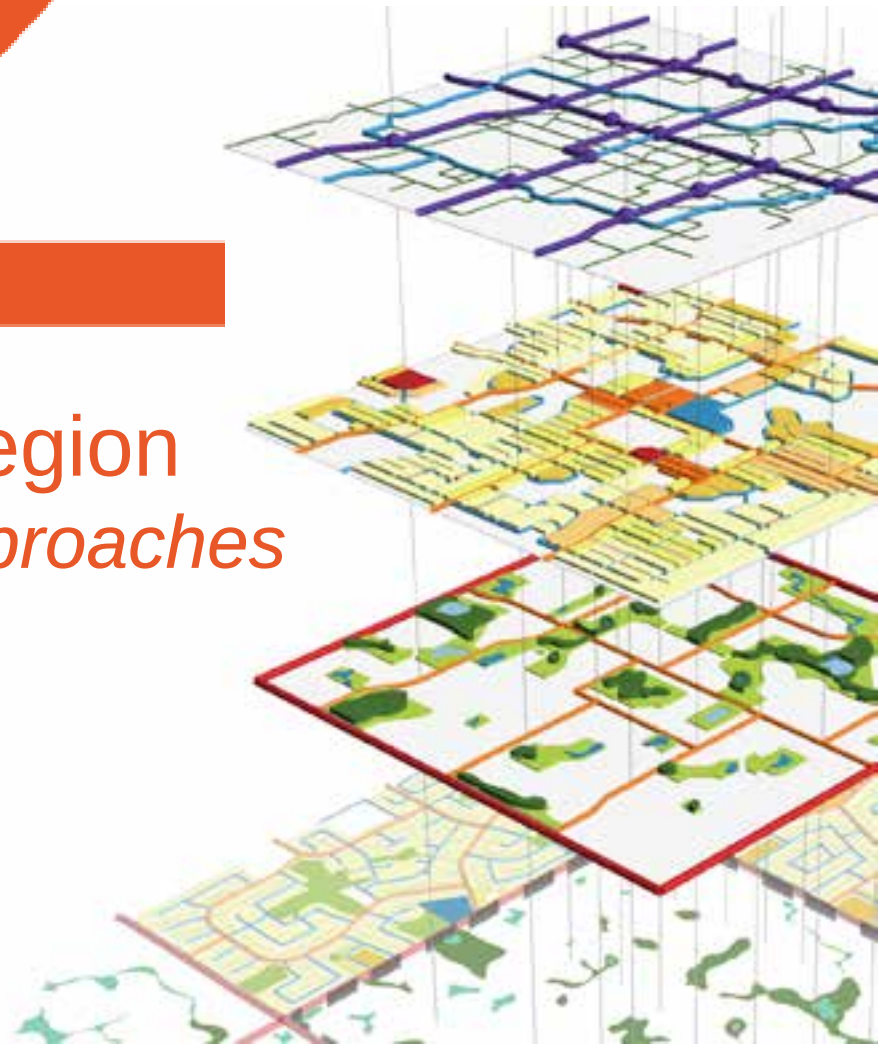
GeoDesign for the City Region

Multiple Scales – Multiple Approaches

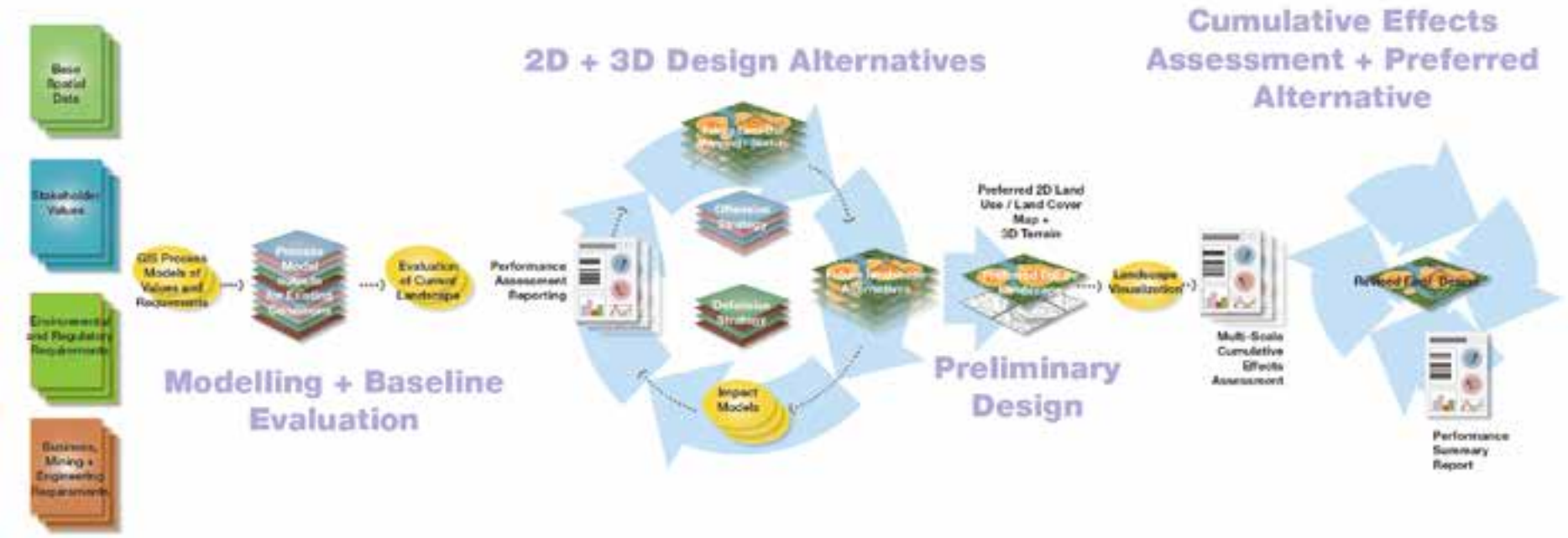
ESRI GeoDesign Summit 2014

Douglas Olson
O2 Planning + Design



OUTLINE

- The need for GeoDesign in the city region
- Examples of GeoDesign in practice across scales



GeoDesign allows us to evaluate the impacts of plans and designs and to recursively adjust the solutions to insure maximum benefits.

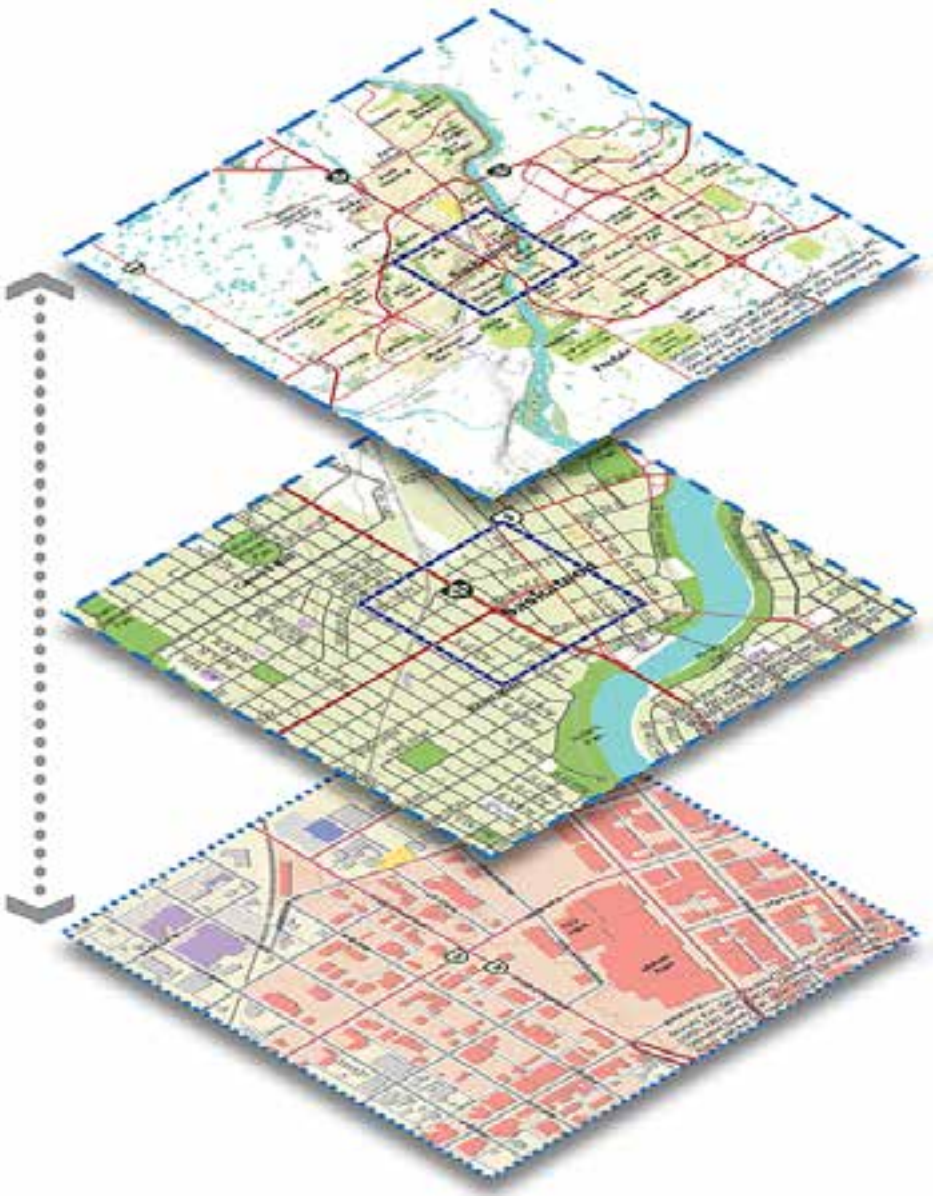
THE NEED FOR GEODESIGN IN THE CITY REGION

- Rapid urbanization is leading to massive transformation of regional landscapes. The city region has become the most important planning scale on the planet.

- GeoDesign and decision support systems can address a diversity of planning objectives that need achievement at multiple scales within a context of enormous complexity.

- Rapid advancements in geospatial technology and visualization software are enabling science based impact assessment and the communication of alternative in support of decision making.

TRANSCENDING SCALES



Always design a thing considering it in its next larger context – a chair in a room, a room in a house, a house in an environment, an environment in a city plan

Eliel Saarinen

THE GOLDILOCKS DETERMINATION

AT WHAT SCALE AND WITH HOW MUCH DETAIL?

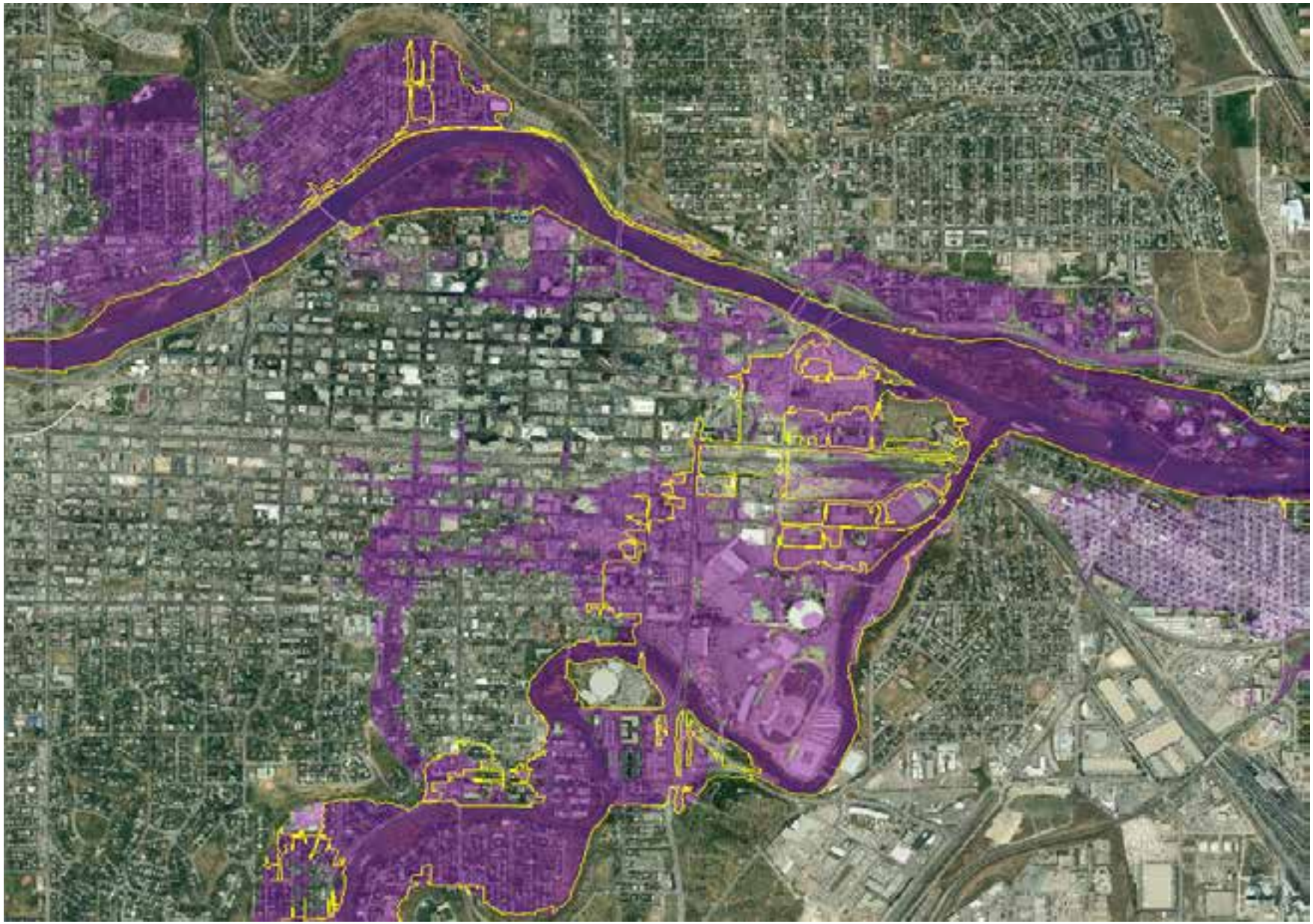
- Modelling and decision support systems are often developed for either strategic or operational use. The links between planning levels or scales are seldom clear.

- Many issues are scale dependent, requiring different grains of analysis further complicating planning level linkages.

- Broad scale analyses may not provide enough direction to inform decisions at the fine scale. The detail of models used in strategic planning may not address the complexity of finer scale planning and may result in oversimplification of recommendations. Conversely, the detail required for operational planning creates

THE NEED FOR A NEW APPROACH – *Close to*

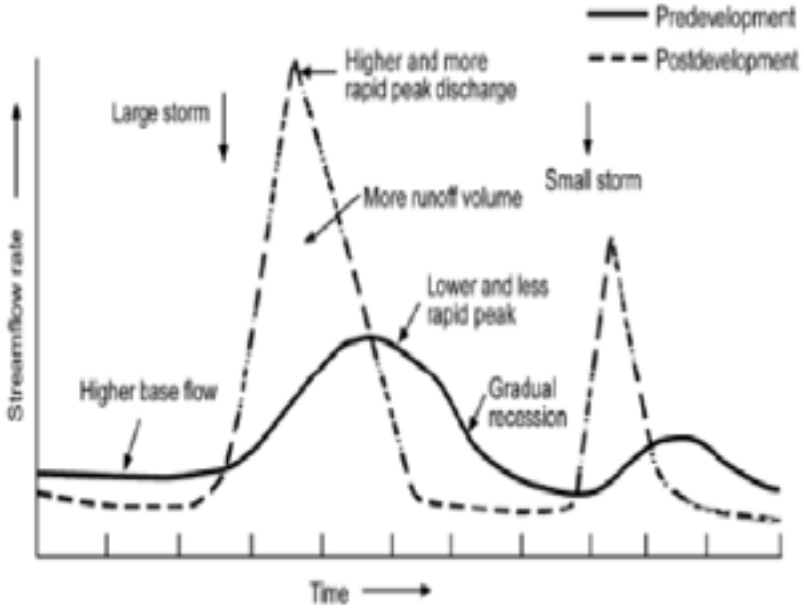
THE NEED FOR A NEW APPROACH



THE NEED FOR A NEW APPROACH

Calgary, Alberta, Canada – Flooding in June 2013, the most costly disaster in Canadian history – more than 8 billion dollars in property loss alone.

URBANIZATION EFFECTS ON WATERSHEDS



Changes in stream hydrology due to urbanization *Source: Schueler (1992)*

- Loss of wetlands, riparian areas, small creeks
- Loss of soil structure, terrestrial habitats, farmland
- Increasing imperviousness

→ Flooding

→ Drought

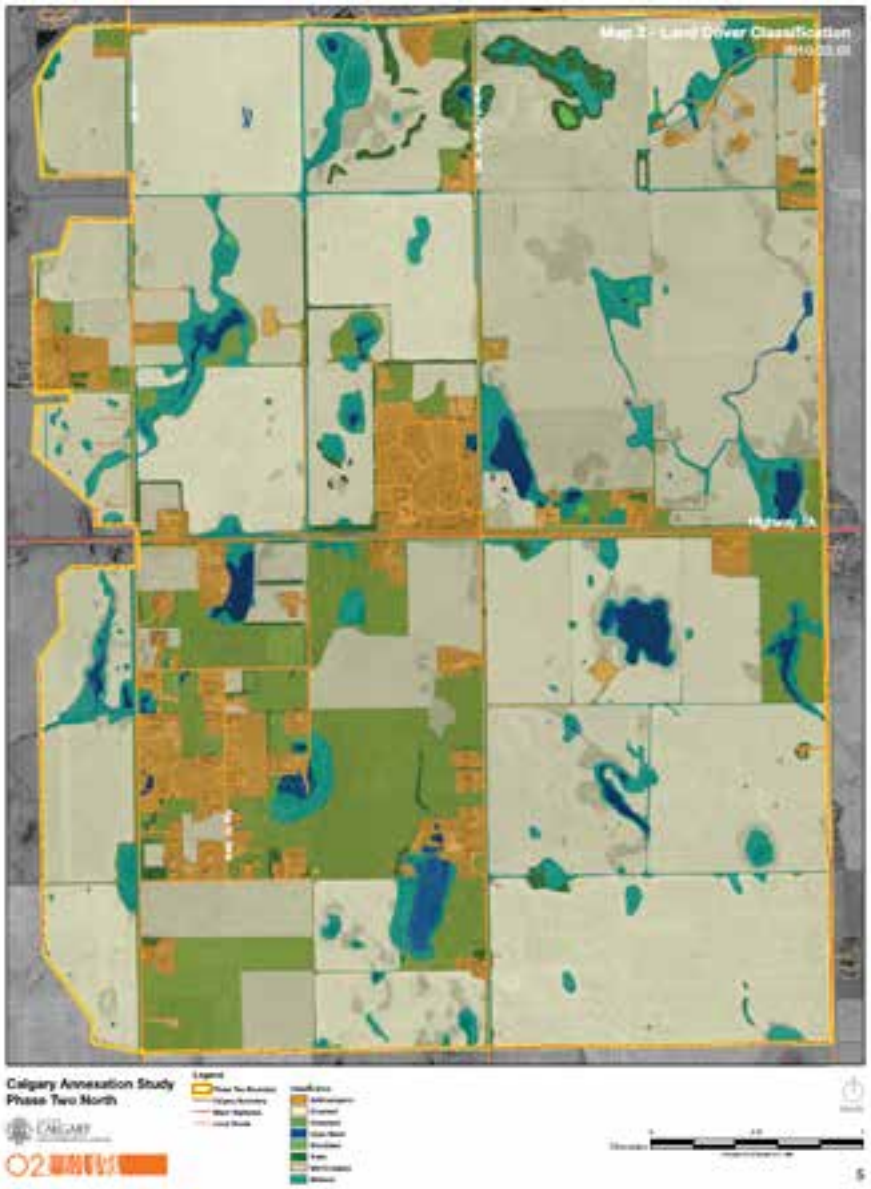
→ Polluti on

→ High stormwater infrastructure

Calgary, June 2006

Calgary, June 2005

City of Calgary Annexation Territory Study

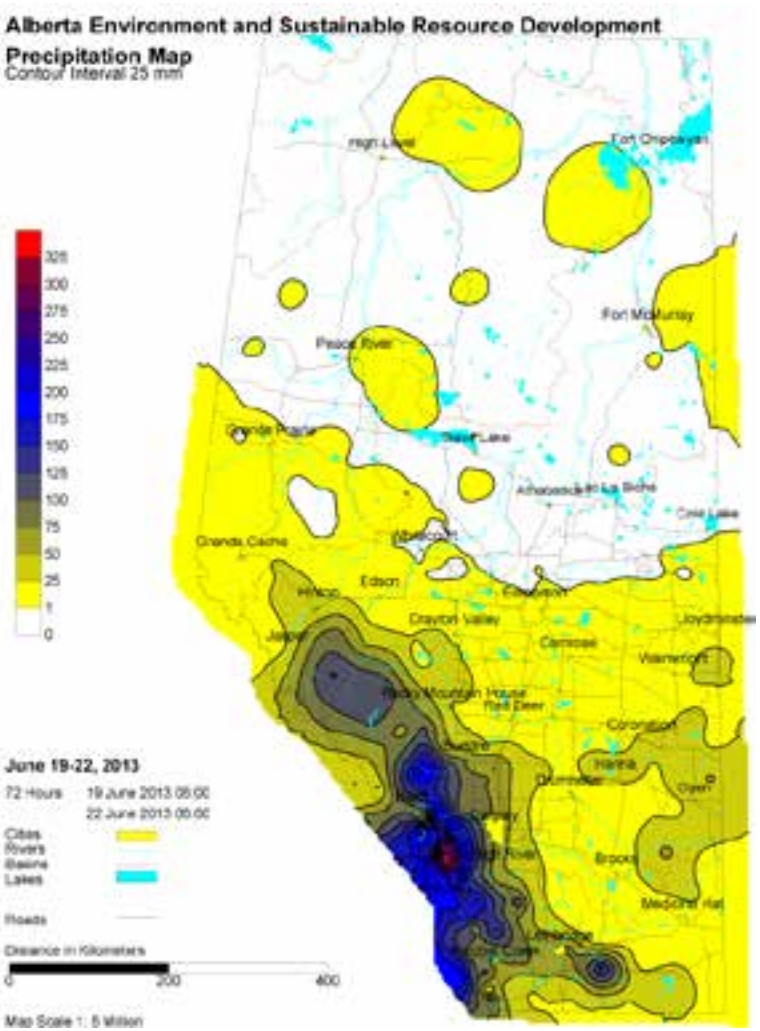


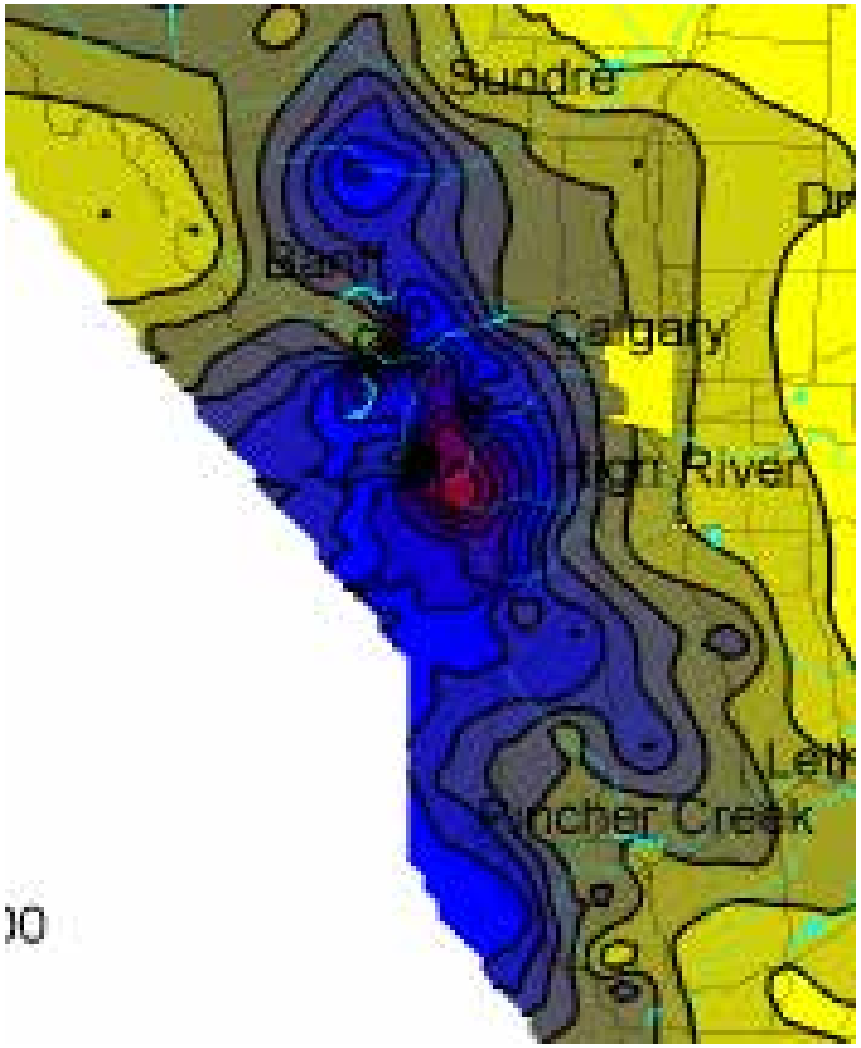
BOWMONT PARK CONCEPT

BOWMONT PARK –
Habitats Along the Water

BOWMONT PARK – Protecting the River Stormwater Polishing Wetlands, Habitat and Amenity

