Stormwater Investigations

Treatment solutions and best practices

Facing challenges related to high groundwater levels and/or the presence of sulfide clay

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Sophia Flybring

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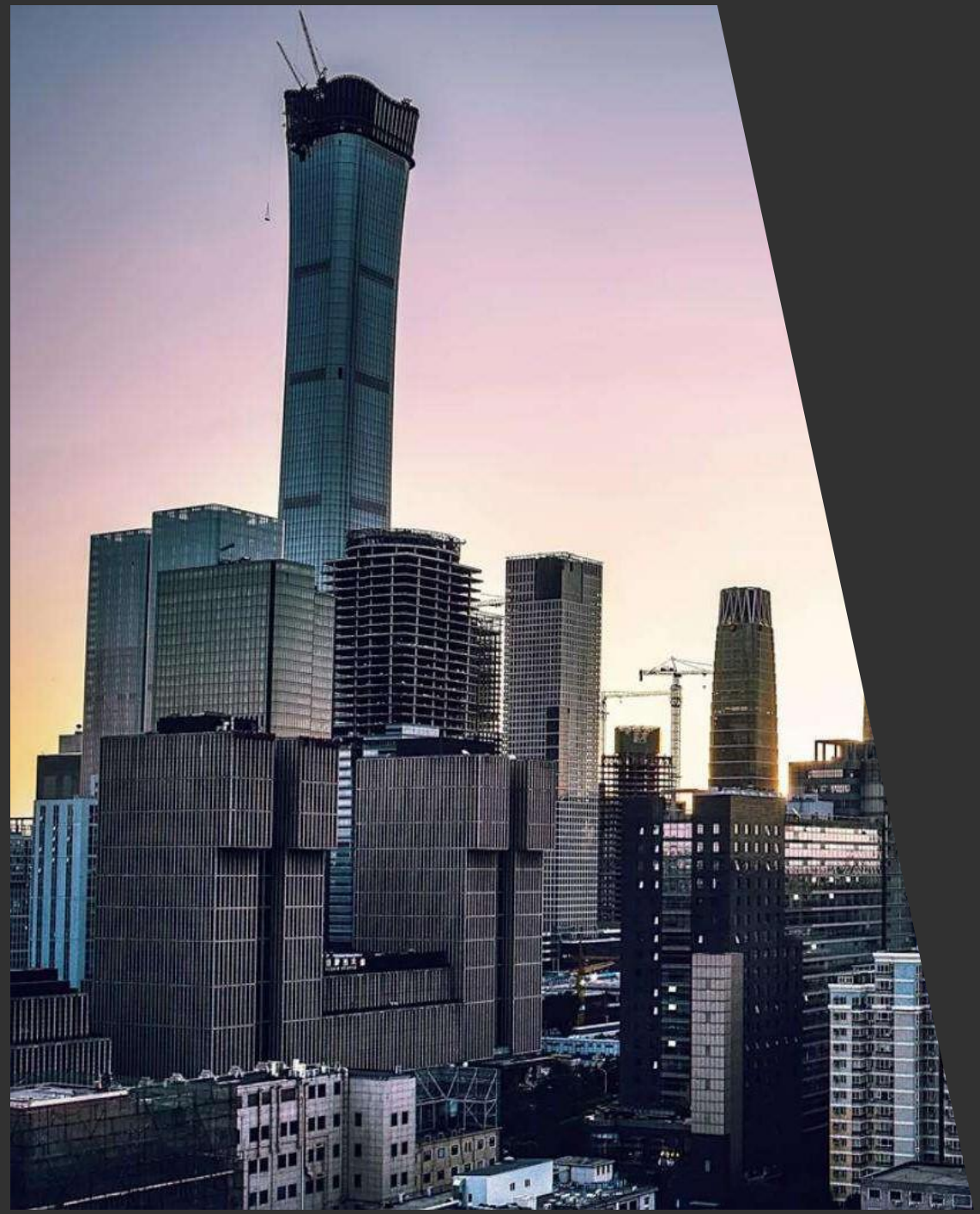

About AFRY

- AFRY: global company, operations in many countries
- Division: Infrastructur
  BA: Water Mid
- 14 stormwater consultants and water & wastewater project engineers
- Uppsala, Gävle, Borlänge, Västerås and Kalmar
- Collaborate across sections

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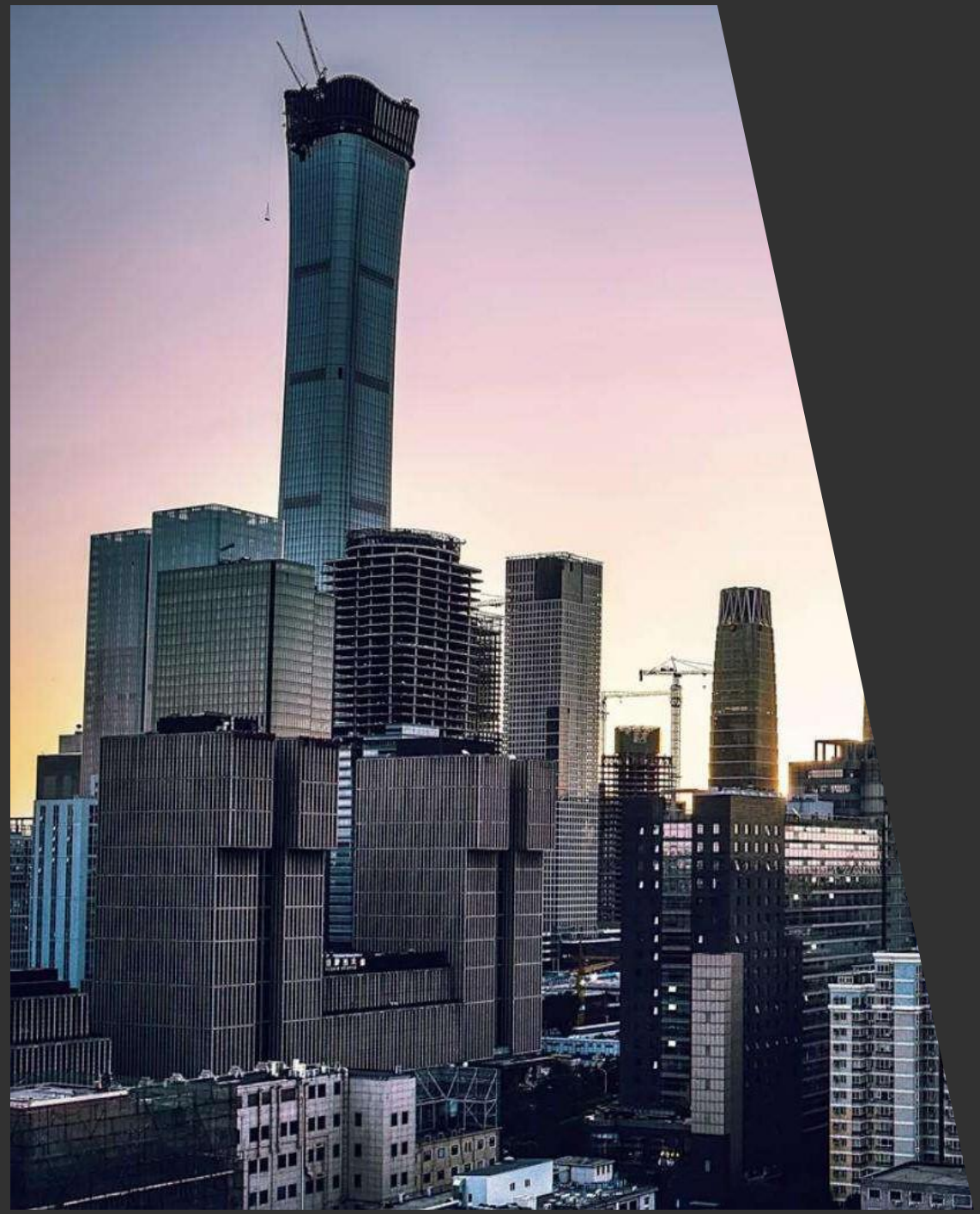

