APPENDIX B

ALGORITHMS

QGIS

Collection of all the algorithms used for the development of Attributes and Metrics starting from Volume and Void Components' input layers as explained in section 5.3.4 and shown in Figure 49.

- Volume Filter
- Surface (work of ArcMap Free Vertical Surface intermediate output)
- UV2B
- Court
- Block
- Attributes
- Metrics

ARCMAP

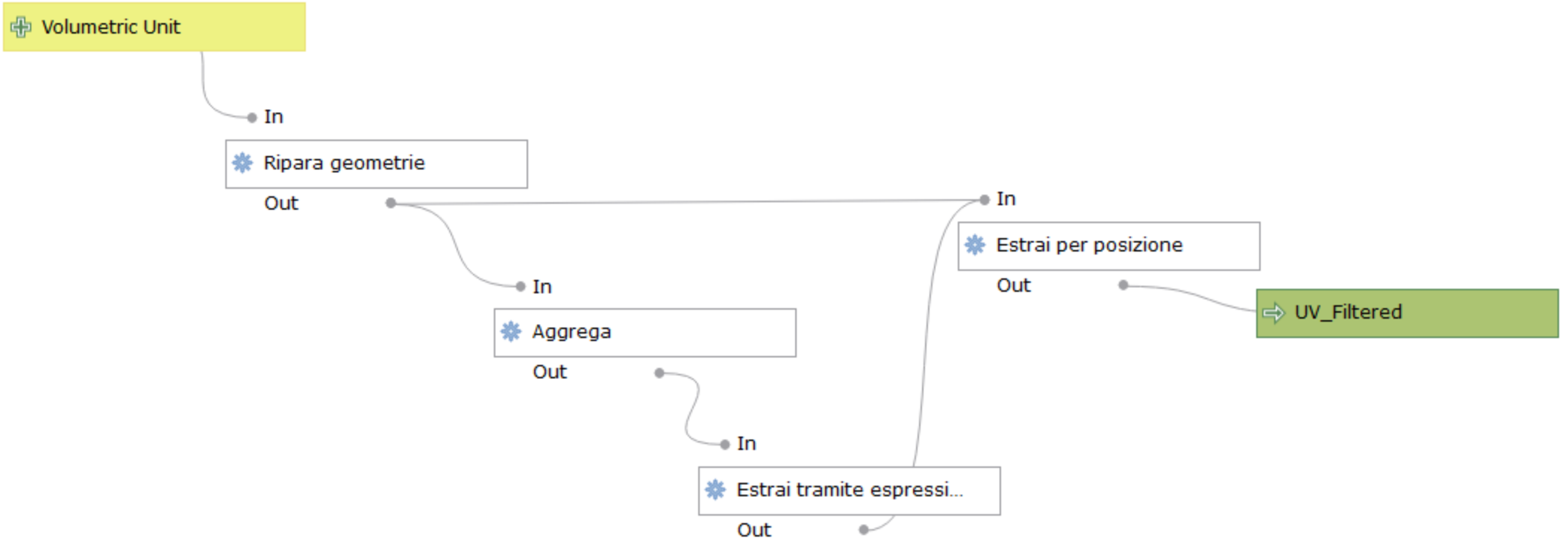
Presentation of the Free Vertical Surface Model builder module that has been used in place of QGis Surface for some computational limits.

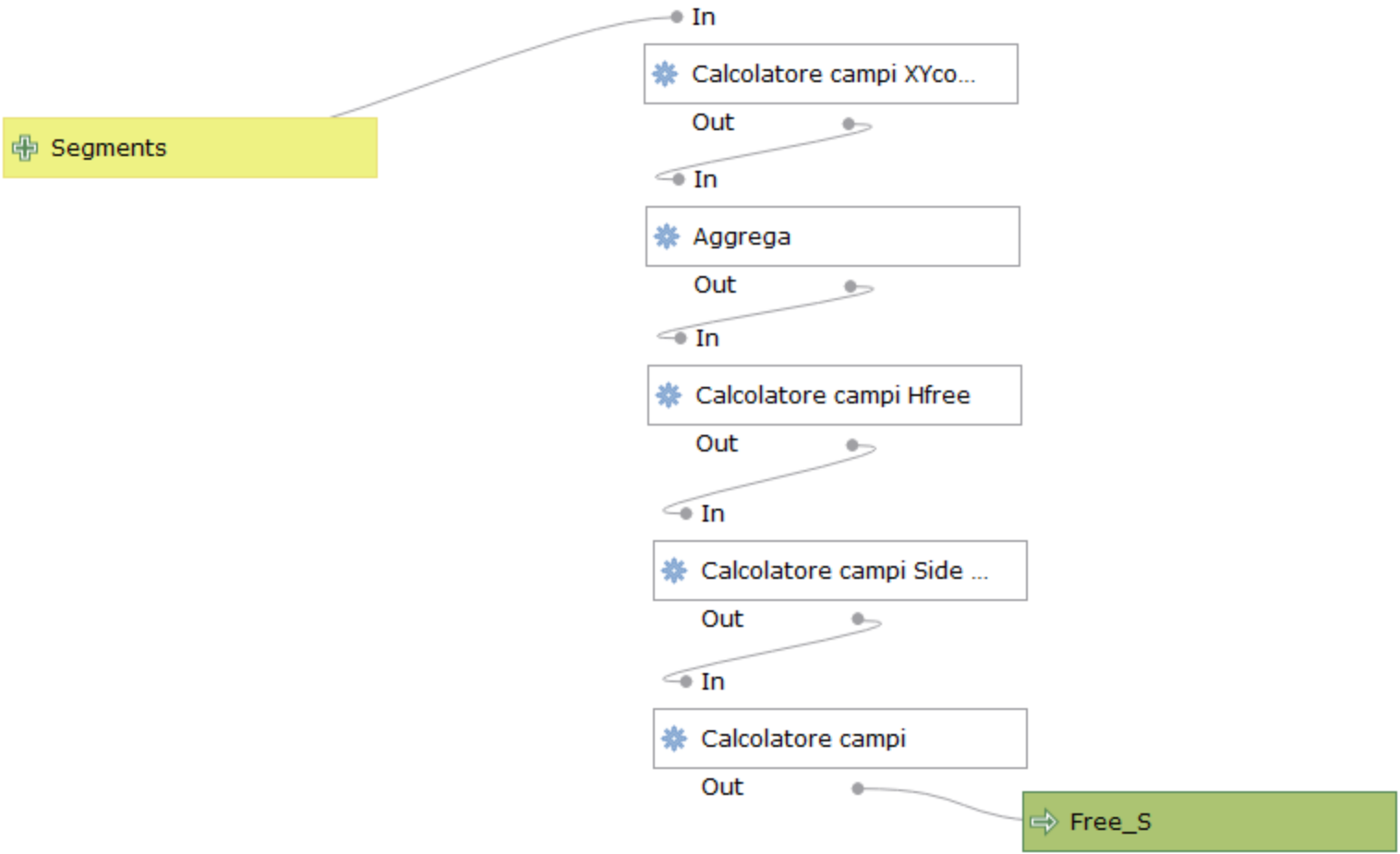
- Description and Formula
- Screenshots of the procedure

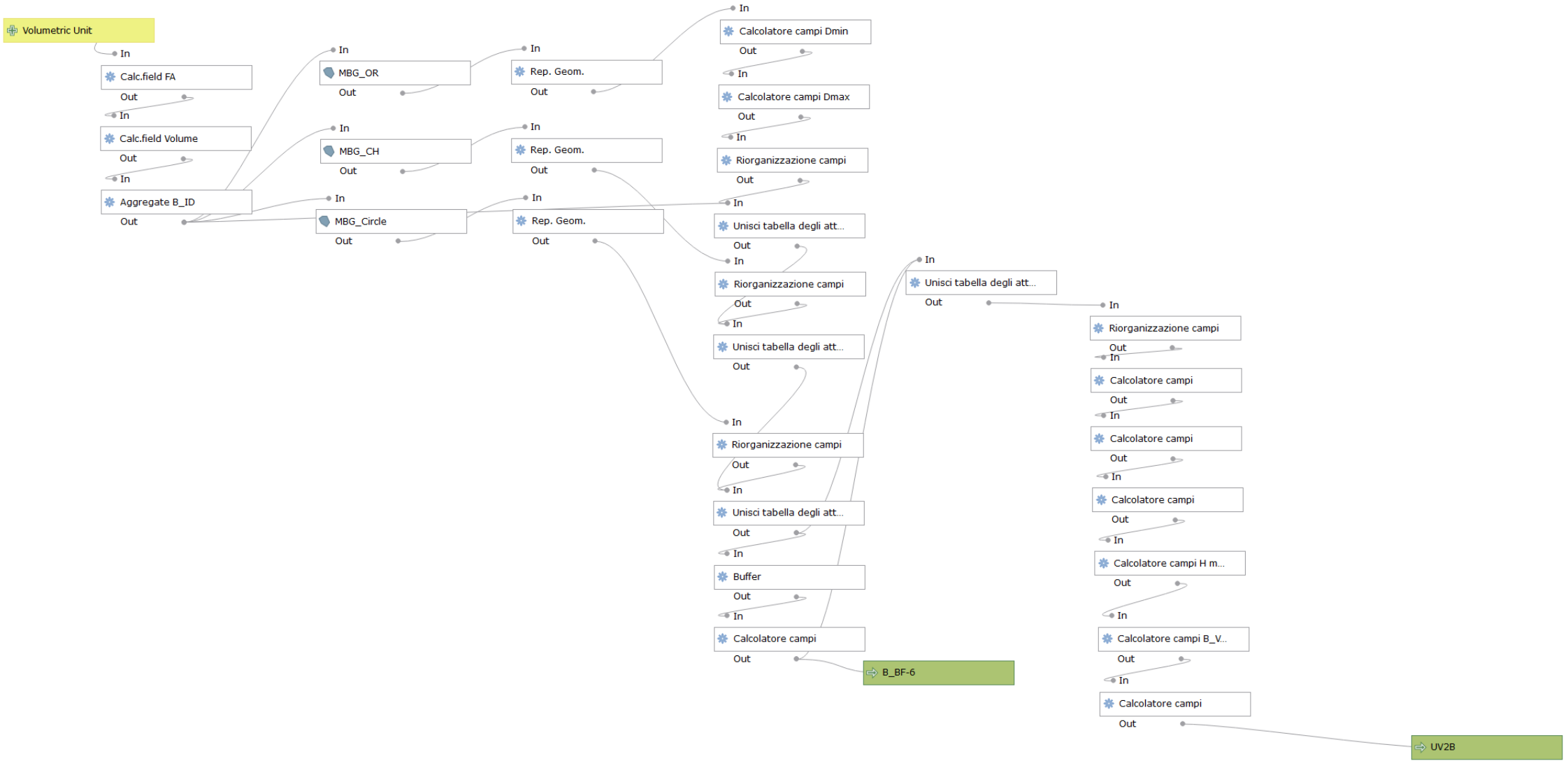
GRASSHOPPER

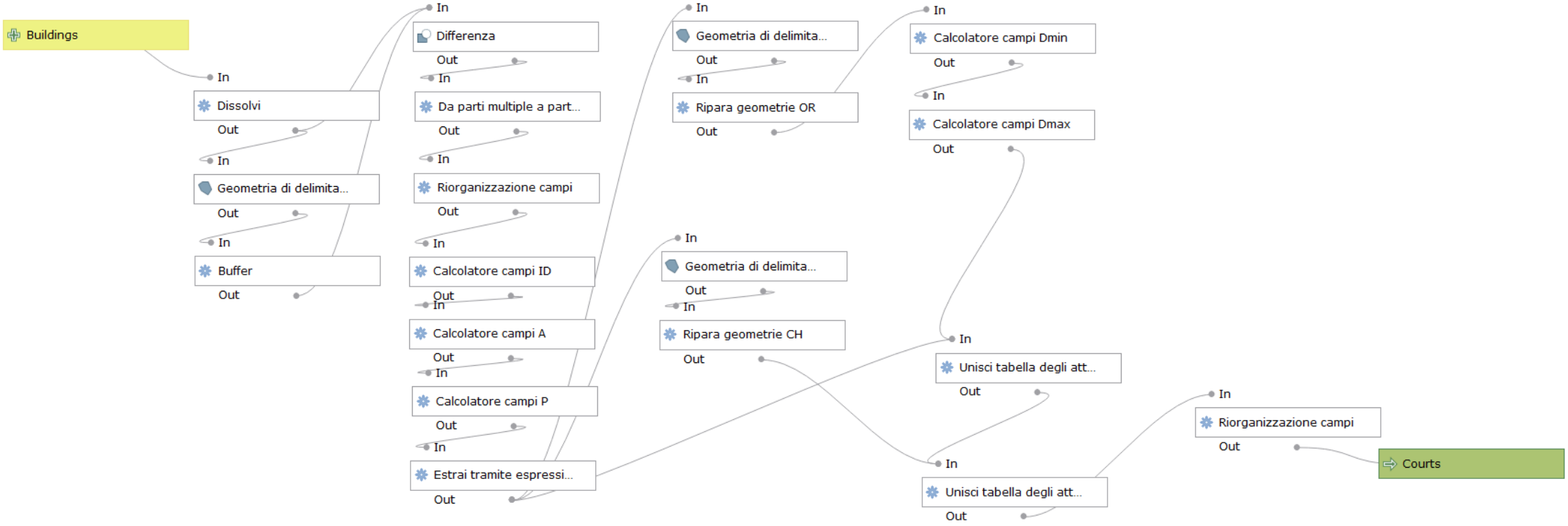
Two visual scripting examples developed for the partrnership with Vectorworks and based on Tadi et al. (2017) for Porosity and with a similar approach using metrics found in the literature for Compactness. Porosity algorithm only compute values and draws the diagrams (here shown for morphological variations with a fix building density) while Compactness one also creates random shapes that simulate the agglomeration of urban patches.

