Environmental Impact Assessment

October 2020

India: Bengaluru Metro Rail Project

Phase 2A (Outer Road Ring Metro Line)

Volume 9
Annex 5

Prepared by Bangalore Metro Rail Corporation Ltd. (BMRCL), India for the Asian Development Bank.

NOTES

(i) The fiscal year (FY) of the Government of India and its agencies ends on 31 March. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2019 ends on 31 March 2019.

(ii) In this report, "$" refers to United States dollars.

KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
Train noise power levels taken from EMU Soundplan 8.1 Library and BMRCL Rolling Stock Specification. Train schedule and speeds from Feasibility Study.

120 2024 2B with Parapet Wall
Noise Contour Map
Leq,d
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/10/2020
Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,d
in dB(A)

- < 45
- 45 - 50
- 50 - 55
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- 60 - 65
- >= 65

Signs and symbols

- Wall
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- Main building
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- Line source
- Geometry bitmap
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- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2109

0 20 40 80 120 1

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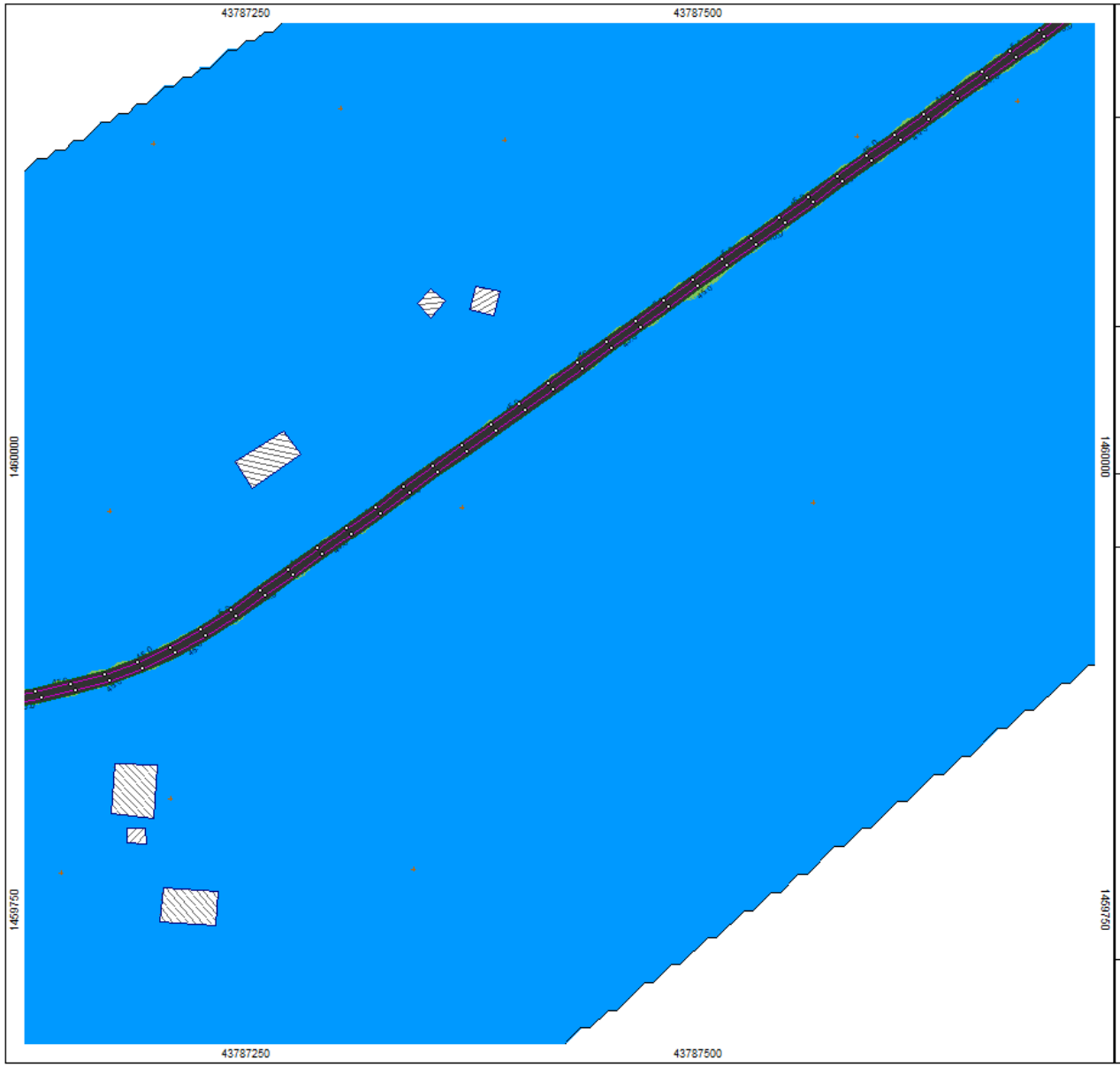

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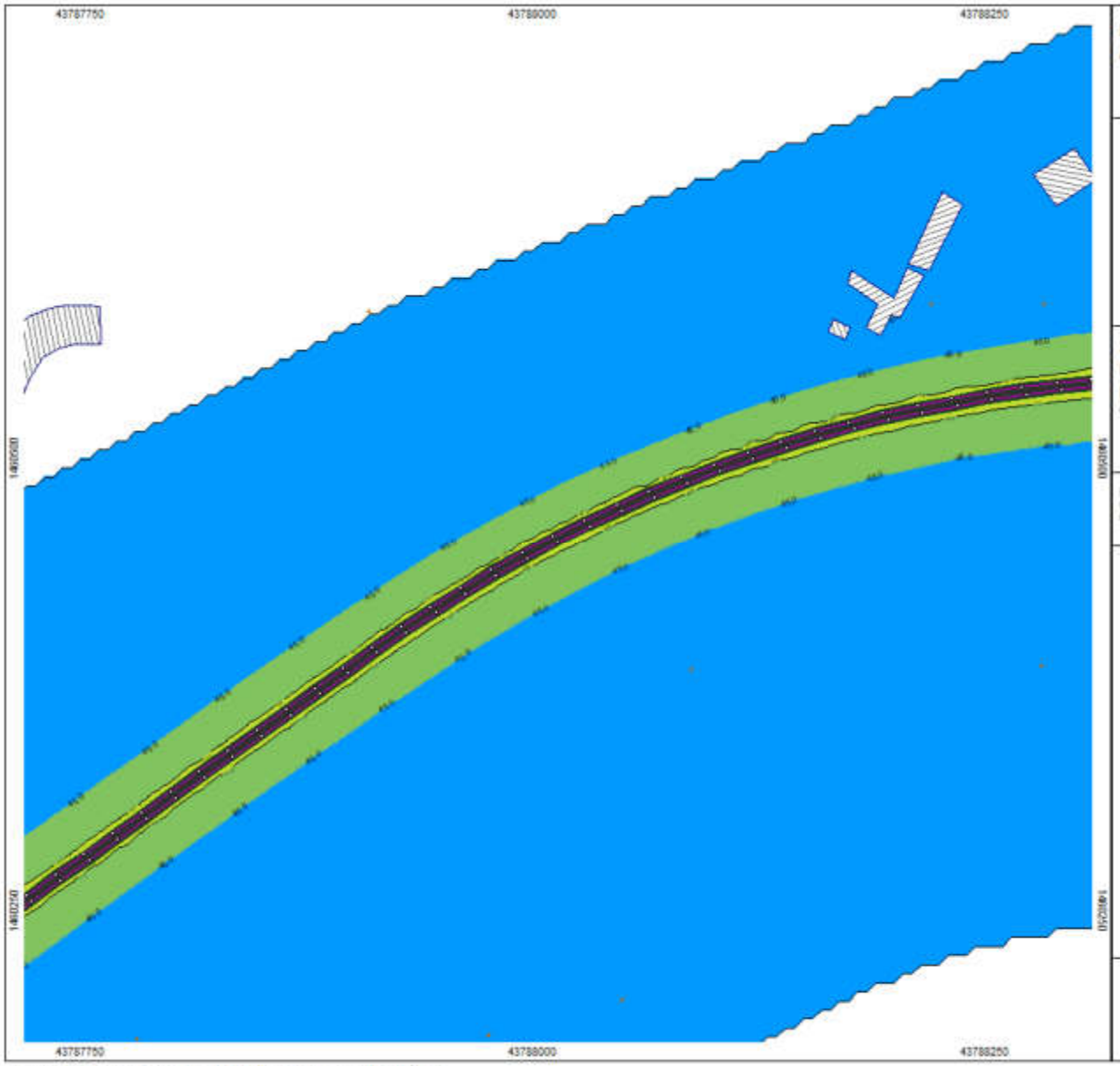

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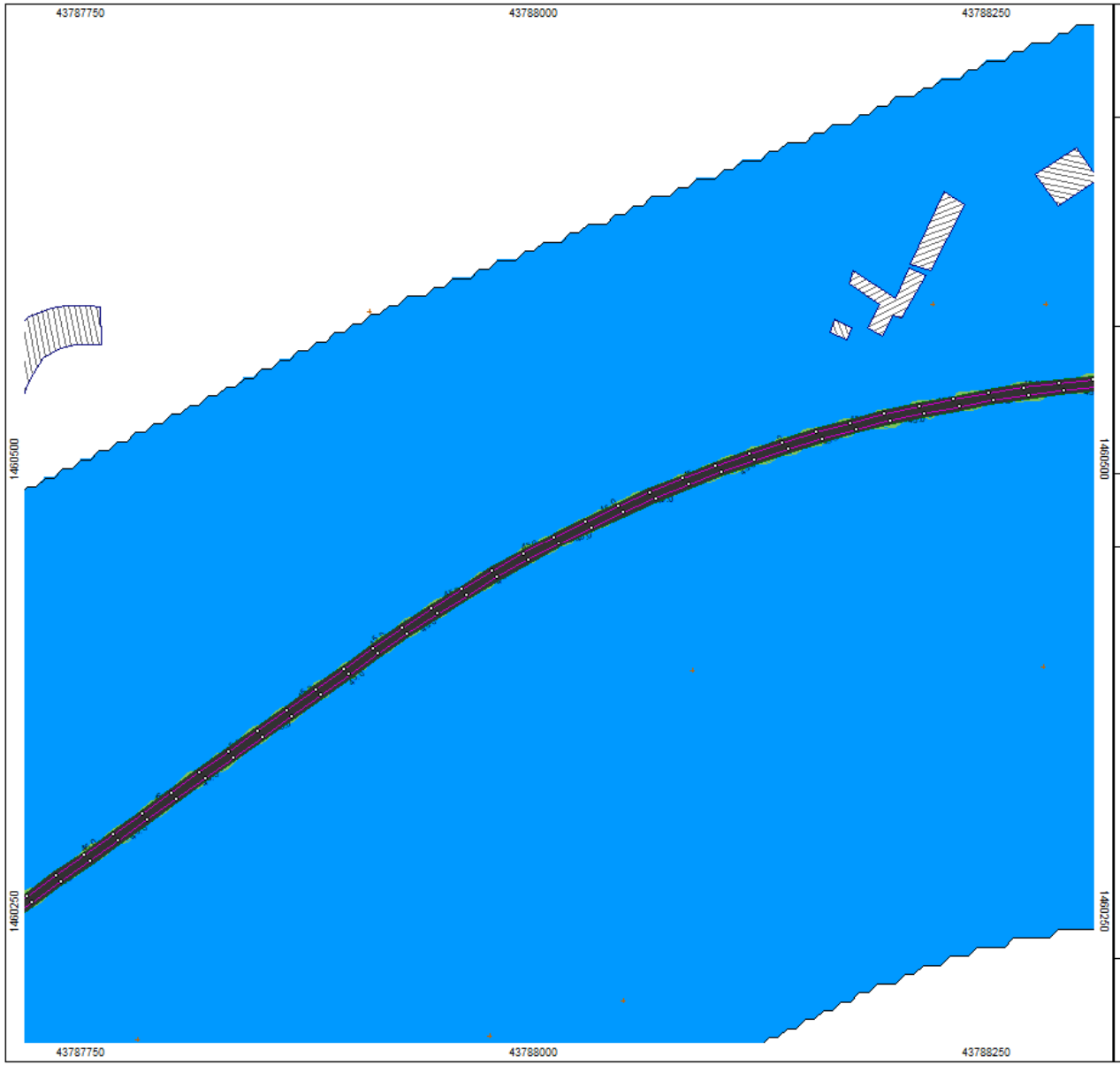

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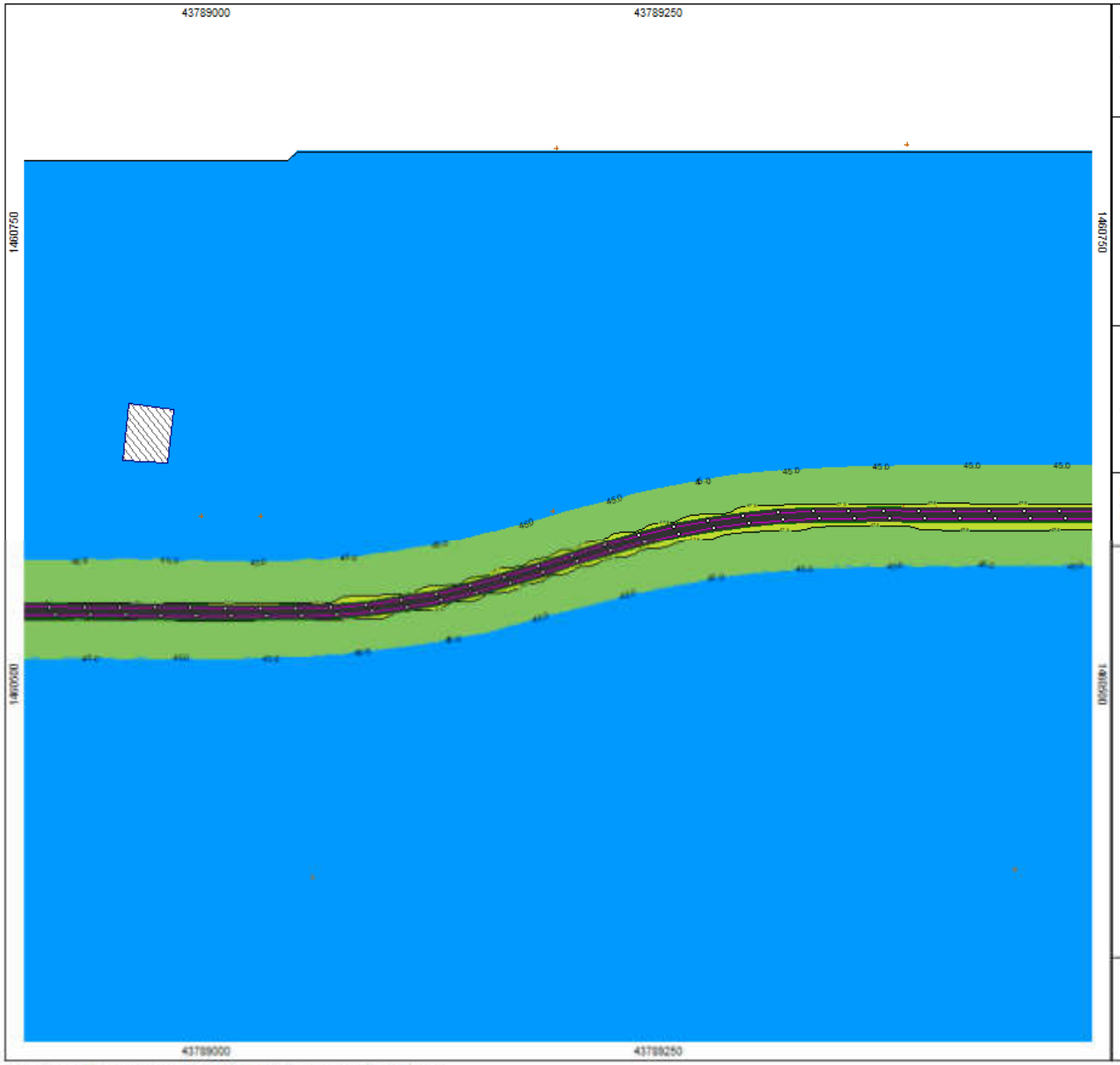

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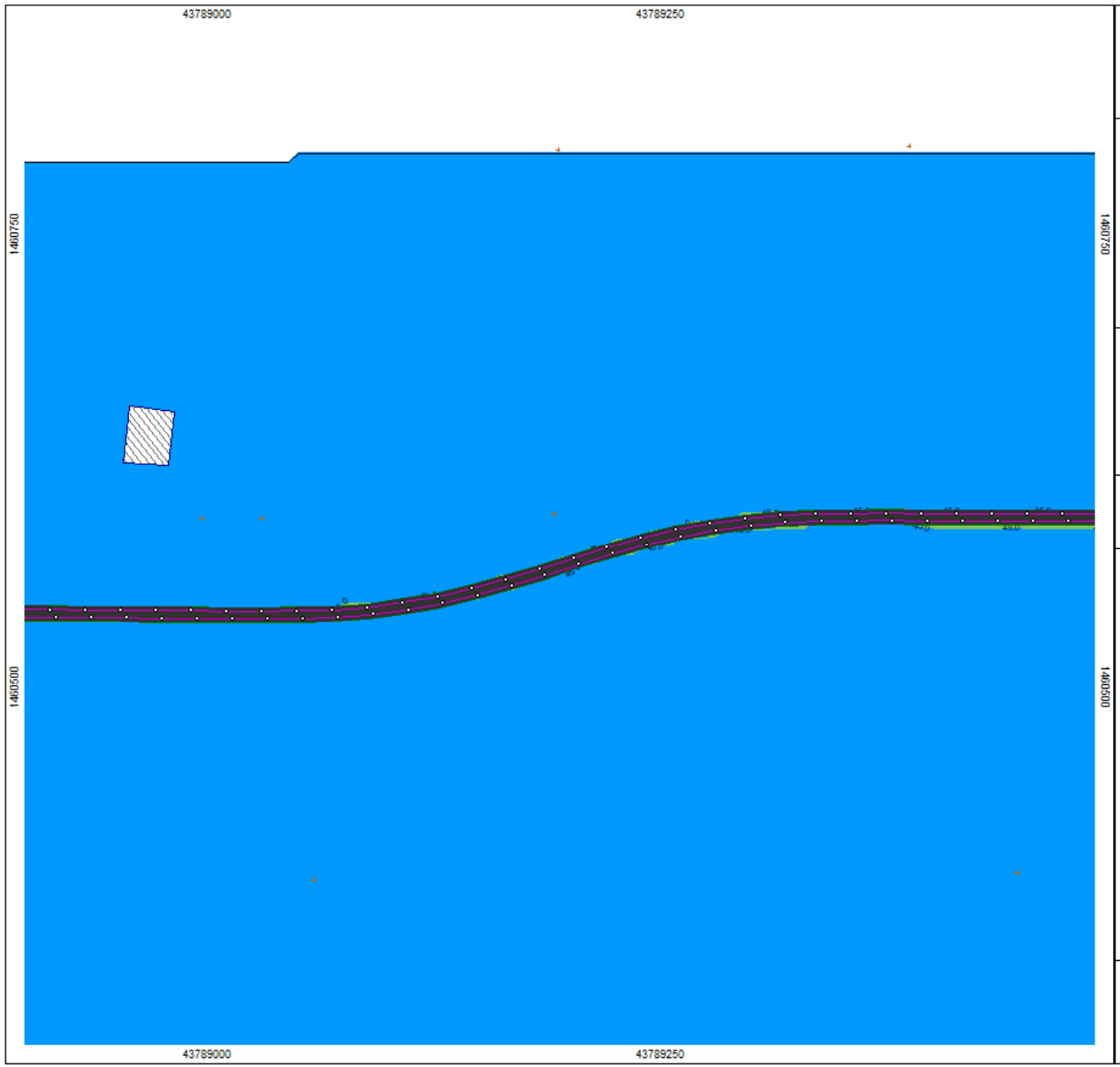

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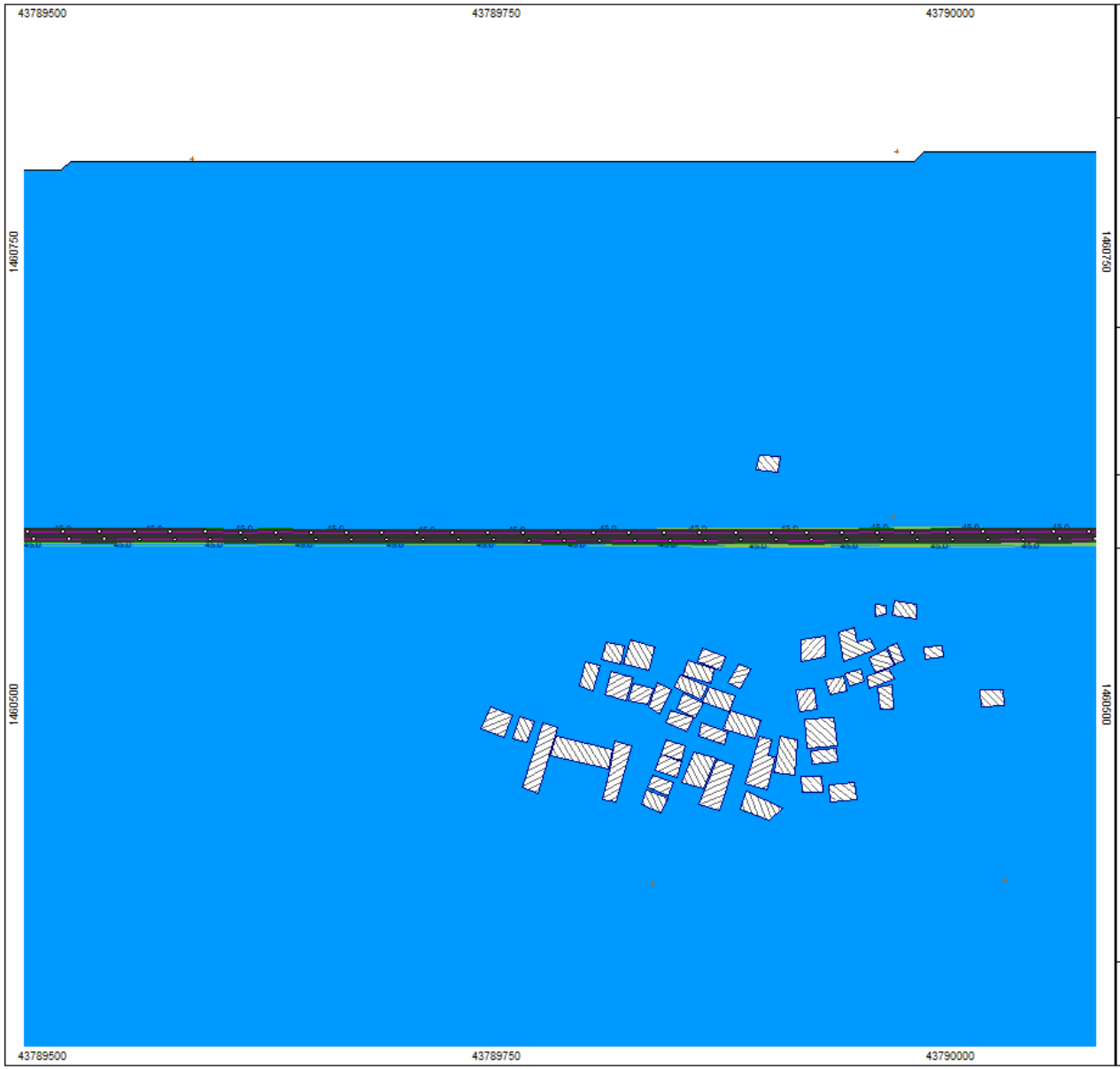

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N

Length scale 1:2006

0 15 30 60 90 120 m

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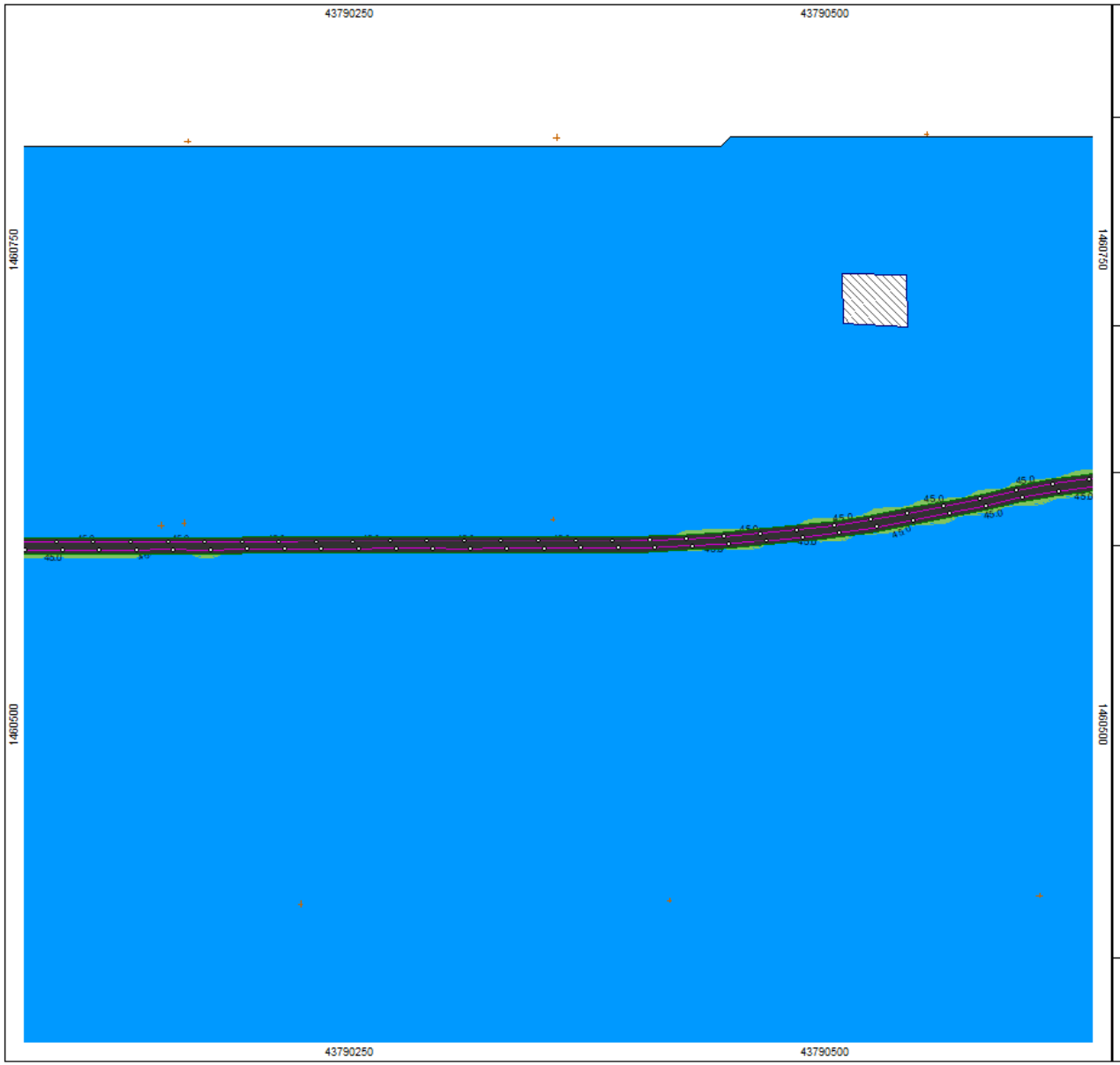

