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Don't Look Up … or Down?! How Climate Change May Impact BC Contaminated Sites

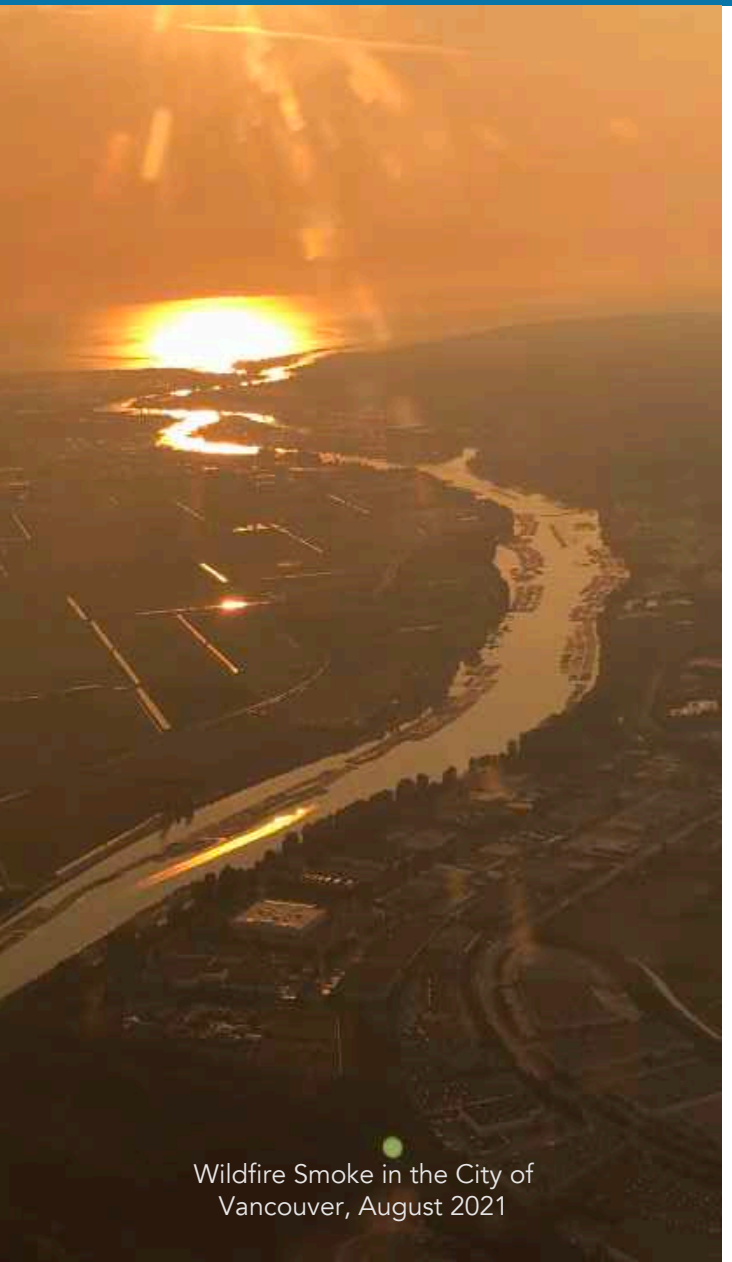
Leane Holloway, *G.I.T, Hydrogeologist*

AGENDA

1. Introduction
2. Climate Change Projections and Risks in BC Regions
3. Contaminant Fate and Transport Under a Changing Climate
    1. Lower Mainland Case Study
    2. Okanagan Case Study
4. Adapting BC Contaminated Sites to Climate Change
5. Key Take-Aways

Vancouver Seawall, Photo of District of West Vancouver

Introduction



Wildfire Smoke in the City of Vancouver, August 2021

- Climate change is already affecting BC:
  - ✓Heat waves
  - ✓Wildfires
  - ✓Extreme weather (rainfall, wind, snow)
  - ✓Flooding
  - ✓Landslide / rockslide / soil erosion
  - ✓Drought
  - ✓Sea level rise
- Variable climate impacts for different regions of BC.
- Potential impacts on contaminants behaviour, affecting contaminants fate and transport, plumes stability, risk assessments and remediations.
- Need to adapt BC contaminated sites to the changing climate.

Climate Change Projections and Risks by BC Region

South and West Coast Regions

- Projections
  - ✓ 2.5 to 3 times as many days over 25°C
  - ✓ 15% less summer rain by 2050s
  - ✓ 10% more rain in the fall
  - ✓ More intense and frequent extreme weather
  - ✓ Decrease in snowpack
- Possible Impacts
  - ✓ Increased risk of flooding
  - ✓ Increased risk of wildfire
  - ✓ Increased risk of landslide and soil erosion
  - ✓ Sea level rise

