

Quality Assuring Digital Landscape Models FME's Automated Data Validation & Reporting Capability at Work

GeoSpatial Product Development
Ciara Beddy

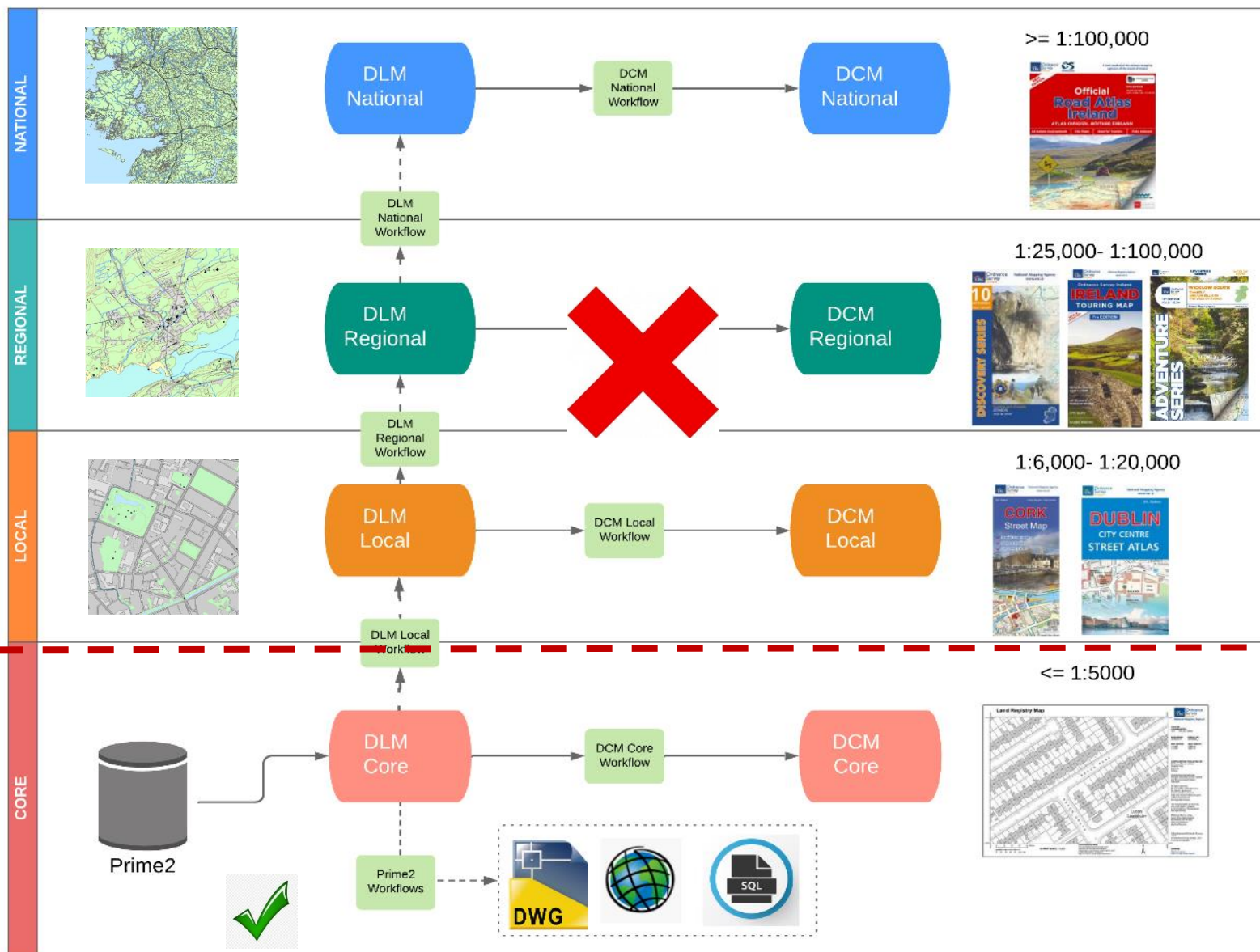


Rialtas na hÉireann
Government of Ireland

The background features a collage of map hexagons in various shades of green, blue, and brown, arranged in a honeycomb pattern. The word "Validation" is prominently displayed in the center in a large, bold, black serif font.