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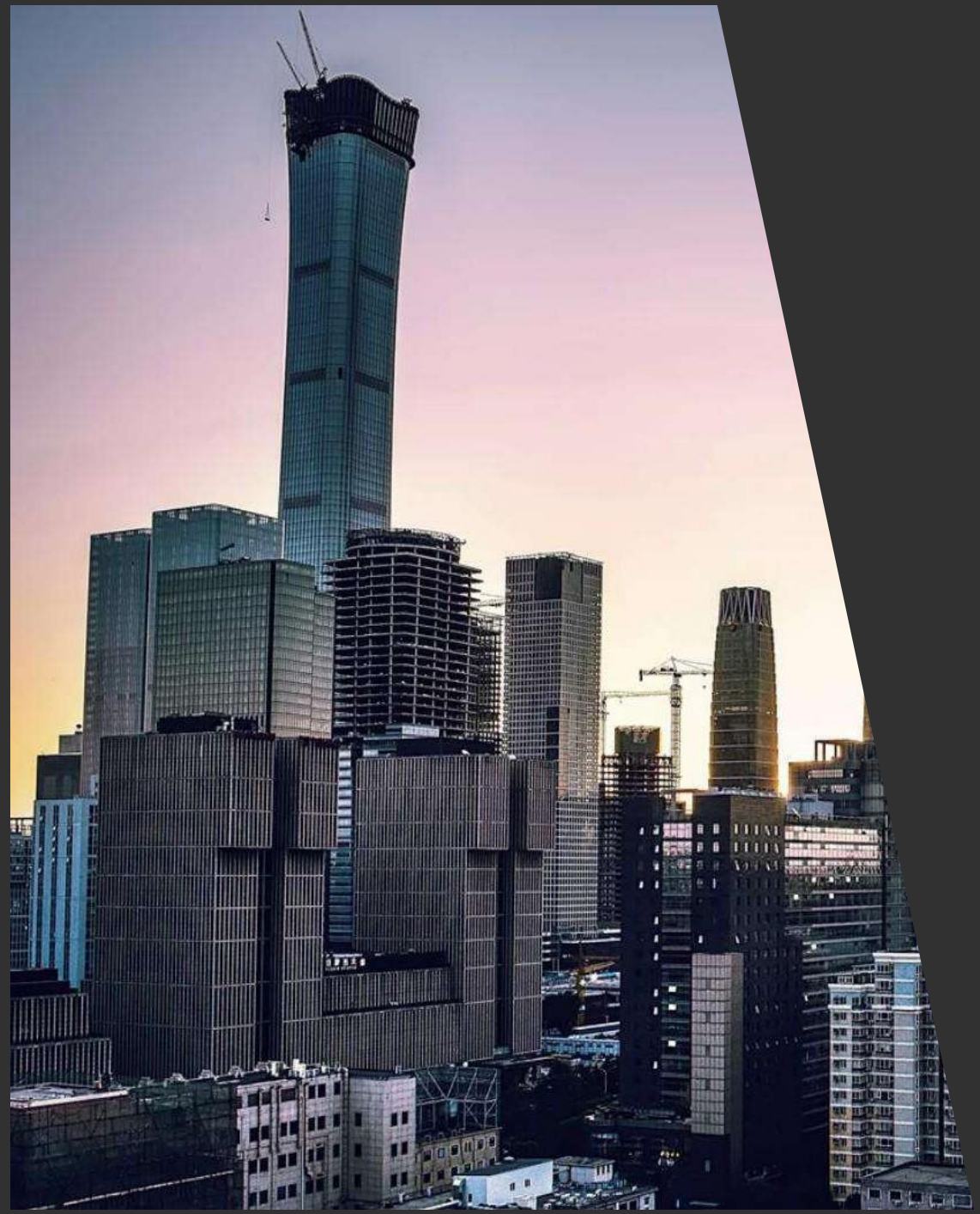

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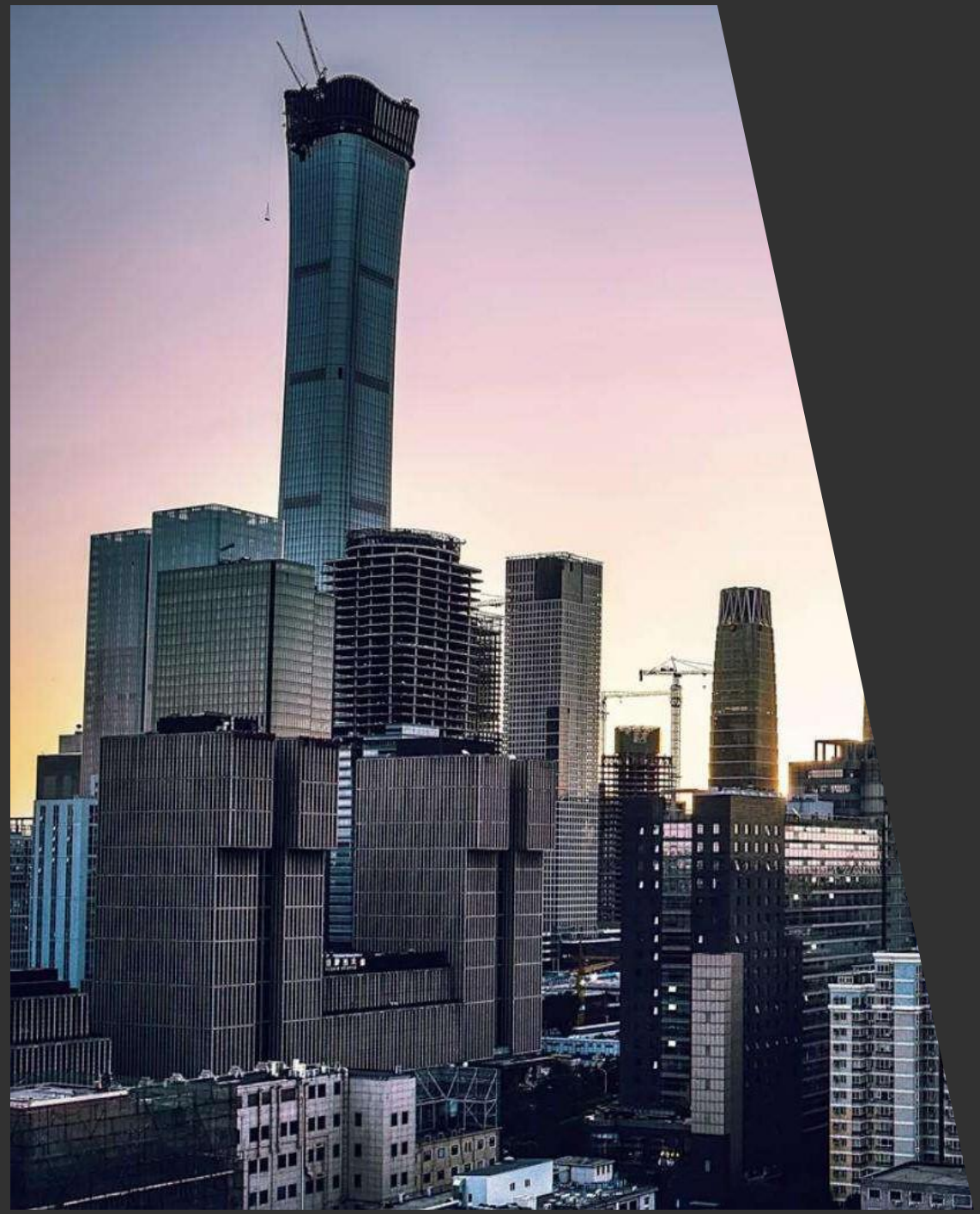