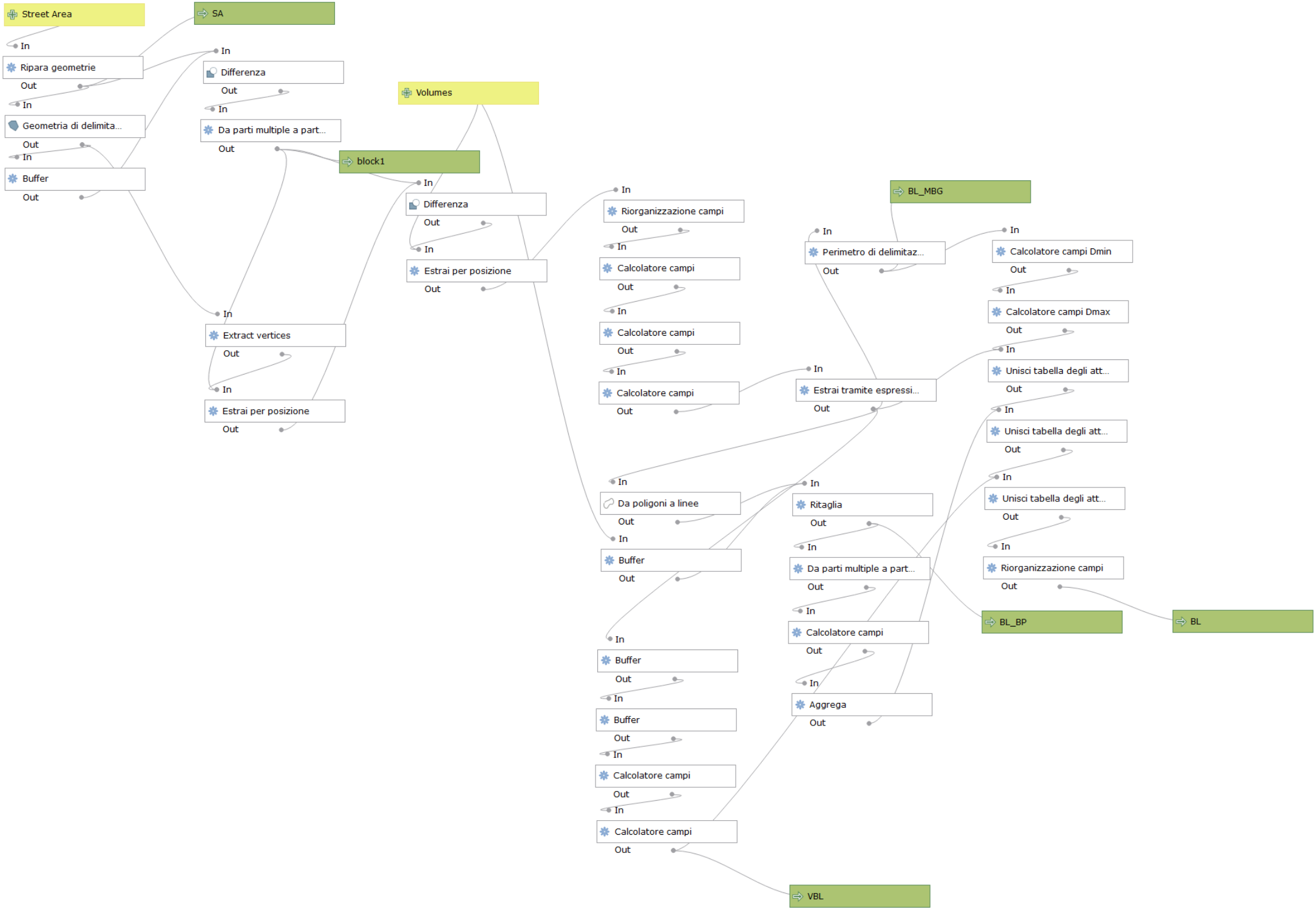
- Porosity
- Compactness

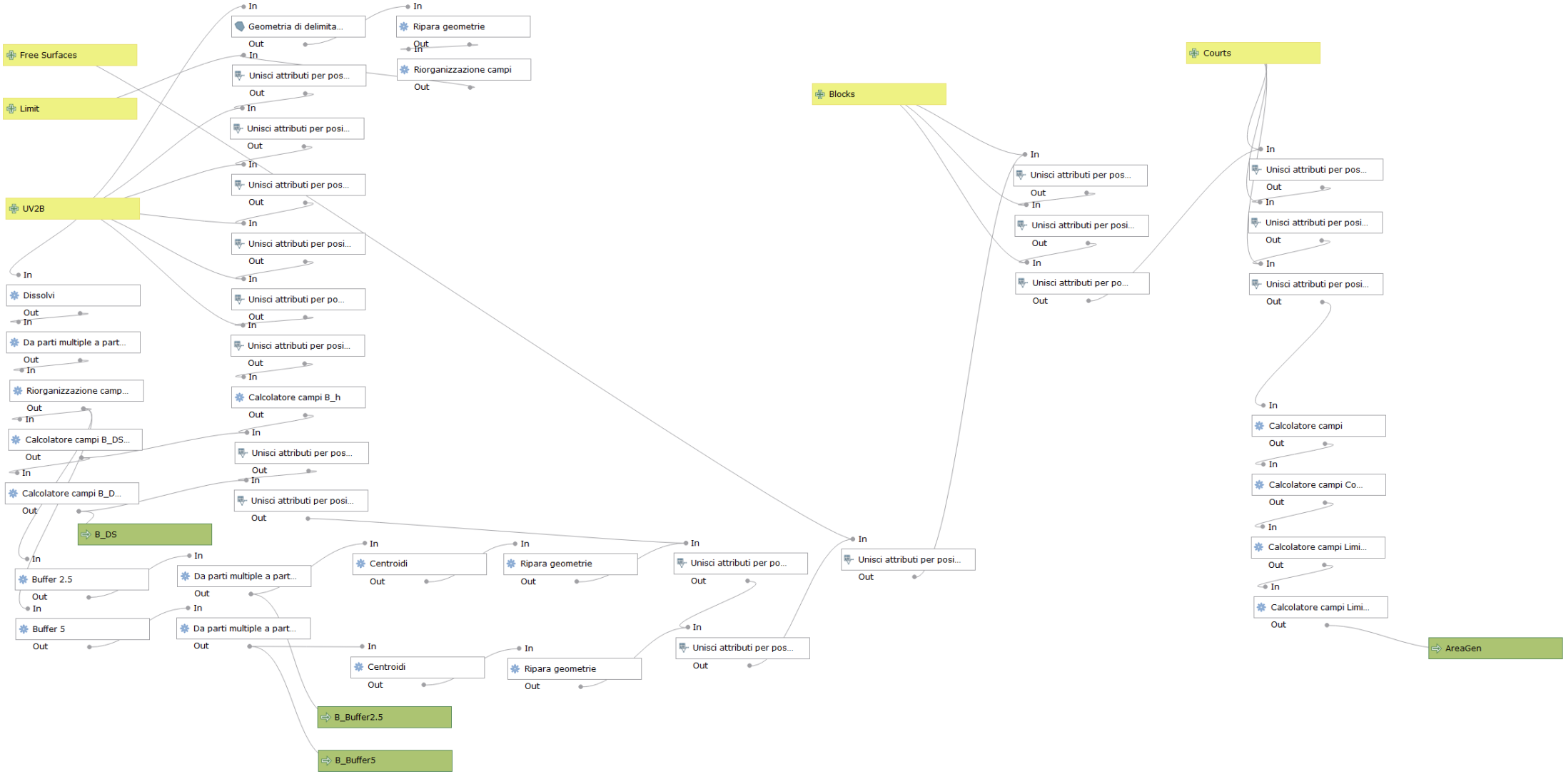

Volumetric Unit
In
Ripara geometrie
Out
In
Aggrega
Out
In
Estrai tramite espressi...
Out
In
Estrai per posizione
Out
UV_Filtered

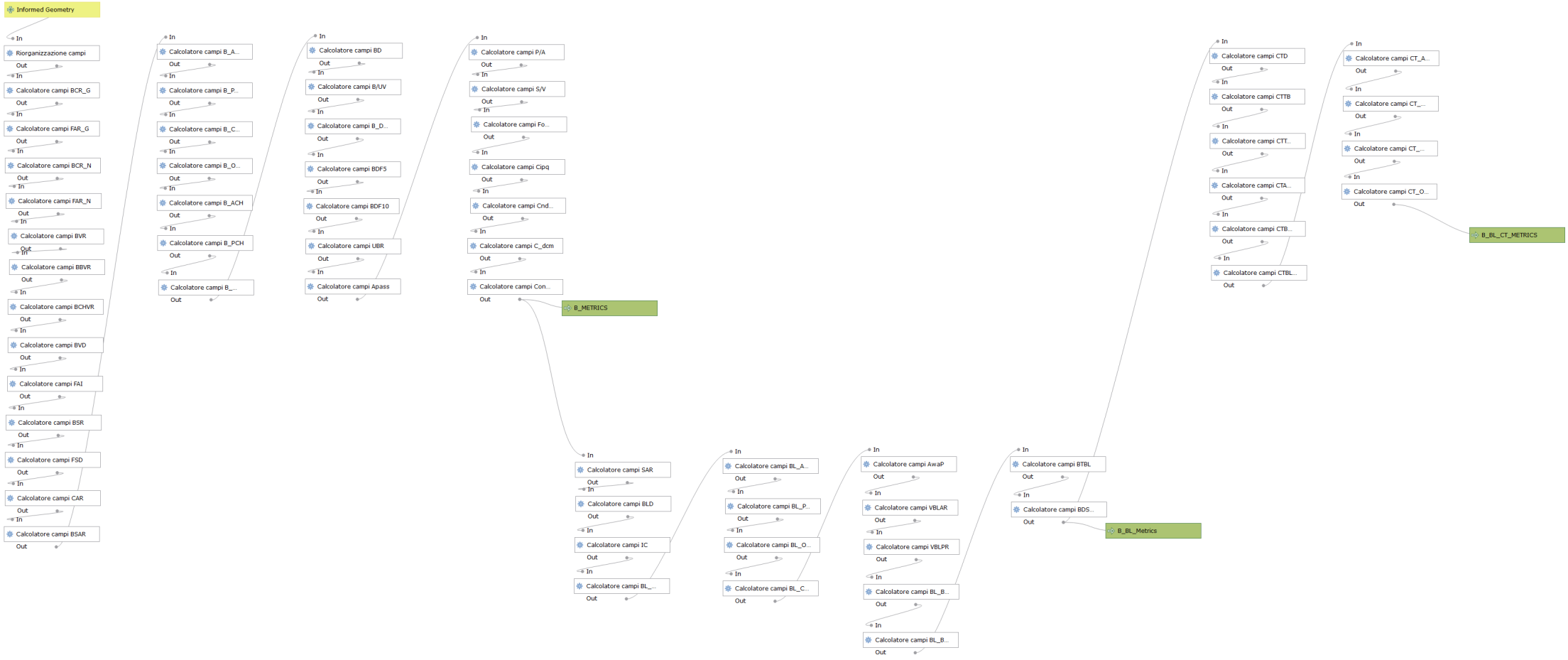

In
Calcolatore campi XYco...
Segments
Out
In
Aggrega
Out
In
Calcolatore campi Hfree
Out
In
Calcolatore campi Side ...
Out
In
Calcolatore campi
Out
Free_S