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Length scale 1:2006

0 15 30 60 90 120 m

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2031

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Wall
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Noise calculation area

Length scale 1:2887

0 25 50 100 150 200 m

N

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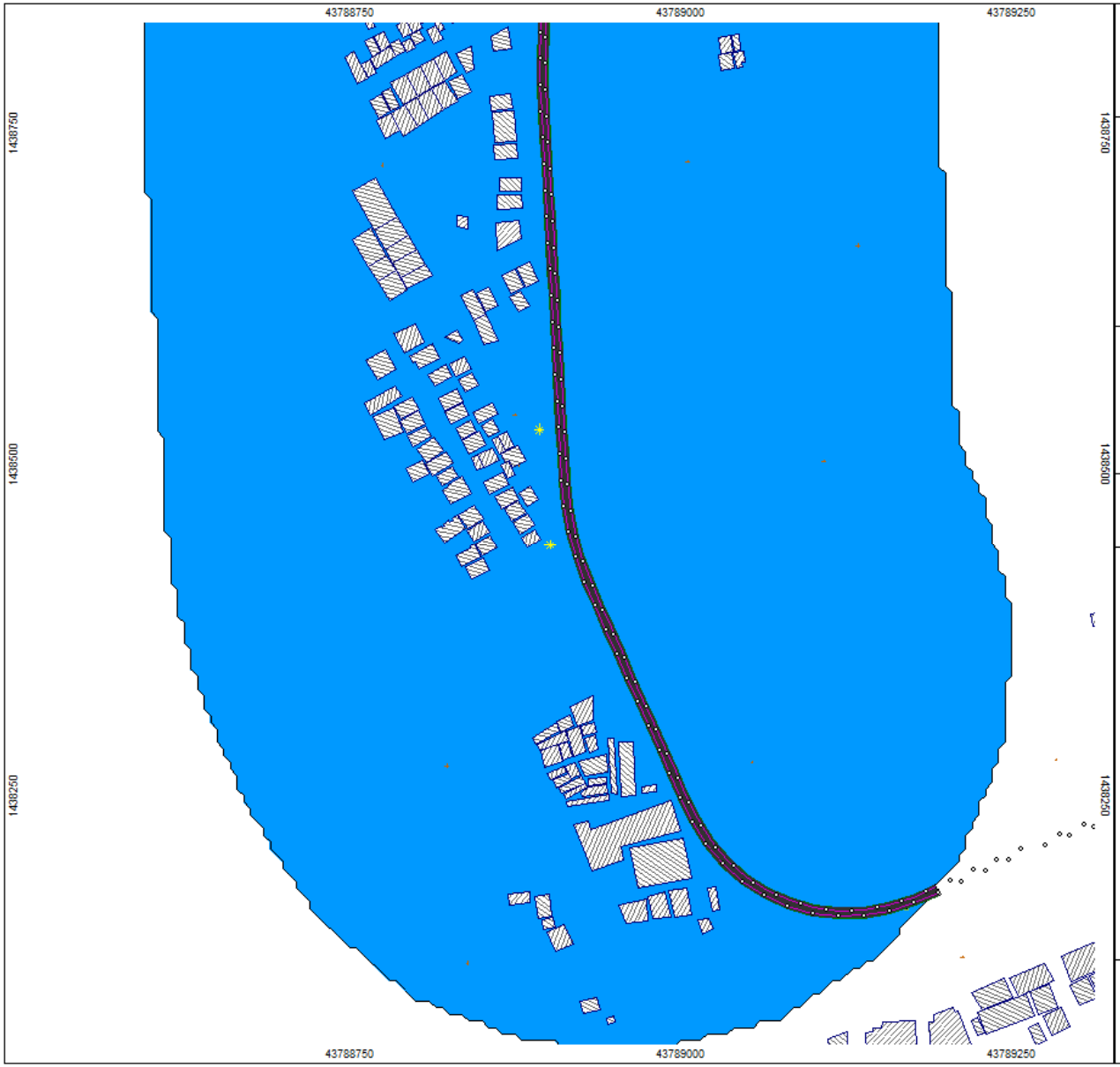

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Length scale 1:2887

0 25 50 100 150 200 m

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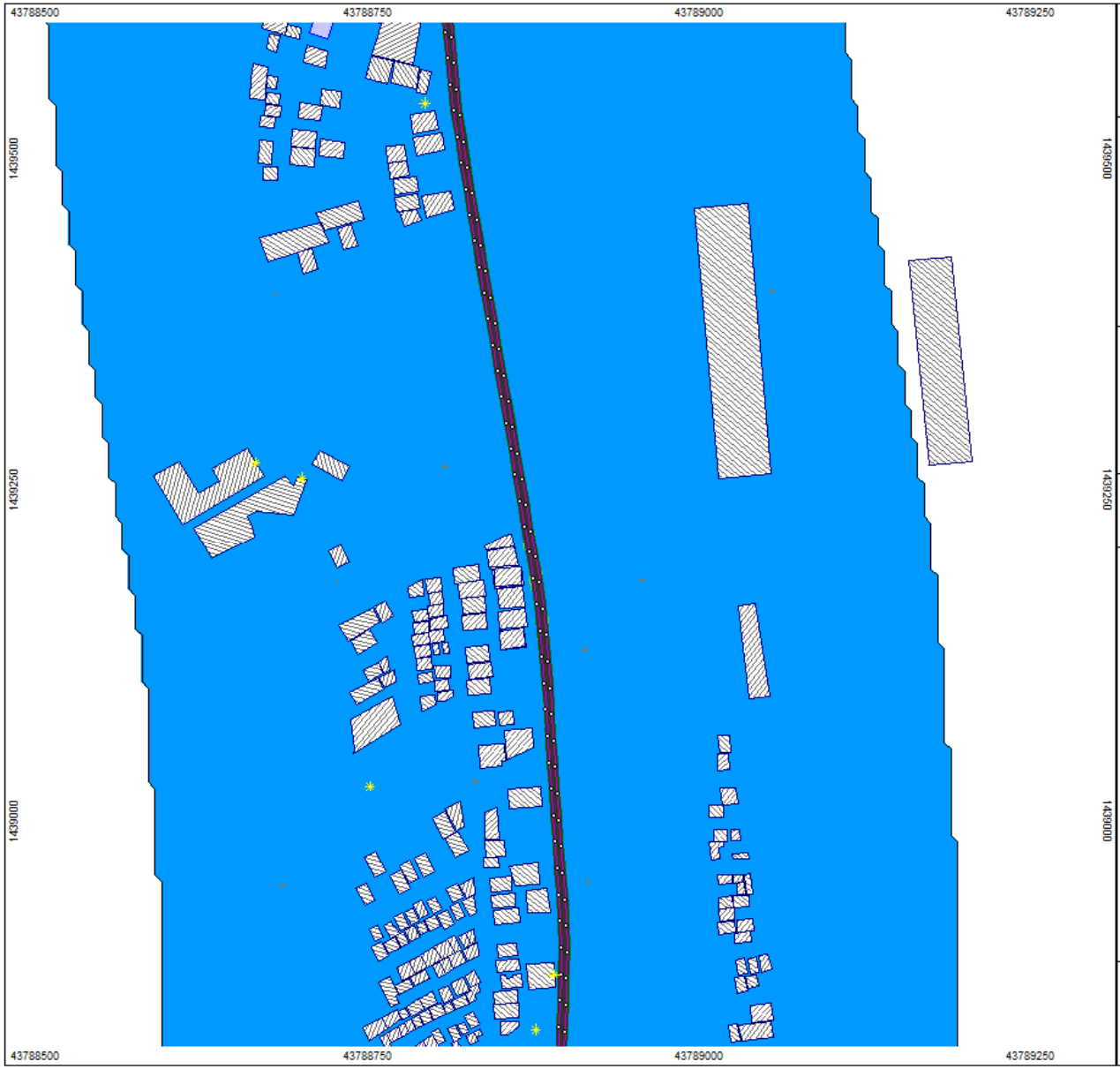

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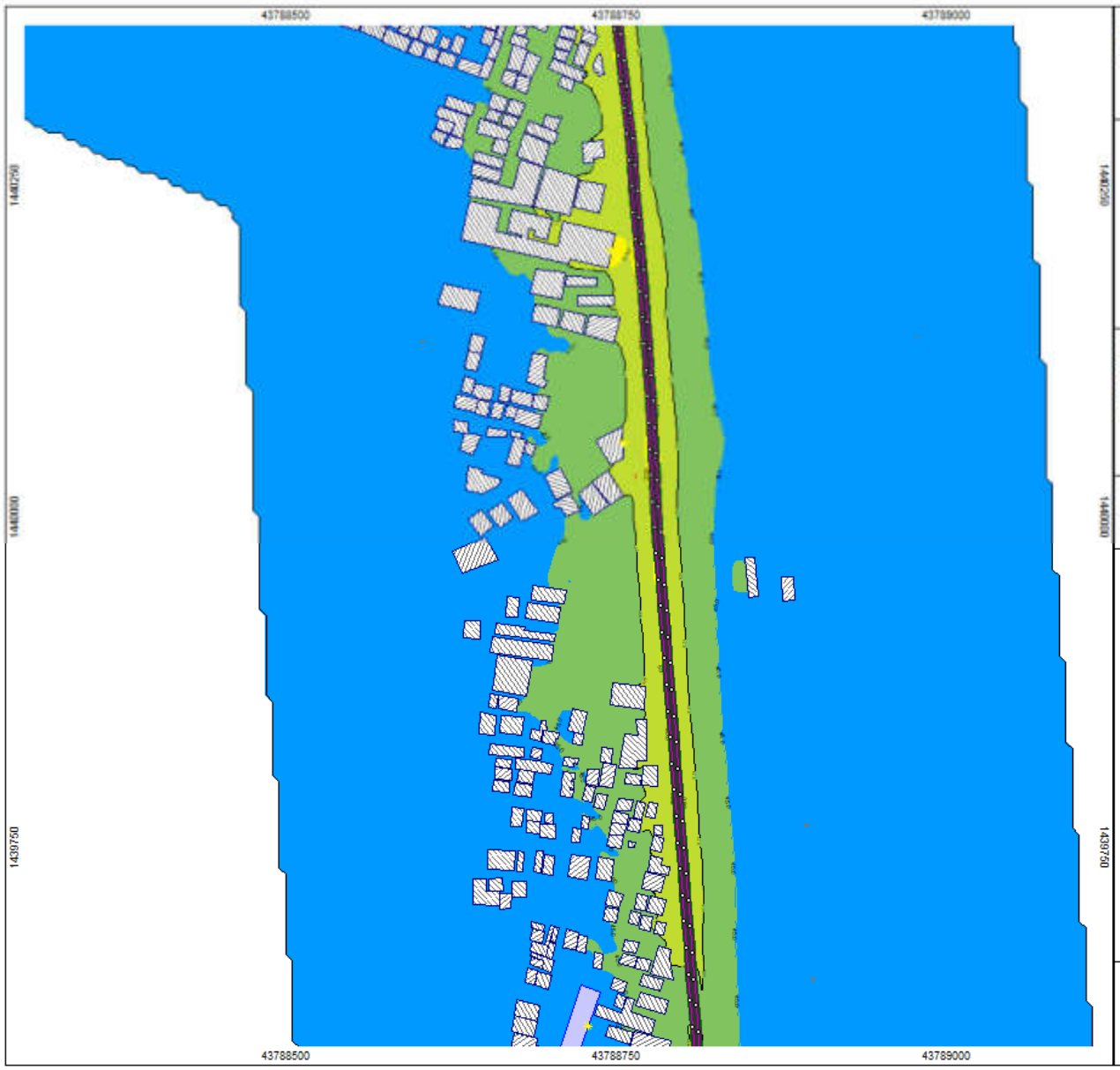

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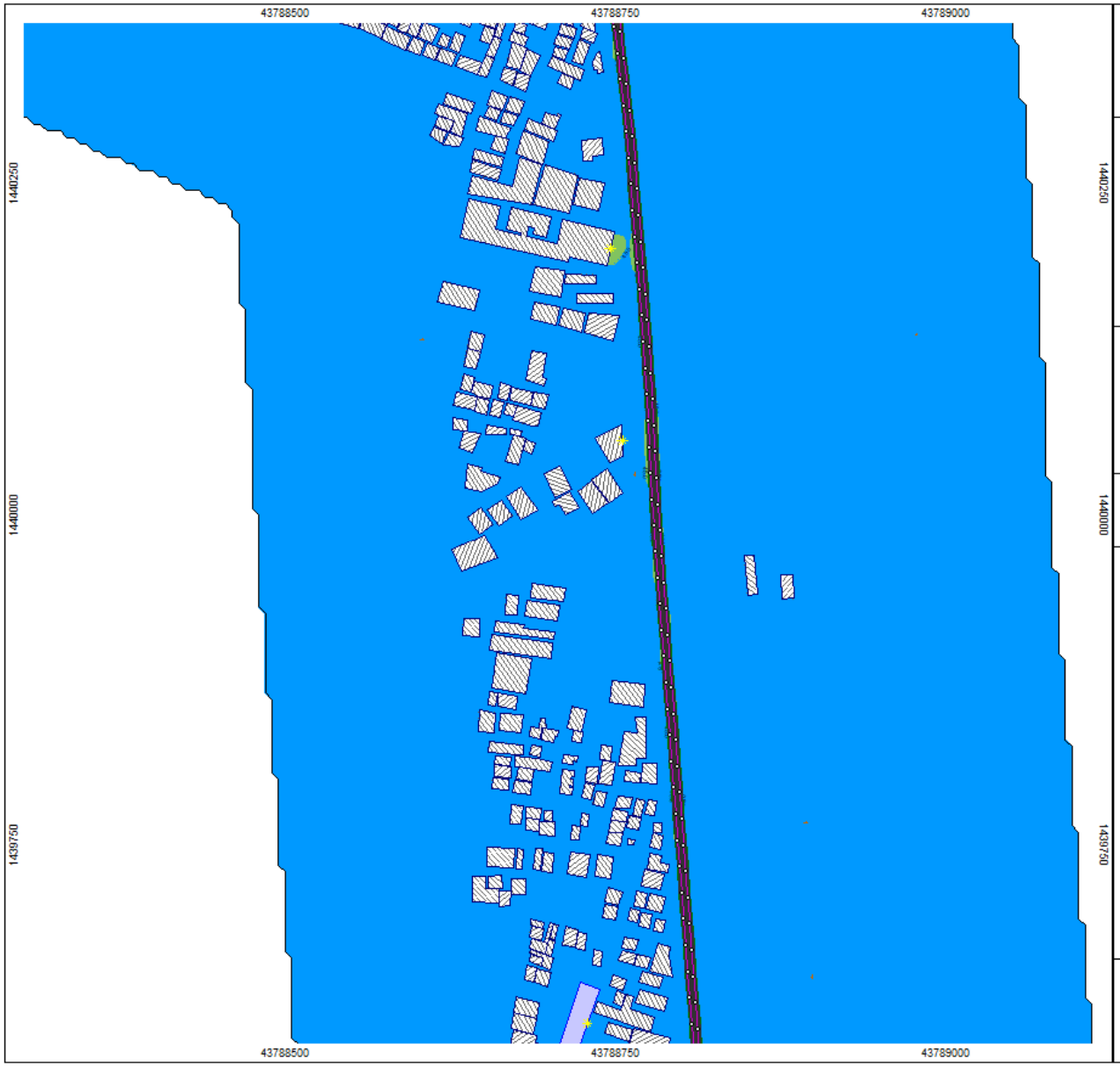

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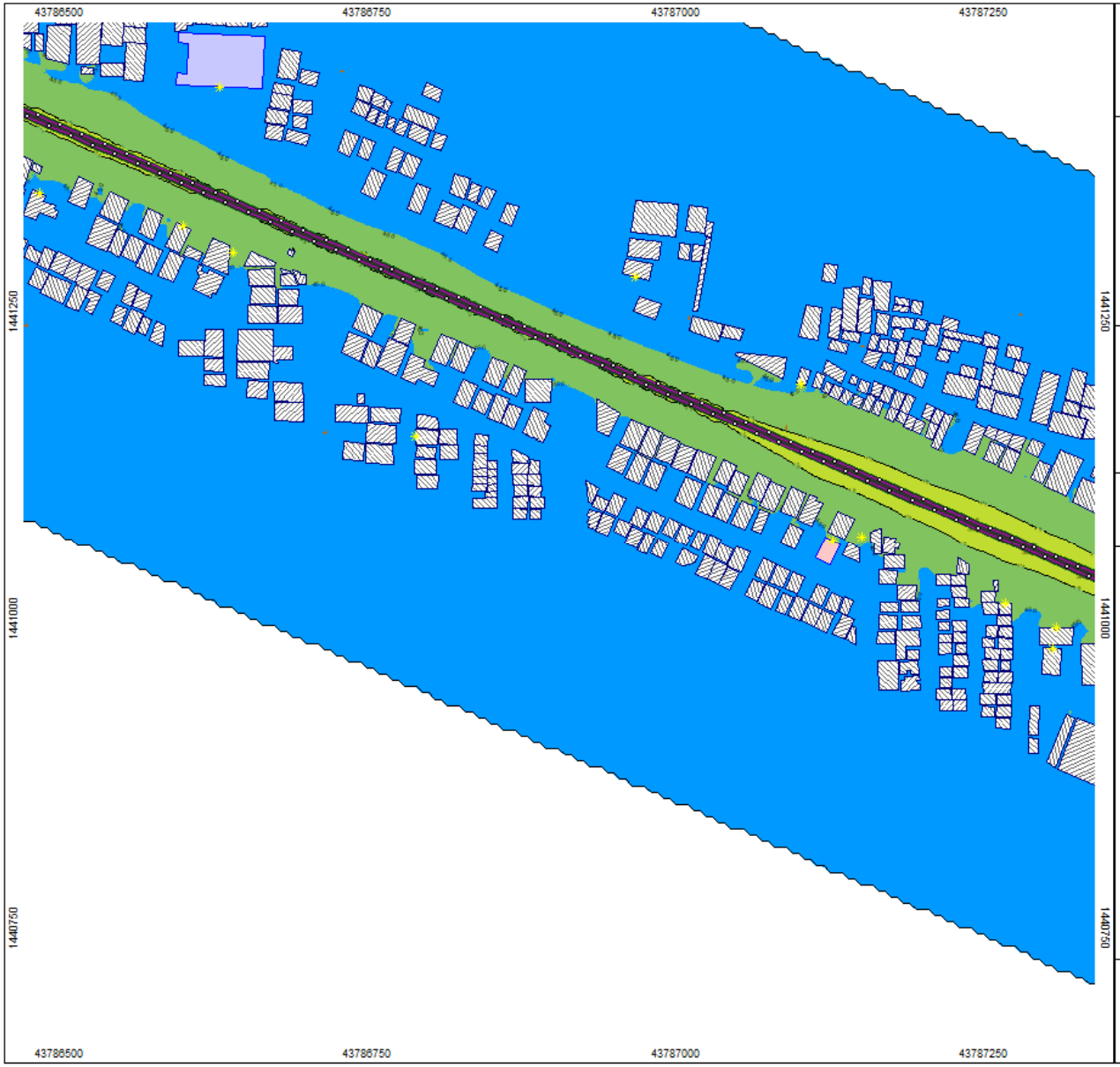

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Length scale 1:3101

0 25 50 100 150 200 m

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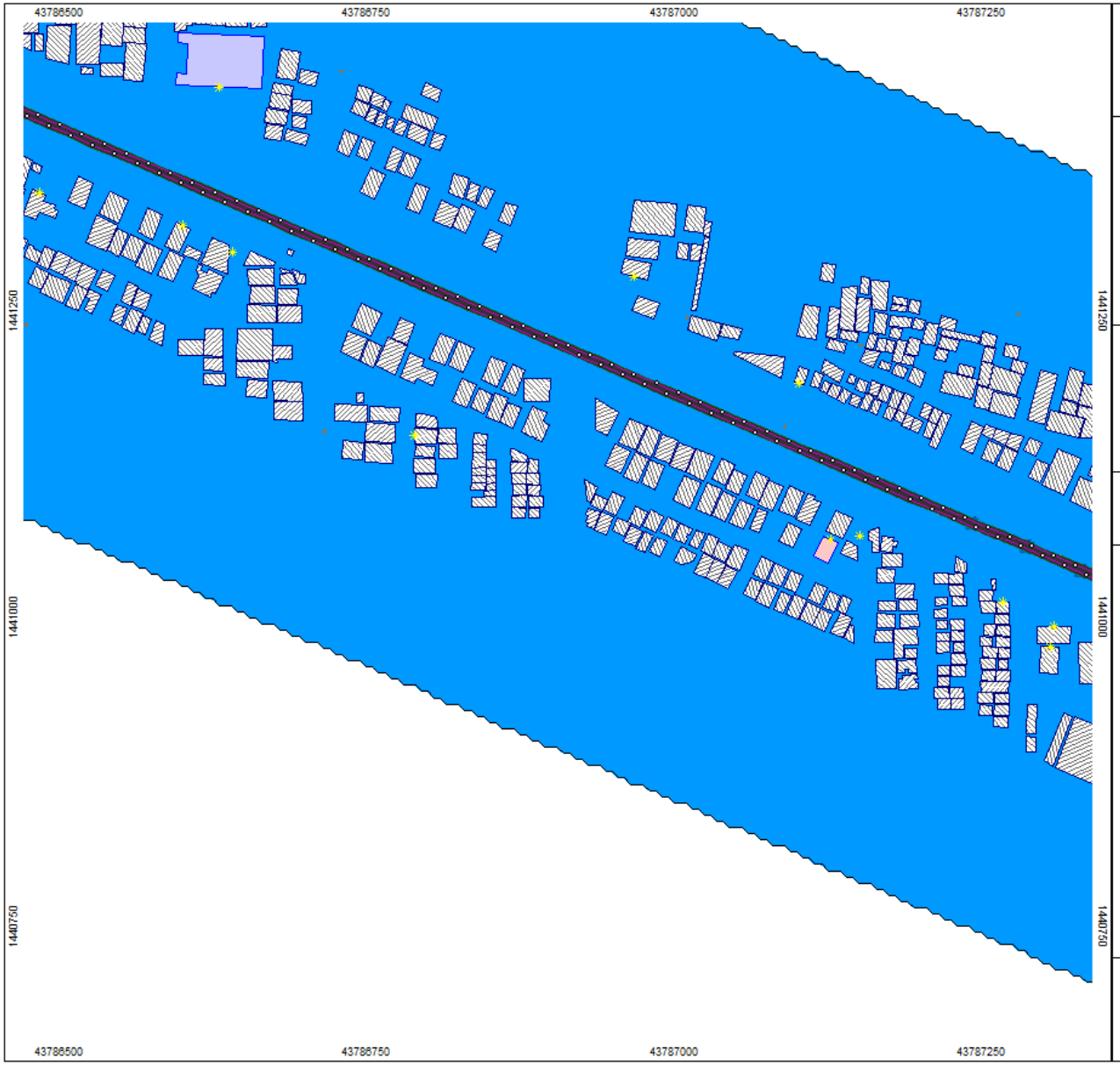

