

Why are traditional SDIs not enough?

Jeremy Tandy



Clemens Portele



Spatial Data Infrastructure (SDI) implemented



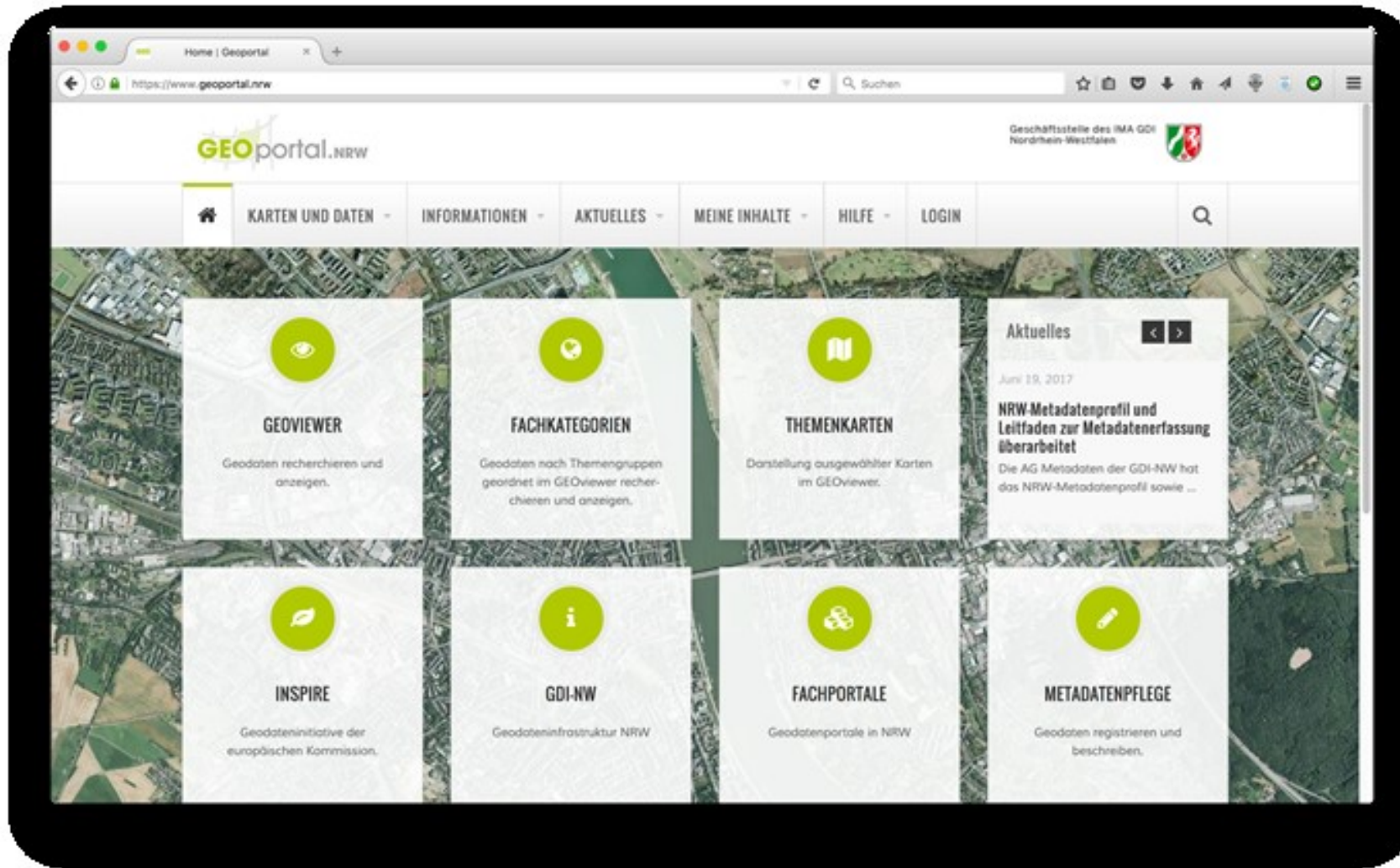
Spatial data management



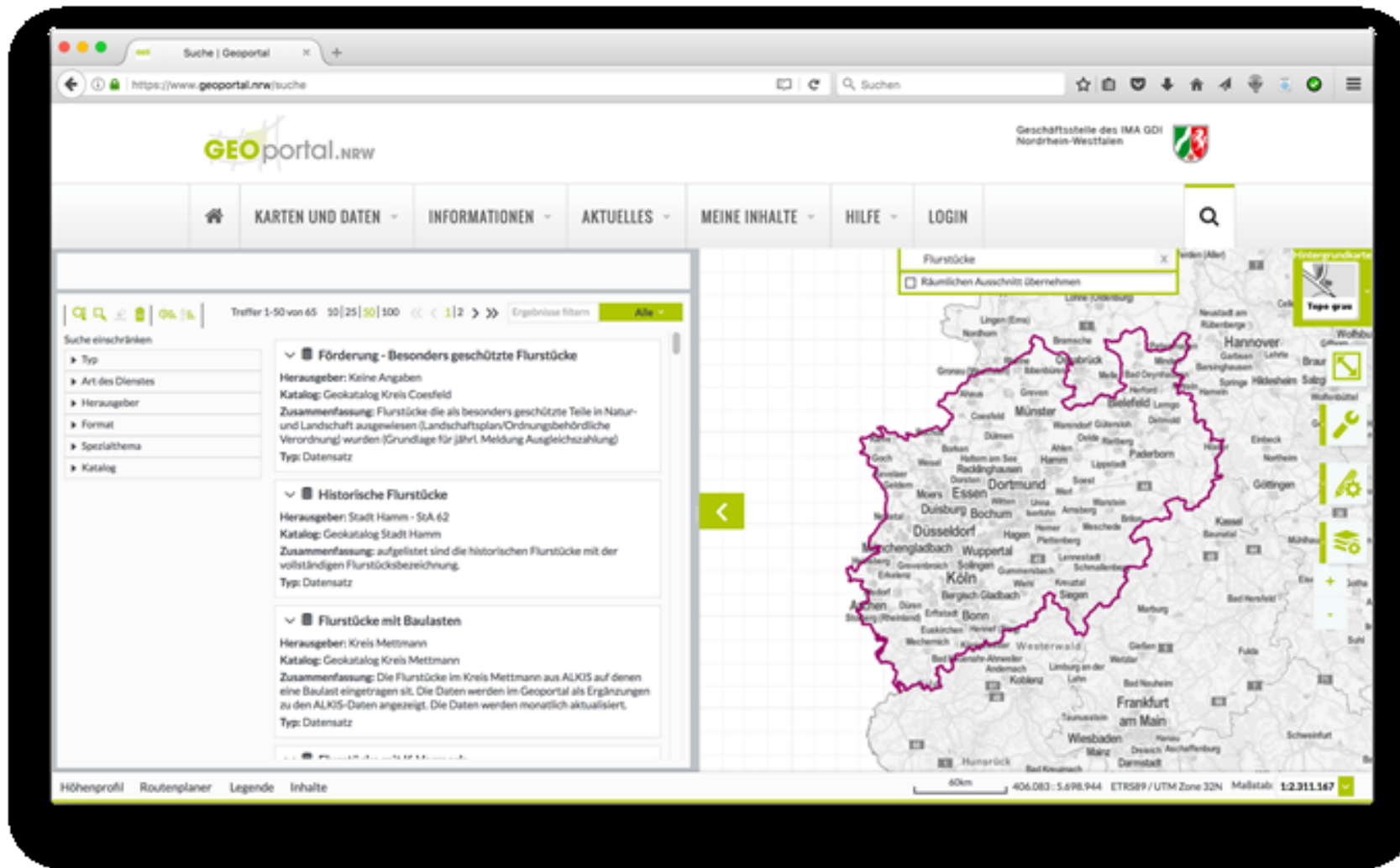
Spatial data usage



... let's take a look at the typical journey to find and use data in an SDI →



1. Open the geoportal in the browser



2. Navigate to search for geodata

3. Enter your search text – optionally using structured search criteria (e.g. format)