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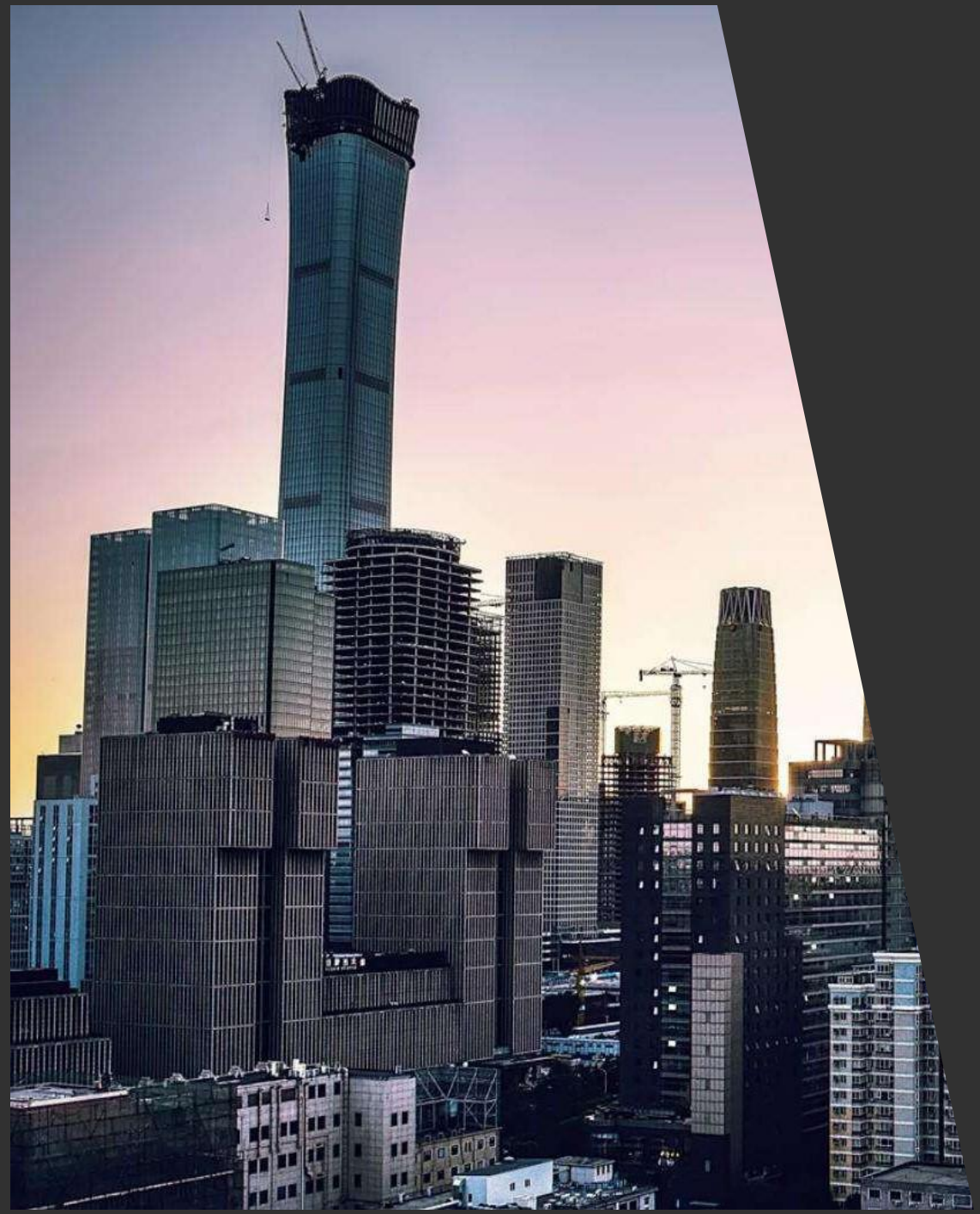

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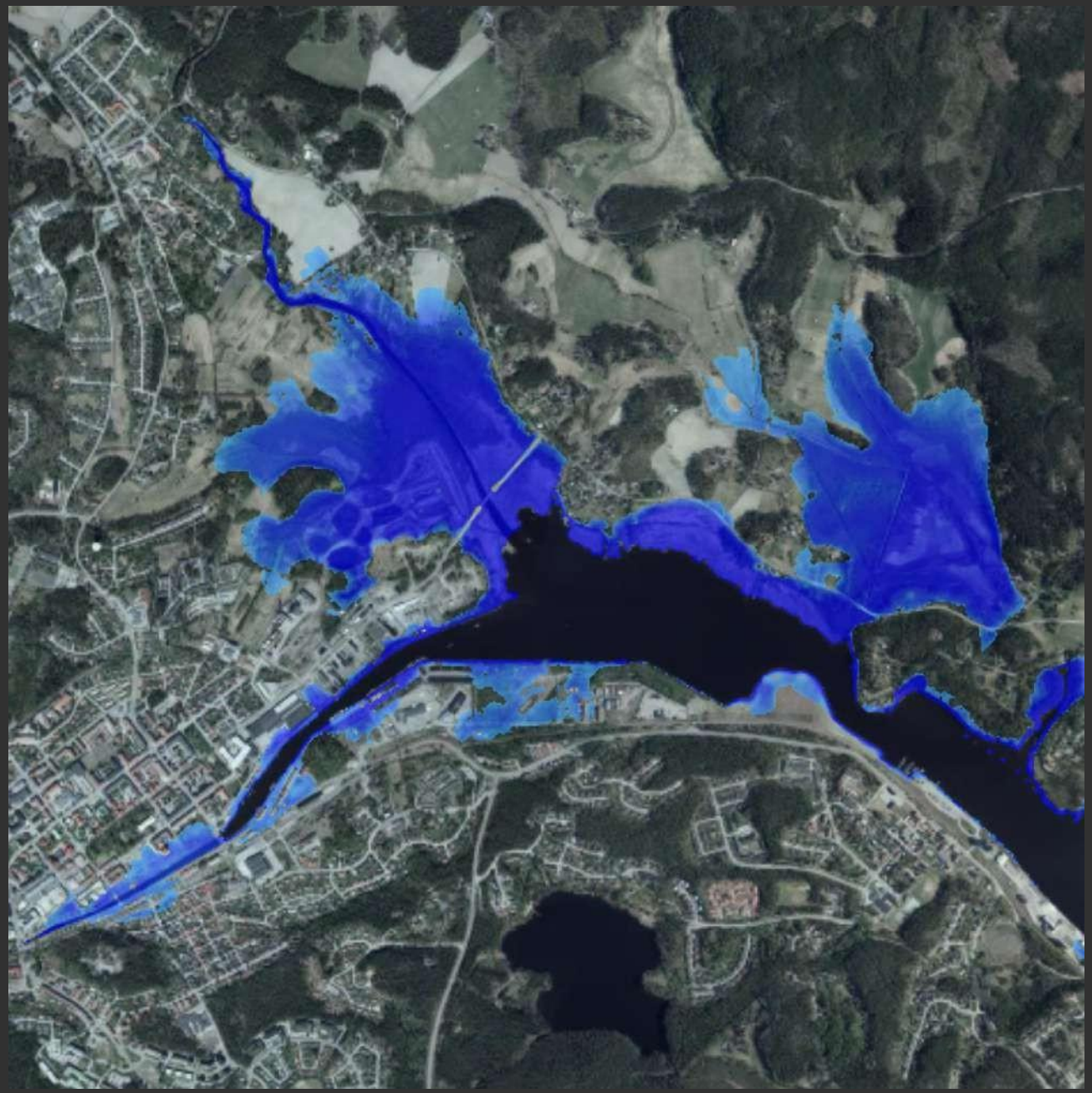
Agenda