THE NEED TO LOOK FOR SOLUTIONS ACROS

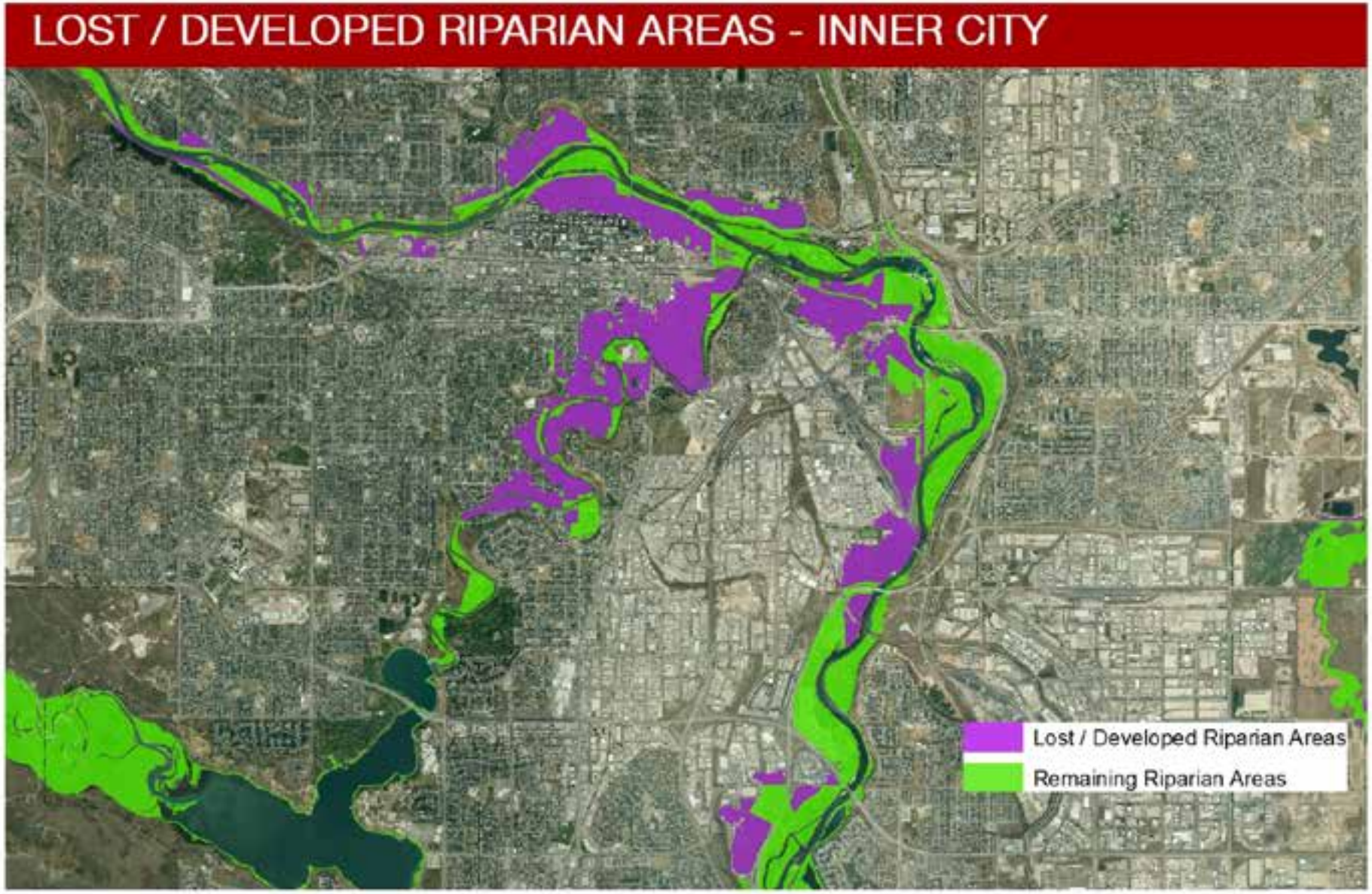




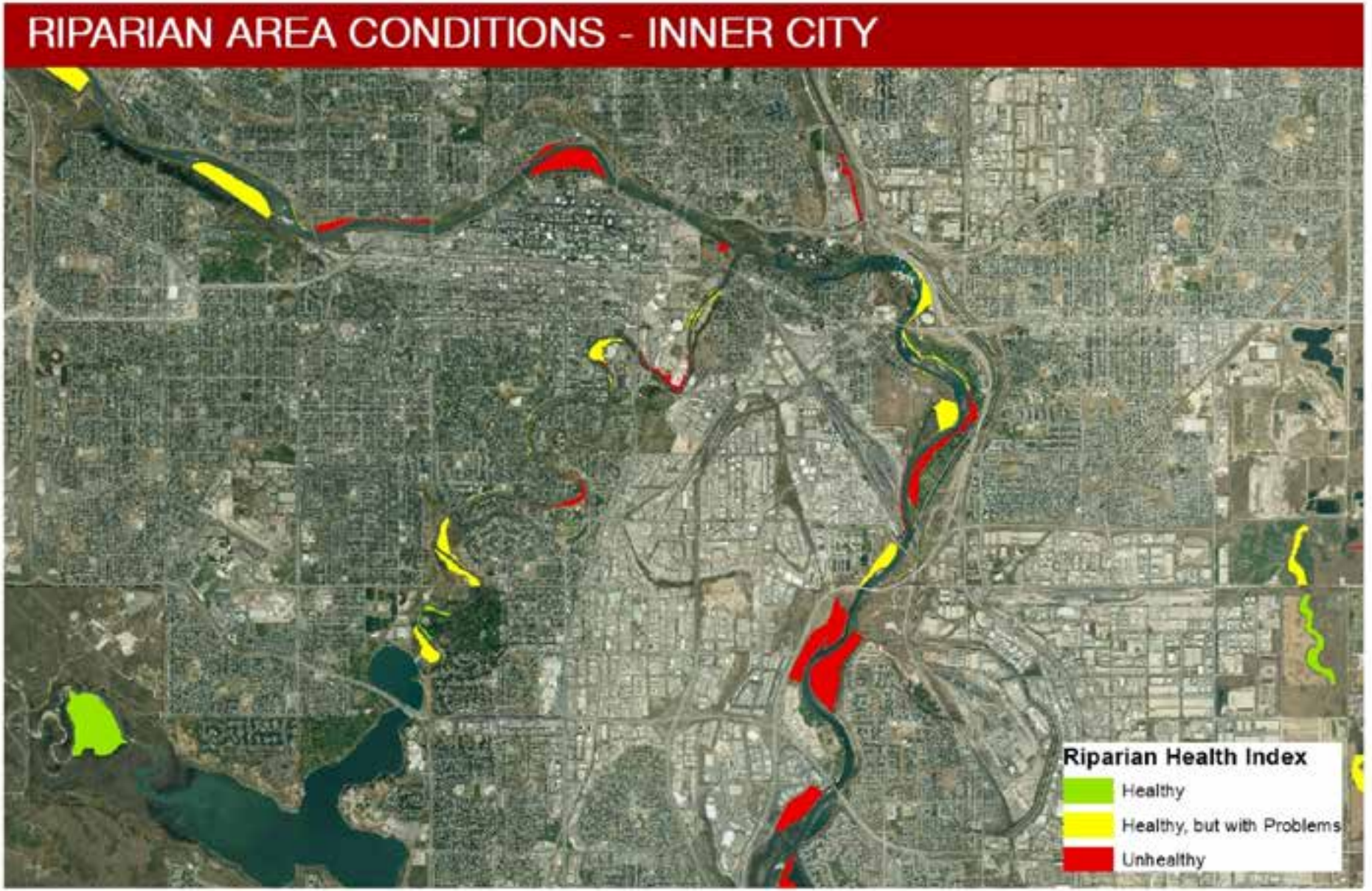

Elbow Falls ***BEFORE*** the 2013 Flood Event

Elbow Falls ***AFTER*** the 2013 Flood Event

THE NEED FOR A NEW APPROACH



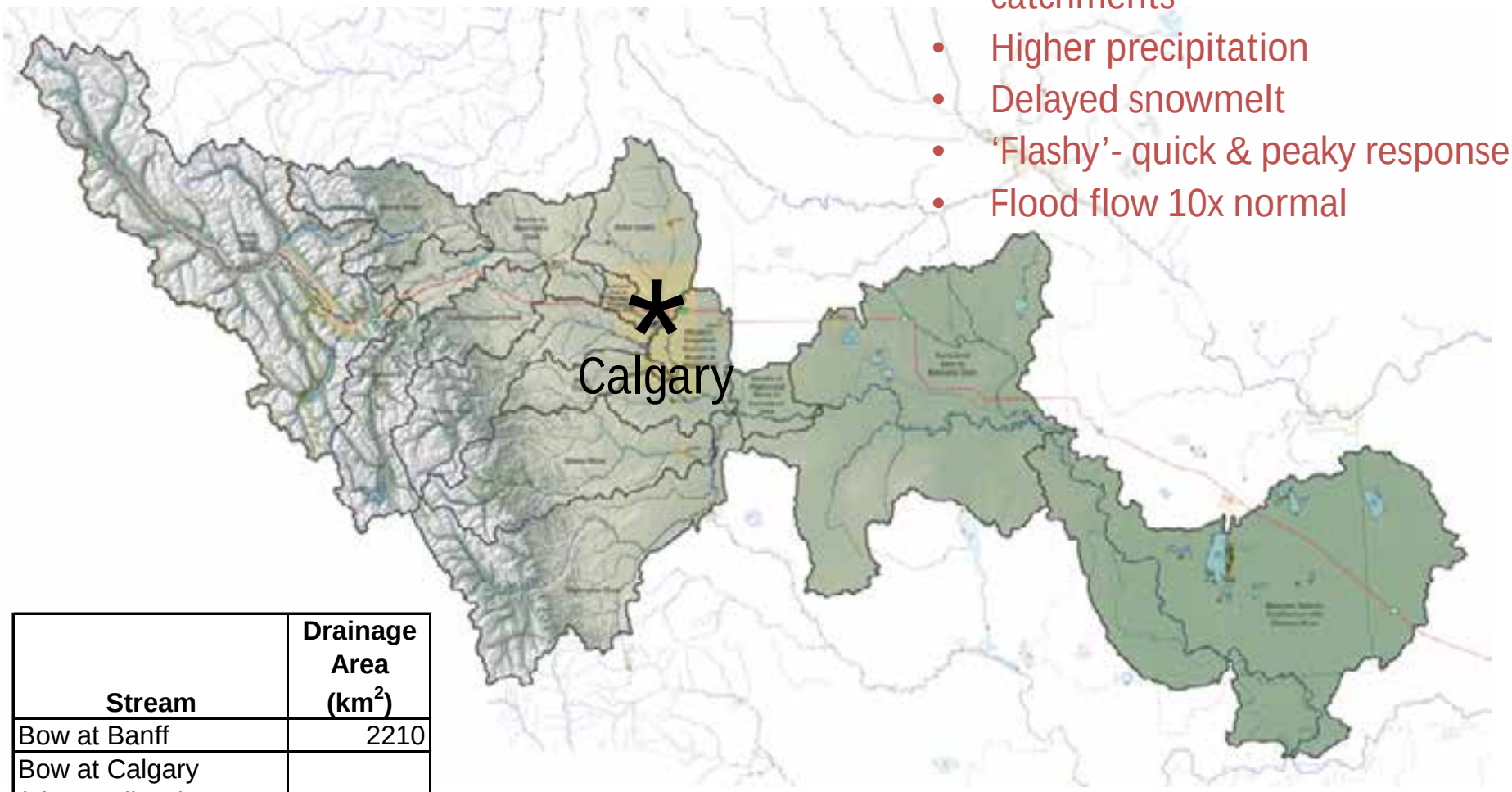
RIPARIAN HEALTH ASSESSMENT



Bow River in Inglewood, Emergency Groins using rock and concrete road barriers

PROBLEMS NEED TO BE ADDRESSED AT MULTIPLE SCALES

- Mountain & Foothills upper catchments
- Higher precipitation
- Delayed snowmelt
- ‘Flashy’- quick & peaky response
- Flood flow 10x normal



Stream	Drainage Area (km^2)
Bow at Banff	2210
Bow at Calgary (above Elbow)	7800
Elbow at Bragg Ck	790
Elbow at Calgary	1200

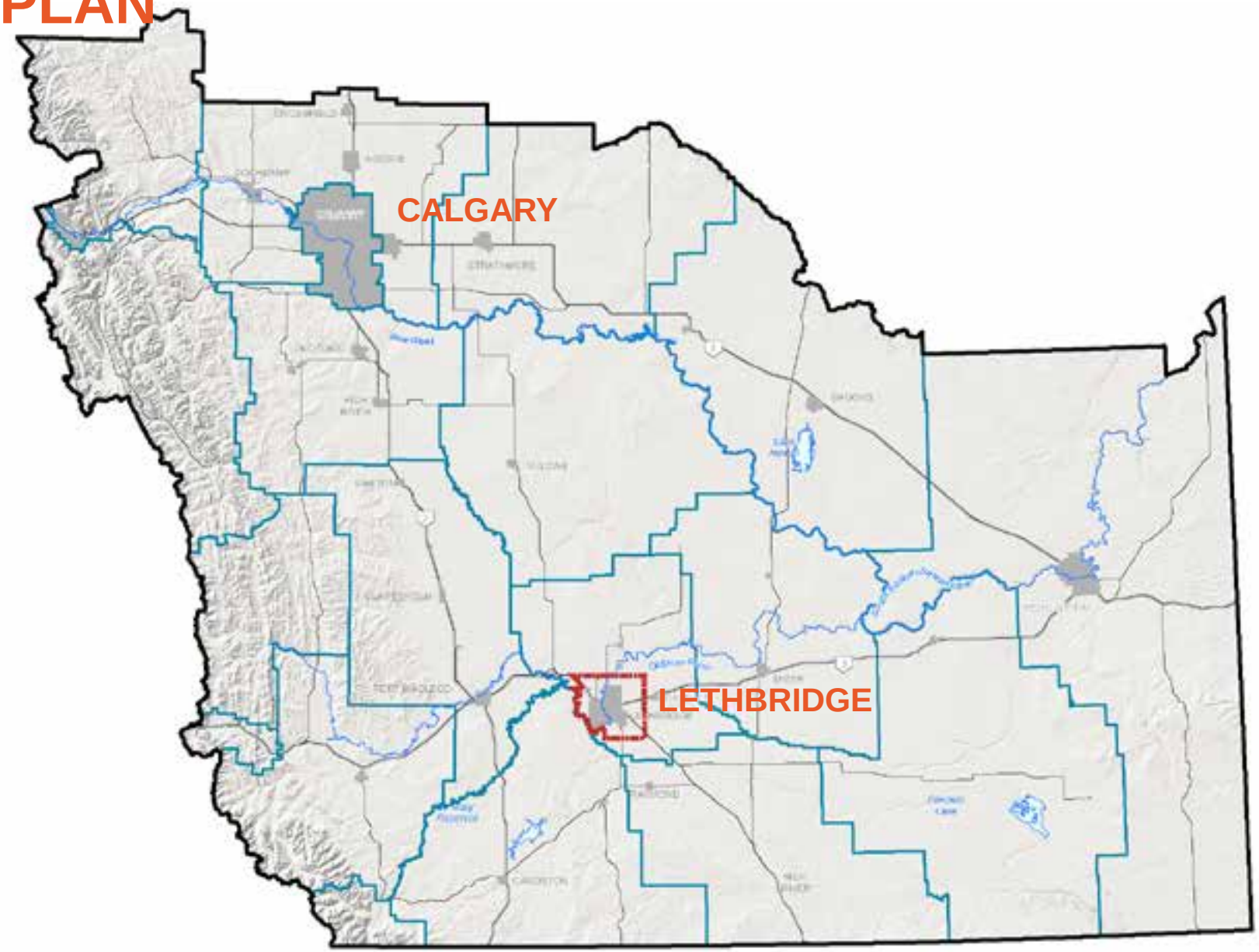
THE BOW RIVER BAS

EXAMPLES OF GEODESIGN IN PRACTICE

ACROSS SCALES

- City- Region
  - South Saskatchewan Regional Plan
  - Calgary Metropolitan Plan
- The City and It's Neighbour
  - Lethbridge and County Growth Management Strategy
- Community
  - Jasper Place Scenarios
  - Forest Lawn Charrette and Outline Plan

SOUTH SASKATCHEWAN RIVER BASIN REGIONAL PLAN



SOUTH SASKATCHEWAN RIVER BASIN REGIONAL LAND USE PLAN

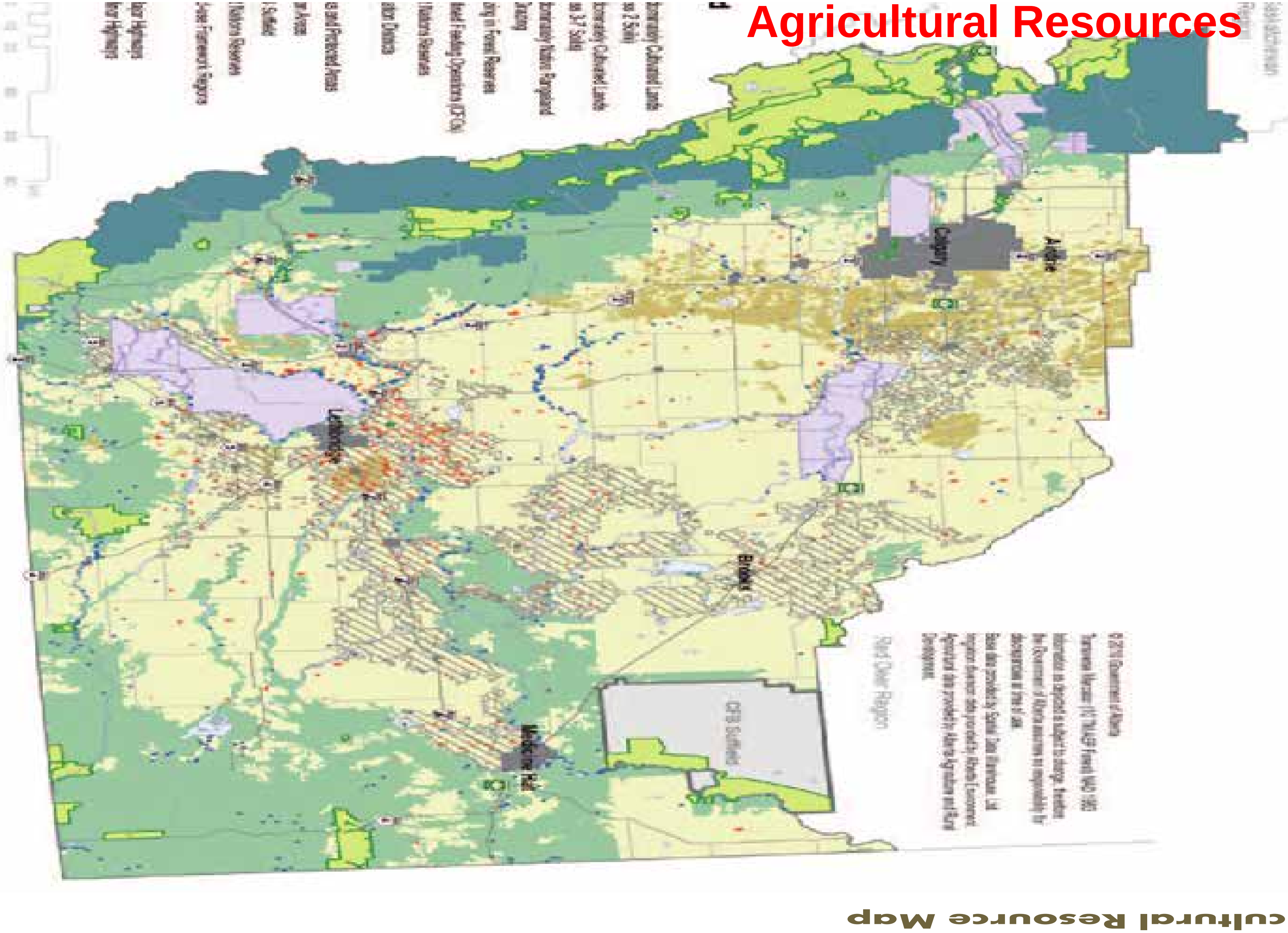
A regional land use plan for southern Alberta

(85,000 km2). The plan strives to achieve the following three interrelated outcomes:

- A healthy economy supported by land and natural resources;
- Healthy ecosystems and environment; and
- Enriched communities with ample recreational and cultural opportunities.

The plan is to provide direction for all land-use plans at finer scales.

