Natural Assets:
The Missing Piece of the Asset Management Puzzle

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Agenda

- Natural Asset Management Methodology
- City of Vancouver Parks Board Asset Management Plan
- Township of Langley Natural Capital Asset Management Plan
- Q&A

Natural AM Methodology

What is Natural Asset Management Planning?

- A strategy for identifying, evaluating, and planning for the earth's stock of natural resources that yield a flow of benefits to people[1].

- These natural resources may include soil, air, water, flora and fauna, as well as the goods and services provided by nature known as ecosystem goods and services[1].
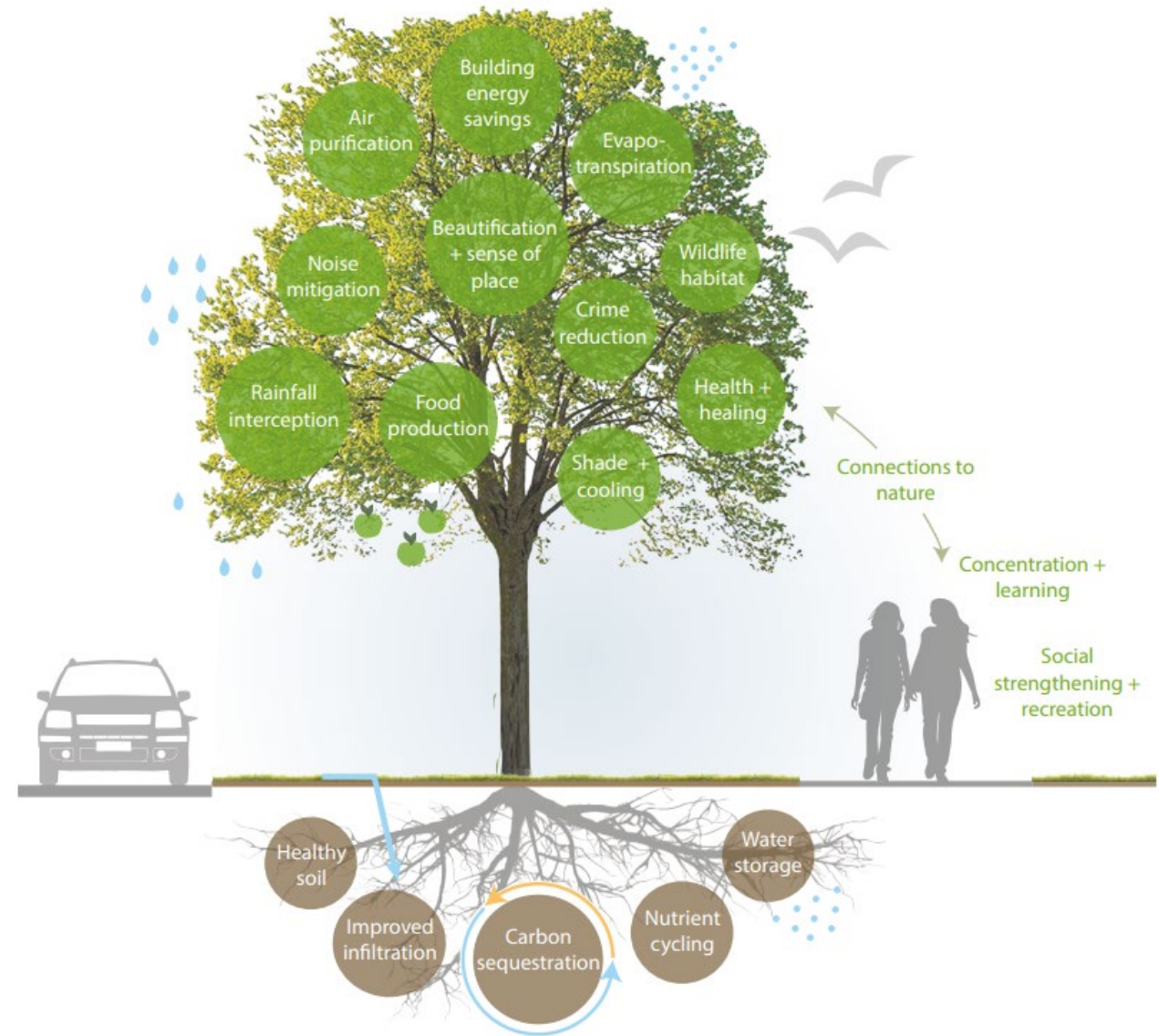
The Value of Vancouver's Urban Forest[2]

1. World Forum on Natural Capital, 2017.
2. Urban Forest Strategy: 2018 Update, City of Vancouver (2018). Retrieved from https://vancouver.ca/files/cov/urban-forest-strategy.pdf

aecom.com

Natural Asset Management Methodology: The Strategic Approach

Natural Asset Management Methodology: The Tactical Approach

1 What is the state of infrastructure?

2 What is the Level of Service (LoS)?

3 What is the Asset Risk?

1.1 Inventory Assets
1.2 Assess Condition
1.3 Determine Residual Life
2.1 Determine LoS
3.1 Consequence x Probability =Risk

4.1 Asset Acquisition Strategies
4.2 Operations and Maintenance Strategies
4.3 Renewal and Replacement Strategies
4.4 Disposal Strategies
5.1 25-Year Funding Needs
6.1 Recommendations for Continuous Improvement

4 What are the asset lifecycle strategies?

5 What are the funding needs?

6 How can AM Planning be improved?

The Relationship between Natural Assets, Enhanced Assets & Engineered Assets[4]

Green Infrastructure

Natural Assets:

Wetlands, Forests, Lakes, Rivers Fields, Soil

Engineered Assets:

Permeable Pavement, Green Roofs, Rain Barrels, Living Walls

Enhanced Assets:

Rain Gardens, Bioswales, Urban Trees, Stormwater, Ponds, Turf

4.   NAI, Defining and Scoping Municipal Natural Assets, 2017.

City of Vancouver
Parks Board Asset Management Plan

Project Scope

- 300+ parks and open space sites distributed across the City

- Over 1,400 hectares (~10% of municipal land)

- Approximately $1.4 B asset portfolio*

*2023 dollars (inflated at 2% from 2021 unit costs); excludes Park Facilities and land.

# Phase 1: Asset Data Gap Assessment

AECOM conducted an **asset data gap assessment** to determine the confidence in the current asset data and to better understand:

- Where is the asset data recorded?

- What is the quality of the asset data?

- What is the confidence in the data?