Key factors in stormwater investigations

- Project approach
- Typical obstacles and challenges
- Coordination needs with other technical disciplines

Examples of solutions and lessons learned; focus on coastal regions

- High groundwater level
- Presence of sulfidic clay



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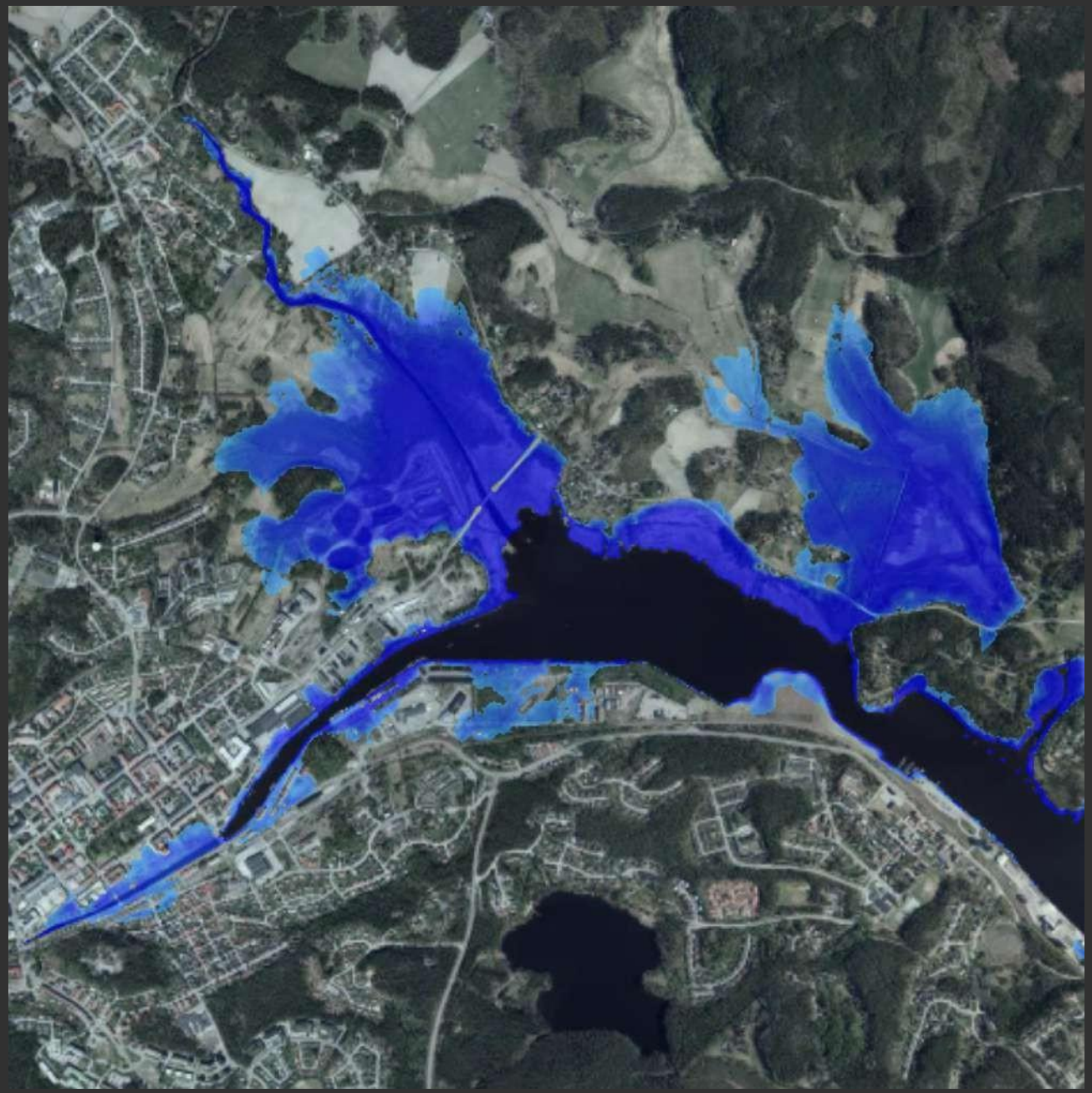

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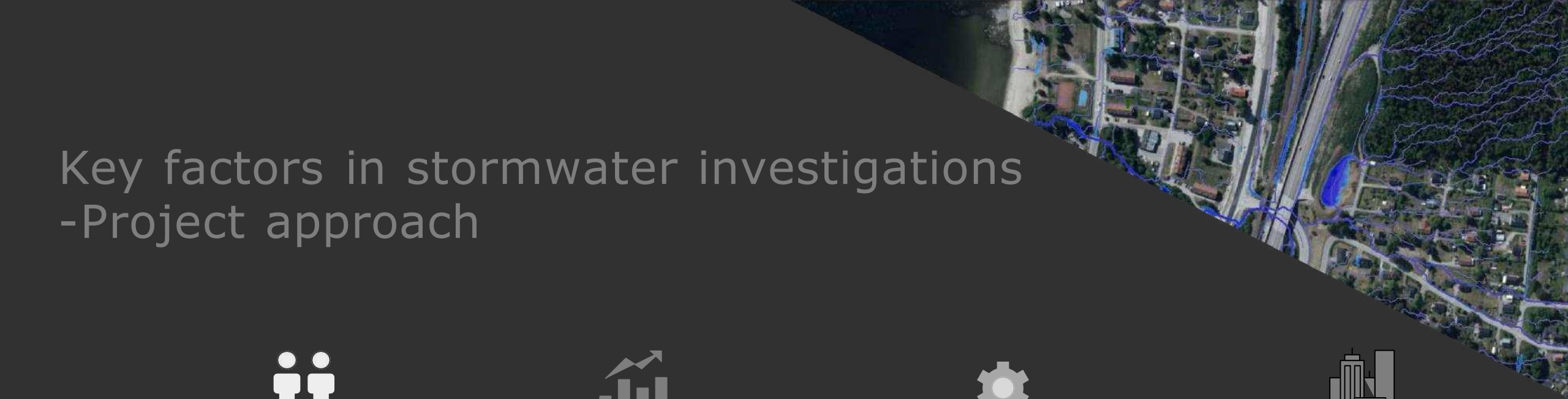
Key factors in stormwater investigations -Project approach