Volumetric Unit
In
Calc.field FA
Out
In
Calc.field Volume
Out
In
Aggregate B_ID
Out
In
MBG_OR
Out
In
MBG_CH
Out
In
MBG_Circle
Out
In
Rep. Geom.
Out
In
Rep. Geom.
Out
In
Rep. Geom.
Out
In
Calcolatore campi Dmin
Out
In
Calcolatore campi Dmax
Out
In
Riorganizzazione campi
Out
In
Unisci tabella degli att...
Out
In
Riorganizzazione campi
Out
In
Unisci tabella degli att...
Out
In
Riorganizzazione campi
Out
In
Unisci tabella degli att...
Out
In
Buffer
Out
In
Calcolatore campi
Out
B_BF-6
In
Unisci tabella degli att...
Out
In
Riorganizzazione campi
Out
In
Calcolatore campi
Out
In
Calcolatore campi
Out
In
Calcolatore campi
Out
In
Calcolatore campi H m...
Out
In
Calcolatore campi B_V...
Out
In
Calcolatore campi
Out
UV2B


Buildings
In
Dissolvi
Out
In
Geometria di delimita...
Out
In
Buffer
Out
In
Differenza
Out
In
Da parti multiple a part...
Out
In
Riorganizzazione campi
Out
In
Calcolatore campi ID
Out
In
Calcolatore campi A
Out
In
Calcolatore campi P
Out
In
Estrai tramite espressi...
Out
In
Geometria di delimita...
Out
In
Ripara geometrie OR
Out
In
Geometria di delimita...
Out
In
Ripara geometrie CH
Out
In
Calcolatore campi Dmin
Out
In
Calcolatore campi Dmax
Out
In
Unisci tabella degli att...
Out
In
Unisci tabella degli att...
Out
In
Riorganizzazione campi
Out
Courts


Street Area
SA
Ripara geometrie
Differenza
Geometria di delimita...
Da parti multiple a part...
Buffer
block1
Volumes
Differenza
Riorganizzazione campi
Calcolatore campi
Calcolatore campi
Calcolatore campi
Estrai per posizione
Extract vertices
Estrai per posizione
BL_MBG
Perimetro di delimitaz...
Calcolatore campi Dmin
Calcolatore campi Dmax
Unisci tabella degli att...
Unisci tabella degli att...
Unisci tabella degli att...
Riorganizzazione campi
Estrai tramite espressi...
Da poligoni a linee
Buffer
Ritaglia
Da parti multiple a part...
Calcolatore campi
Aggrega
Buffer
Buffer
Calcolatore campi
Calcolatore campi
BL_BP
BL
VBL
In
Out


Free Surfaces
Limit
UV2B
Blocks
Courts
Geometria di delimita...
Ripara geometrie
Riorganizzazione campi
Unisci attributi per pos...
Unisci attributi per posi...
Unisci attributi per po...
Dissolvi
Da parti multiple a part...
Riorganizzazione camp...
Calcolatore campi B_DS...
Calcolatore campi B_D...
Calcolatore campi B_h
B_DS
Buffer 2.5
Buffer 5
Centroidi
Ripara geometrie
Unisci attributi per po...
Unisci attributi per posi...
Calcolatore campi
Calcolatore campi Co...
Calcolatore campi Limi...
B_Buffer2.5
B_Buffer5
AreaGen
In
Out


Informed Geometry
In
Riorganizzazione campi
Out
In
Calcolatore campi BCR_G
Out
In
Calcolatore campi FAR_G
Out
In
Calcolatore campi BCR_N
Out
In
Calcolatore campi FAR_N
Out
In
Calcolatore campi BVR
Out
In
Calcolatore campi BBVR
Out
In
Calcolatore campi BCHVR
Out
In
Calcolatore campi BVD
Out
In
Calcolatore campi FAI
Out
In
Calcolatore campi BSR
Out
In
Calcolatore campi FSD
Out
In
Calcolatore campi CAR
Out
In
Calcolatore campi BSAR
Out
In
Calcolatore campi B_A...
Out
In
Calcolatore campi B_P...
Out
In
Calcolatore campi B_C...
Out
In
Calcolatore campi B_O...
Out
In
Calcolatore campi B_ACH
Out
In
Calcolatore campi B_PCH
Out
In
Calcolatore campi B_...
Out
In
Calcolatore campi BD
Out
In
Calcolatore campi B/UV
Out
In
Calcolatore campi B_D...
Out
In
Calcolatore campi BDF5
Out
In
Calcolatore campi BDF10
Out
In
Calcolatore campi UBR
Out
In
Calcolatore campi Apass
Out
In
Calcolatore campi P/A
Out
In
Calcolatore campi S/V
Out
In
Calcolatore campi Fo...
Out
In
Calcolatore campi Cipq
Out
In
Calcolatore campi Cnd...
Out
In
Calcolatore campi C_dcm
Out
In
Calcolatore campi Con...
Out
B_METRICS
In
Calcolatore campi SAR
Out
In
Calcolatore campi BLD
Out
In
Calcolatore campi IC
Out
In
Calcolatore campi BL_...
Out
In
Calcolatore campi BL_A...
Out
In
Calcolatore campi BL_P...
Out
In
Calcolatore campi BL_O...
Out
In
Calcolatore campi BL_C...
Out
In
Calcolatore campi AwaP
Out
In
Calcolatore campi VBLAR
Out
In
Calcolatore campi VBLPR
Out
In
Calcolatore campi BL_B...
Out
In
Calcolatore campi BL_B...
Out
In
Calcolatore campi BTBL
Out
In
Calcolatore campi BDS...
Out
B_BL_Metrics
In
Calcolatore campi CTD
Out
In
Calcolatore campi CTTB
Out
In
Calcolatore campi CTT...
Out
In
Calcolatore campi CTA...
Out
In
Calcolatore campi CTB...
Out
In
Calcolatore campi CTBL...
Out
In
Calcolatore campi CT_A...
Out
In
Calcolatore campi CT_...
Out
In
Calcolatore campi CT_...
Out
In
Calcolatore campi CT_O...
Out
B_BL_CT_METRICS

MODEL BUILDER

One of the model developed for the research is here presented. This is about the computation of the free vertical surfaces using as input the volumetric units layer. This is the only part that required the use of ESRI ArcMap software while all the rest has been developed using the open source QGis.

The goal is to achieve within a GIS environment what is actually a very simple operation for 3D modelling software, calculating the filtering from the total vertical surfaces those that share a portion of their area with other surfaces. Contact surfaces can belong to the same building (UV – UV) or to the same Bds (B – B). In a 3D modelling environment we would normally perform a boolean union of building volumes, in order to obtain a single full object, followed by an explosion or Brep deconstruction to receive as output the single free faces. In GIS terms this could be seen as a tridimensional Dissolve followed by a split according to volumes edges, but unfortunately is not possible to do it.

The algorithm follow an alternative and more tortuous path that will be explained step by step before showing the code.

Free Vertical Surface

Input: Volumetric Units (UV)

Feature to Line: trasformtion from polygons to lines

Feature Vertices to point: extraction of verteces from the lines just obtained in a point layer

Split Line at Point: split of the lines using the points generated by the previous step. In this way each line will be divided also according to verteces belonging to an adjacent different line.

Add Geometry Attributes: Add to these new lines the x and y coordinates of the centroid as attributes and the length of the line (LENGTH field)

Add field: XYCOORD, text field to host a code composed by the two coordinates of the centroid just created

Calculate Field: XYCOORD, concatenation of the two coordinates in a single text code

Dissolve: on XYCOORD field, asking to mantain as attributes the minimum and maximum value of height field and the count of the dissolved geometries [1;2]

Add Field: H_FREE to host the difference between maximum (Hmax) and minimum (Hmin) height for contact surfaces

Calculate Field: H_FREE, Hmax – Hmin

Add Field: FREE_S to host free vertical surfaces

Calculate Field: FREE_S according to the following formula:

```
dim x

if [COUNT_UN_V] = 1 then
```

x = [Hmax] * [LENGTH]

elseif [COUNT_UN_V] <> 1 then

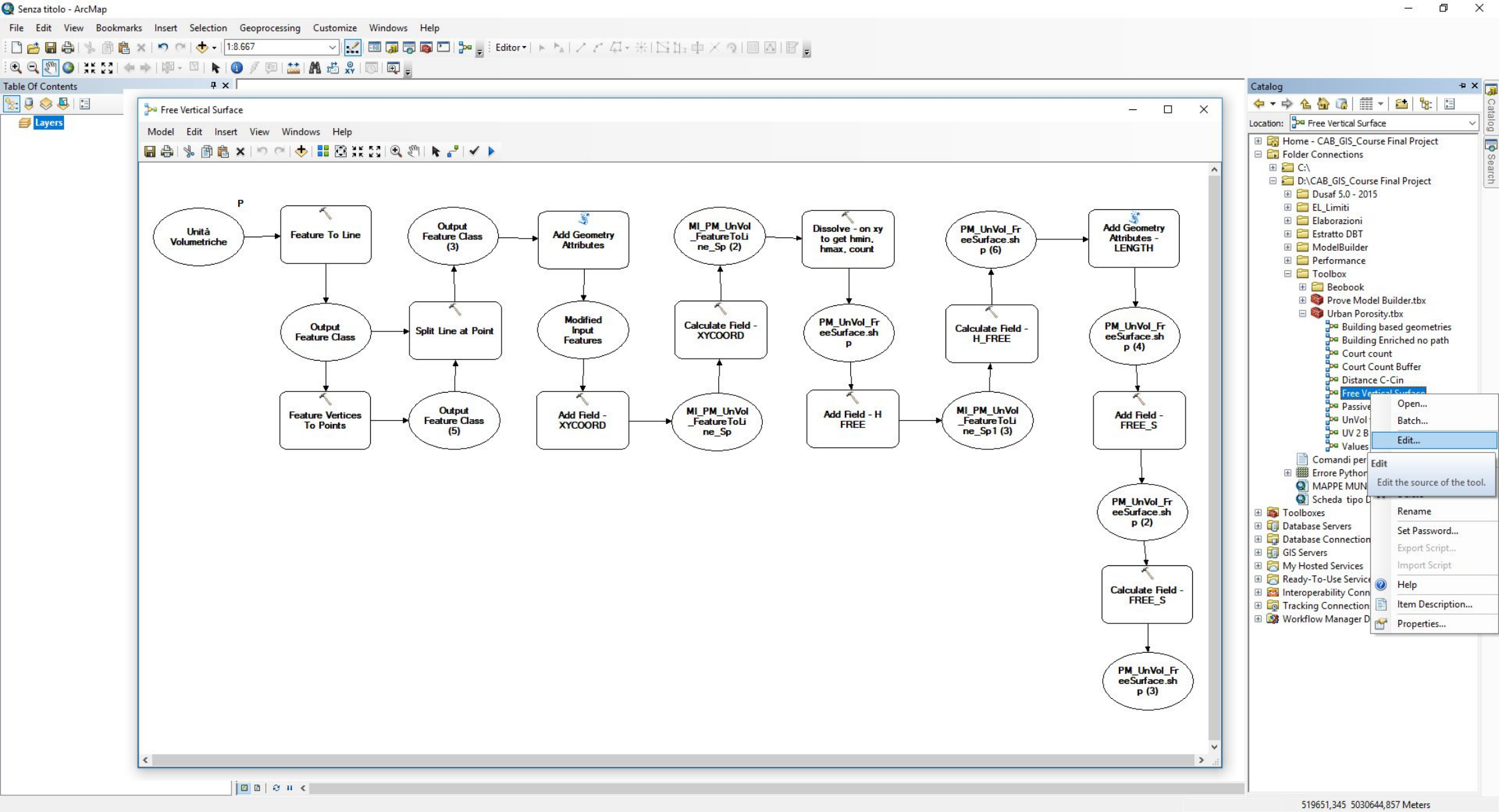
x = [H_FREE]* [LENGTH]

end if

that means: if one line doesn’t overlap with others (count = 1) take Hmax as value and multiply it by the LENGTH field, If two lines overlap (more than two is physically impossible) take H_FREE field and multiply it by the LENGTH field.