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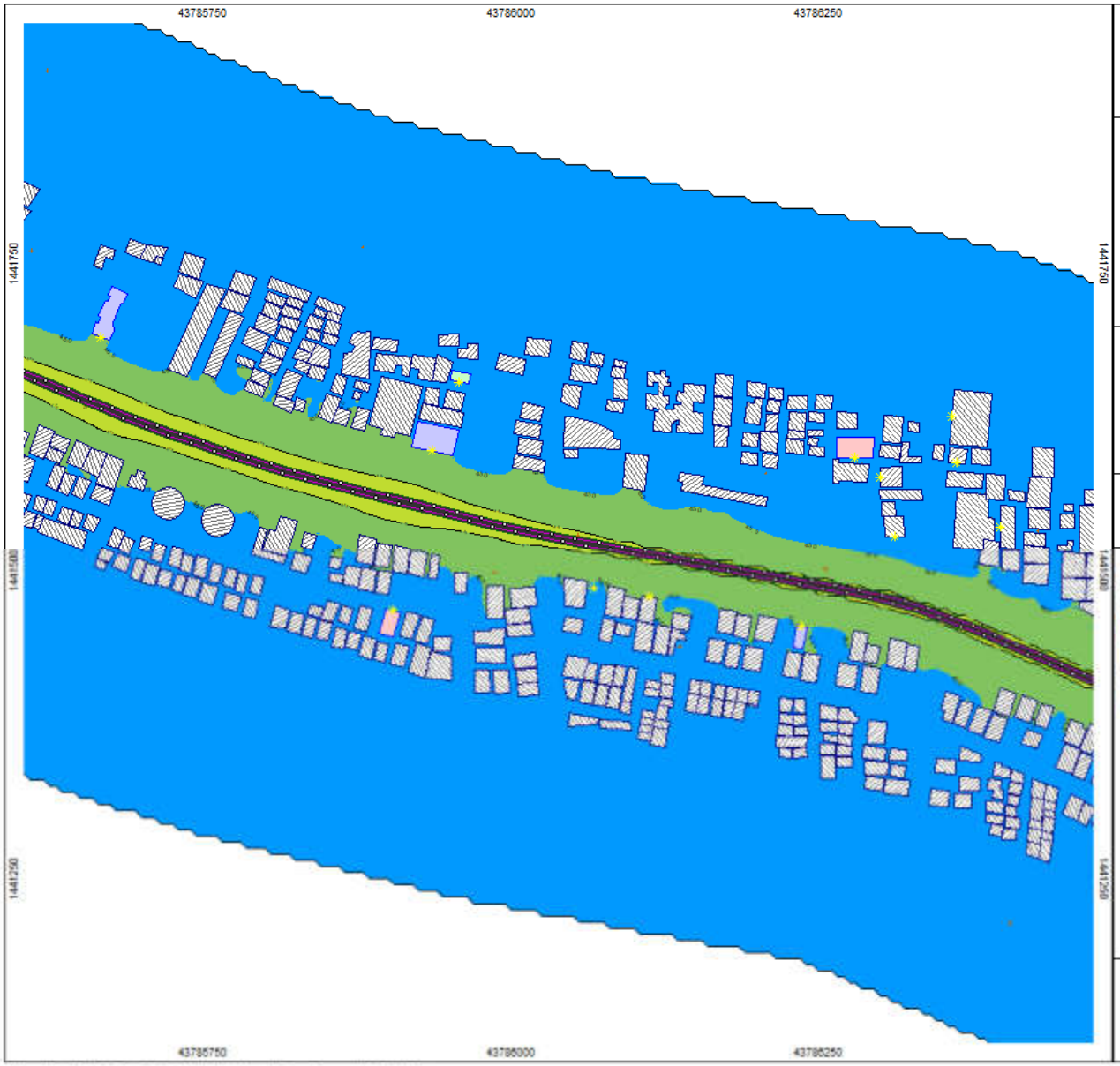

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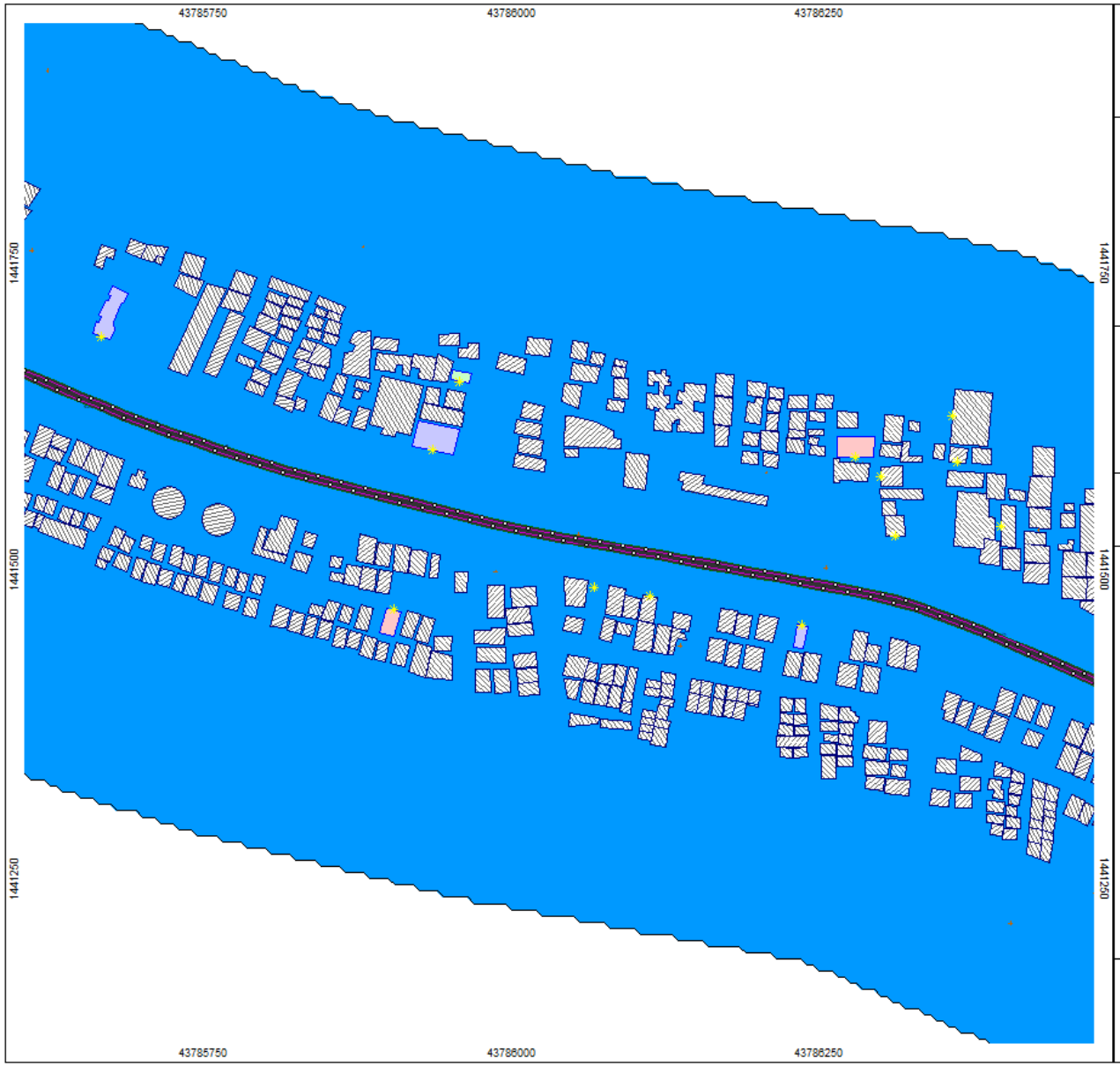

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Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,n
in dB(A)

< 45
45 - 50
50 - 55
55 - 60
60 - 65
>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
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- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

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Length scale 1:3101

0 25 50 100 150 200 m

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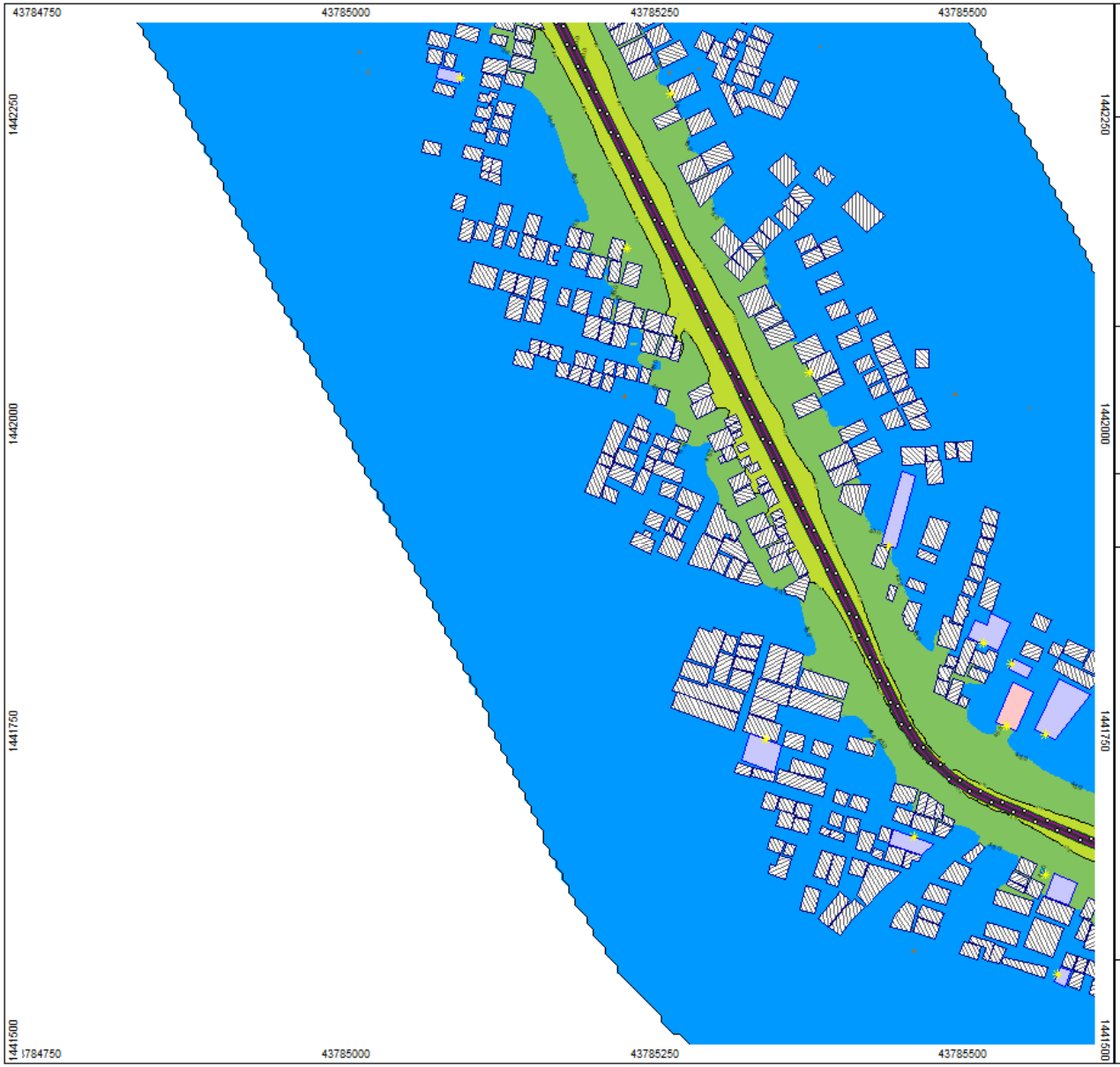

KR Puram to Kempegowda International Airport

Operational Noise.
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120 2031 2b with Parapet Wall
Noise Contour Map
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Length scale 1:3101

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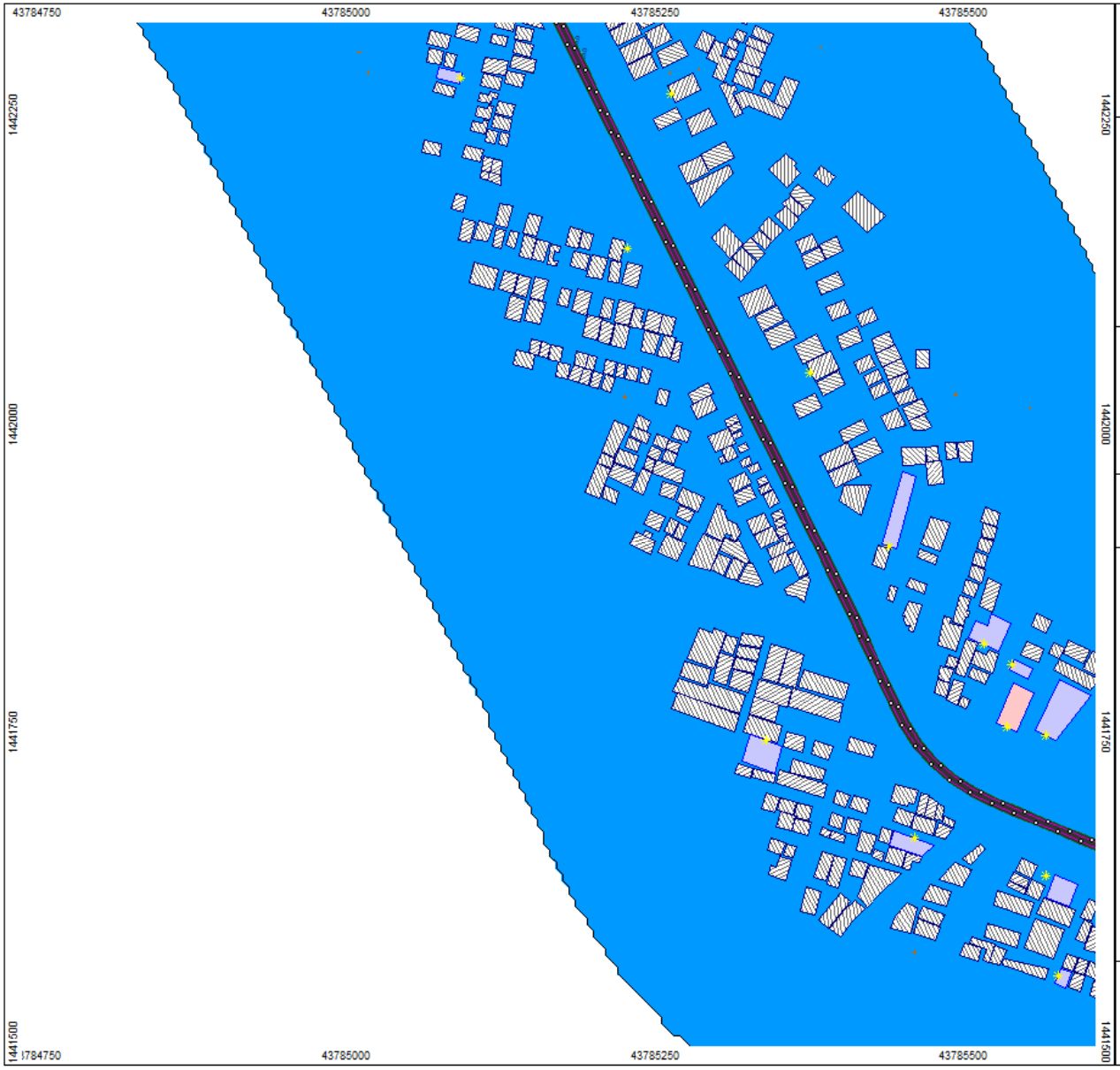

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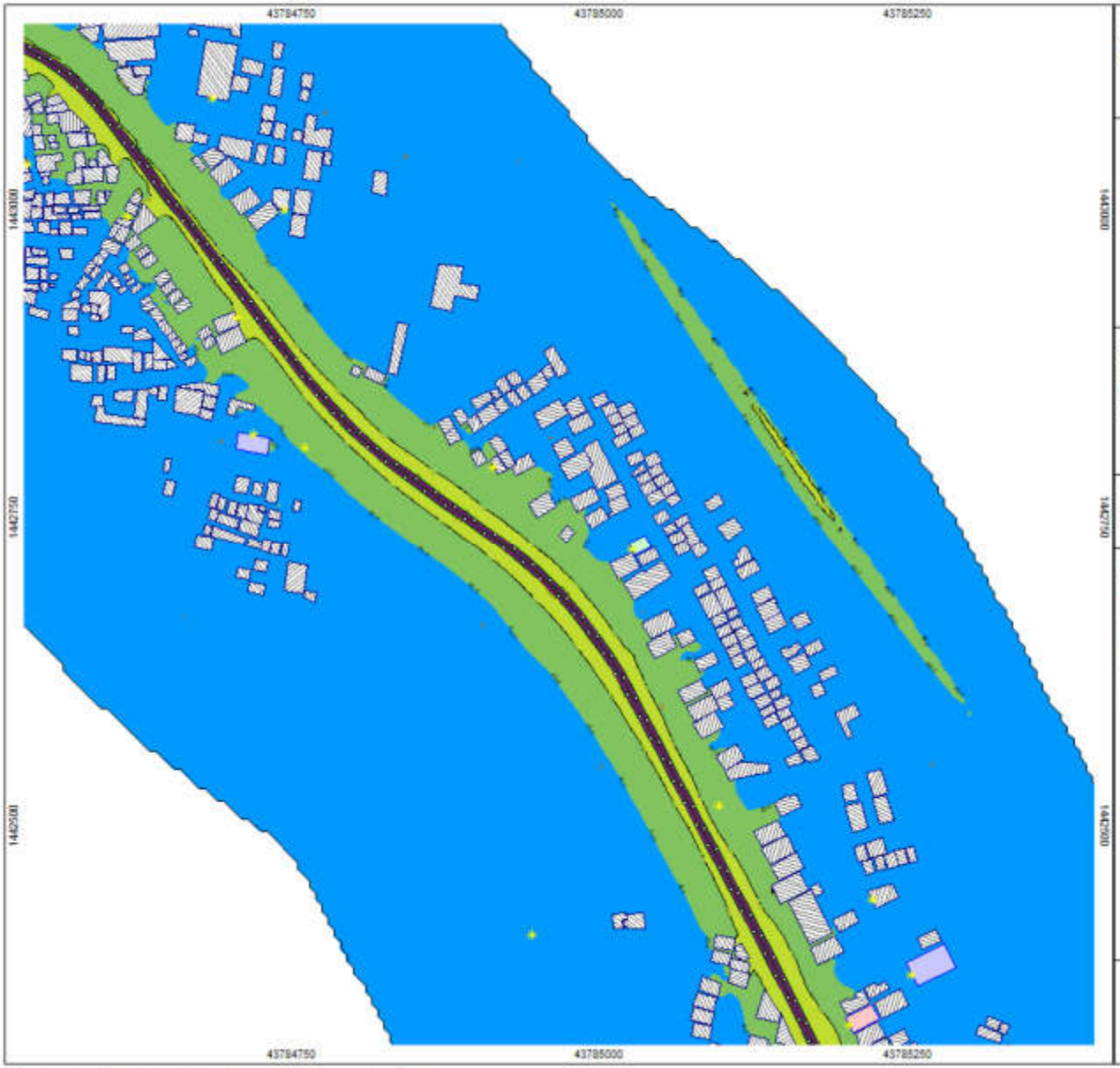

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Length scale 1:3101

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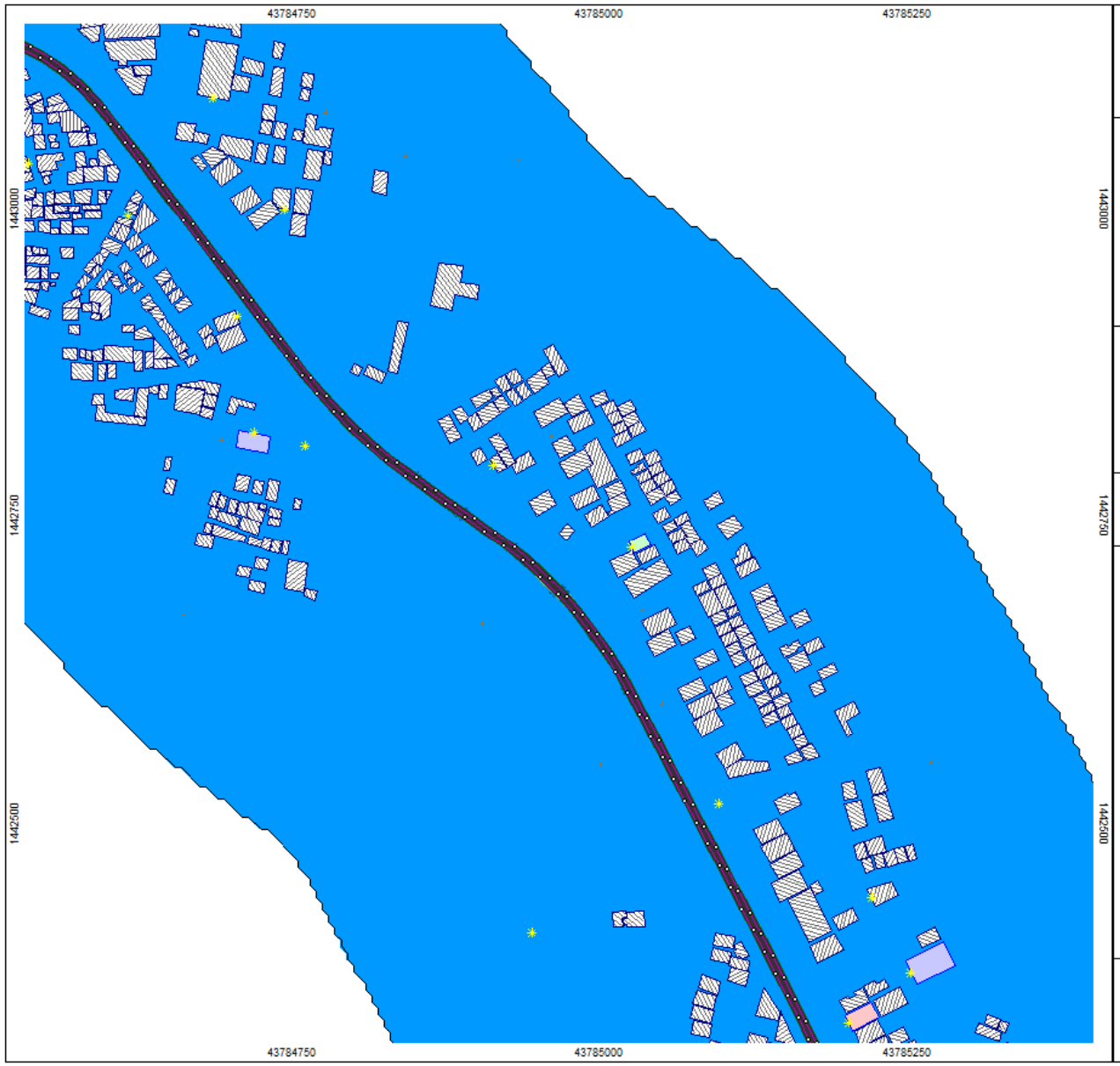

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Signs and symbols

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- Geometry bitmap
- Wall
- Wall
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Length scale 1:2727

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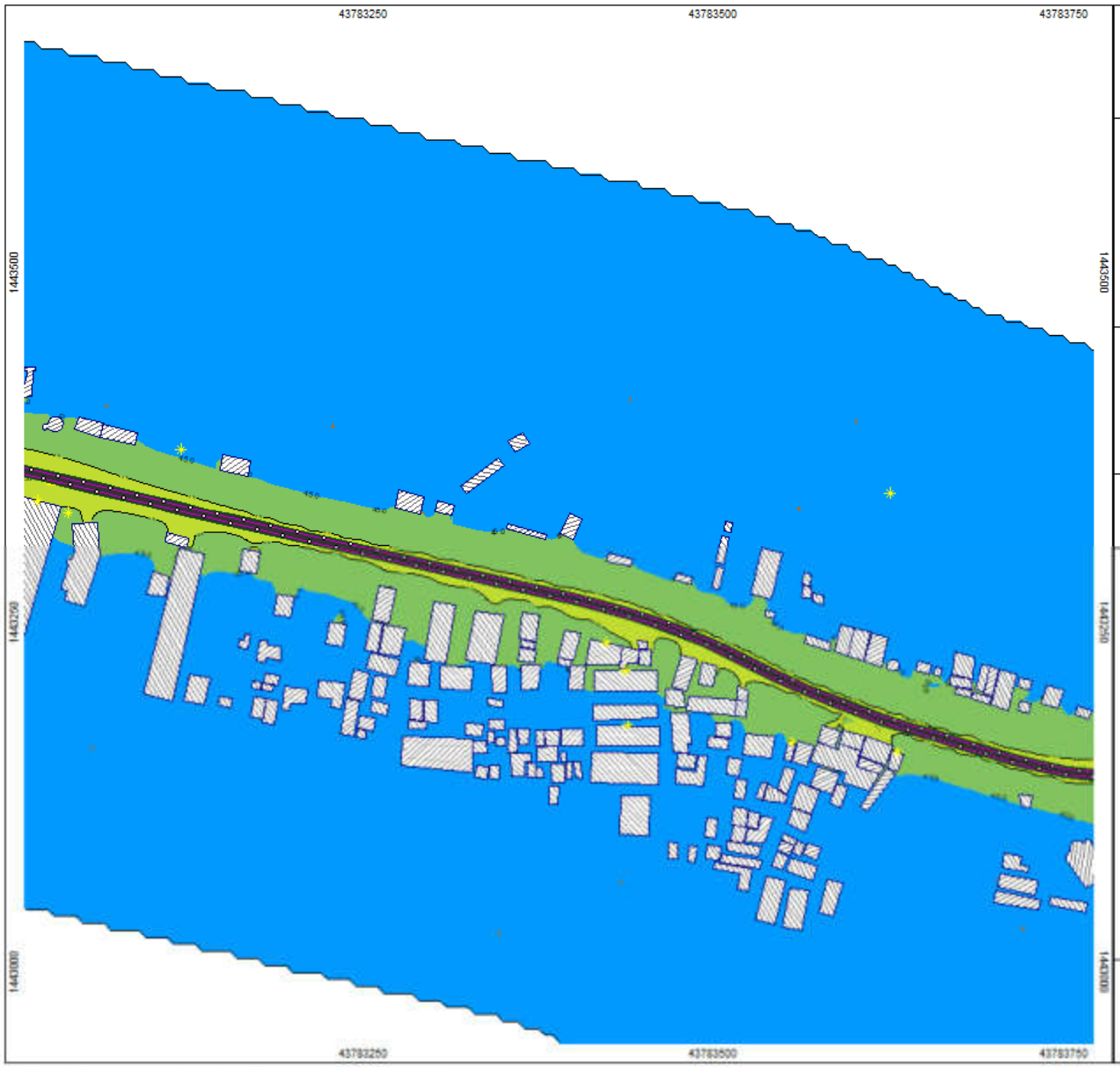