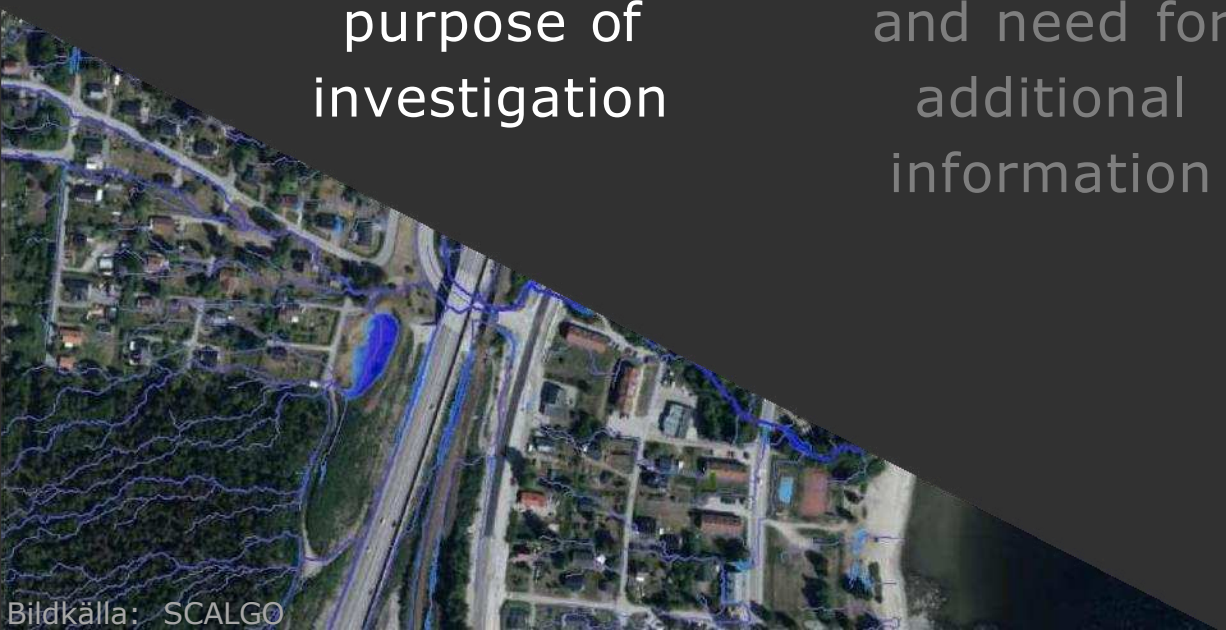


Client type and purpose of investigation

Available data and need for additional information

Model creation, simulation, and analysis

Stormwater solutions and impact assessment



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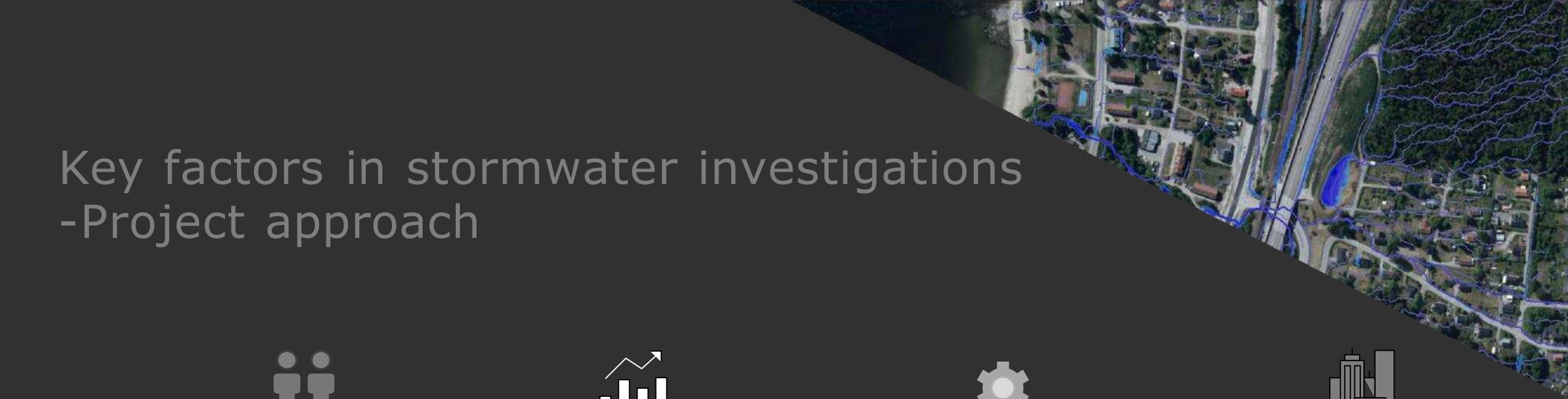
Key factors in stormwater investigations -Project approach



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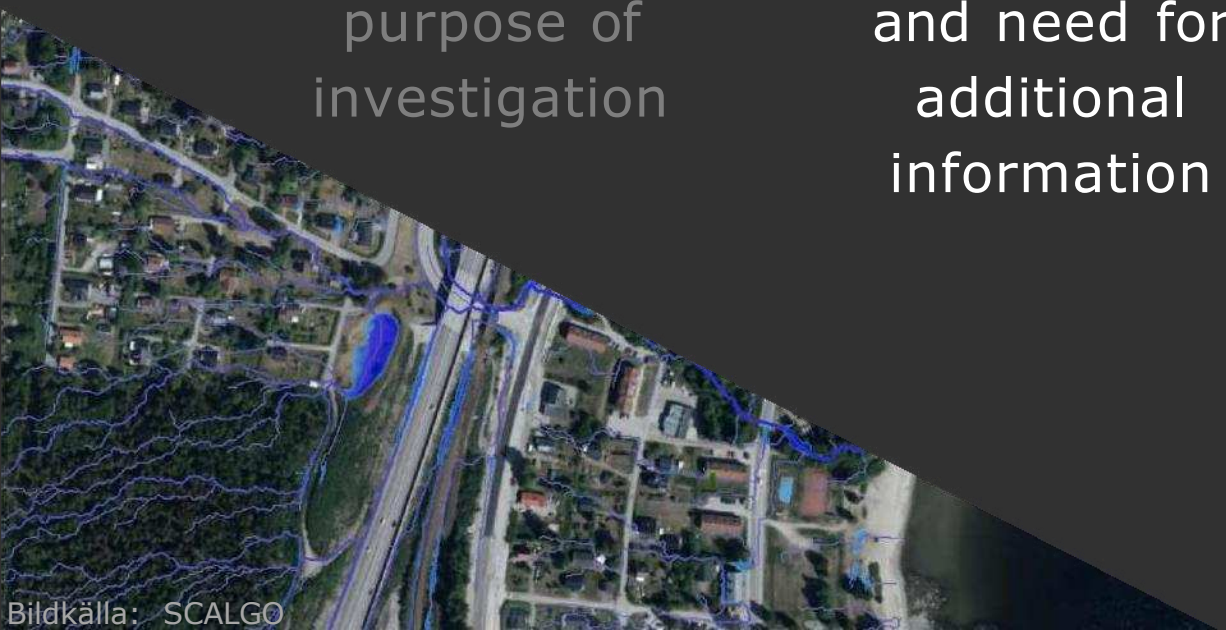