A set of pictures will show this process for the Porto di Mare Area:

- Blank Model builder module, before inputs
- Validated Model builder module with FREE_S expression
- Loading…
- Line output with attribute table
- Free Surface map
- Free Surface on Max Surface map


Senza titolo - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:8.667
Editor
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Layers
Free Vertical Surface
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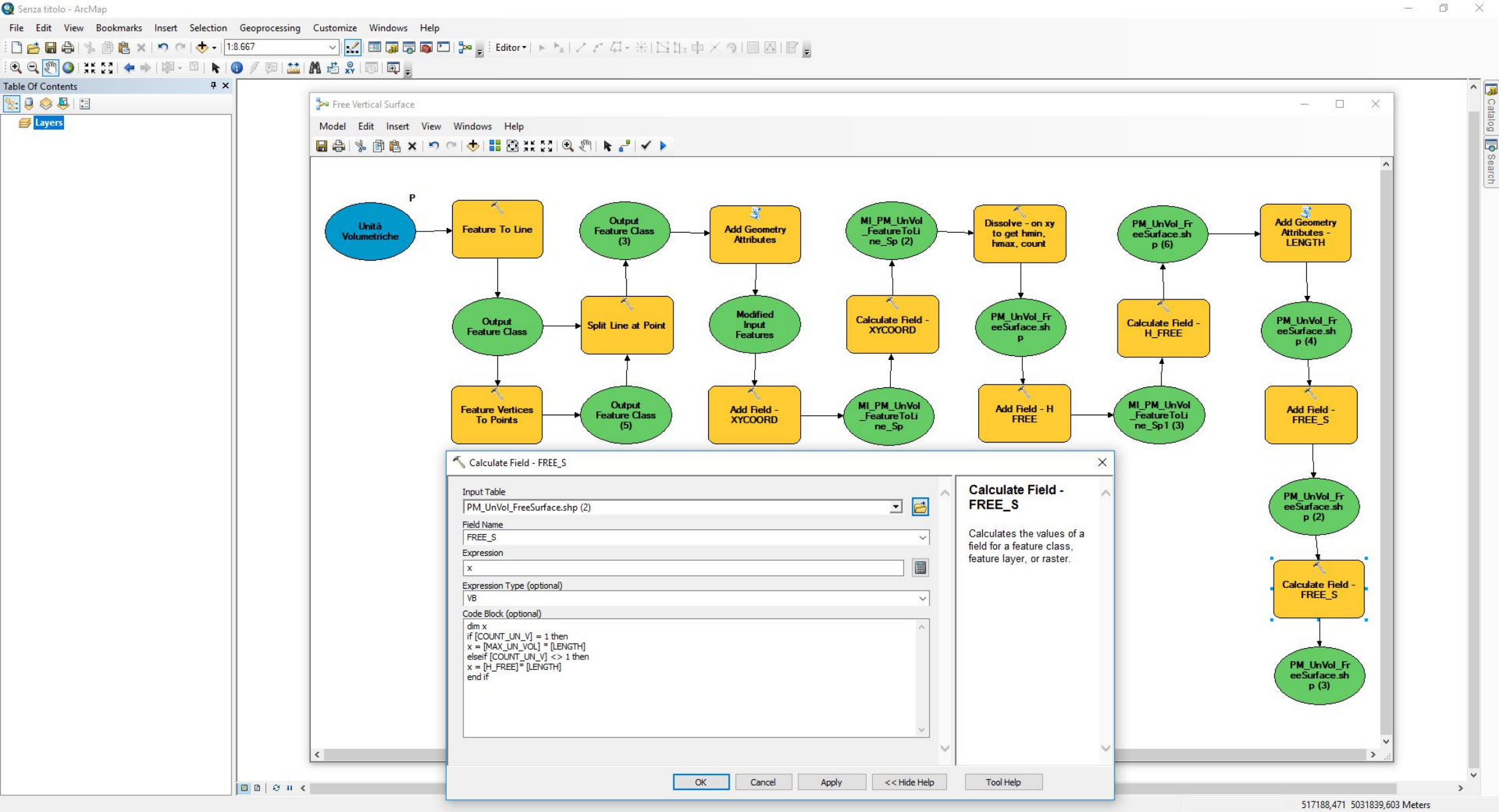
P
Unità Volumetriche
Feature To Line
Output Feature Class
Split Line at Point
Output Feature Class (3)
Add Geometry Attributes
Modified Input Features
Add Field - XYCOORD
Output Feature Class (5)
Feature Vertices To Points
MI_PM_UnVol_FeatureToLine_Sp
Calculate Field - XYCOORD
MI_PM_UnVol_FeatureToLine_Sp (2)
Dissolve - on xy to get hmin, hmax, count
PM_UnVol_FreeSurface.shp
Add Field - H FREE
MI_PM_UnVol_FeatureToLine_Sp1 (3)
Calculate Field - H_FREE
PM_UnVol_FreeSurface.shp (6)
Add Geometry Attributes - LENGTH
PM_UnVol_FreeSurface.shp (4)
Add Field - FREE_S
PM_UnVol_FreeSurface.shp (2)
Calculate Field - FREE_S
PM_UnVol_FreeSurface.shp (3)
Catalog
Location: Free Vertical Surface
Home - CAB_GIS_Course Final Project
Folder Connections
C:\
D:\CAB_GIS_Course Final Project
Dusaf 5.0 - 2015
EL_Limiti
Elaborazioni
Estratto DBT
ModelBuilder
Performance
Toolbox
Beobook
Prove Model Builder.tbx
Urban Porosity.tbx
Building based geometries
Building Enriched no path
Court count
Court Count Buffer
Distance C-Cin
Free Vertical Surface
Open...
Batch...
Edit...
Edit
Edit the source of the tool.
Rename
Set Password...
Export Script...
Import Script
Help
Item Description...
Properties...
Toolboxes
Database Servers
GIS Servers
My Hosted Services
Tracking Connection
519651,345 5030644,857 Meters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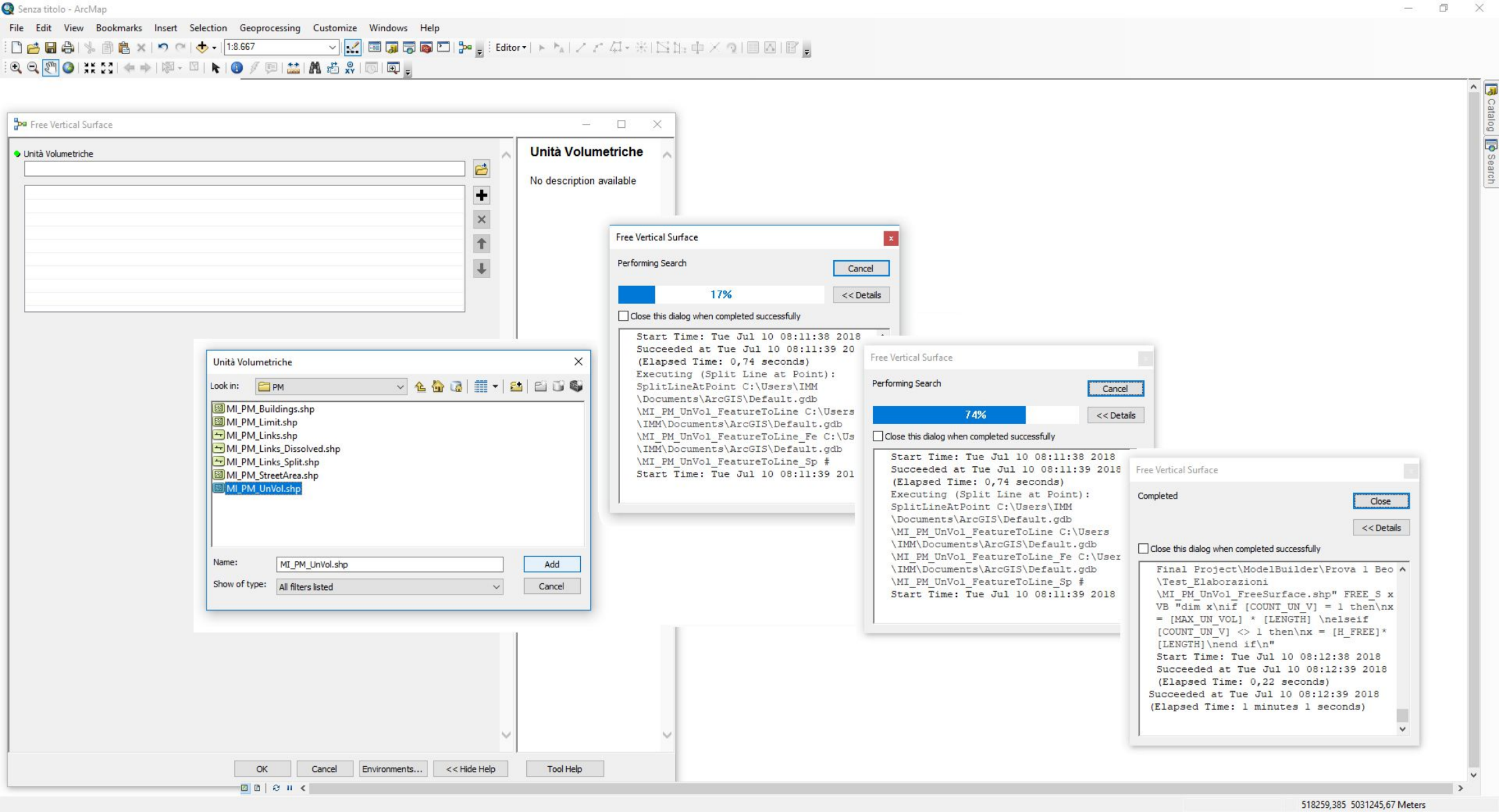
Unità Volumetriche
Feature To Line
Output Feature Class
Feature Vertices To Points
Output Feature Class (5)
Split Line at Point
Output Feature Class (3)
Add Geometry Attributes
Modified Input Features
Add Field - XYCOORD
MI_PM_UnVol_FeatureToLine_Sp
Calculate Field - XYCOORD
MI_PM_UnVol_FeatureToLine_Sp (2)
Dissolve - on xy to get hmin, hmax, count
PM_UnVol_FreeSurface.shp
Add Field - H FREE
MI_PM_UnVol_FeatureToLine_Sp1 (3)
Calculate Field - H_FREE
PM_UnVol_FreeSurface.shp (6)
Add Geometry Attributes - LENGTH
PM_UnVol_FreeSurface.shp (4)
Add Field - FREE_S
PM_UnVol_FreeSurface.shp (2)
Calculate Field - FREE_S
PM_UnVol_FreeSurface.shp (3)
Calculate Field - FREE_S
Input Table
PM_UnVol_FreeSurface.shp (2)
Field Name
FREE_S
Expression
x
Expression Type (optional)
VB
Code Block (optional)
dim x
if [COUNT_UN_V] = 1 then
x = [MAX_UN_VOL] * [LENGTH]
elseif [COUNT_UN_V] <> 1 then
x = [H_FREE] * [LENGTH]
end if
Calculate Field - FREE_S
Calculates the values of a field for a feature class, feature layer, or raster.
OK
Cancel
Apply
<< Hide Help
Tool Help
517188,471 5031839,603 Meters


