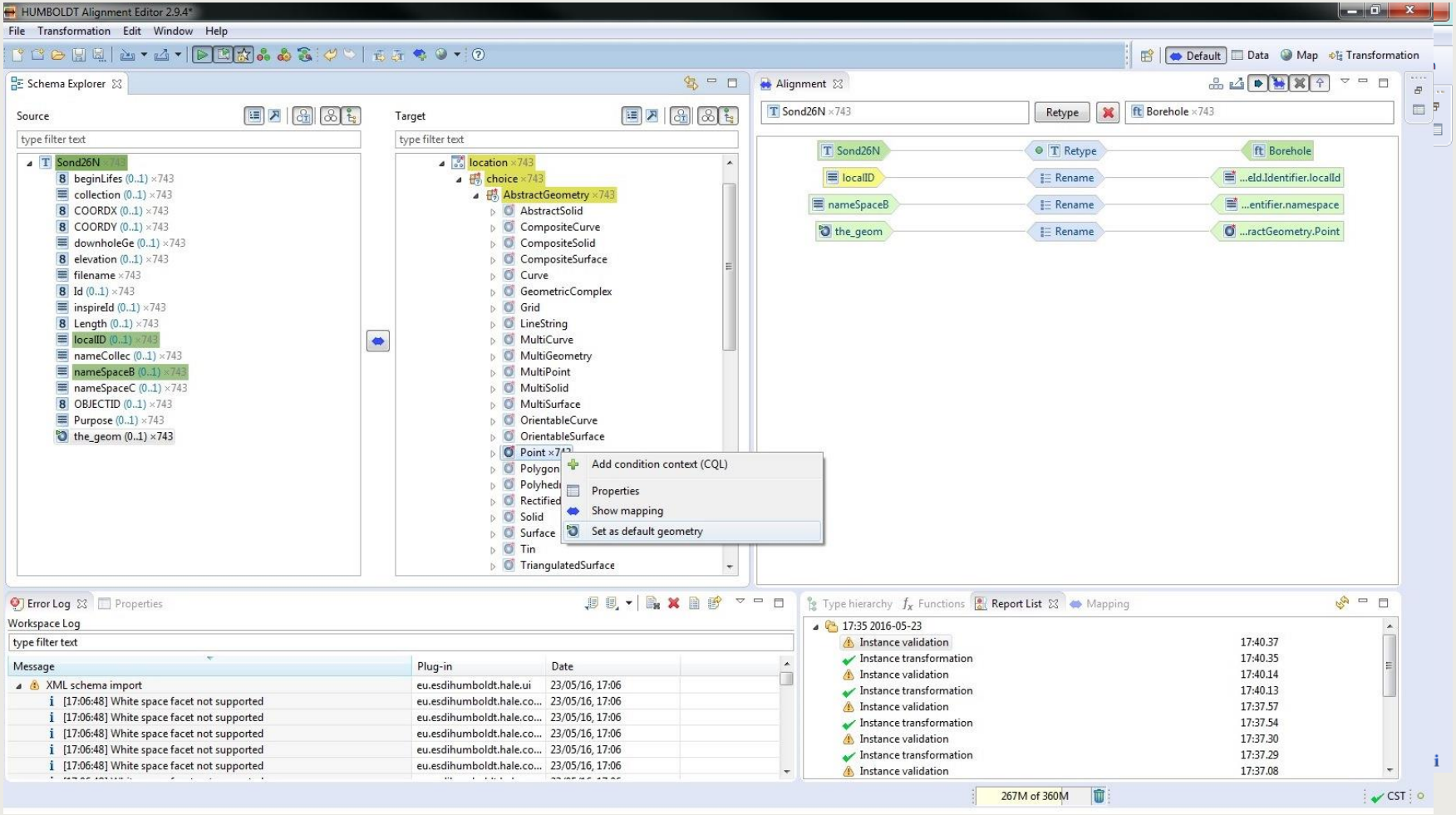
The HUMBOLDT Alignment Editor - HALE

- ✓ Função Retype



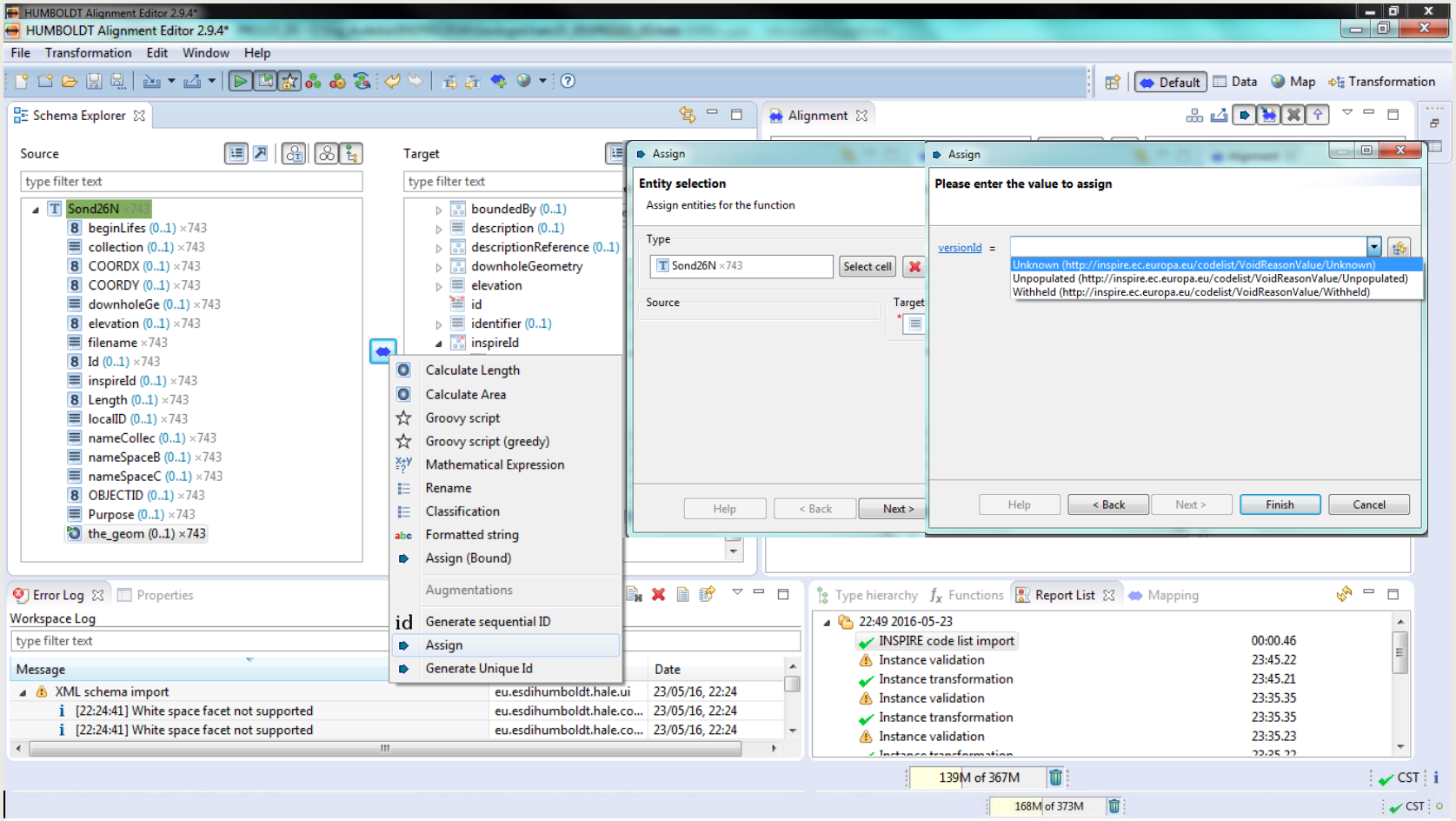
The HUMBOLDT Alignment Editor - HALE

- ✓ Função Rename



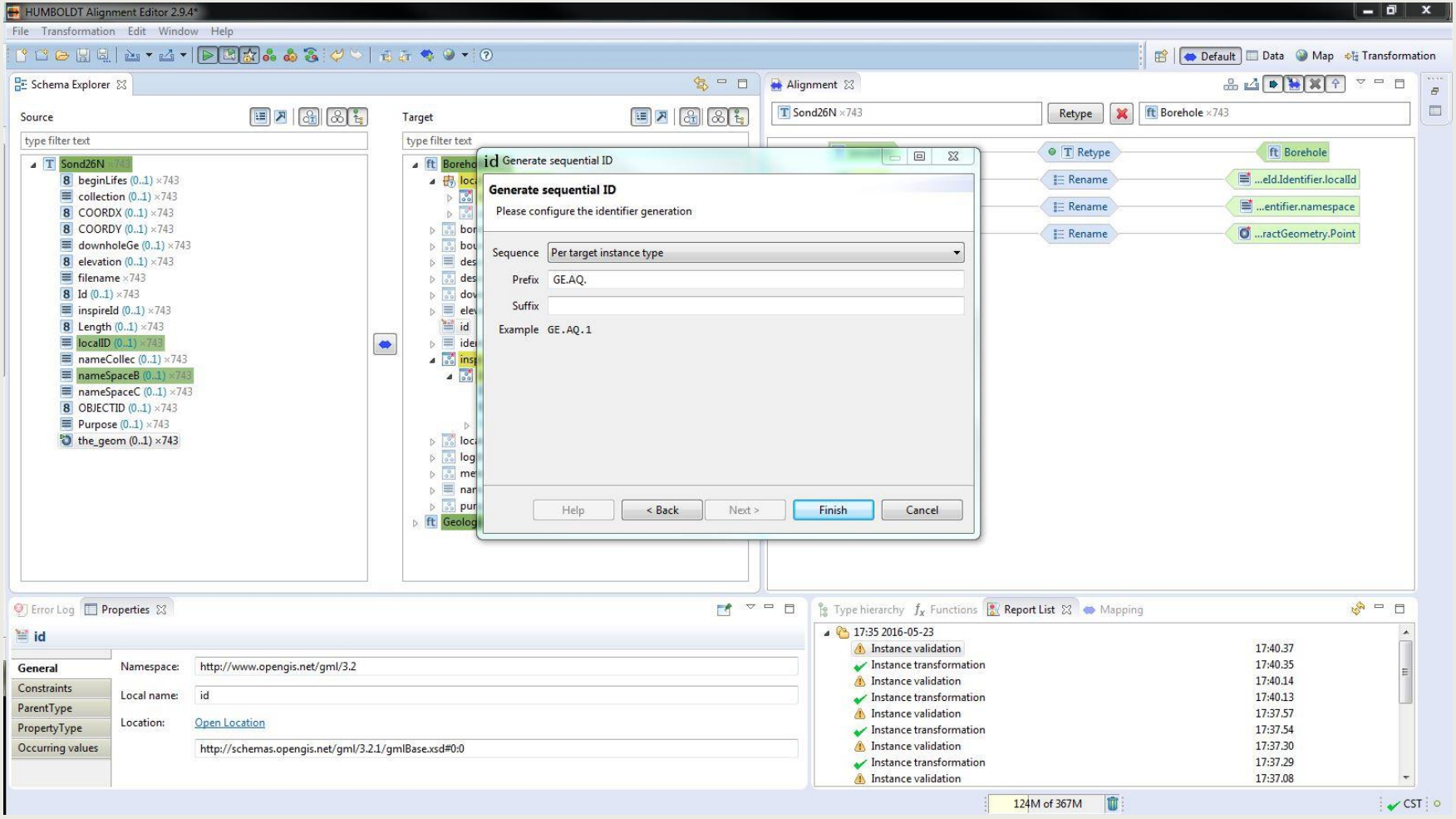
The HUMBOLDT Alignment Editor - HALE

- ✓ Função Assign e Import Code List