Validation

- MRDS Project Overview
- Technical Overview-Validation Solution
- Reporting on Validation Results
- Data Quality Dashboards
- Questions



Jan 2020 Status for Validation of MRDS DLM/DCM

No Automated Checks

Manual Review Only

Difficult to capture all Issues

Time & Resource Intensive

Automate Everything



Objective

Develop Automated Validation using available software

No manual Fixes/Editing of Data

Validation results feed back as model/process improvements

Next DLM/DCM Run should show improved Validation outputs



PROCESS

Develop a Testing Strategy for a completed DLM/DCM DataStore



- ☒ BuildingTests
- ☒ Edgematching
- ☒ Geometry
- ☒ NetworkTests
- ☒ SOE
- ☒ TestAttribution
- ☒ TestDLMEquivalence
- ☒ Typology
- ☒ Graphic Conflict



- AttributeTests
- BuildingTests_Geometry_NetworkTests_SOE_Typology
- DLMEquivalence
- Edgematching
- National_DLMLocal_Results



MRDS
Distributed Processing Homepage
MRDS
Validation
ABOUT MRDS
CONTACT

MRDS Validation Results

DLM Local	DLM Regional	DLM National
Geometry	Geometry	Geometry
Topology	Topology	Topography
SOE	SOE	SOE
Network	Network	Network
Building	Building	Building
Edgematching	Edgematching	Edgematching
Equivalence	Equivalence	Equivalence



Validation Criteria

Geometry (All Tables)

Geometry evaluated according to OGCStandard

Multipart Geom

Self Intersections

Null Geom

Silvers

Spikes

Typology (All tables)

Duplicates

Overlaps within same class

SOE (SOE Tables)

Holes/Gaps

Overlaps with another SOE

Network Tests

Pylon Structure Pnt must intersect Service Line

Rail Pnt must intersect Rail Network

Water line must be contained within water poly

Way line & GDF2 must be contained within way poly

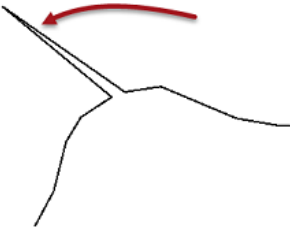
Building Tests

Build Poly must Equal BE Poly

Build Point must be contained in Build Poly

Edgematching

Unconnected Linear data on Edge of Partition Boundaries



AttributeTests

INVALID_CLASS_INTER_COMBOS

INVALID_FORM_COMBOS

INVALID_FUNC_COMBOS

INVALID_FORM_FUNC_COMBOS

INVALID_FORM_FUNC_INTER_COMBOS

INVALID_GAELTACHT_AREA_VALUES

INVALID_GDF_LEVEL_VALUES

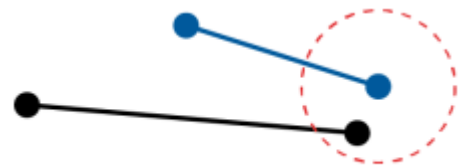
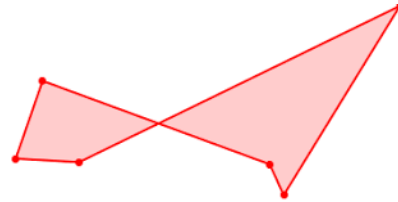
INVALID_RAIL_TYPE_VALUES