Senza titolo - ArcMap
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
1:8.667
Editor
Free Vertical Surface
Unità Volumetriche
Unità Volumetriche
No description available
Unità Volumetriche
Look in: PM
MI_PM_Buildings.shp
MI_PM_Limit.shp
MI_PM_Links.shp
MI_PM_Links_Dissolved.shp
MI_PM_Links_Split.shp
MI_PM_StreetArea.shp
MI_PM_UnVol.shp
Name: MI_PM_UnVol.shp
Add
Show of type: All filters listed
Cancel
OK
Cancel
Environments...
<< Hide Help
Tool Help
Free Vertical Surface
Performing Search
Cancel
17%
<< Details
Close this dialog when completed successfully
Start Time: Tue Jul 10 08:11:38 2018
Succeeded at Tue Jul 10 08:11:39 20
(Elapsed Time: 0,74 seconds)
Executing (Split Line at Point):
SplitLineAtPoint C:\Users\IMM
\Documents\ArcGIS\Default.gdb
\MI_PM_UnVol_FeatureToLine C:\Users
\IMM\Documents\ArcGIS\Default.gdb
\MI_PM_UnVol_FeatureToLine_Fe C:\Us
\IMM\Documents\ArcGIS\Default.gdb
\MI_PM_UnVol_FeatureToLine_Sp #
Start Time: Tue Jul 10 08:11:39 201
Free Vertical Surface
Performing Search
Cancel
74%
<< Details
Close this dialog when completed successfully
Start Time: Tue Jul 10 08:11:38 2018
Succeeded at Tue Jul 10 08:11:39 2018
(Elapsed Time: 0,74 seconds)
Executing (Split Line at Point):
SplitLineAtPoint C:\Users\IMM
\Documents\ArcGIS\Default.gdb
\MI_PM_UnVol_FeatureToLine C:\Users
\IMM\Documents\ArcGIS\Default.gdb
\MI_PM_UnVol_FeatureToLine_Fe C:\User
\IMM\Documents\ArcGIS\Default.gdb
\MI_PM_UnVol_FeatureToLine_Sp #
Start Time: Tue Jul 10 08:11:39 2018
Free Vertical Surface
Completed
Close
<< Details
Close this dialog when completed successfully
Final Project\ModelBuilder\Prova 1 Beo
\Test_Elaborazioni
\MI_PM_UnVol_FreeSurface.shp" FREE_S x
VB "dim x\nif [COUNT_UN_V] = 1 then\nx
= [MAX_UN_VOL] * [LENGTH] \nelseif
[COUNT_UN_V] <> 1 then\nx = [H_FREE]*
[LENGTH]\nend if\n"
Start Time: Tue Jul 10 08:12:38 2018
Succeeded at Tue Jul 10 08:12:39 2018
(Elapsed Time: 0,22 seconds)
Succeeded at Tue Jul 10 08:12:39 2018
(Elapsed Time: 1 minutes 1 seconds)
Catalog
Search
518259,385 5031245,67 Meters

Senza titolo - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

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Editor

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Layers

MI_PM_UnVol_FreeSurface

Table

MI_PM_UnVol_FreeSurface

FID	Shape	XYCOORD	MIN_UN_VOL	MAX_UN_VOL	COUNT_UN_V	H_FREE	LENGTH	FREE_S
0	Polyline ZM	517045,0729;5031501,4886	18,97	18,97	1	0	30,210964	573,10199
1	Polyline ZM	517045,801830868;5031475,24644639	15,64	15,64	1	0	24,929929	389,904091
2	Polyline ZM	517049,0329;5031485,8694	15,64	18,97	2	3,33	11,596098	38,615007
3	Polyline ZM	517051,889277675;5031526,68543856	15,7	15,7	1	0	24,580918	385,920407
4	Polyline ZM	517052,6041;5031515,78645	15,7	18,97	2	3,27	11,538315	37,73029
5	Polyline ZM	517056,484286744;5031479,58905964	15,64	15,64	1	0	12,696959	198,580433
6	Polyline ZM	517056,547381975;5031470,15145506	15,64	19,09	2	3,45	13,40014	46,230485
7	Polyline ZM	517056,5641;5031500,16725	18,97	18,97	1	0	30,047949	570,0096
8	Polyline ZM	517061,292722072;5031520,15375579	15,7	15,7	1	0	12,565272	197,274776
9	Polyline ZM	517062,767014722;5031463,94121248	19,09	19,09	1	0	38,531765	735,571401
10	Polyline ZM	517063,460246313;5031529,14597184	15,7	18,89	2	3,19	12,881919	41,093322
11	Polyline ZM	517071,078842741;5031533,83408464	18,89	18,89	1	0	39,012258	736,941545
12	Polyline ZM	517087,317000393;5031437,16825148	15,6	15,6	1	0	48,074313	749,959289
13	Polyline ZM	517091,221958321;5031547,29229956	15,37	15,37	1	0	60,275977	926,441763
14	Polyline ZM	517095,0851;5031429,1164	15,6	18,99	2	3,39	11,419864	38,71334
15	Polyline ZM	517099,550028297;5031470,68608754	15,44	15,44	1	0	85,085458	1313,719477
16	Polyline ZM	517102,13096797;5031458,295569	15,44	15,44	1	0	93,714652	1446,954221
17	Polyline ZM	517104,07402925;5031493,47005958	15,56	15,56	1	0	59,044549	918,733184
18	Polyline ZM	517107,073555062;5031431,50082705	18,99	18,99	1	0	19,320593	366,898069
19	Polyline ZM	517107,318;5031502,0677	15,56	15,56	1	0	35,884463	558,36224
20	Polyline ZM	517109,158331651;5031421,67598504	18,99	18,99	1	0	45,179497	857,958651
21	Polyline ZM	517112,199470217;5031516,58506706	15,14	15,14	1	0	59,080934	894,485344
22	Polyline ZM	517115,320028237;5031525,31947262	15,14	15,14	1	0	36,037016	545,600416
23	Polyline ZM	517118,9365;5031434,247	15,28	18,99	2	3,71	11,436303	42,428685
24	Polyline ZM	517122,412858783;5031571,11045056	4,99	4,99	1	0	9,871126	49,25692
25	Polyline ZM	517122,428132041;5031444,24716406	15,28	15,28	1	0	45,257773	691,538766
26	Polyline ZM	517123,7439;5031571,99005	4,99	15,42	2	10,43	5,883556	61,365487
27	Polyline ZM	517130,431617611;5031476,16898043	1,678	1,678	1	0	22,368794	37,534836
28	Polyline ZM	517130,517302368;5031542,74993315	15,07	15,07	1	0	153,81209	2317,94819
29	Polyline ZM	517132,961;5031581,53445	15,42	15,42	1	0	25,877862	399,036626
30	Polyline ZM	517136,860015585;5031570,78882908	15,42	15,42	1	0	31,124203	479,935207
31	Polyline ZM	517141,125076291;5031497,12906724	15	15	1	0	98,811029	1482,165434

1 (0 out of 1596 Selected)

MI_PM_UnVol_FreeSurface

Catalog Search

517151,78 5031929,037 Meters

Senza titolo - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

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Editor

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Layers

MI_PM_UnVol_FreeSurface

FREE_S

0,000000 - 165,058718

165,058719 - 518,274379

518,274380 - 1108,268547

1108,268548 - 1960,338587

1960,338589 - 6183,039931

Catalog

Search

518020,895 5031823,551 Meters

Senza titolo - ArcMap

File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help

1:8.667 Editor

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Layers
- MI_PM_UnVol_FreeSurface
  - FREE_S / MAX_S
  - < -1,5 Std. Dev.
  - -1,5 - -0,50 Std. Dev.
  - -0,50 - 0,50 Std. Dev.
  - 0,50 - 0,63 Std. Dev.

Table

MI_PM_UnVol_FreeSurface

FID	Shape	XYCOORD	MIN_UN_VOL	MAX_UN_VOL	COUNT_UN_V	H_FREE	LENGTH	FREE_S	MAX_S
0	Polyline ZM	517045,0729;5031501,4886	18,97	18,97	1	0	30,210964	573,10199	573,10199
1	Polyline ZM	517045,801830868;5031475,24644639	15,64	15,64	1	0	24,929929	389,904091	389,904091
2	Polyline ZM	517049,0329;5031485,8694	15,64	18,97	2	3,33	11,596098	38,615007	219,977981
3	Polyline ZM	517051,889277675;5031526,68543856	15,7	15,7	1	0	24,580918	385,920407	385,920407
4	Polyline ZM	517052,6041;5031515,78645	15,7	18,97	2	3,27	11,538315	37,73029	218,881834
5	Polyline ZM	517056,484286744;5031479,58905964	15,64	15,64	1	0	12,696959	198,580433	198,580433
6	Polyline ZM	517056,547381975;5031470,15145506	15,64	19,09	2	3,45	13,40014	46,230485	255,808681
7	Polyline ZM	517056,5641;5031500,16725	18,97	18,97	1	0	30,047949	570,0096	570,0096
8	Polyline ZM	517061,292722072;5031520,15375579	15,7	15,7	1	0	12,565272	197,274776	197,274776
9	Polyline ZM	517062,767014722;5031463,94121248	19,09	19,09	1	0	38,531765	735,571401	735,571401
10	Polyline ZM	517063,460246313;5031529,14597184	15,7	18,89	2	3,19	12,881919	41,093322	243,339451
11	Polyline ZM	517071,078842741;5031533,83408464	18,89	18,89	1	0	39,012258	736,941545	736,941545
12	Polyline ZM	517087,317000393;5031437,16825148	15,6	15,6	1	0	48,074313	749,959289	749,959289
13	Polyline ZM	517091,221958321;5031547,29229956	15,37	15,37	1	0	60,275977	926,441763	926,441763
							11,419864	38,71334	216,863223
							85,085458	1313,719477	1313,719477
							93,714652	1446,954221	1446,954221
							59,044549	918,733184	918,733184
							19,320593	366,898069	366,898069
							35,884463	558,36224	558,36224
							45,179497	857,958651	857,958651
							59,080934	894,485344	894,485344
							36,037016	545,600416	545,600416
							11,436303	42,428685	217,175397
							9,871126	49,25692	49,25692
							45,257773	691,538766	691,538766
							5,883556	61,365487	90,72443
							22,368794	37,534836	37,534836
							153,81209	2317,94819	2317,94819
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							31,124203	479,935207	479,935207
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Layer Properties

Hatches | Joins & Relates | Time | HTML Popup

General | Source | Selection | Display | Symbology | Fields | Definition Query | Labels | Routes

Show:
- Features
- Categories
- Quantities
  - Graduated colors
  - Graduated symbols
  - Proportional symbols
- Charts
- Multiple Attributes

Draw quantities using color to show values. Import...

Fields
Value: FREE_S
Normalization: MAX_S

Classification
Standard Deviation
Classes: 4 Classify...

Color Ramp:

Symbol	Range	Label
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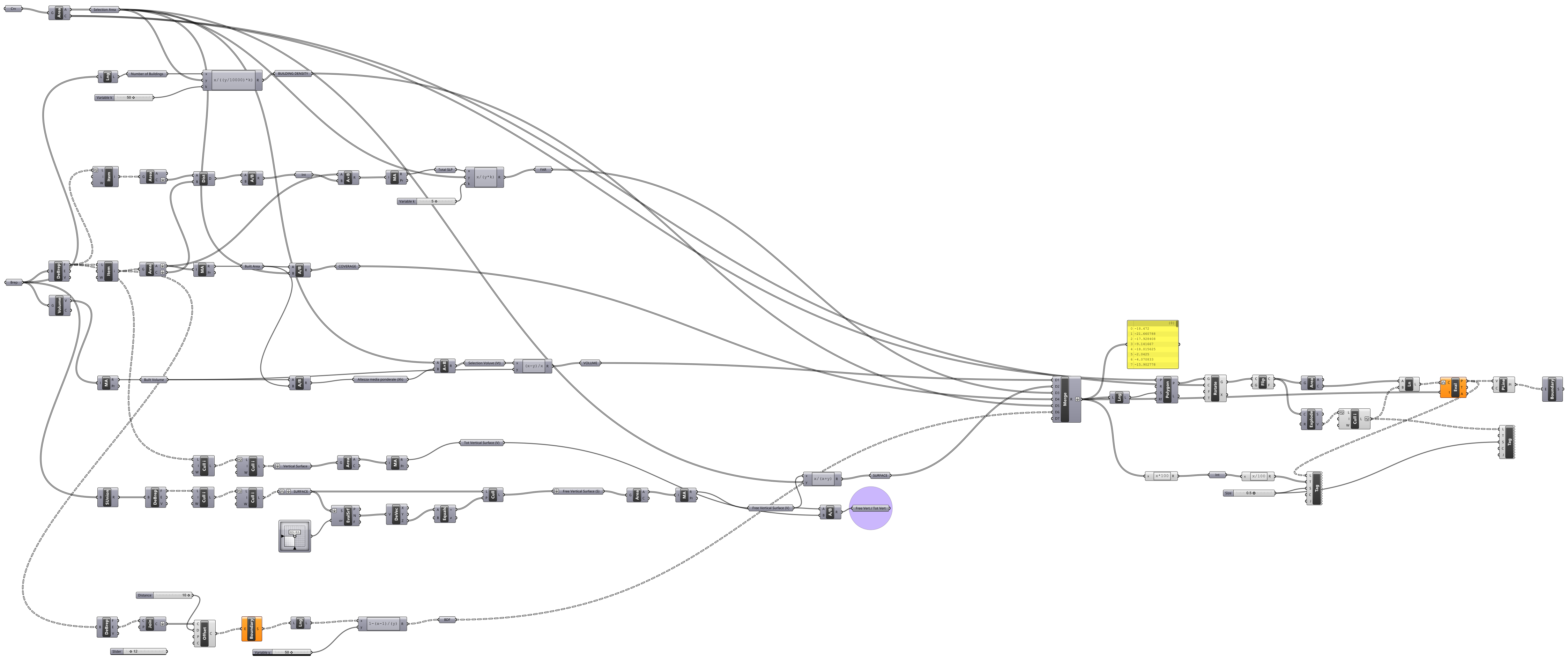
	0,198873191 - 0,575773431	-1,5 - -0,50 Std. Dev.
	0,575773432 - 0,952673672	-0,50 - 0,50 Std. Dev.
	0,952673673 - 1,00000000	0,50 - 0,63 Std. Dev.