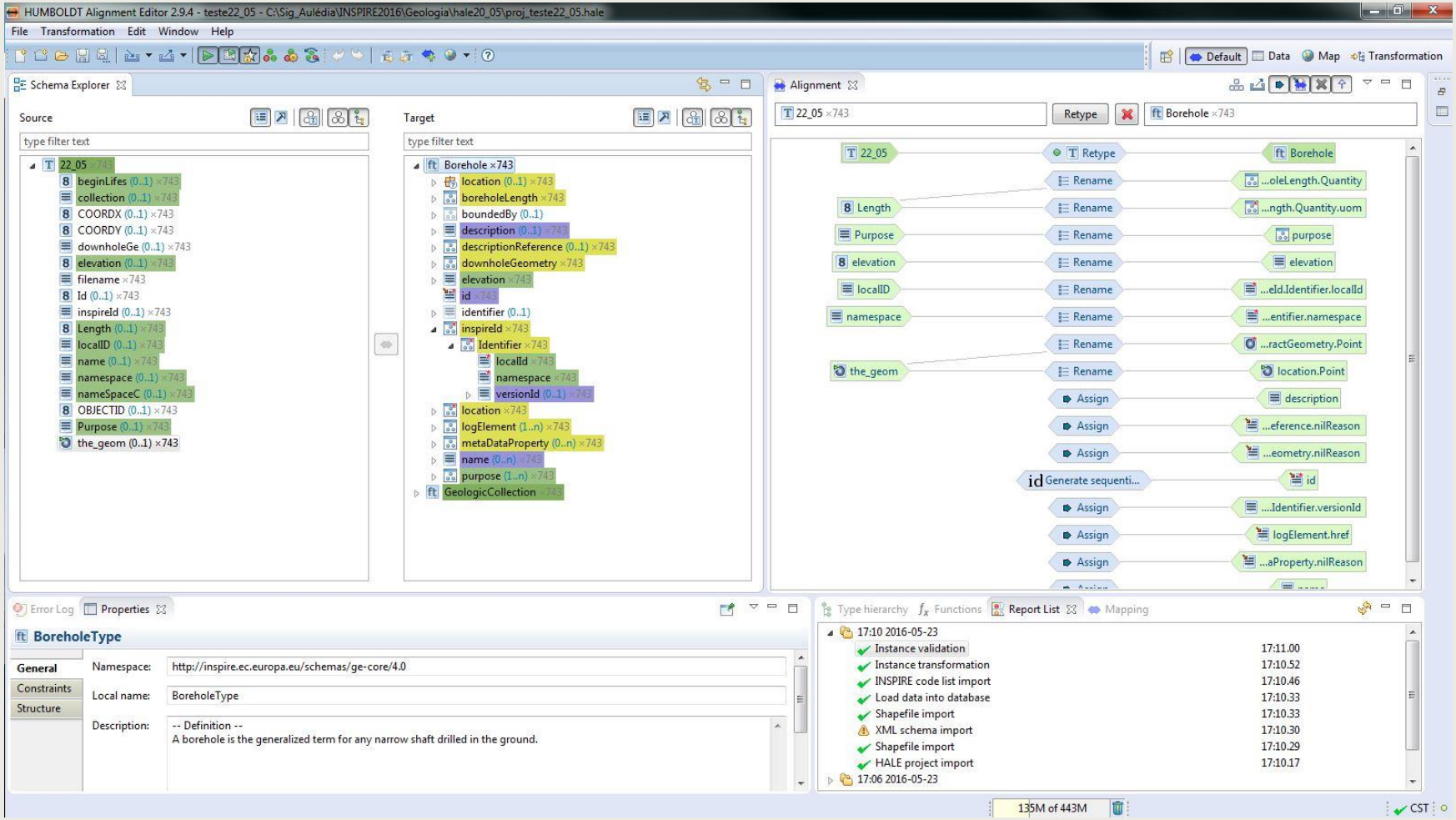
The HUMBOLDT Alignment Editor - HALE

- ✓ Função Generate Sequential ID



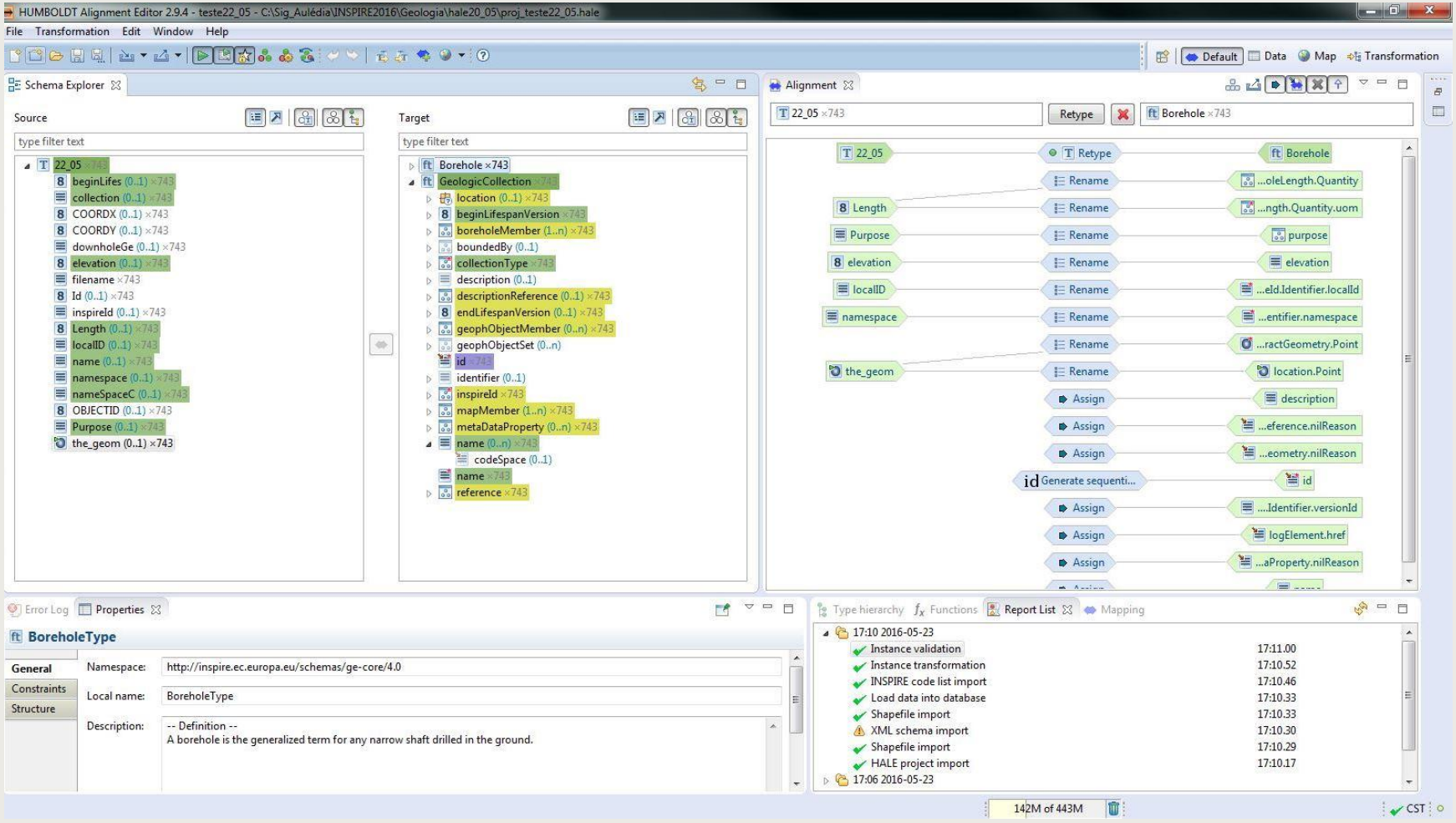
The HUMBOLDT Alignment Editor - HALE

- ✓ Borehole - Instance Validation

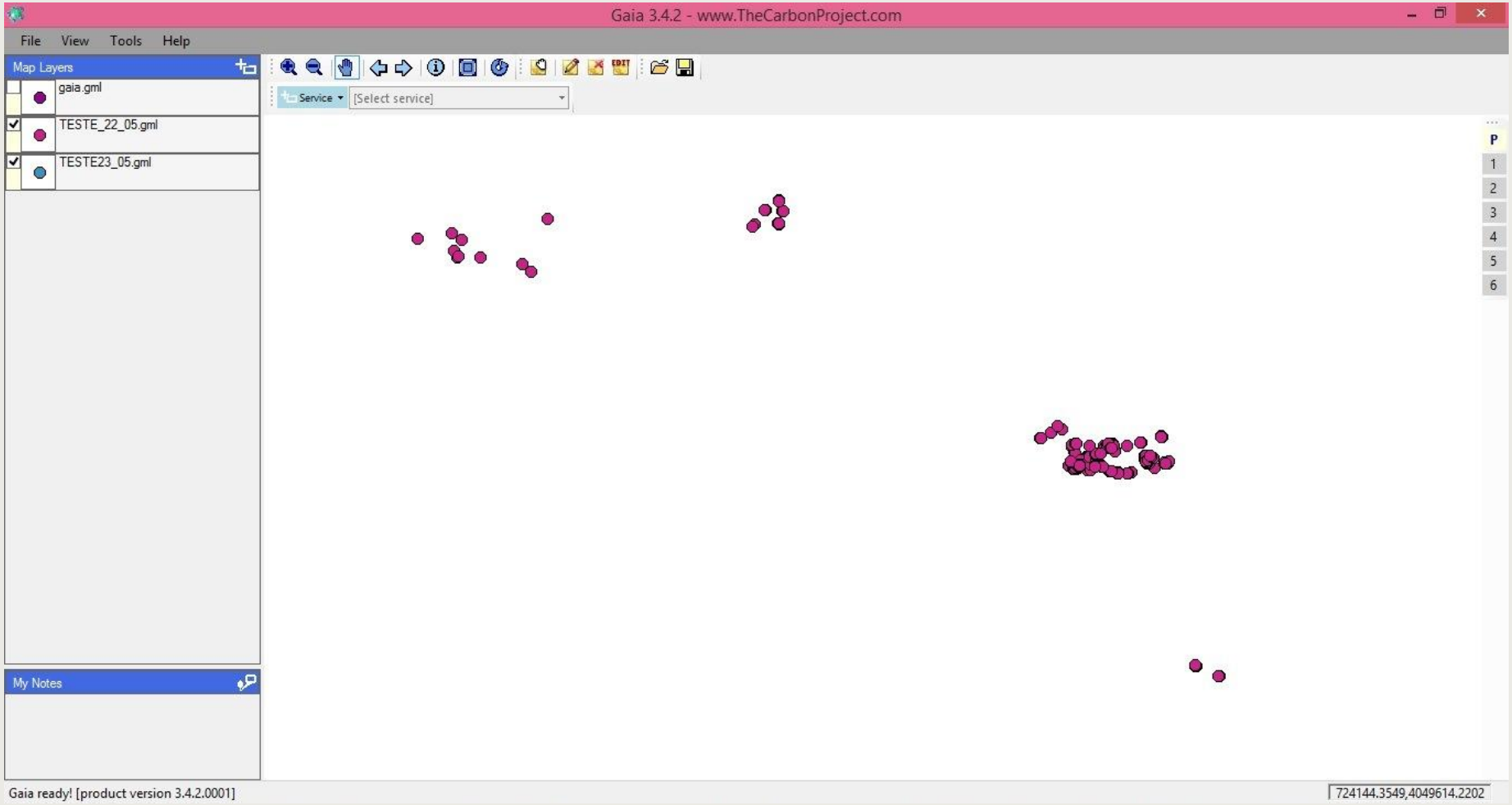


The HUMBOLDT Alignment Editor - HALE