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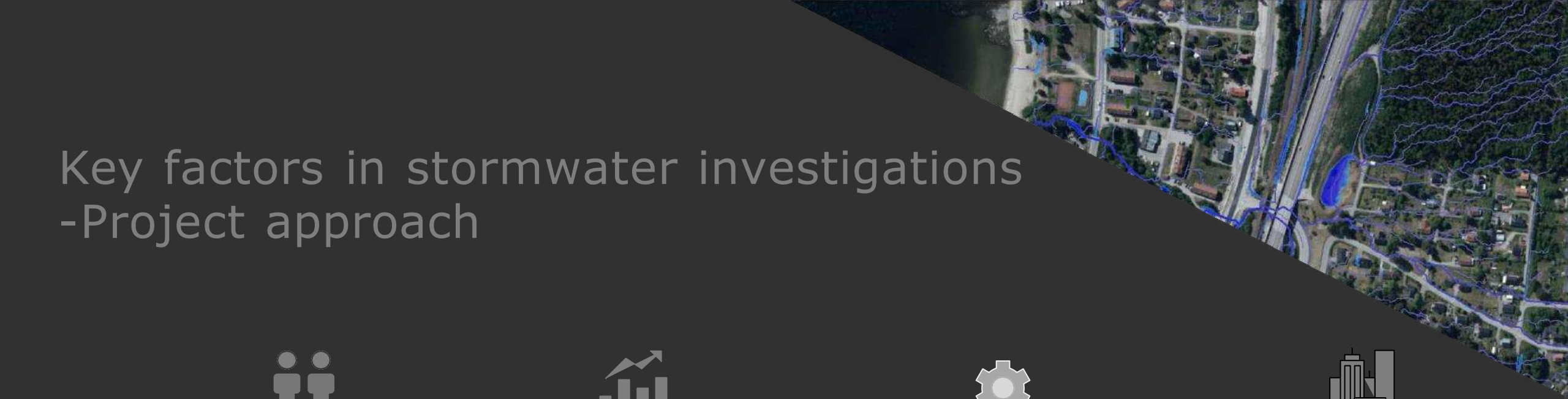

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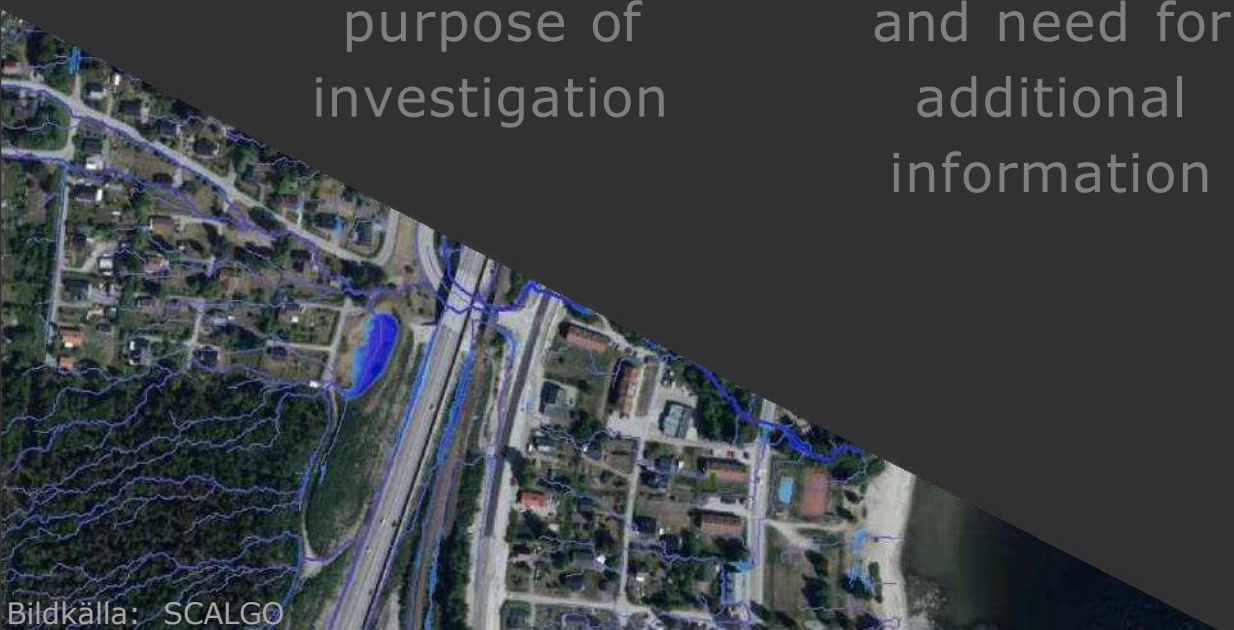

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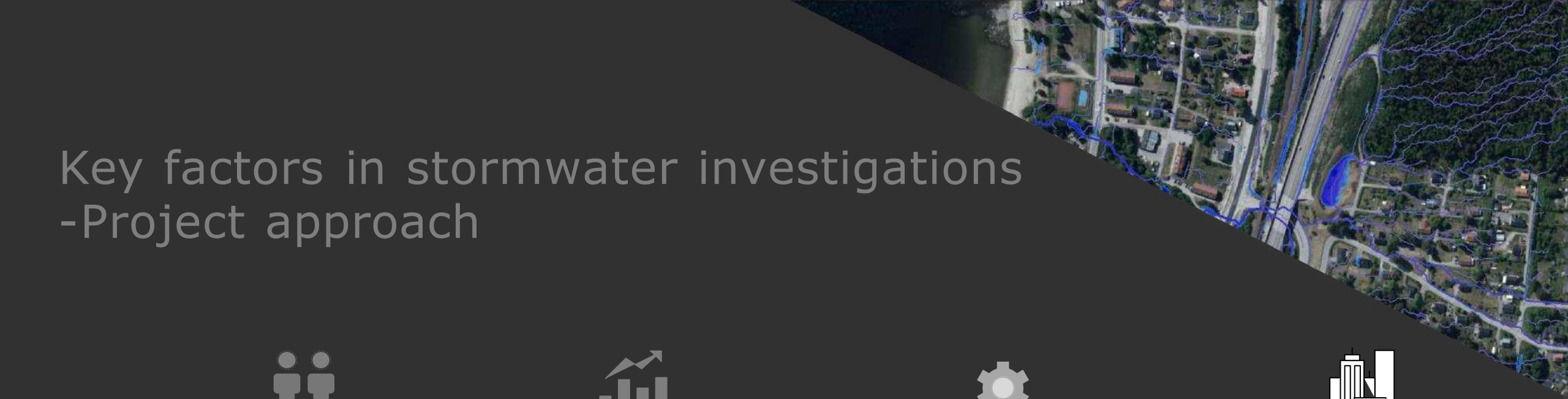