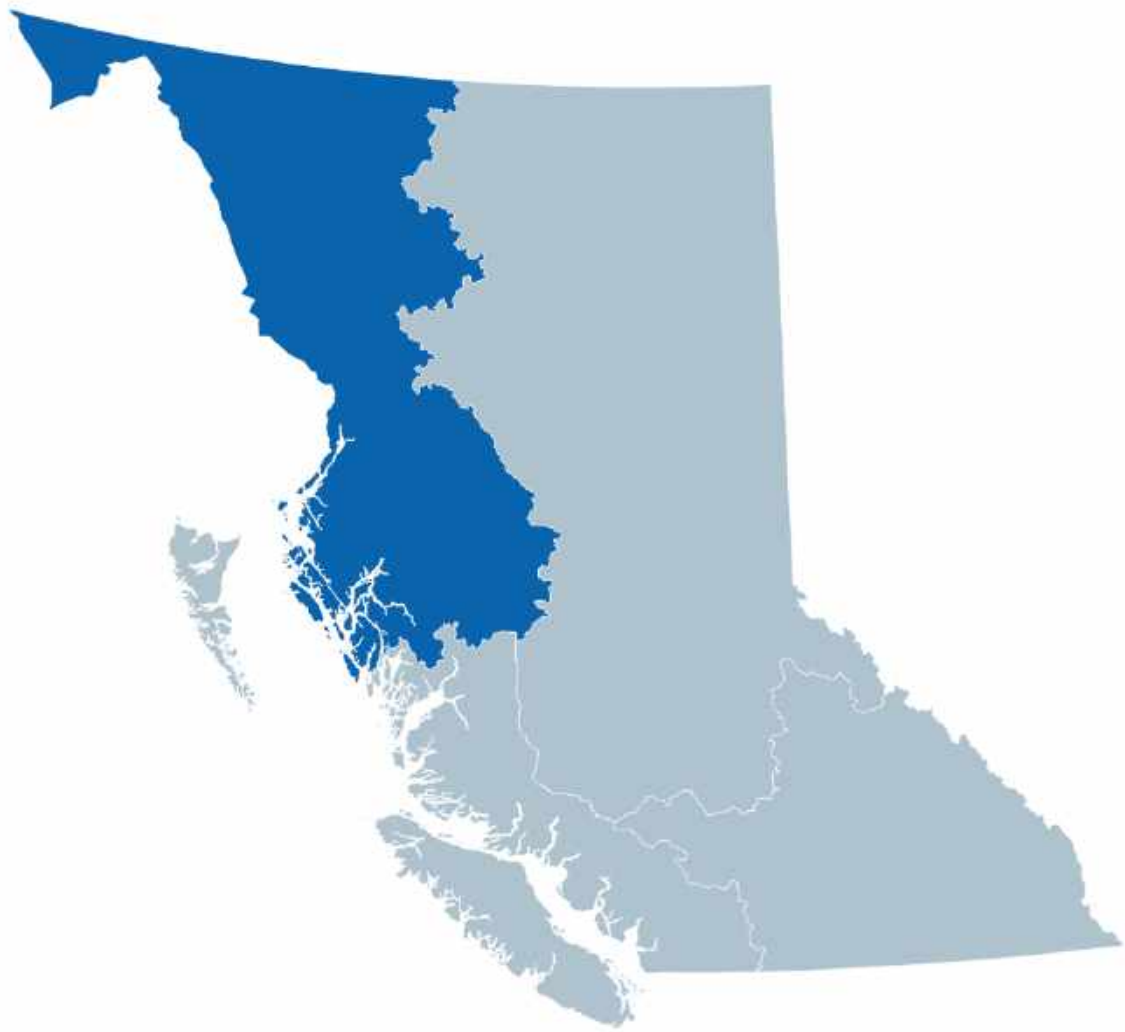
Regional projections from ReTooling for Climate change website.

Numeric projections are 2050s difference from 1971-2000 baseline (CMIP5).

Climate Change Projections and Risks by BC Region

Skeena Region

- Projections
  - ✓ 8 times as many days over 25°C
  - ✓ 30% fewer frost days
  - ✓ 15% more rain in the fall
  - ✓ More intense and frequent extreme weather
  - ✓ Decrease in snowpack
- Possible Impacts
  - ✓ Increased risk of flooding
  - ✓ Increased risk of wildfire
  - ✓ Increased risk of landslide and soil erosion
  - ✓ Sea level rise



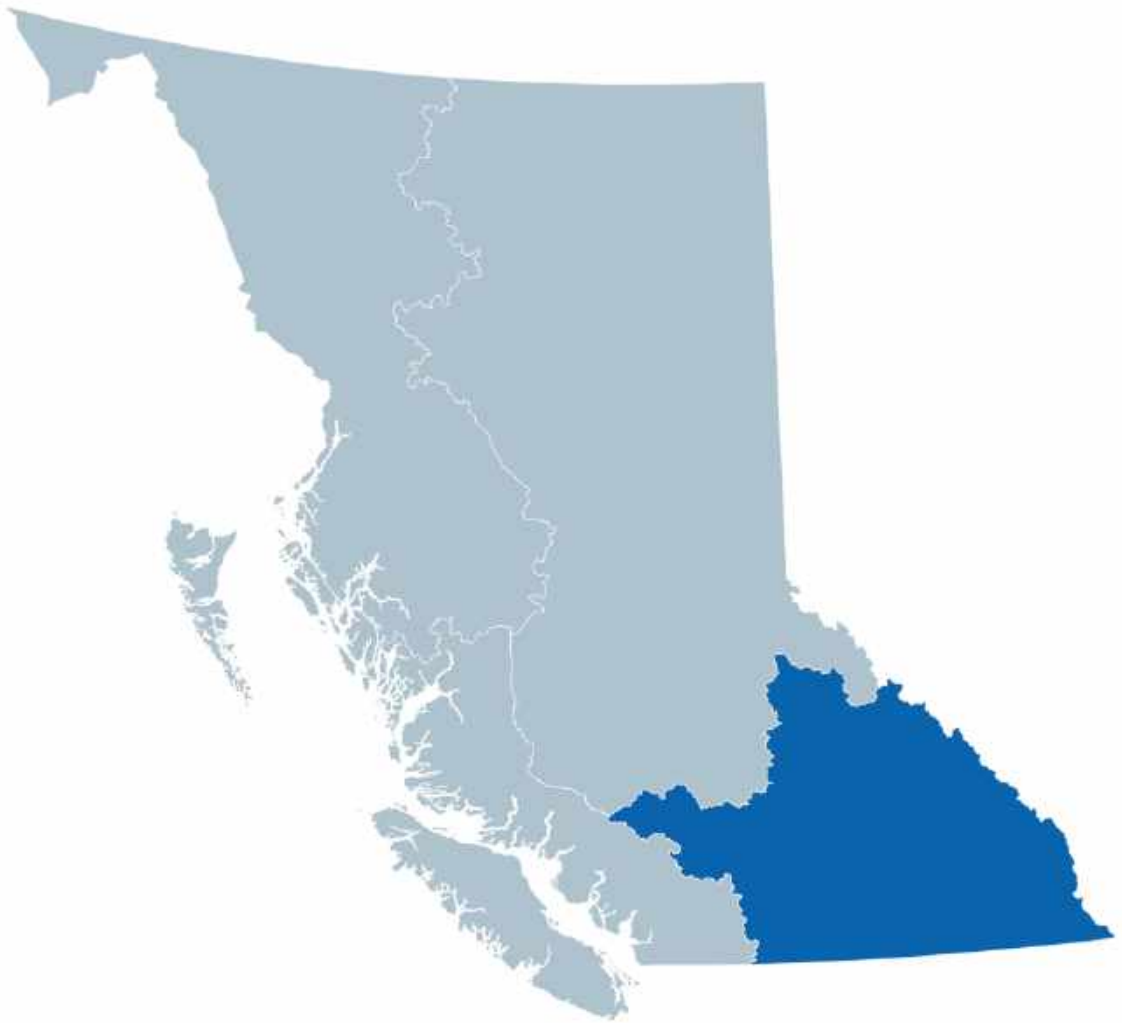
Regional projections from ReTooling for Climate change website.

Numeric projections are 2050s difference from 1971-2000 baseline (CMIP5).