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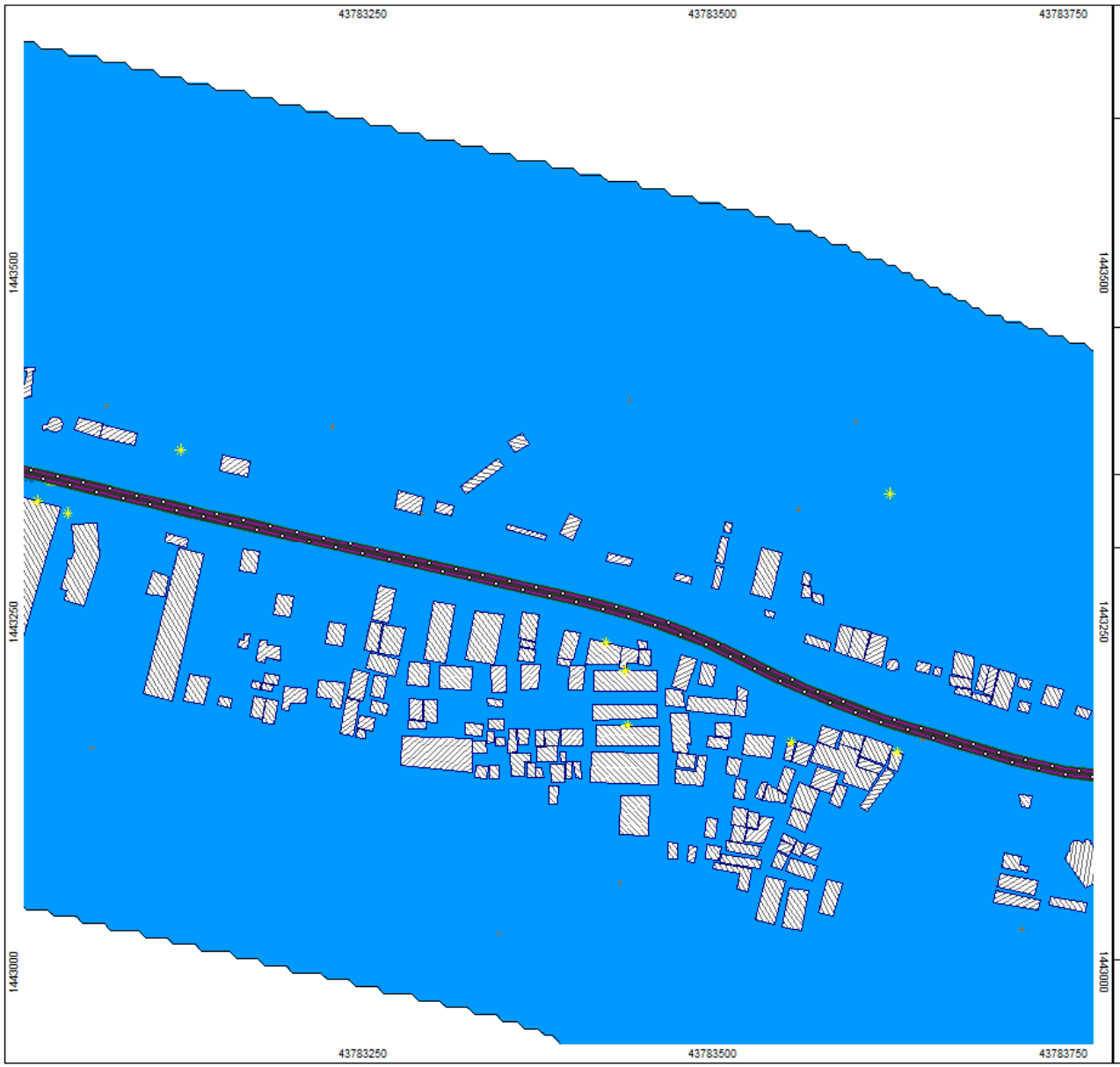

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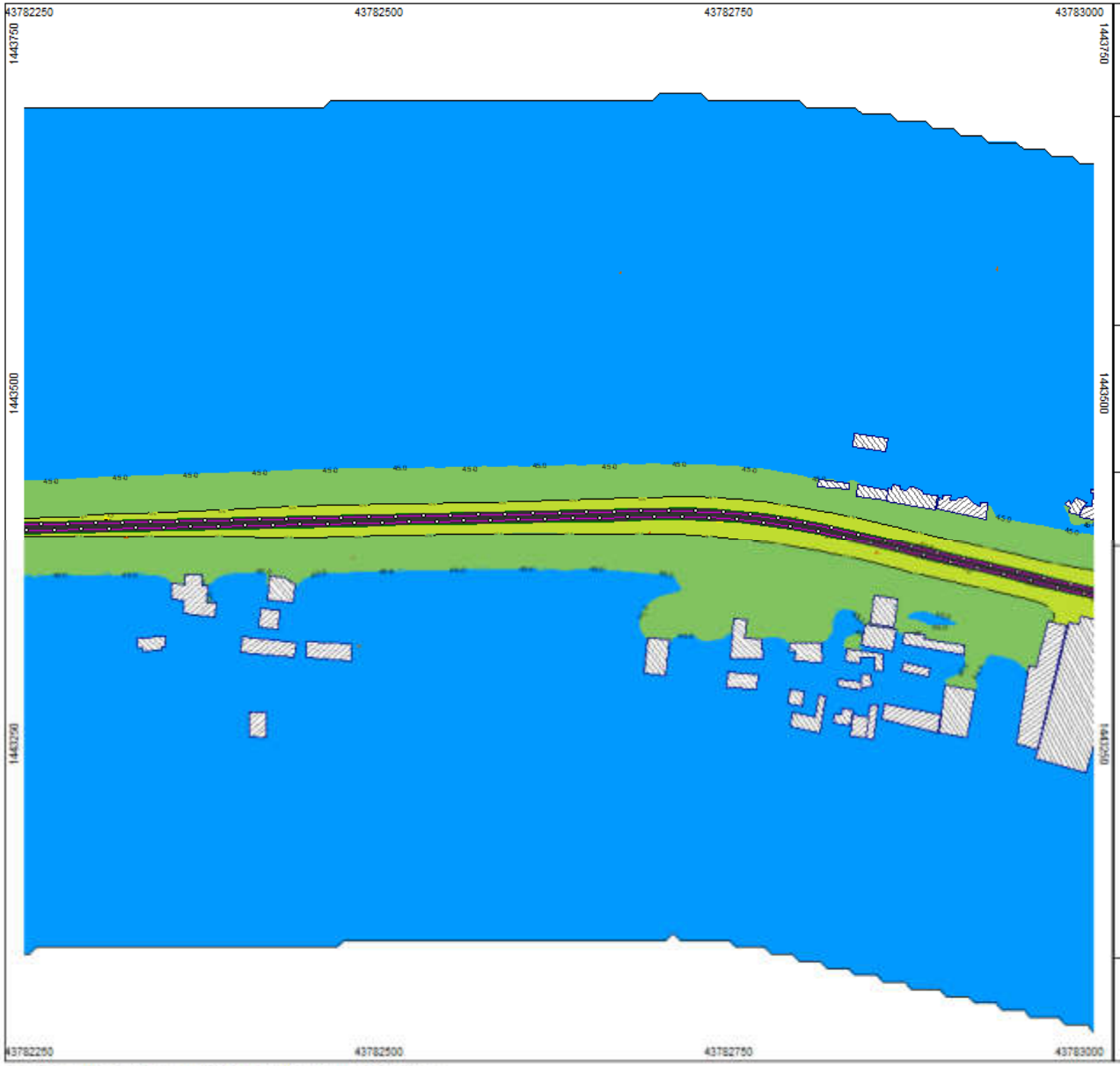

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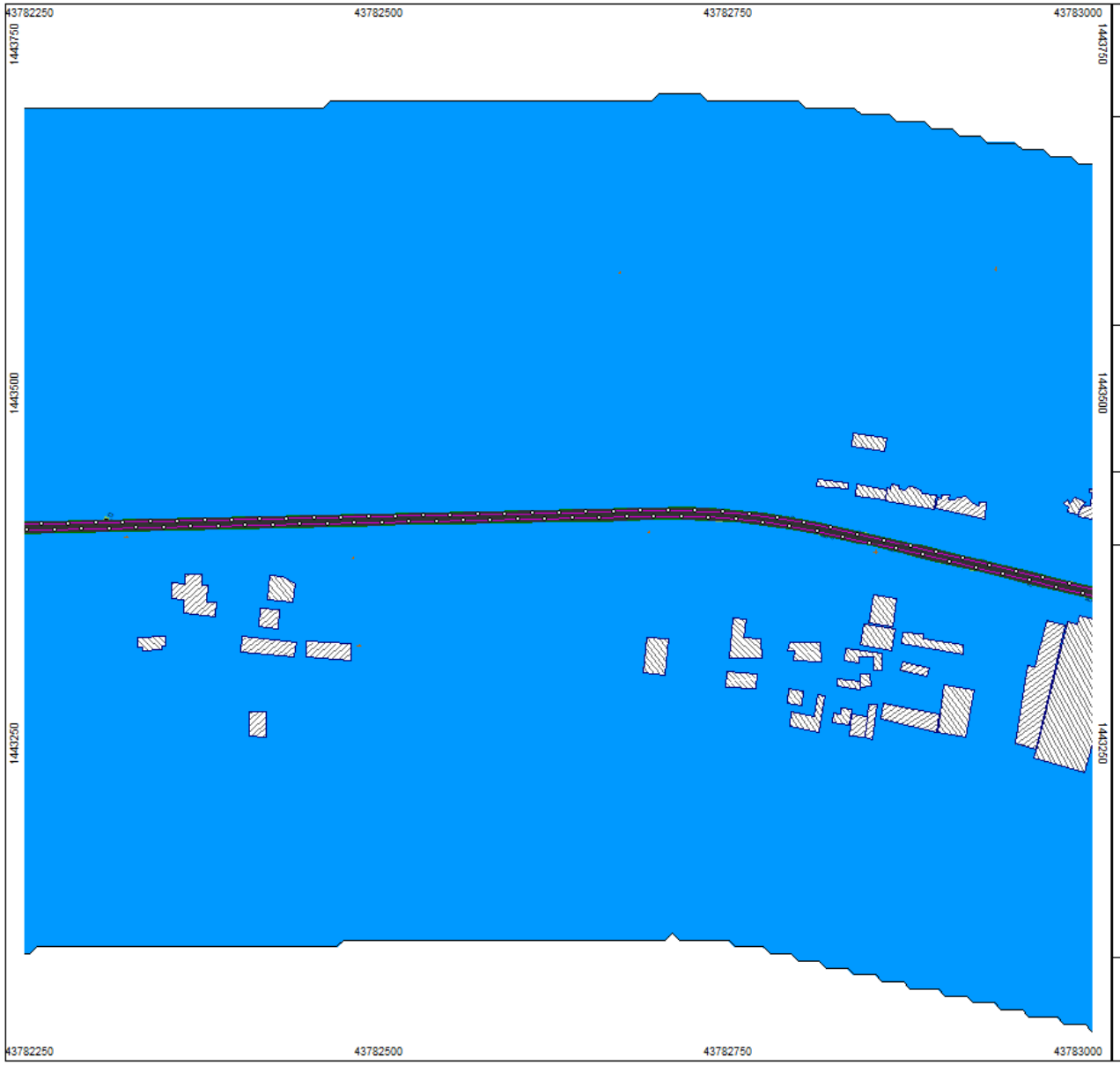

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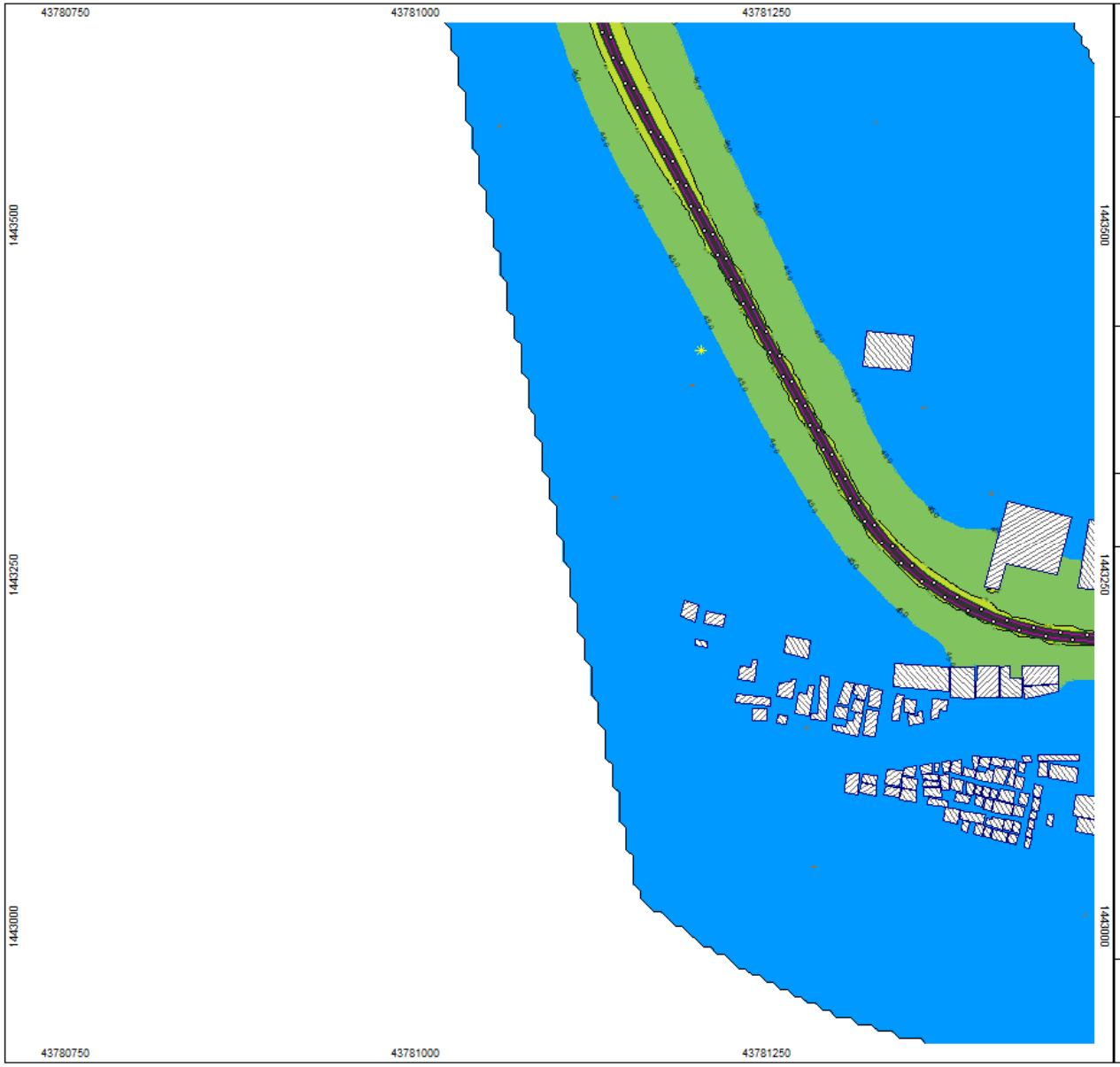

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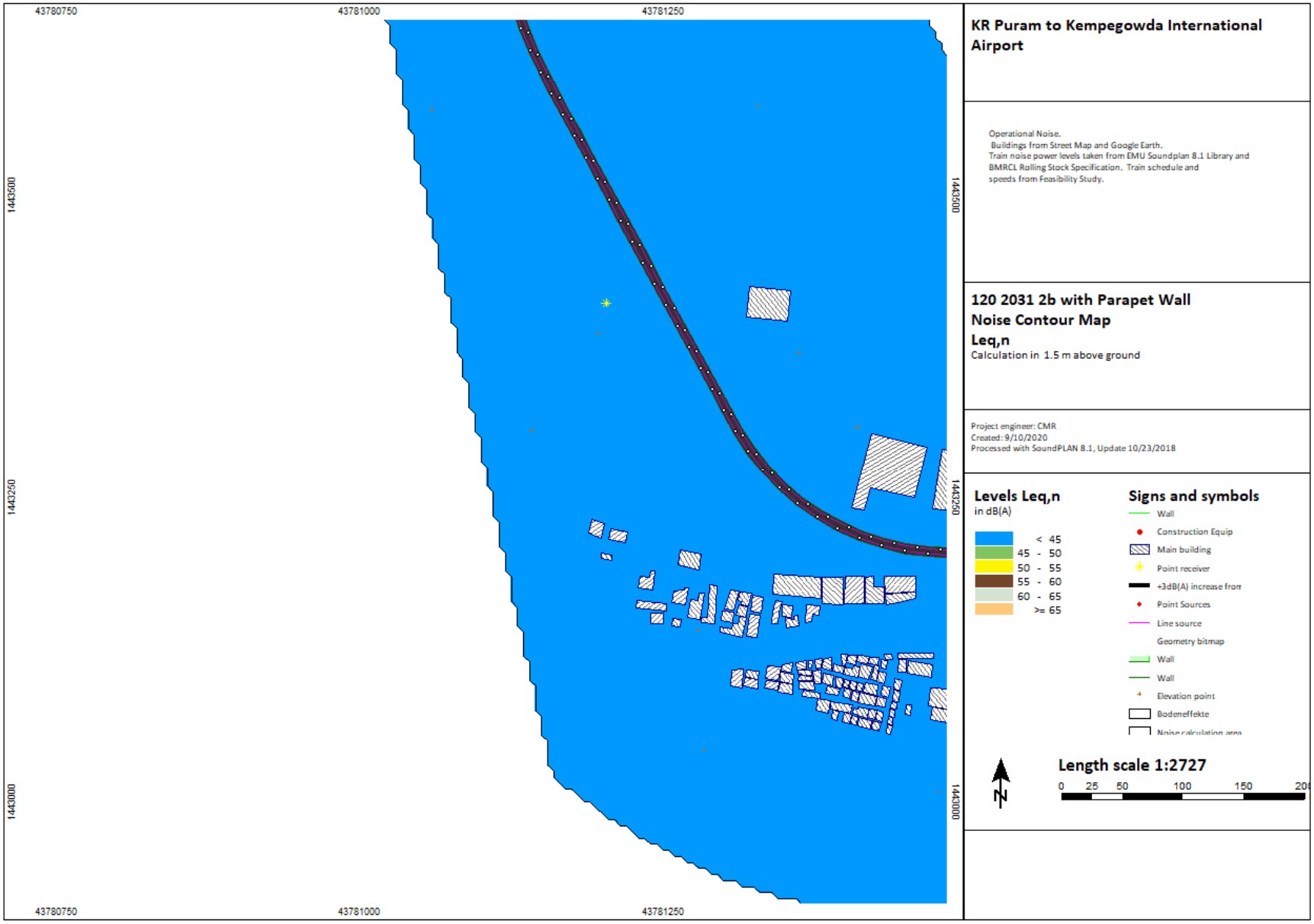

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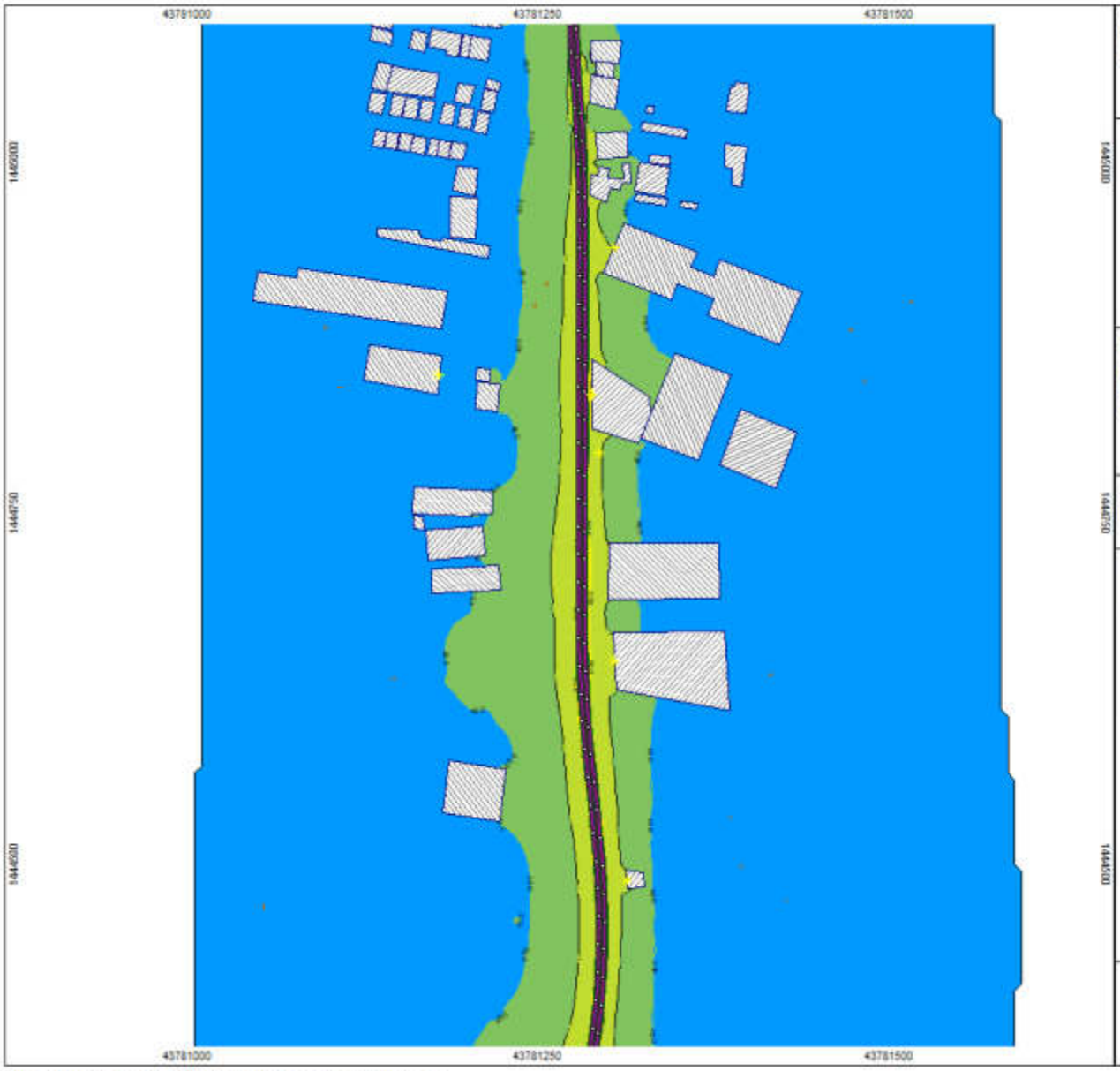

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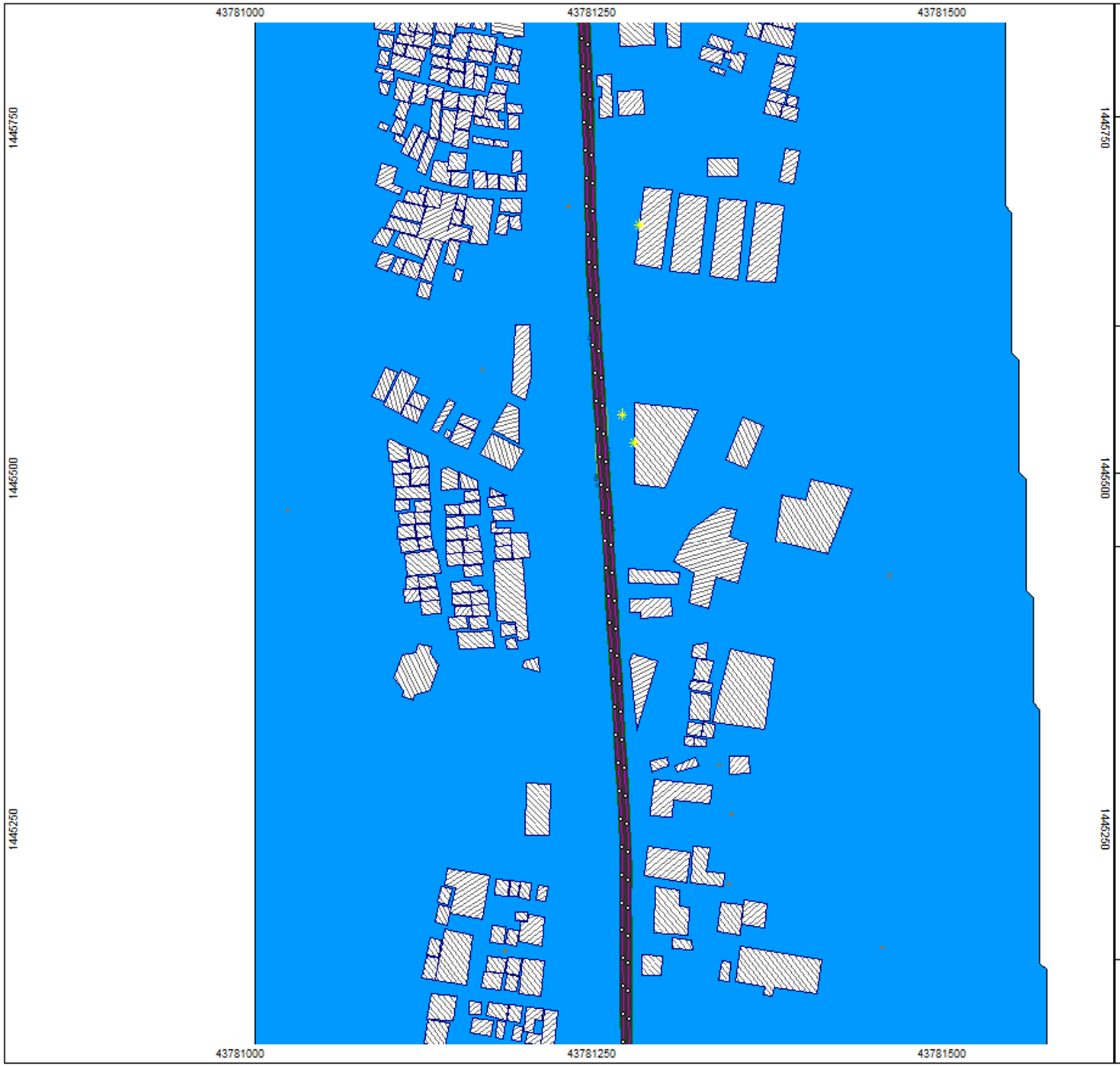

