Airborne Data Collection

Drone, Helicopter,
Fixed-wing, Satellite

April 2024

Salt Lake City

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Contents

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Data from a Different Perspective

- We are a complete solution data company for utilities, energy, agricultural, infrastructure and emergency response to make better decisions with better data while reducing overall cost and headaches of data collection.

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Services

- Smart meter reading
- Leak detection
- Cathodic protection monitoring
- Right of way monitoring
- Emergency response support services

Data Collection Requirement Setting

Outcomes - What do you want to achieve?

Analytics - What do you need to know?

Integration - How will you access/use the info?

Collection Technology - What sensors and tech will work?

Collection Platform - How will data collection be done?

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- What decisions need to be made?
- What information is useful to those decisions?
- Are there regulatory requirements?
- What is the financial impact of those decisions, i.e. how much budget do we have to get the information?

Outcomes →

Decision Possibilities

Analytics → Data to Information

- How will the analyses be done?
- What inputs are need for the analytics?

Integration → Data Usability

- Integration into existing processes and systems
- Frequency & scalability
- Formats
- Usability
- Storage
- Display

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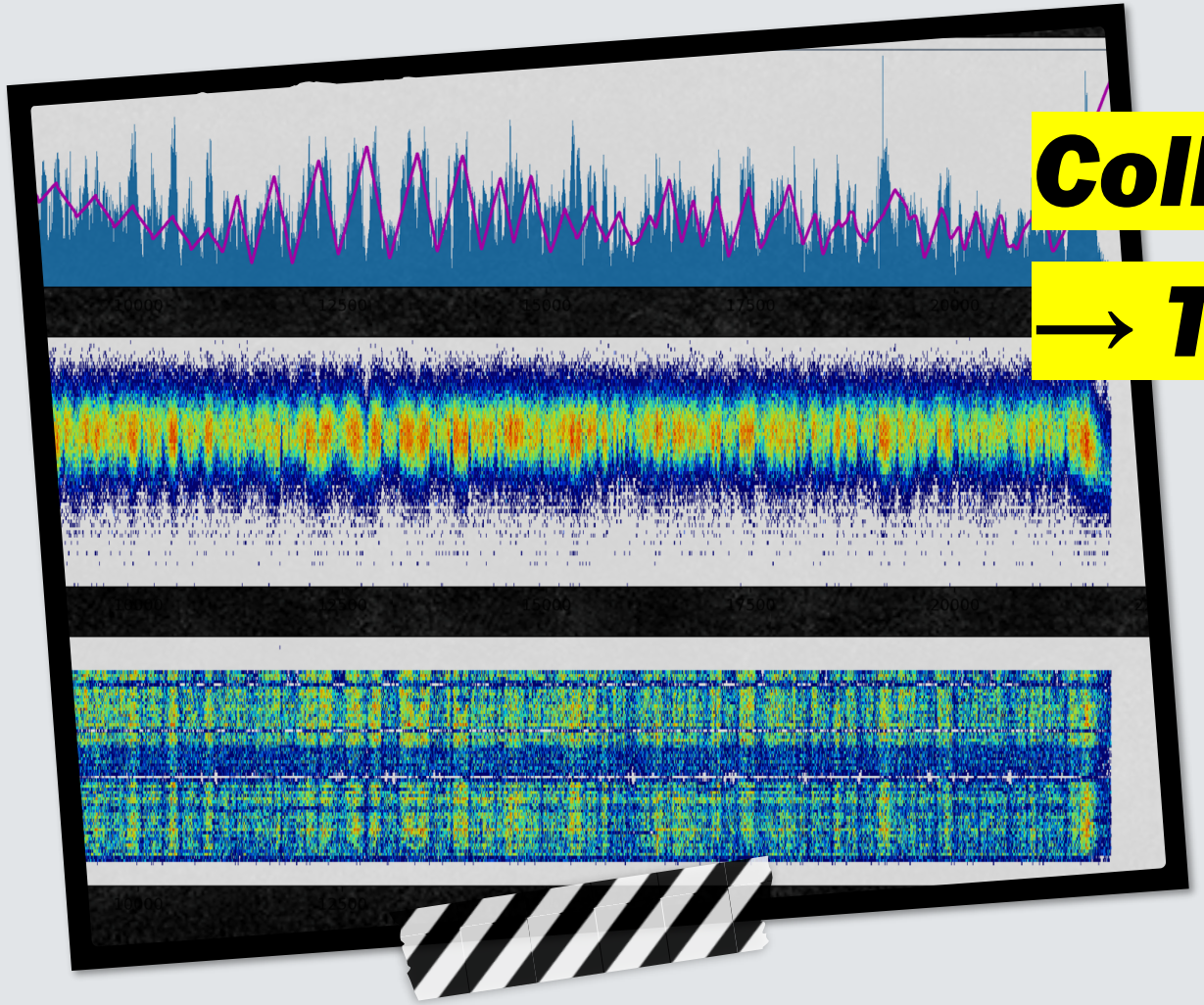


Collection Technology → Tech Choices

- What technology capabilities meet my requirements?
- Which sensors can get to the data required?
- What protocols are most suitable?