Agricultural Resources

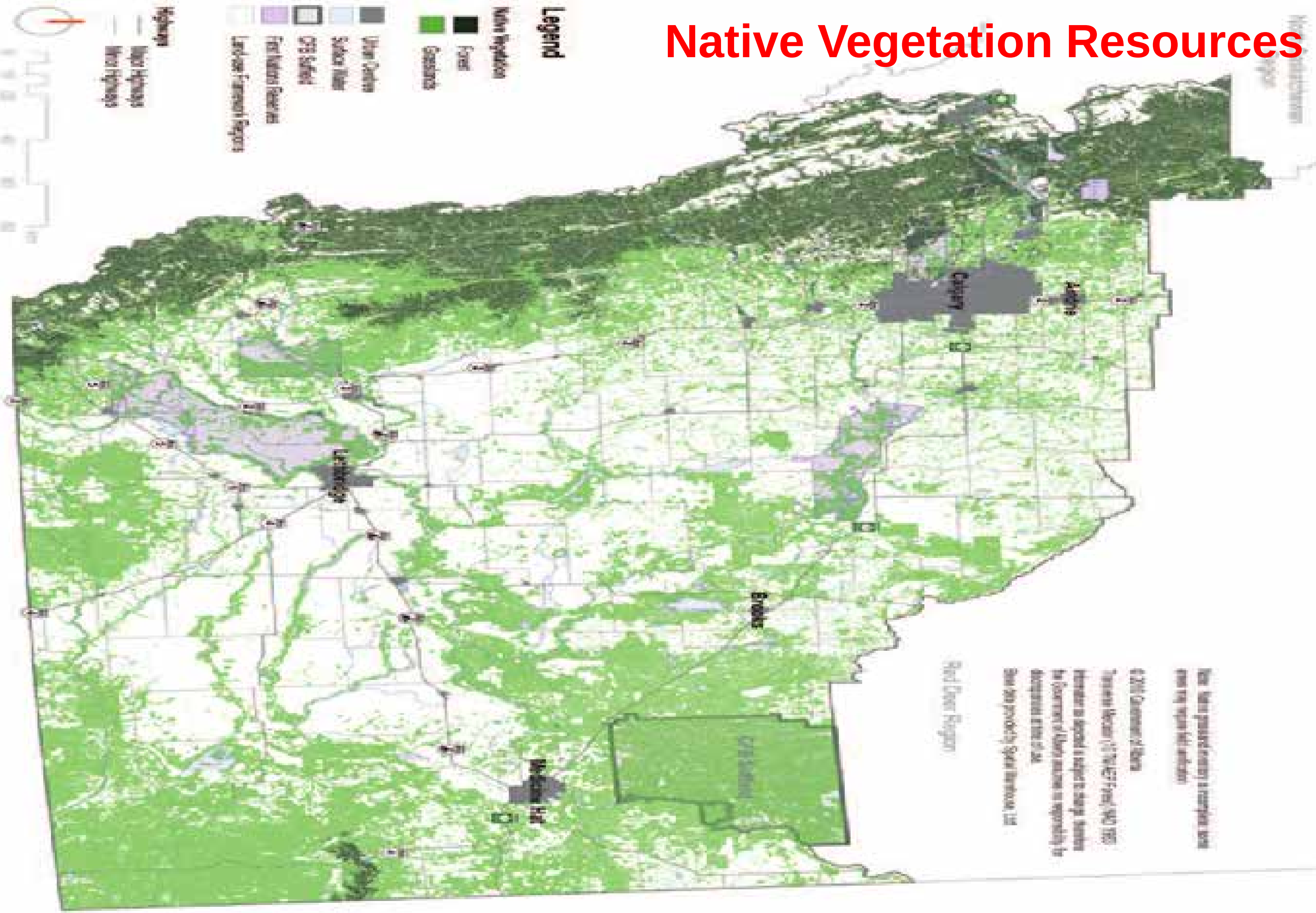


Forestry Resources

Energy and Mineral Resources

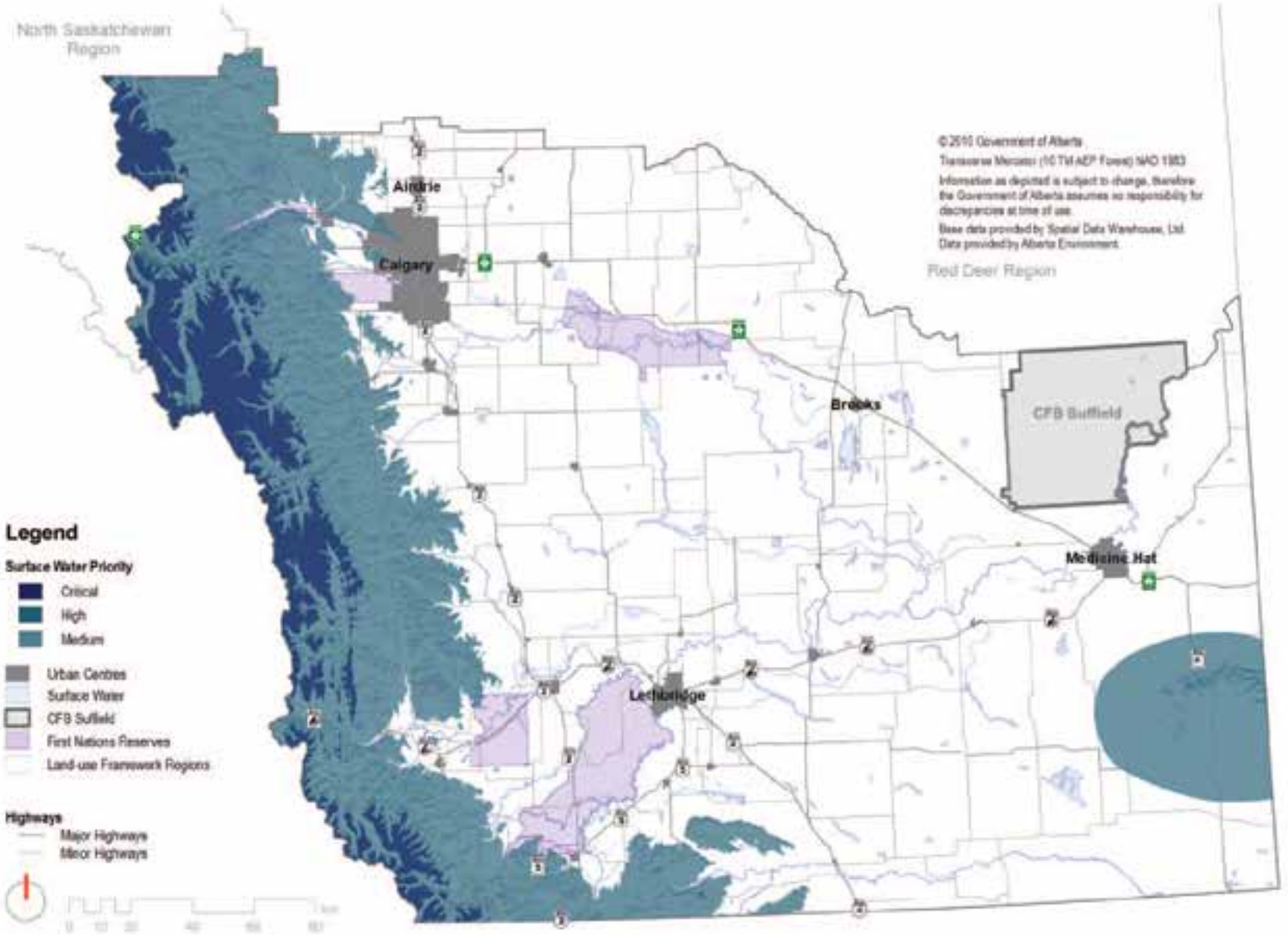
Tourism and Recreation Resources

Native Vegetation Resources

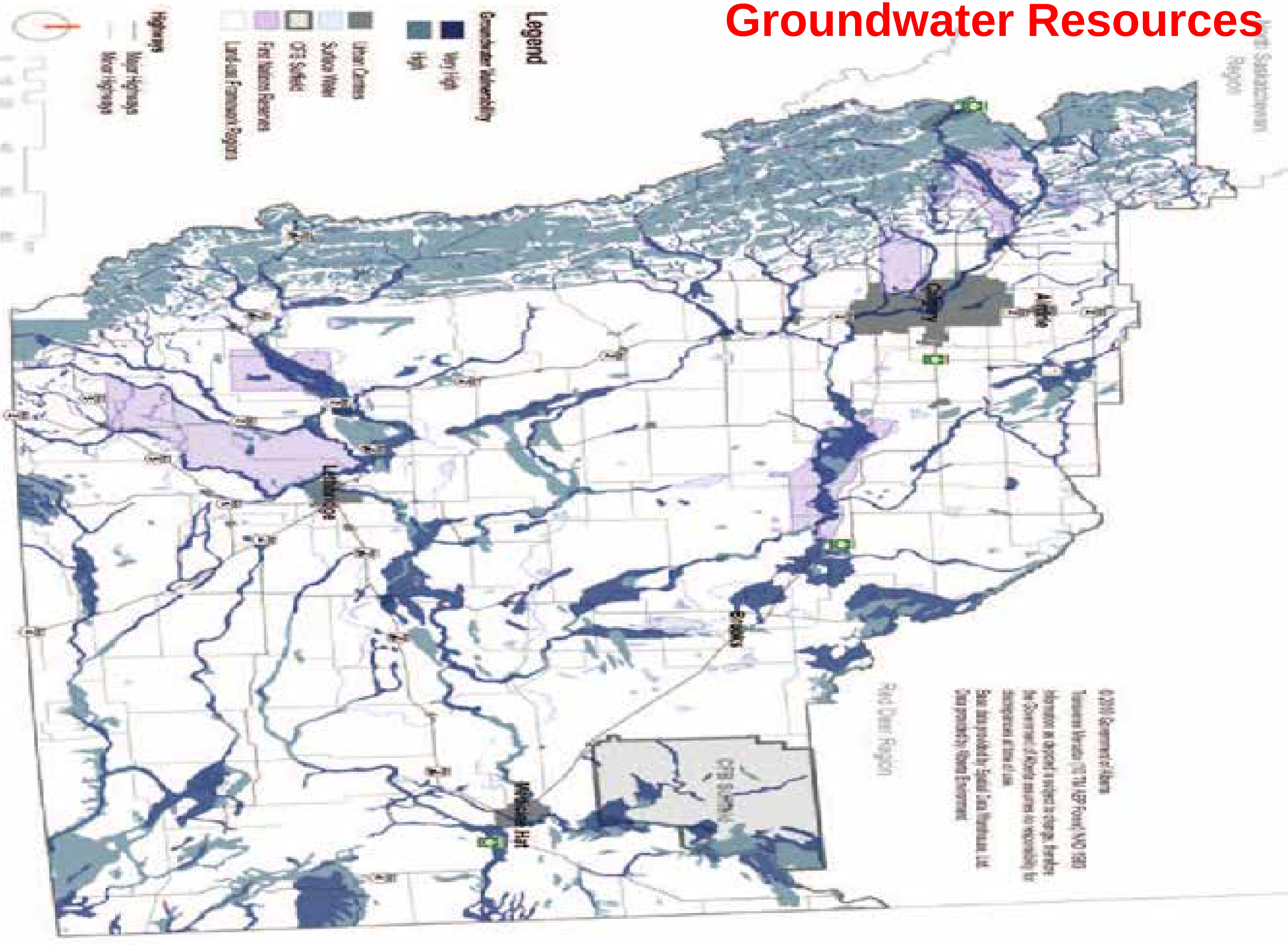


ive Vegetation Resource Map

Priority Surface Water Resources

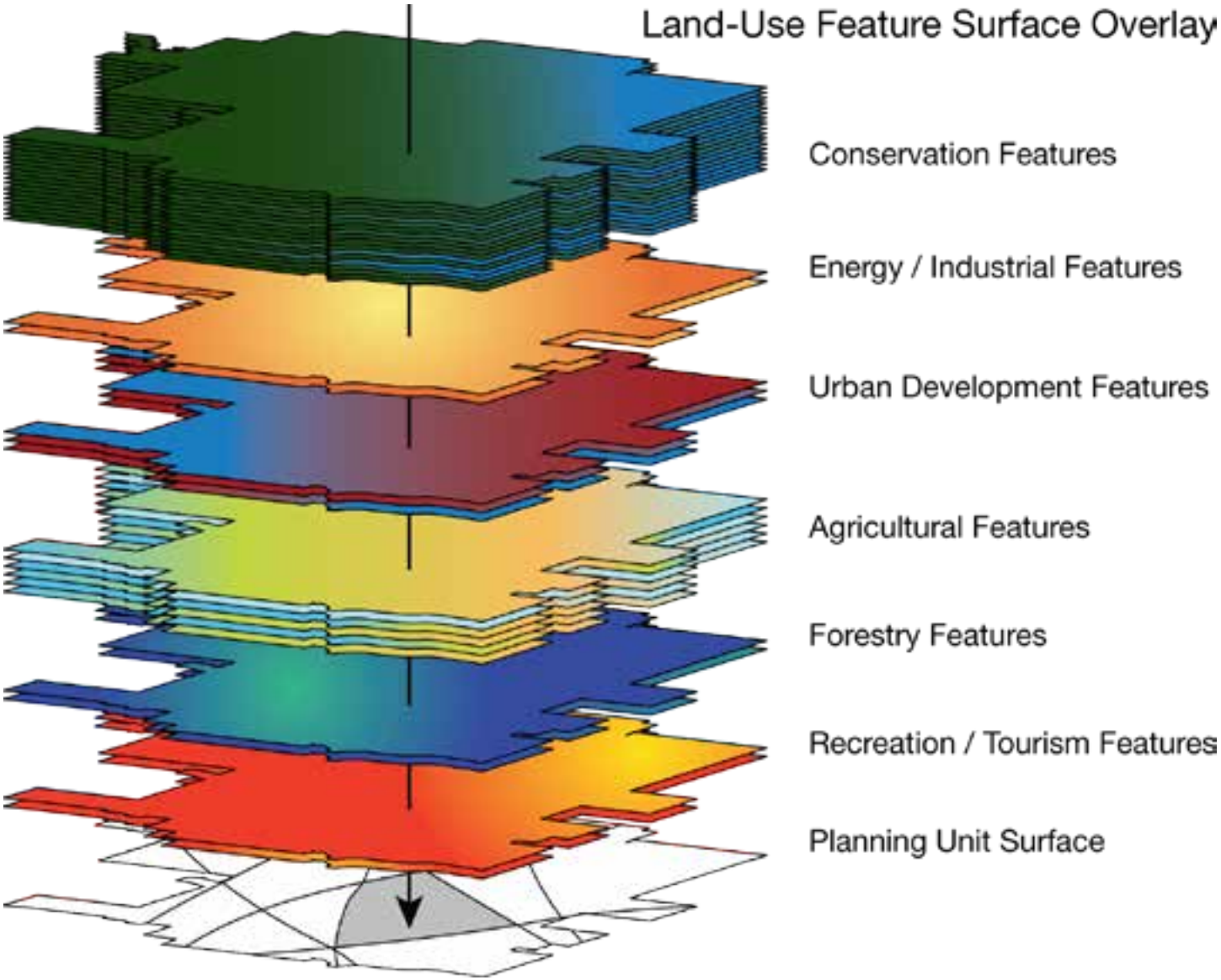


Groundwater Resources



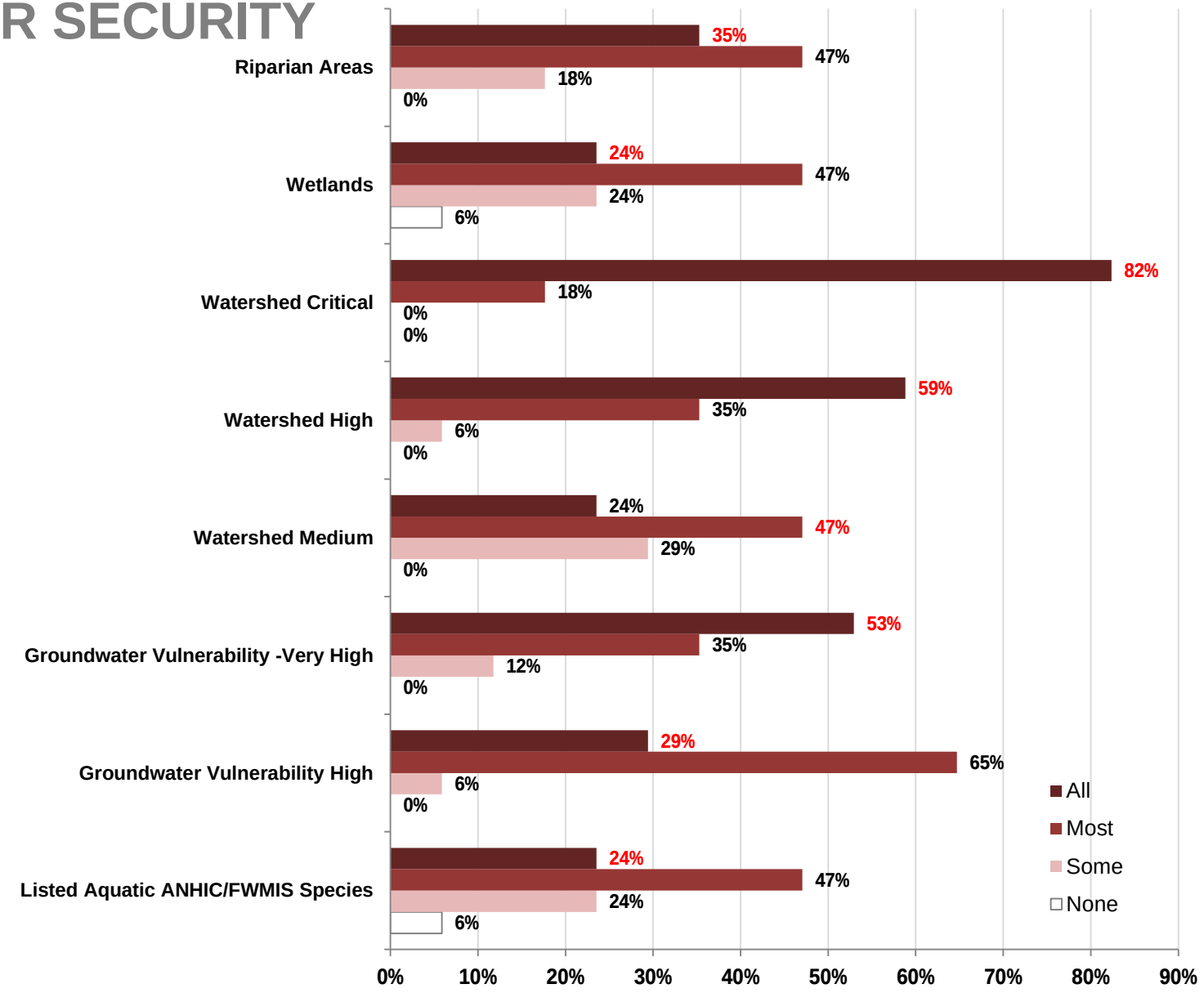
oundwater Resource Map

SPATIALLY EXPLICIT MULTIPLE OBJECTIVE OPTIMIZATION MODELLING (MARXAN WITH ZONES)



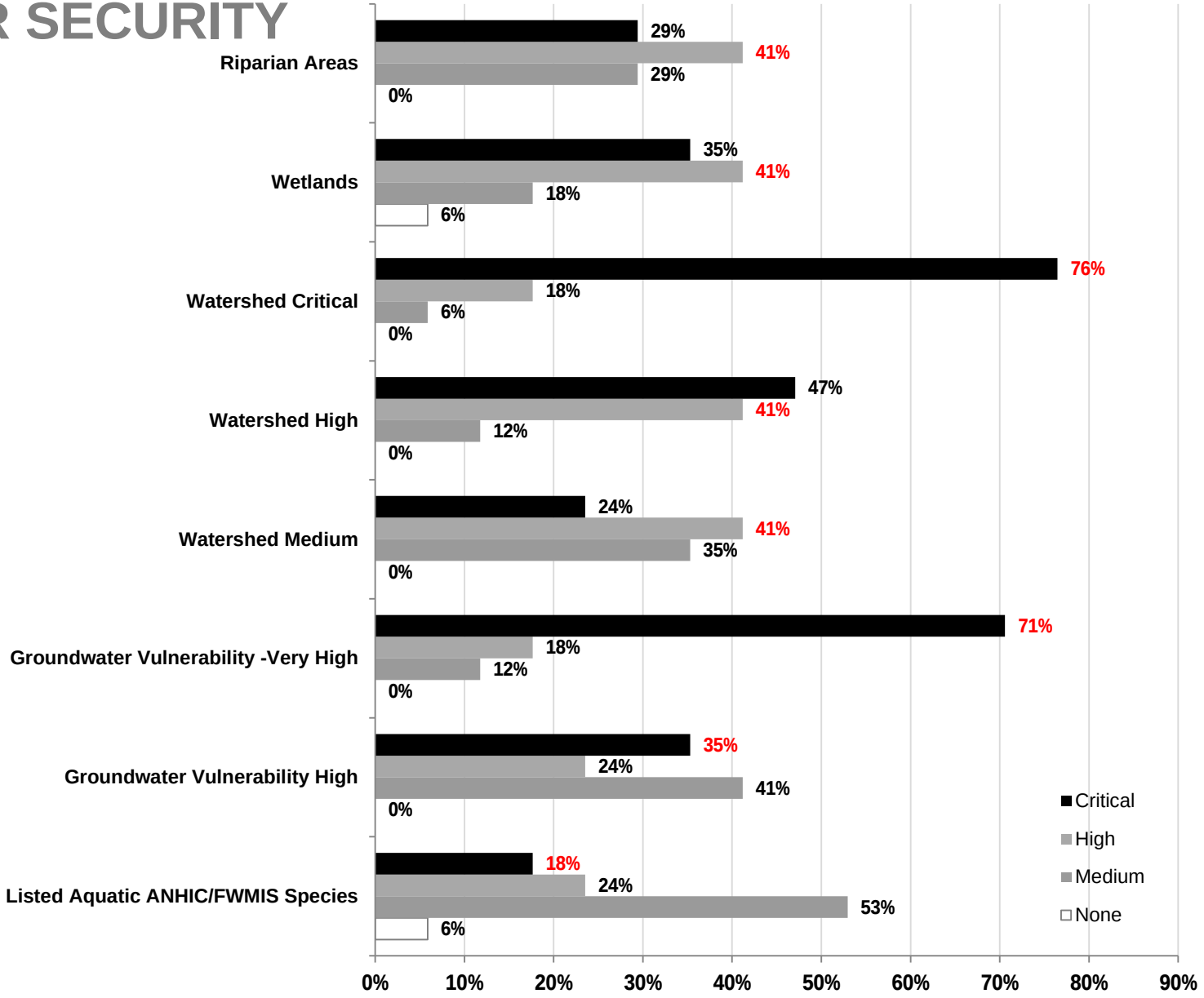
WHAT DO YOU WANT TO KEEP AND HOW MUCH OF IT?

WATER SECURITY



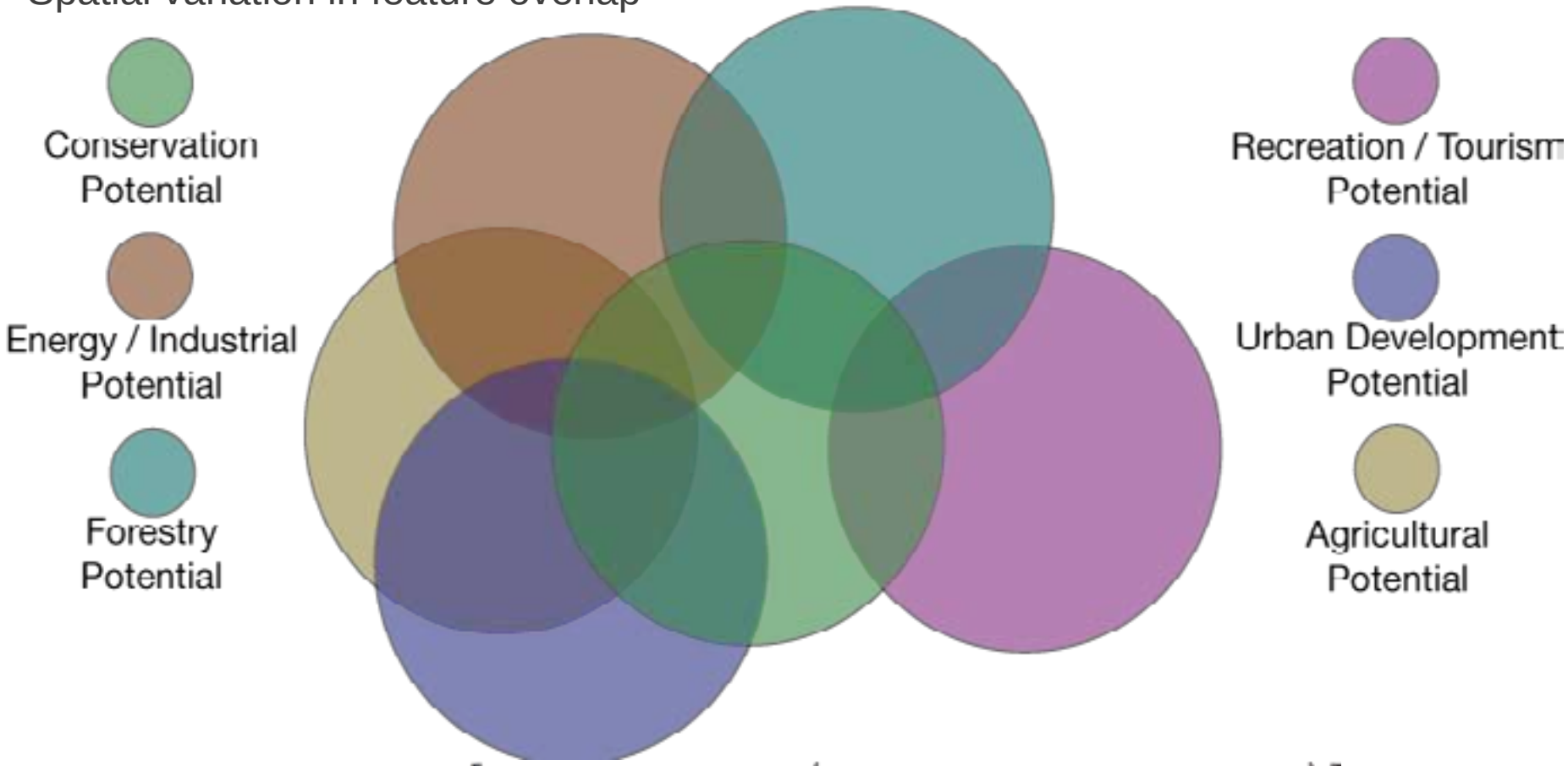
HOW BADLY DO YOU WANT IT?