Catalog Search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Total SLP
FAR
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Built Area
COVERAGE
Selection Volume (Vt)
(x-y)/x
VOLUME
Built Volume
Altezza media ponderale (Kh)
Vertical Surface
Tot Vertical Surface (V)
SURFACE
Free Vertical Surface (S)
Free Vertical Surface (V)
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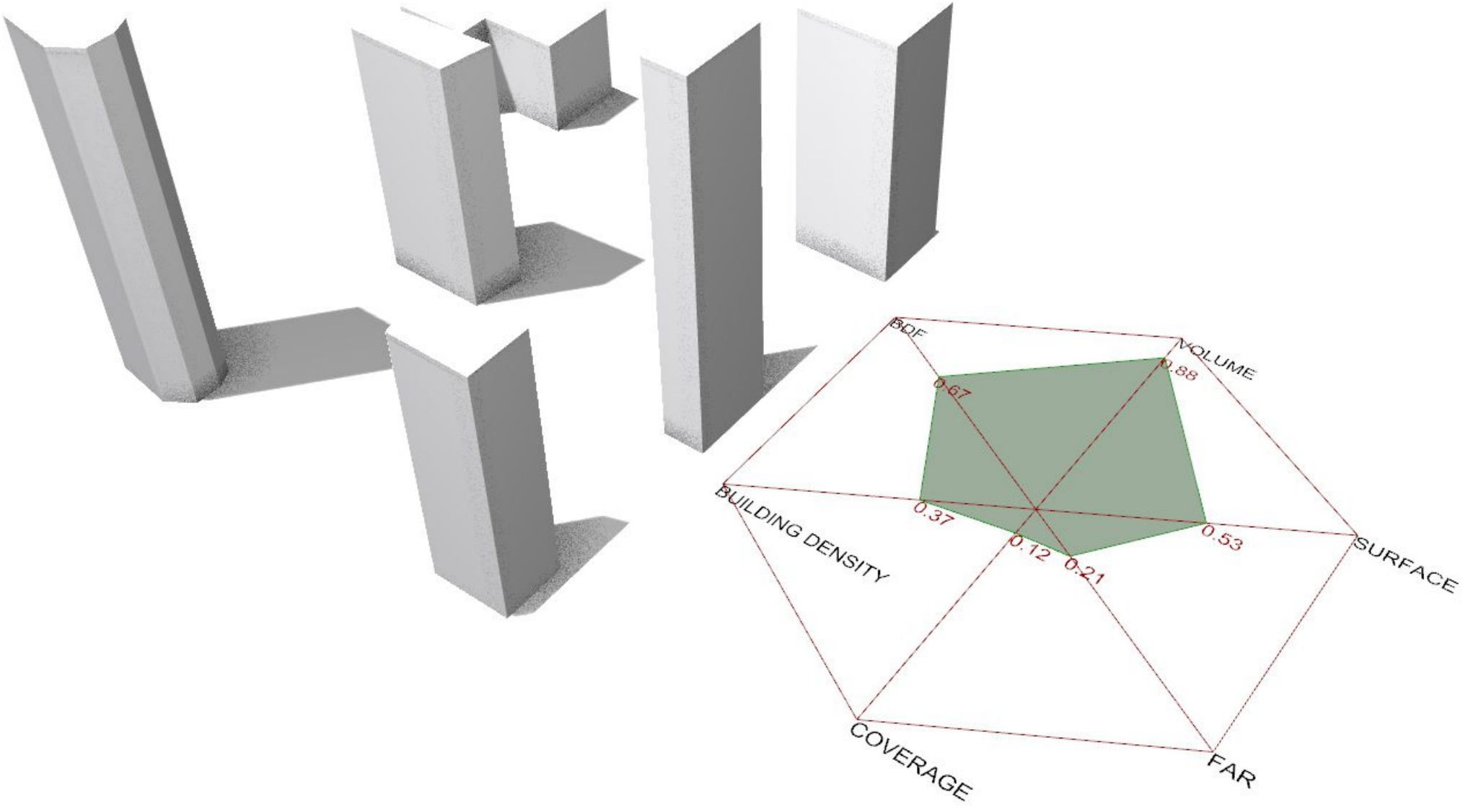
Free Vert / Tot Vert
Distance
Slider
Variable y
1-(x-1)/(y)
BDF
Size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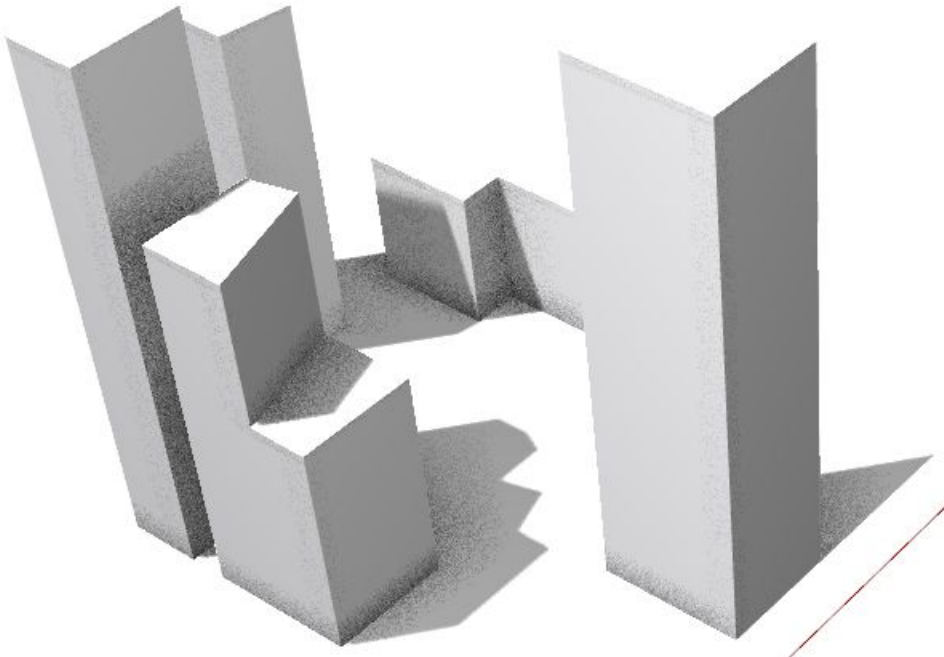

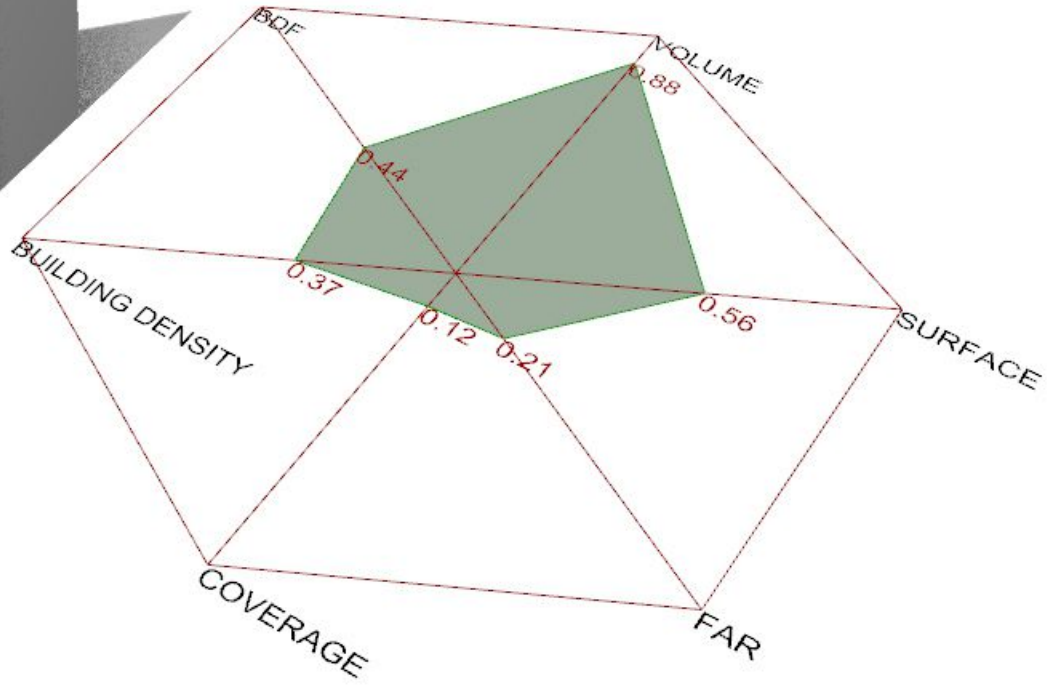
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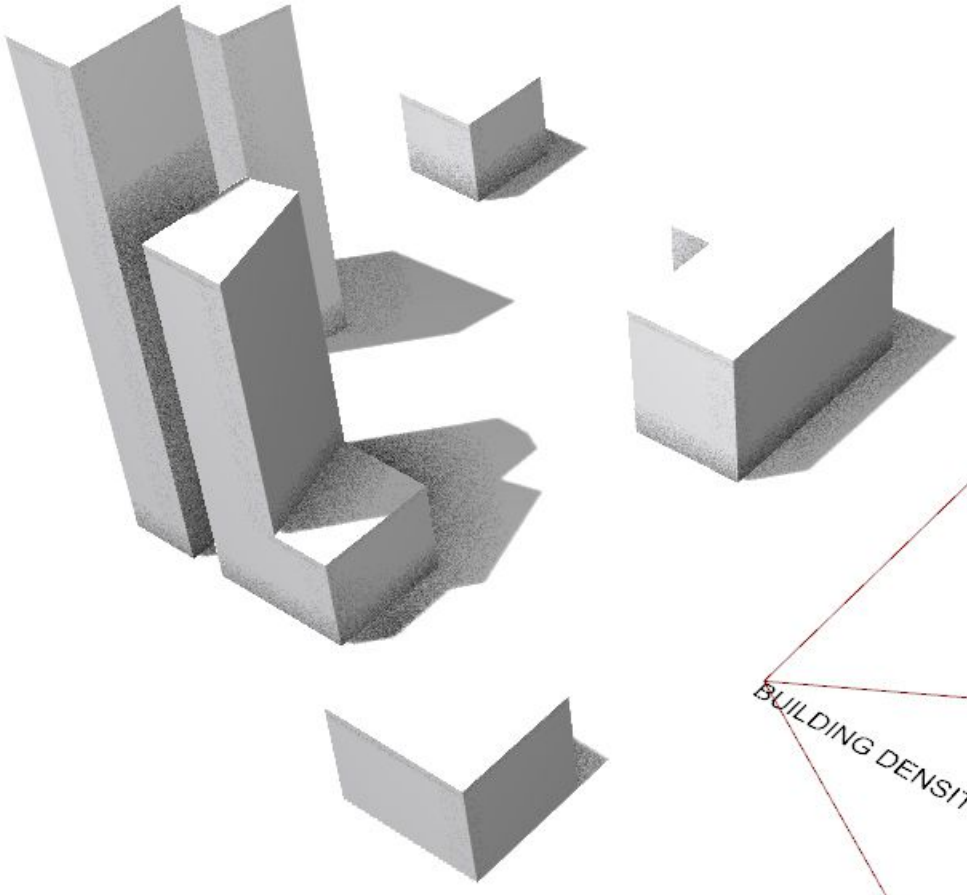
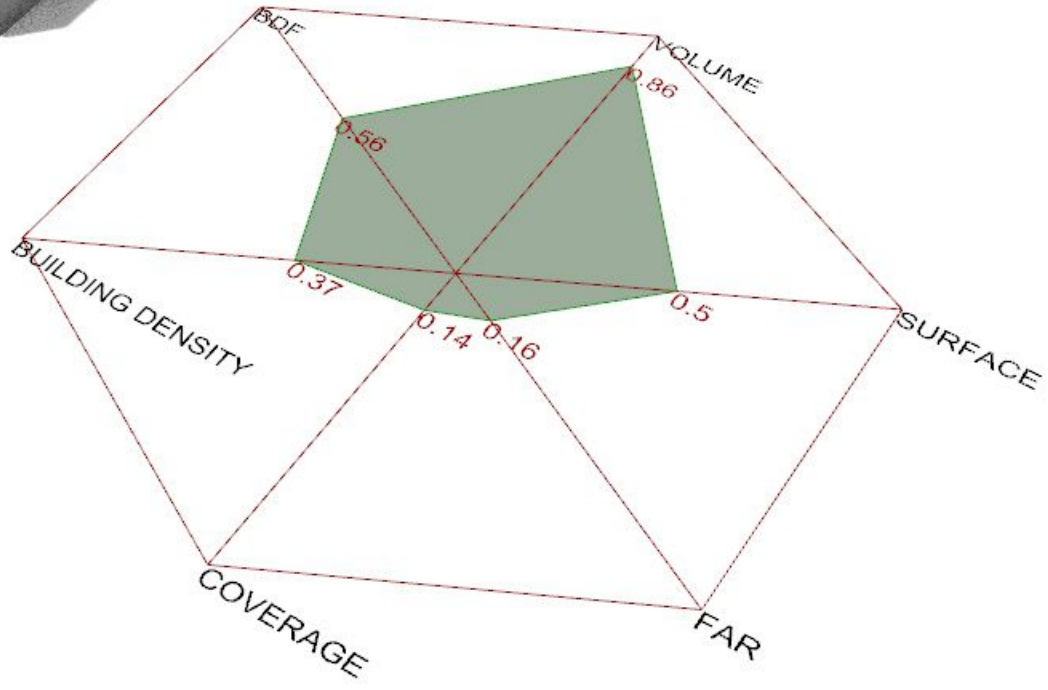
COVERAGE
FAR