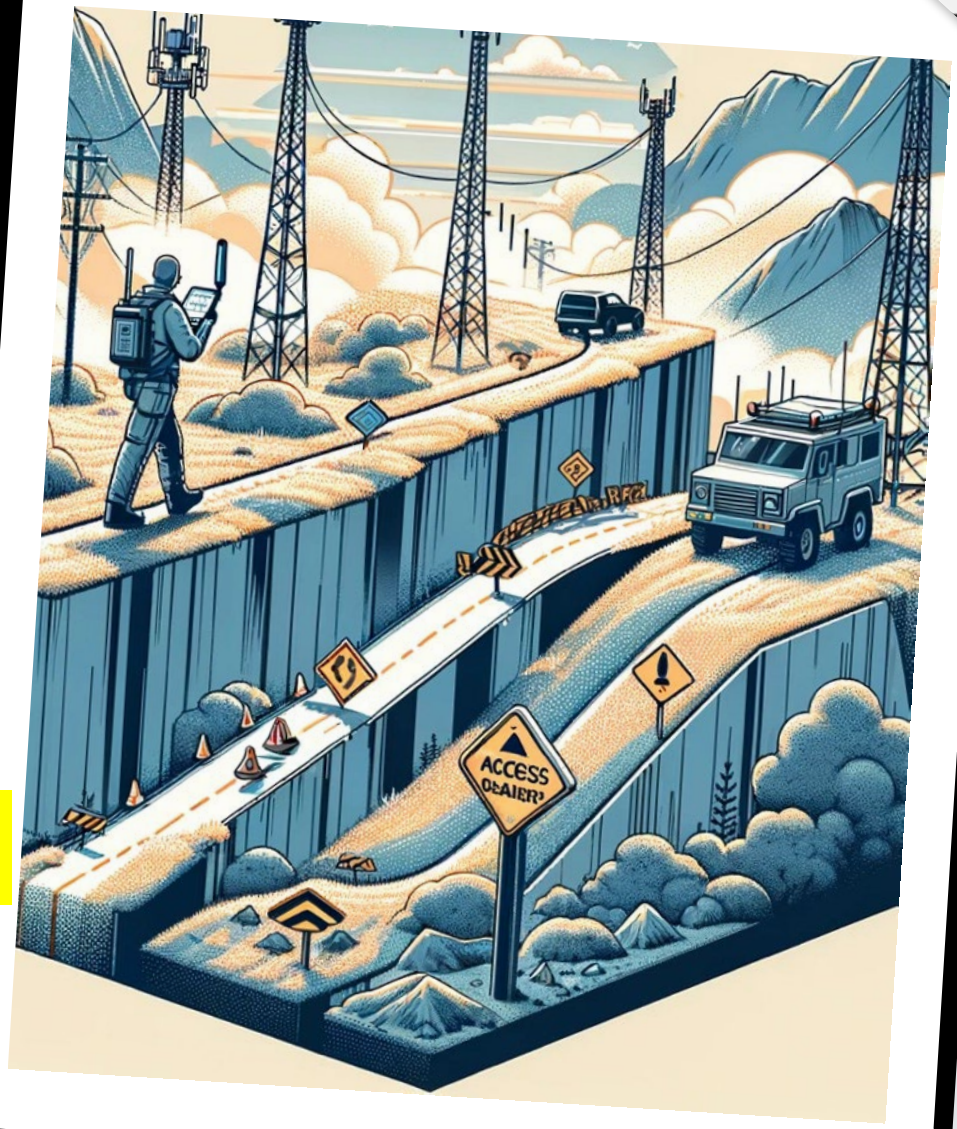
Collection Platform → Tech Carrier

- Fixed or mobile?
- What platforms can carry the required sensors/tech?

  + Underground/water or ground or airborne?
- What collection tracks are required?
- What is most cost effective? Can we increase efficiency by changing a requirement slightly?
- What is the safest platform?
- Do you have the right inputs for the platform capabilities?