WATER SECURITY



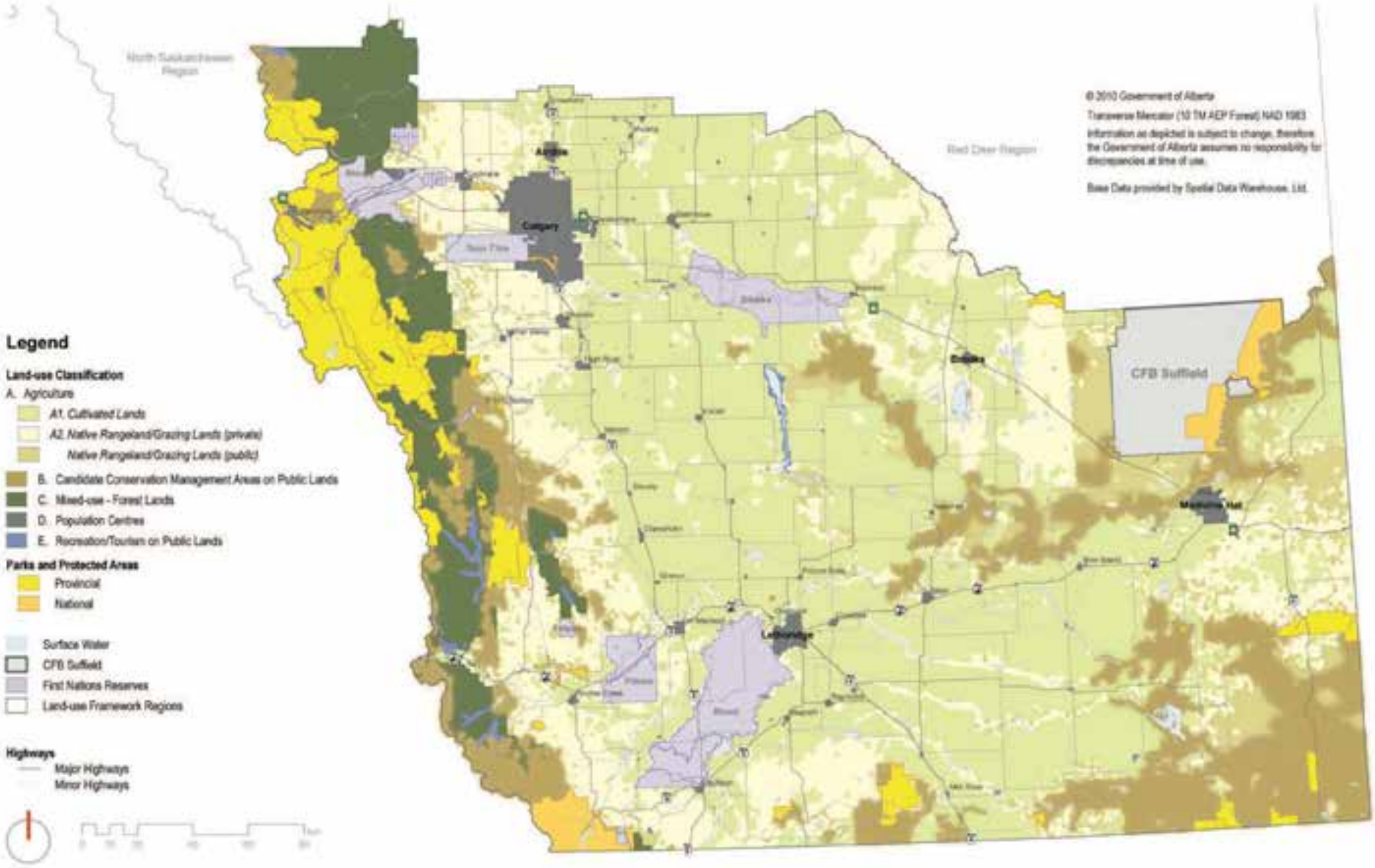
SPATIALLY EXPLICIT MULTIPLE OBJECTIVE OPTIMIZATION MODELLING (MARXAN WITH ZONES)

- Spatial variation in feature overlap



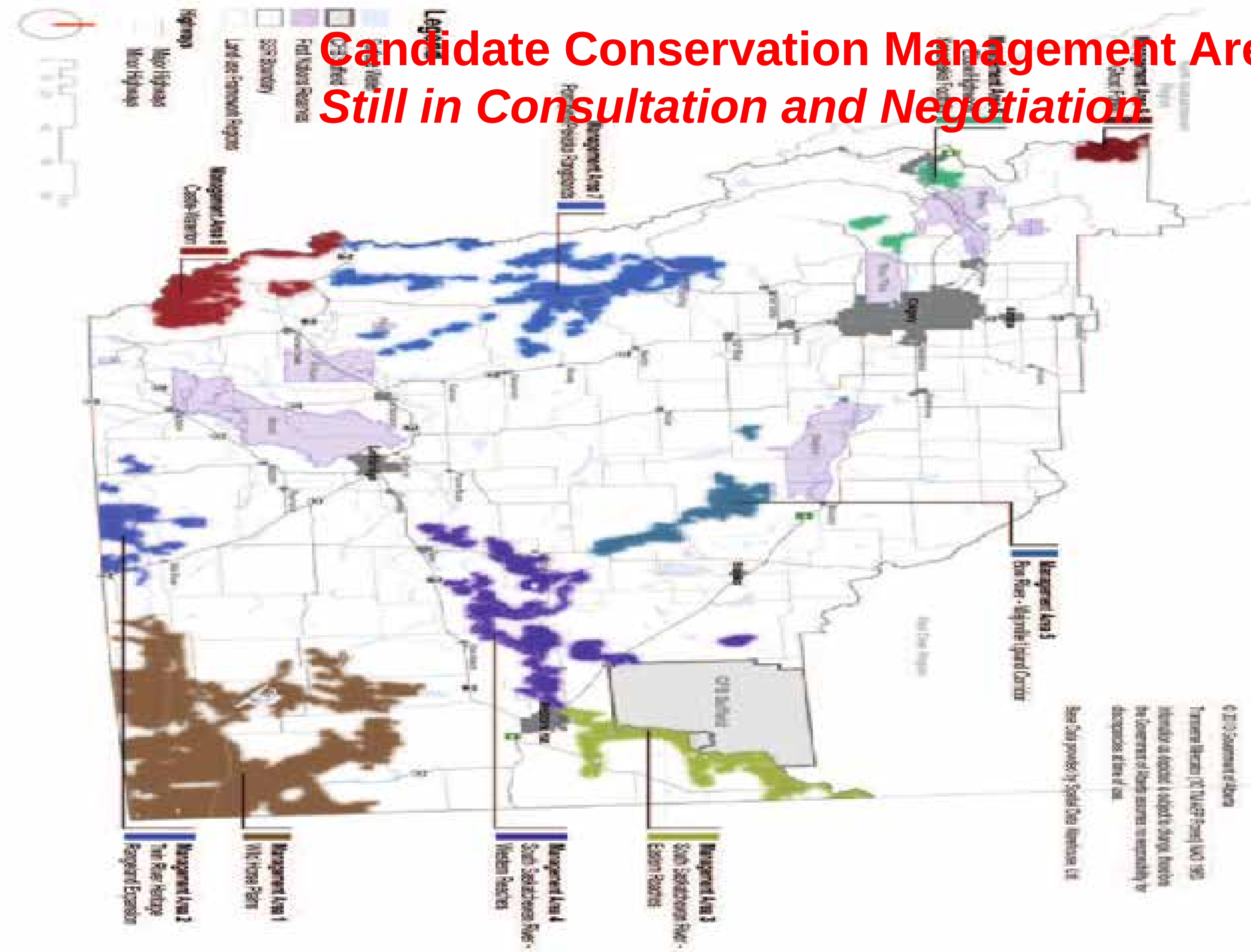
$$Total\ Cost = \sum_{classes} \left[Weighting_{class} * \sum_{features} \left(Target_{feature} - \sum_{\substack{planning \\ units}} Amount_{feature} \right) \right]$$

RAC Recommended Land-use Classification



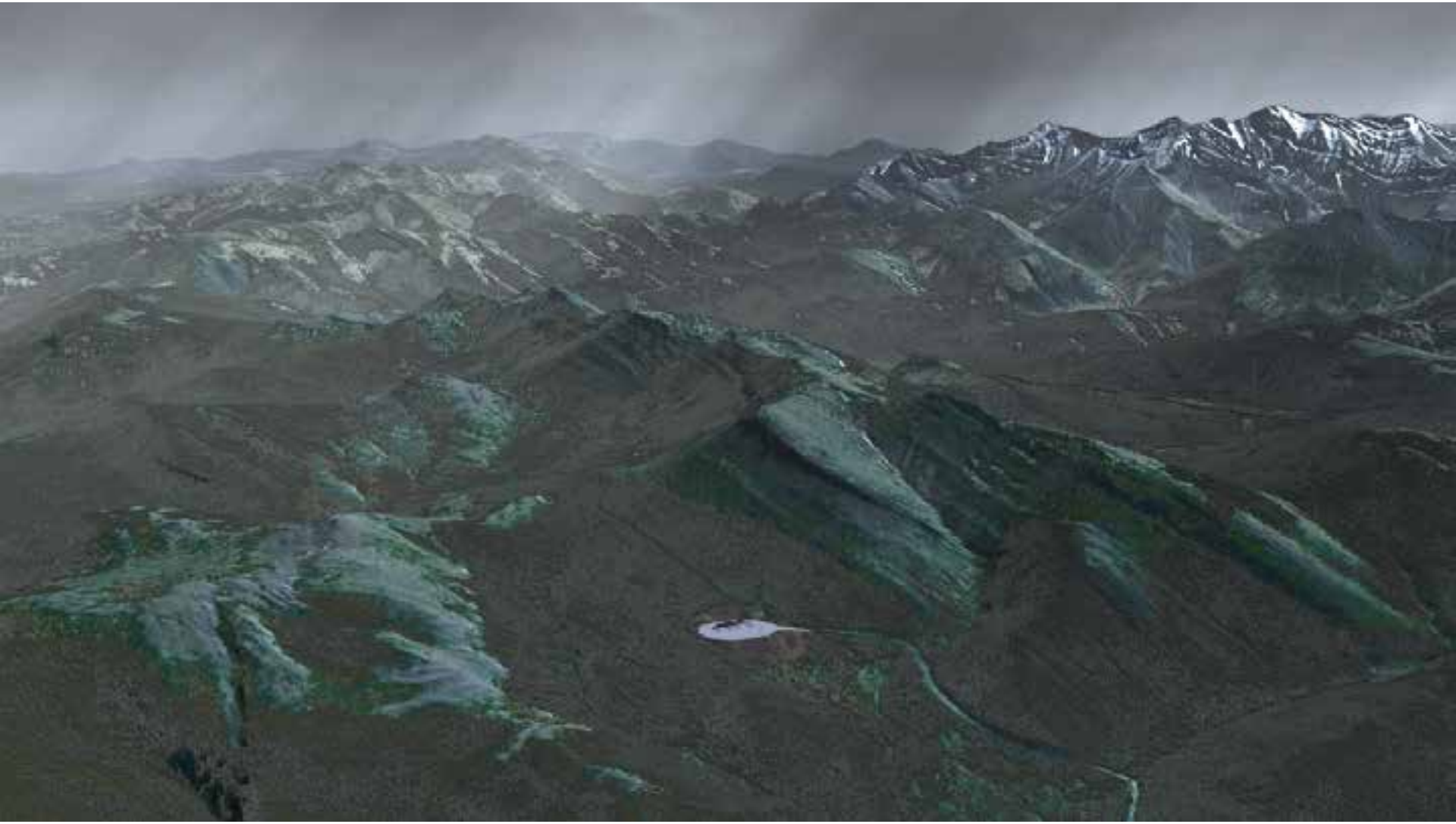
Candidate Conservation Management Areas

Still in Consultation and Negotiation

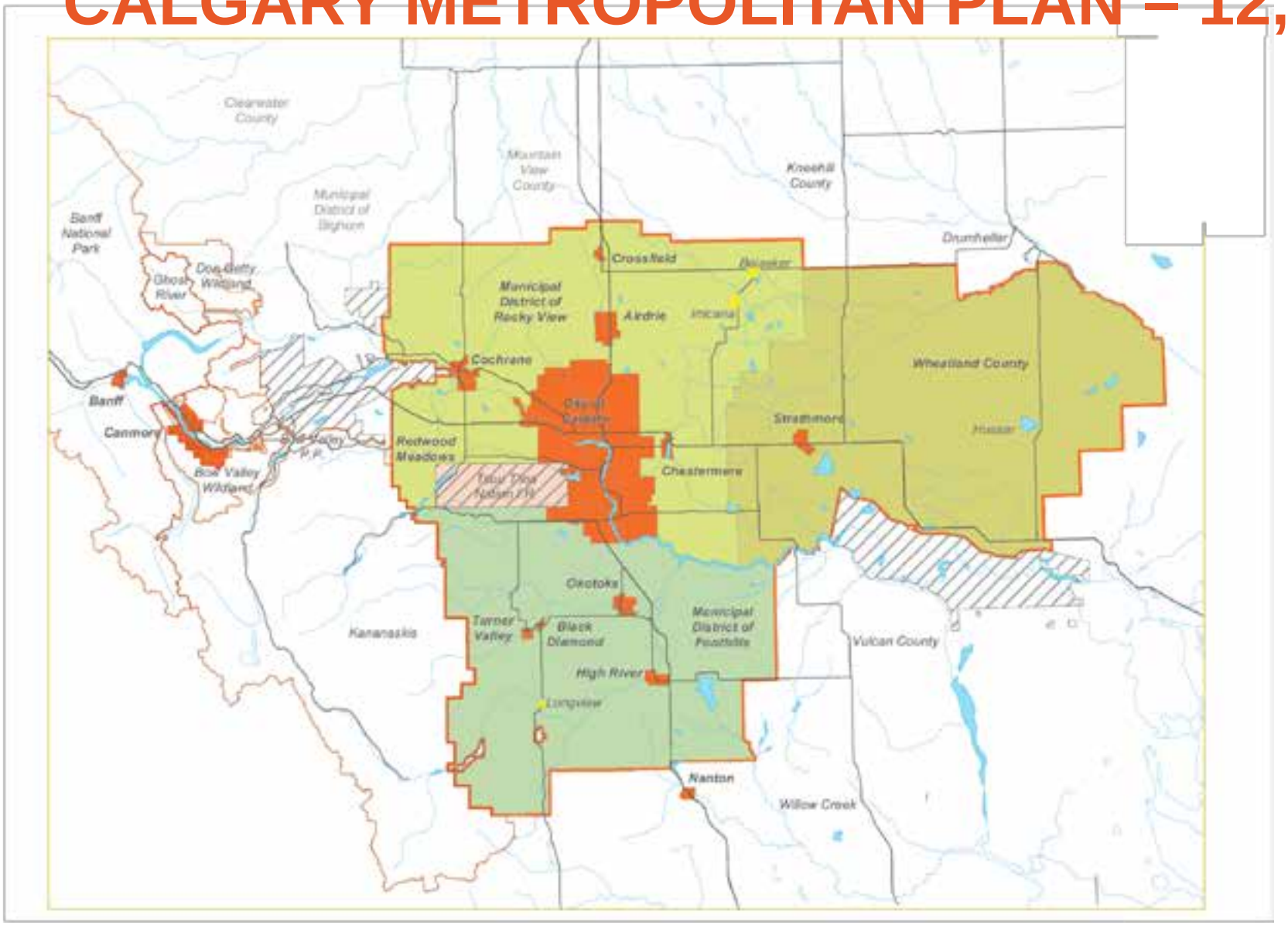


ndidate Conservation Management Areas on Public Lands Map

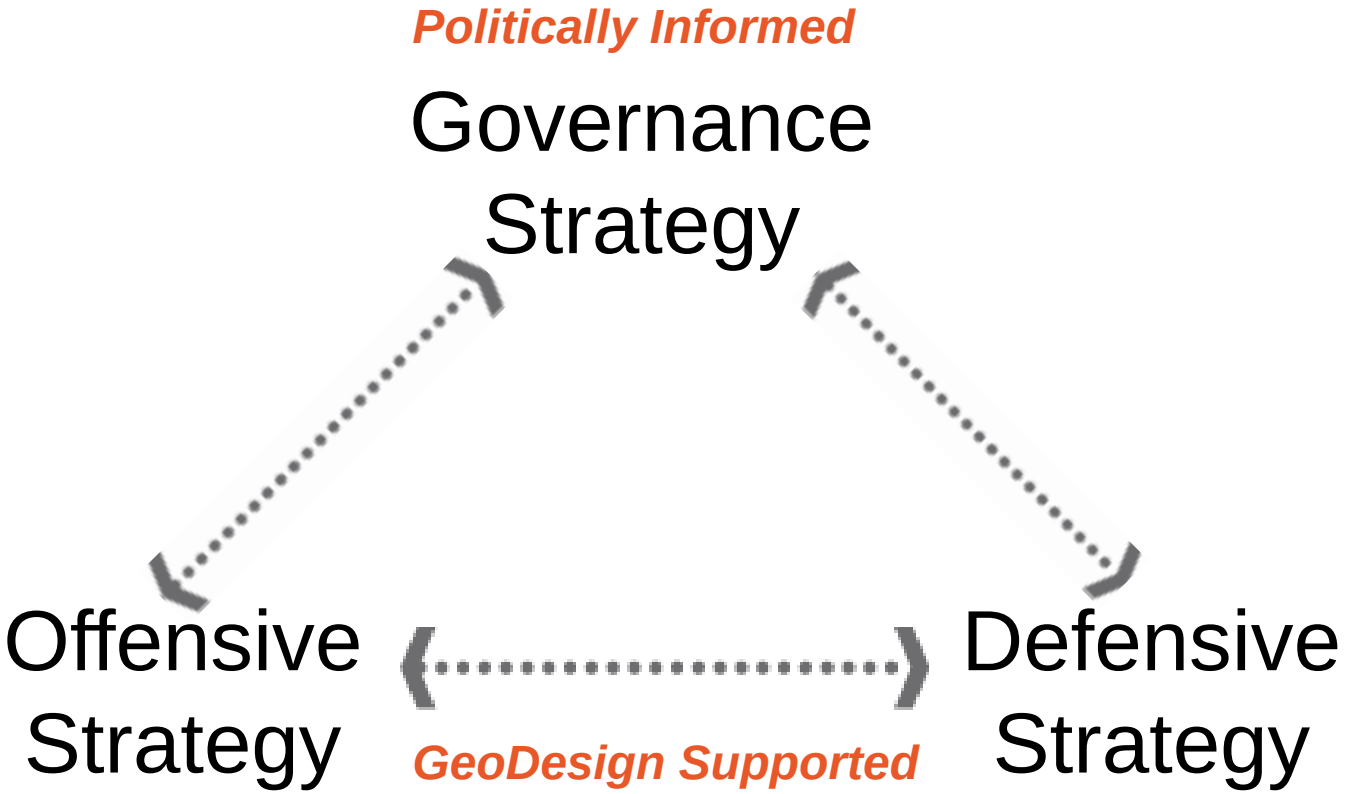
Visualization



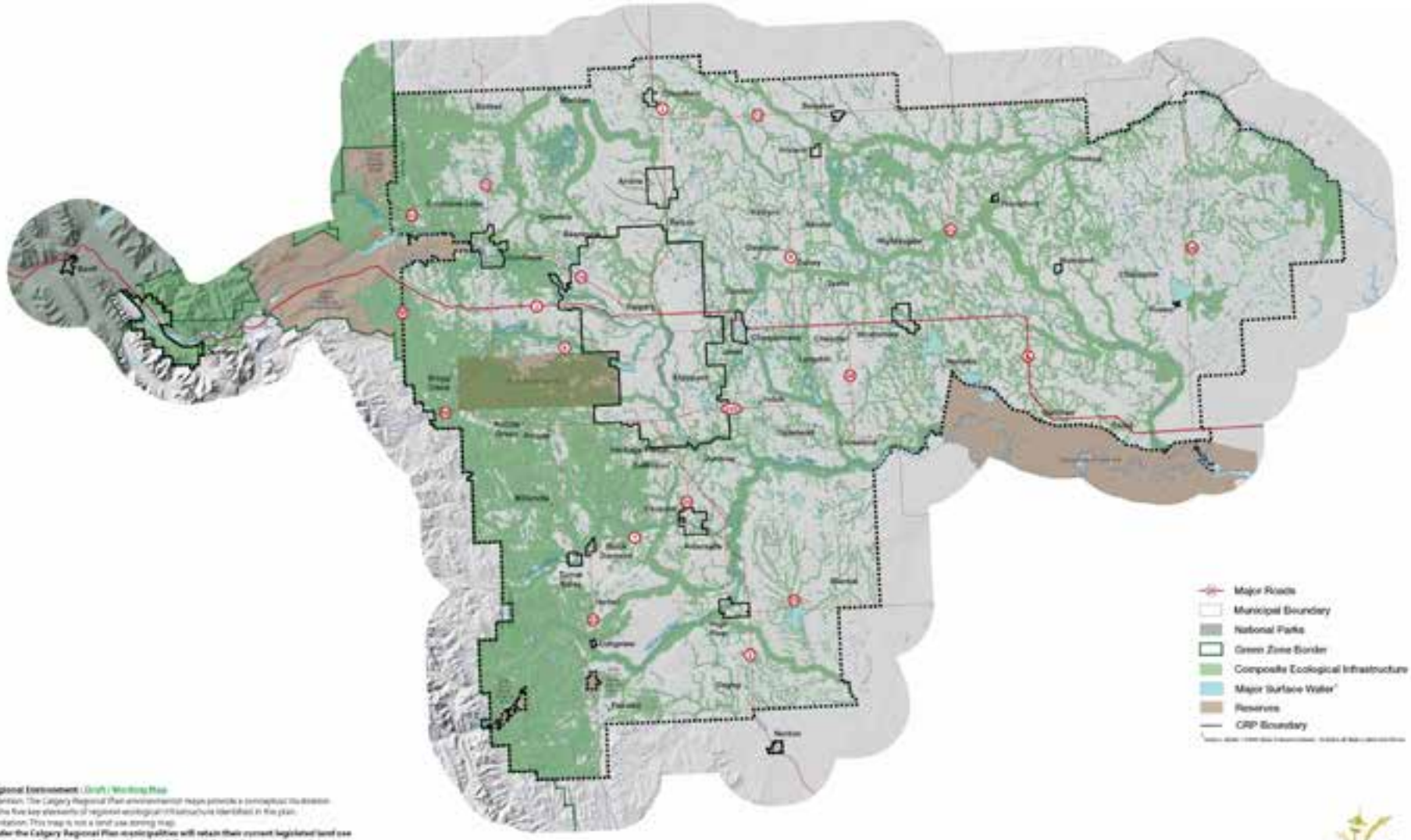
CALGARY METROPOLITAN PLAN – 12,000 K



REGIONAL LAND USE PLANNING WITHIN THE CITY REGION NEEDS THREE INTEGRATED STRATEGIES



COMPOSITE ECOLOGICAL INFRASTRUCTU



Regional Environment | Draft | Working Map

Intention: The Calgary Regional Plan environment maps provide a conceptual illustration of the five key elements of regional ecological infrastructure identified in the plan.