Climate Change Projections and Risks by BC Region

Okanagan and Boundary Regions

- Projections
  - ✓ 3 times as many days over 30°C
  - ✓ 10% less summer rain by 2050s
  - ✓ 15% more rain in the spring
  - ✓ More intense and frequent extreme weather
  - ✓ Decrease in snowpack
- Possible Impacts
  - ✓ Increased risk of drought
  - ✓ Increased risk of wildfire
  - ✓ Increased risk of flooding
  - ✓ Increased heat stress



Regional projections from ReTooling for Climate change website.

Numeric projections are 2050s difference from 1971-2000 baseline (CMIP5).

Climate Change Projections and Risks by BC Region

Northeast, Omineca and Cariboo Regions

- Projections
  - ✓ 2 to 3 times as many days over 25°C
  - ✓ 15 to 30% more rain in the fall and spring
  - ✓ More intense and frequent extreme weather
  - ✓ Decrease in snowpack
- Possible Impacts
  - ✓ Increased risk of drought
  - ✓ Increased risk of wildfire
  - ✓ Increased risk of flooding
  - ✓ Increased heat stress

Regional projections from ReTooling for Climate change website.

Numeric projections are 2050s difference from 1971-2000 baseline (CMIP5).

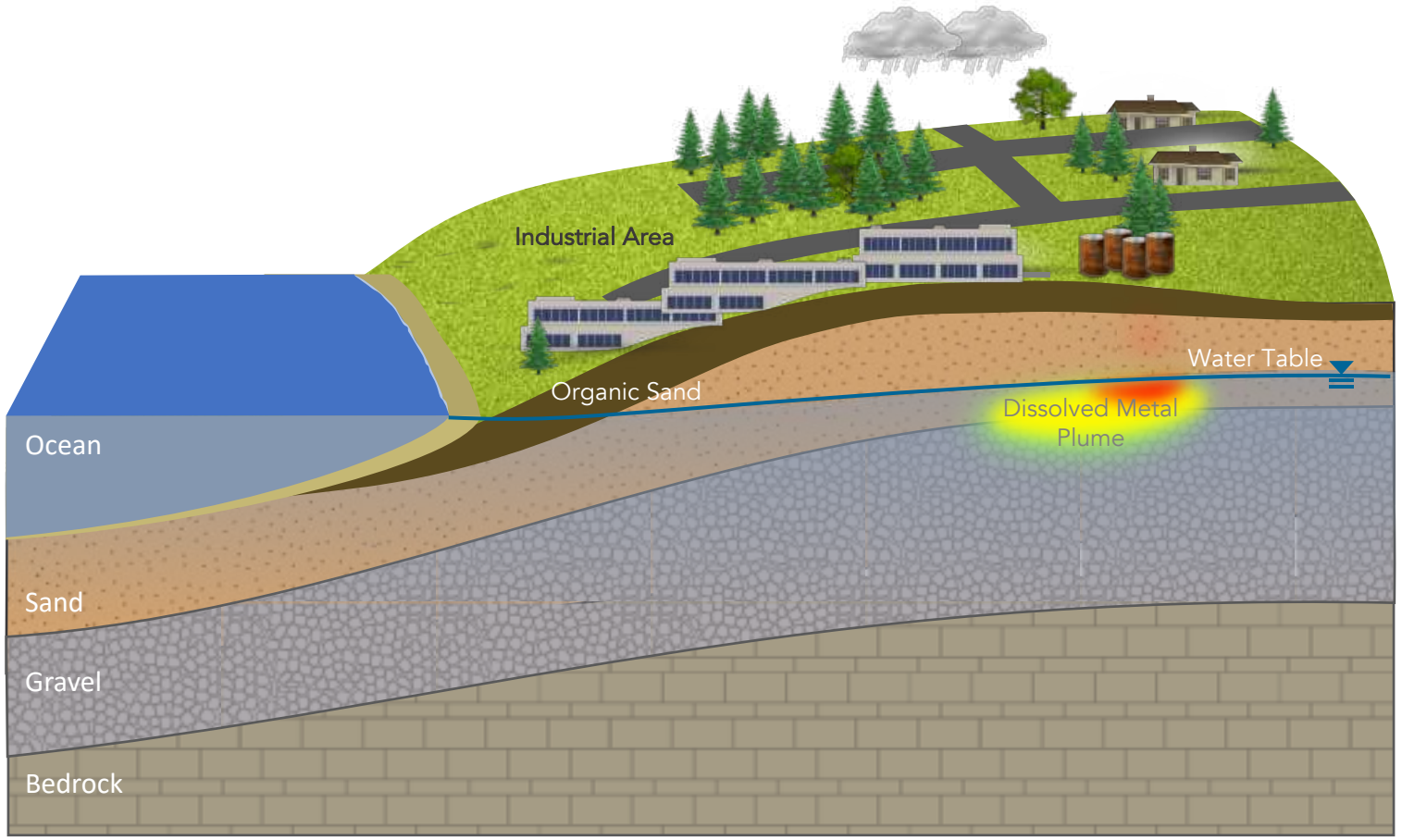
Contaminant Fate and Transport Under a Changing Climate

- Climate change impacts on fate and transport of contaminants are:
  - ✓ Complex
  - ✓ Challenging to predict
  - ✓ Site-specific
- Requires an understanding of:
  - ✓ Site-specific groundwater recharge
  - ✓ Site geology
  - ✓ Site contaminant properties
  - ✓ Site contaminant source location
  - ✓ Site contaminant transport processes
- Two Conceptual Site Models (CSM) examples:
  - ✓ Coastal BC ⟹ Lower Mainland
  - ✓ Interior BC ⟹ Okanagan