Key Improvement Initiatives:
- ✓ Consolidate the parks asset data
- ✓ Enhance data collection efficiency and accuracy
- ✓ Close asset data gaps
- ✓ Align asset hierarchy with industry best practice
- ✓ Develop a Data Governance Framework
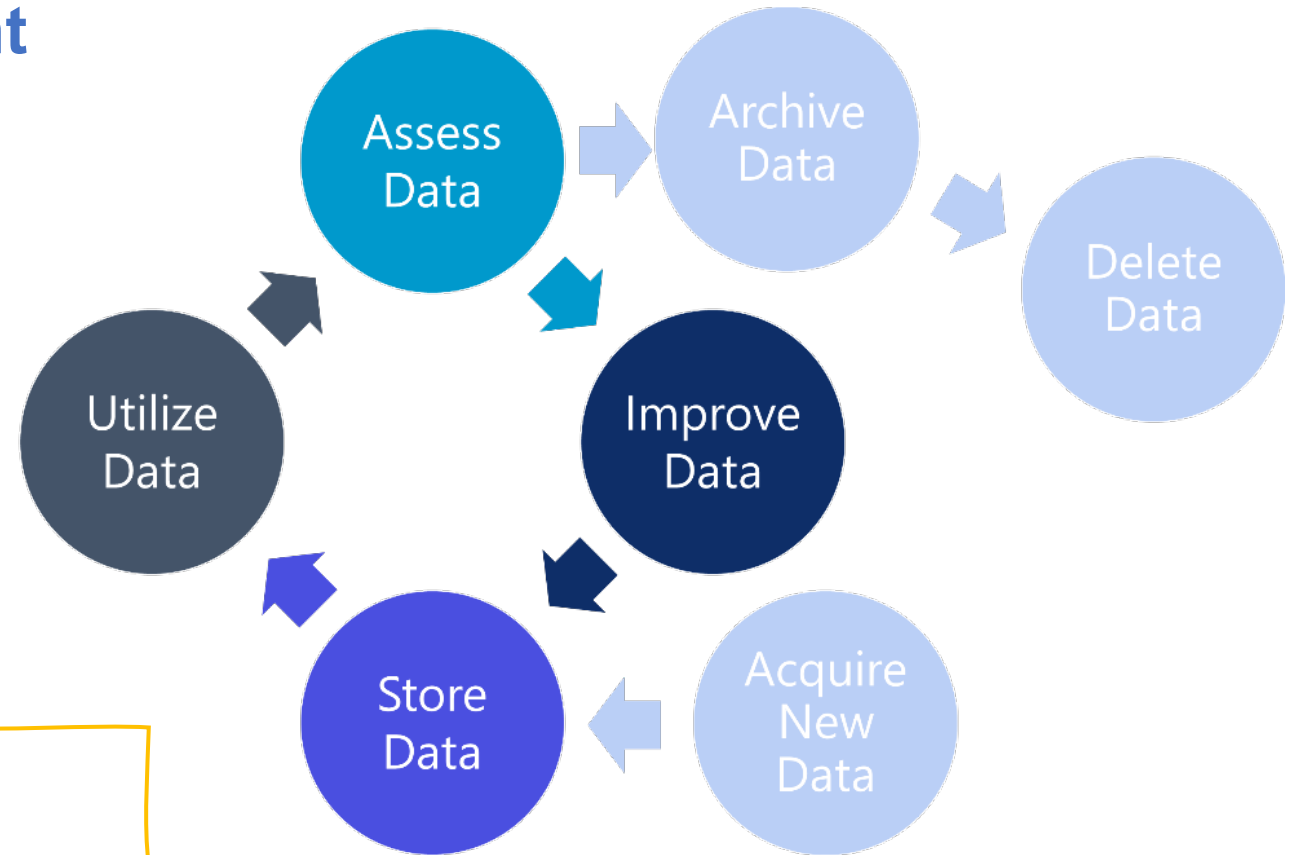
The Asset Information Lifecycle

Phase 2: Current State of the Assets

Expected Service Lives (ESLs):

- **Engineered Assets:** ESLs were assigned based on the Park Board's Tangible Capital Asset (TCA) Policy, industry standards, and discussion with key staff