Limitation: This map is not a land use zoning map.

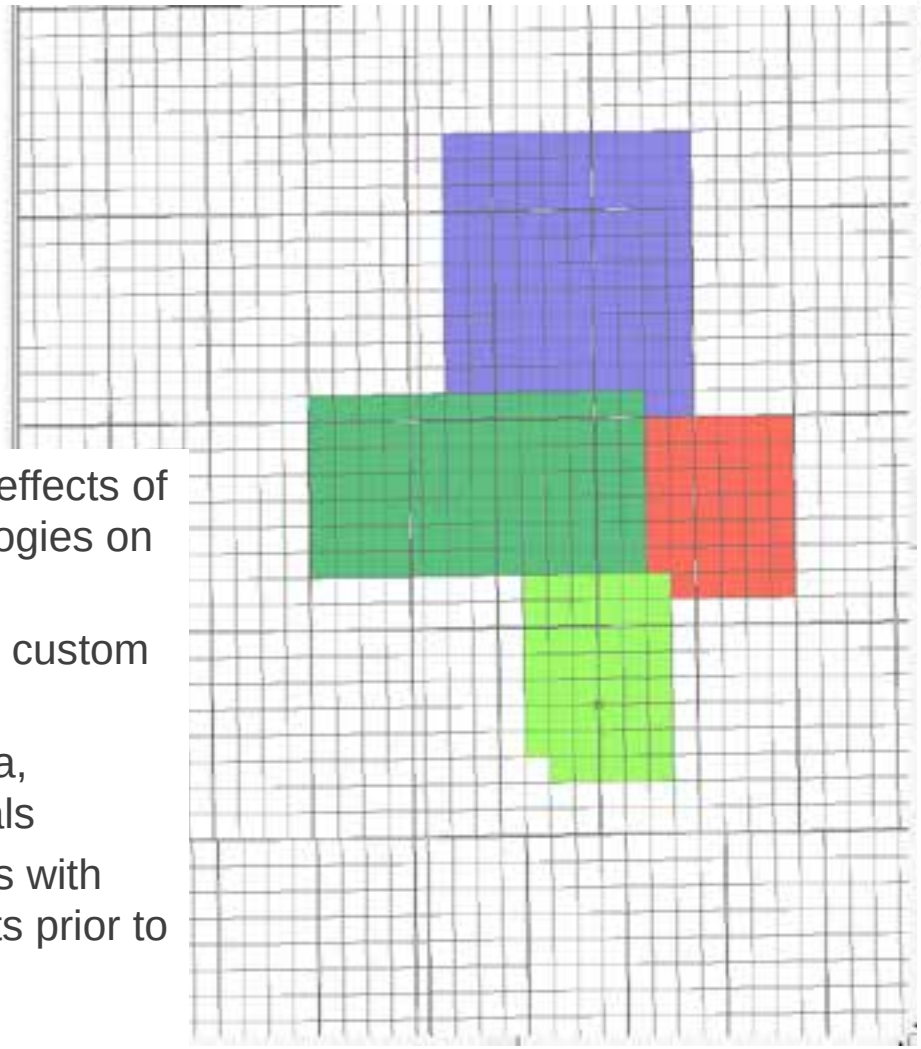
Under the Calgary Regional Plan municipalities will retain their current legislated land use planning and decision-making authority to define and choose the most appropriate implementation actions to achieve plan policy directions in their local context.

CALGARY

CALGARY REGIONAL PARTNERSHIP

CALGARY METROPOLITAN PLAN – CHANGE MODEL

LAND USE TYPOLOGY ‘PAINT’ OR SKETCHING TOOL

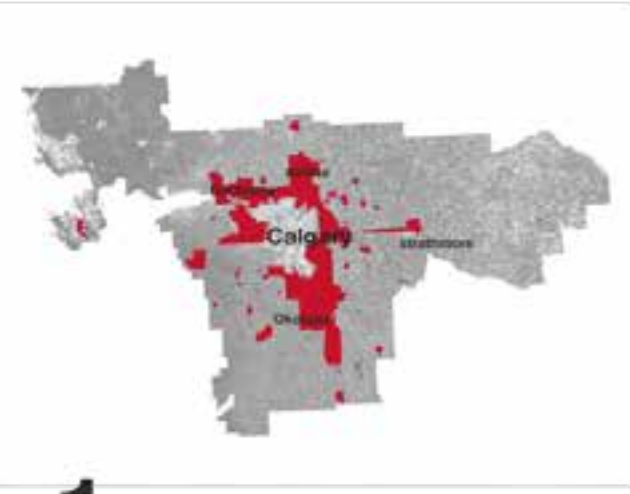


- Allows GIS analysis of effects of different land-use typologies on landscape
- Can be modified to use custom typologies
- Reports developed area, population, and job totals
- User can subtract areas with development constraints prior to assigning land-uses

To date we have developed three growth scenarios that show what the region could look like if we made certain assumptions.

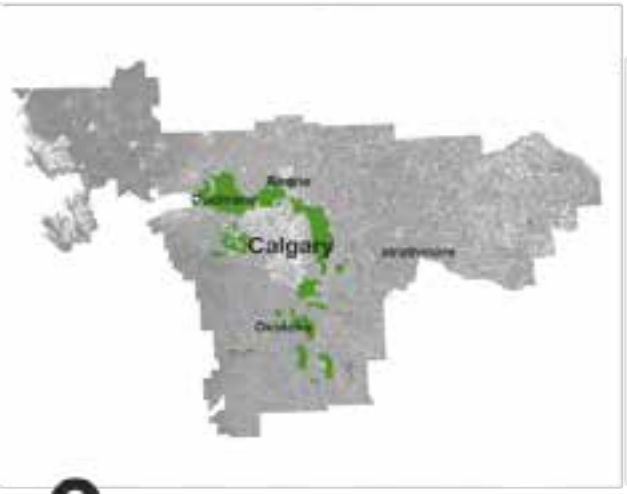
Coloured areas represent new growth.

the decisions we make now will affect our quality of life and available resources for future generations.



1

Trend Scenario. The first being – what if we continued to grow as we are now? What would be the implications for the Region and for municipalities if development continued as a reflection of our current trends. Trend Scenario. The first being – what if we continued to grow as we are now? What would be the implications for the Region and for municipalities if development continued as a reflection of our



2

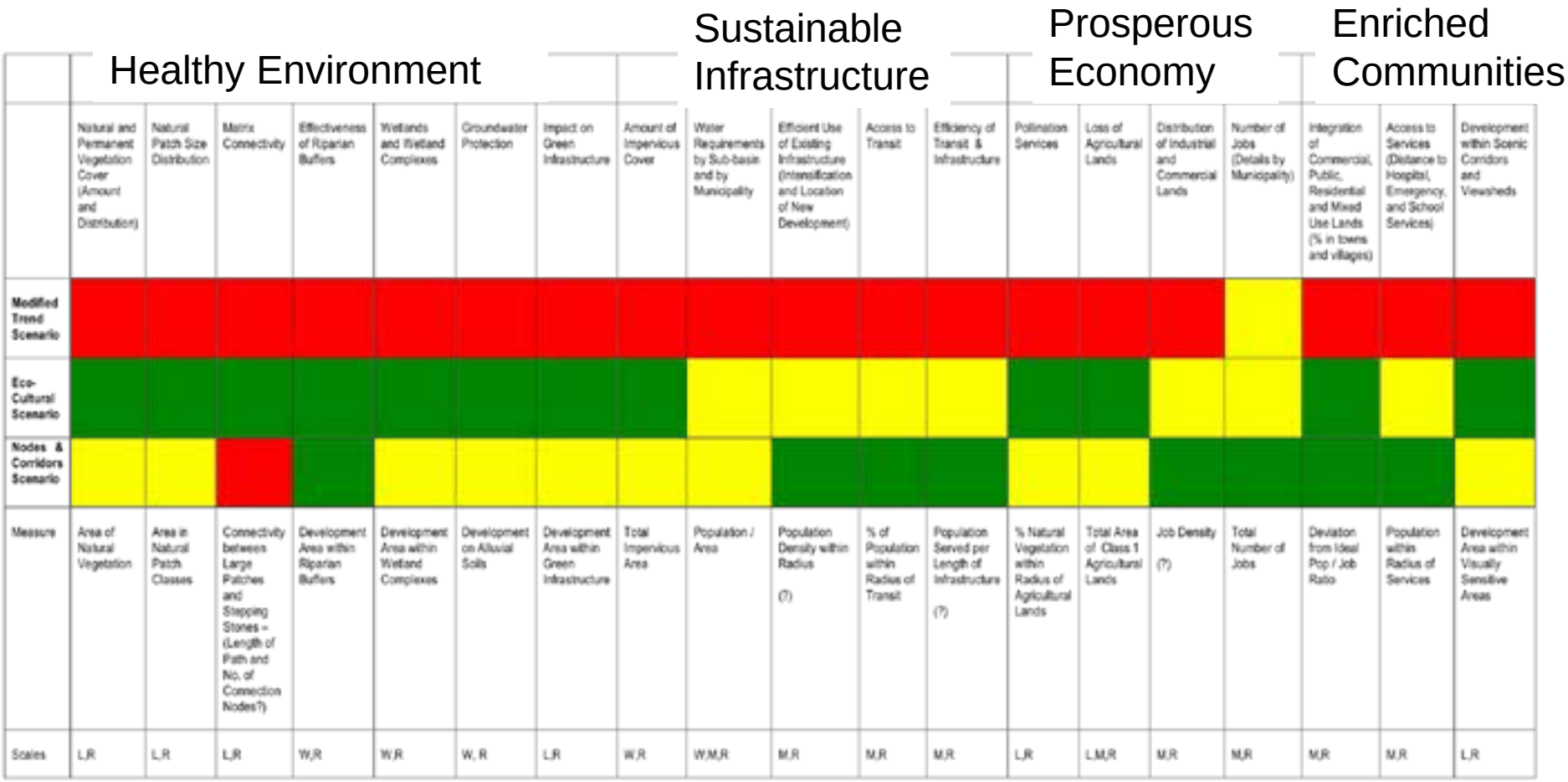
Ecological scenario. The second assumes that we want to develop with the least use of our resources and the least impact on the environment - what would that look like? Ecological scenario. The second assumes that we want to develop with the least use of our resources and the least impact on the environment - what would that look like? Ecological scenario. The second assumes that we want to develop with the least use of our

3

Nodes & Corridors Scenario. The final scenario assumes a network of connected nodes and corridors of intensified development that will provide for efficient service and transportation delivery. Nodes & Corridors Scenario. The final scenario assumes a network of connected Nodes & Corridors Scenario. The final scenario assumes a network of connected nodes and corridors of intensified development that of intensified

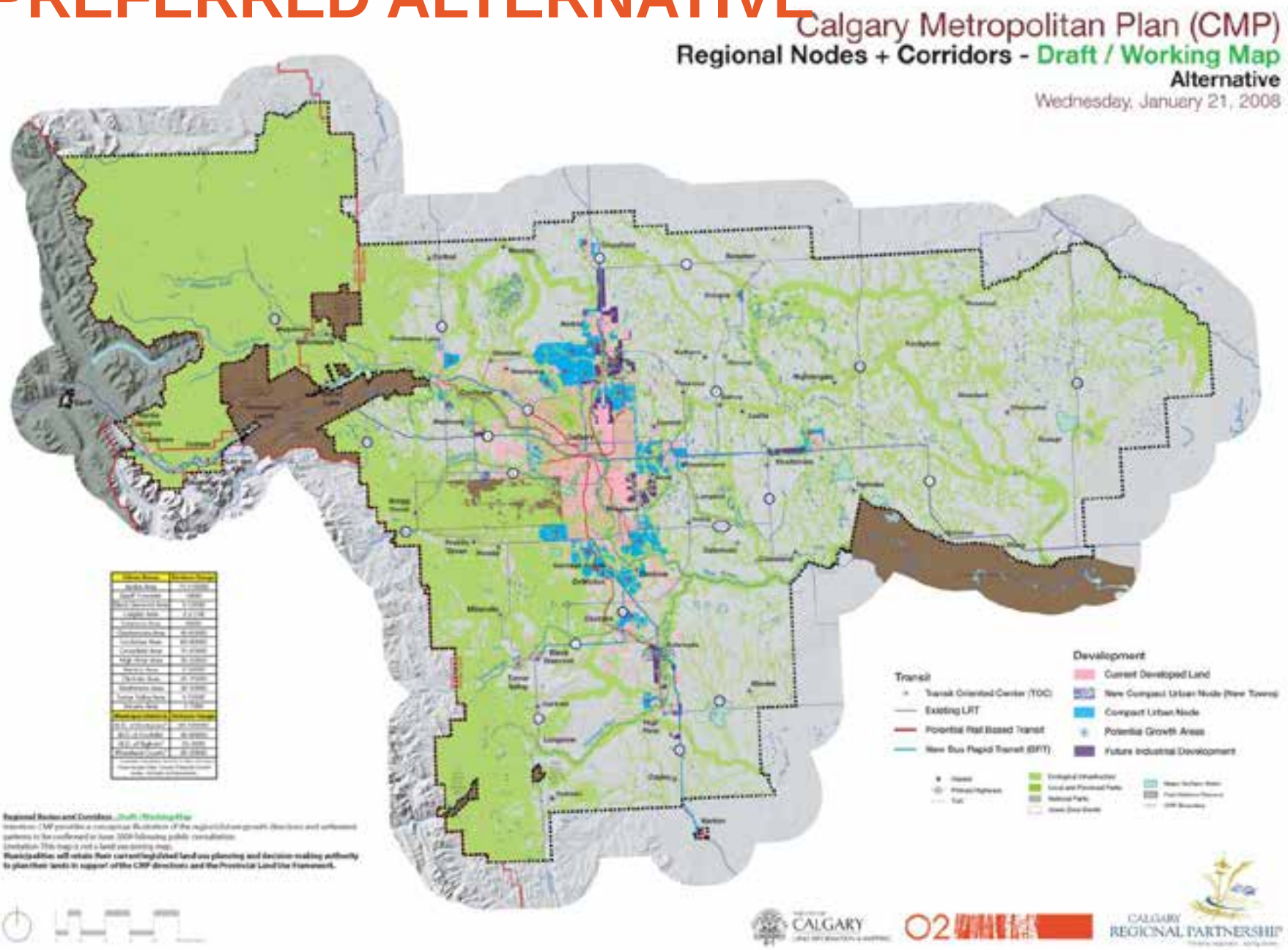
MEASURING THE IMPACT OF OPTIONS

ASSESSING SOLUTIONS



	Healthy Environment							Sustainable Infrastructure					Prosperous Economy				Enriched Communities		
	Natural and Permanent Vegetation Cover (Amount and Distribution)	Natural Patch Size Distribution	Matrix Connectivity	Effectiveness of Riparian Buffers	Wetlands and Wetland Complexes	Groundwater Protection	Impact on Green Infrastructure	Amount of Impervious Cover	Water Requirements by Sub-basin and by Municipality	Efficient Use of Existing Infrastructure (Intensification and Location of New Development)	Access to Transit	Efficiency of Transit & Infrastructure	Pollination Services	Loss of Agricultural Lands	Distribution of Industrial and Commercial Lands	Number of Jobs (Details by Municipality)	Integration of Commercial, Public, Residential and Mixed Use Lands (% in towns and villages)	Access to Services (Distance to Hospital, Emergency, and School Services)	Development within Scenic Corridors and Viewsheds
Modified Trend Scenario																			
Eco-Cultural Scenario																			
Nodes & Corridors Scenario																			
Measure	Area of Natural Vegetation	Area in Natural Patch Classes	Connectivity between Large Patches and Stepping Stones – (Length of Path and No. of Connection Nodes?)	Development Area within Riparian Buffers	Development Area within Wetland Complexes	Development on Alluvial Soils	Development Area within Green Infrastructure	Total Impervious Area	Population / Area	Population Density within Radius (?)	% of Population within Radius of Transit	Population Served per Length of Infrastructure (?)	% Natural Vegetation within Radius of Agricultural Lands	Total Area of Class 1 Agricultural Lands	Job Density (?)	Total Number of Jobs	Deviation from Ideal Pop / Job Ratio	Population within Radius of Services	Development Area within Visually Sensitive Areas
Scales	L,R	L,R	L,R	W,R	W,R	W, R	L,R	W,R	W,M,R	M,R	M,R	M,R	L,R	L,M,R	M,R	M,R	M,R	M,R	L,R

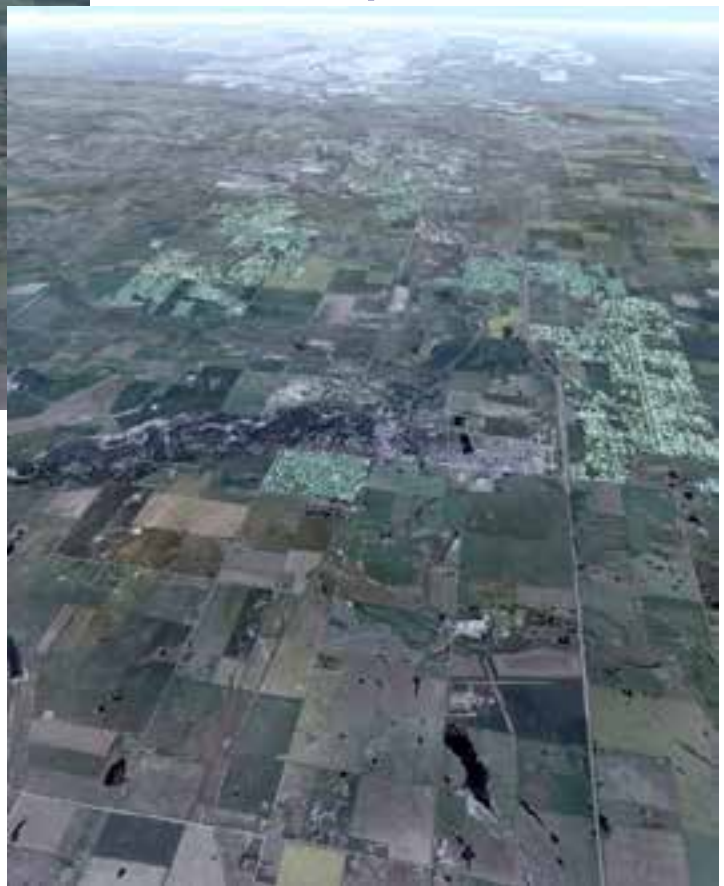
PREFERRED ALTERNATIVE



VISUALIZING AND ASSESSING THE ALTERNATIVES

Trend

Proposed…



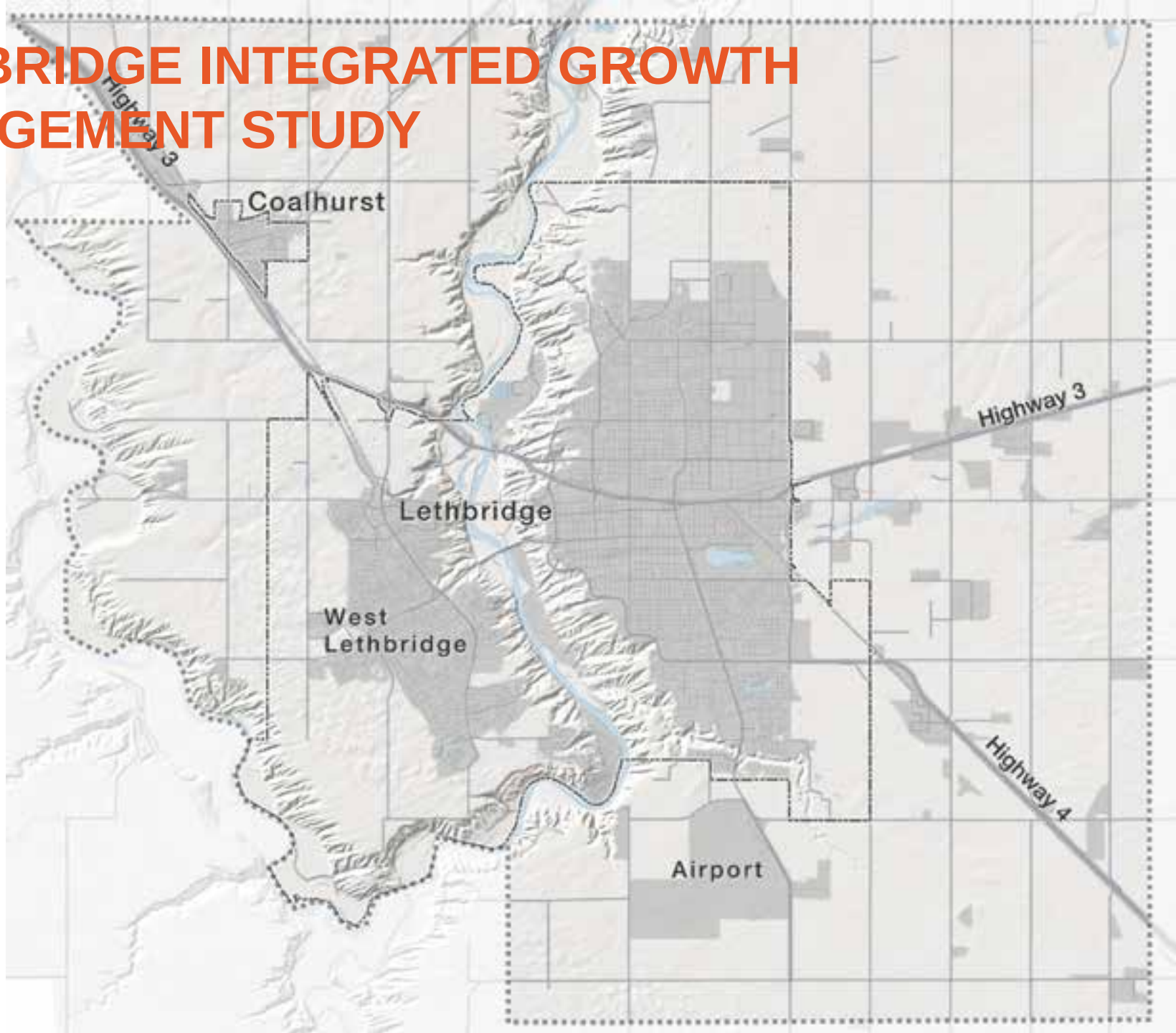
… 64% reduction of footprint
(800 km2 less hectares)
… 30% efficiency of infrastructure