INVALID_STATUS_COMBOS

INVALID_DIRECTION_COMBOS

INVALID_Z_ORDER_VALUES

NULLS_AND_VALUES



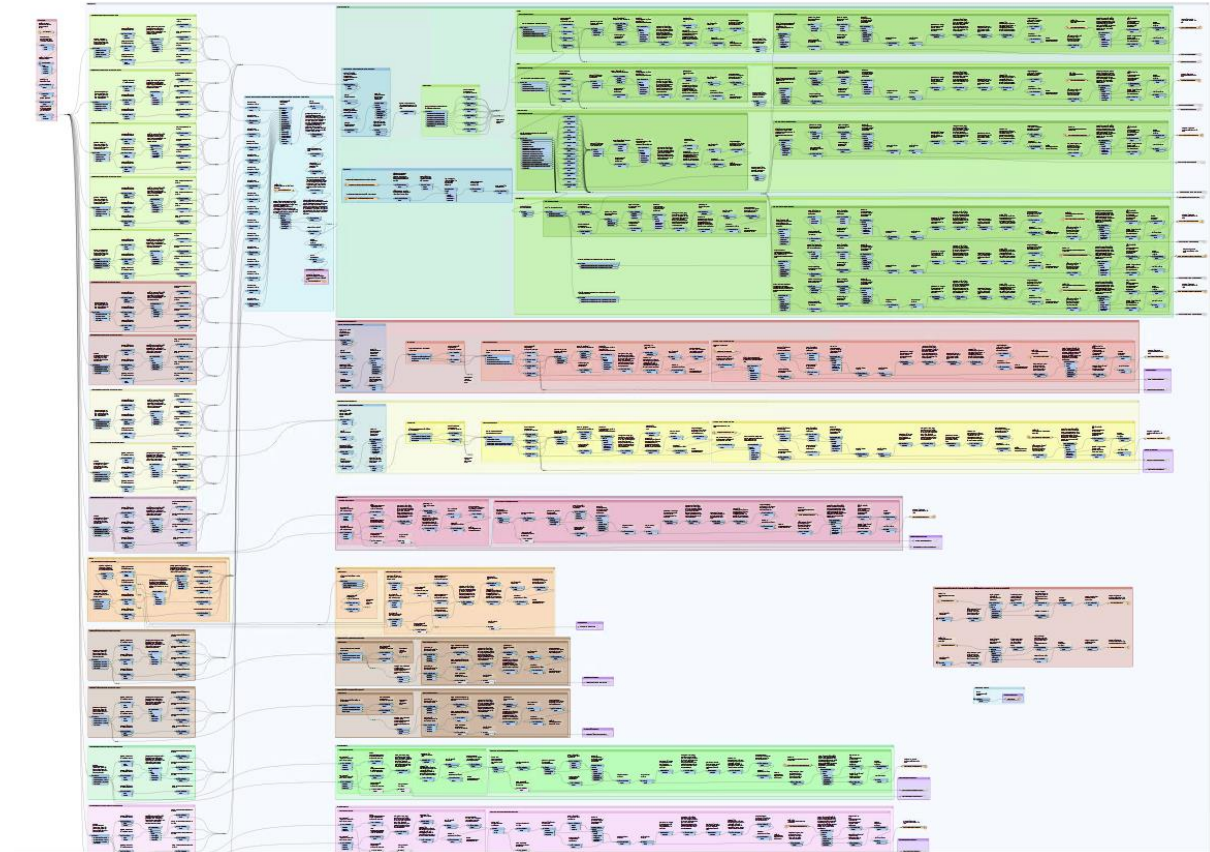
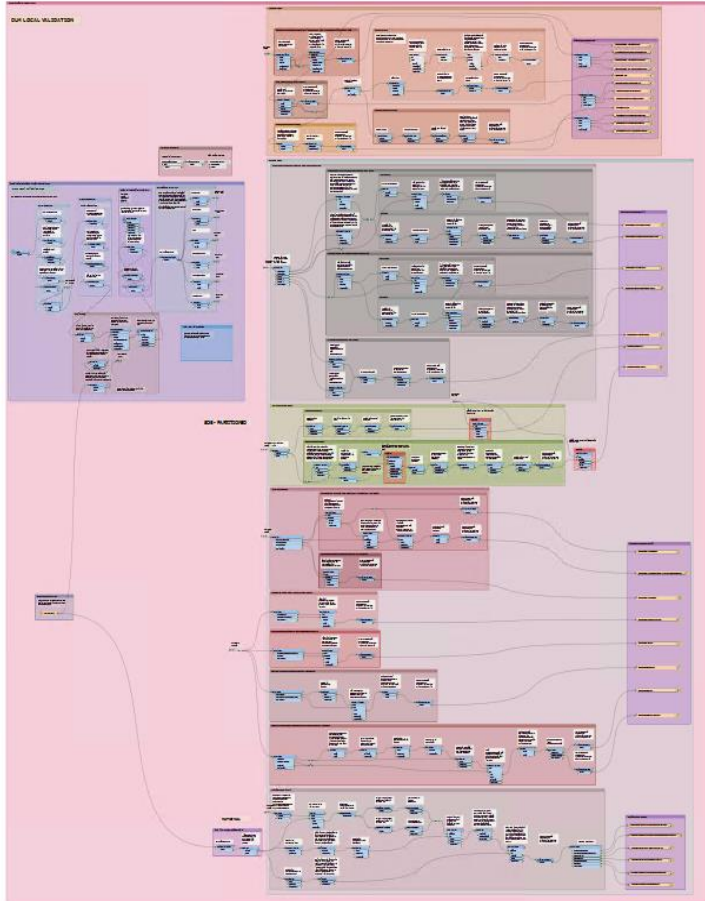
Equivalence Testing