Drought in British Columbia, Photograph: CBC

Contaminant Fate and Transport Under a Changing Climate

Example 1 of CSM in the Lower Mainland

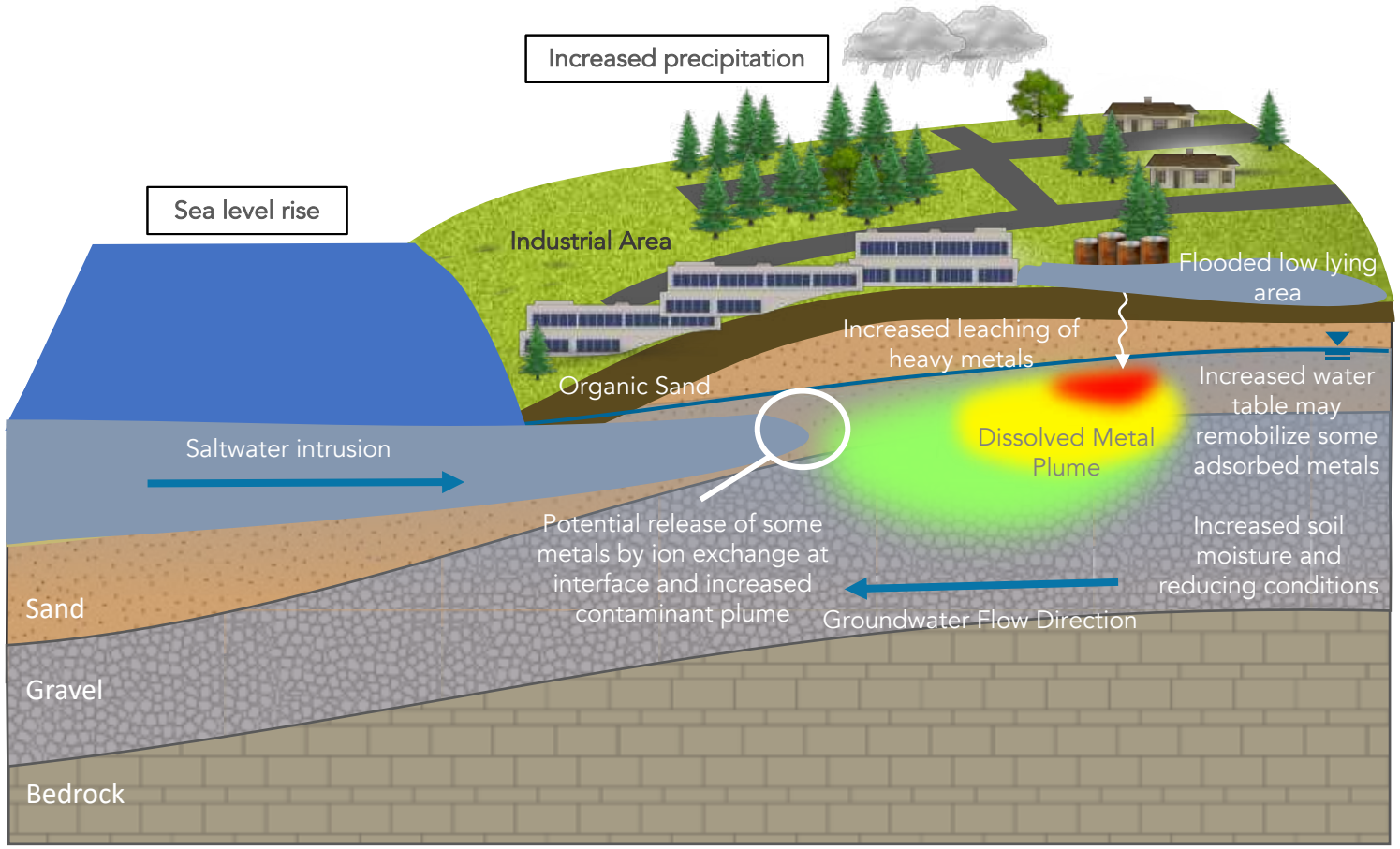


*Modified from the Health Canada CSM Builder Tool (2015)

Contaminant Fate and Transport Under a Changing Climate

Potential Impacts of Climate Change on Contaminated Sites in the Lower Mainland

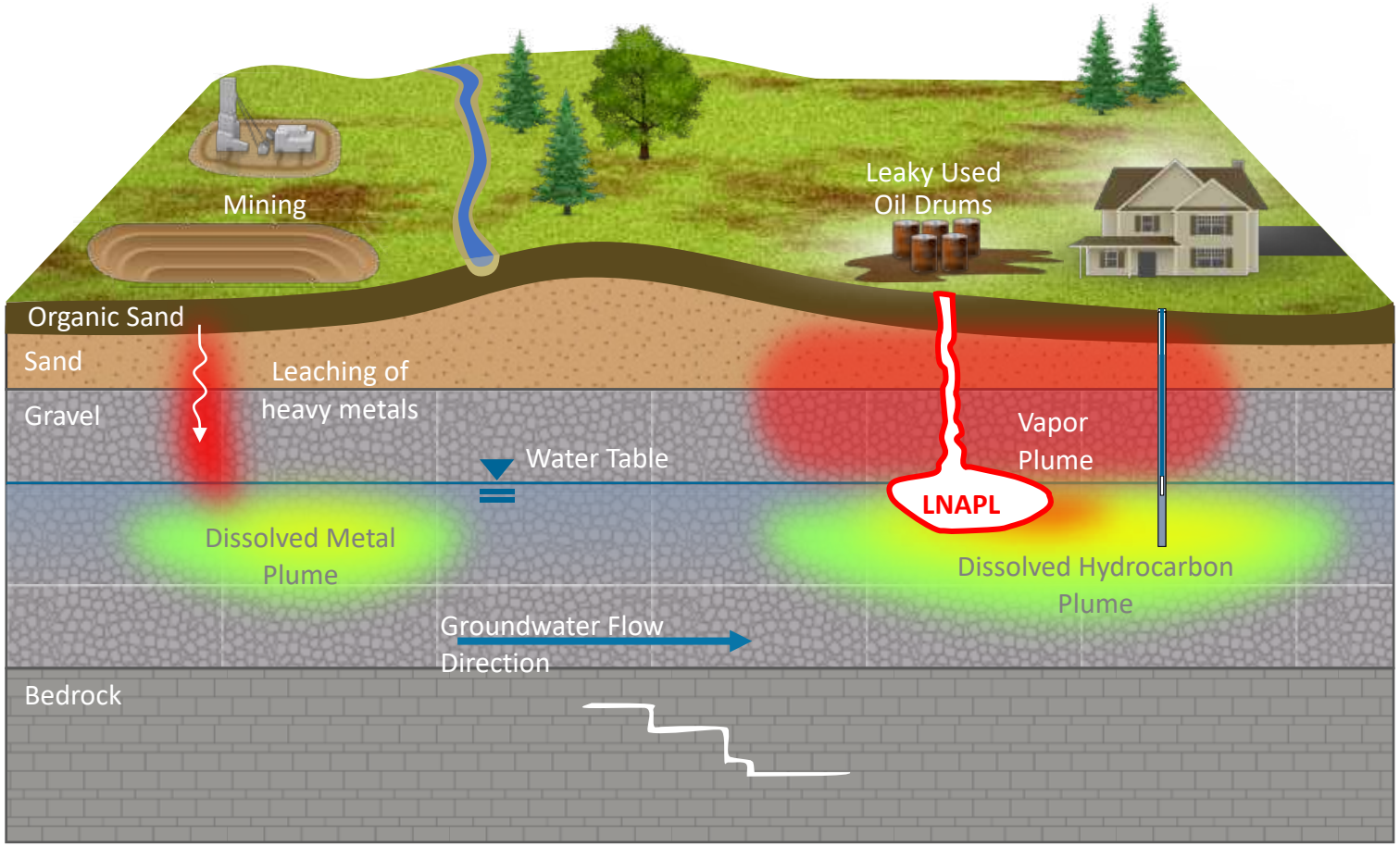
- Sea level rise
- Flooding



*Modified from the Health Canada CSM Builder Tool (2015)