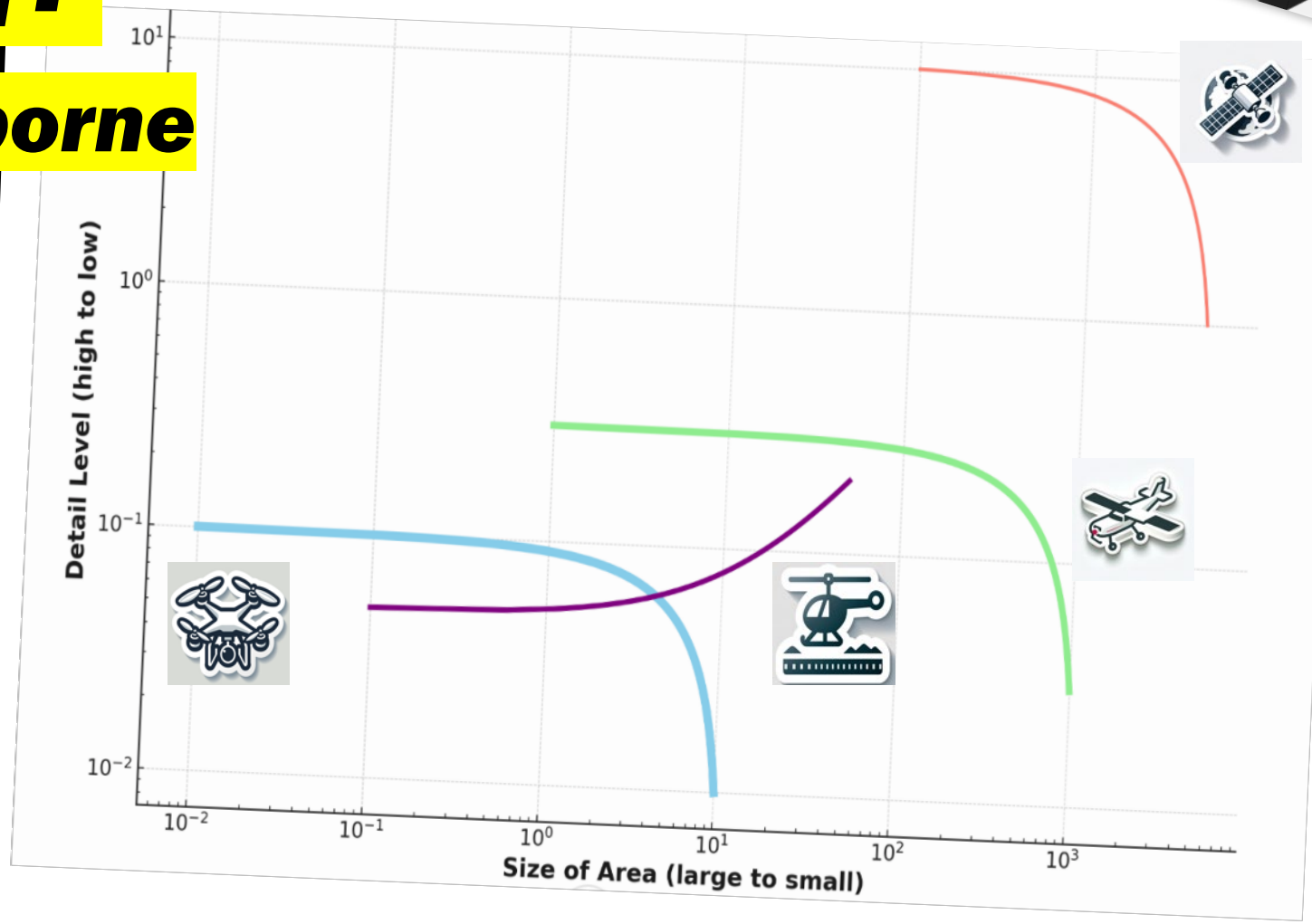
- Tangible, up-close and personal collection
- Immediate on-site action possible
- Access difficulties
- Limited perspective
- Often not verifiable
- Liability and safety risks
- Another alternative? Yes, aerial.

