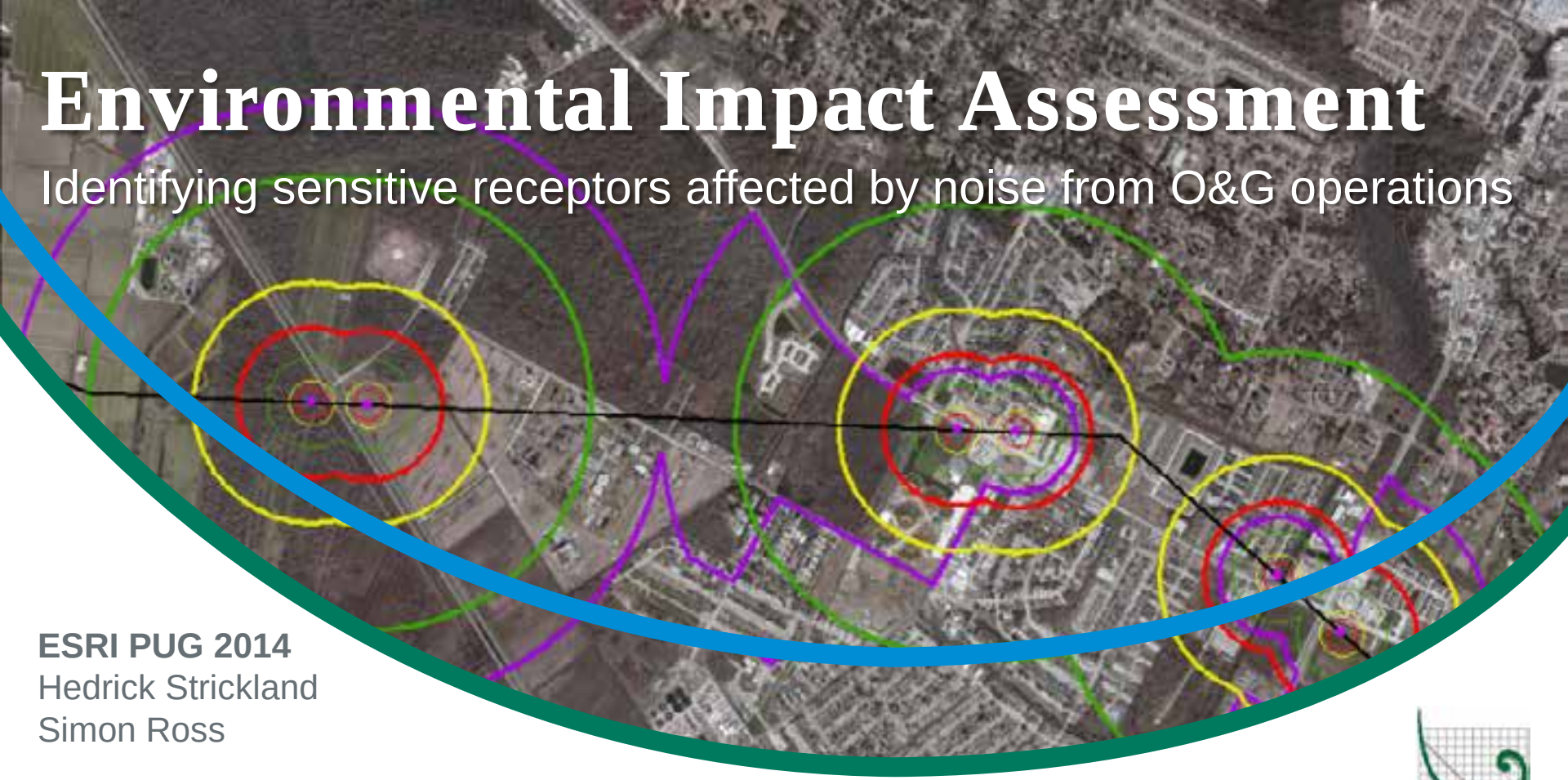
Environmental Impact Assessment

Identifying sensitive receptors affected by noise from O&G operations



ESRI PUG 2014
Hedrick Strickland
Simon Ross

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Contents

Overview: Defining Noise Impacts

- Determination of impact dependent on source, pathway and receptor
- Wide range of specialist noise modeling tools available
- Basic relationships between distance from source and noise level are simpler to determine
- GIS integration enables rapid overlay and analysis of environmental and social receptors