- **Natural Assets:** ESLs were not assigned as age is not always an indictor of replacement or health of the asset
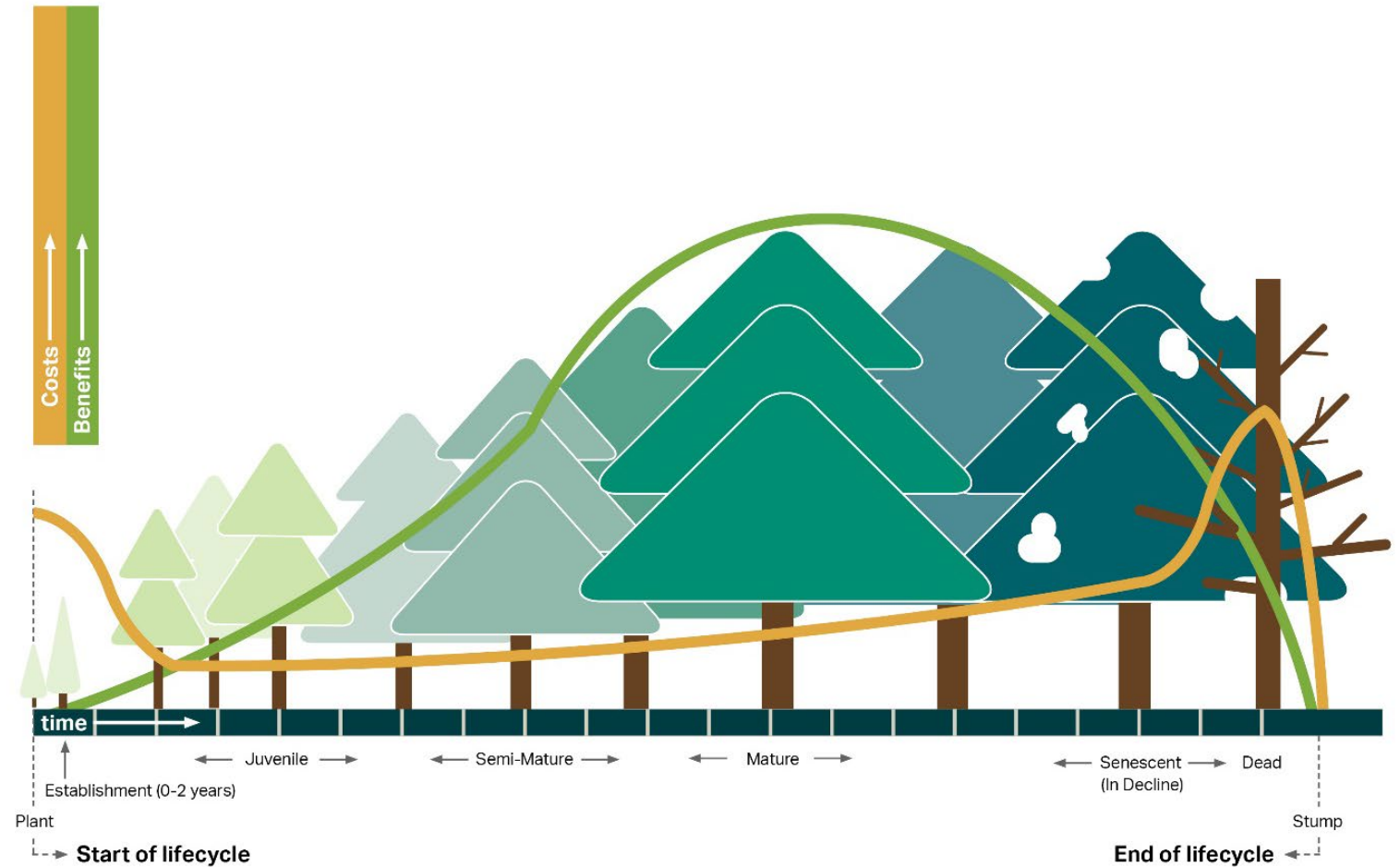
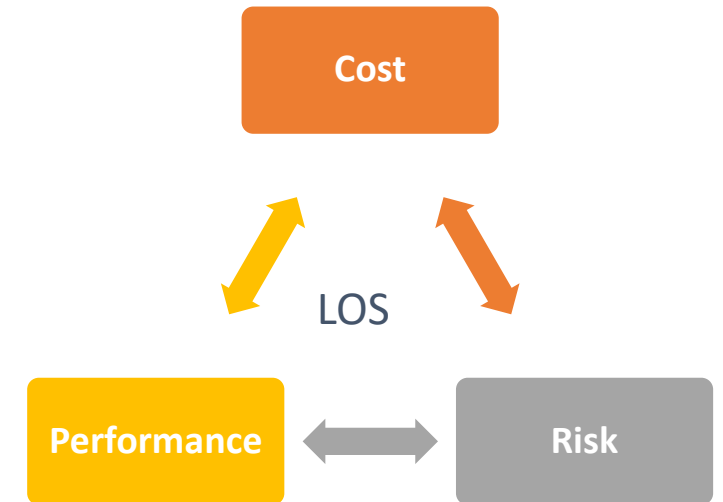*The Life Stages of a Tree in Relation their Benefits and Management Costs[5]*

Phase 3.1: Levels of Service (LoS)

Stakeholder Value	LoS Performance Measures
Safe, Clean & Accessible	% of tennis courts in good condition annually
	# of hazardous trees removed
	% increase of available hours of play on field sports by 2040
	# of new universally accessible playgrounds per year
Connections & Network	Average neighbourhood parkland area per 1,000 people
	% increase of tree canopy coverage across the City per year
Protect & Acquire	Total area of natural areas restored or enhanced per year
	# of street trees planted per year
Responsive	Annual average response time to respond to Priority Code 1 requests
	Annual average response time to clear ice/snow from parking lots
Diversity	Annual street tree density in below average blocks

Sample LOS Framework

Key Improvement Initiatives:
- ✓ Refine the LOS Framework
- ✓ Monitor service levels and adjust targets as needed
- ✓ Develop a Stakeholder Engagement & Communication Plan

Cost

LOS

Performance

Risk

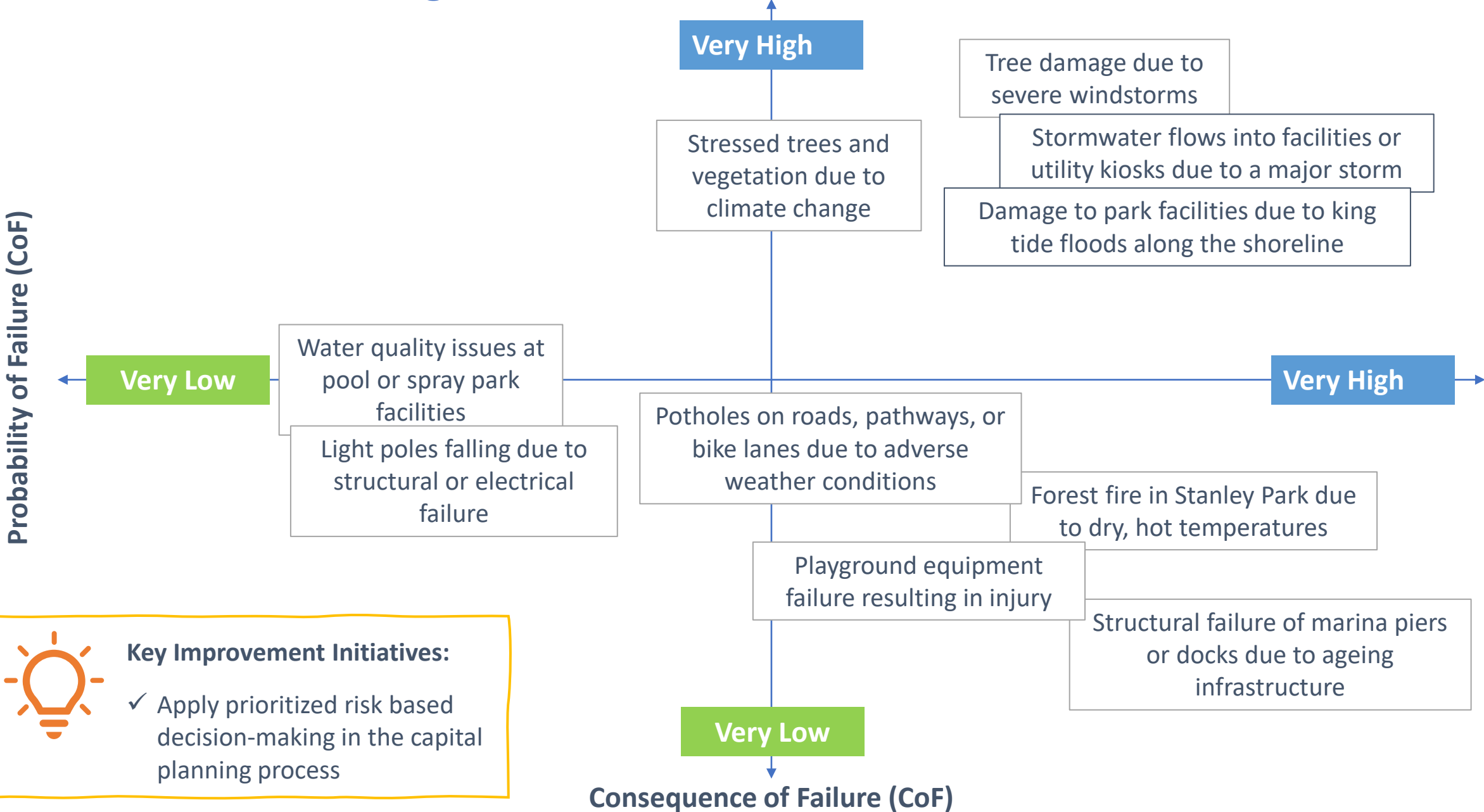# Phase 3.2: Climate Change Adaptation Strategies