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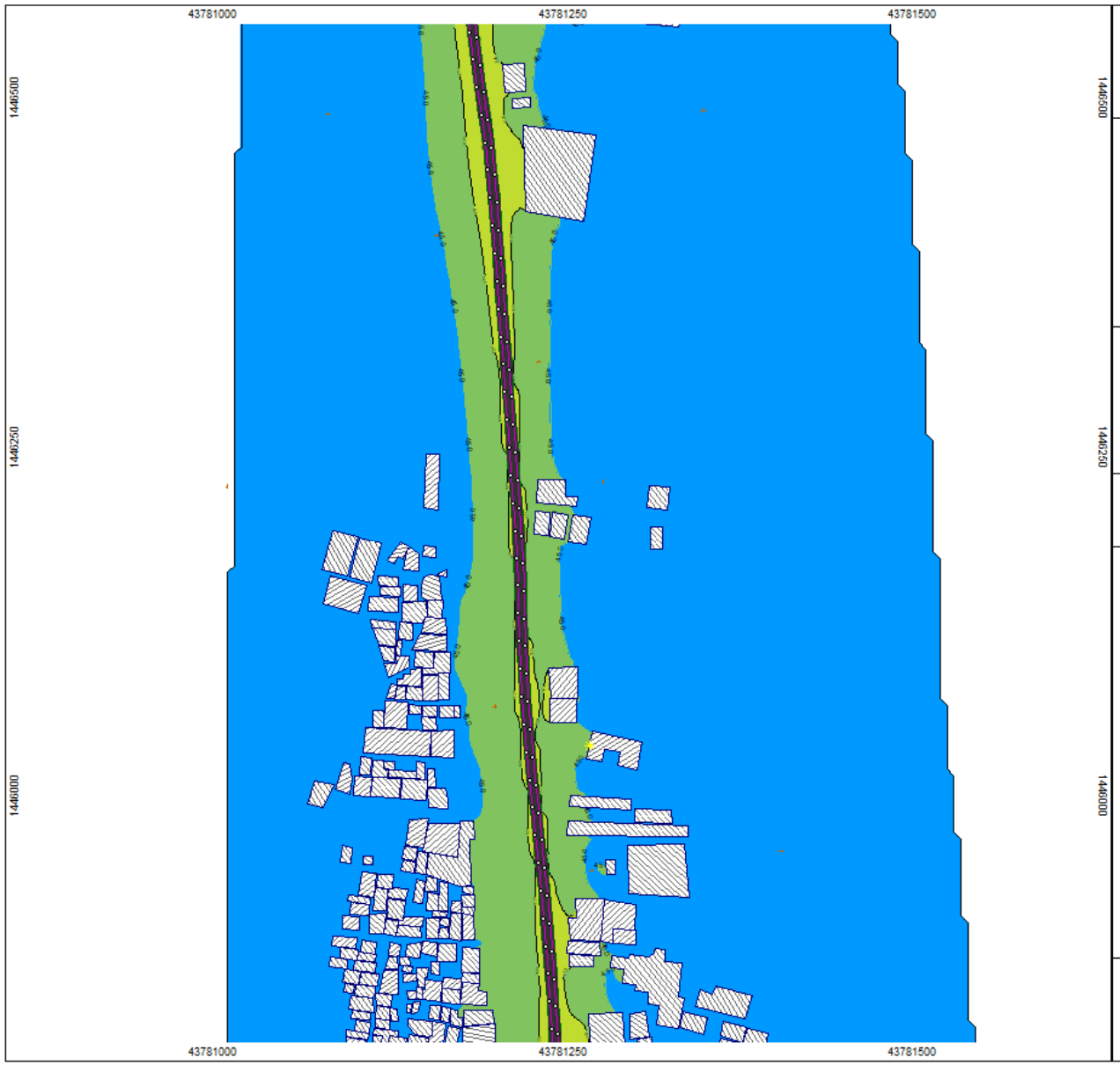

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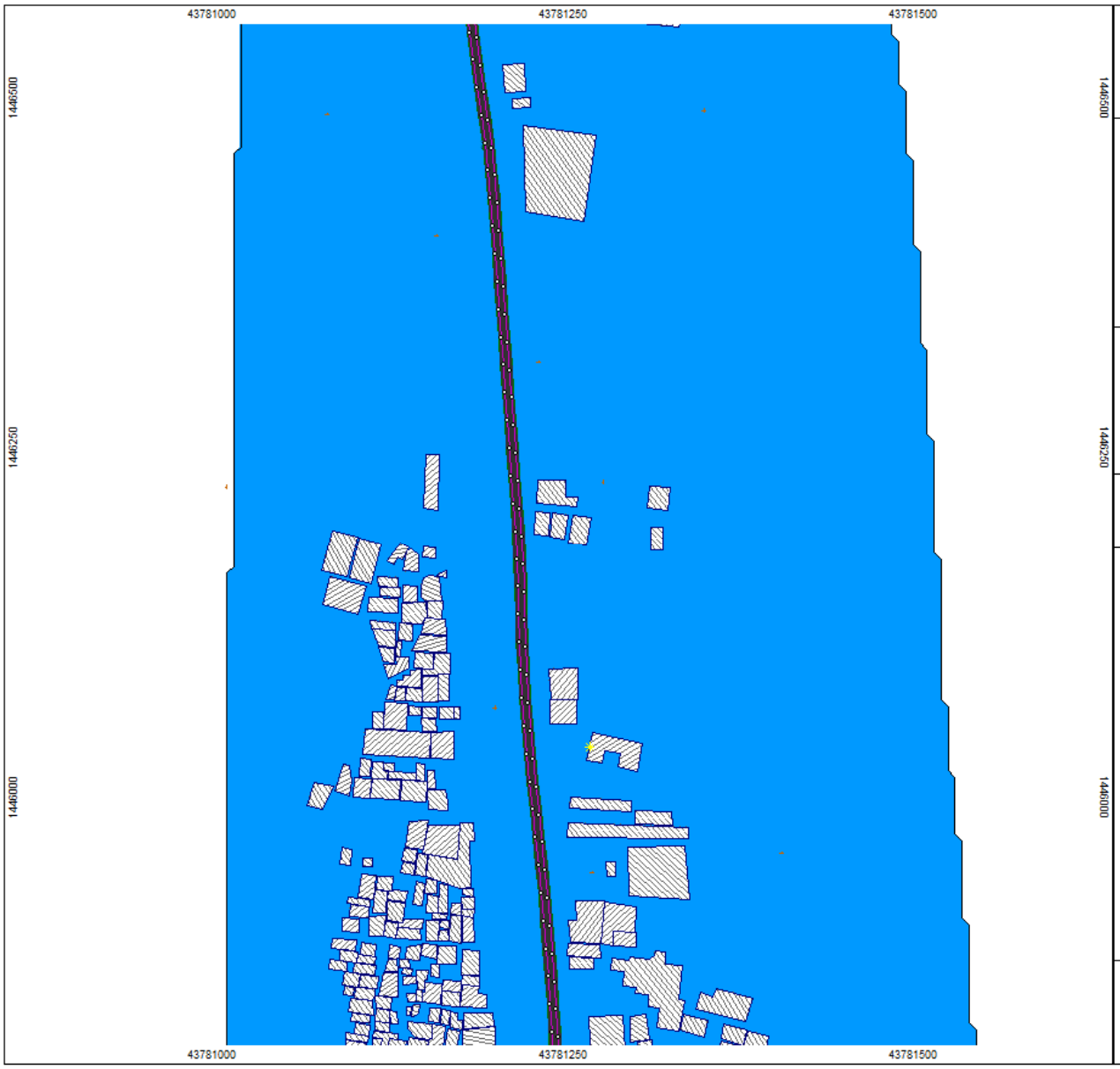

KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
Train noise power levels taken from EMU Soundplan 8.1 Library and BMRCL Rolling Stock Specification. Train schedule and speeds from Feasibility Study.

120 2031 2b with Parapet Wall
Noise Contour Map
Leq,n
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/10/2020
Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,n
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2727

0 25 50 100 150 200

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Levels Leq,d
in dB(A)

Levels
< 45
45 - 50
50 - 55
55 - 60
60 - 65
>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
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- Wall
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- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2727
0 25 50 100 150 200

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KR Puram to Kempegowda International Airport

Operational Noise.
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	45 - 50
	50 - 55
	55 - 60
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Signs and symbols

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- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

Length scale 1:2727

0 25 50 100 150 200

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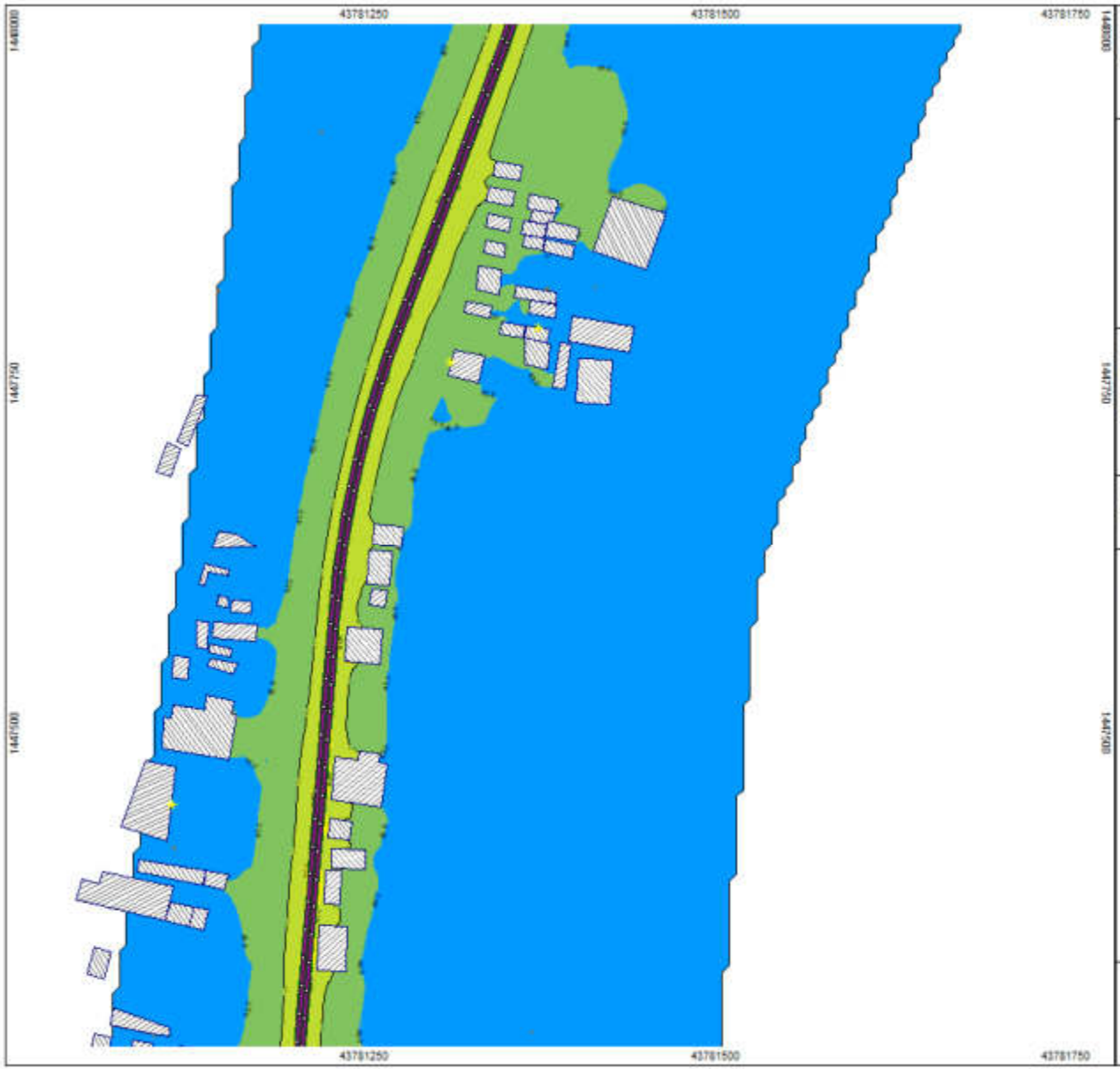

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- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekt

N

Length scale 1:2727

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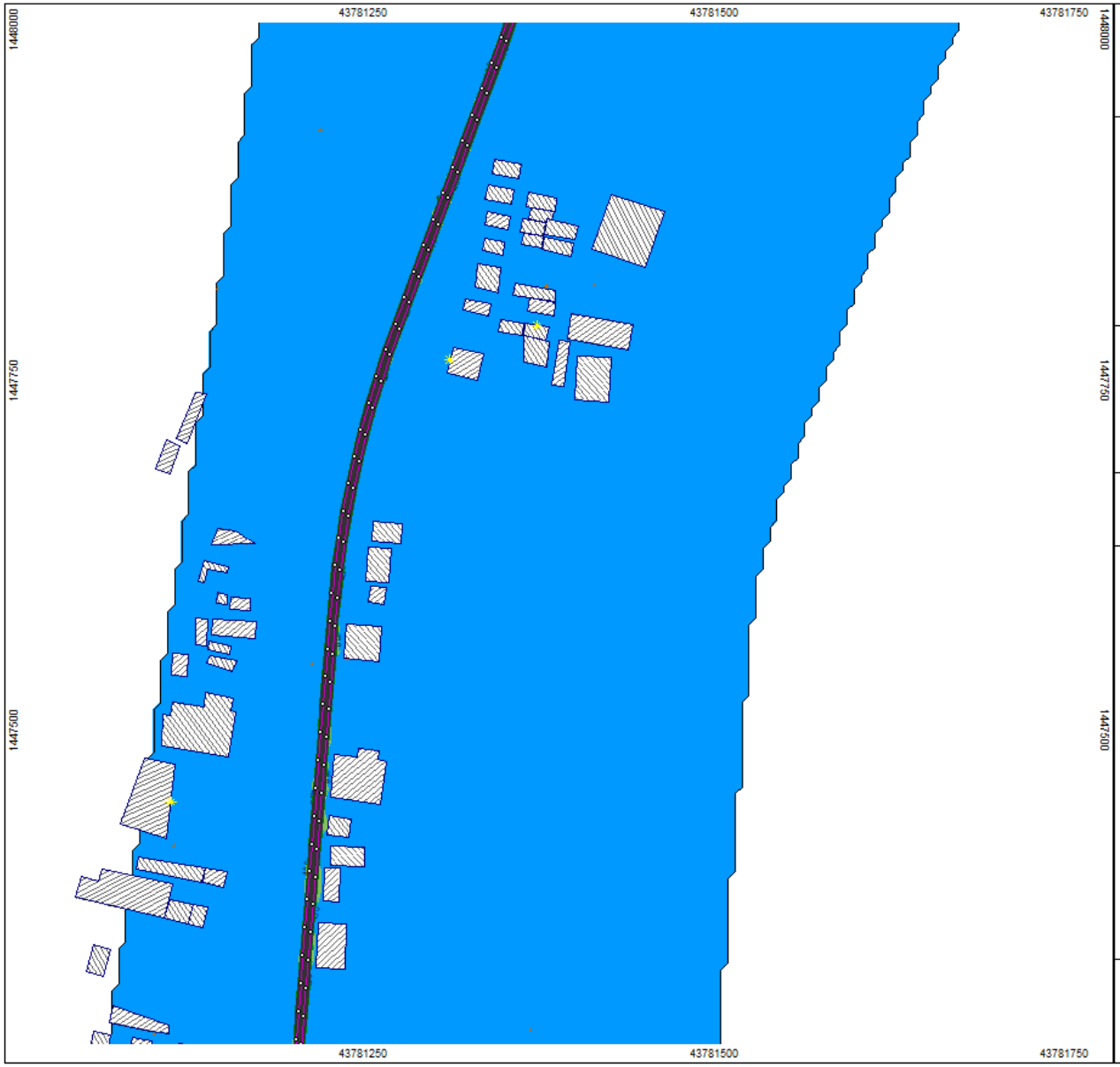

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120 2031 2b with Parapet Wall

Noise Contour Map

Leq,n

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Levels Leq,n
in dB(A)

< 45
45 - 50
50 - 55
55 - 60
60 - 65
>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2727

0 25 50 100 150 200

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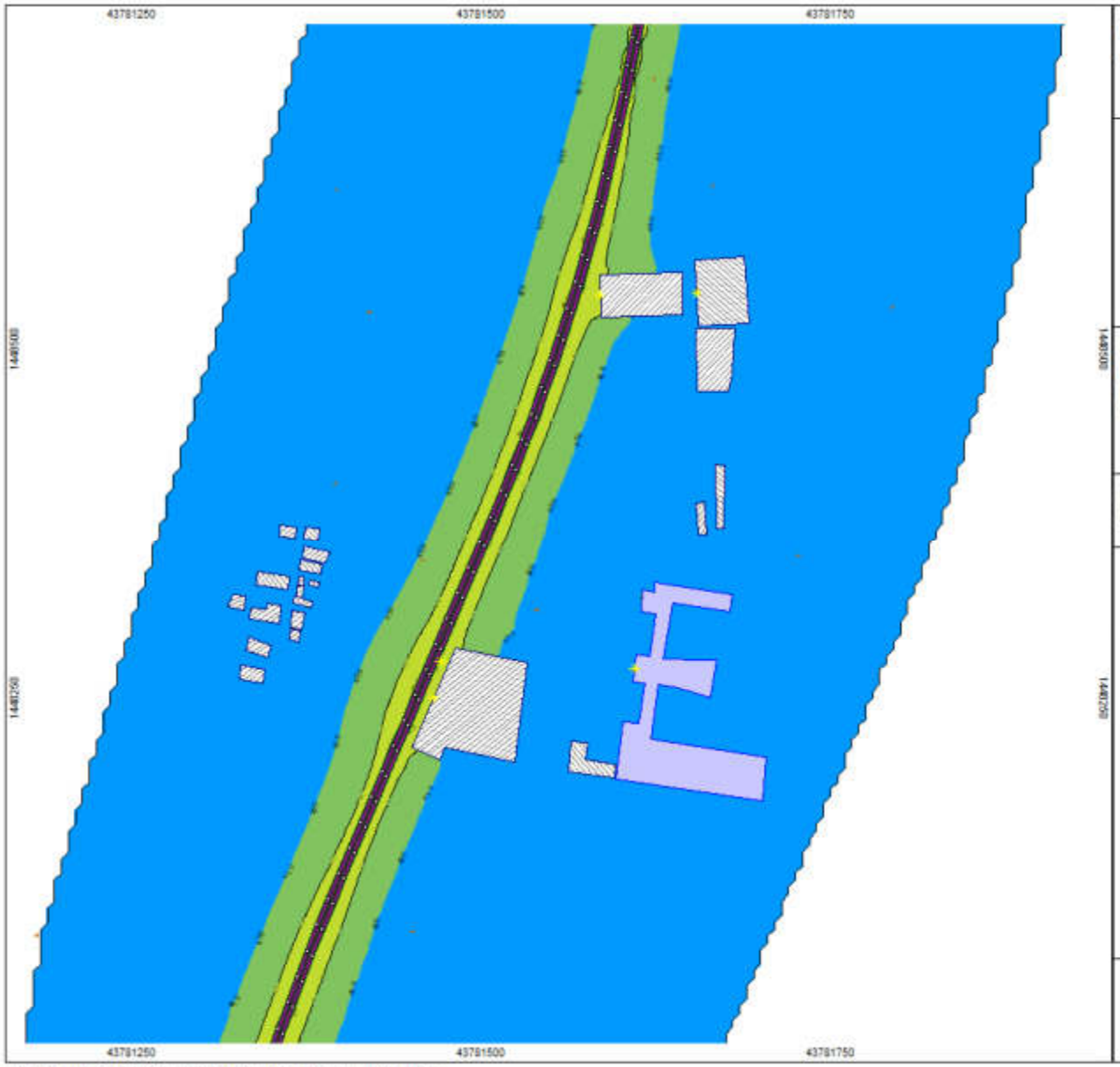

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Levels Leq,d
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Buildingfloor
- Noise calculation area

N

Length scale 1:2727

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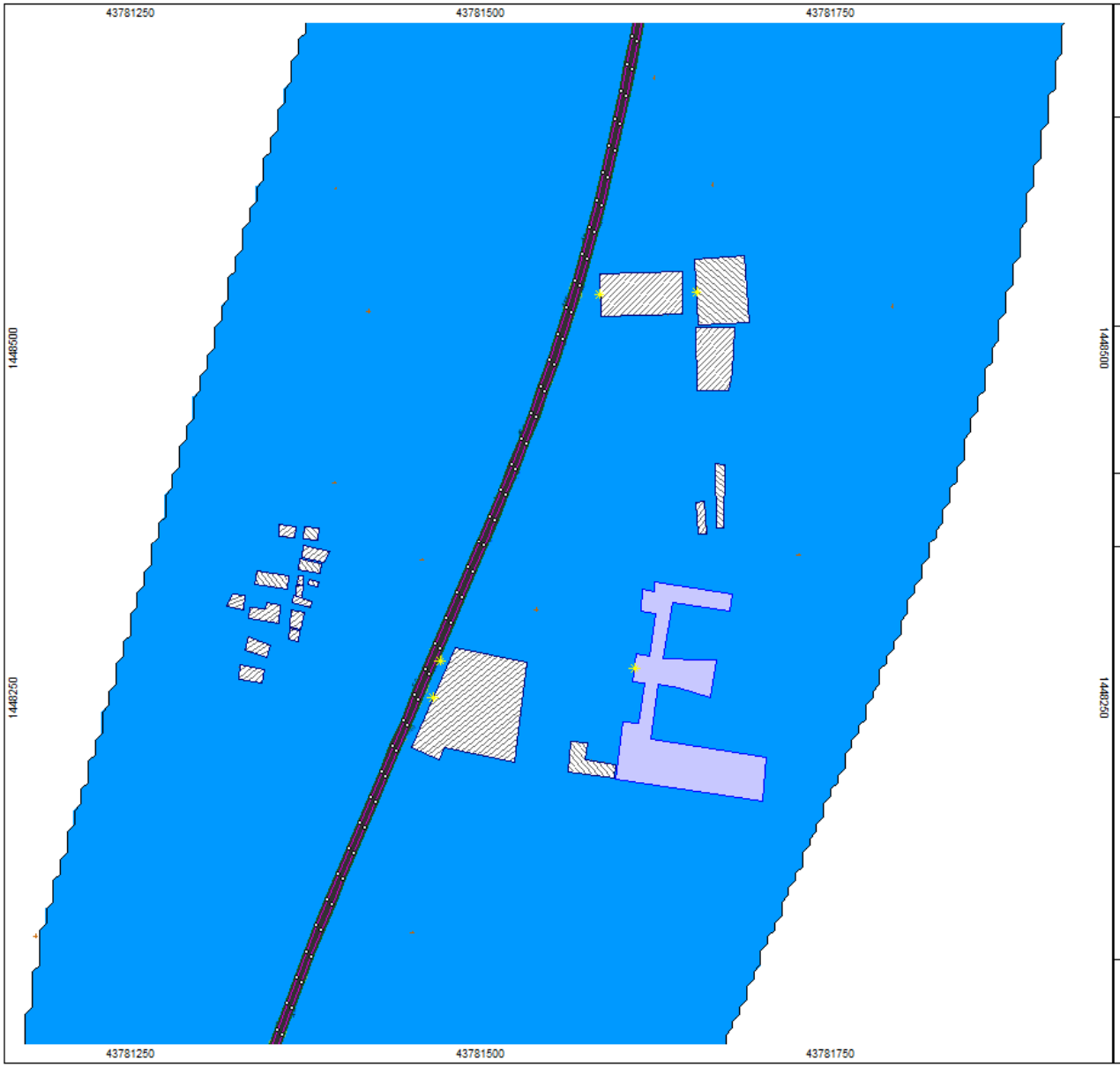

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	< 45
	45 - 50
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- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2727

0 25 50 100 150 200

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KR Puram to Kempegowda International Airport

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120 2031 2b with Parapet Wall
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Levels Leq,d
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	< 45
	45 - 50
	50 - 55
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Signs and symbols

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- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2727

0 25 50 100 150 200

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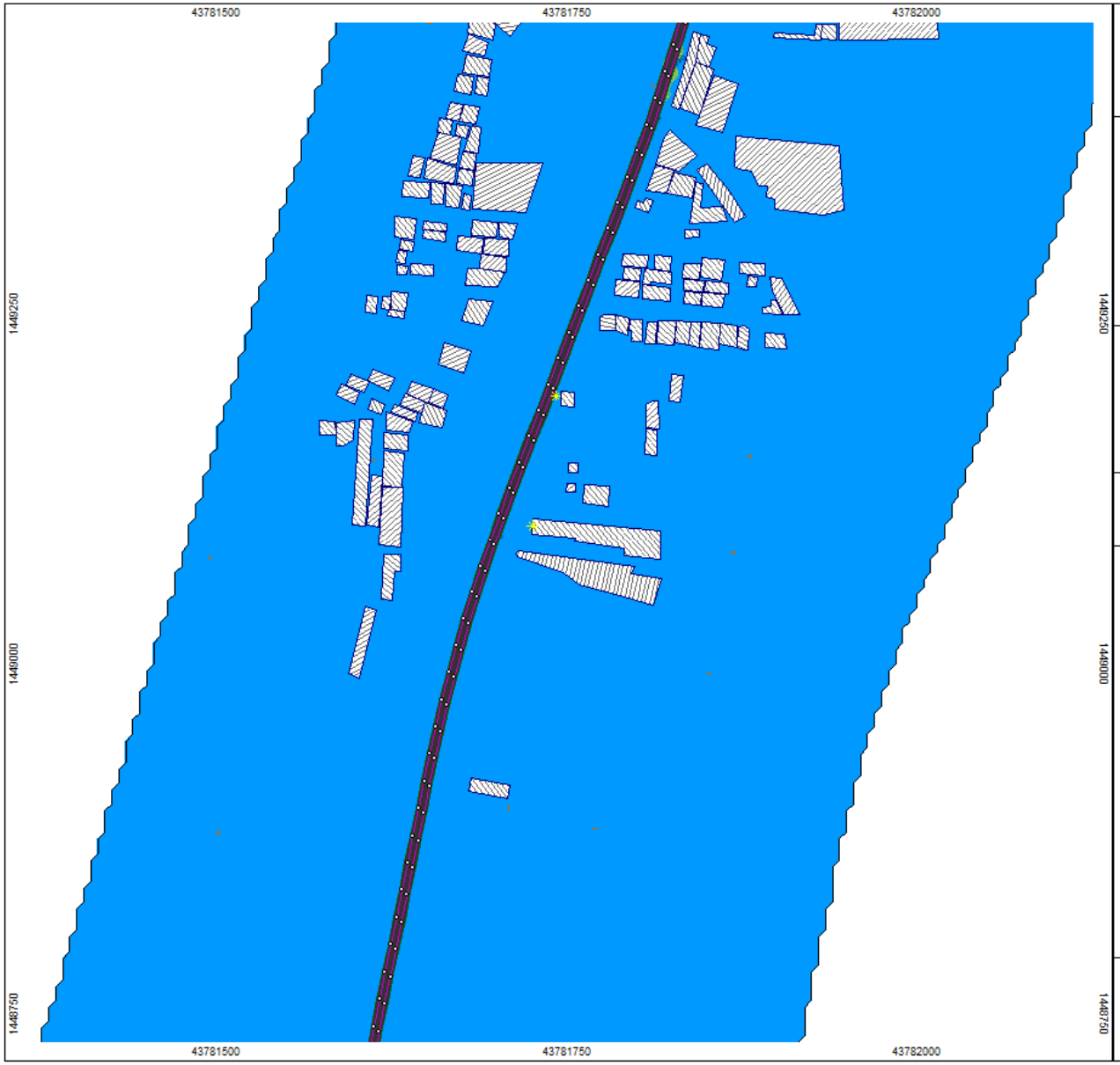