Overview: Key Considerations

Noise levels that are acceptable during the day may be unacceptable at night

On the average, each increase of 10 DbA = an approximate doubling of subjective loudness

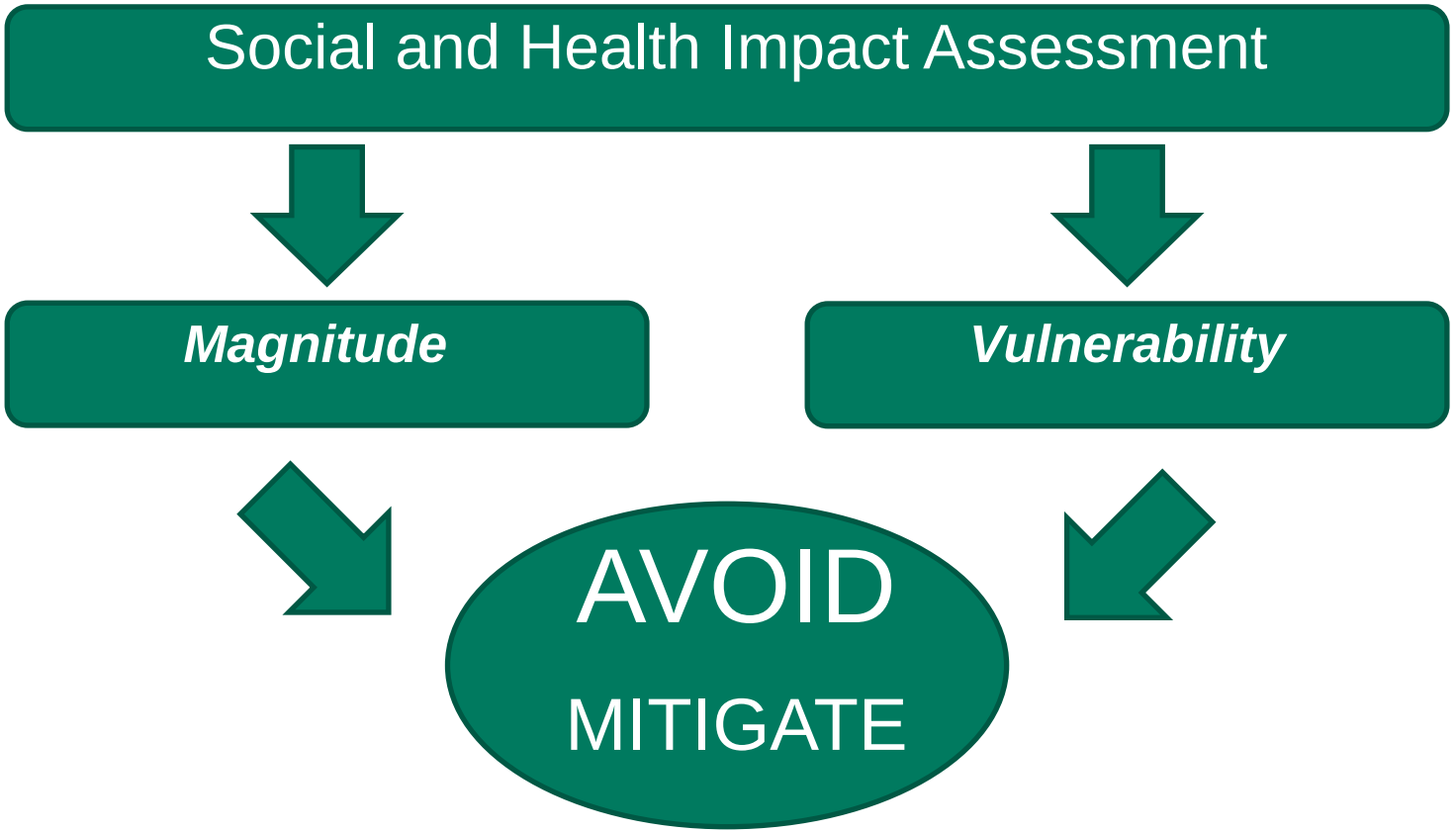
Therefore it is important to understand:

- Absolute noise levels,
- Change in noise levels,
- Timing of HDD activities, and
- Variations in county, city, or neighborhood noise ordinances