VISUALIZING THE ALTERNATIVES

VISUAL NATURE STUDIO

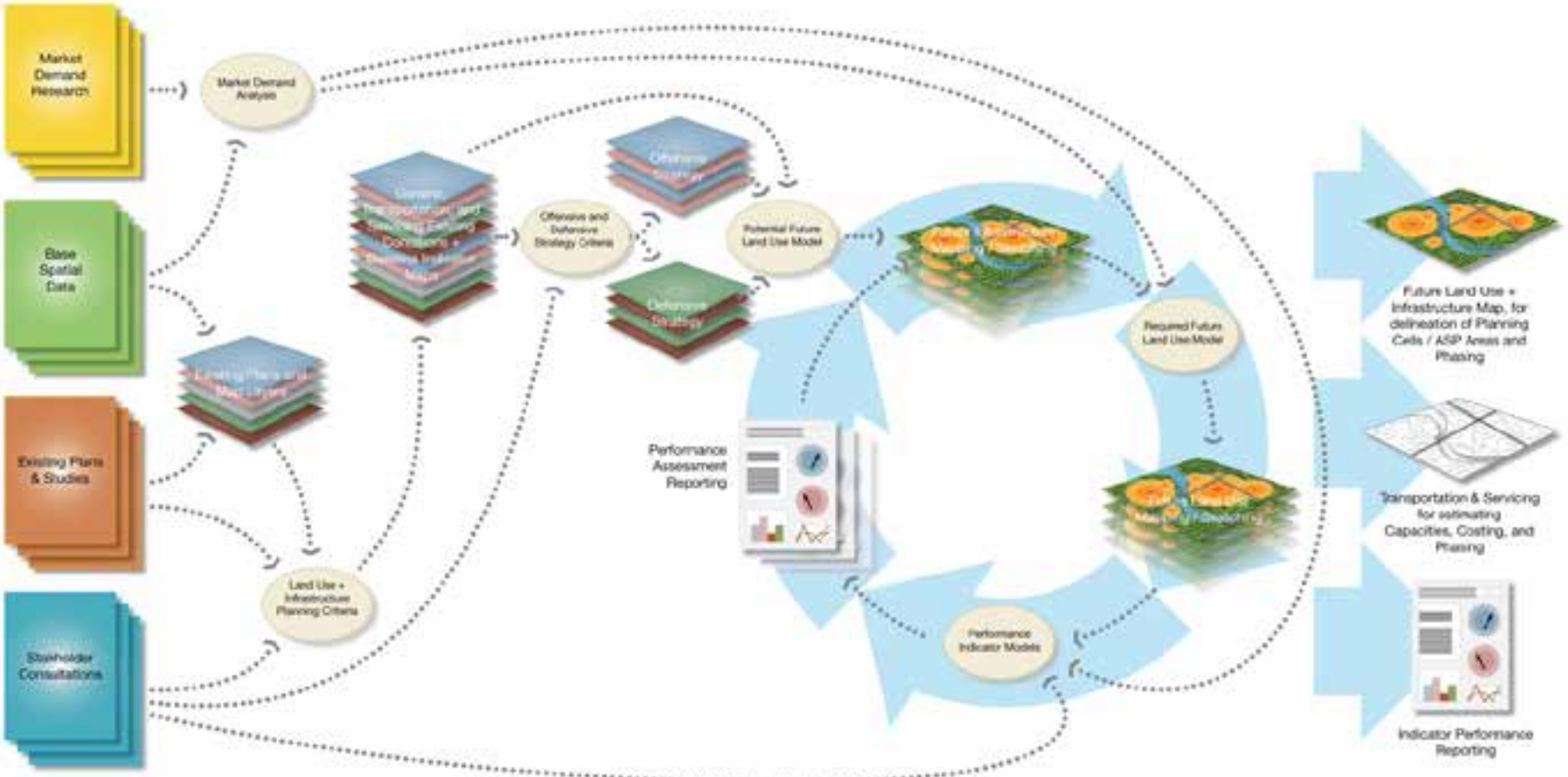
- Visualization is an effective tool for informing stakeholders and the general public about proposed urban planning initiatives and comparing options.

LETHBRIDGE INTEGRATED GROWTH MANAGEMENT STUDY



LETHBRIDGE INTEGRATED GROWTH MANAGEMENT STUDY

A GeoDesign Approach



APPROACH

How Much?

- Projected Population + Employment Growth
- Projected Land Demand

Where?

- Preferred growth areas based on policy and stakeholder direction: Suitability and Vulnerability Maps updated at each phase

Impact?

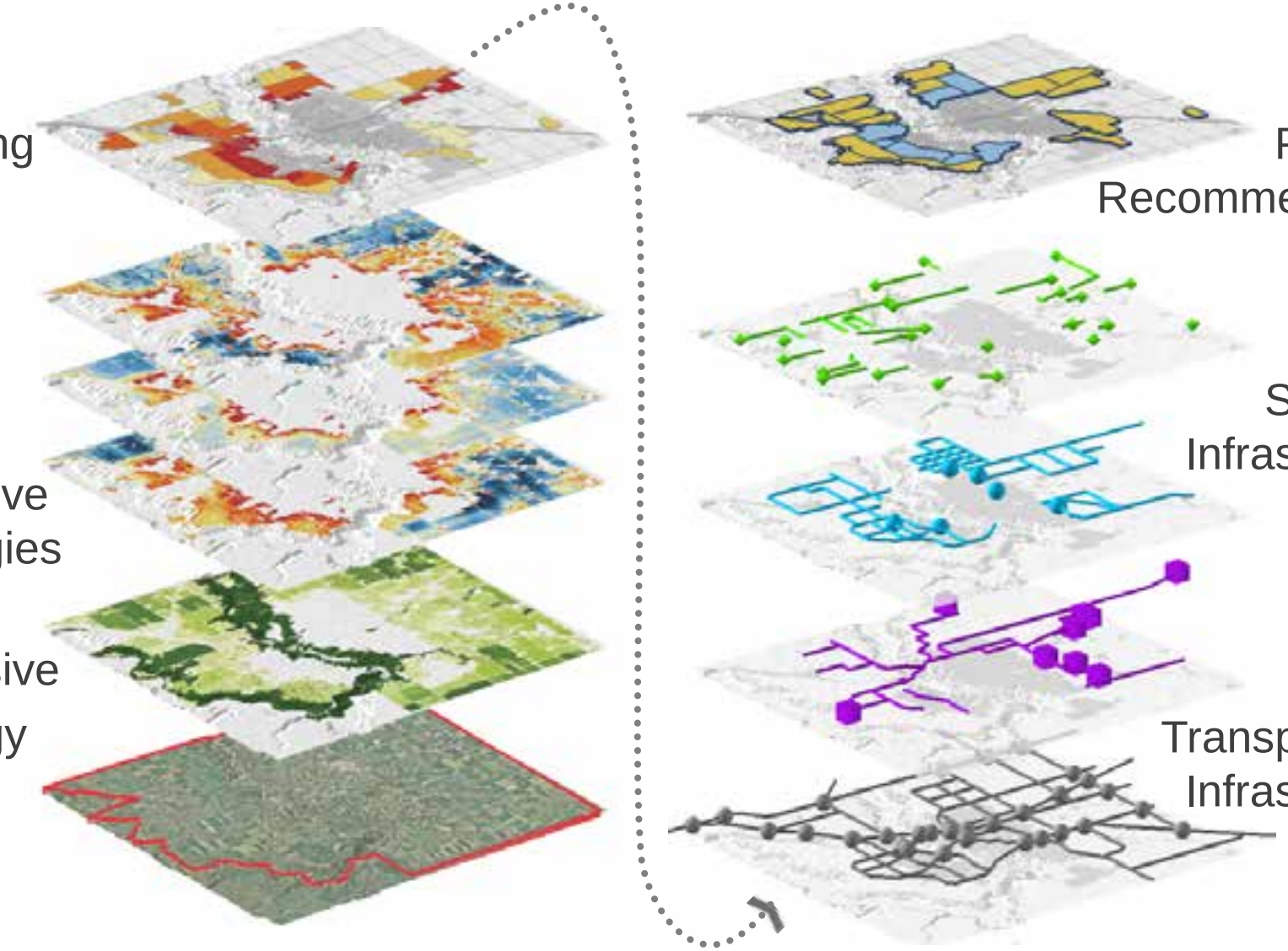
- Calculate infrastructure costs: Sanitary, Water, Stormwater, Transportation

Outcome?

- Cost-effective growth planning sequence

APPROACH

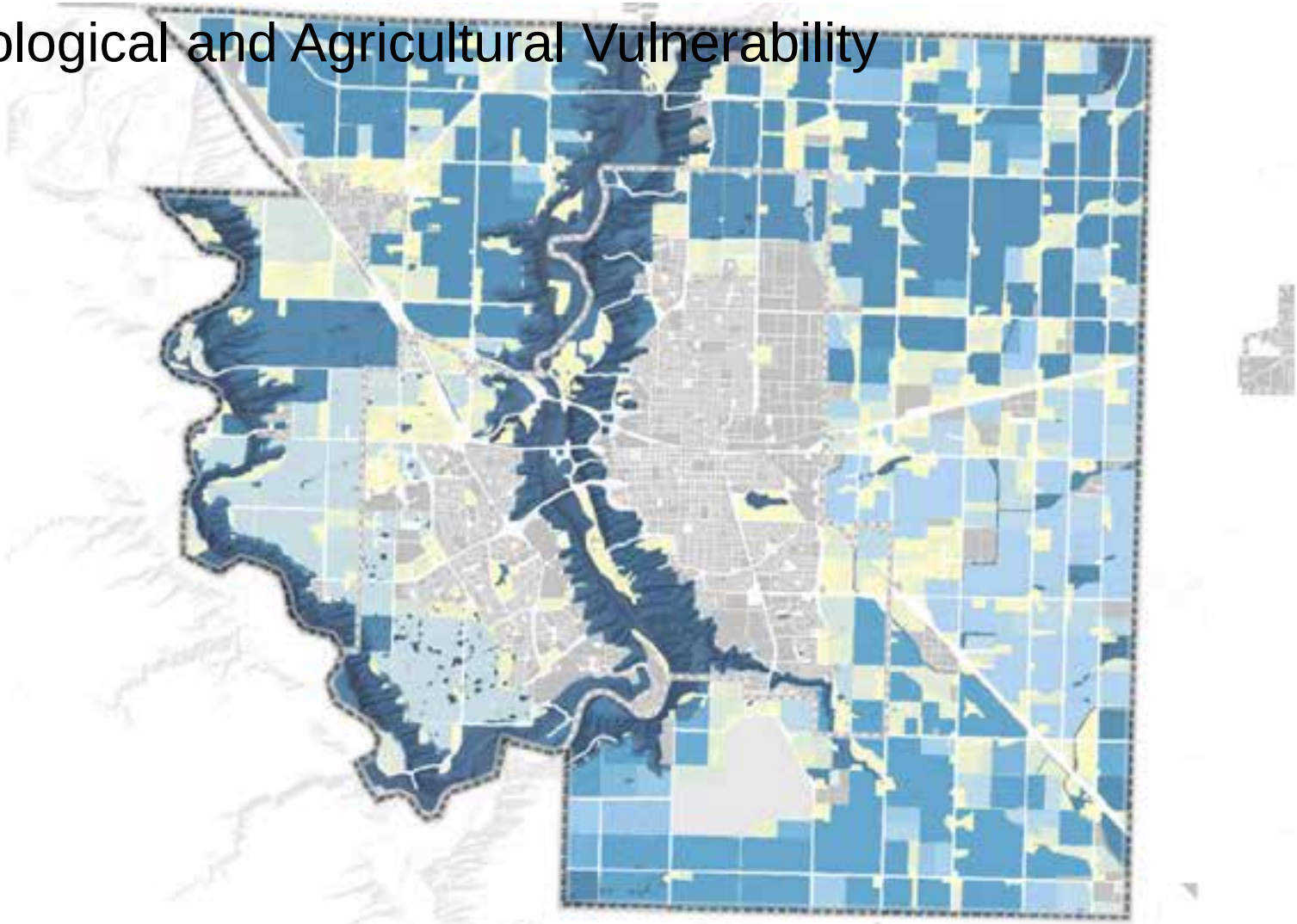
02


Planning
Units
Offensive
Strategies
Defensive
Strategy
Planning
Recommendation
Servicing
Infrastructure
Transportation
Infrastructure

LETHBRIDGE INTEGRATED GROWTH MANAGEMENT STUDY

DEFENSIVE STRATEGY

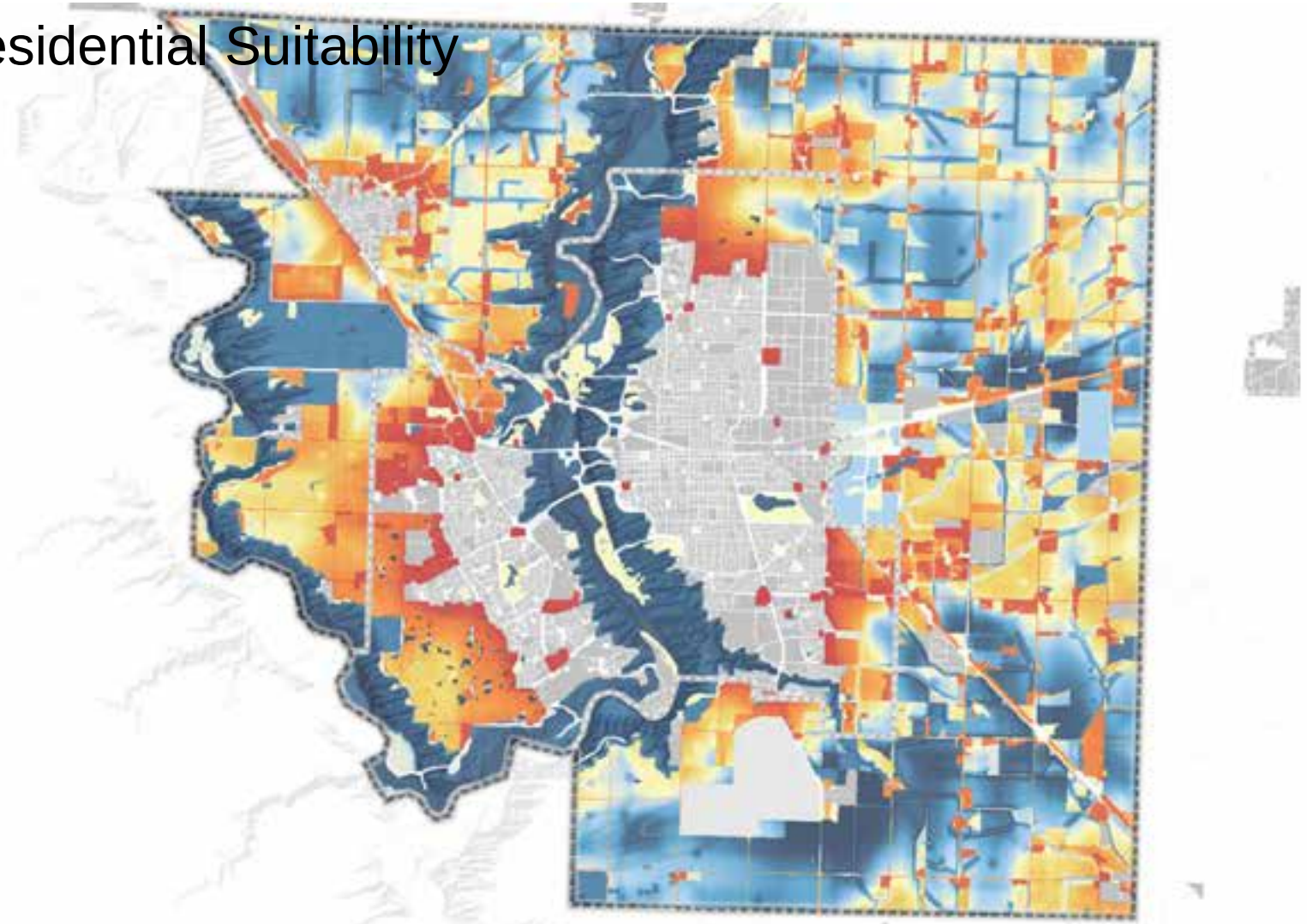
Ecological and Agricultural Vulnerability



LETHBRIDGE INTEGRATED GROWTH MANAGEMENT STUDY

OFFENSIVE STRATEGY

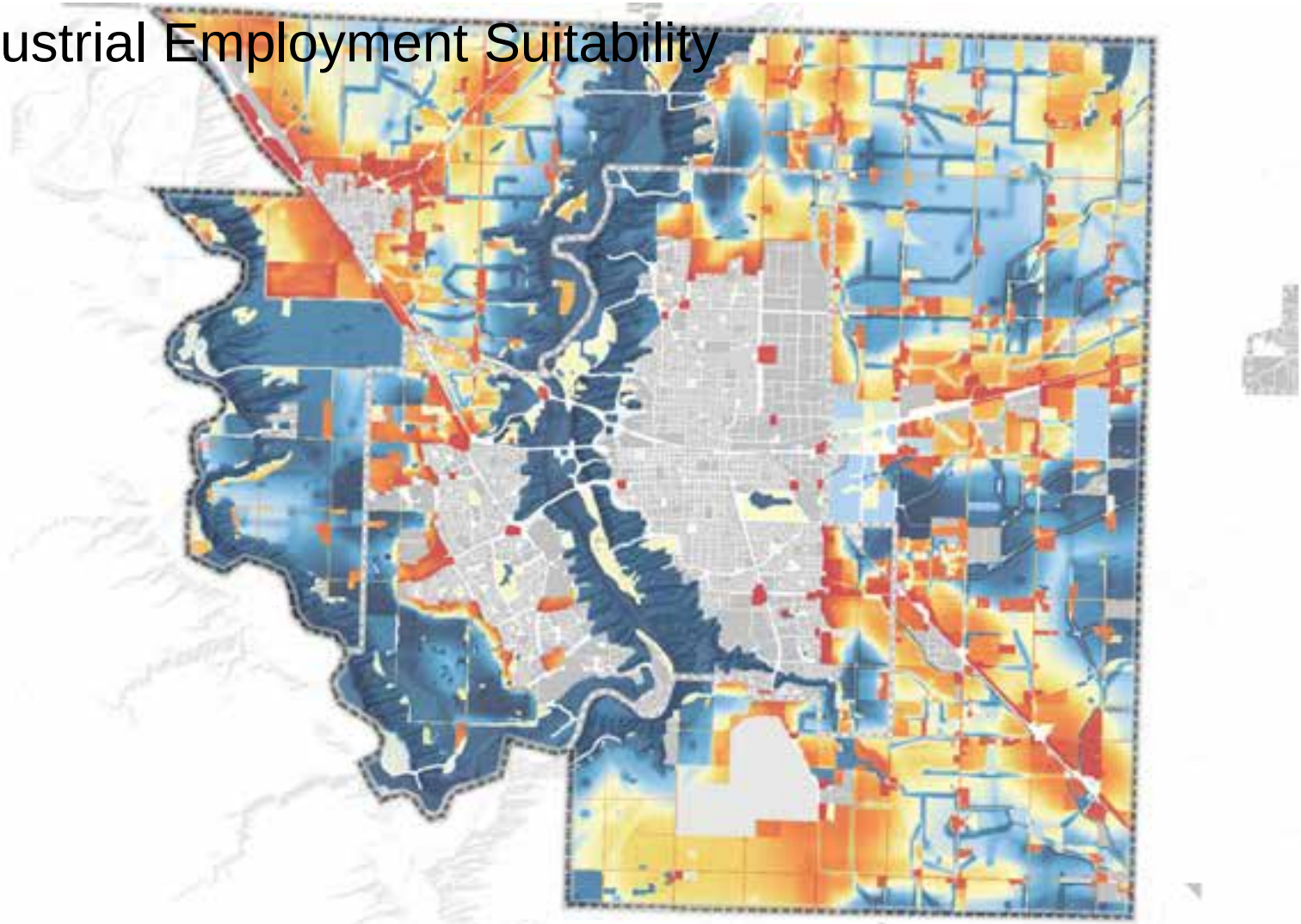
Residential Suitability



LETHBRIDGE INTEGRATED GROWTH MANAGEMENT STUDY

OFFENSIVE STRATEGY

Industrial Employment Suitability



STRATEGIES DASHBOARD

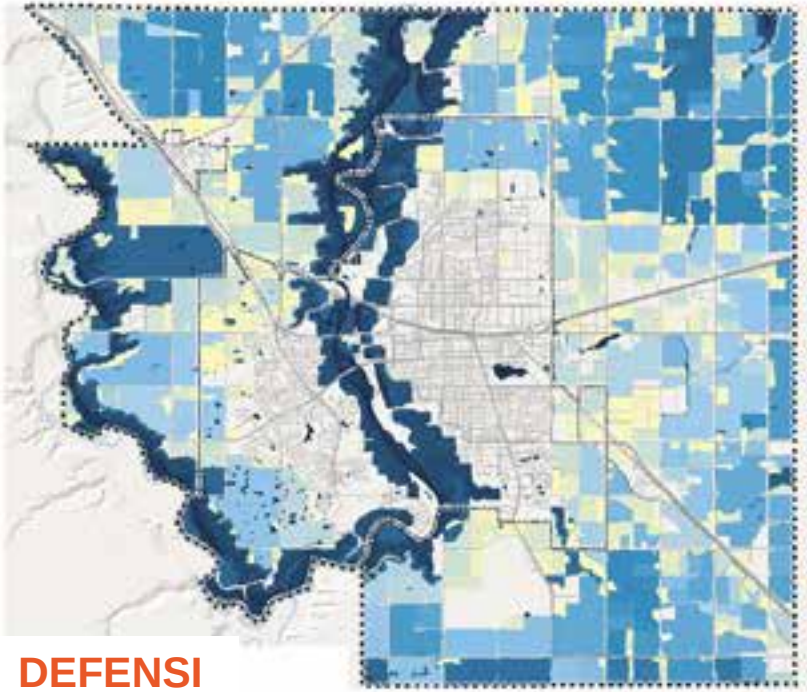
Lethbridge IDMS
Modelling Parameters

		Residential Suitability			Commercial Suitability			Industrial Suitability		
		Compatibility/Incompatibility Weight	Distance	Constraint	Compatibility/Incompatibility Weight	Distance	Constraint	Compatibility/Incompatibility Weight	Distance	Constraint
Roads	Local / Collector Roads	50	400	☐	20	200	☑	0	200	☑
	Arterial Roads	50	800	☑	100	400	☑	80	400	☑
	Highways / Access Points	-50	1000	☑	50	1000	☑	100	1000	☑
	CANAMEX / Access Points	-50	1000	☑	20	1000	☑	100	1000	☑
Transportation Systems	Railroads	-50	100	☑	100	0	☑	100	0	☑
	Airport	-80	2000	☑	80	2000	☑	100	2000	☑
	Airport NEP Zone	-100	0	☐	0	0	☐	0	0	☐
Transit	Bus Stops	100	800	☐	100	800	☐	100	800	☐
Deep Services	Water	100	200	☐	100	200	☐	100	200	☐
	Sanitary	100	200	☐	100	200	☐	100	200	☐
Land Uses + Zoning	Residential	100	1000	☑	80	1000	☑	-100	1000	☑
	Commercial	80	1000	☑	100	1000	☑	50	1000	☑
	Industrial	-100	1000	☑	50	1000	☑	100	1000	☑
	Parks + Open Spaces	50	1000	☑	0	1000	☑	-100	1000	☑
	Urban-Rural Fringe Zones	80	0	☐	80	0	☐	20	0	☐
Energy Infrastructure	Wells	-50	100	☑	-50	100	☑	-50	100	☑
	Pipelines	-20	100	☐	-20	100	☐	-20	100	☐
Agricultural Operations	Irrigation Infrastructure	-100	30	☑	-100	30	☑	-100	30	☑
	High Quality Agricultural Land	-50	0	☐	-50	0	☐	-50	0	☐
	Confined Feeding Operations	-100	2000	☑	-100	2000	☑	0	2000	☑
Special Considerations	BioSecurity (CFIA)	-100	800	☑	-50	800	☑	0	800	☑
	Ag Research Centre (AC)	0	800	☑	-50	800	☑	-100	800	☑