Contaminant Fate and Transport Under a Changing Climate

Example 2 of CSM in the Okanagan Region

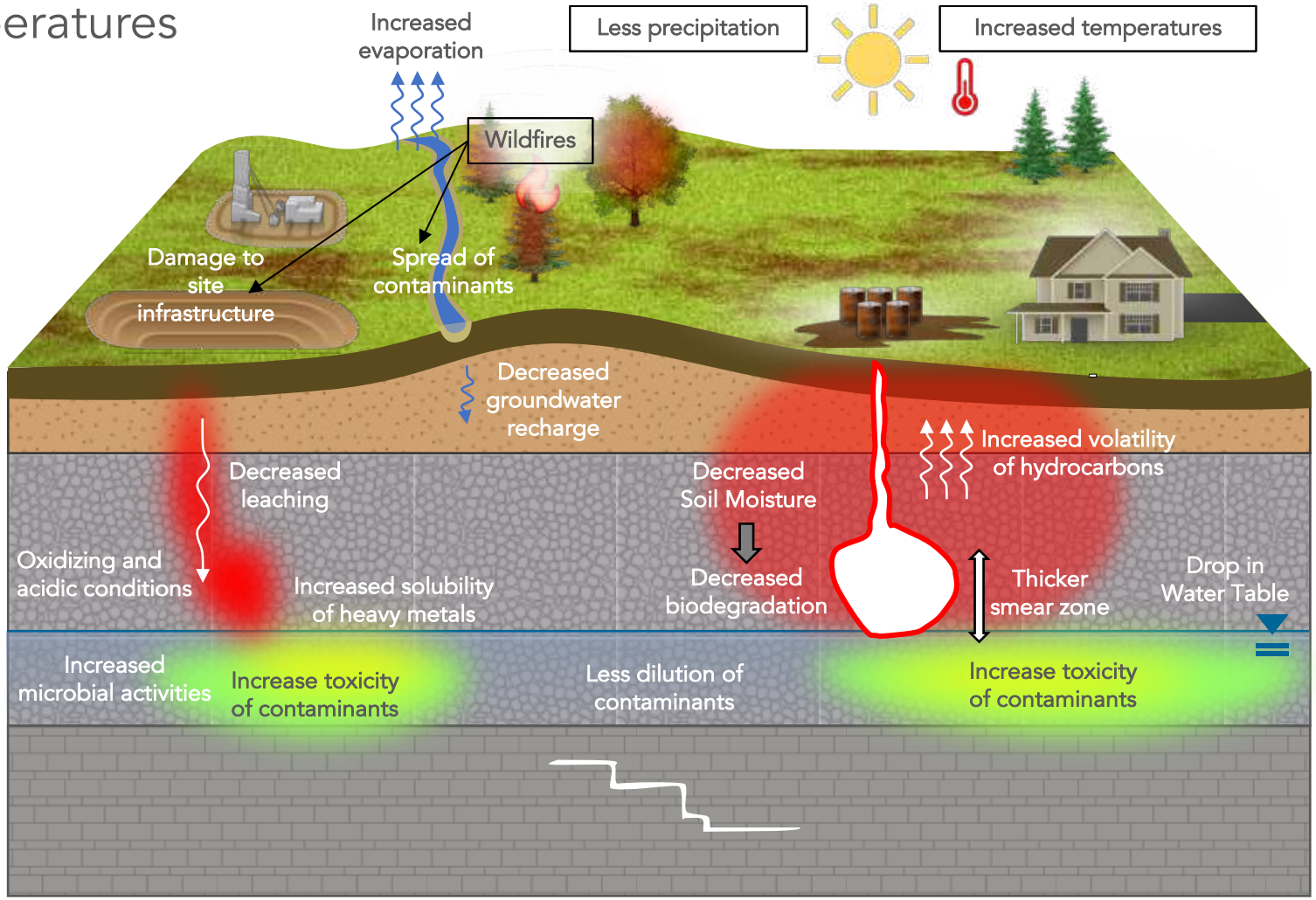


*Modified from the Health Canada CSM Builder Tool (2015)