Case Study 1: Pipeline Planning

Noise Impact Assessment of Horizontal Directional Drilling

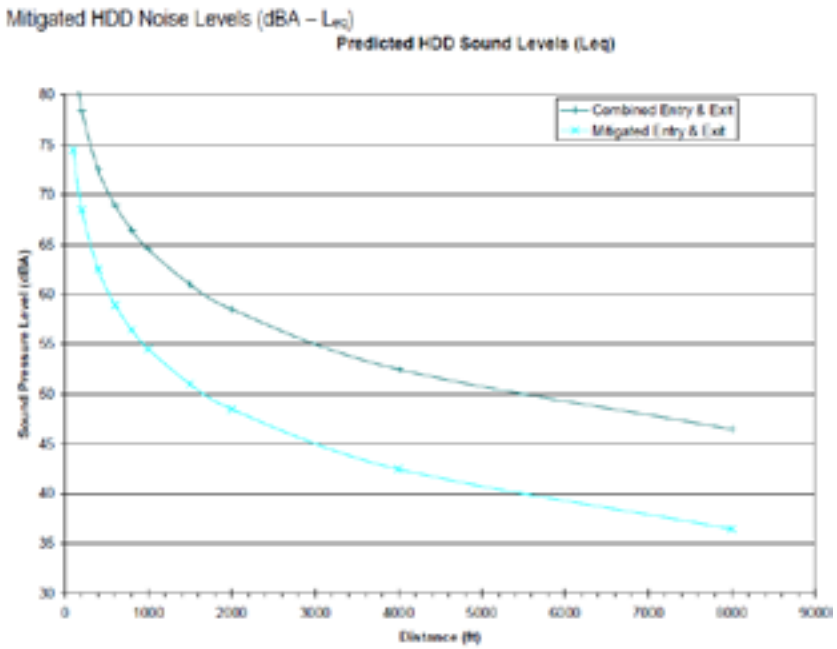
Overview


Social and Health Impact Assessment
Magnitude
Vulnerability
AVOID
MITIGATE

Assessment Process

1. Determine noise attenuation with distance from activities
2. Determine baseline noise levels
3. Calculate change over baseline
4. Identify sensitive receptors within impact zones
5. Develop mitigation strategies as required

1. Determine Noise Attenuation



Operating Period	Daytime Noise Level, LAeq, day dB			
Impact Rating	Negligible	Small	Medium	Large
Short term exposure < 1 month	<70	70-75	>75-80	>80
Medium term exposure 1 to 6 months	<65	65-70	>70-75	>75
Long term exposure > 6 month	<55	55-60	>60-65	>65

Operating Period	Night-time Noise Level, LAeq, night dB			
Impact Rating	Negligible	Small	Medium	Large
Short term exposure < 1 month	<55	55-60	>60-65	>65
Medium term exposure 1 to 6 months	<45	45-55	>55-60	>60
Long term exposure > 6 month	<45	45-50	>50-55	>55

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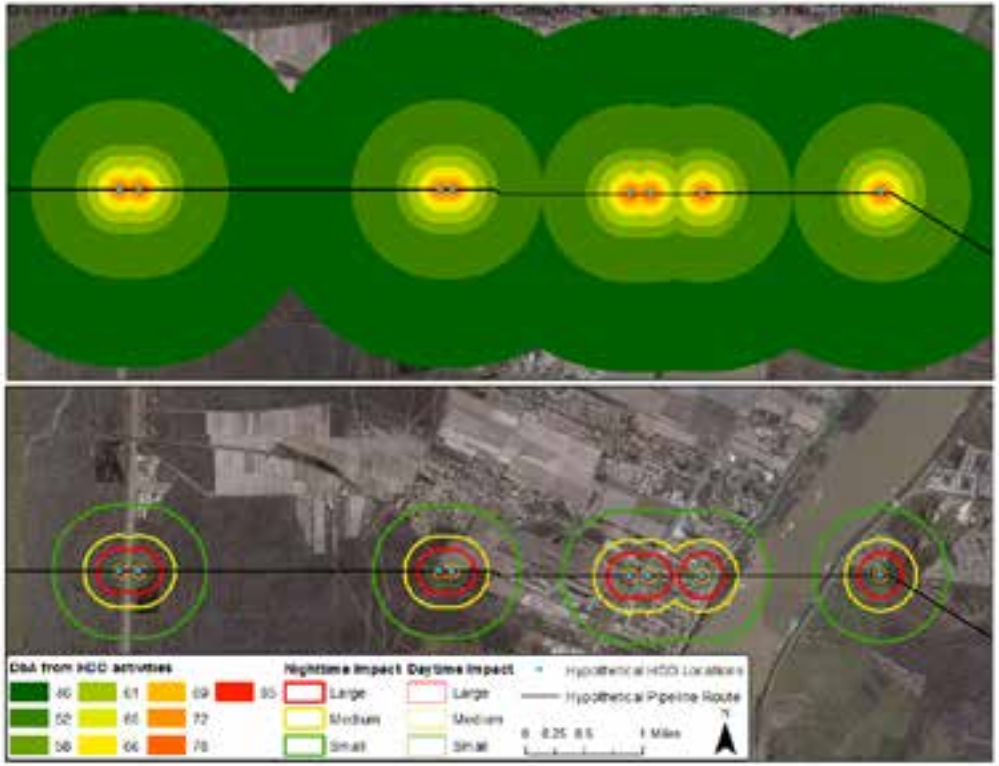
1. Determine Noise Attenuation