Traditional Ground-based Data Collection



Collection Platform - Comparison of Airborne

- Size of coverage
- Resolution
- Cost
- Payload capabilities
  + Size and type
  + Accuracy



Aerial Unmanned Data Collection

- Autonomy – semi to fully autonomous
- Altitude – typically <400 ft AGL
- Weather - limited
- Payload capabilities - limited
- Range - short
- Regulations – significant
- Cost – increases with coverage area
- Trends – increasing usage

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Limitations of Aerial Unmanned

- Altitude
- Range
- Licensing and government requirements
- Cost to scale

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- High resolution for smaller projects
- Good for ad-hoc localized surveying, high resolution imaging, with increasing LIDAR and remote sensing capabilities
- Transmission tower inspection
- gas riser inspection
- plant leak detection
- Small area emergency response

Use Cases Aerial Unmanned

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Helicopter (Manned) Data Collection

- Altitude – 200 – 1,000 ft AGL
- Weather - flexible
- Payload capabilities - high
- Range – medium to long
- Regulations – noise & altitude
- Cost - High
- Trends – decreasing usage

Limitations Helicopter

- Huge hourly costs
- Airspace and accessibility limitations
- Noise
- Low altitude safety risks

- Low altitude granular surveying & sensing
- Relatively long range
- Flexibility
- Great for stops and starts
- High resolution LiDAR and other sensors requiring slow speeds and heavy lift capabilities

Use Cases Helicopter

Fixed-wing (Manned) Data Collection

- Altitude – 2,000 – 20,000 ft AGL
- Weather – flexible
- Payload capabilities – huge variety
- Range – medium to long range
- Regulations - minimal
- Cost – decreasing
- Trends – increasing usage

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Limitations Fixed-wing

- Altitude
- Collection speed for high input sensors
- No stop/hover capabilities

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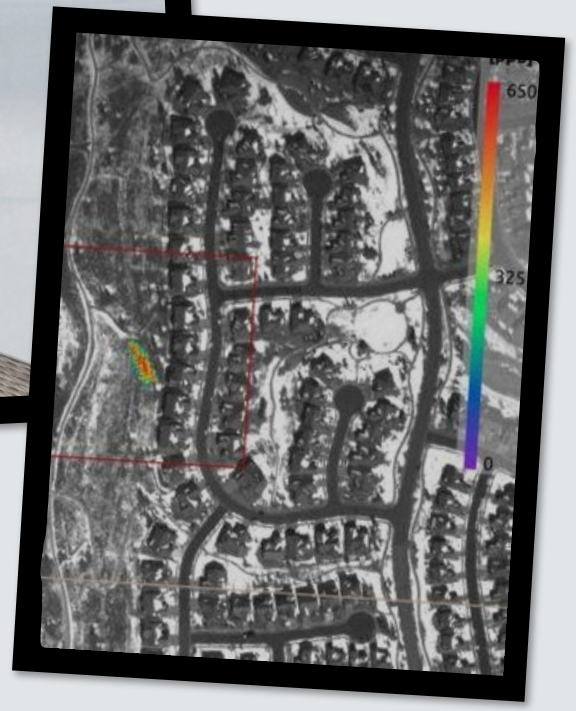

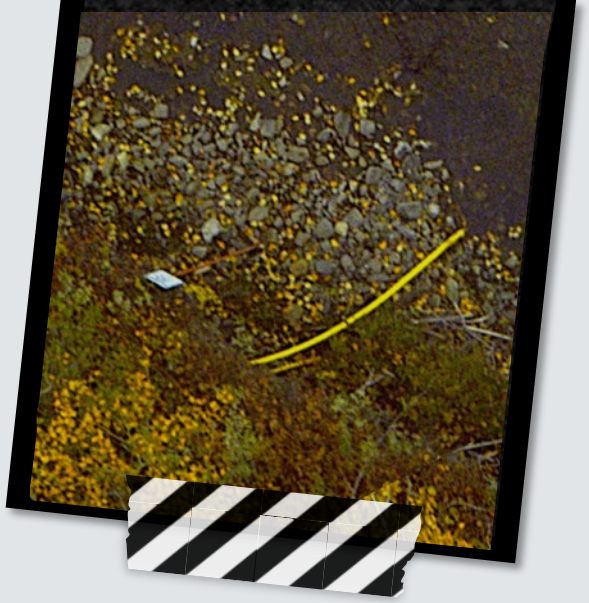

Use Cases
Fixed- wing

- Broad range with good resolution
- Areas with safety or noise concerns
- Linear asset inspections
- Smart meter reading

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Satellite Data Collection

- Altitude – >100 miles AGL
- Weather – limited
- Lift capabilities – huge range
- Range – huge area coverage
- Regulations – minimal
- Cost – high but decreasing significantly
- Trends – increasing usage