Contaminant Fate and Transport Under a Changing Climate

Potential Impacts of Climate Change on Contaminated Sites in the Okanagan Region

- Increased temperatures
- Drought
- Wildfires



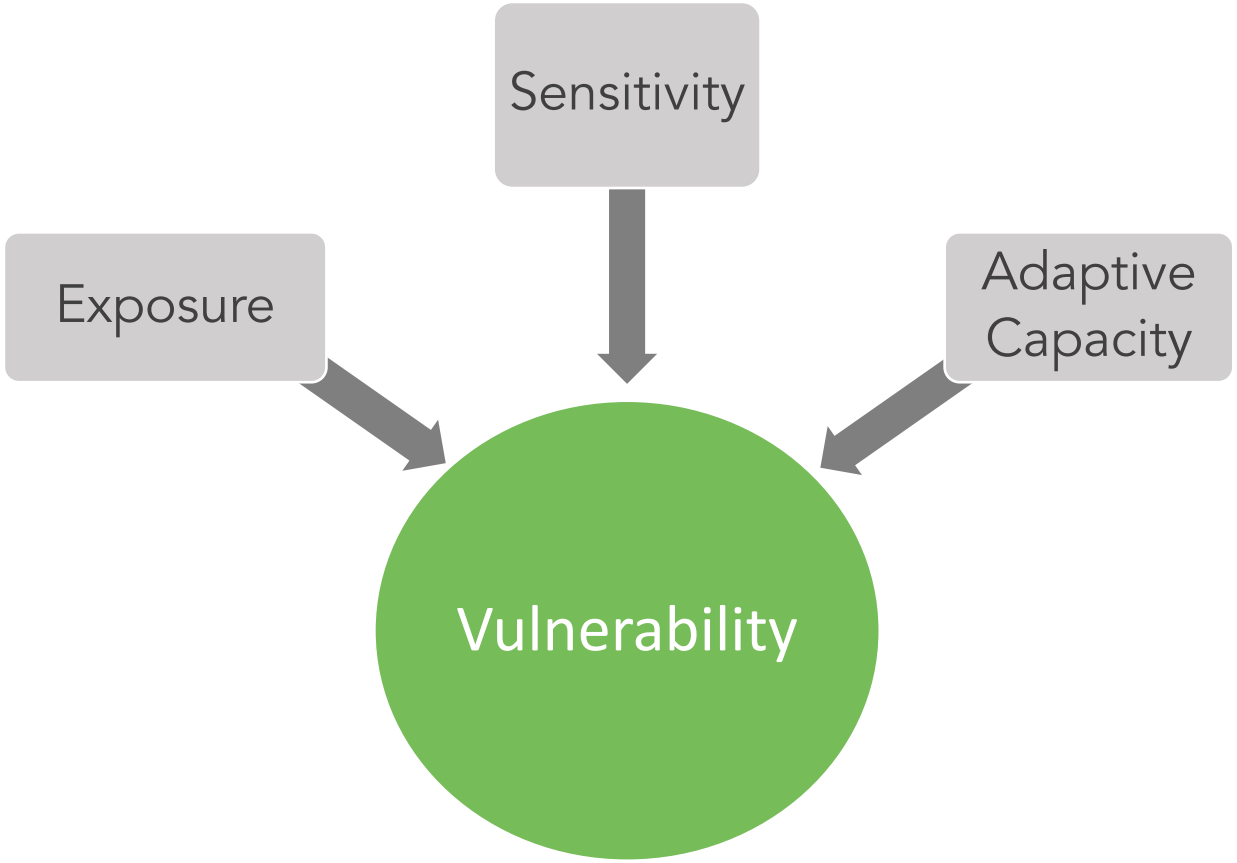
*Modified from the Health Canada CSM Builder Tool (2015)

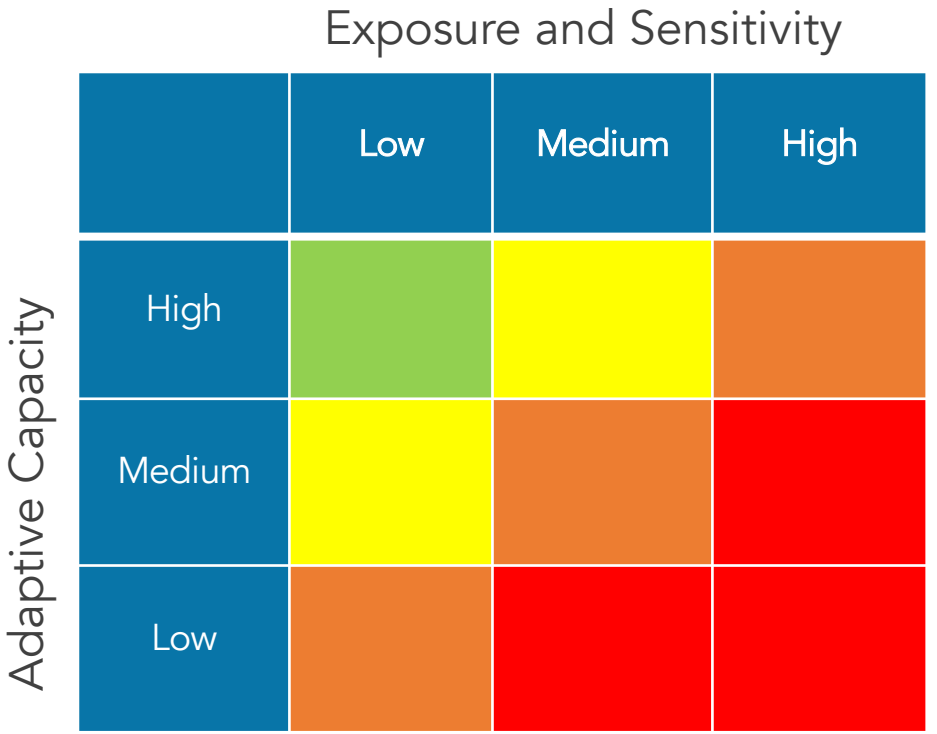
Adapting BC Contaminated Sites to Climate Change

*Adapted from State of Washington Department of Ecology Adaptation Strategies for Resilient Cleanup Remedies

Adapting BC Contaminated Sites to Climate Change

Climate Change Site-Specific Vulnerability Assessment





Adapting BC Contaminated Sites to Climate Change

Climate Change Site-Specific Risk Assessment

- What is the risk to the site?
- Conceptualize the site for in-depth knowledge
- Identify AECs and categorize the impacts of each AEC (onsite and offsite) by determining probability and potential consequences.