Create noise attenuation buffers from 100’ – 8,000’

- Convert to raster with decibel level as the value field

Create noise magnitude buffers for day and night



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2. Determine Baseline Noise

Create buffers around airports, roads, and railroads.

- Assign a DbA level to each buffer.

Calculate population density (block groups)

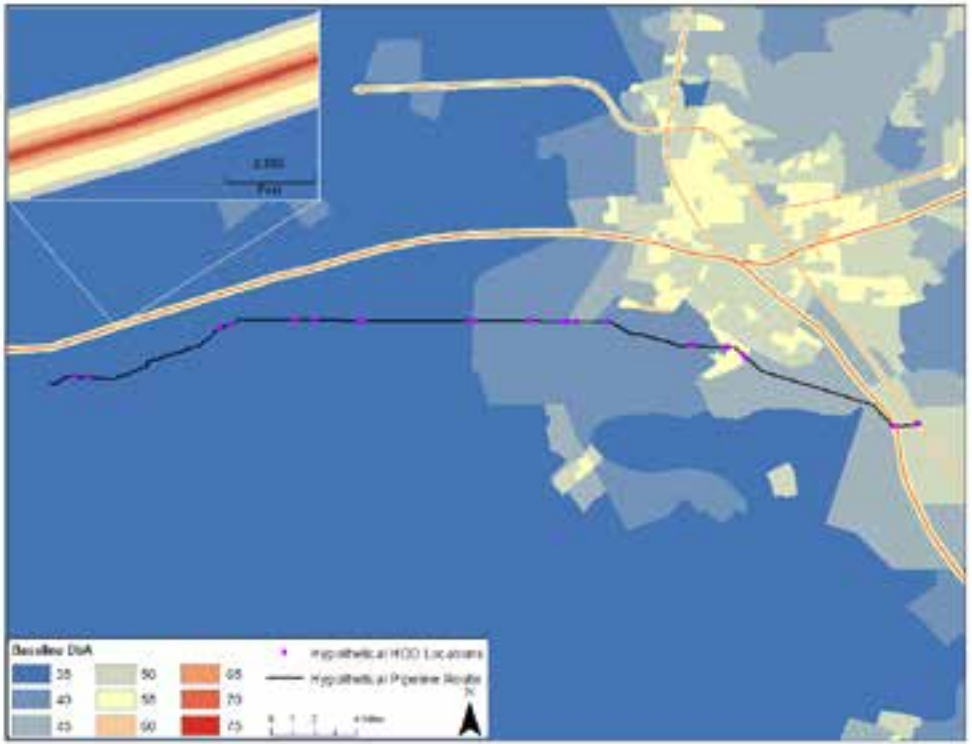
- Assign a DbA level to each density category

Interstates	Other Major Roads	Population Density (people/sq mile)	L_{dn}
10 - 50 50 - 100 100 - 200 200 - 400 400 - 800 800 - 1000			75 70 65 60 55 50
	10 - 50 50 - 100 100 - 200 200 - 400 400 - 1000		70 65 60 55 50
		1 - 100 100 - 300 300 - 1000 1000 - 3000 3000 - 10000 10000 - 30000 > 30000	35 40 45 50 55 60 65

2. Determine Baseline Noise

Merge airport, road, and railroad buffers with census units

- Convert to raster with decibel level as the value field
- decibel level should also be the priority field