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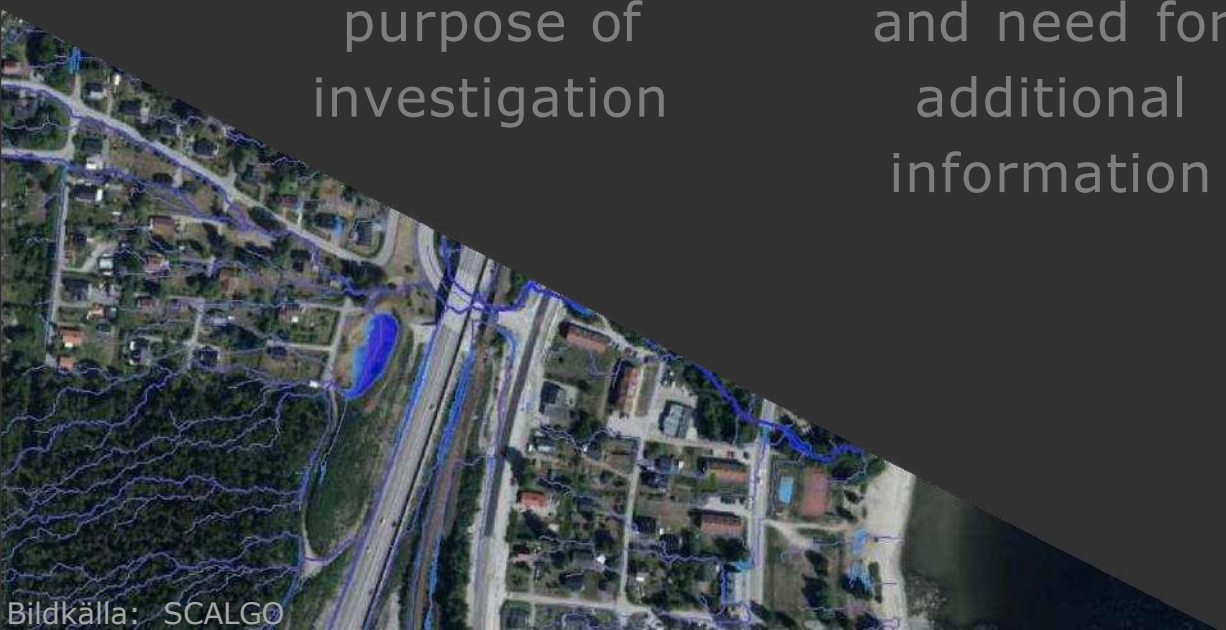

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Key factors in stormwater investigations - Typical obstacles and challenges

- Tight deadlines
- Optimal location for stormwater management is unavailable

- Order of operations
- Difficulty in defining the bigger picture and correct boundaries

- The model’s connection to reality and project focus
- Result detail level, plausibility, and uncertainty assessment

- Conservative assessments provide margin; lacking margin requires further studies.
- Revisions are costly.
- Optimal solution,
- other interests?

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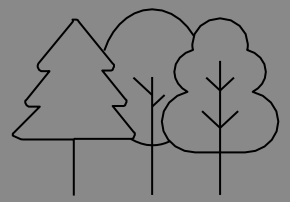
Key factors in stormwater investigations
Coordination with other technical disciplines

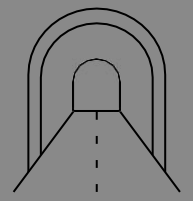
Geotechnical specialists

Landscape architects

Road and infrastructure engineers



Hydrogeologists



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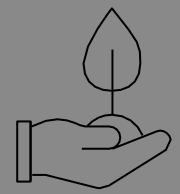

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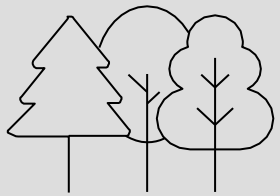

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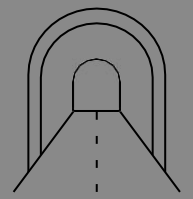

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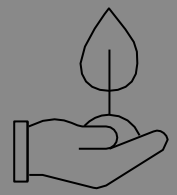

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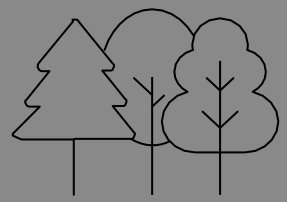

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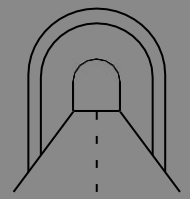

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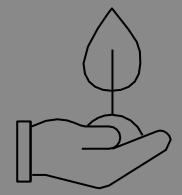

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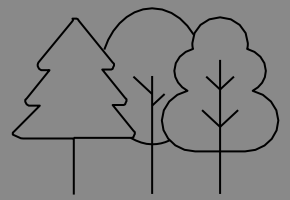

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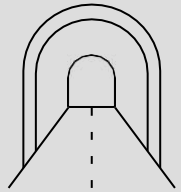

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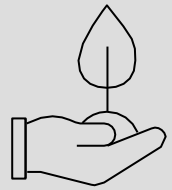

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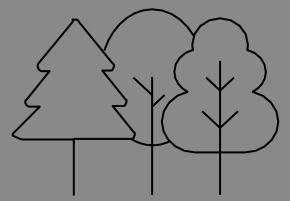

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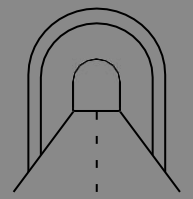

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Examples of solutions and lessons learned -High Groundwater levels in coastal areas

- Groundwater level vs sea water level
- Local measures are preferred – source control
- End of pipe solutions
- Legal responsibility, land ownership, operation and maintenance programs
- Geotechnical and structural concerns - groundwater levels impact stormwater management
- Counteracting forces
- Construction - Pumping and excavation

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Examples of solutions and lessons learned -Presence of Sulfidic clay in coastal areas

- Oxidation → sulfuric acid → low pH → metal leaching → environmental damage
- Lowering groundwater increases oxidation risk; the clay must remain saturated for stability
- Avoid disturbance (minimize excavation)
- If excavated: cover, don’t stockpile, sample for risk assessment
- Treat as hazardous waste
- Reuse possible with lime (neutralizes pH, improves buffering – e.g. good in Stockholm, poorer in northern Sweden)
- Mismanagement = costly, long-term impact