4. Browse through the results and select a dataset to look at more closely

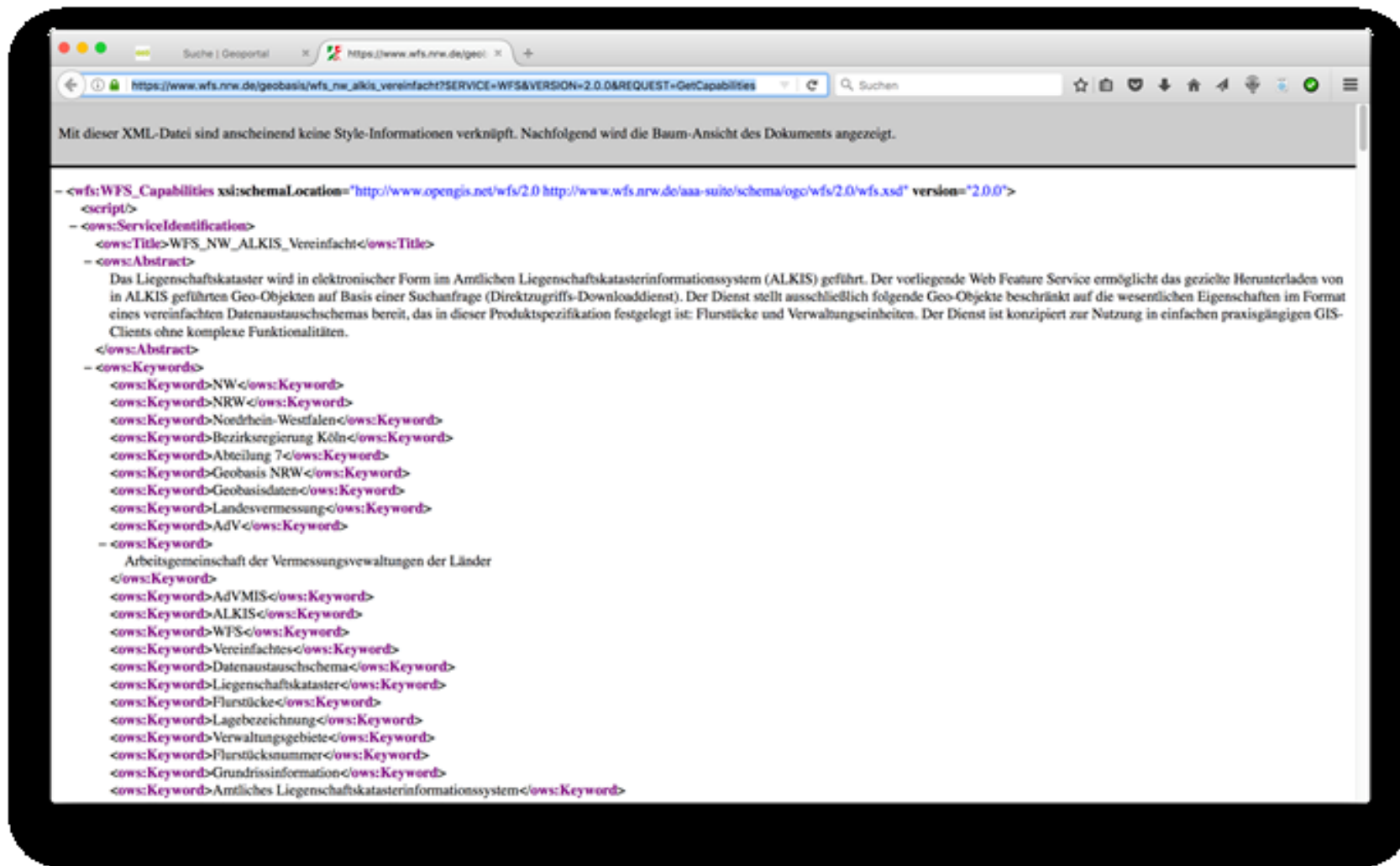
The screenshot shows a web browser window with the URL <https://www.geoportal.nrw/suche>. The page header includes the GEOportal.NRW logo and the text 'Geschäftsstelle des IMA GDI Nordrhein-Westfalen'. A navigation menu contains 'KARTEN UND DATEN', 'INFORMATIONEN', 'AKTUELLES', 'MEINE INHALTE', 'HILFE', and 'LOGIN'. A search bar is located on the right side of the menu.