- ✓ GeologicCollection - Instance Validation



Gaia 3.4.2 – www.TheCarbonProject.com



http://www.thecarbonproject.com/Products/Gaia

Vantagens e Desvantagens do Hale

- ✓ *Software* Open Source que harmoniza a informação Geográfica em conformidade com as especificações técnicas do INSPIRE. Este *Software* atualiza automaticamente os Schemas e as Codelists INSPIRE;
- ✓ Auxilia e indica correções a executar no preenchimento do Target Schema do nosso tema;
- × Descobrir as funções a usar no mapeamento entre a Source Schema e a Target schema, segundo a génese dos nossos dados;
- × Entender os Warnings resultantes e os eventuais problemas de Cardinalidade.

Essencialmente, contribuiu para o cumprimento da Diretiva INSPIRE.

Considerações Finais e Perspetivas Futuras

- ✓ A harmonização possibilitou a estruturação dos nossos dados, e consequentemente, a criação de uma excelente ferramenta de trabalho interno;
- ✓ O Modelo de Dados RAA permitiu estruturar a nossa Base de Dados de acordo com algumas regras e, consequentemente, o Hale auxiliou a cumprir outras, de modo a estar em condições para exportar para um GML;
- ✓ O GML resultante permite a publicação de Serviços, igualmente obrigatório segundo a Diretiva INSPIRE.

OBRIGADA

Pela atenção!