Key Improvement Initiatives:

- ✓ Increase system resilience when assets are replaced at the end of their service life

- ✓ Incorporate green initiatives

- ✓ Continual application and development of emergency preparedness strategies

Service Impact	Adaptation Strategies *(Retreat, Resist, or Accommodate)*
Coastal park flooding with submersion of parkland and pathways	• Dike system • Acquire land for new parks at higher elevations • Raise pathways and other critical infrastructure • Temporary closures
Erosion of seawall and deterioration of foreshore infrastructure	• Hardscaping • Relocation of critical infrastructure (where possible)
Stressed (and possible loss of) vegetation	• Plant different species that are better suited for projected climatic changes • Install new irrigation systems • Review soil matrix to ensure appropriate water retention
Forest fires	• Emergency response plans for critical parks (i.e., Stanley Park Forest Management Plan) • Temporary park closures
Increased stormwater runoff	• Control runoff in parks through grey or green infrastructure

Image Source: https://vancouver.ca/news-calendar/floating-days-are-over-for-barge-at-english-bay.aspx

Sample Climate Change Adaption Strategy

Phase 3.3: Risk Management

Probability of Failure (CoF) *(vertical axis)*

Very High *(top)*

Very Low ← *(left)*

Very High → *(right)*

Very Low *(bottom)*

Consequence of Failure (CoF) *(horizontal axis)*

Tree damage due to severe windstorms

Stressed trees and vegetation due to climate change

Stormwater flows into facilities or utility kiosks due to a major storm

Damage to park facilities due to king tide floods along the shoreline

Water quality issues at pool or spray park facilities

Light poles falling due to structural or electrical failure

Potholes on roads, pathways, or bike lanes due to adverse weather conditions

Forest fire in Stanley Park due to dry, hot temperatures

Playground equipment failure resulting in injury

Structural failure of marina piers or docks due to ageing infrastructure

Key Improvement Initiatives:

✓ Apply prioritized risk based decision-making in the capital planning process

Phase 3.4: AM Lifecycle & Capital Planning

Three reinvestment scenarios were evaluated:

- Scenario 1: Average annual expenditure of $31M (unconstrainted)
- Scenario 2: Average annual expenditure of $20M (~65% of unconstrained budget)
- Scenario 3: Average annual expenditure of $15M (~48% of unconstrained budget)