KR Puram to Kempegowda International Airport

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KR Puram to Kempegowda International Airport

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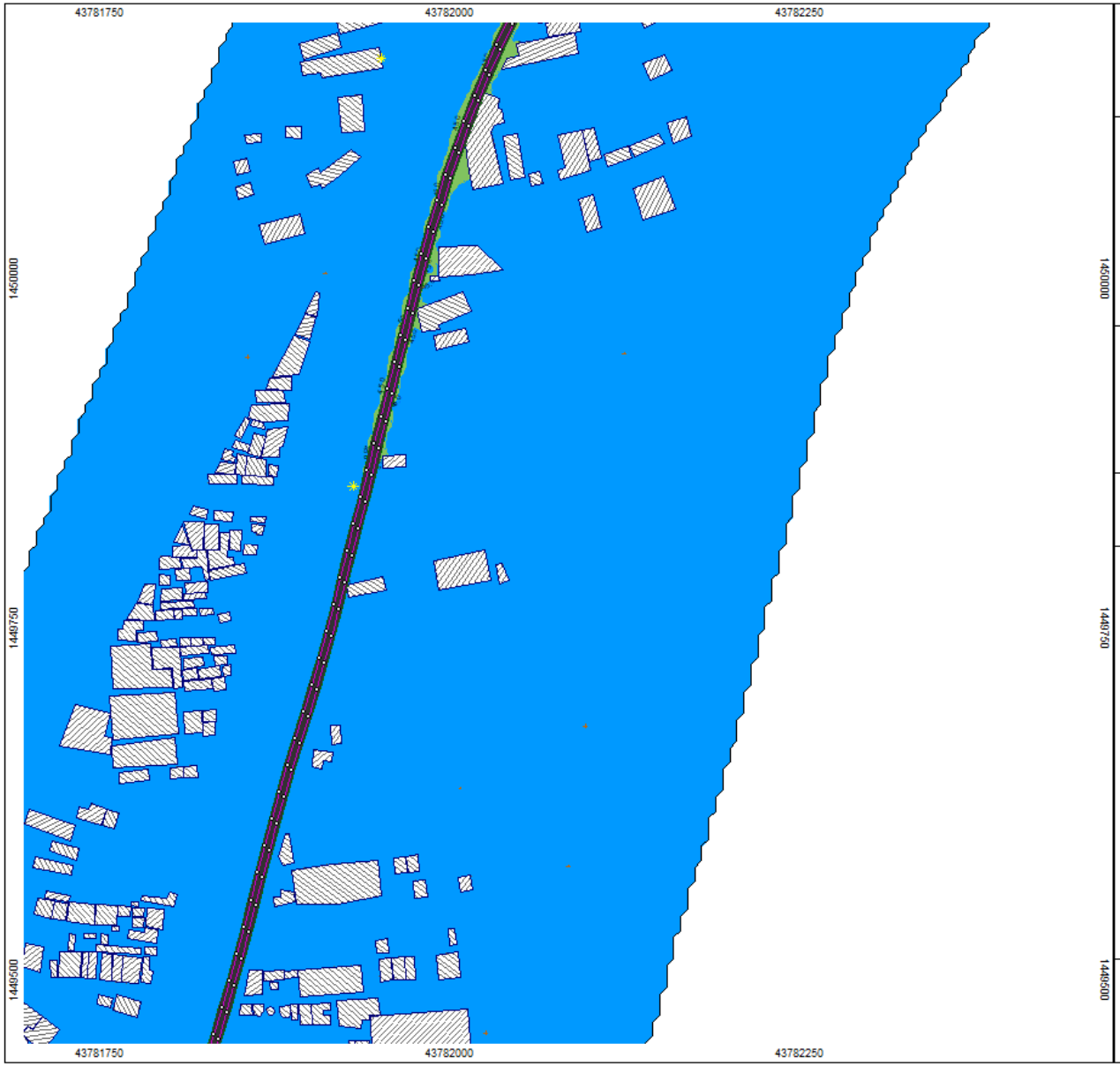

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N

Length scale 1:2727

0 25 50 100 150 200

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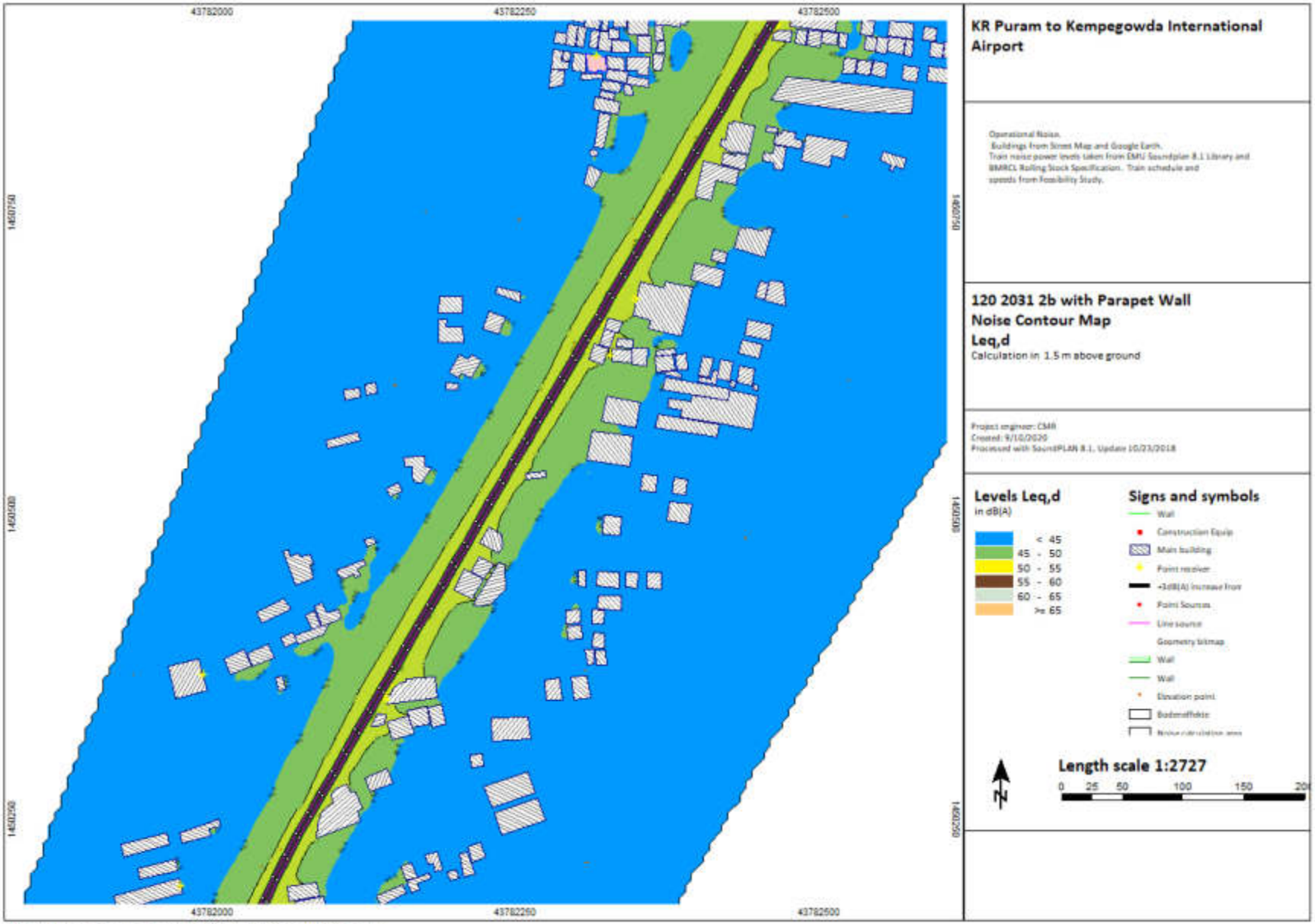

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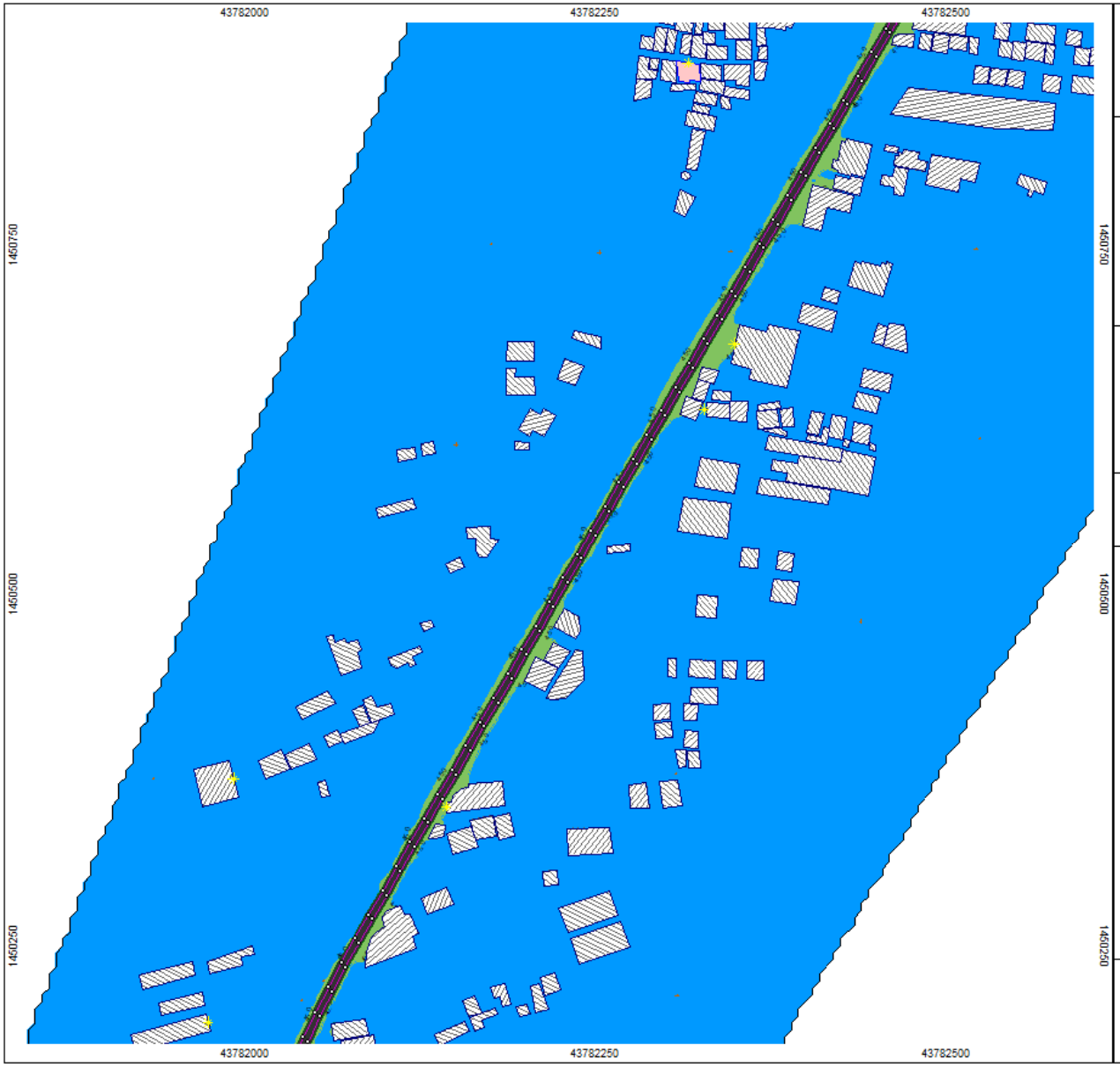

KR Puram to Kempegowda International Airport

Operational Noise.
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120 2031 2b with Parapet Wall
Noise Contour Map
Leq,n
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/10/2020
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Levels Leq,n
in dB(A)

< 45
45 - 50
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Signs and symbols

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- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2727

0 25 50 100 150 200

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KR Puram to Kempegowda International Airport

Operational Noise.
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120 2031 2b with Parapet Wall
Noise Contour Map
Leq,d
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/10/2020
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Levels Leq,d
in dB(A)

< 45
45 - 50
50 - 55
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Signs and symbols

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- Line source
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- Wall
- Wall
- Elevation point
- Bodeneffekte

N

Length scale 1:2727

0 25 50 100 150 200

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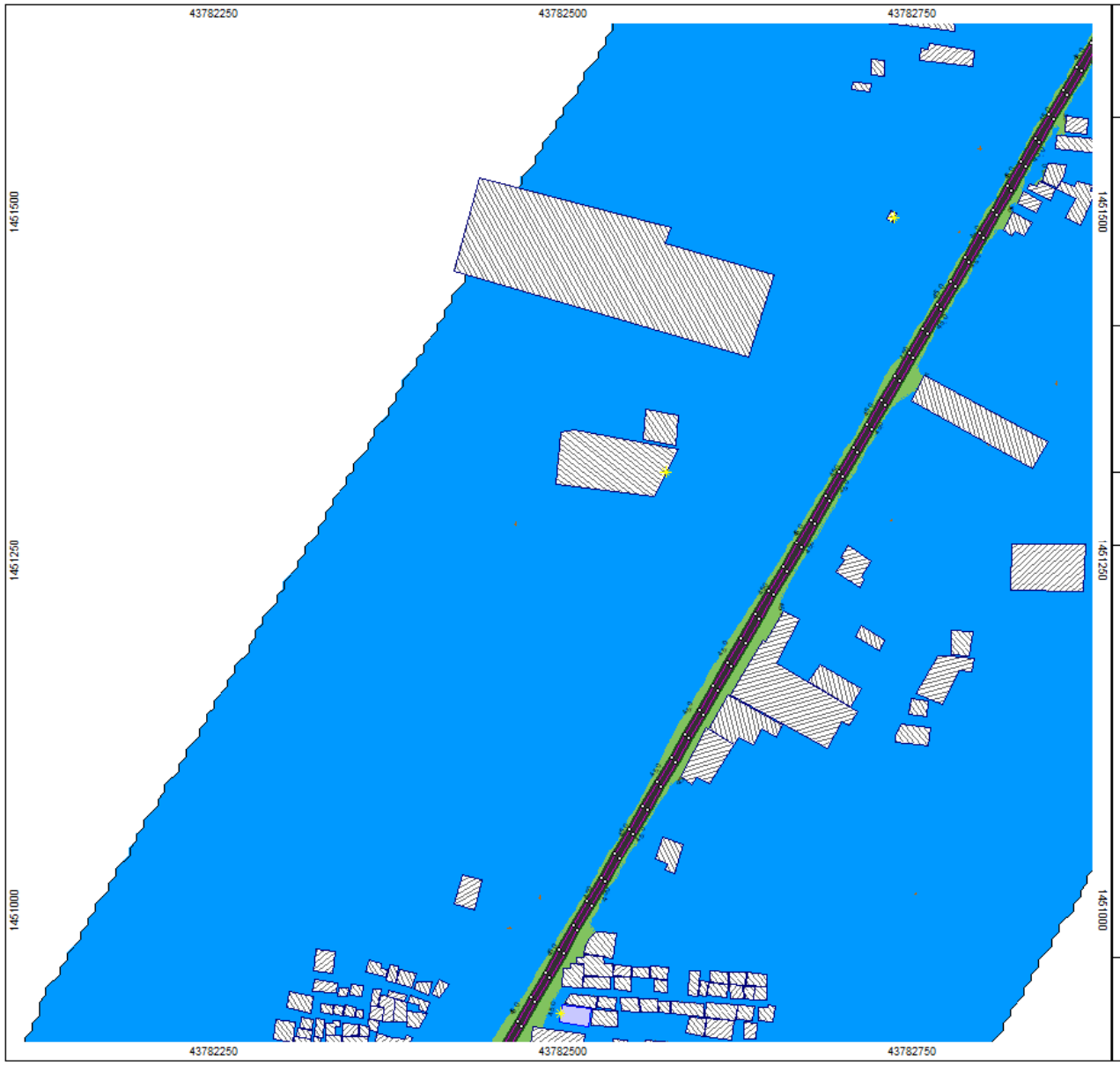

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- Noise calculation area

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Length scale 1:2727

0 25 50 100 150 200

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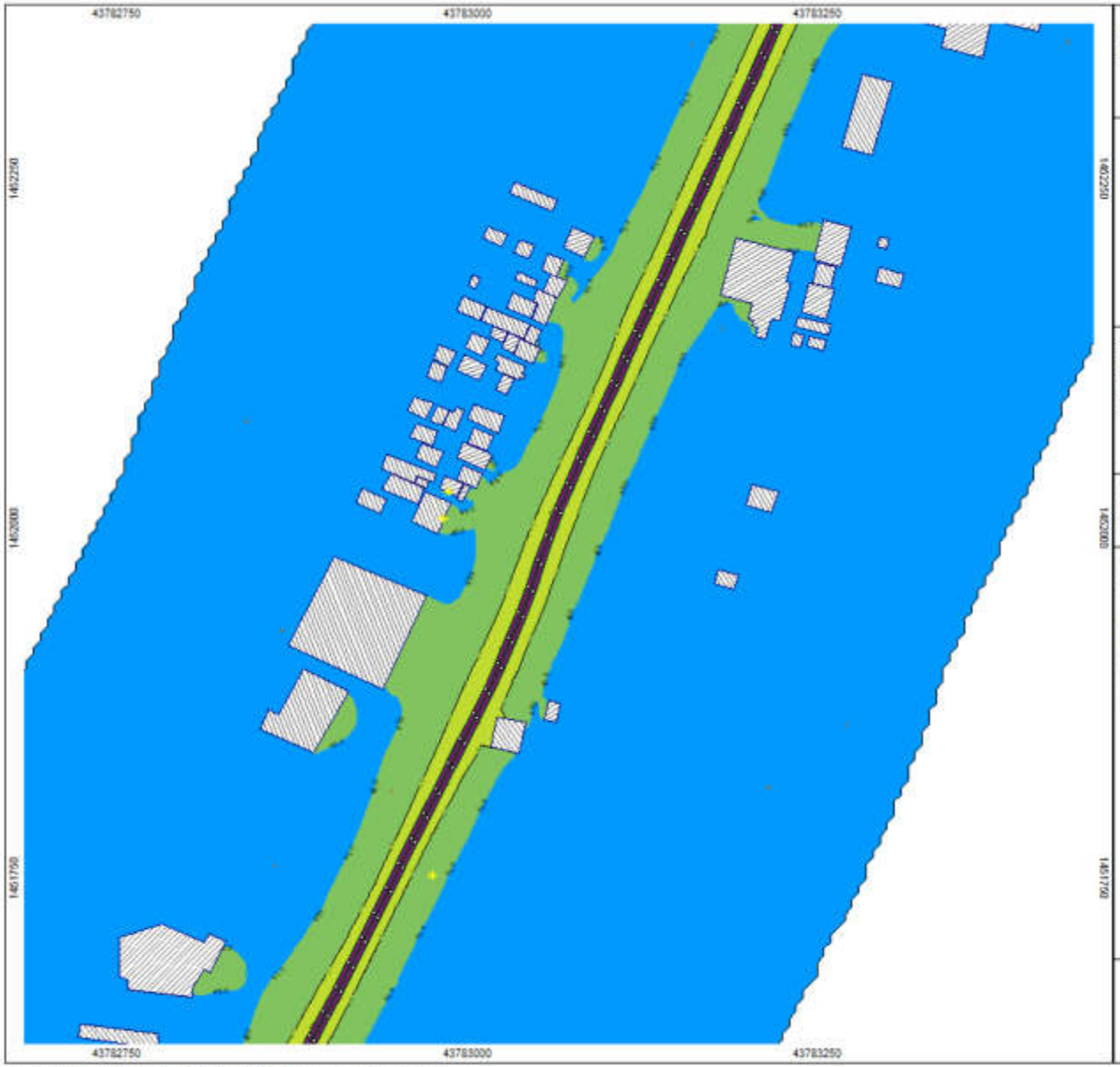

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Levels Leq,d
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	< 45
	45 - 50
	50 - 55
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Signs and symbols

- Wall
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- Wall
- Wall
- Elevation points
- Bodenreflekte

N

Length scale 1:2727

0 25 50 100 150 200

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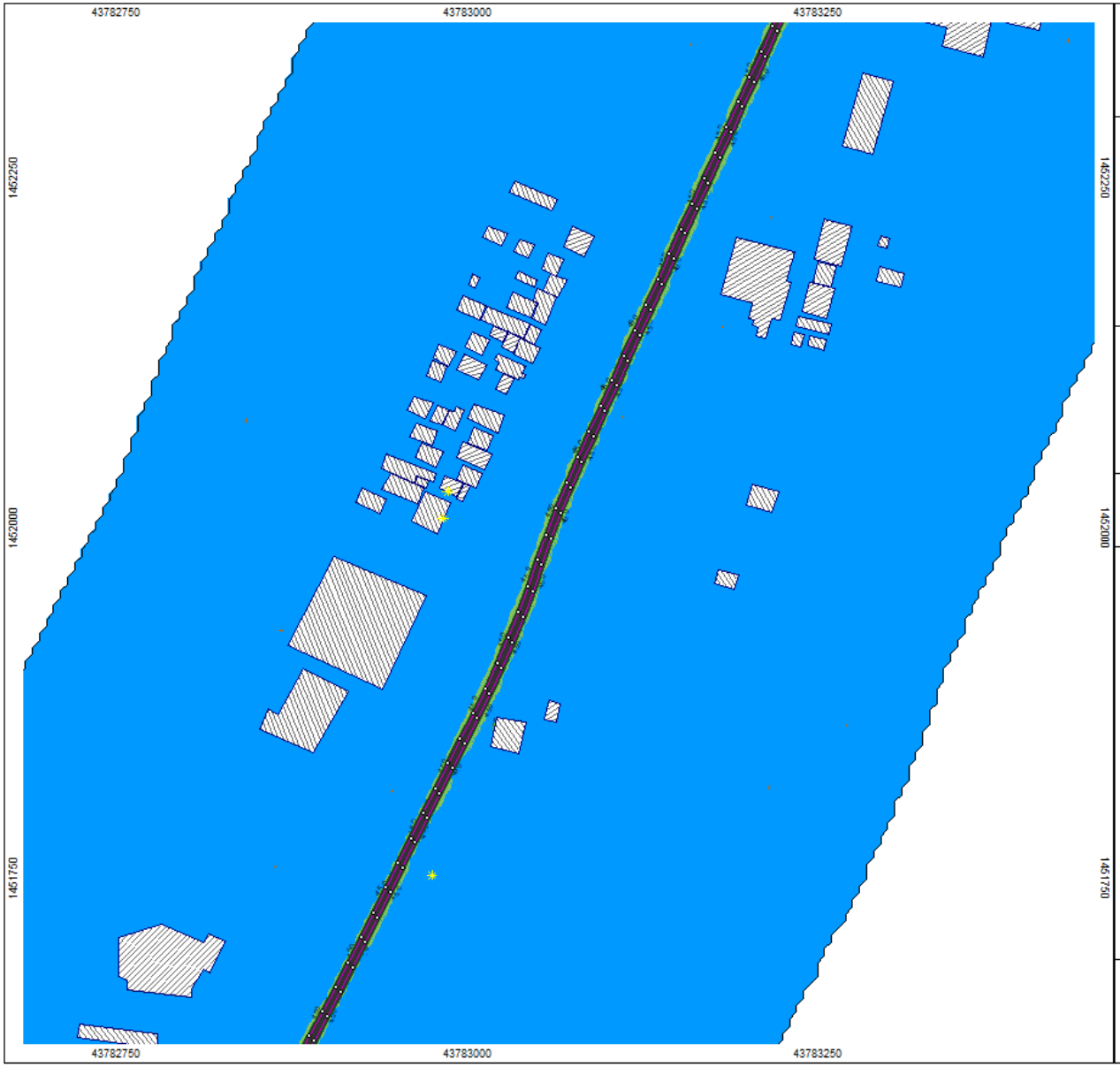

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- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

Length scale 1:2727

0 25 50 100 150 200

N

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KR Puram to Kempegowda International Airport

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Level
< 45
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Signs and symbols

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- Wall
- Wall
- Elevation point
- Bodenreflexe
- Noise calculation area