Comparing point on the ground between different scales



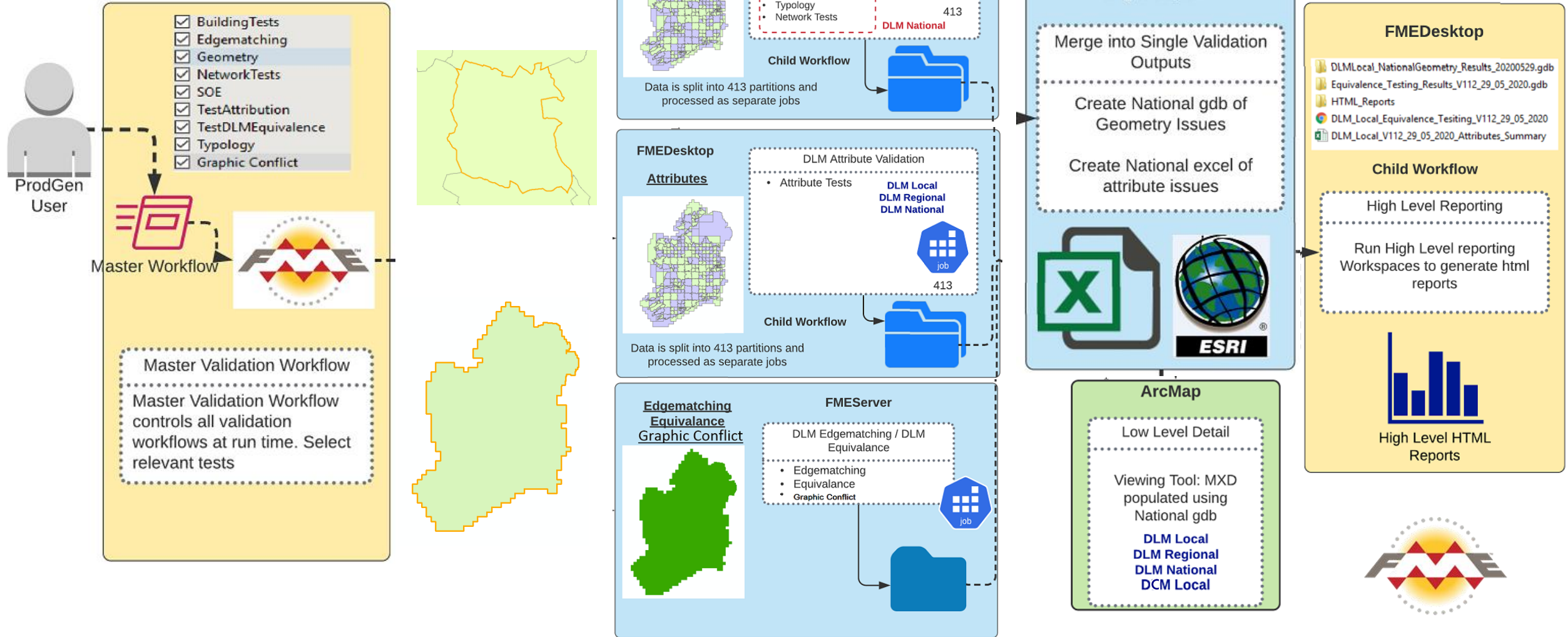
Graphic Conflict-DCM

Flowline



Name	Date modified	Type
DLMLocal_NationalGeometry_Results_20200605.gdb	14/06/2020 23:09	File folder
Equivalence_Testing_Results_V112_05_06_2020_FME.gdb	07/06/2020 20:39	File folder
HTML_Reports	08/06/2020 03:14	File folder
DLM_Local_Equivalence_Testing_V112_05_06_2020_FME	07/06/2020 20:39	HTML Document
DLM_Local_V112_05_06_2020_FME_Attributes_Summary.xlsx	08/06/2020 03:14	XLSX File

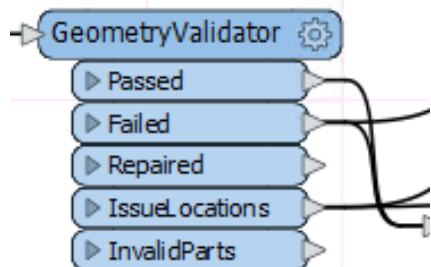
DLM/DCM



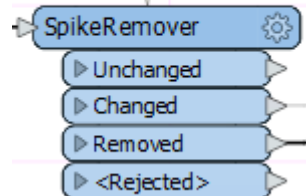
Key Transformers



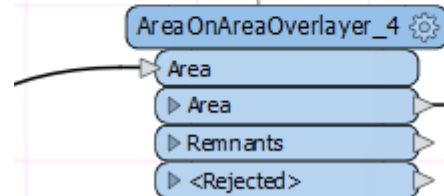
Test OGC Simple Geometry on every spatial table



Find Spikes



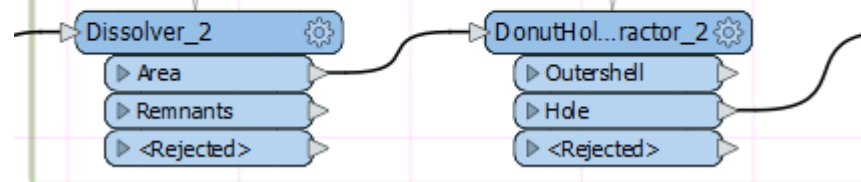
Check for class duplicates and self-overlaps. Group by fme_feature_type and Z_ORDER_VALUE to ensure overlaps with different Z orders are not included. Create an Overlaps list which will include each of the overlapping polygons (i.e. the overlapping polygon segment for each overlapping class)



IDENTIFY SOE HOLES

Dissolve all SOE polygons

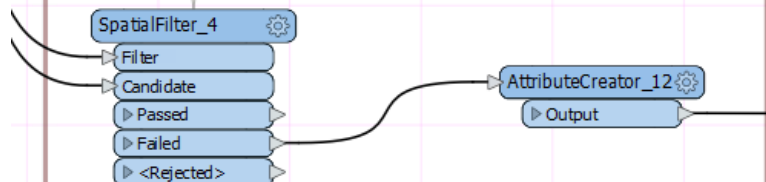
Search for holes in the SOE



BUILDING_PNT MUST BE CONTAINED WITHIN BUILDING_POLY

Identify all BUILDING_PNT features which are not contained within BUILDING_POLY features