The main content area displays the metadata for the 'WFS ALKIS vereinfachtes Schema' service. The service is provided by 'Geobasis NRW' and is a 'Dienst (download OGC/WFS 2.0.0 & OGC/WFS 1.1.0)'. The description states that it provides a simplified data exchange schema for the ALKIS system, focusing on parcels and administrative units.

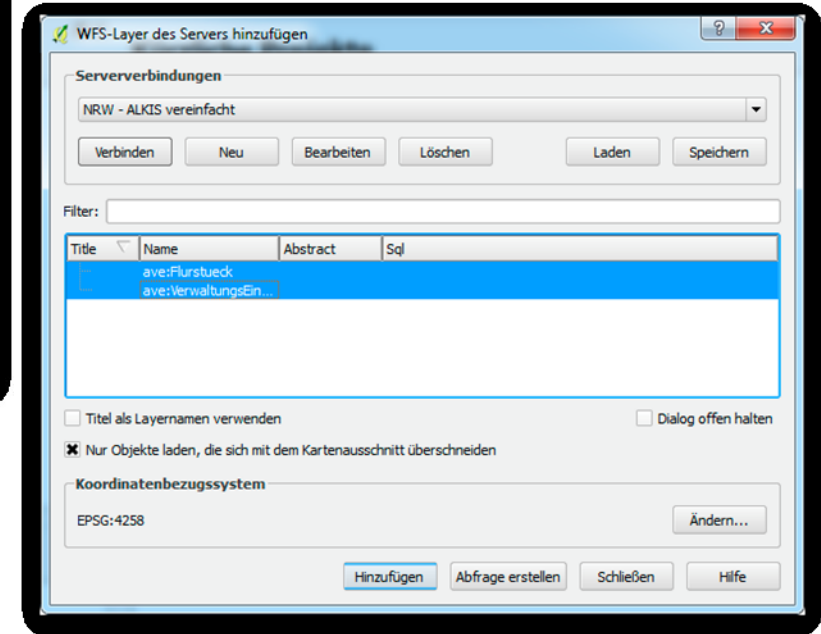
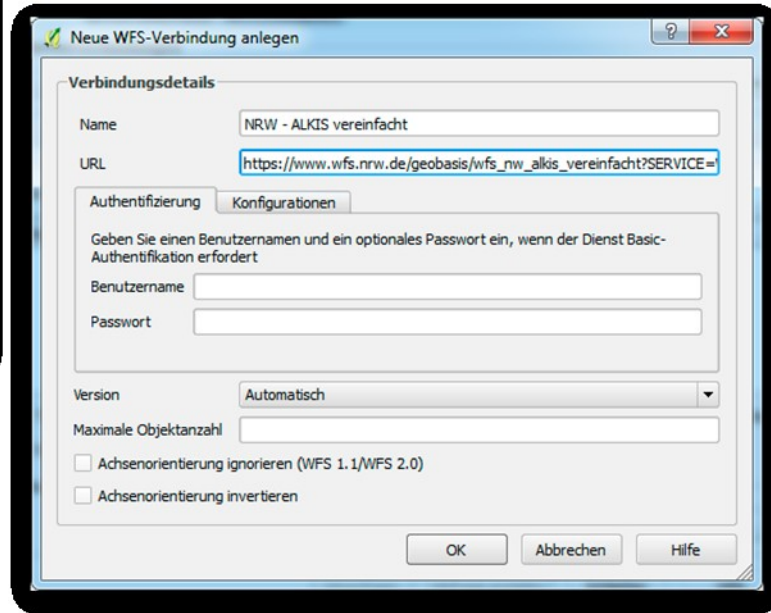
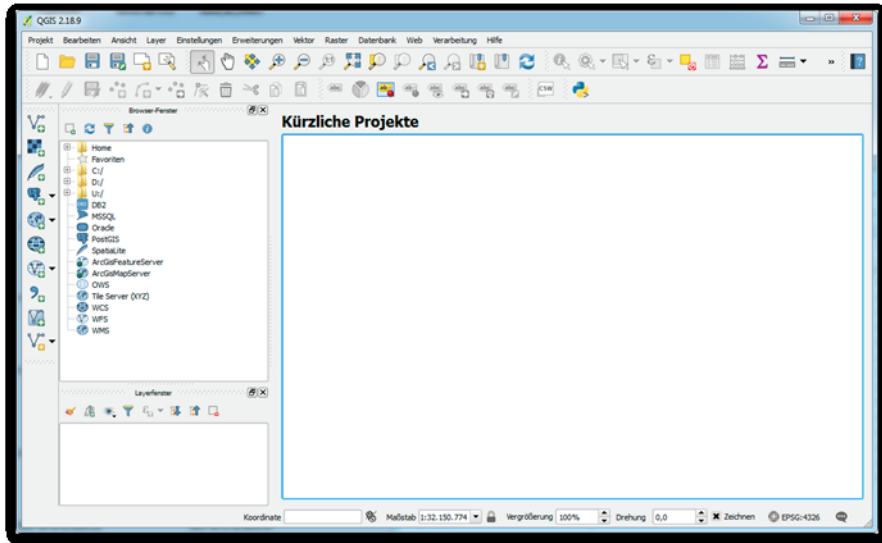
Beschreibung	Kategorien	Zugriff	Vertrieb	Qualität	Metadaten
Format		1	2		
Name				GML	
Version				3.2.1	
Spezifikation					
Kompressionsrate					
Online resource		1	2		
URL					https://www.wfs.nrw.de/geobasis/wfs_nw_alkis vereinfacht?SERVICE=WFS&VERSION=2.0.0&REQUEST=GetCapabilities
Funktion				Information	
Mediumname					
Mediumnotiz					
Transferformat					

On the right side of the metadata view, there are buttons for 'XML' and 'PDF'. Below the table, it states 'Insgesamt werden 1 von 1 verwandte Metadatenätze angezeigt.'