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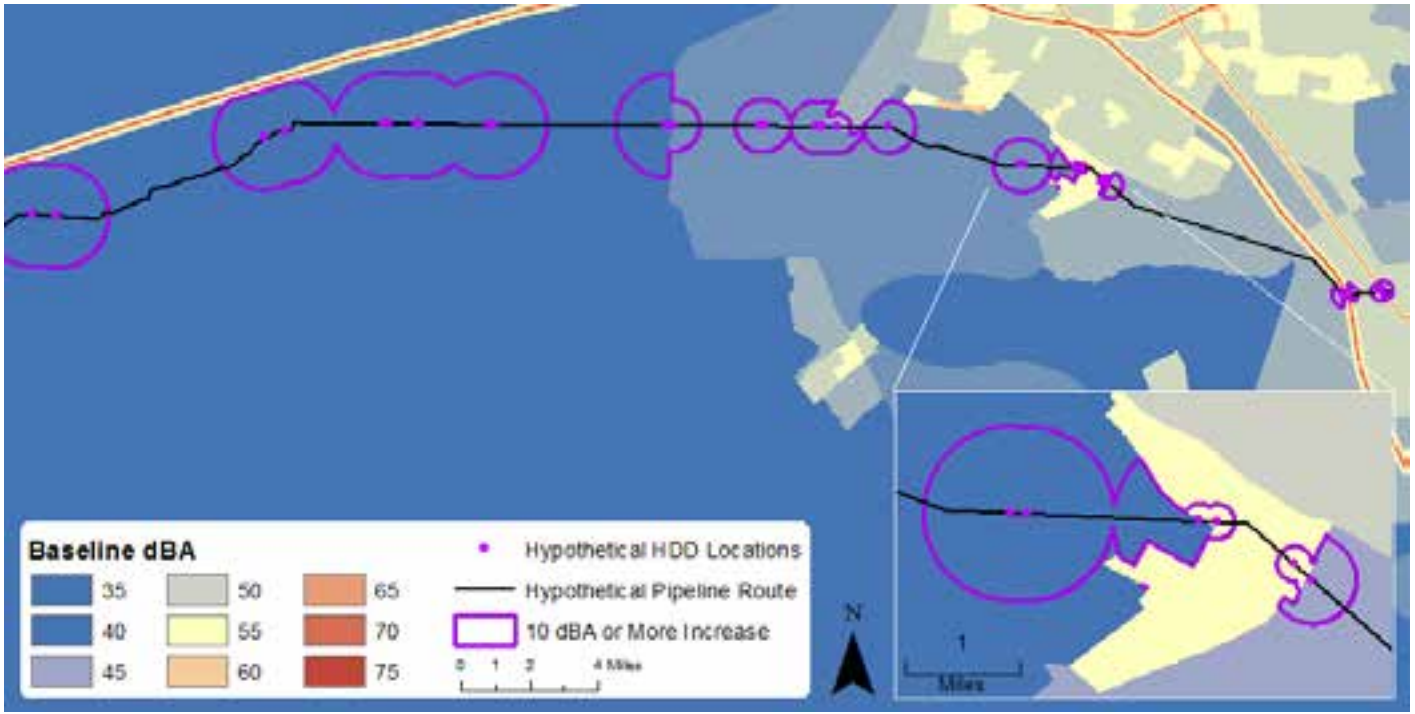
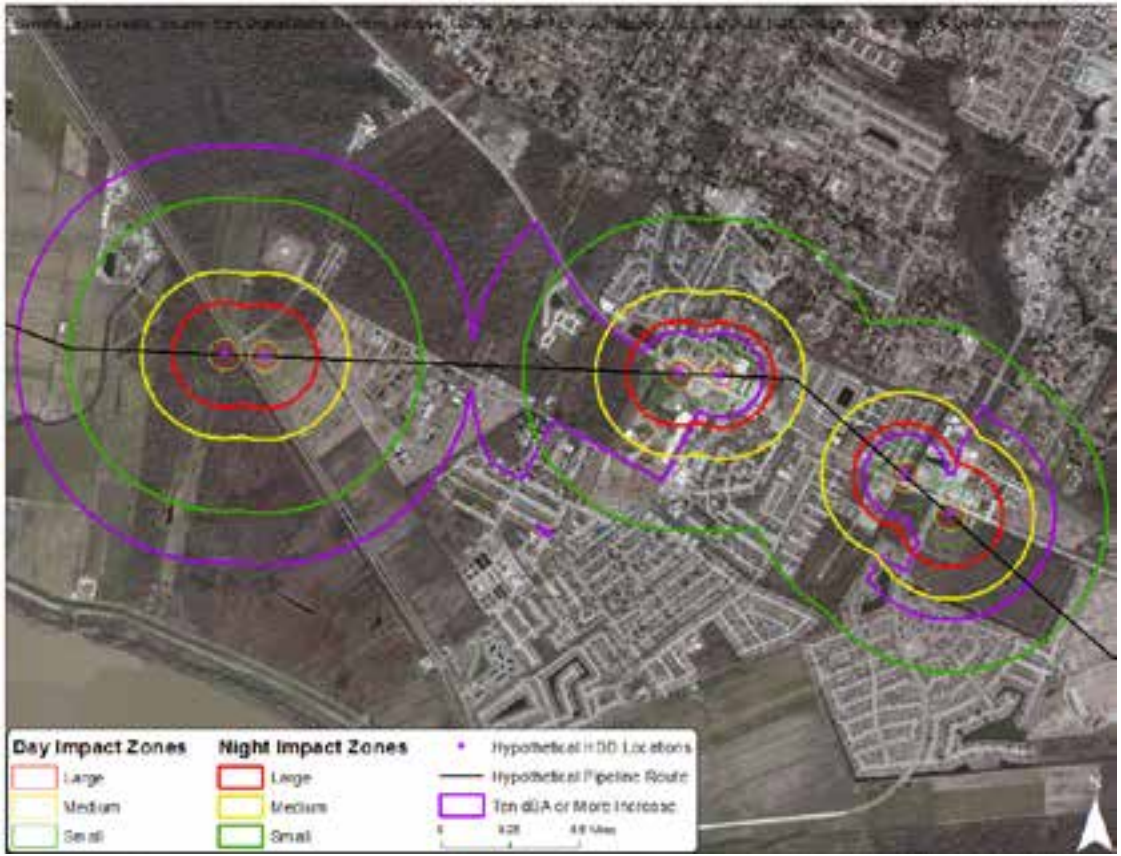
3. Calculate Change from Baseline