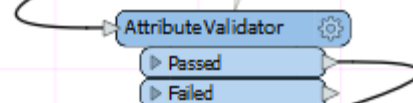
Create ERROR and CLASS_VALUE attributes for reporting in the Excel output file



FORM AND FUNC

TEST FOR NULL VALUES

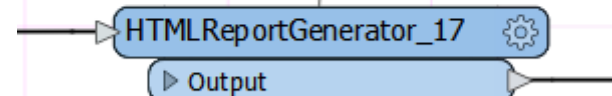
Test for FORM_ID, FORM_VALUE, FUNC_ID and FUNC_VALUE NULLS



SOE: HOLES

Holes in Skin-of-Earth

Chart (Bar)

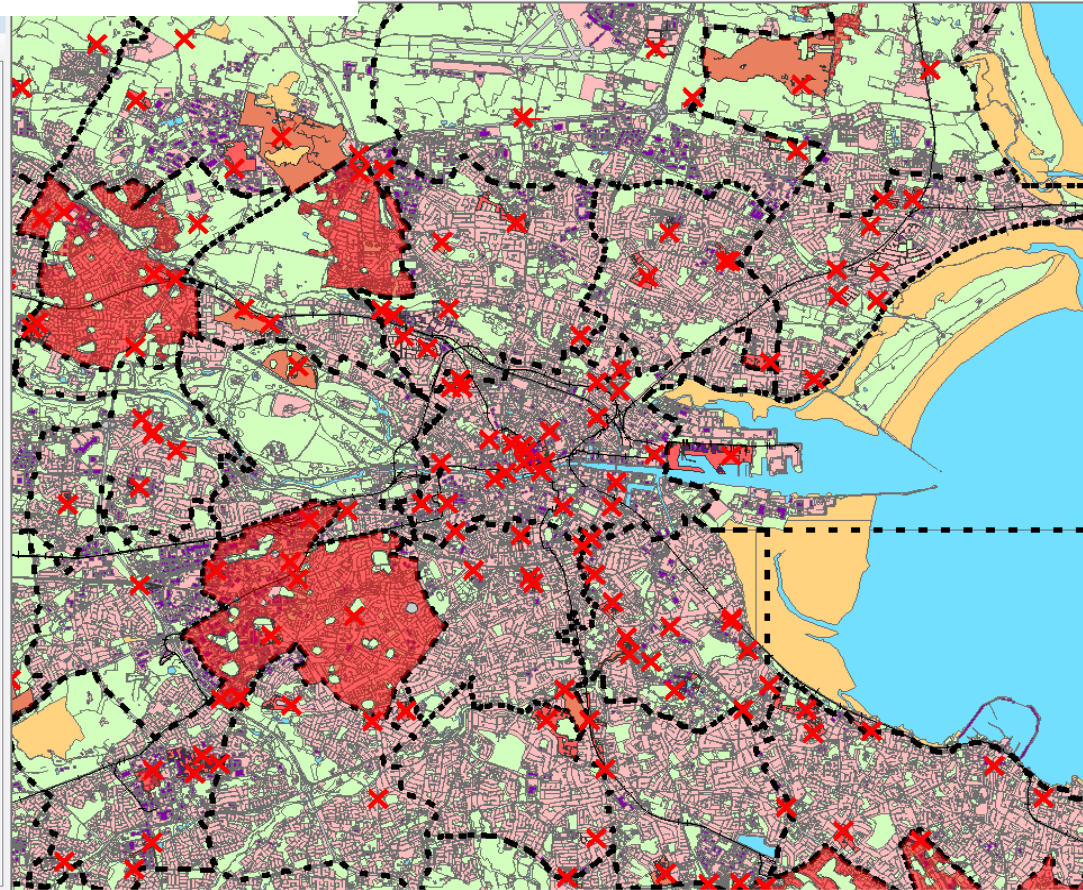


Low Level Details



Table Of Contents

- ☒ General
 - ☐ Edge Matching
 - ☒ ERRORS_EDGE_MATCHING_CONTOUR_10_20_5
 - ☒ ERRORS_EDGE_MATCHING_RAIL_NETWORK_SE
 - ☒ ERRORS_EDGE_MATCHING_SERVICE_LINE
 - ☒ ERRORS_EDGE_MATCHING_WATER_LINE
 - ☒ ERRORS_EDGE_MATCHING_WAY_GDF2_Named
 - ☒ ERRORS_EDGE_MATCHING_WAY_LINE
 - ☐ SOE Overlaps
 - ☐ SOE Gaps/Holes
 - ☐ Same Class Overlaps
 - ☐ Duplicates
- ☒ GEOMETRY
 - ☐ Slivers
 - ☐ Spikes
 - ☐ Multipart
 - ☐ Null Geometries
 - ☒ OGC Simple (Self-Intersections)
 - ☒ ERRORS_OGC_SIMPLE_LOCATION
 - ☒ ERRORS_OGC_SIMPLE_GEOMETRY_POINT
 - ☒ ERRORS_OGC_SIMPLE_GEOMETRY_LINE
 - ☒ ERRORS_OGC_SIMPLE_GEOMETRY_POLYGON
- ☒ Original DLM Local Feature Classes