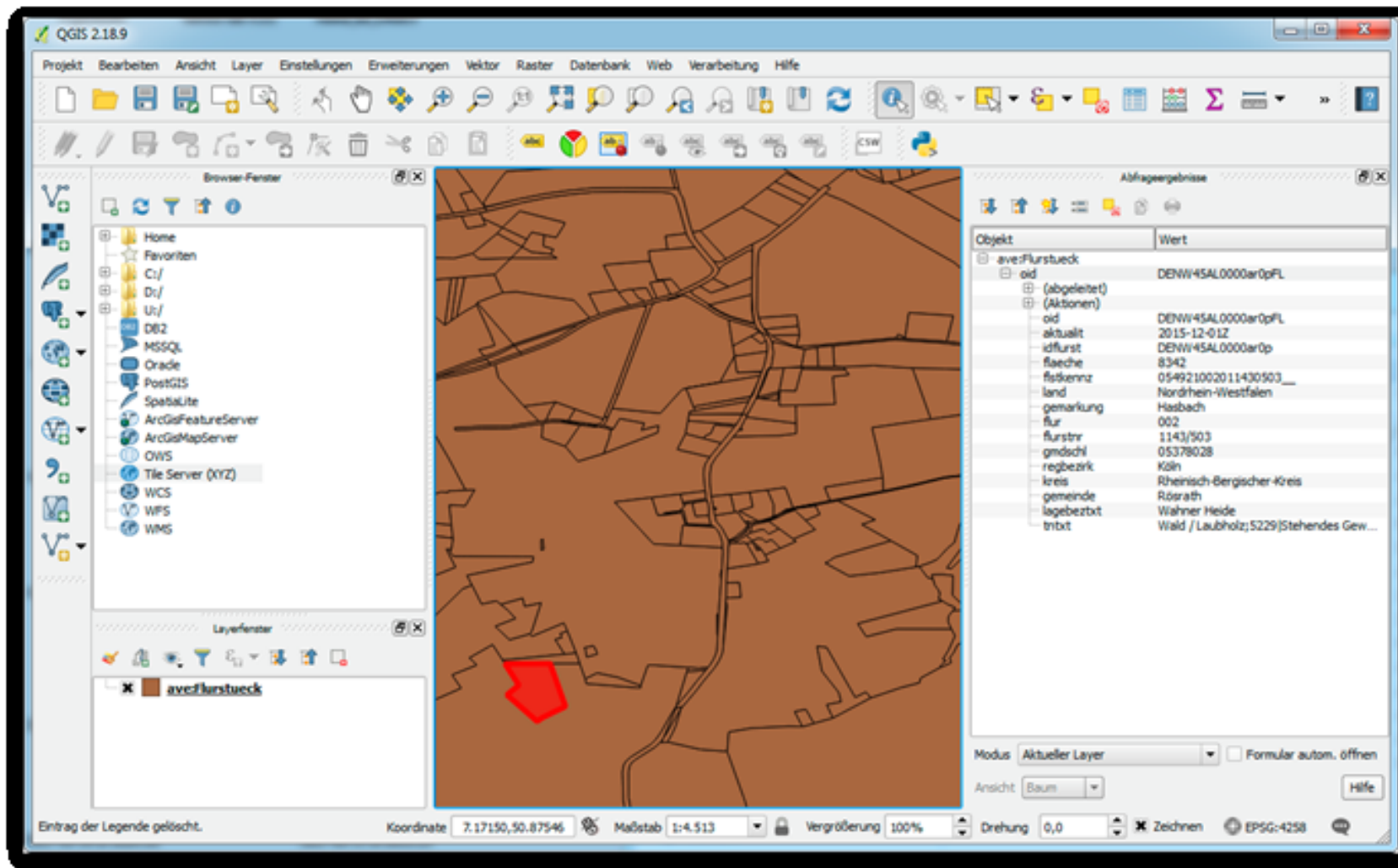
5. View the metadata



6. Copy the WFS GetCapabilities URL



7. Open a WFS client application and access the data via the WFS service



7. Analyse the record to determine if it contains the information you needed
... then you can start using the data!

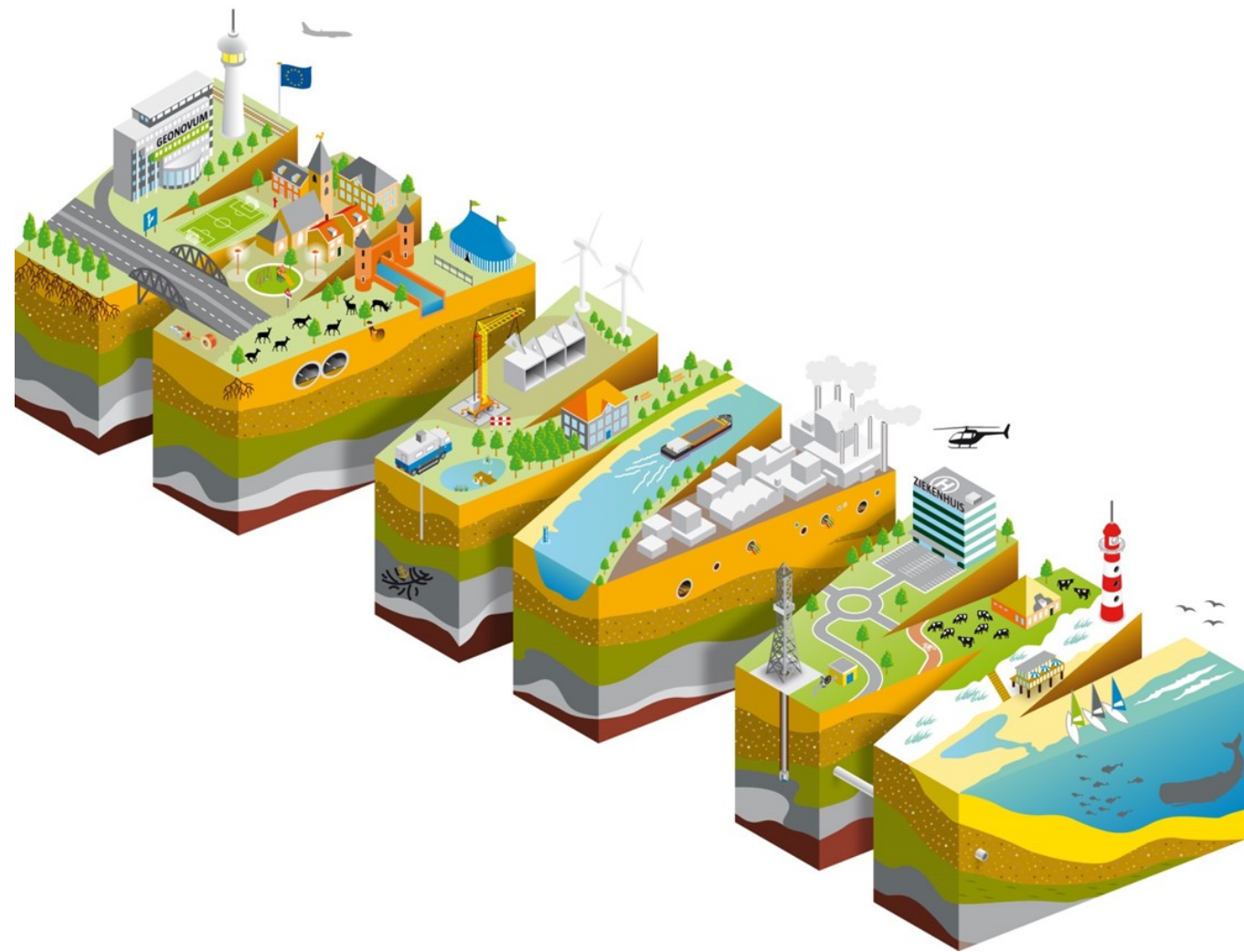
Finding, accessing and using data published through SDIs based on OGC Web services is difficult for non-expert users.

1. prior knowledge about geoportals is needed – most people start with a search engine
2. geoportals and their catalogues, by design, only provide access to metadata – not the data itself
3. geographic metadata (ISO 19115) is for GIS specialists – it is hard for many to understand

(cont.)

(cont.)

4. OGC capabilities documents are hard to interpret – what do you do with this *huge* XML document?
5. there are no links to the data itself in the capabilities document – so you need to query the Web service
6. OGC Web service standards are complex – you need expert knowledge to build your own query, or use a special application to do it for you which many users will not have
7. the data itself is often difficult for non-expert users to understand and use – domain specific complexities (data models, coordinate reference systems, formats etc.) need further explanation, but links to documentation are often unavailable



But there is another way:

... let's repeat the "find and use" journey using the Webby approach →

1. enter search criteria for the data using a browser and search engine
2. browse through the results and check if one seems to provide your desired data or refers to it
3. click through to browse the data and determine if it contains the required information – don't forget to check the license!
4. download the data for you to use (the whole dataset or just the part that interests you) – the data is provided in formats that can be parsed in mainstream applications and tools
5. complex data may be presented via an API – links to documentation describing how to use it are provided from the service end-point
6. an expert Web user may want to build an application that uses the data – APIs follow well-known, Web-centric patterns (e.g. REST) allowing developers to build fast using their standard tools

Use of the Web platform's standard tools:

- search engines
- browsers
- HTTP (and HTTPS)
- hypermedia / Web links