Lethbridge IDMS
Modelling Parameters

		Weight *relative importance for protection*	Constraint Threshold *the higher the value, the more of the vulnerable area will be considered an absolute constraint*
Landscape Vulnerability	Sensitive Slopes	100	50
	Hydrologically Sensitive Land	100	50
	Natural Landscape Patches	100	50
	Landscape Connectivity	100	50
Agricultural Vulnerability	Agricultural Land Quality by soil, irrigation, size	100	0
	Agricultural Land Fragmentation by patch	100	0

BASELINE



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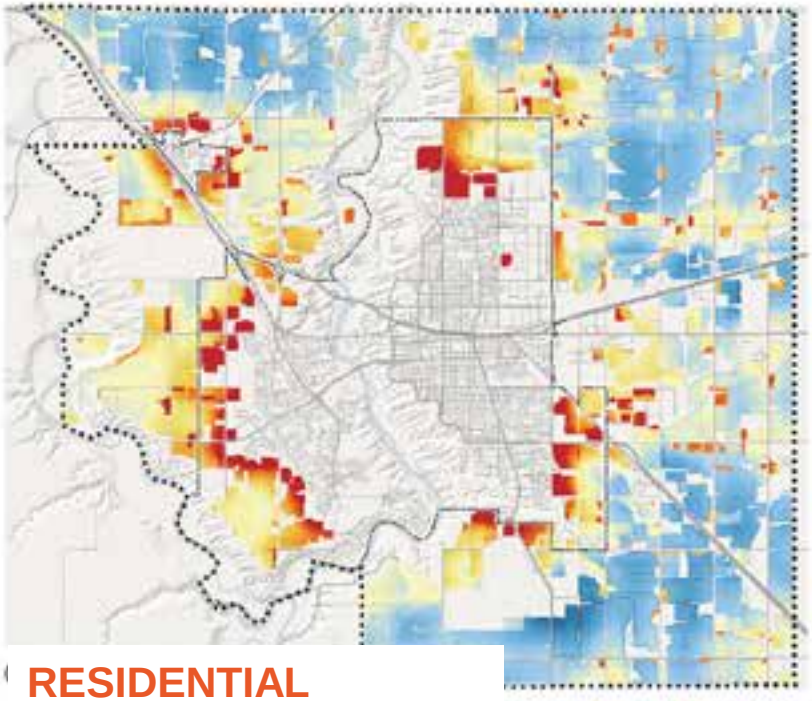

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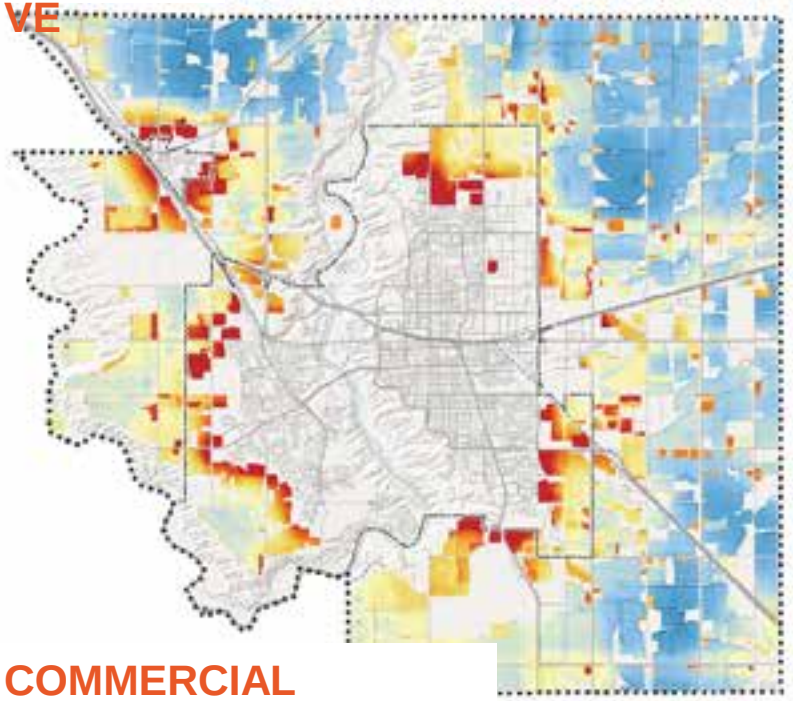

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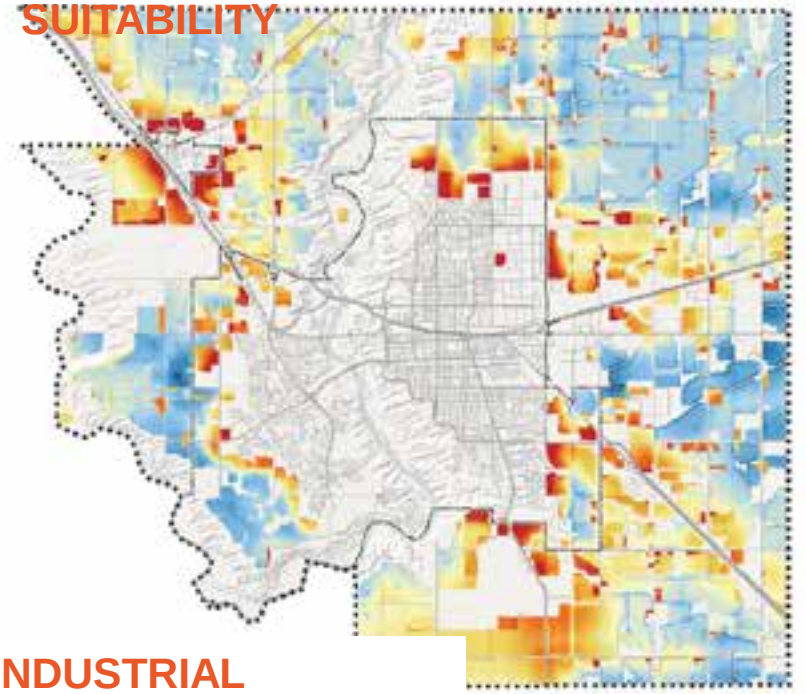

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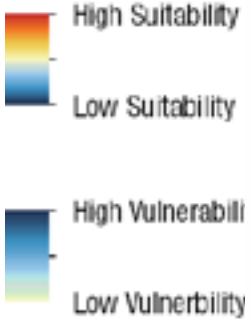

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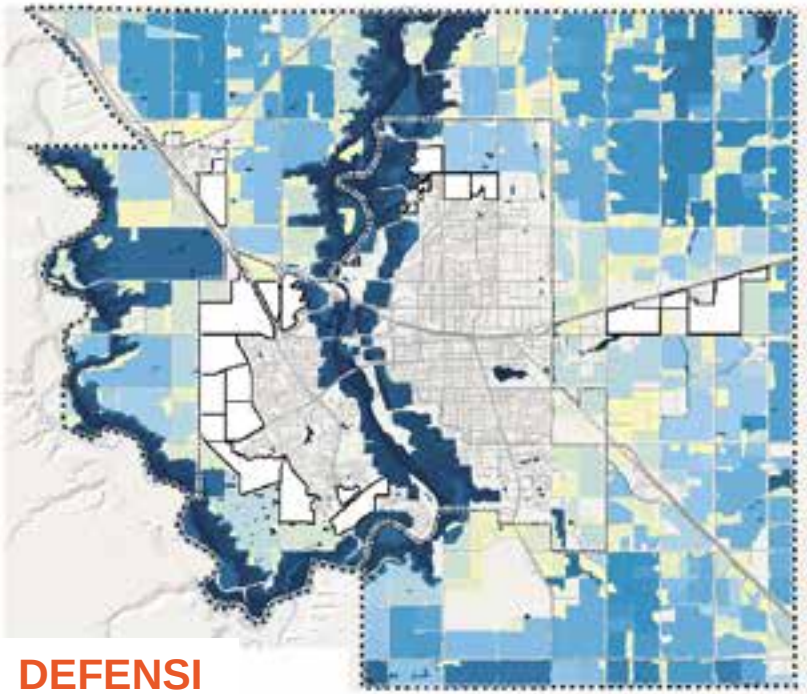

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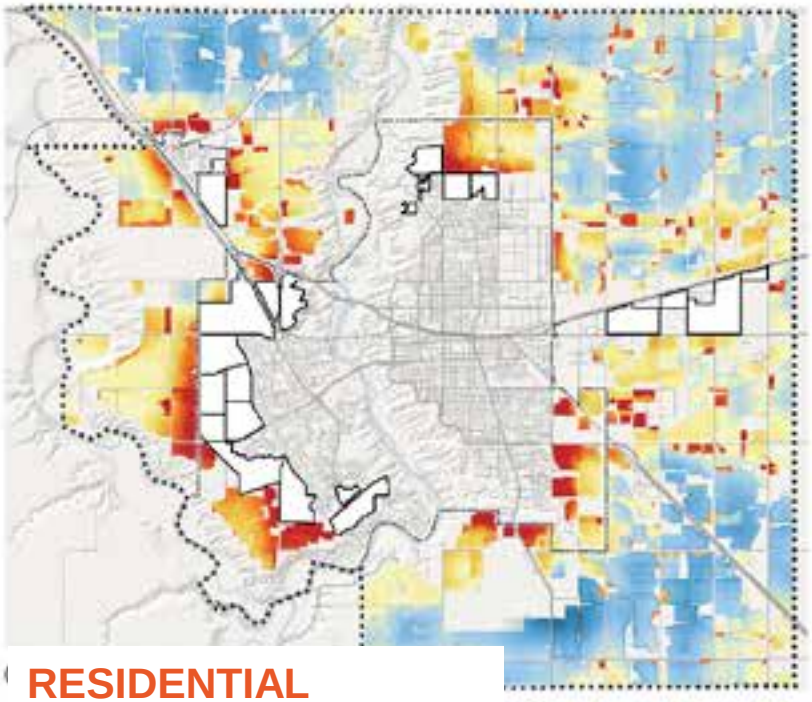

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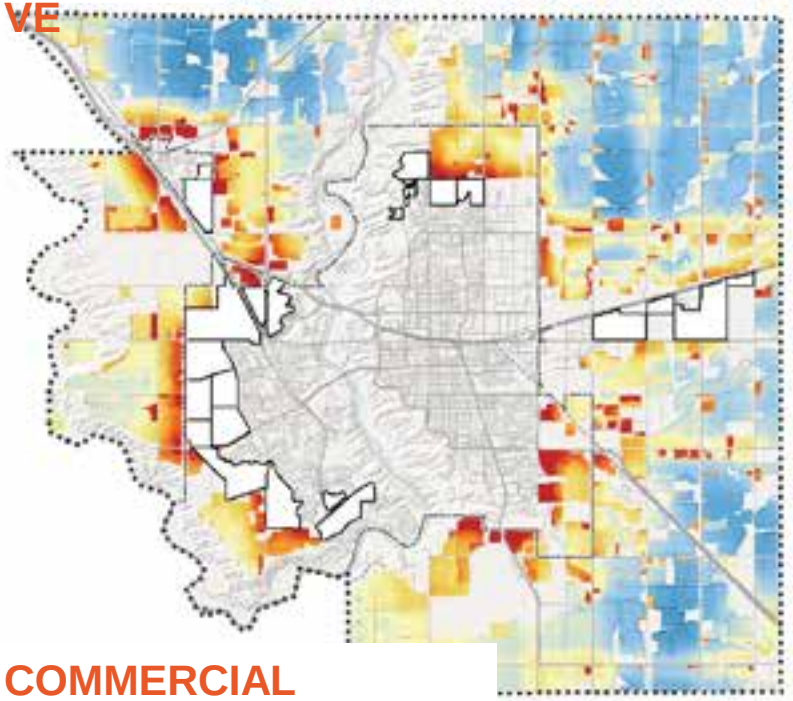

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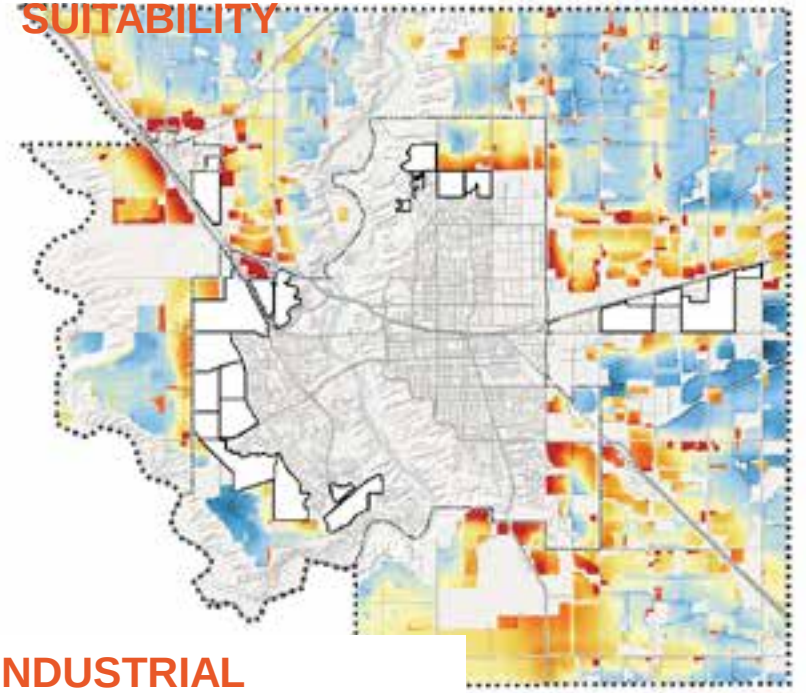

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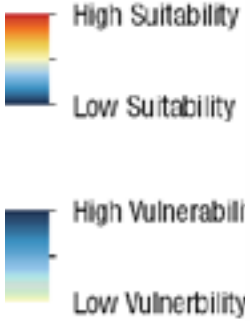

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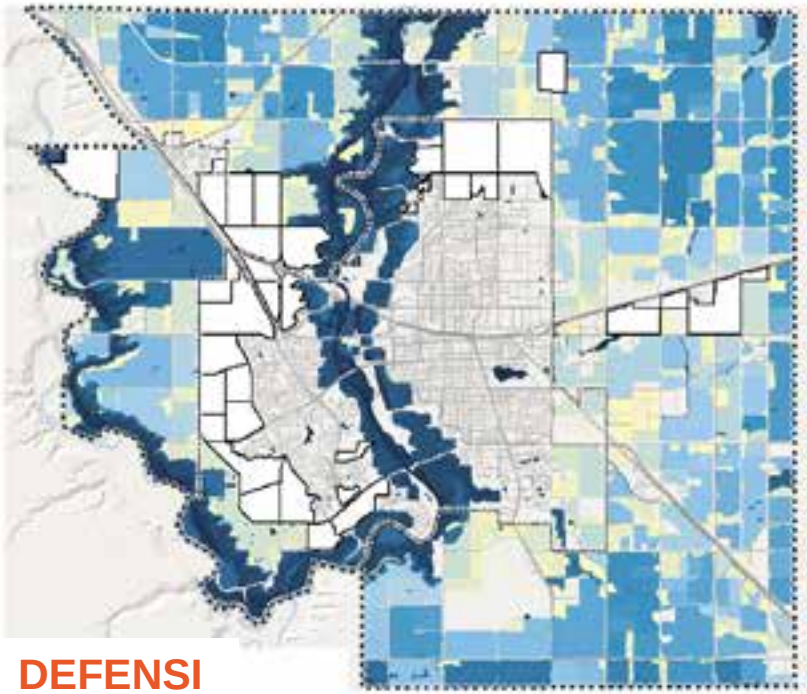

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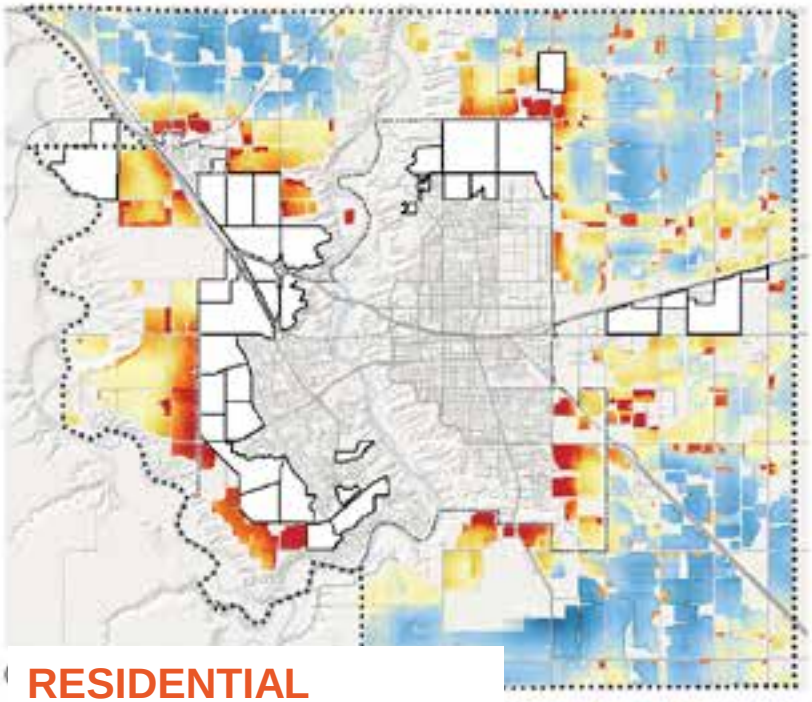

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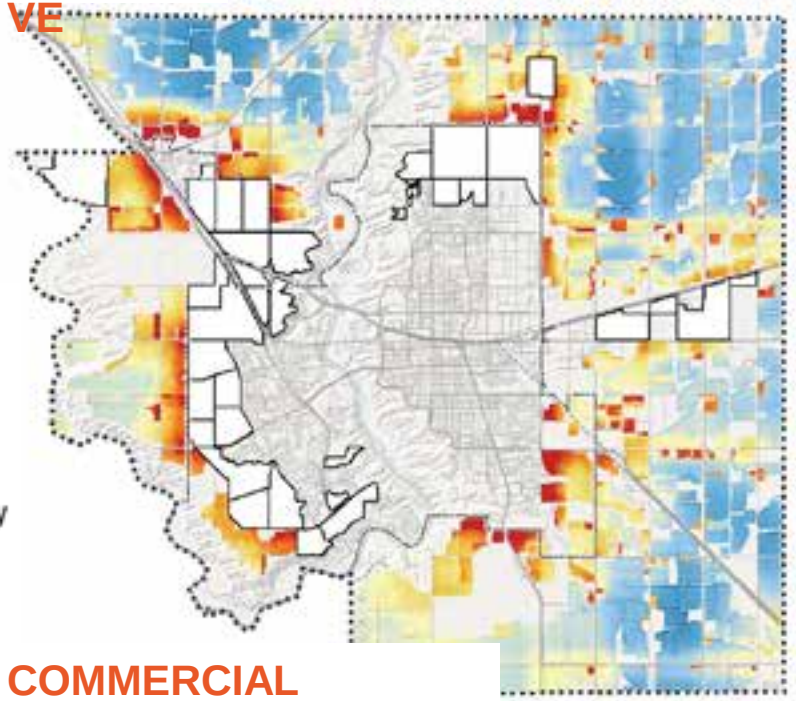

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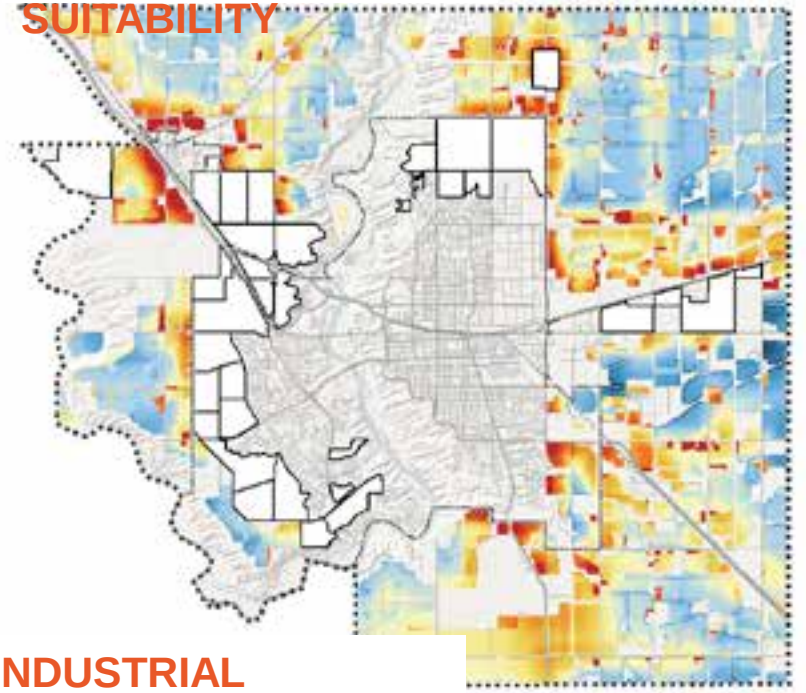


INDUSTRIAL

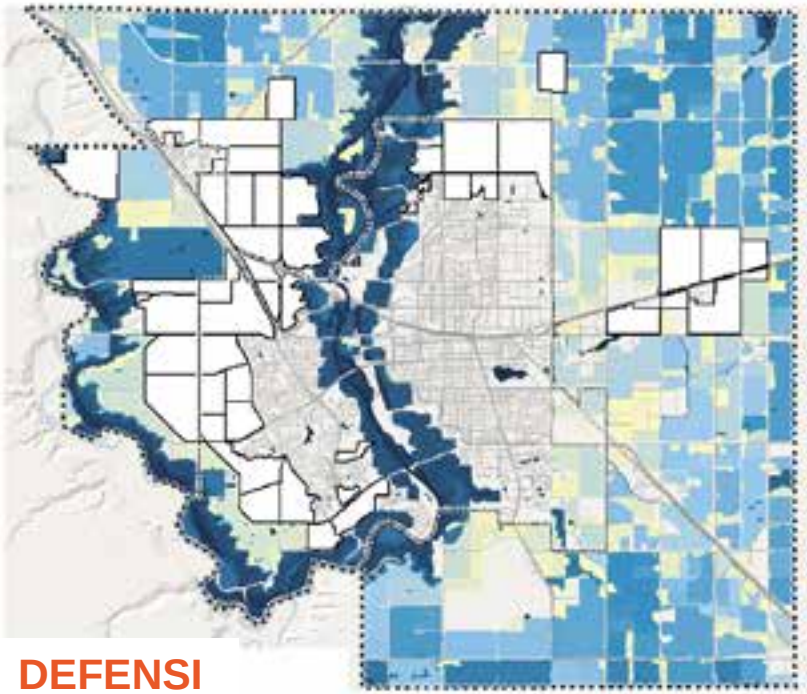
High Suitability

Low Suitability

High Vulnerability

Low Vulnerbility

AFTER PHASE 3



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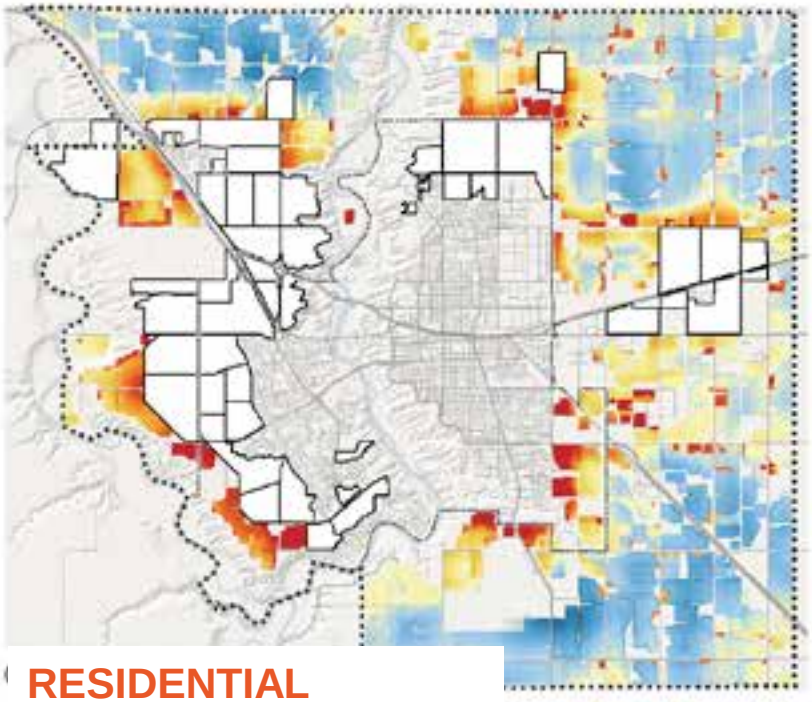
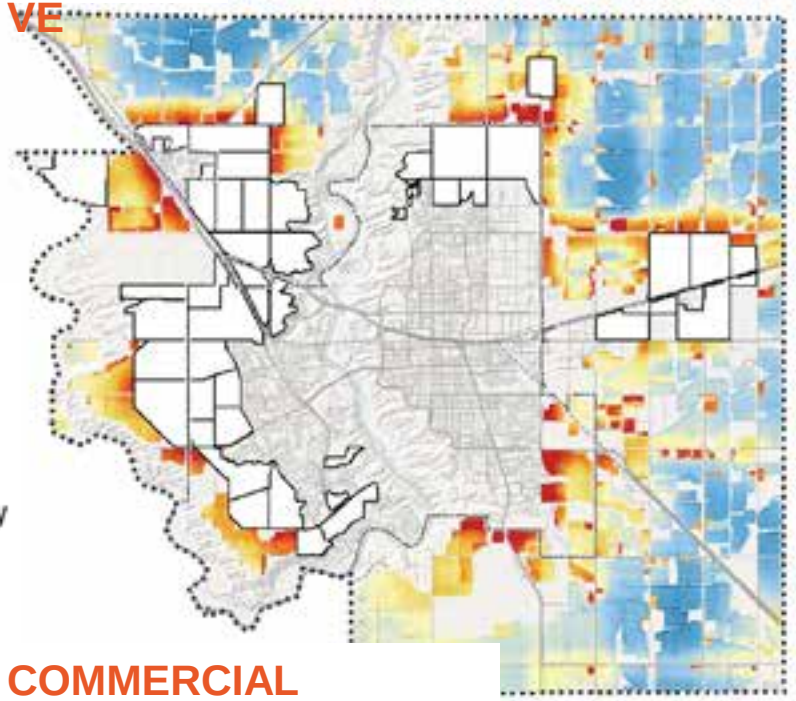