Low Level- Detailed errors captured as spatial tables viewed in MXD to assist with analysing the errors

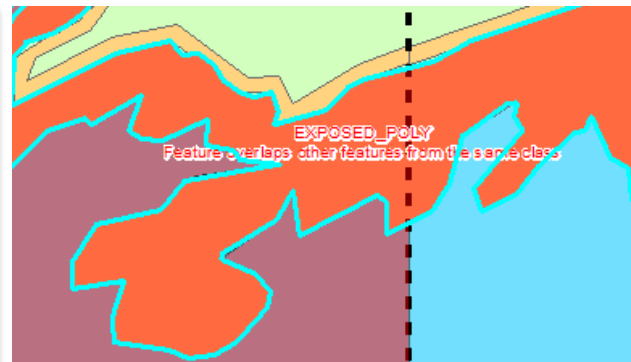
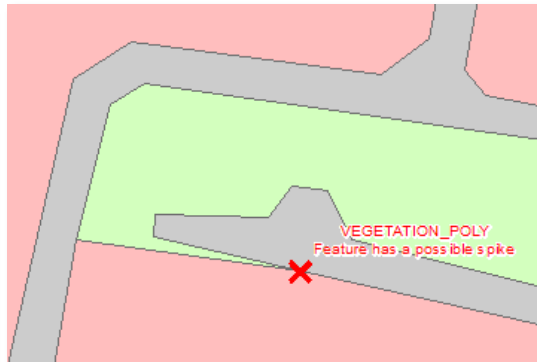


Results DLM

Spikes

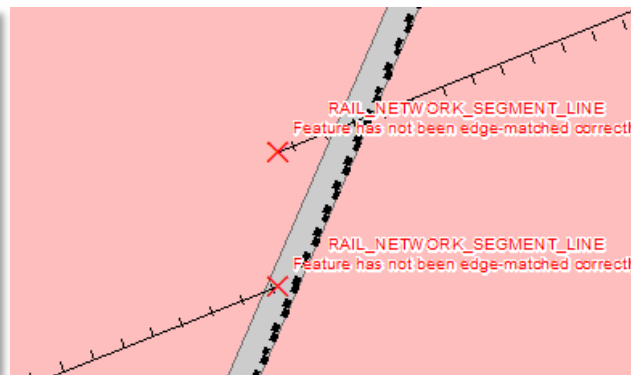
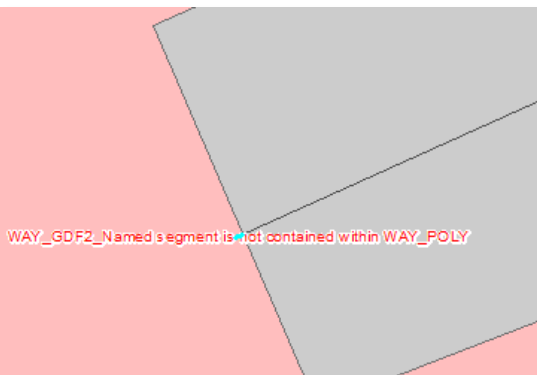
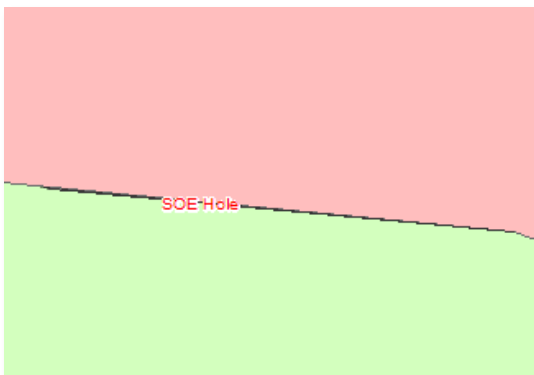


Self
Intersections



Duplicates

Gaps



Loss of
connectivity

Falls outside

Results: Visual detail of all validation errors. Providing direction on where to place development efforts to improve the outputs



Results DCM

DLM/DCM Validation Counts

dlmCore_CLASS	dlmLocal_CLASS	dcmLocal_CLASS	FORM_ID	FORM_VALUE	FUNC_ID	FUNC_VALUE	dlmCore_COUNT	dlmLocal_COUNT	dcmLocal_COUNT	dcmLocal/dlmCore
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	39	Art Gallery	13	13	13	0
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	94	Cinema	31	29	29	-2
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	263	Library	137	124	124	-13
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	301	Museum	75	68	68	-7
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	342	Post Office	235	221	221	-14
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	474	Theatre	55	50	50	-5
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	55	Building General	482	Tourist Office	28	22	22	-6
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	82	Chapel	632	Not Applicable	71	62	62	-9
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	84	Church	80	Catholic Cathedral	32	32	32	0
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	84	Church	81	Catholic Church	1,792	1,762	1,762	-30
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	84	Church	89	Church of Ireland Church	450	436	436	-14
BUILDING_PNT	BUILDING_PNT	BUILDING_PNT	84	Church	90	Church of Ireland Cathedral	16	16	16	0



Where did my features go??!