- delegation to applications via media types
- openAPI metadata (Swagger)

Spatial Data on the Web Best Practices



W3C Working Group Note 28 September 2017

This version:

<https://www.w3.org/TR/2017/NOTE-sdw-bp-20170928/>

Latest published version:

<https://www.w3.org/TR/sdw-bp/>

Latest editor's draft:

<https://w3c.github.io/sdw/bp/>

Previous version:

<https://www.w3.org/TR/2017/NOTE-sdw-bp-20170511/>

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Introducing a couple of essential concepts for spatial data on the Web →

Spatial Thing: “Anything with spatial extent, shape, or position, e.g. people, places, buildings as well as abstract areas like cubes” [[W3C BASIC GEO](#)]

... or even a 5 metre tall orange statue of a man on the telephone

(Orange Man at Cité Centre de Congrès de Lyon)

Feature: similar – but is the digital representation instead of the actual entity



Linked data is an approach to publishing data that puts linking at the core of data representation and uses Web linking to “weave data into a global graph”

By identifying spatial things and other resources with URLs we can link data describing those spatial things just the same as Web-pages are linked using hyperlinks

We (both humans and software) can follow those links to find out more information and build an increasingly complete picture of the world around us

<https://www.wikidata.org/wiki/Q57783921>

We think that the concept of Linked Data is fundamental to the publishing of spatial data on the Web.

(come to the Spatial Data on the Web masterclass if you'd like to learn more)



This Linked Data approach is well described by the [WEB-DATA](#) 5-star scheme:

- ★ **Linkable:** use stable and discoverable global identifiers
- ★★ **Parseable:** use standardized data metamodels such as CSV, XML, RDF, or JSON.
- ★★★ **Understandable:** use well-known or at least well-documented vocabularies/schemas
- ★★★★ **Linked:** link to other resources whenever possible
- ★★★★★ **Usable:** label your document with a license

If you have geodata in an SDI today then you should read:

- [Best Practice 1: Use globally unique persistent HTTP URIs for Spatial Things](#)
- [Best Practice 2: Make your spatial data indexable by search engines](#)
- [Best Practice 3: Link resources together to create the Web of data](#)
- [Best Practice 12: Expose spatial data through 'convenience APIs'](#)