Noise attenuation raster – Baseline raster = Change in dBA

Convert values ≥10 to polygons



4. Identify Sensitive Receptors



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4. Identify Sensitive Receptors

Identify and engage stakeholders in “large” impact zones

- ≥ 80 DbA during the day
- ≥ 65 DbA overnight
- ≥ 10 DbA above ambient noise levels

Including:

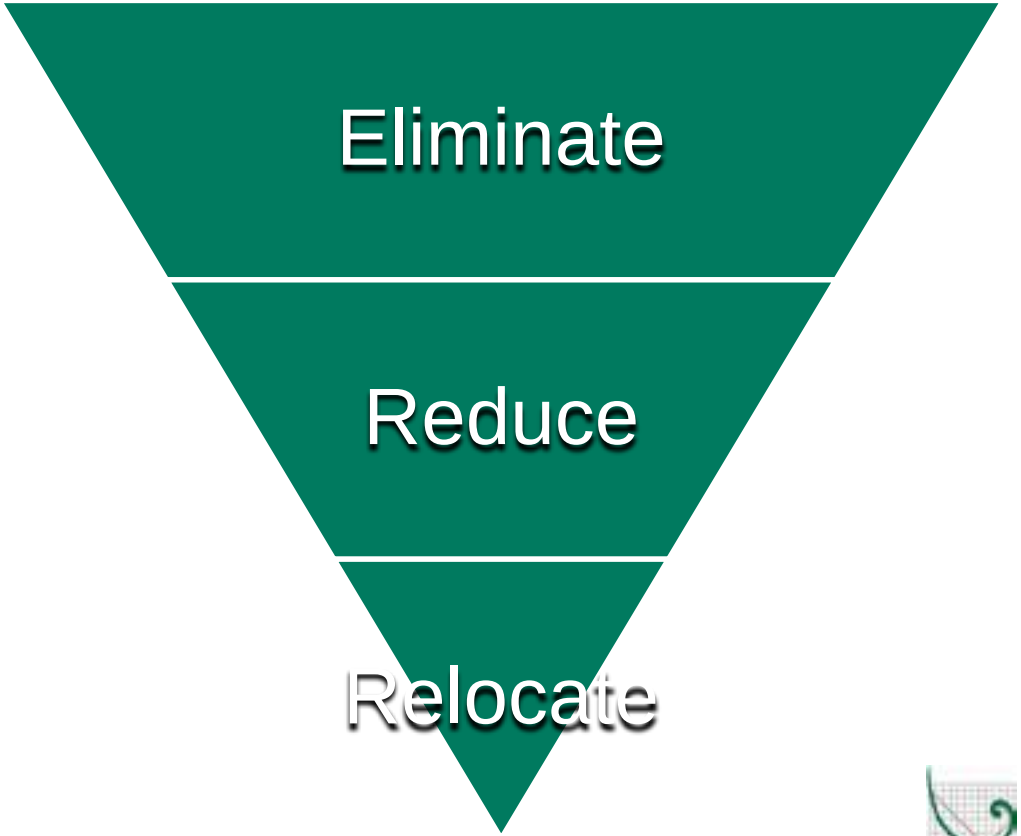
- Residents, businesses, and community groups
- Recreational users and site operators