Abbotsford Flooding Photograph:
City of Abbotsford/AFP/Getty Images

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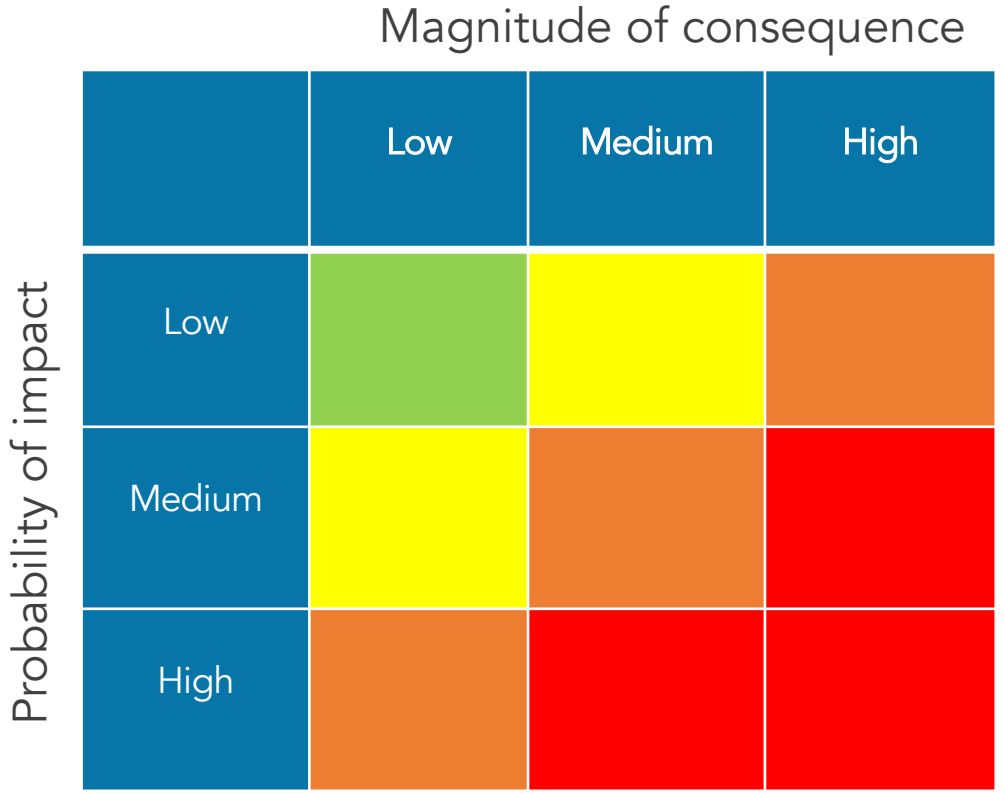
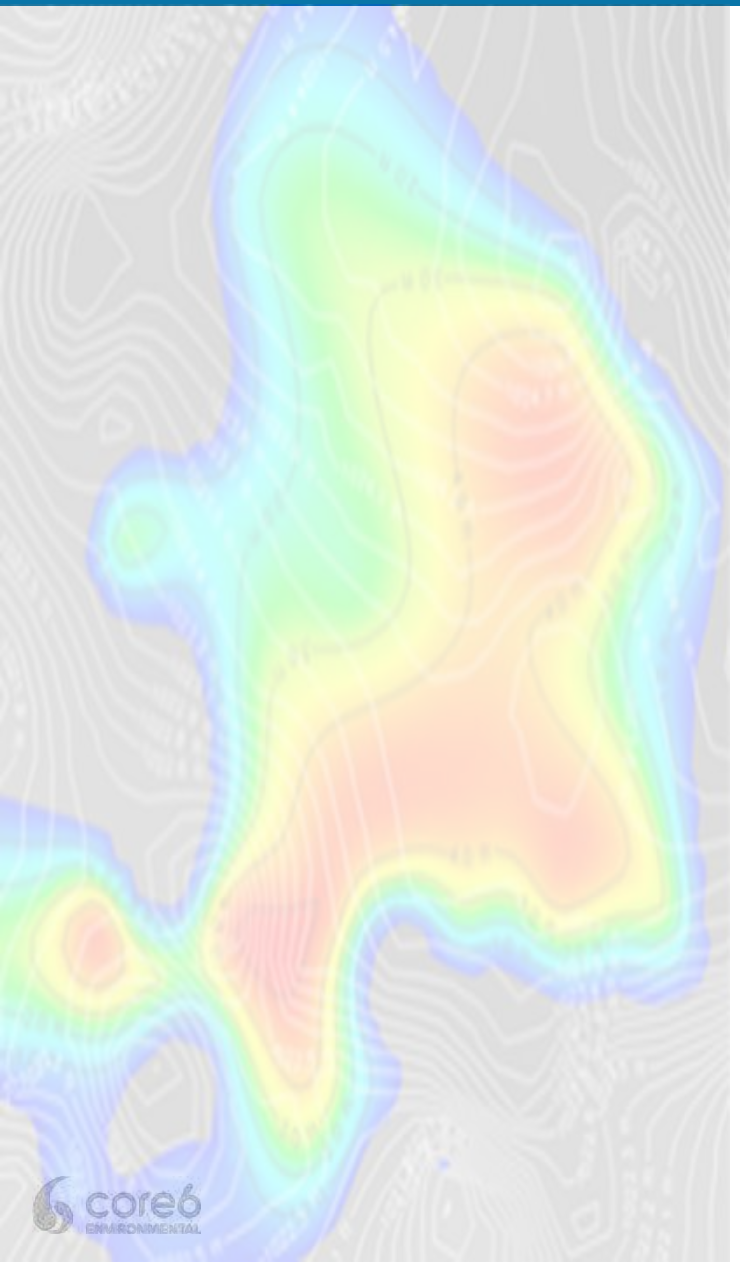
Adapting BC Contaminated Sites to Climate Change

Climate Change Site-Specific Risk Assessment

- Identify risk to site
  - ✓Low risk – only requires monitoring
  - ✓Moderate risk – requires some adaptation measures, remediation, additional monitoring
  - ✓High to very high risk – potential severe impact requiring remediation



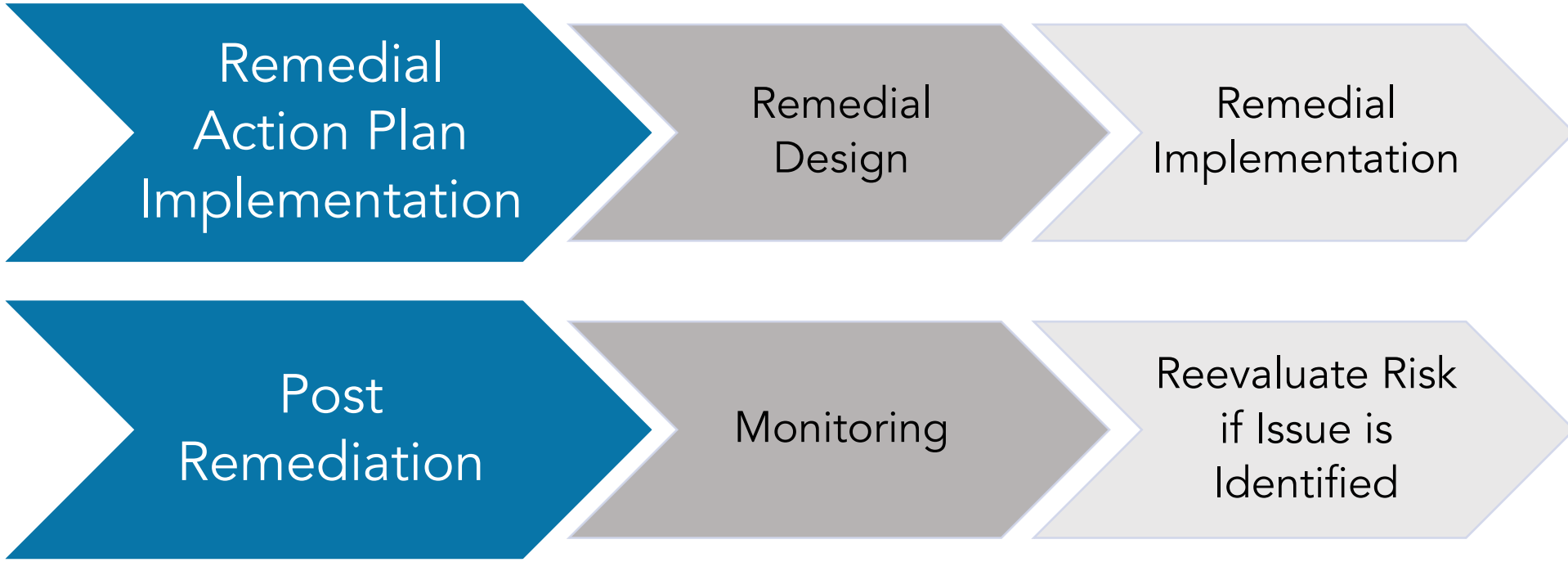
Adapting BC Contaminated Sites to Climate Change