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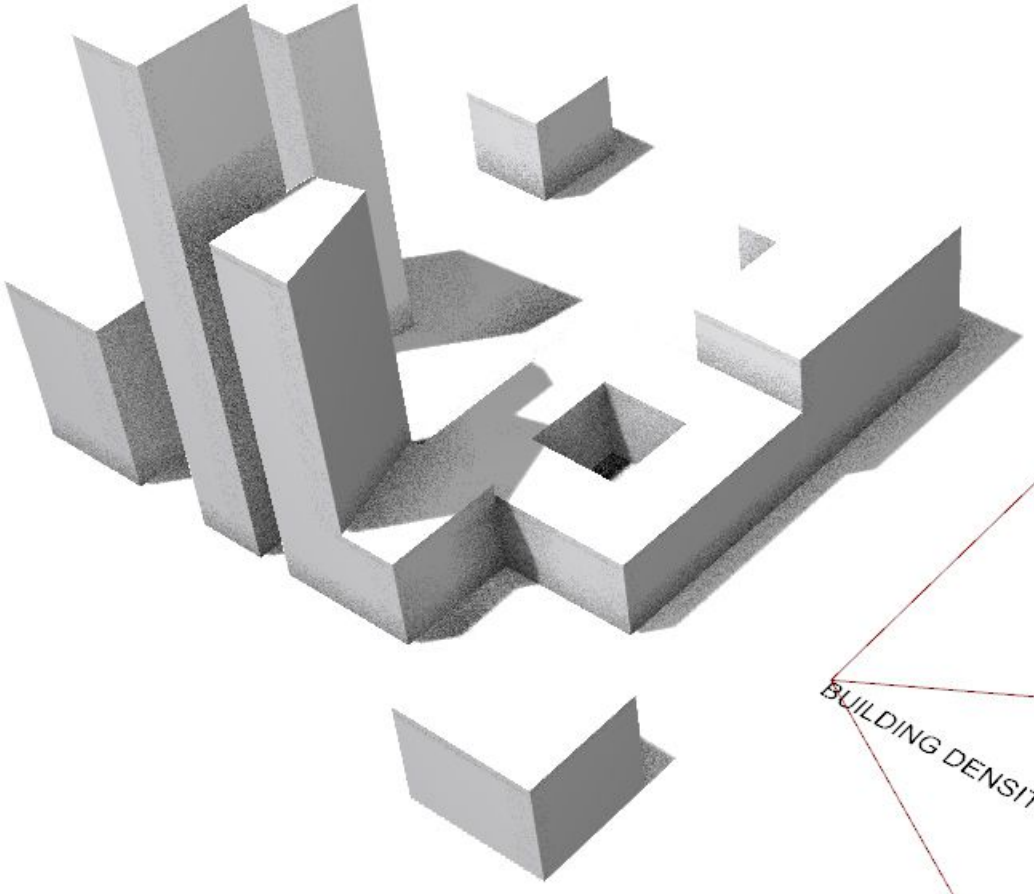

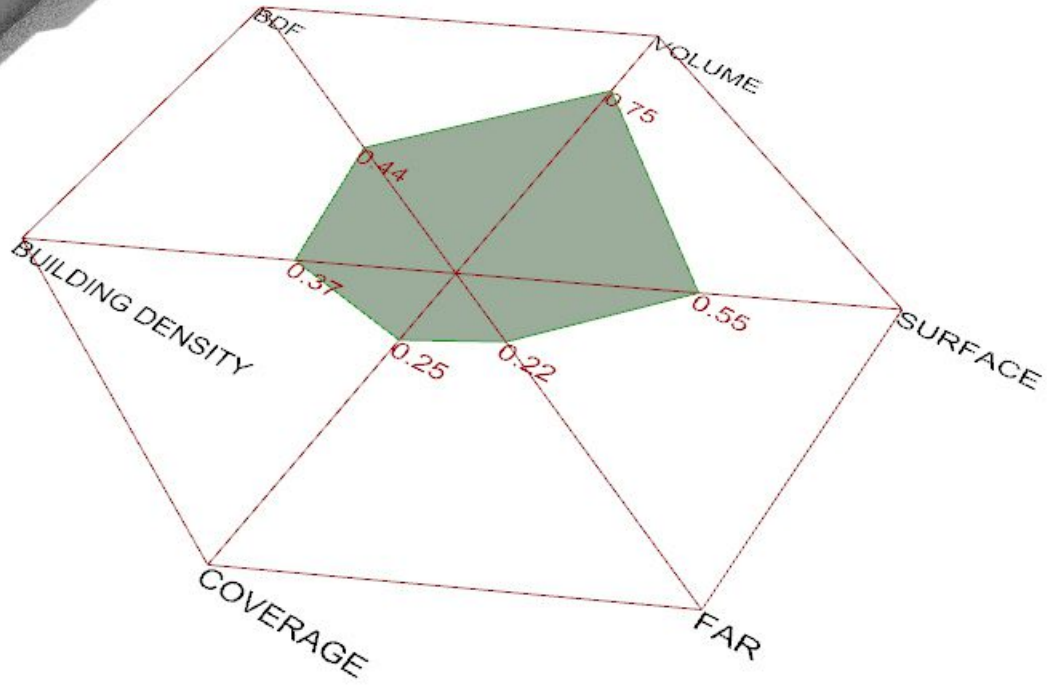
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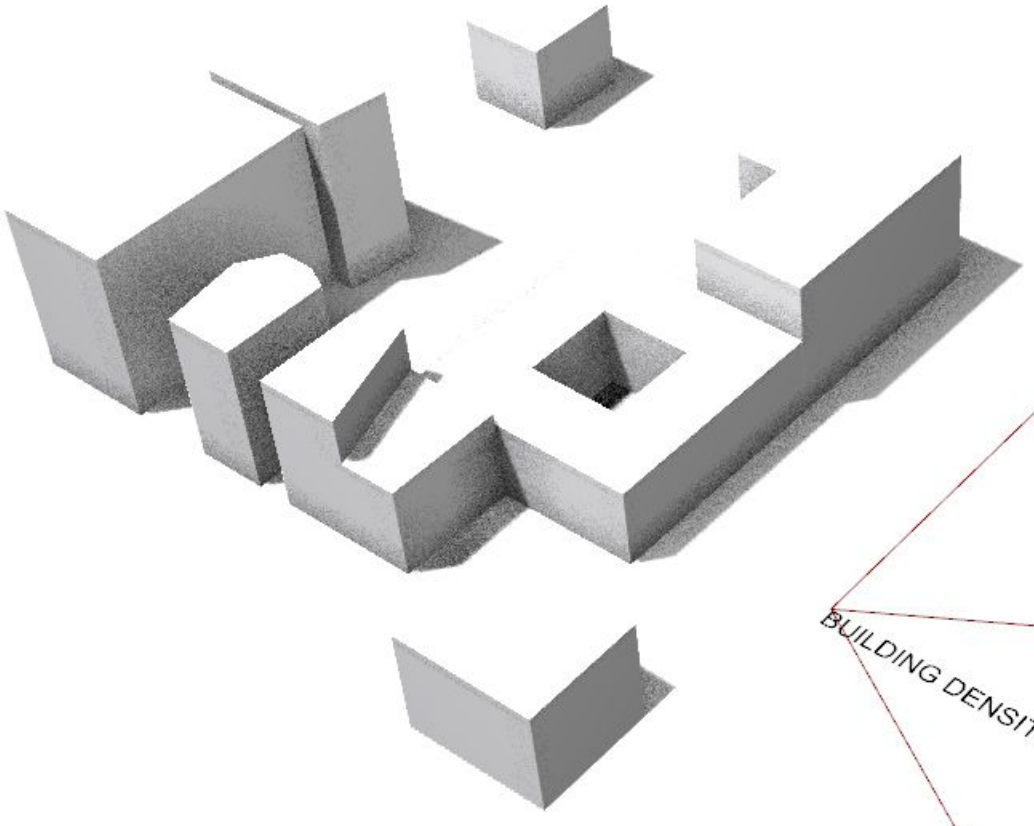