OGC Web Feature Service 3.0: Part 1 - Core

Open Geospatial Consortium

Submission Date: <yyyy-mm-dd>

Approval Date: <yyyy-mm-dd>

Publication Date: <yyyy-mm-dd>

External identifier of this OGC® document: <http://www.opengis.net/doc/IS/wfs-1/3.0>

Internal reference number of this OGC® document: 17-069

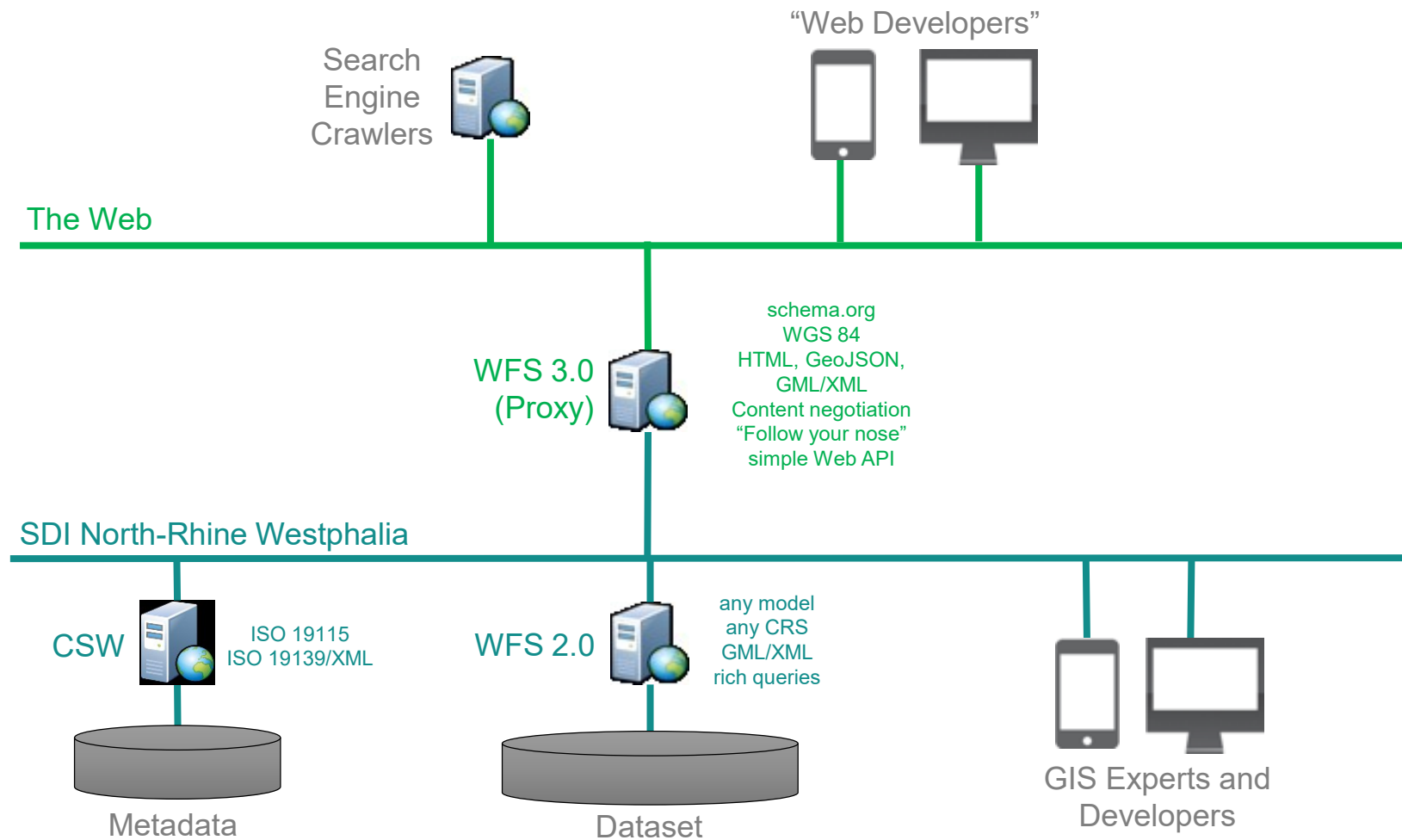
Version: 3.0.0-draft.1 (2018-04-07)

Category: OGC® Implementation Specification

WFS 3.0 (currently in development) is strongly influenced by the Best Practices and will make it much easier for you to publish spatial data on the Web

SDIs are a key component of the broader spatial data ecosystem – providing policies, workflows and tools related to the management of spatial datasets, plus the rich set of capabilities required by the expert community.

You don't need to start again – you can leverage your existing investment in SDI ...



Example: Spatial data on the Web over North-Rhine Westphalia SDI platform (implemented by interactive instruments)

Liegenschaftskataster (NRW)

Das Liegenschaftskataster wird in elektronischer Form im Amtlichen Liegenschaftskatasterinformationssystem (ALKIS) geführt. Der vorliegende Web Feature Service ermöglicht das gezielte Herunterladen von in ALKIS geführten Geo-Objekten auf Basis einer Suchanfrage (Direktzugriffs-Downloaddienst). Der Dienst stellt ausschließlich folgende Geo-Objekte beschränkt auf die wesentlichen Eigenschaften im Format eines vereinfachten Datenaustauschschemas bereit, das in dieser Produktspezifikation festgelegt ist: Flurstücke und Verwaltungseinheiten. Der Dienst ist konzipiert zur Nutzung in einfachen praxisingängigen GIS-Clients ohne komplexe Funktionalitäten.