Feasibility Study and Remedial Action Plan (RAP)

- Screen and evaluated potential adaptation and remediation options.
- Select the best option.
- Ensure option's resilience to climate change factors over appropriate timeline.
- Prioritize AECs and associated timeline for implementation.
- Create RAP

Adapting BC Contaminated Sites to Climate Change



*Adapted from State of Washington Department of Ecology Adaptation Strategies for Resilient Cleanup Remedies

Key Take-Aways

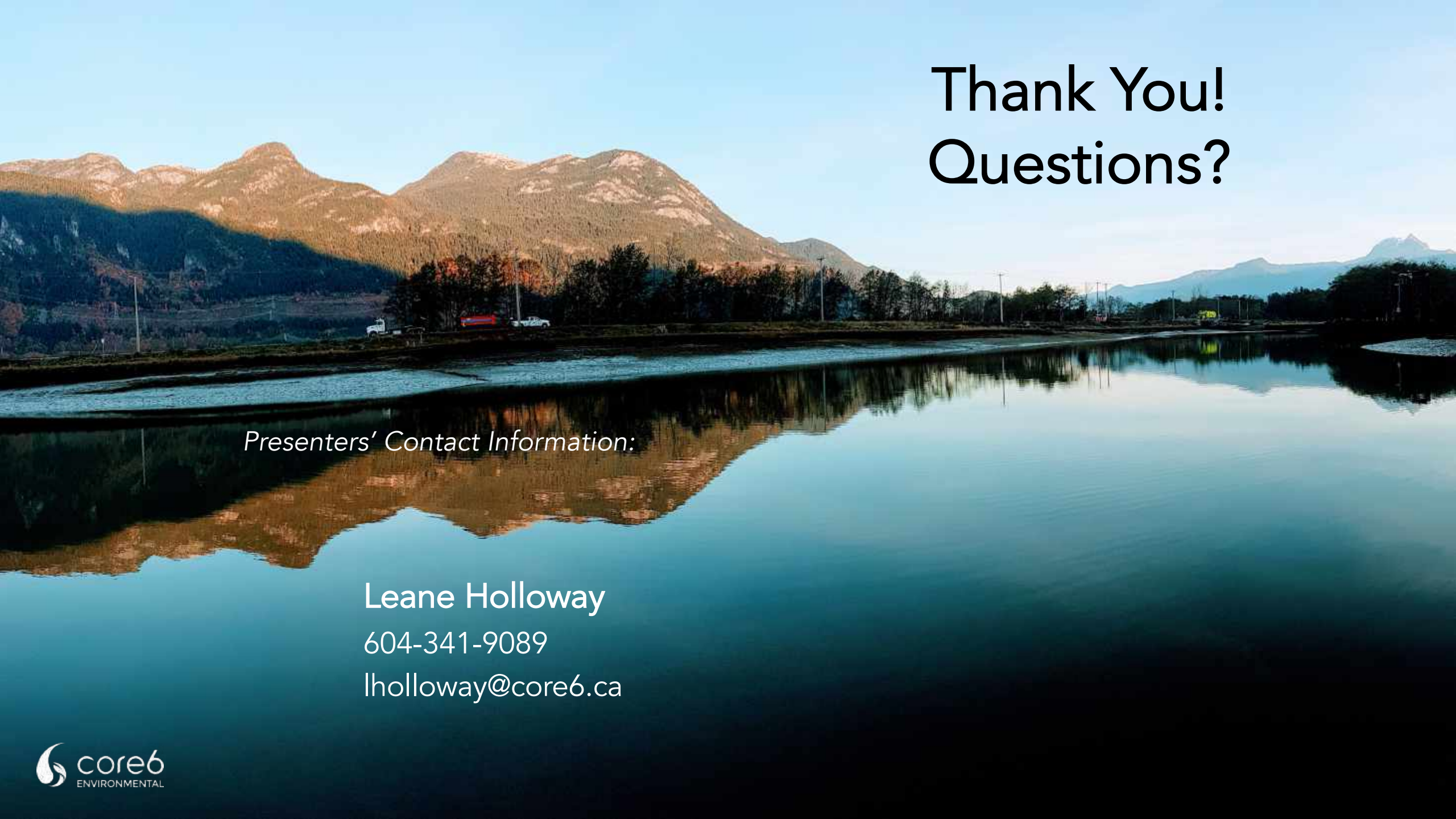
Vernon Wildfire, Photograph: Vernon Morning Star

- Variable climate change projections and impacts in different regions of BC.
- Effects of climate change on contaminant fate and transport are complex and site-specific.
- A good understanding site-specific fate and transport processes is key.
- Make your contaminated site projects more resilient to climate change by conducting Vulnerability Assessments.
- Select more sustainable and resilient remediation options by completing a Feasibility Study.

Adapting BC Contaminated Sites to Climate Change

Resources and References

- UN Intergovernmental Panel on Climate Change (IPCC)
- CCME Guidance on Good Practices in Climate Change Risk Assessment
- Interactive maps, GIS layers, projection reports (iMapBC, ClimateData.ca, ClimateAtlas.ca, ArcGIS/ESRI, Metro Vancouver)
- BC Protocols
- BC Contaminated Site Regulation (CSR)
- Retooling for Climate Change, https://retooling.ca/
- *Adaptation Strategies for Resilient Remedies* guidance (Ecology, 2017).



Thank You!
Questions?

Presenters' Contact Information:

Leane Holloway
604-341-9089
lholloway@core6.ca

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