A sustainable funding level for asset renewal and replacement is essential to ensure that the asset backlog is eliminated and that no assets last beyond their expected service lives.
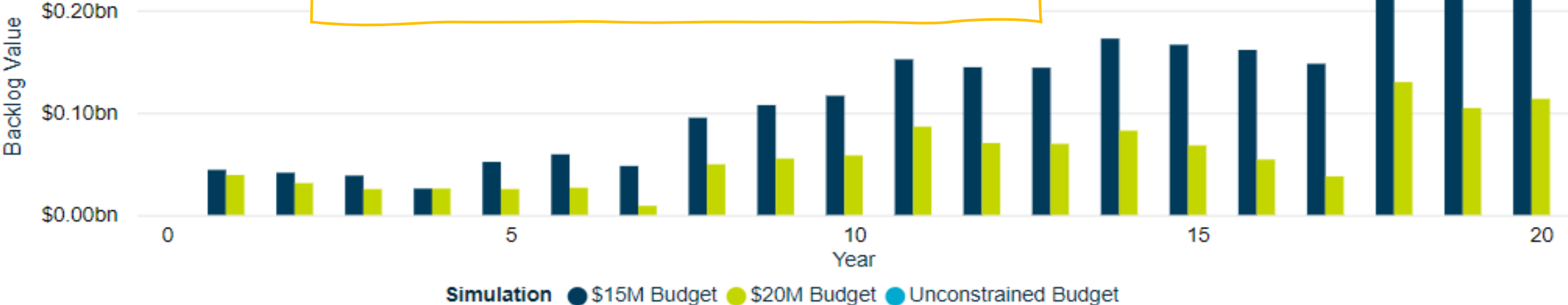
Infrastructure Backlog for the Three Different Funding Scenarios
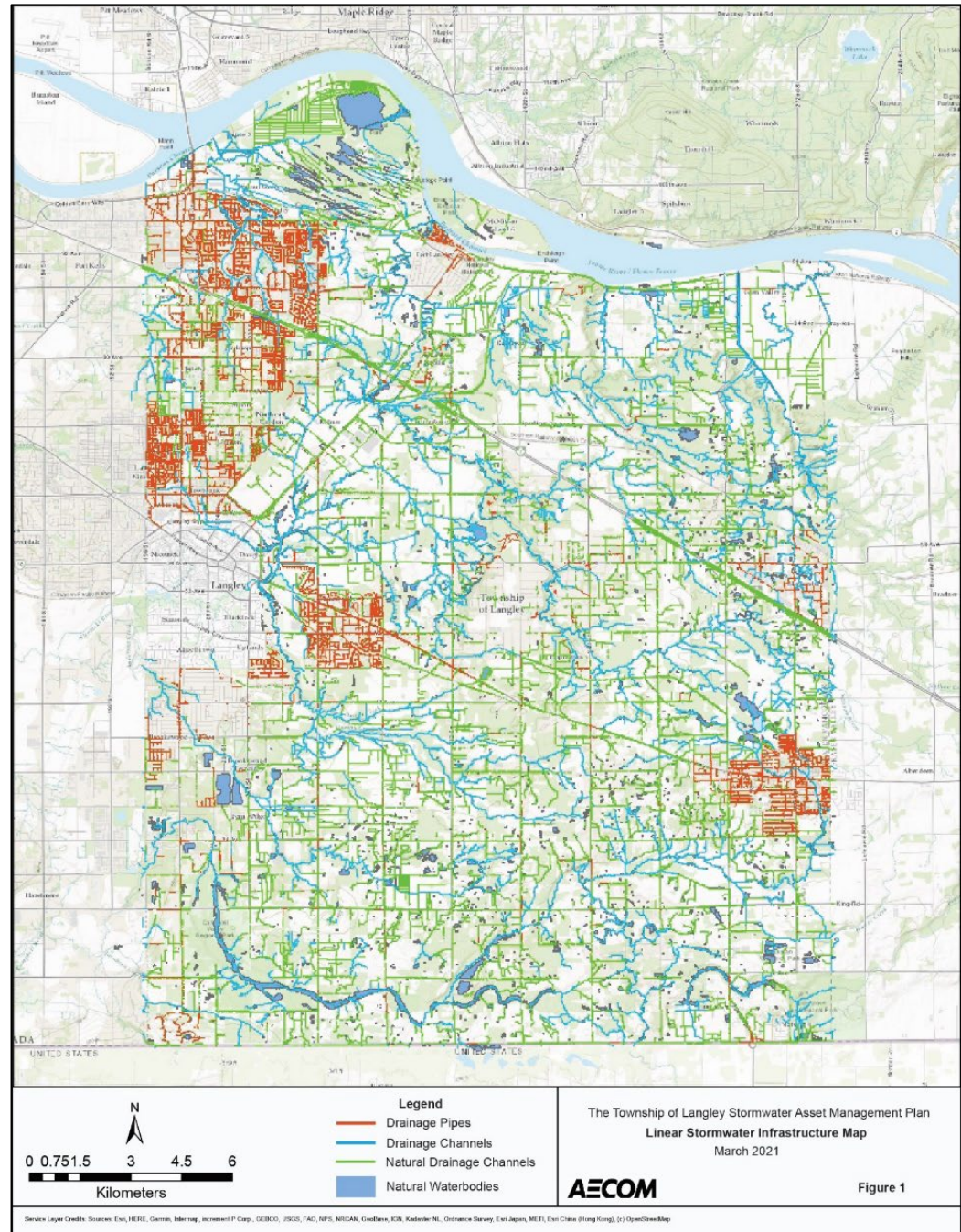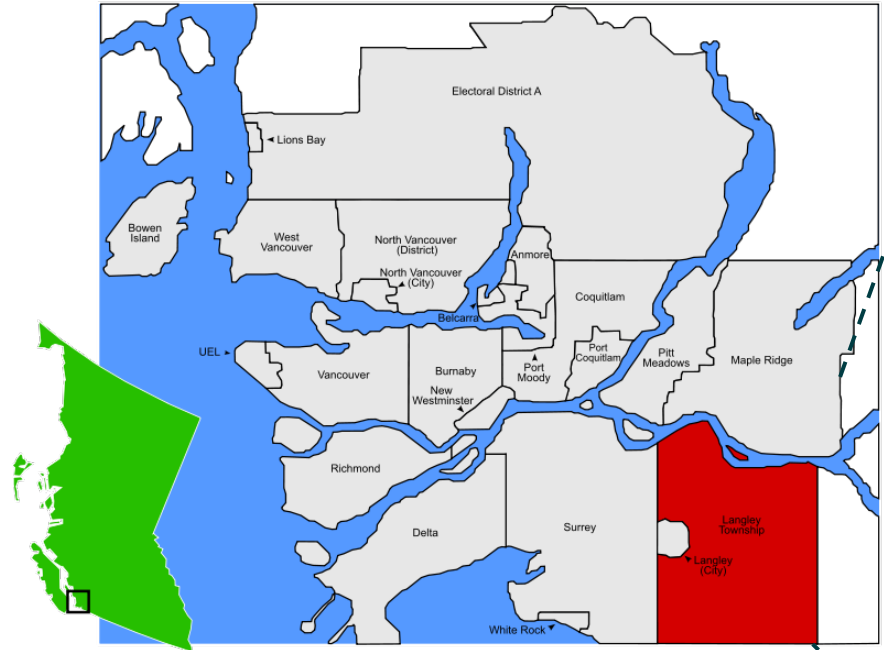
5 key take-aways

1. Asset data does not need to be perfect

2. Internal collaboration and knowledge sharing is key

3. Guidance from other municipalities, agencies, and resources is helpful

4. Don't let effort on the engineered assets overshadow the natural assets effort
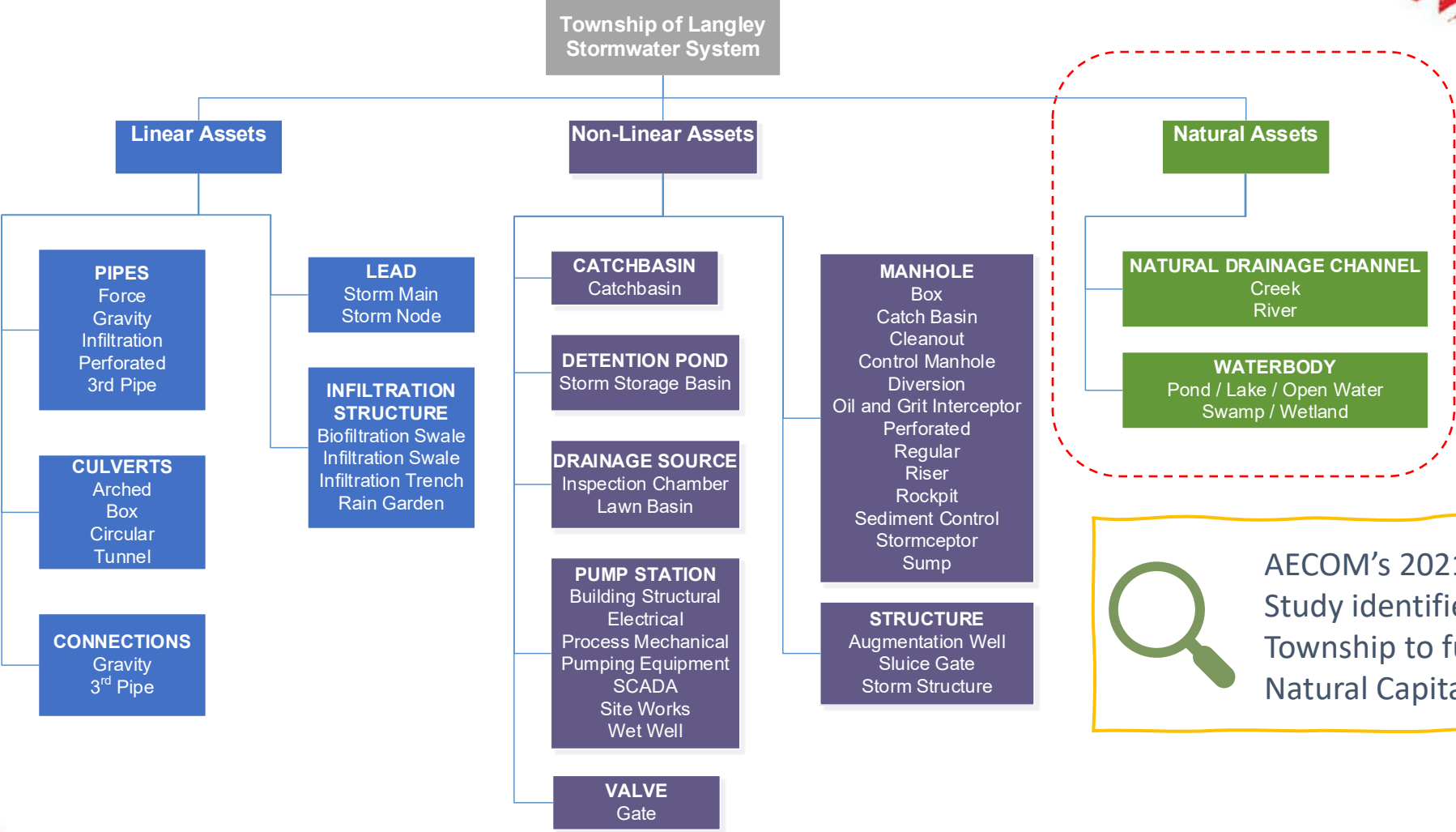
5. It's about the journey!