Feature Types	Flurstück Gebäude, Bauwerk Verwaltungseinheit
API	OpenAPI 3.0
Keywords	NW, NRW, Nordrhein-Westfalen, Bezirksregierung Köln, Abteilung 7, Geobasis NRW, Geobasisdaten, Landesvermessung, AdV, Arbeitsgemeinschaft der Vermessungsverwaltungen der Länder, AdVMIS, ALKIS, WFS, Vereinfachtes, Datenaustauschschemata, Liegenschaftskataster, Flurstücke, Lagebezeichnung, Verwaltungsgebiete, Flurstücksnummer, Grundrissinformation, Amtliches Liegenschaftskatasterinformationssystem, Flurstückskennzeichen, WFS_NW_ALKIS_Vereinfacht
License	Es gelten keine Beschränkungen.
Extent	5.61272621360749,50.2373512077239 9.58963433710139,52.5286304537795
WFS	http://www.wfs.nrw.de/geobasis/wfs_nw_alkis_vereinfacht?REQUEST=GetCapabilities&SERVICE=WFS
Provider	Geobasis NRW http://www.geobasis.nrw.de

All geodata resources in HTML; browse via hyperlinks

Flurstück

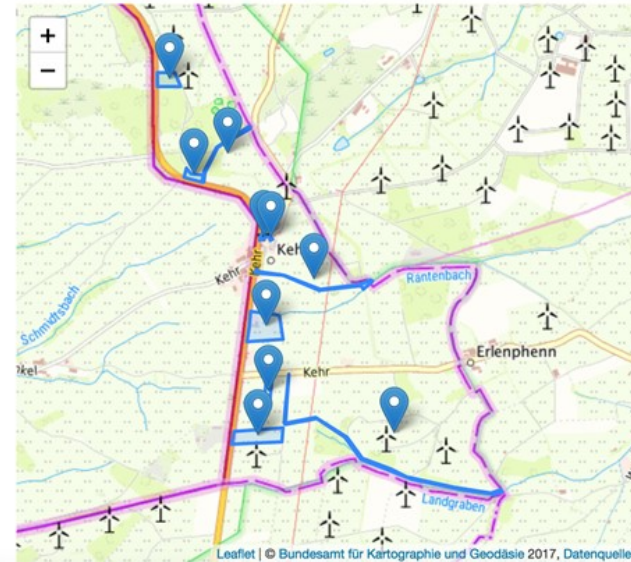
Filter

« < 1 **2** > »

Hellenthal, Losheim, 007 58

Letzte Aktualisierung	24.07.2009
Fläche (Quadratmeter)	189.00
Flurstückskennzeichen	05439400700058_____
Land	Nordrhein-Westfalen
Gemarkung	Losheim
Flur	007
Flurstücksnummer	58
Gemeineschlüssel	05366020
Regierungsbezirk	Köln
Kreis	Euskirchen
Gemeinde	Hellenthal
Bezeichnung der Lage	Kehr 7
anteilige Nutzung	Wohnbaufläche;189

Hellenthal, Losheim, 008 6



Textual content is complemented by Web maps – again supporting browsing by hyperlinks

Filter Apply Cancel

lagebeztxt=Friedrichstr* x bbox=6.78,51.21,6.78,51.21 x

FIELD

none

filter pattern

Add

Use * as wildcard

BBOX

6.7756032943725595

51.21197818058808

6.780109405517579

51.2142901401467

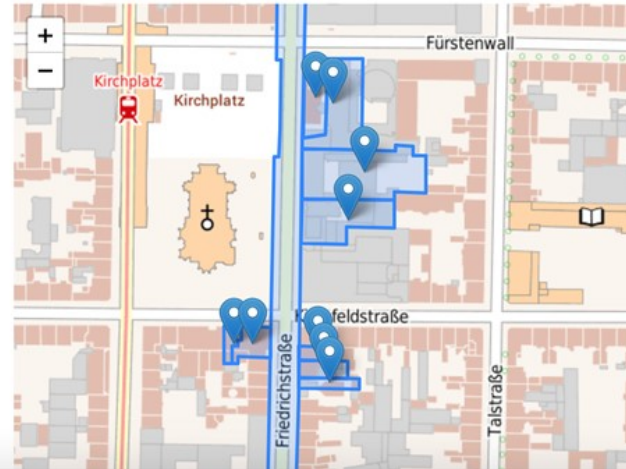
Add



« < 1 > »

Düsseldorf, Unterbilk, 003 744

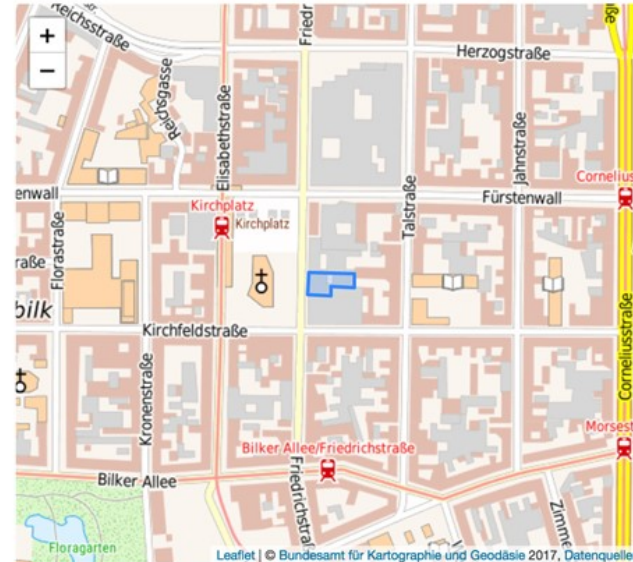
Letzte Aktualisierung	22.10.2015
Fläche (Quadratmeter)	1389.00
Flurstückskennzeichen	05346600300744_____
Land	Nordrhein-Westfalen
Gemarkung	Unterbilk
Flur	003
Flurstücksnummer	744
Gemeindeschlüssel	05111000
Regierungsbezirk	Düsseldorf
Kreis	Düsseldorf
Gemeinde	Düsseldorf



Easy data selection

Düsseldorf, Unterbilk, 003 744

id	DENW20AL00003H76FL
Letzte Aktualisierung	22.10.2015
Fläche (Quadratmeter)	1389.00
Flurstückskennzeichen	05346600300744_____
Land	Nordrhein-Westfalen
Gemarkung	Unterbilk
Flur	003
Flurstücksnummer	744
Gemeindeschlüssel	05111000
Regierungsbezirk	Düsseldorf
Kreis	Düsseldorf
Gemeinde	Düsseldorf
Bezeichnung der Lage	Friedrichstraße 80
anteilige Nutzung	Fläche besonderer funktionaler Prägung / Verwaltung;1389