Length scale 1:2727

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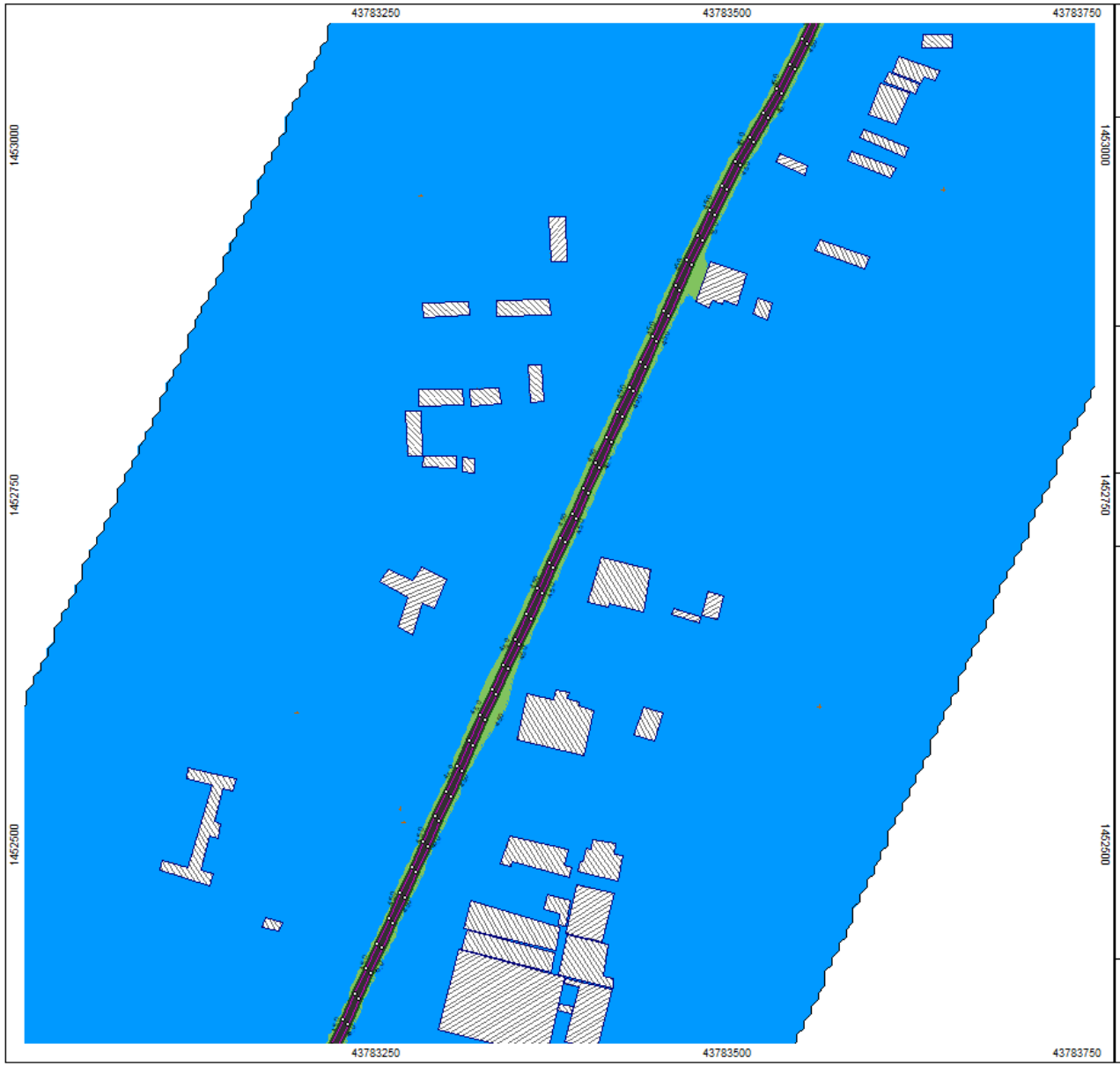

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Length scale 1:2727

0 25 50 100 150 200

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- Point Sources
- Line source
- Geometry bkmap
- Wall
- Wall
- Elevation point
- Bedeneffekte

N

Length scale 1:1008
0 5 10 20 30 40 m

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KR Puram to Kempegowda International Airport

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N

Length scale 1:1008
0 5 10 20 30 40 m

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KR Puram to Kempegowda International Airport

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Created: 9/10/2020
Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,d
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekt
- Noise calculation area

Length scale 1:2109

0 20 40 80 120

N

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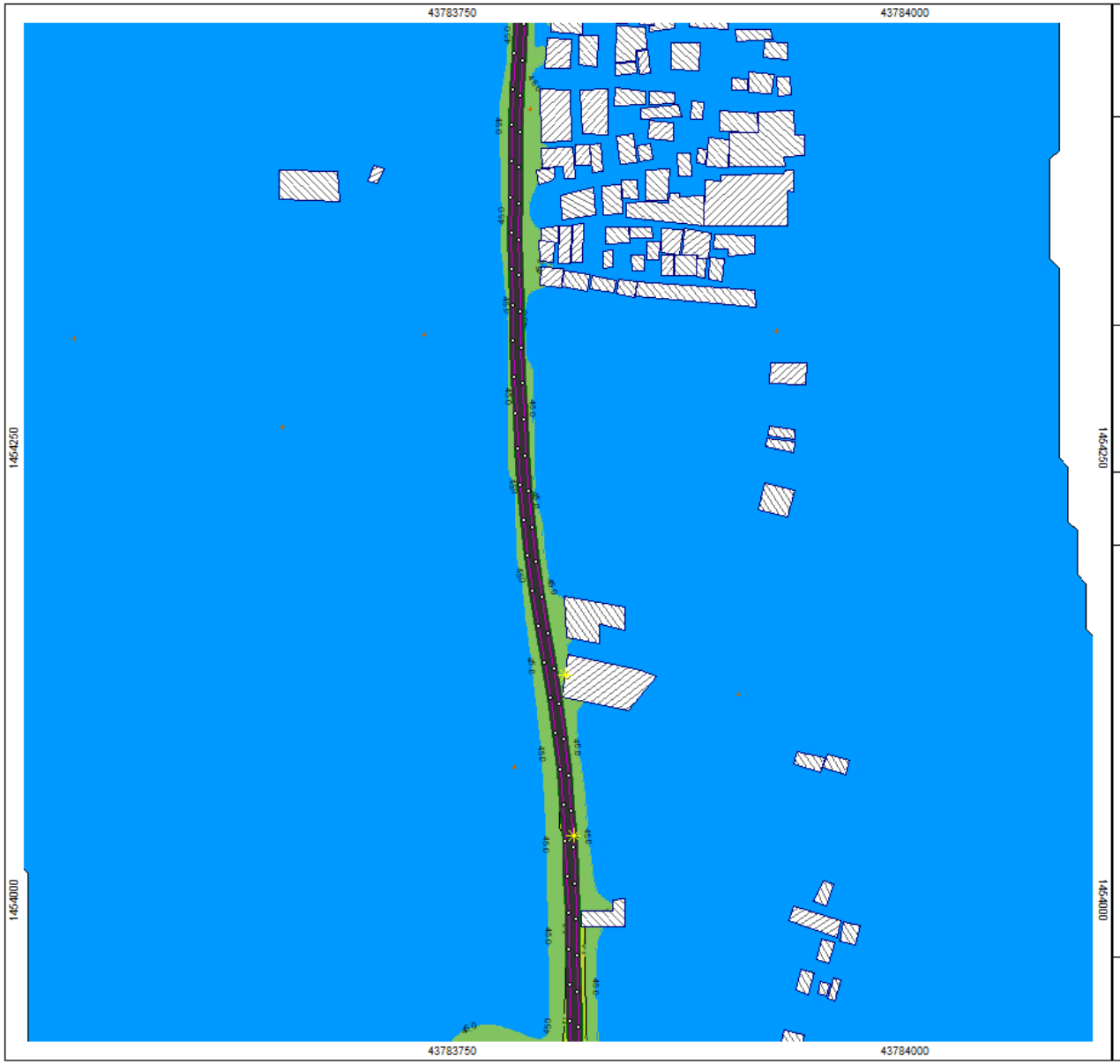

KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
Train noise power levels taken from EMU Soundplan 8.1 Library and BMRCL Rolling Stock Specification. Train schedule and speeds from Feasibility Study.

120 2031 2b with Parapet Wall
Noise Contour Map
Leq,n
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/10/2020
Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,n
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

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Length scale 1:2109
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120 2031 2b with Parapet Wall
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Project engineer: CMR
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Levels Leq,d
in dB(A)

Levels
< 45
45 - 50
50 - 55
55 - 60
60 - 65
>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase front
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
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Length scale 1:2109

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Signs and symbols

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- Noise calculation area

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Length scale 1:2109

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Length scale 1:2109

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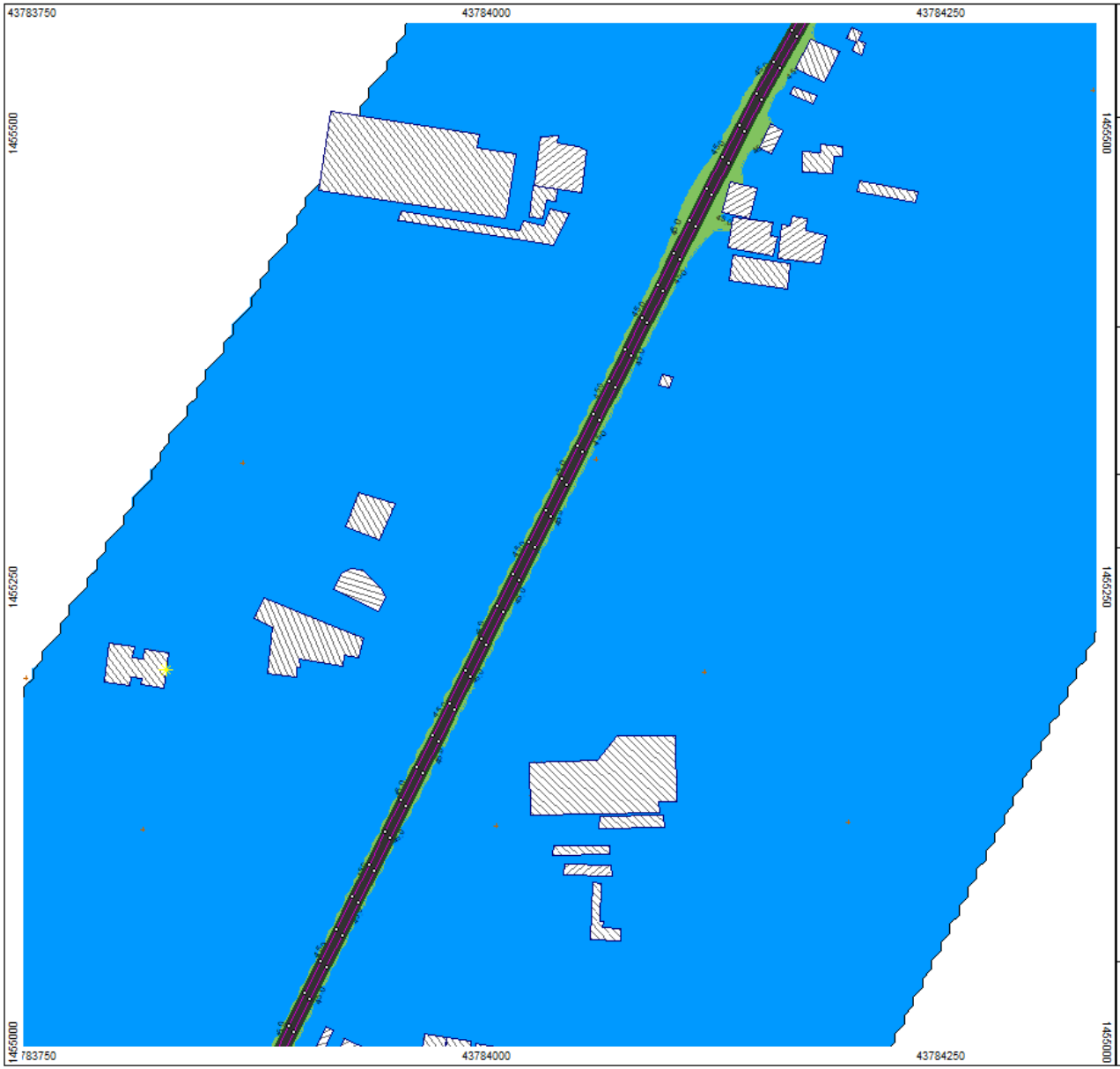

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Levels Leq,d
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Signs and symbols

- Wall
- Construction Equip
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- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodenoffsite

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Length scale 1:2109
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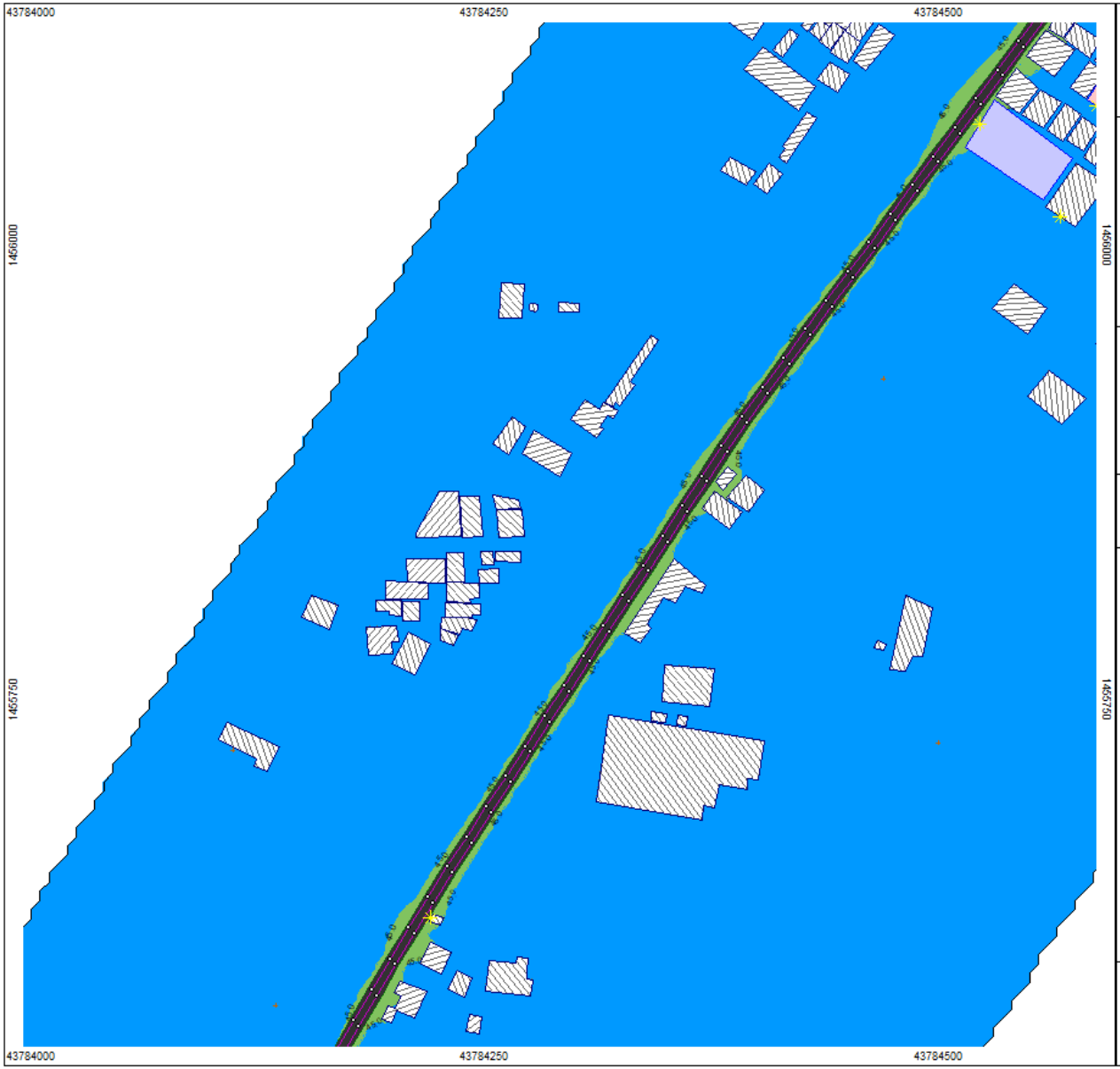

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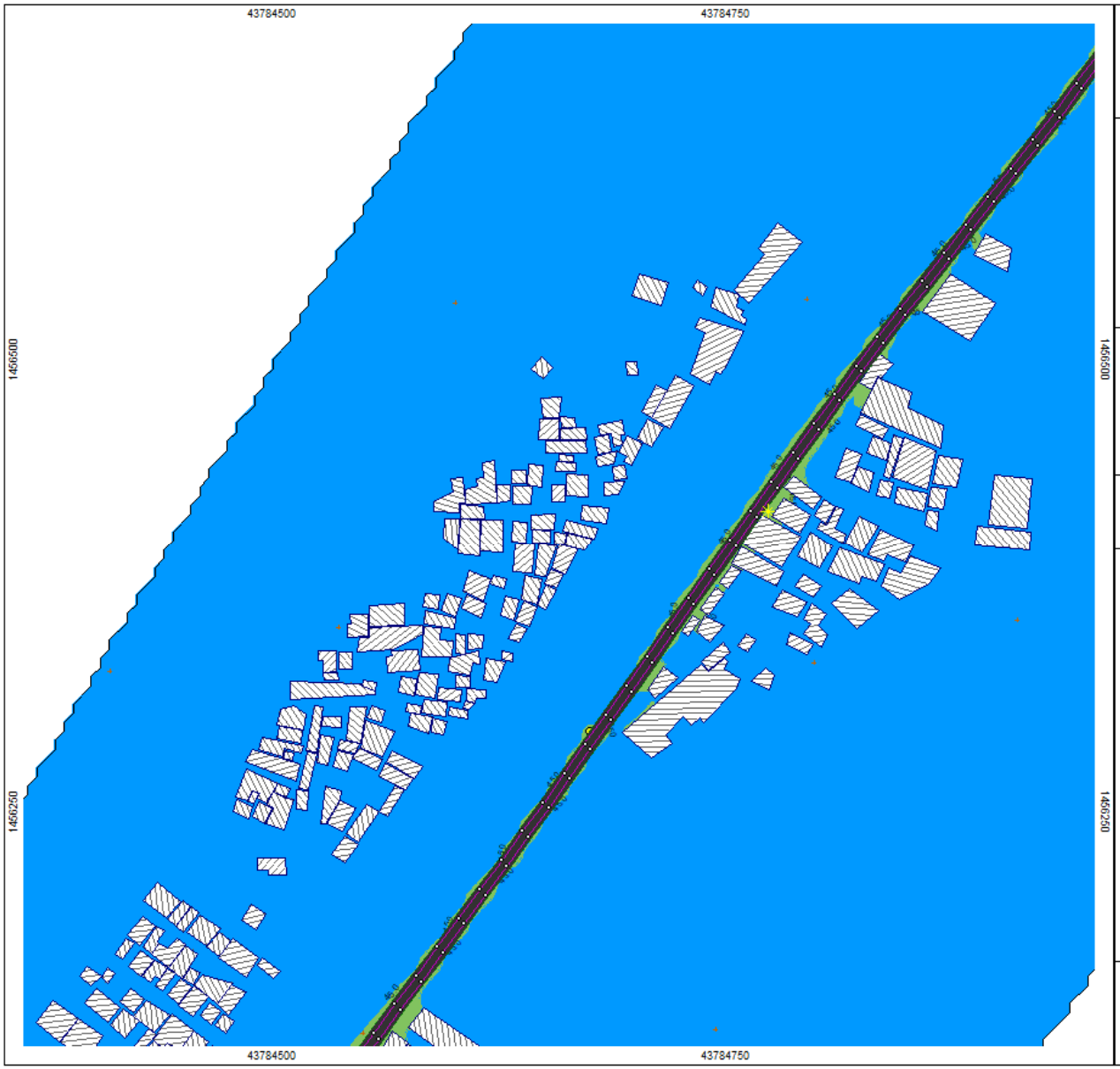

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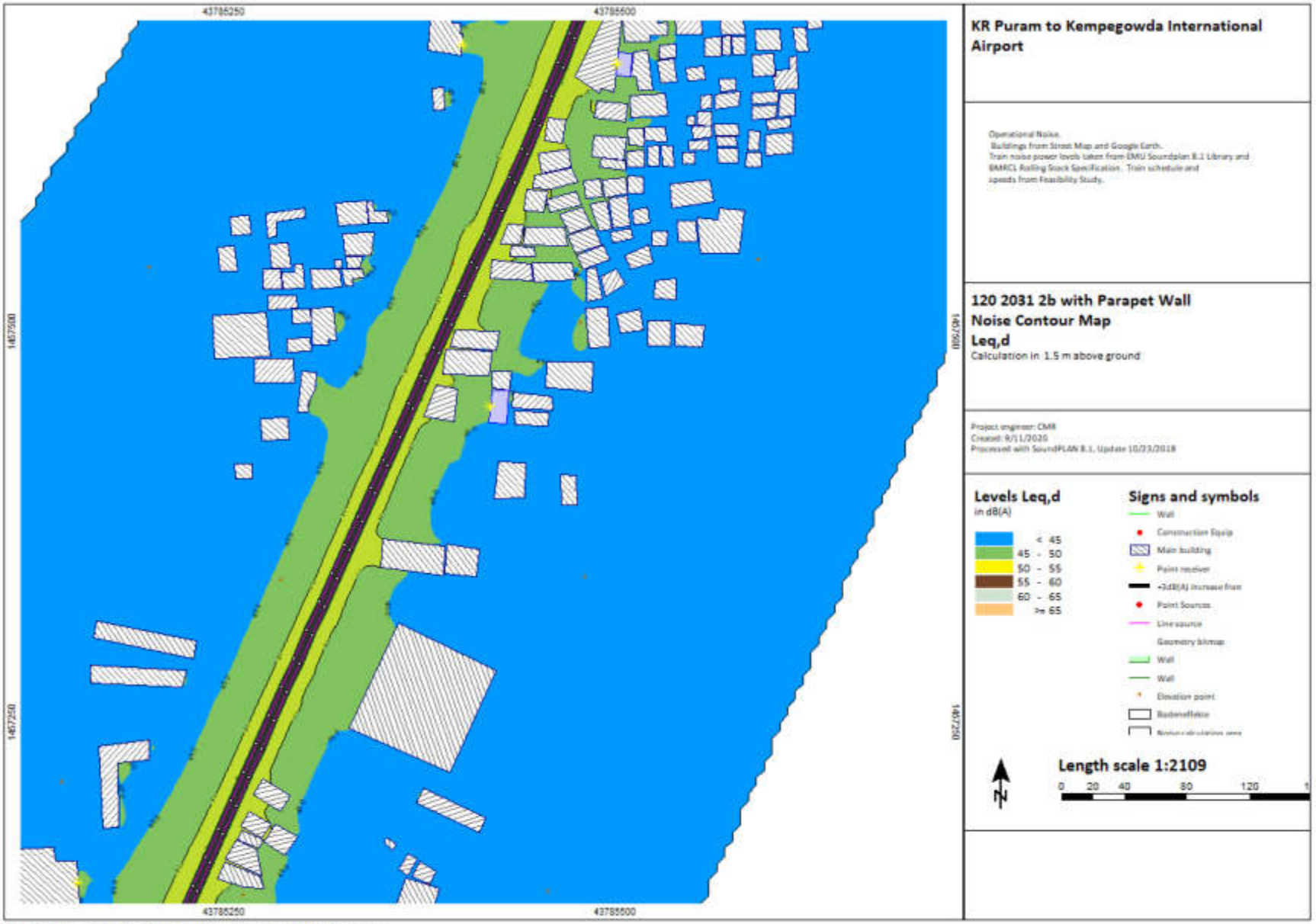

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Length scale 1:2109

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KR Puram to Kempegowda International Airport

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120 2031 2b with Parapet Wall
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Signs and symbols
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- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

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Length scale 1:2109

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KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
Train noise power levels taken from DMU Soundplan 8.1 Library and BMRCL Rolling Stock Specification. Train schedule and speeds from Feasibility Study.

120 2031 2b with Parapet Wall
Noise Contour Map
Leq,d
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/11/2020
Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,d
in dB(A)

< 45
45 - 50
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Signs and symbols

- Wall
- Construction Equip
- Main building
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- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte

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Length scale 1:2109

0 20 40 80 120

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KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
Train noise power levels taken from EMU Soundplan 8.1 Library and BMRCL Rolling Stock Specification. Train schedule and speeds from Feasibility Study.