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Satellite Limitations

- Payload type
- Spatial resolution
- Time/angle limitations due to orbital parameters
- Feature type

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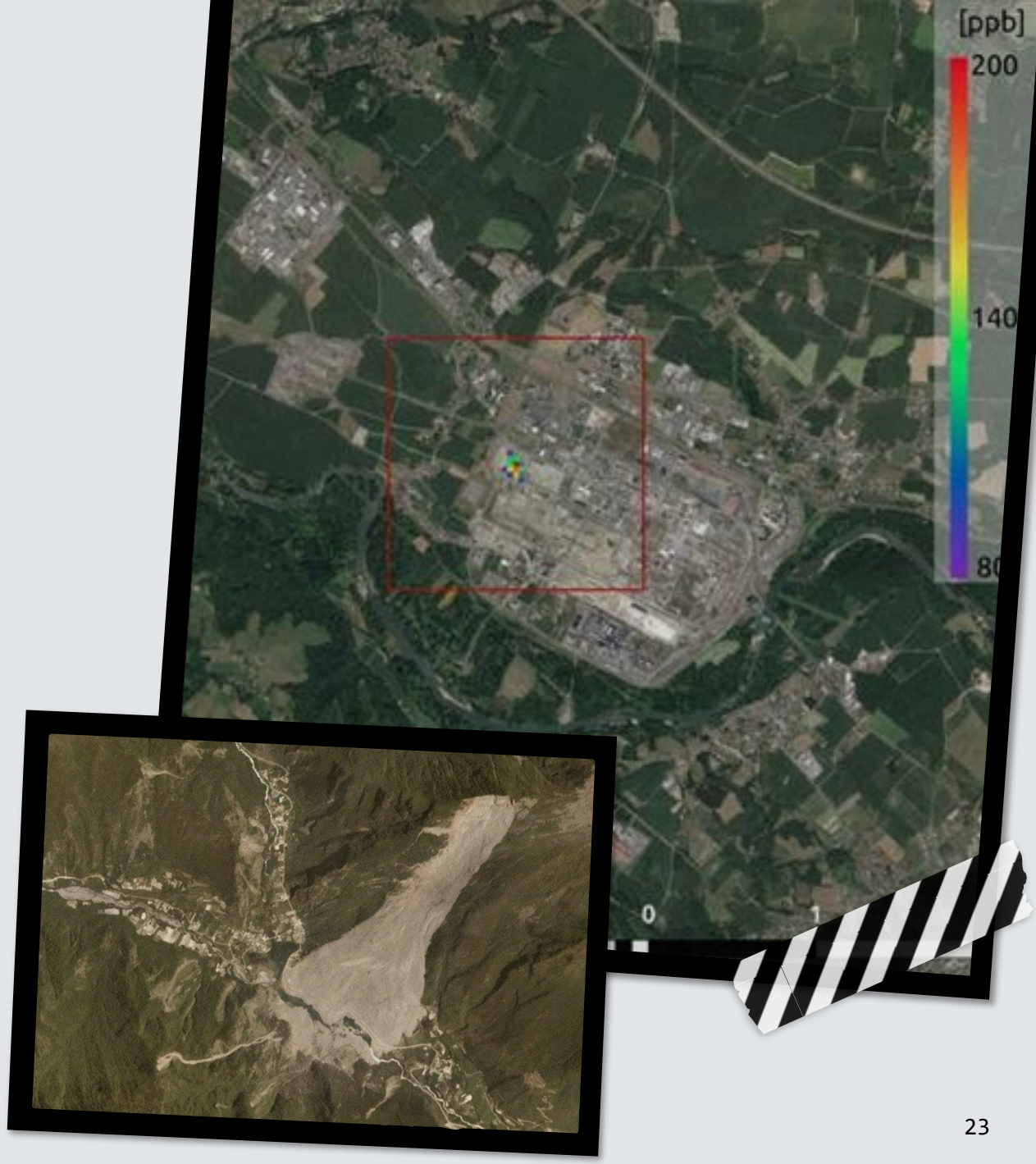
Use Cases Satellite

- Large coverage with moderate resolution
- Large scale disaster analysis
- Large scale system leak detection



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Conclusion

- Requirement Setting is Key!

- No platform is suitable for all things:
  + Aerial Unmanned – High resolution for smaller projects
  + Helicopter - Low altitude with heavy lift and hover capability
  + Fixed-wing - Broad range with good resolution
  + Satellite - Large coverage with moderate resolution