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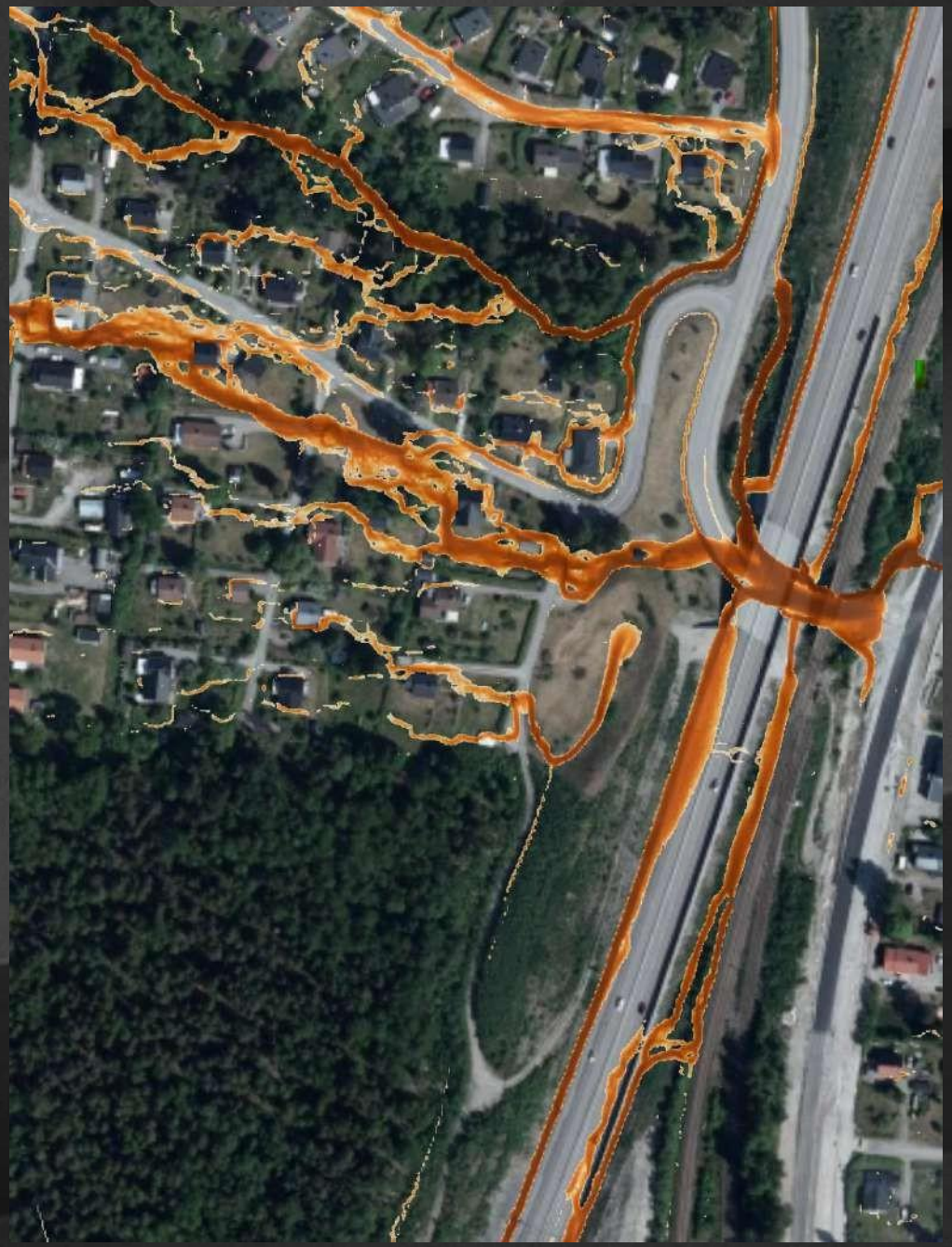

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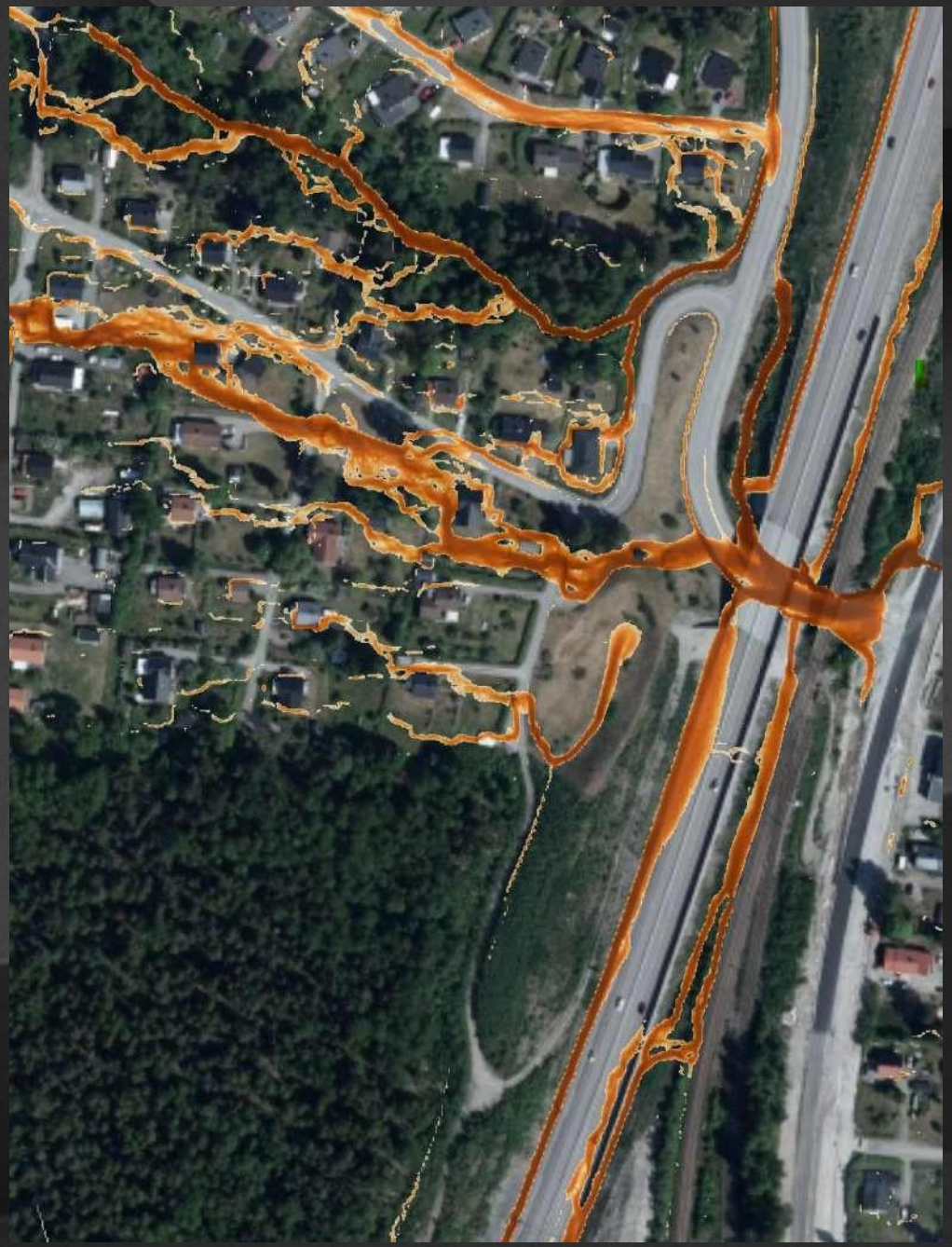

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