Township of Langley Natural Capital Asset Management Plan

Township of Langley Location

Legend
- Drainage Pipes
- Drainage Channels
- Natural Drainage Channels
- Natural Waterbodies

The Township of Langley Stormwater Asset Management Plan
Linear Stormwater Infrastructure Map
March 2021

AECOM

Figure 1

0 0.75 1.5 3 4.5 6
Kilometers

The Township's Stormwater Assets

Township of Langley Stormwater System

Linear Assets

PIPES
Force
Gravity
Infiltration
Perforated
3rd Pipe

LEAD
Storm Main
Storm Node

INFILTRATION STRUCTURE
Biofiltration Swale
Infiltration Swale
Infiltration Trench
Rain Garden

CULVERTS
Arched
Box
Circular
Tunnel

CONNECTIONS
Gravity
3rd Pipe

Non-Linear Assets

CATCHBASIN
Catchbasin

DETENTION POND
Storm Storage Basin

DRAINAGE SOURCE
Inspection Chamber
Lawn Basin

PUMP STATION
Building Structural
Electrical
Process Mechanical
Pumping Equipment
SCADA
Site Works
Wet Well

VALVE
Gate

MANHOLE
Box
Catch Basin
Cleanout
Control Manhole
Diversion
Oil and Grit Interceptor
Perforated
Regular
Riser
Rockpit
Sediment Control
Stormceptor
Sump

STRUCTURE
Augmentation Well
Sluice Gate
Storm Structure

Natural Assets

NATURAL DRAINAGE CHANNEL
Creek
River

WATERBODY
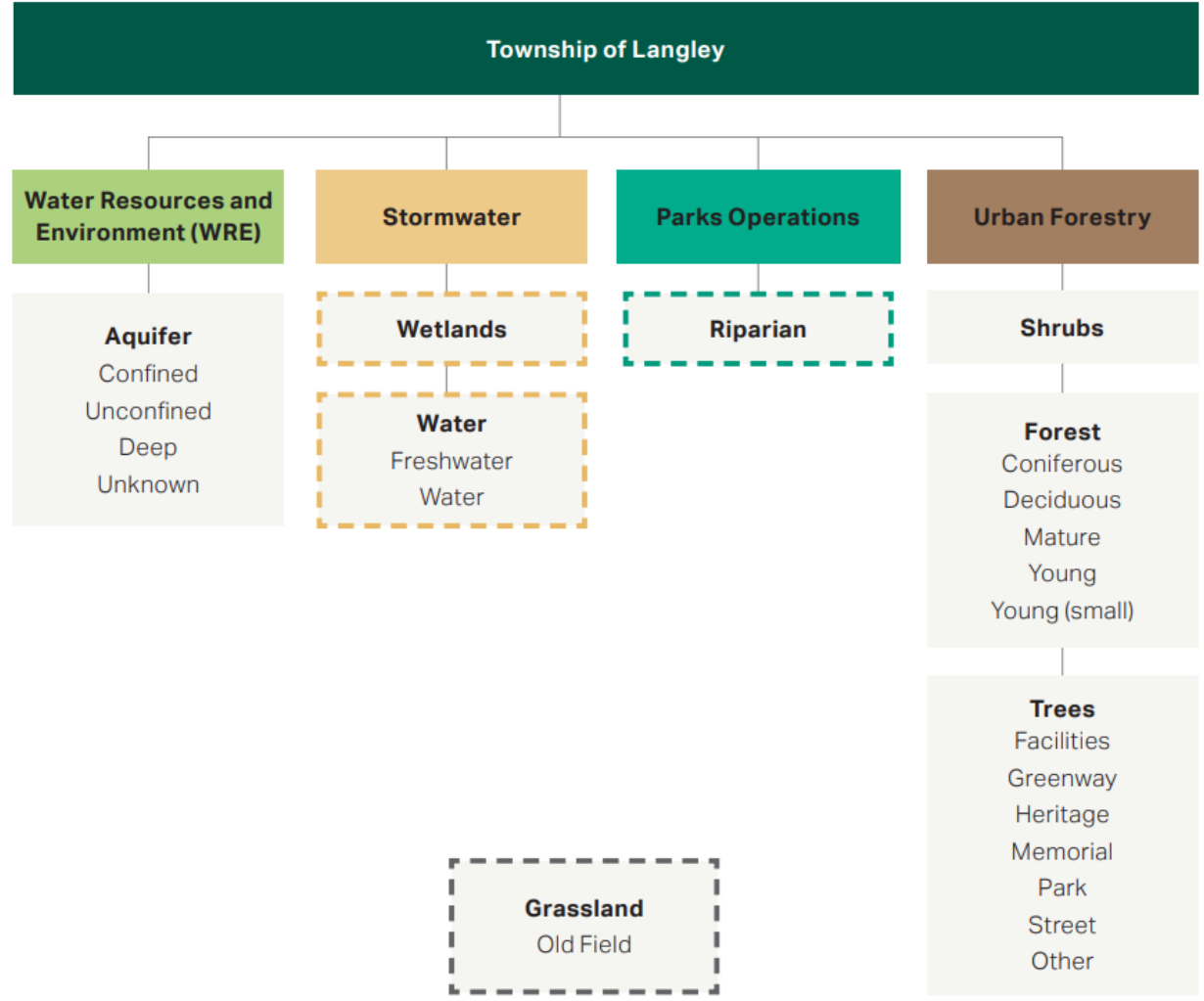Pond / Lake / Open Water
Swamp / Wetland