Results Attributes



CLASS_V			ARTIFICIAL_POLY	BARONY_POLY	BUA_DLM3_130_28_12	BUA_DLM6_200_42_14	BUA_DLM9_280_48_16	BUILDING_PNT	BUILDING_POLY	CONTOUR_10_20_50	COUNTY_POLYGON	DIVISION_LINE_NEW	EXPOSED_POLY	GAELTACHT_POLYGON	LOCALE_PNT	LOCALE_POLY	PARISH_POLYGON	PNT_ALL	PNT_ALLBUILDINGS_UNGENERALISED	PNT_SITE_POLY	NAME_VALUE	ENG_N
BUILDING_PN																					Brendan's National Sch	
BUILDING_PO																					Brendan's National Sch	
WAY_POLY																						
WAY_GDF2_N																					284-41bc-8383-5cd2032	
WAY_GDF2_N																					2c3-45bf-b8fb-f642beb	
WAY_GDF2_N																					ff4-42ca-9d65-837b9f58	
WAY_GDF2_N																					b71-4669-ace5-aeff044	
WAY_GDF2_N																					7855-40c9-9b17-ded424i	
WAY_GDF2_N																					4b6-47be-a662-dae1b5:	
WAY_GDF2_N																					80a-438c-97b4-75981e6	
WAY_GDF2_N	FORM_ID & FORM_VALUE	INVALID NO NULLS																		3	d28-4fbd-b51f-55714d:	
WAY_GDF2_N		INVALID BECAUSE OF NULLS											1								b584-49d2-b4ba-32f8d3:	
WAY_GDF2_N		INVALIDS AS % OF TOTAL FEATURES											0.00							0.02	4b6-47be-a662-dae1b5:	
WAY_LINE	FUNC_ID & FUNC_VALUE	INVALID NO NULLS																			2c3-45bf-b8fb-f642beb	
WAY_LINE		INVALID BECAUSE OF NULLS	540										1								80a-438c-97b4-75981e6	
WAY_LINE		INVALIDS AS % OF TOTAL FEATURES	24.92										0.00								ff4-42ca-9d65-837b9f58	
WAY_LINE	FORM_ID, FORM_VALUE, FUNC_ID, FUNC_VALUE	INVALID NO NULLS																		11	d28-4fbd-b51f-55714d:	
WAY_LINE		INVALID BECAUSE OF NULLS	540										1								b71-4669-ace5-aeff044	
WAY_LINE		INVALIDS AS % OF TOTAL FEATURES	12.46										0.00								7855-40c9-9b17-ded424i	
BUILDING_PN		INVALID NO NULLS																			onport Garda Station	
BUILDING_PO																					onport Garda Station	

Range of tests to determine what attributes are of any use after generalisation

High Level Details



DLM LOCAL

VALIDATION REPORT

Quality Check: ATTRIBUTE VALIDITY

Date of verification: 30/05/2020

Class: ARTIFICIAL_POLY

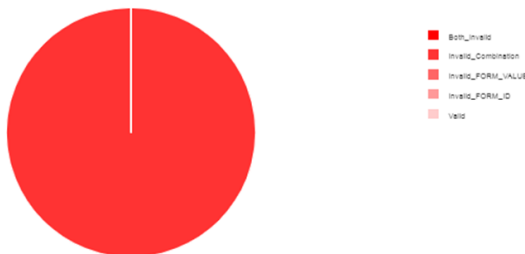
Count of Features: 732,892

Output Directory: \\oshp2supl\p2_supply\Validation\MRDS_Stack\Outputs\DLM_Local_20200529\National_DLMLocal_Results\DLMLocal_National\Geometry_Results_20200529