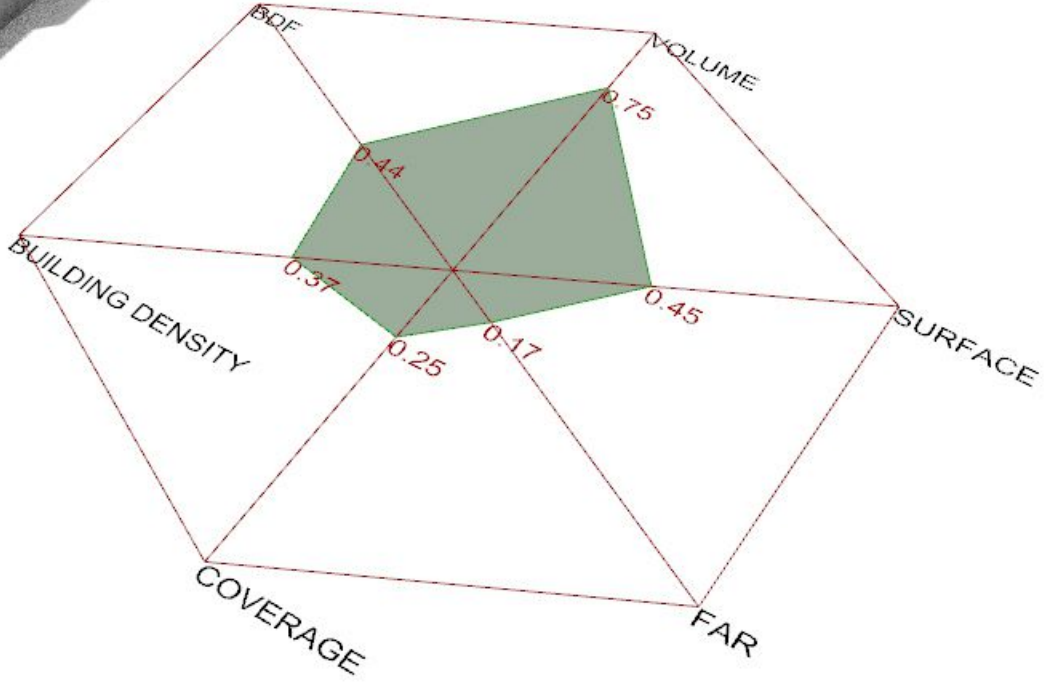
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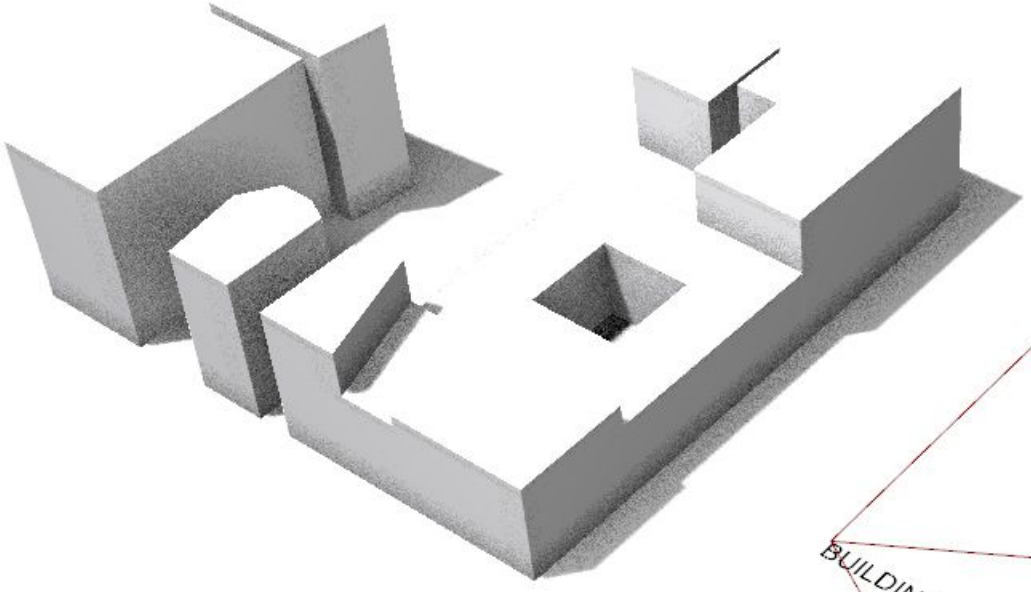

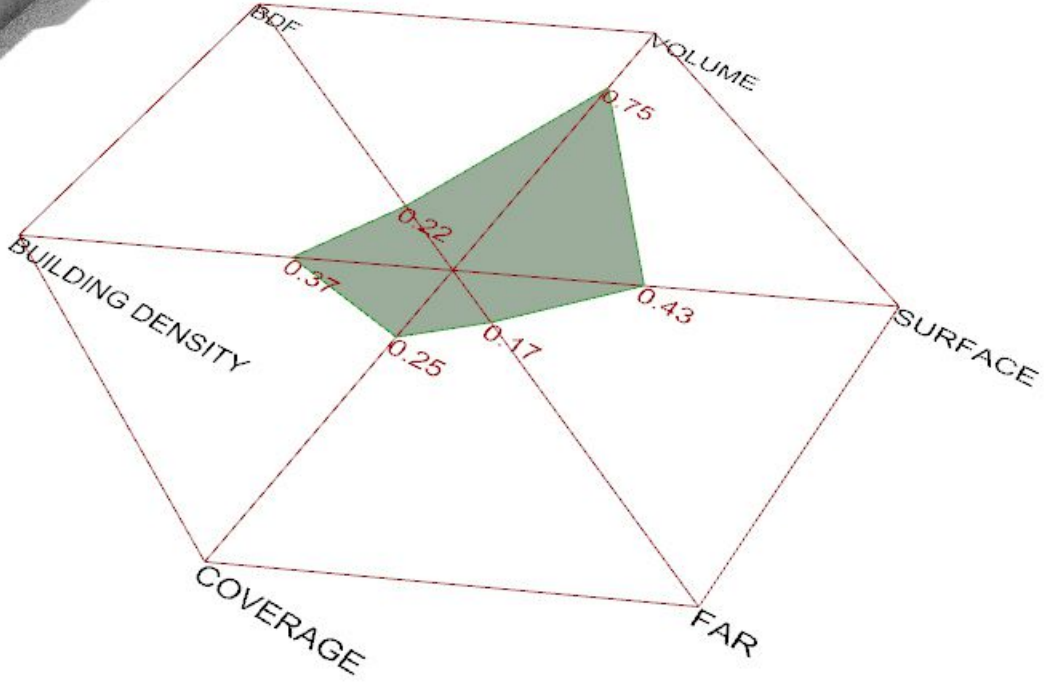
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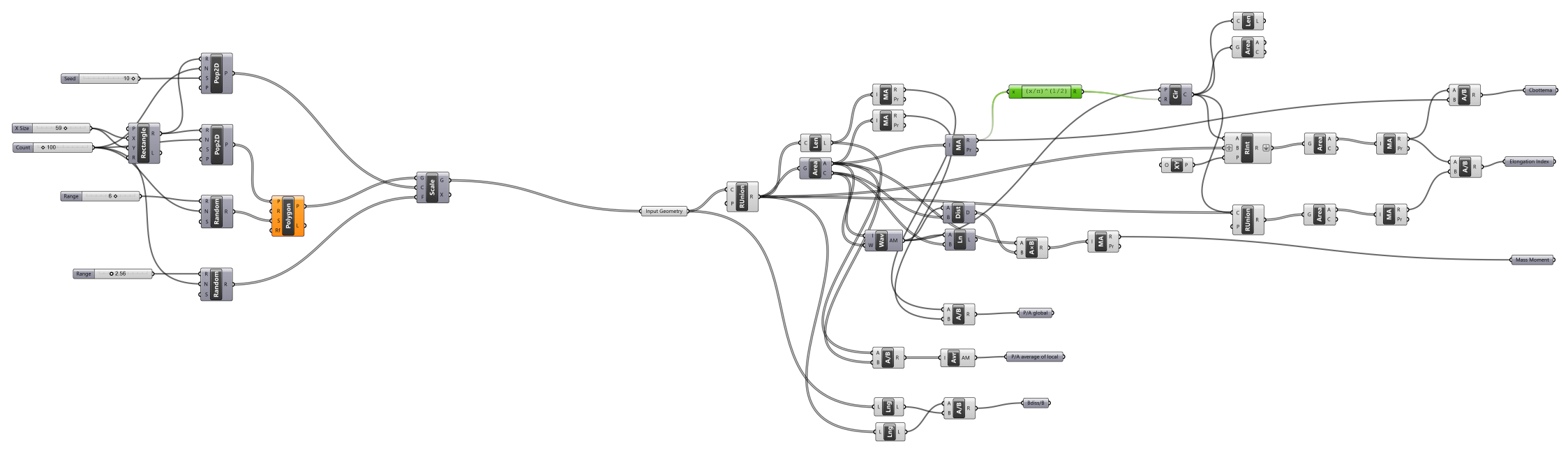
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Input Geometry
RUnion
Len
Area
MA
MA
MA
Dist
Ln
Wav
A×B
A/B
A/B
A/B
Avr
Lng
Lng
(x/π)^(1/2)
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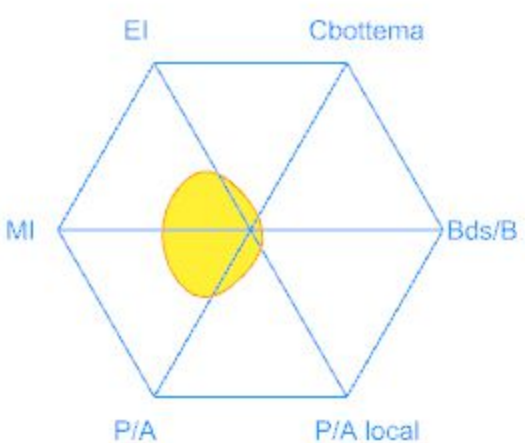
Area
XY
RInt
RUnion
Area
Area
MA
MA
MA
A/B
A/B
Cbottema
Elongation Index
Mass Moment
P/A global
P/A average of local
Bdiss/B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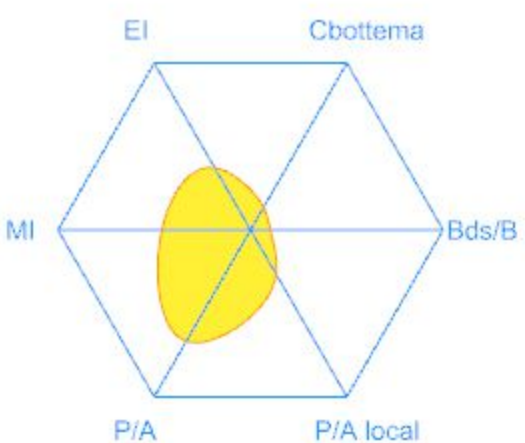
Cbottema
MI
Bds/B
P/A
P/A local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Cbottema
MI
Bds/B
P/A
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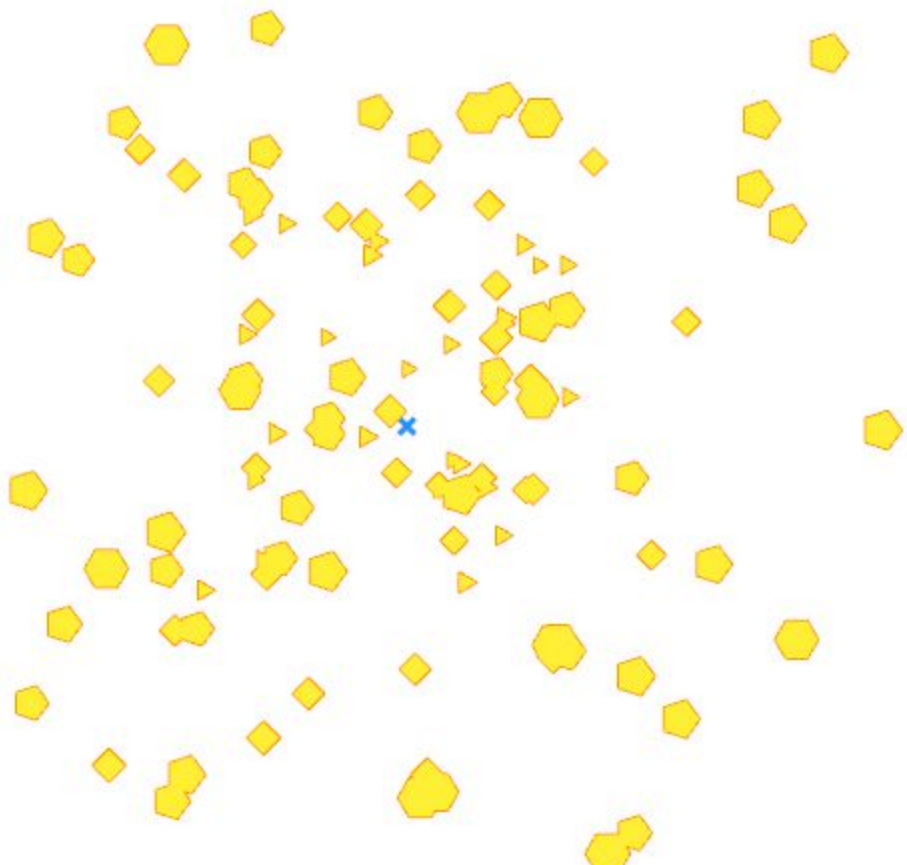

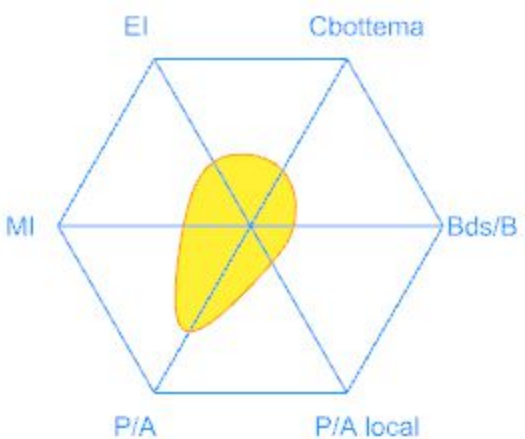
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