Dieser Dienst stellt Geobasisdaten zu Flurstücken, Gebäuden, Verwaltungseinheiten, der Landnutzung und topographischen Merkmalen bereit. Die Aktualität der Daten ist in jedem einzelnen Objekt angegeben. Die amtlichen Koordinaten liegen im Koordinatenreferenzsystem mit dem EPSG-Code 25832 vor. Die von diesem Dienst angebotenen Koordinaten wurden serverseitig über eine entsprechende Transformation in ein global gültiges Koordinatenreferenzsystem konvertiert. Die Transformation unterliegt Ungenauigkeiten. Für die von diesem Dienst gelieferten nicht amtlichen Koordinaten übernimmt Geobasis NRW keine Gewähr.

powered by [ldproxy](#)

Permanent URLs for all resources exposed onto the Web

https://www.ldproxy.nrw.de/kataster/Flurstueck/DENW20AL00003H76FL/ NEUER TEST

```

1 <!DOCTYPE html>
2 <html>
3 <head>
4   <meta charset="utf-8">
5   <meta http-equiv="X-UA-Compatible" content="IE=edge">
6   <meta name="viewport" content="width=device-width, initial-scale=1">
7   <title>Düsseldorf, Unterbilk, 003 744</title>
8   <meta name="description" content="Flurstück">
9   <meta name="keywords" content="">
10  <link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/4.0.0-
beta.2/css/bootstrap.min.css" integrity="sha384-
PsH8R72JQ3S0dhVi3uxftmaW6Vc5lMKb0q5P2rRUPvrszuE4W1povHYgTpBfshb"
crossorigin="anonymous">
11  <link rel="stylesheet"
href="https://unpkg.com/leaflet@1.2.0/dist/leaflet.css" integrity="sha512-
M2wvCLH6DSRazYe2RImlJnYyh22purTM+FDB5CsyxtQJYeKq83arPe5wgbNmcFXGqISH2XR8dT/fJISVA
1r/zQ==" crossorigin="" />
12  <link rel="stylesheet" href="/app/css/app3.css" />
13 </head>
14 <body>
15 <!-- Fixed navbar -->
16 <nav class="navbar navbar-light bg-light navbar-expand-sm">
17   <div class="container">
18     <div id="navbar" class="navbar-collapse collapse d-flex justify-content-
between align-items-center">
19       <ol class="breadcrumb bg-light my-0 pl-0">
20         <li class="breadcrumb-item"><a
href="../../../../">Datasets</a></li>
21         <li class="breadcrumb-item"><a
href="../../../../kataster/">Liegenschaftskataster (NRW)</a></li>
22         <li class="breadcrumb-item"><a
href="../../../../kataster/Flurstueck/">Flurstück</a></li>
23         <li class="breadcrumb-item active">Düsseldorf,
Unterbilk, 003 744</li>
24       </ol>

```

Place	
@type	Place
name	Düsseldorf, Unterbilk, 003 744
url	https://www.ldproxy.nrw.de/kataster/Flurstueck/DE-NW20AL00003H76FL/
hasMap	https://www.ldproxy.nrw.de/kataster/Flurstueck/DE-NW20AL00003H76FL/?f=html
sameAs	https://www.wfs.nrw.de/geobasis/wfs_nw_alkis_ve-reinfacht?REQUEST=GetFeature&OUTPUTFORMAT=application%2Fgml%2Bxml%3B+version%3D3.2&VERSION=2.0.0&NAMESPACES=xmlns%28ave%2Chttp%3A%2F%2Frepository.gdi-de.org%2Fschemas%2Fadv%2Fprodukt%2Falkis-vereinfacht%2F1.0%29&TYPENAMES=ave%3AFlurstueck&SERVICE=WFS&COUNT=1&RESOURCEID=DE-NW20AL00003H76FL
geo	
@type	GeoShape
	6.776857426050415,51.21280826736151
	6.776885982043752,51.212807892738425
	6.777272571494604,51.212802783285206
	6.777276133232207,51.212903039925756
	6.777506955982481,51.21289979925066
	6.777543634367356,51.21289935395316

Behind the scenes – HTML with schema.org annotation for search engines

Liegenschaftskataster (NRW) 1.0.0 OAS3

[?json](#)

Das Liegenschaftskataster wird in elektronischer Form im Amtlichen Liegenschaftskatasterinformationssystem (ALKIS) geführt. Der vorliegende Web Feature Service ermöglicht das gezielte Herunterladen von in ALKIS geführten Geo-Objekten auf Basis einer Suchanfrage (Direktzugriffs-Downloaddienst). Der Dienst stellt ausschließlich folgende Geo-Objekte beschränkt auf die wesentlichen Eigenschaften im Format eines vereinfachten Datenaustauschschemas bereit, das in dieser Produktspezifikation festgelegt ist: Flurstücke und Verwaltungseinheiten. Der Dienst ist konzipiert zur Nutzung in einfachen praxisgängigen GIS-Clients ohne komplexe Funktionalitäten.

[Geobasis NRW - Website](#)

[Send email to Geobasis NRW](#)

Es gelten keine Beschränkungen.

Servers

Capabilities Essential characteristics of this API including information about the data.

GET / describe the feature collections in the dataset

GET /api the API description - this document

Features Access to data (features).

GET /flurstueck retrieve collection of features of type Flurstück

GET /flurstueck/{id} retrieve a Flurstück

Access the data via an easy to use Web API –
documented with openAPI metadata (Swagger)

SDIs are useful – but they're hard for non-experts to use

Release your geodata – embrace the Web and Linked Data:

1. Use persistent URLs for your spatial things
2. Make your spatial data indexable by search engines
3. Link resources together to create the Web of data
4. Expose spatial data through Web APIs

Leverage your SDI investment – build Web-centric access on top

Conclusion: SDI ☺ SDW

DANK JE