Processing Time: 04 min 50 sec

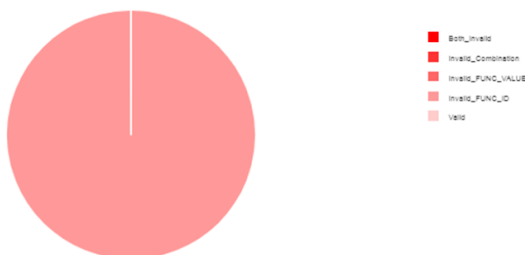
FORM_ID / FORM_VALUE

Errors: 733,345



FUNC_ID / FUNC_VALUE

Errors: 733,345



DLM LOCAL

VALIDATION REPORT

Quality Check: TOPOLOGY

Date of verification: 30/05/2020

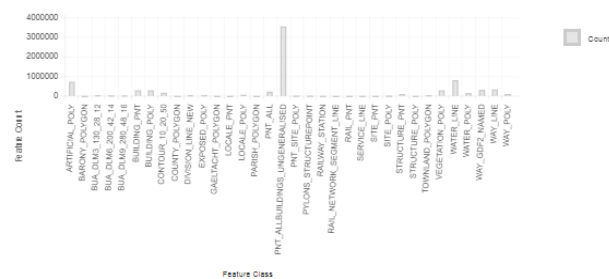
Errors: 30,325

Total Count of Features: 7,702,738

Output Directory: \\oshp2supl\p2_supply\Validation\MRDS_Stack\Outputs\DLM_Local_20200529\National_DLMLocal_Results\DLMLocal_National\Geometry_Results_20200529

Processing Time: 04 min 50 sec

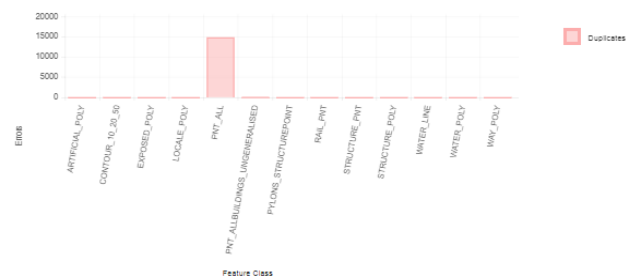
DLM LOCAL (COUNT OF FEATURES)



DUPLICATES

Duplicate Points / Lines / Polygons

Errors: 15,007



DLM LOCAL

VALIDATION REPORT

Quality Check: DLM Local and DLM Core Equivalence

Date of Verification: 30/05/2020

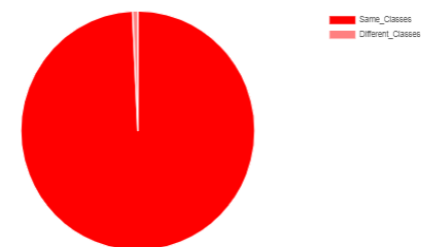
Number of DLM Local Samples: 10000

Classes: SOE (ARTIFICIAL_POLY, EXPOSED_POLY, VEGETATION_POLY, WATER_POLY, WAY_POLY)

Output Directory: \\oshp2supl\p2_supply\Validation\MRDS_Stack\Outputs\DLM_Local_20200529\National_DLMLocal_Results\Equivalence_Testing_Results_V112_20_05_2020.gdb

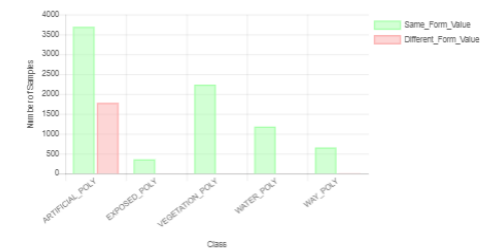
CLASS EQUIVALENCE

TOTAL ERRORS: 71 out of 9999



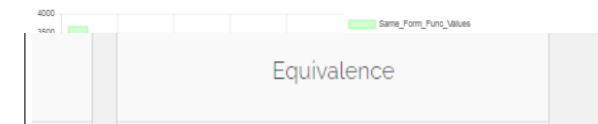
FORM_VALUE EQUIVALENCE

TOTAL ERRORS: 1792 out of 9925



FORM_VALUE AND FUNC_VALUE EQUIVALENCE

TOTAL ERRORS: 1822 out of 9925



MRDS Product Creation & FME



DLM Local



DLM Regional



DLM National



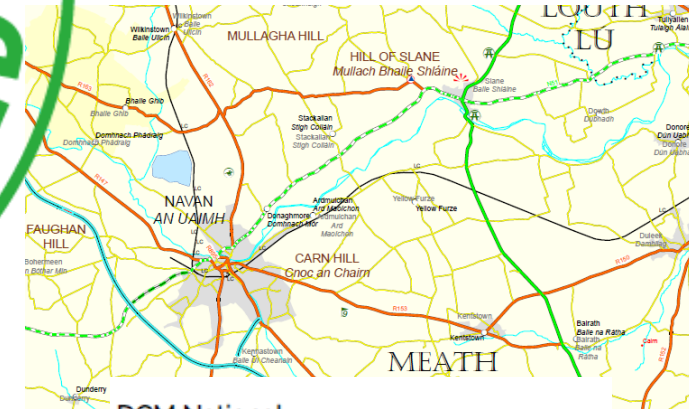
DCM Local

Scale- 1:6,000- 1:25,000 Products: Town Series, City Series



DCM Regional

Scale 1:25,000-1:100,000 Products: Adventure Series, Discovery Series



DCM National

Scale-1:100,000+ Products: Road Atlas



Next Steps

Configure Further Validation Tests



Interrogate Results & Improve Process



Investigate Labelling Validation



Investigate further DCM Validation





Questions

Contact: ciara.beddy@osi.ie