120 2031 2b with Parapet Wall
Noise Contour Map
Leq,n
Calculation in 1.5 m above ground

Project engineer: CMR
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Levels Leq,n
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
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	>= 65

Signs and symbols
- Wall
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- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2109

0 20 40 80 120

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KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
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Levels Leq,d
in dB(A)

< 45
45 - 50
50 - 55
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Signs and symbols

- Wall
- Construction Equip
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Length scale 1:2109

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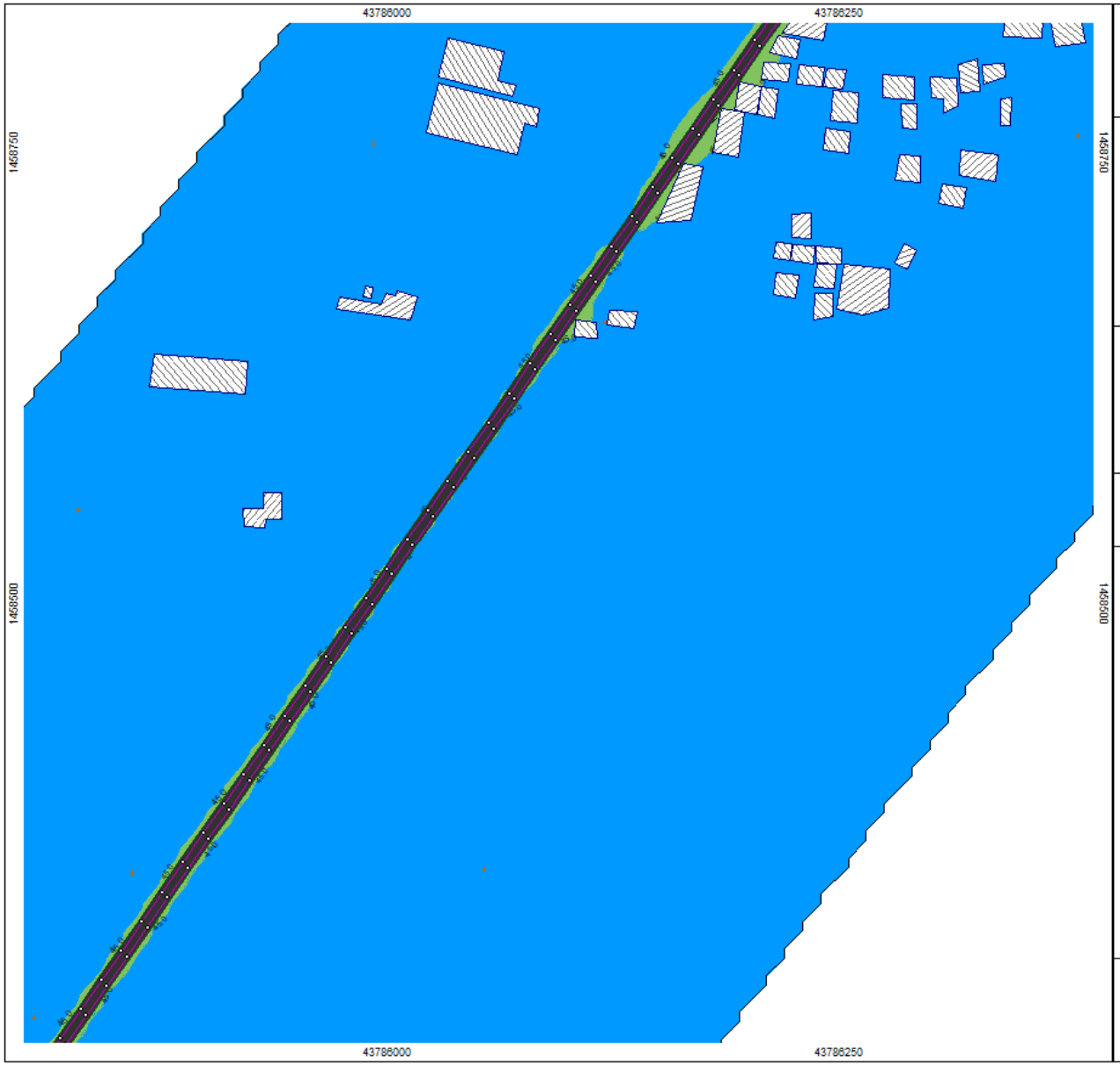

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Length scale 1:2109

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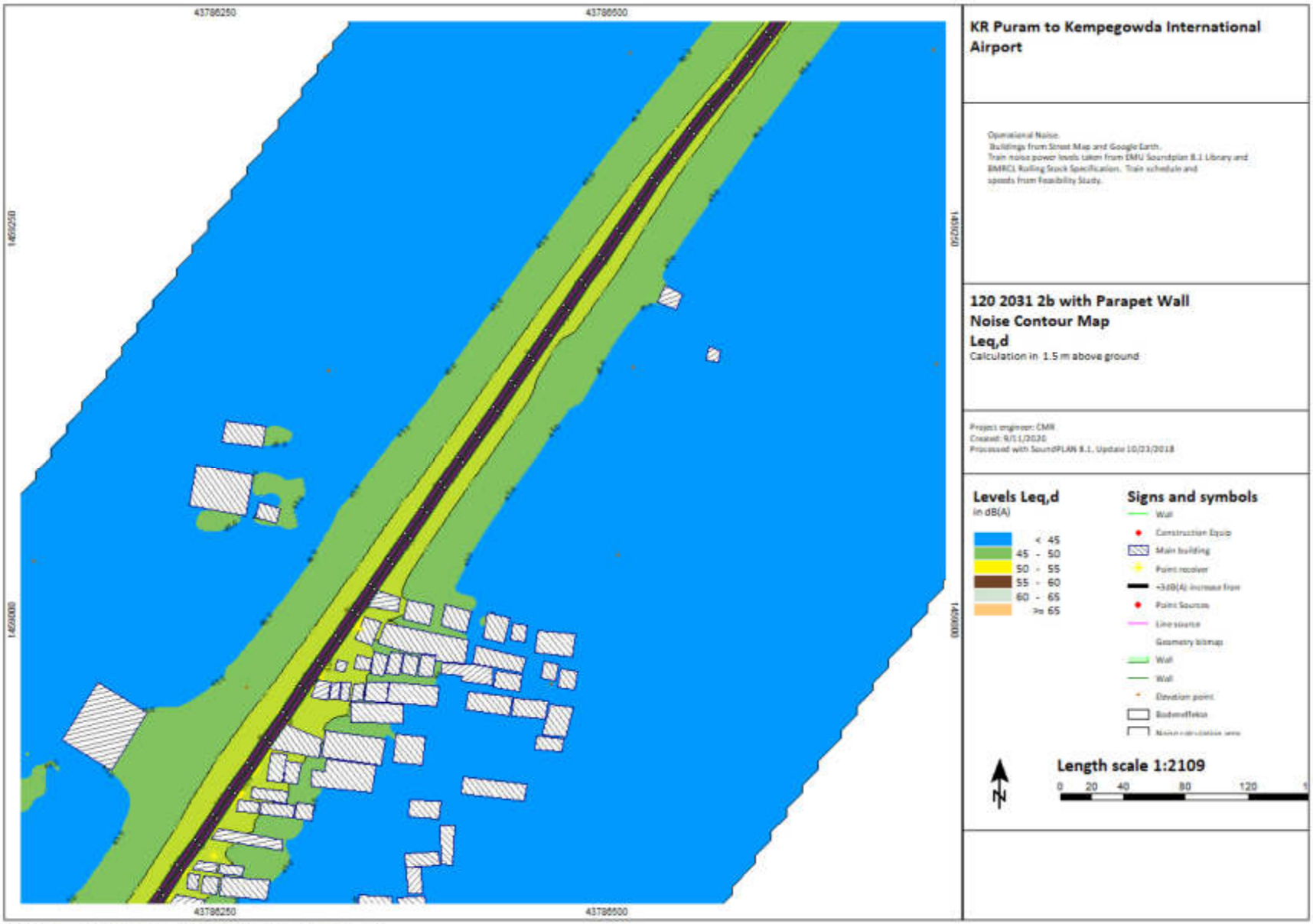

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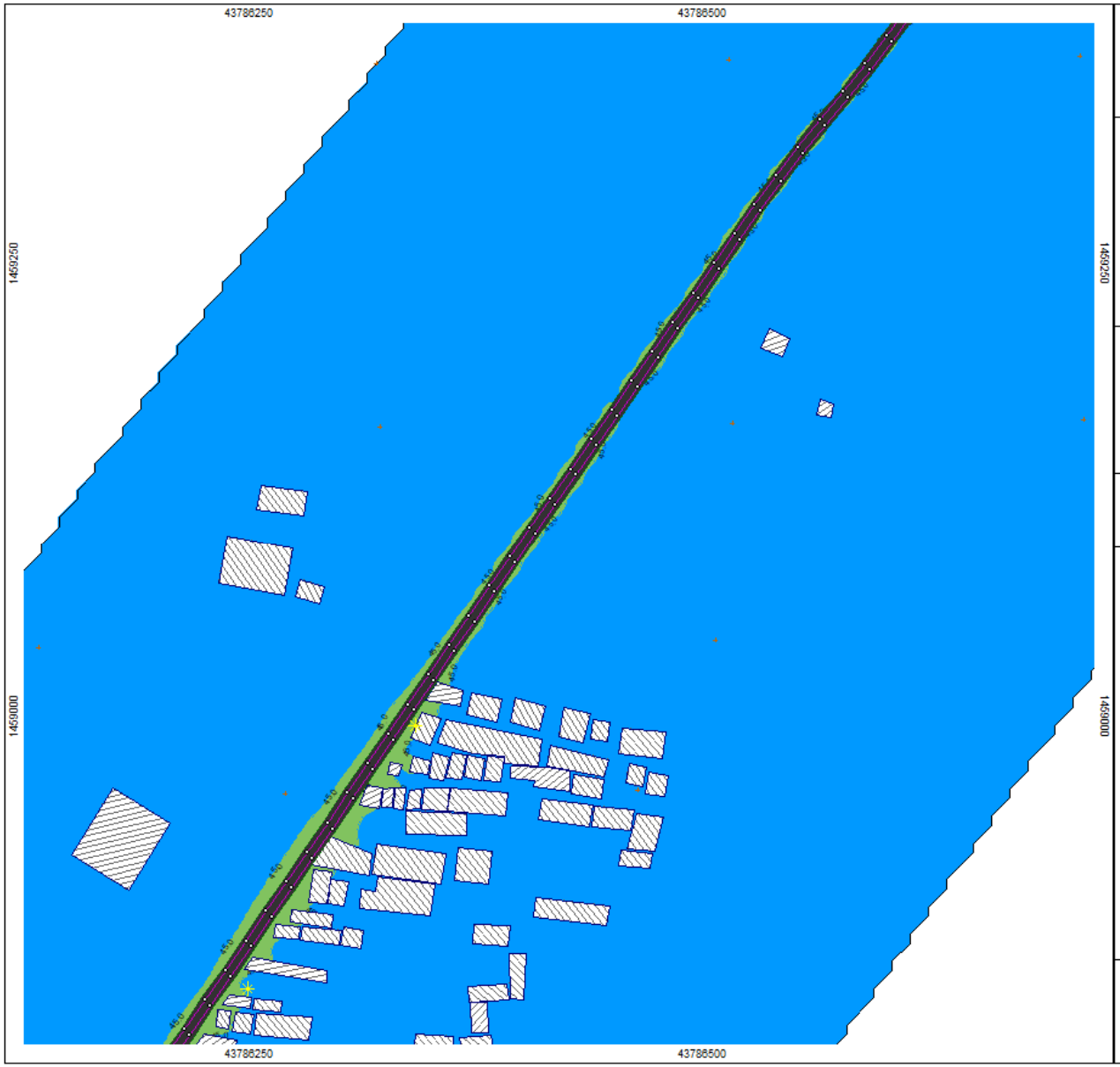

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Length scale 1:2109

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Length scale 1:2109

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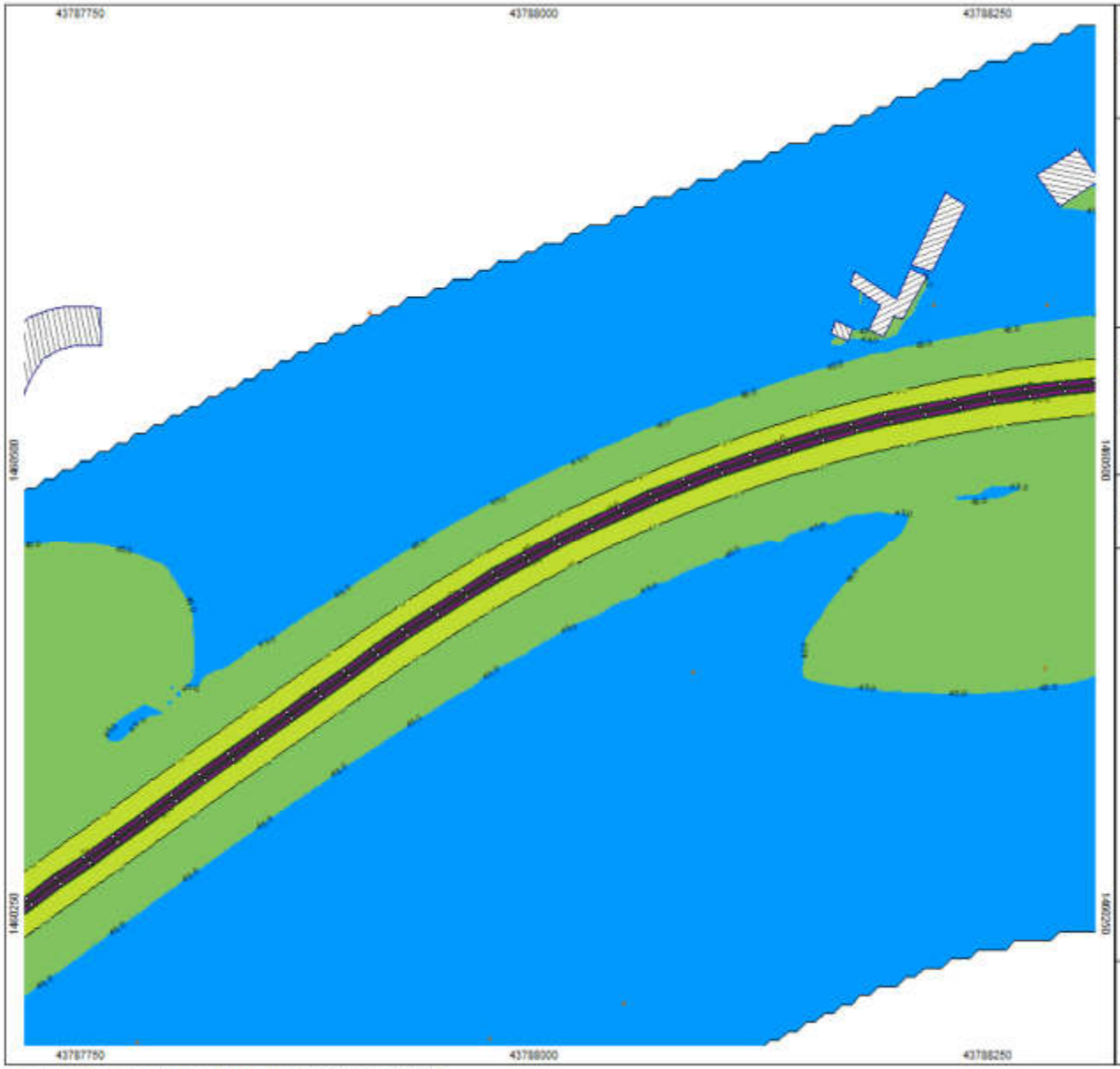

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	>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- <1dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodenaffekte

N

Length scale 1:2109

0 20 40 80 120

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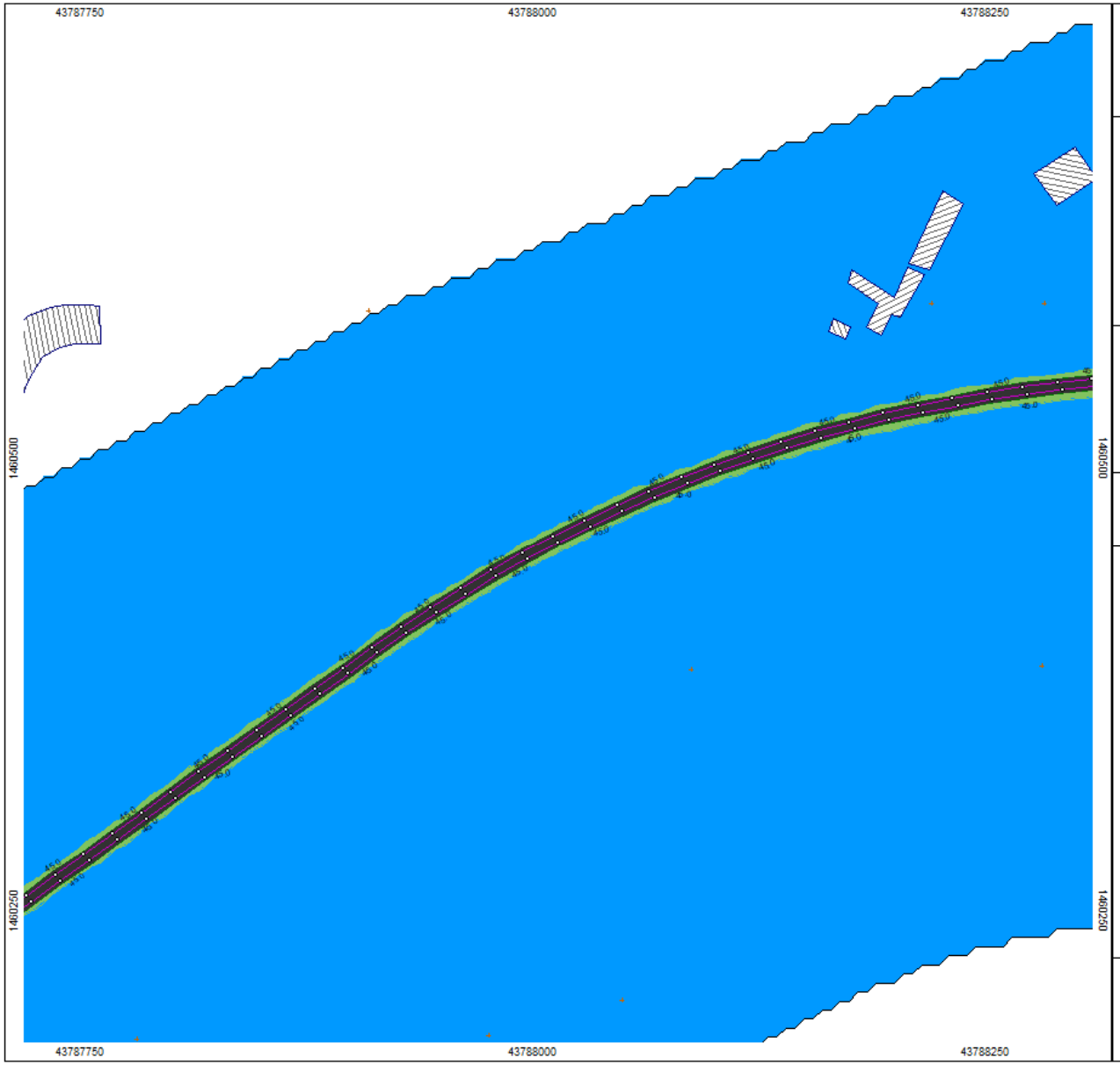

KR Puram to Kempegowda International Airport

Operational Noise.
Buildings from Street Map and Google Earth.
Train noise power levels taken from EMU Soundplan 8.1 Library and BMRCL Rolling Stock Specification. Train schedule and speeds from Feasibility Study.

120 2031 2b with Parapet Wall
Noise Contour Map
Leq,n
Calculation in 1.5 m above ground

Project engineer: CMR
Created: 9/11/2020
Processed with SoundPLAN 8.1, Update 10/23/2018

Levels Leq,n
in dB(A)

	< 45
	45 - 50
	50 - 55
	55 - 60
	60 - 65
	>= 65

Signs and symbols

- Wall
- Construction Equip
- Main building
- Point receiver
- +3dB(A) increase from
- Point Sources
- Line source
- Geometry bitmap
- Wall
- Wall
- Elevation point
- Bodeneffekte
- Noise calculation area

N

Length scale 1:2109

0 20 40 80 120

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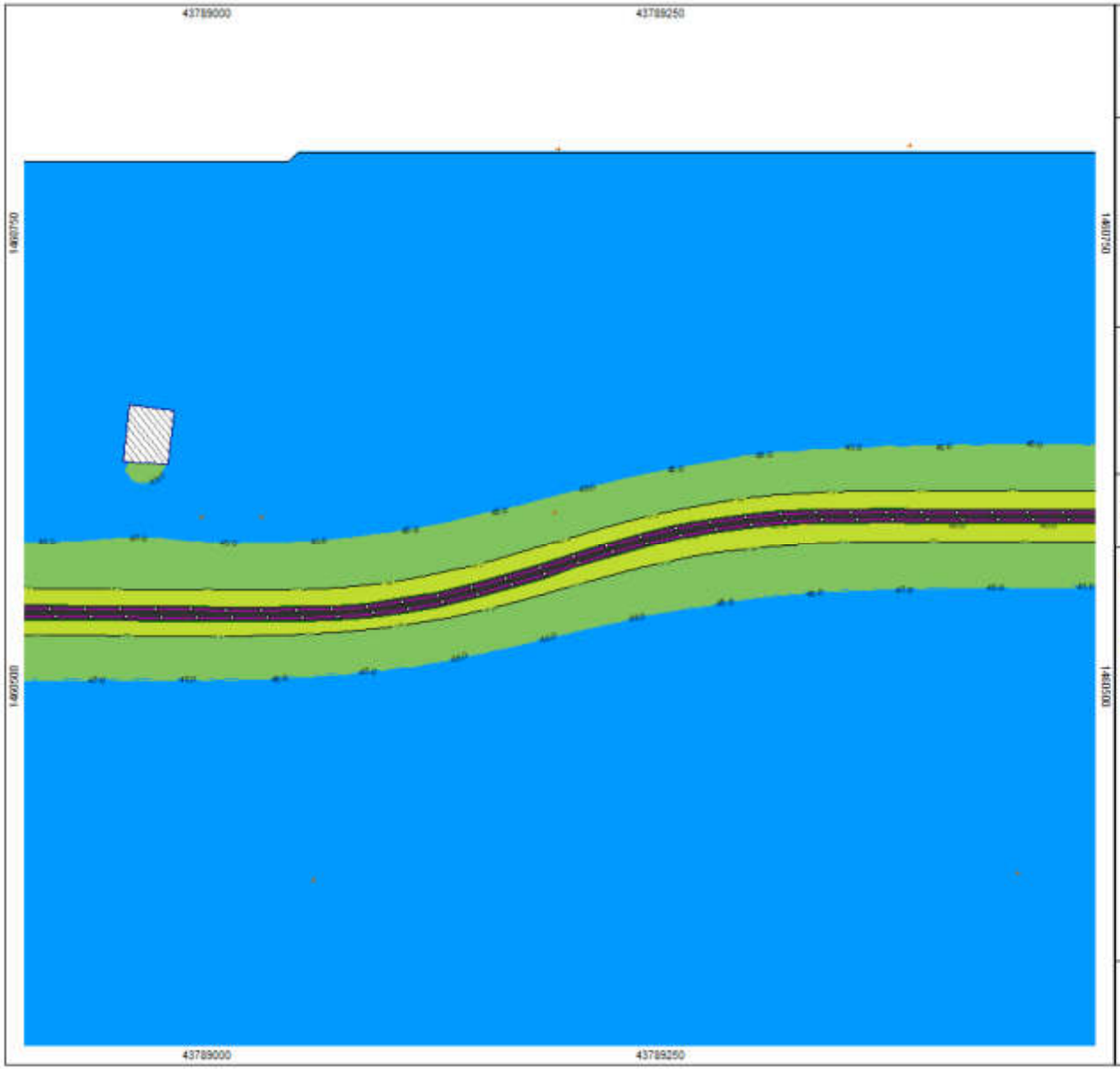

KR Puram to Kempegowda International Airport

Operational Notes:
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Length scale 1:2109

0 20 40 80 120

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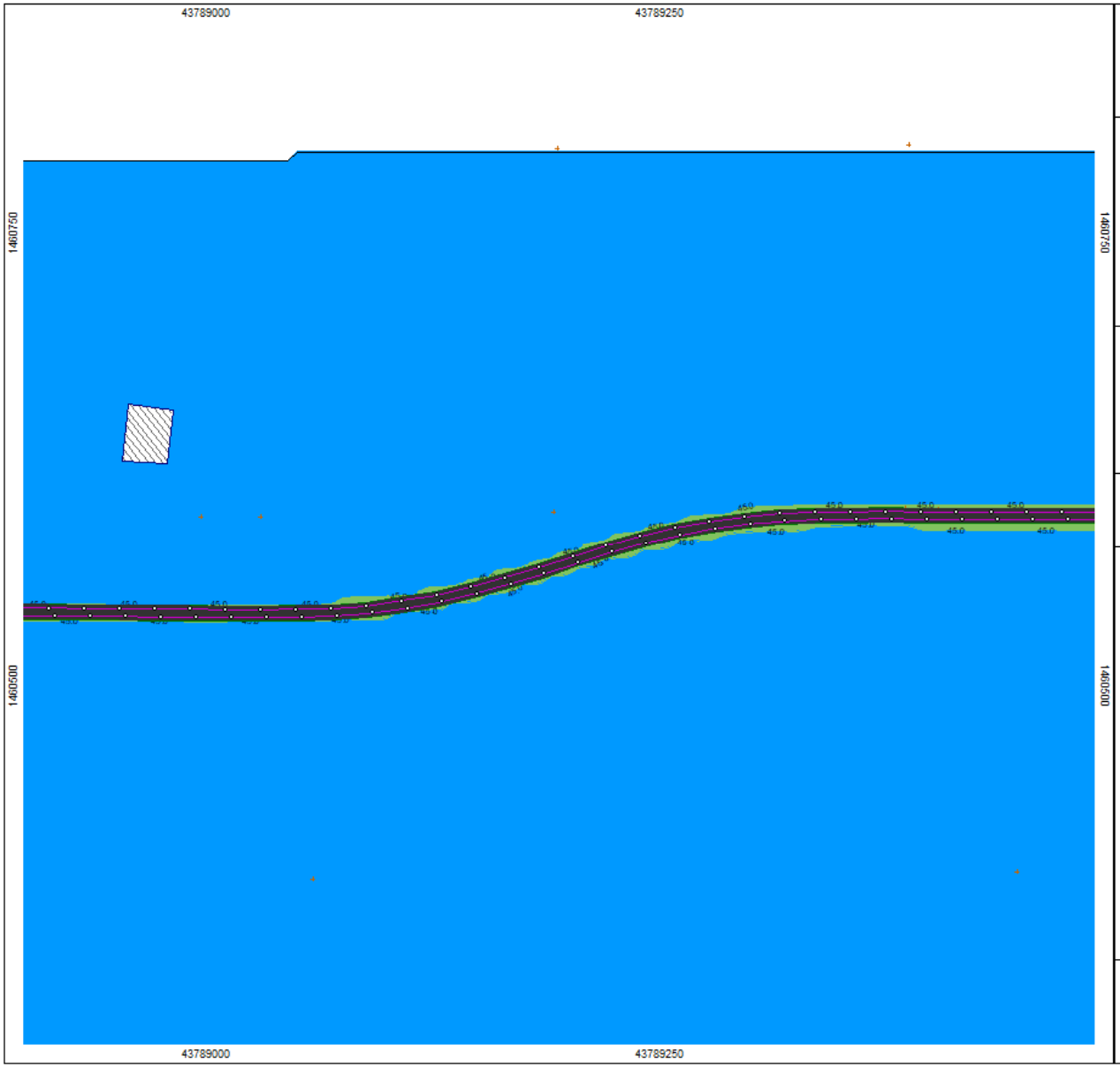

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Length scale 1:2109

0 20 40 80 120 1

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