5. Develop Mitigation Strategy

Conduct detailed noise study for potential significant impacts

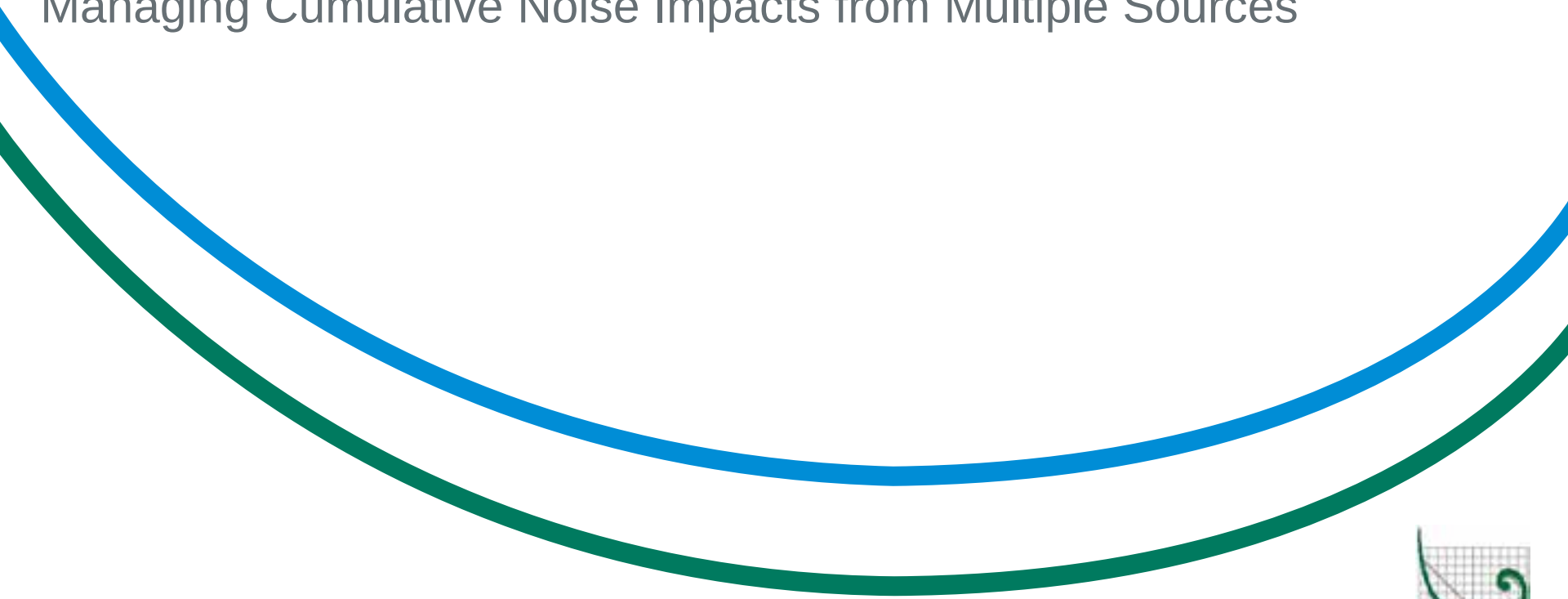
Engage with stakeholders to identify initial mitigation options

Incorporate mitigation plan into project ESIA



Case Study 2: Well Field Development

Managing Cumulative Noise Impacts from Multiple Sources



Overview

Impact assessment for well drilling in new development area

Sites for initial 40-50 wells selected by spatial analysis

- Considered both ‘technical’ and ‘non-technical’ risks
- Potential noise impacts integrated in site selection but unavoidable

Primary concern was therefore cumulative noise impacts

- Plan and stage activities to mitigate cumulative impacts
- Avoid simultaneous sources (e.g. drill rigs) to a single receptor