AECOM's 2021 Stormwater AMP Study identified the need for the Township to further explore its Natural Capita Assets

Township's Natural Asset Inventory

Legend

- Department
- Asset Class
- Managed by WRE and Stormwater group
- Managed by WRE, Stormwater and Parks group
- Not defined under any specific group

Township of Langley

Water Resources and Environment (WRE)

Aquifer
Confined
Unconfined
Deep
Unknown

Stormwater

Wetlands

Water
Freshwater
Water

Parks Operations

Riparian

Urban Forestry

Shrubs

Forest
Coniferous
Deciduous
Mature
Young
Young (small)

Trees
Facilities
Greenway
Heritage
Memorial
Park
Street
Other

Grassland
Old Field

A key challenge was to map the various asset classes to the departments with line-of-sight responsibility AND budgets for managing the assets
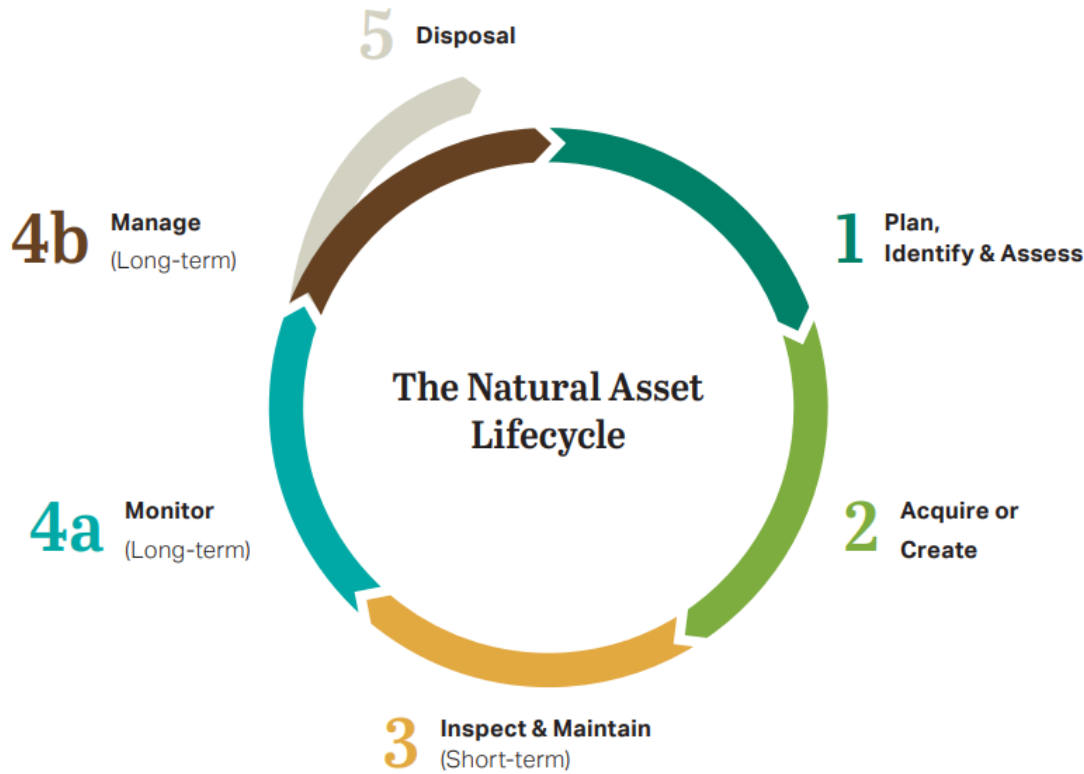
Natural Capital Asset Levels of Service (LoS)

Ecosystem Service	LoS Statement	Asset Type	KPI	Stakeholder Value	Type of Measure	Current Performance	Current Performance Data Source	Target Performance	Target Performance Data Source
Stormwater Management	Protect and preserve the natural assets to reduce incidences of flooding and drought	All Natural Capital Assets	# of days residents are affected by flooding	Reliability, Responsiveness & Customer Service	Customer	TBD	TBD	TBD	TBD
Stormwater Management	Protect and preserve the natural assets to reduce incidences of flooding and drought	All Natural Capital Assets	# of days residents are affected by drought	Reliability, Responsiveness & Customer Service	Customer	TBD	TBD	TBD	TBD
Stormwater Management	Protect and preserve the natural assets to reduce incidences of flooding and drought	Water, Wetland, Forest	% of wetlands, stream channels, forests restored to support drainage	Sustainability	Technical	TBD	TBD	TBD	TBD
Stormwater Management	Protect and preserve the natural assets to reduce incidences of flooding and drought	All Natural Capital Assets	Up-to-date flood mapping completed, with climate scenarios incorporated	Health & Safety	Technical				

Ecosystem Service	LoS Statement	Asset Type	KPI	Stakeholder Value	Type of Measure			ormance	
Groundwater Management	Support the long-term viability of aquifers and protect nearby surface water connected to the groundwater	Aquifer	% of aquifers modeled	Quality	Technical				
Groundwater Management	Support the long-term viability of aquifers and protect nearby surface	Aquifer	% of aquifers monitored (level)	Quality	Technical	TBD	TBD	TBD	TBD

Ecosystem Service	LoS Statement	Asset Type	KPI	Stakeholder Value	Type of Measure	Current Performance	Current Performance Data Source	Target Performance	Target Performance Data Source
Climate Resilience	Provide a forest with diverse native species to improve resilience to climate change	Forest, Trees	% tree canopy coverage (urban)	Accessibility / Capacity	Technical	TBD	TBD	TBD	TBD
Climate Resilience	Protect and conserve existing natural areas	All Natural Capital Assets	# of hectares of natural areas restored	Sustainability	Customer	TBD	TBD	TBD	TBD

LoS were linked with the Ecosystem Service and Asset Type. In most cases, no current data existed for measuring LoS but will be developed over the next five years

Natural Capital Asset Lifecycle Strategies

The Natural Asset Lifecycle

5 Disposal
4b Manage (Long-term)
4a Monitor (Long-term)
1 Plan, Identify & Assess
2 Acquire or Create
3 Inspect & Maintain (Short-term)

The different asset lifecycle strategies were documented for each primary natural asset class. This helped to identify areas where additional funding might be needed to fully support the lifecycle activities

Asset Class	Current Activity	Desired Activity (Expansion of current activities to meet service levels)
Forest / Tree	The acquisition is driven through development, where the landscape plans and species appropriate for the site are reviewed. The Township has a species profile in place which lists the commonly and rarely planted tree species within the municipality. There is a one-year warranty period on a tree that is planted by a developer. The process includes approvals and a 11-month review of the trees planted by the developer, if tree health is acceptable, it gets acquired by the Township for the maintenance and is otherwise removed immediately.	In alignment with the Community Forest Management Strategy, the Township aims to reduce overused trees. The Township has not fully implemented the ArcGIS Collector and envisions to capture the new inventory, especially around the new developments along with capturing maintenance records in the system. This will be integrated as part the grant application that is underway. The Township has tree canopy targets in place, which have been developed by working with a local tree protection advisory group and a desktop land use analysis exercise. Funding and staffing are the major identified constraints to achieve the targets.
Grassland / Shrub	There is a program in place for the acquisition of parkland in the new areas of development that are pre-identified as potential locations for parks.	The Township desires to expand the invasive species program.
Riparian	The Township as part of the water assets has programs aimed at conserving, restoring, and enhancing its riparian habitats.	The Township aspires property owners to be accountable and responsible for the maintenance of riparian areas that are on private lands.
Wetland	The acquisition is driven by development process, where the Township secures the natural assets. A recent example includes industrial application in Gloucester area which brought approximately three acres of land to the Township.	Implementation of the Integrated Stormwater Management Plans points to the needs and locations of new restoration sites.

Natural Capital Asset Financial Needs Analysis Breakdown by Programs
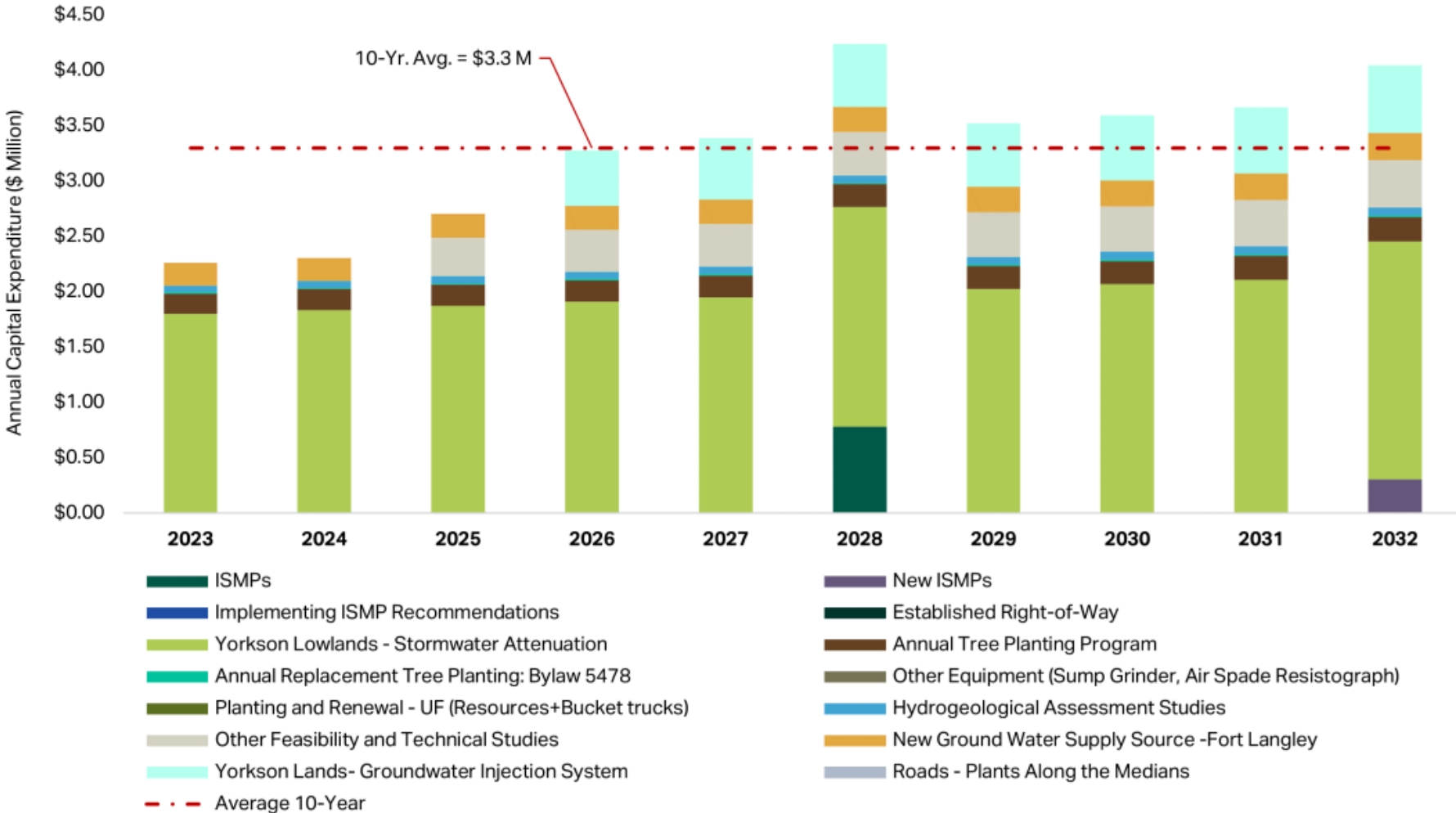
Recommended budgets were based on both capital reinvestment needs and an increase in targeted maintenance activities on each major natural asset

Lessons Learnt and the Way Forward

- ✓ Perfect data is not a must.....but the more detailed the asset inventory, the better line-of-sight you have to the many and varied natural assets
  - I.e., to make sure that "no asset gets left behind"

- ✓ Form a robust understanding of the different lifecycle stages (i.e., procurement, O&M, disposal) of natural assets

- ✓ Work extensively with the various client "groupings" to understand their challenges and resource needs

- ✓ This is not a once-off: Set the client up for continuous improvement

Q&A

Thank You!

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