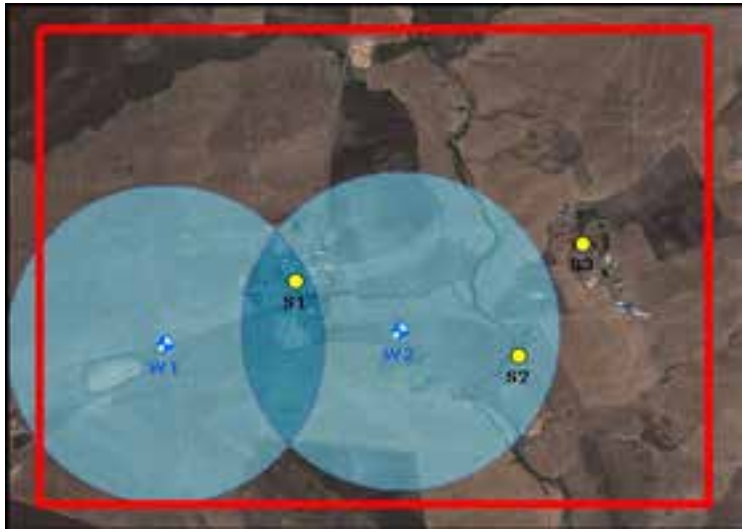
Assessment Process

1. Determine noise distance thresholds
2. Calculate cumulative noise impact areas
3. Identify sensitive receptors within cumulative impact zones
4. Develop mitigation strategies

Cumulative Impacts for Proposed Well Sites

Receptors mapped from satellite imagery

Geoprocessing model calculates cumulative impacts

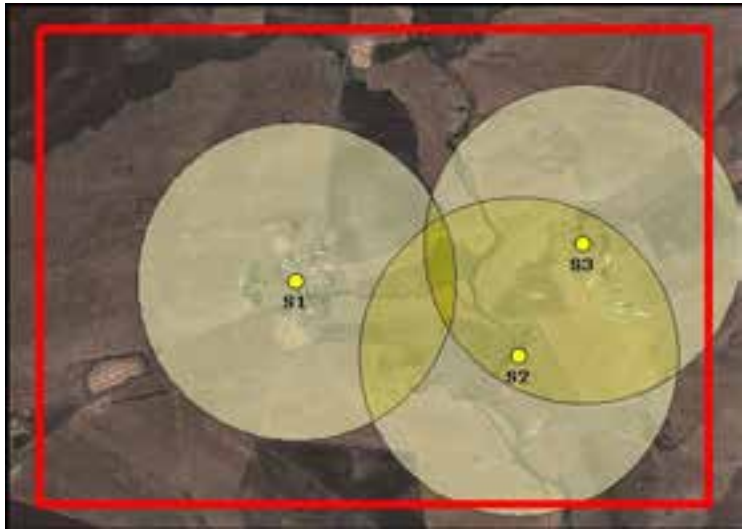


Settlement Name	Number of Wells	Wells by Distance
S1	2	W1 - 456m W2 - 361m
S2	1	W2 - 380m
S3	0	N/A

Cumulative Impacts for Proposed Well Sites

Designed for future well site selection

Pre-determine cumulative impact areas for well siting



Number of Settlements Impacted	Area (sq. km)
0	1.34
1	1.3
2	0.47
3	0.02

Develop Mitigation Strategies

Analysis facilitated several mitigation options:

- Move proposed well sites
- Schedule drilling to avoid cumulative impacts
- Reduce drilling noise at source

For all mitigation options the GIS approach enabled:

- Rapid rerun of model with alternative parameters
- Immediate visualization of results (project web-GIS)
- Reuse of analysis method for scaling up to production

Conclusions

Integrating GIS and Noise Impact Assessment

Conclusions

Benefits of GIS for Noise Impact Analysis

- Easy to model simple noise attenuation relationships
- Noise results can be immediately integrated with baseline data
- Repeatable analysis models can be developed for specific activities
- Low-cost to implement and target areas for detailed assessment

Limitations of GIS approach

- Requires expert determination of noise attenuation curves
- Does not address attenuation along noise pathways
- Best suited to short-term operations to maximize cost-benefit

Paper Authors

Hedrick Strickland
Staff GIS Scientist | ERM South Atlantic
Raleigh, North Carolina
T| +1 919 233 4501
E| hedrick.strickland@erm.com

Simon Ross
Principal GIS Consultant | ERM Northeast
Boston, Massachusetts
T| +1 617 646 7892
E| simon.ross@erm.com

www.erm.com