RESIDENTIAL SUITABILITY



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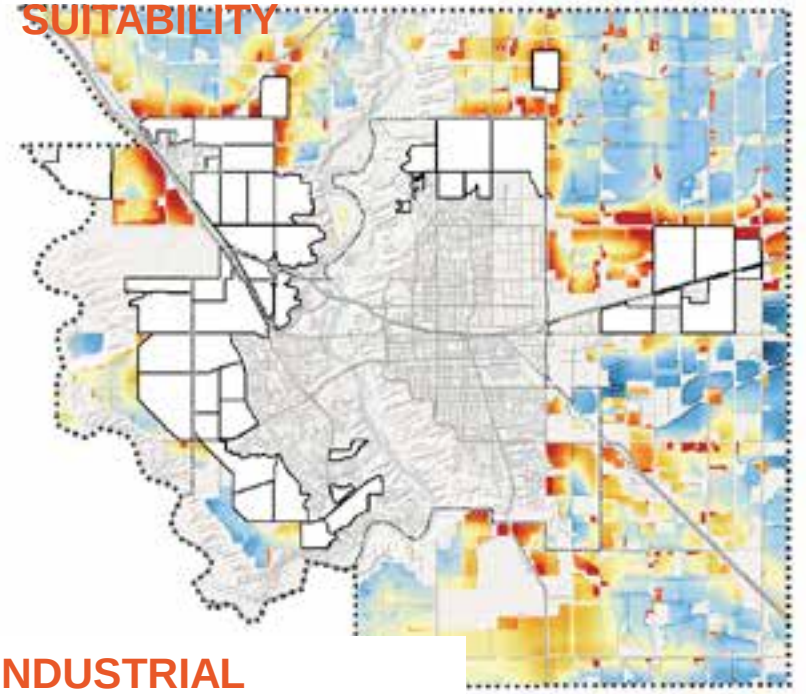


INDUSTRIAL

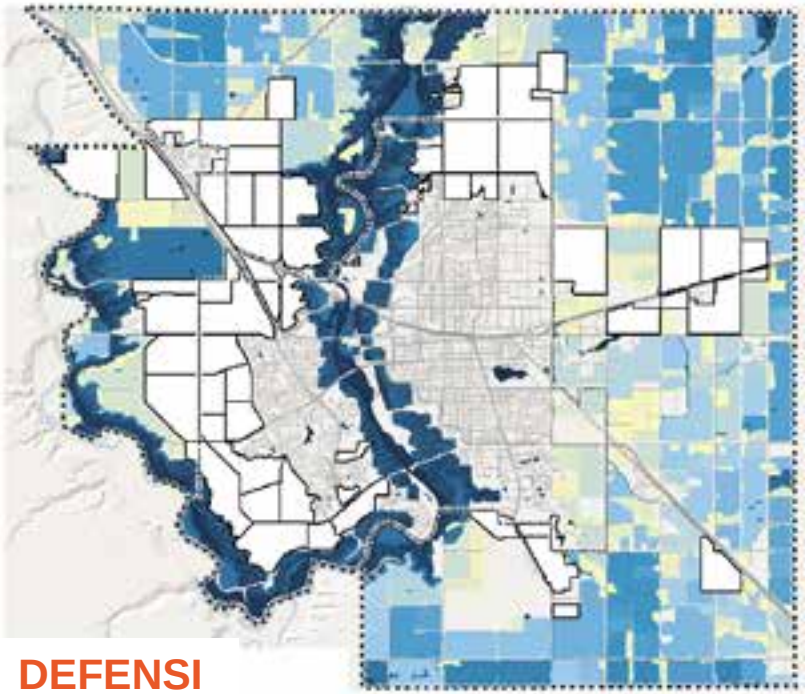
High Suitability

Low Suitability

High Vulnerability

Low Vulnerbility

AFTER PHASE 4



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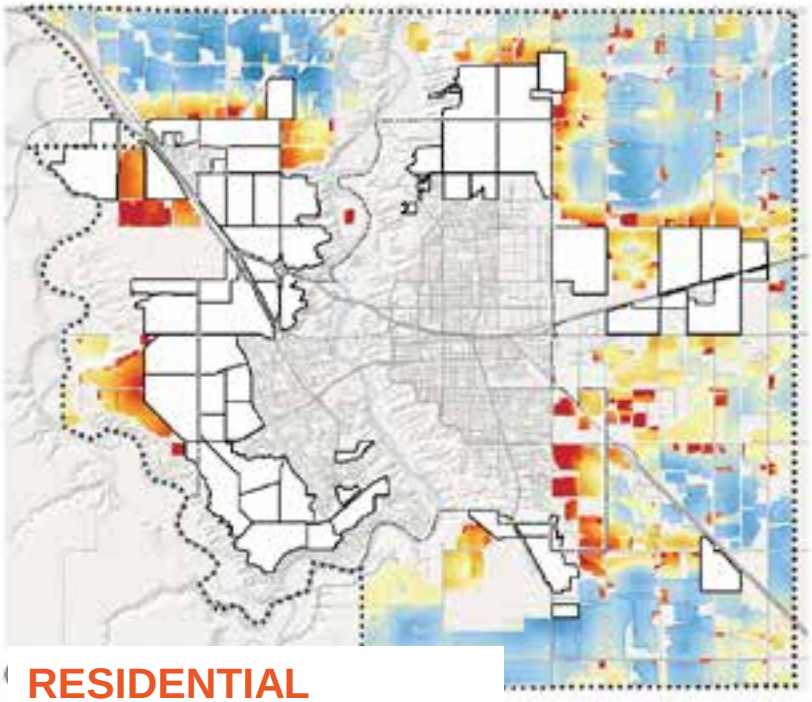

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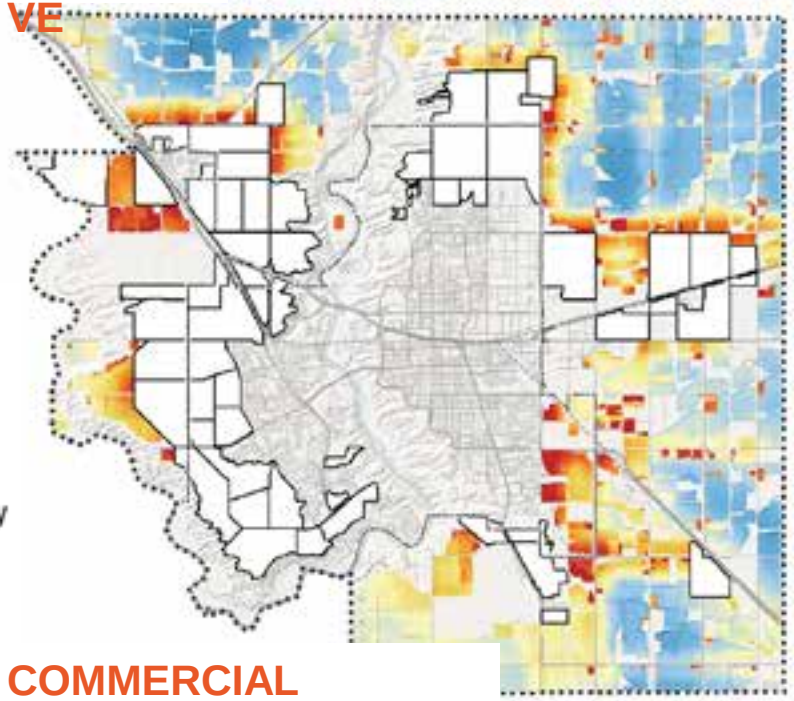

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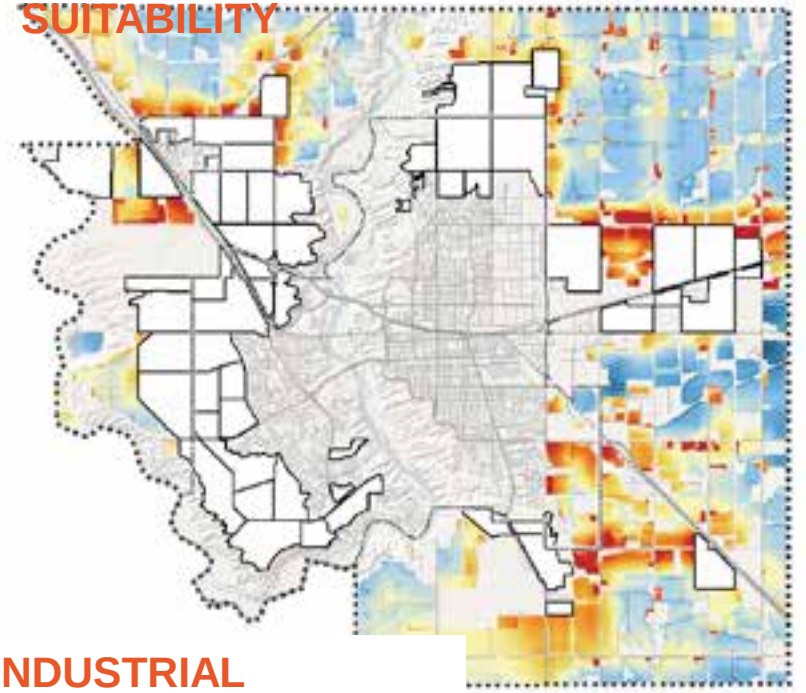

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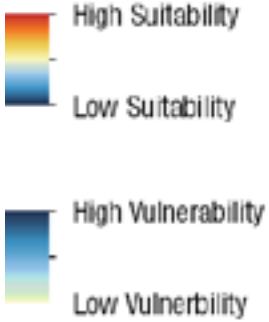
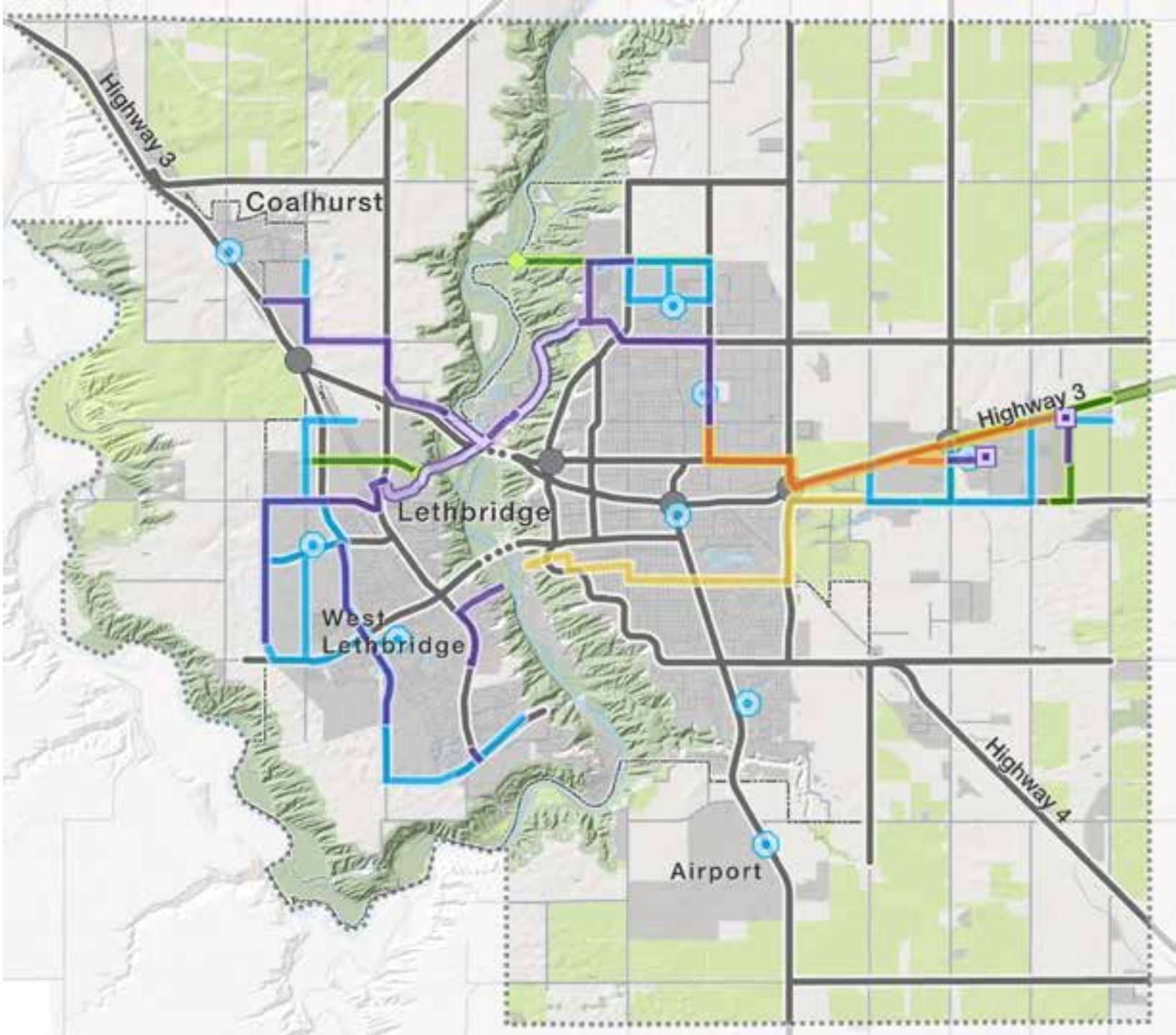


INFRASTRUCTURE EXPLORATION IN GIS

- Explore infrastructure configurations for each development phase
  - New infrastructure
  - Upgraded infrastructure
  - Phased infrastructure

- Reconfigure infrastructure based on costs, efficiency, timing

PHASE 1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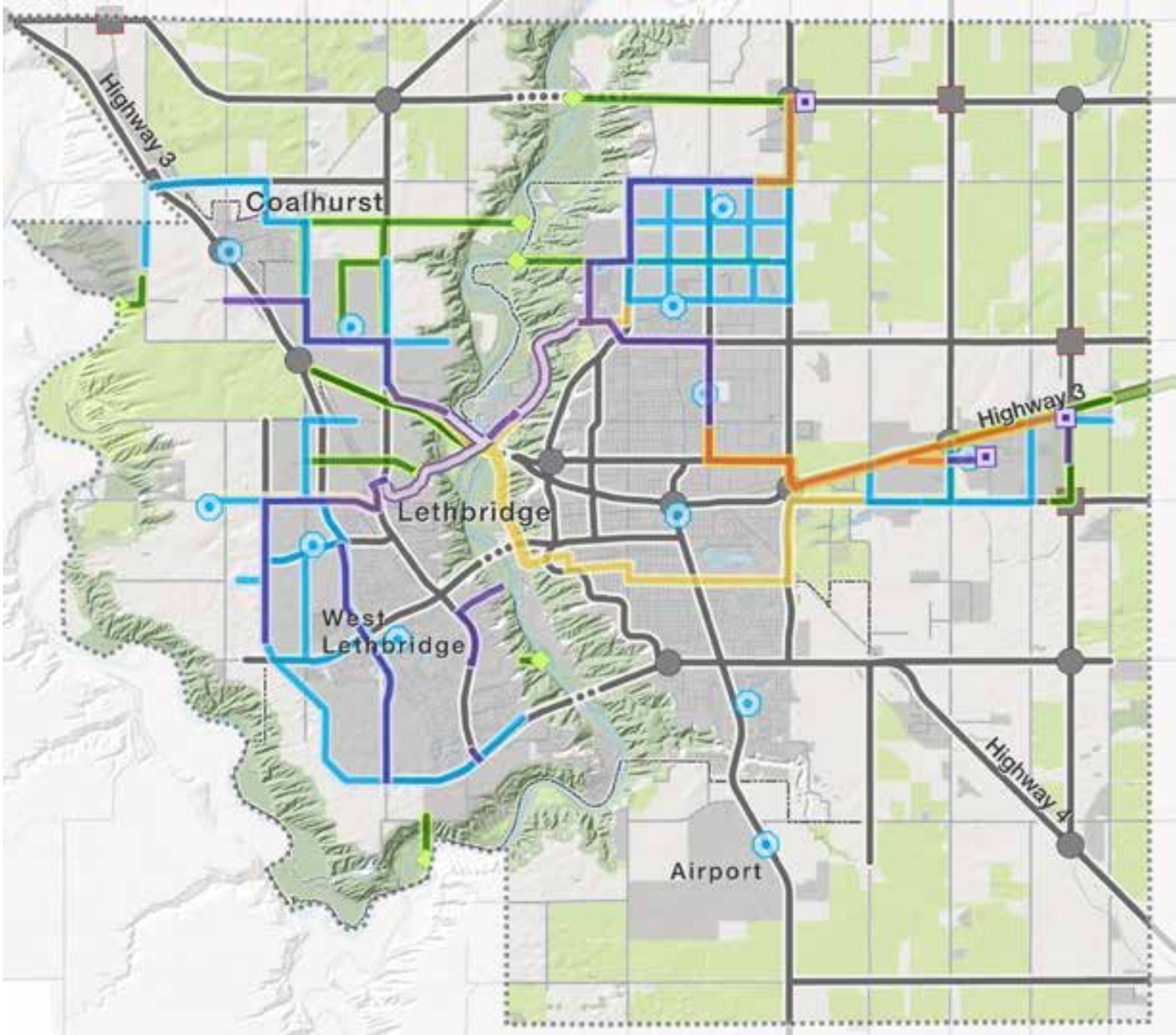
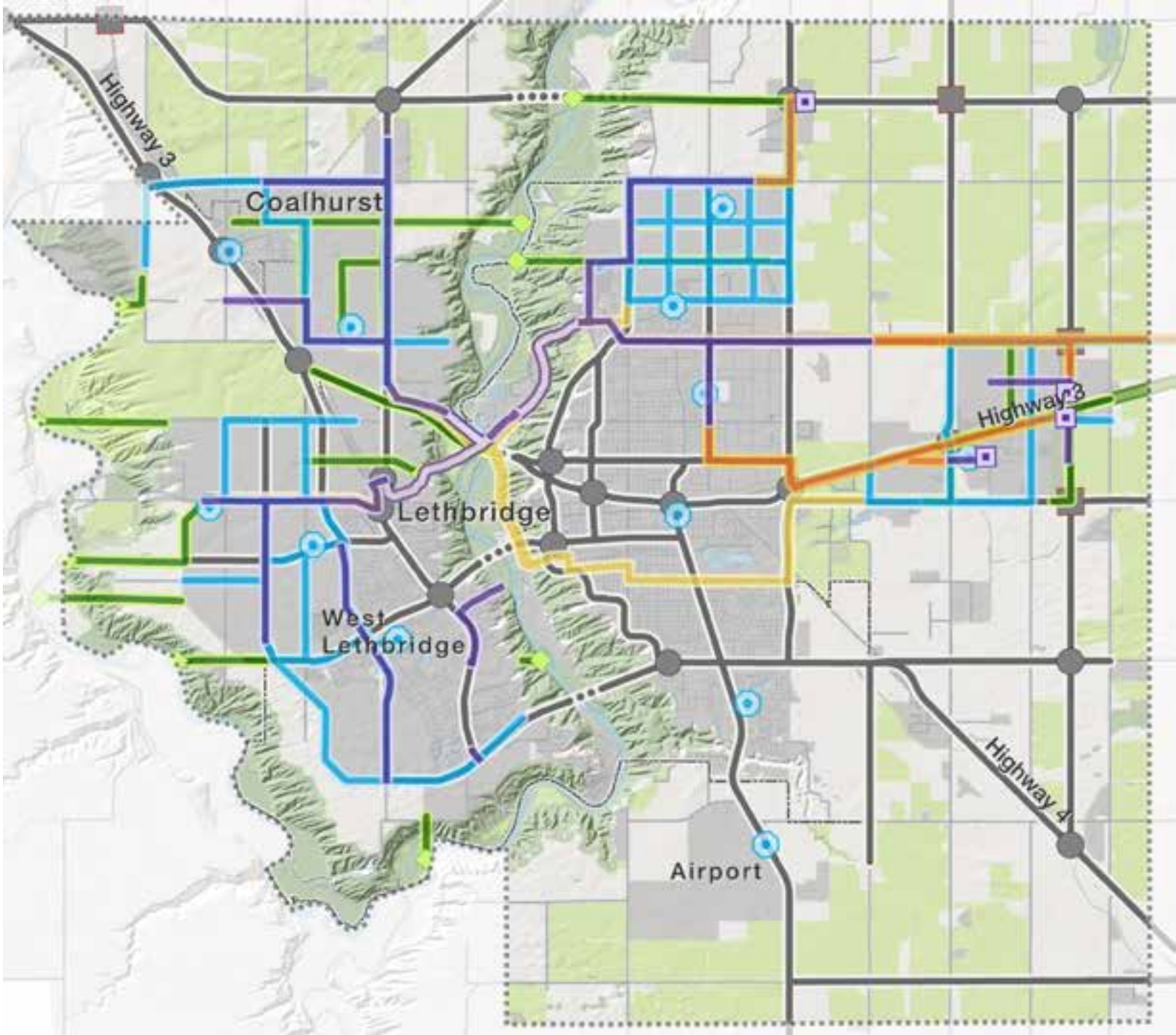
Coalhurst
Lethbridge
West Lethbridge
Highway 3
Highway 4
Airport

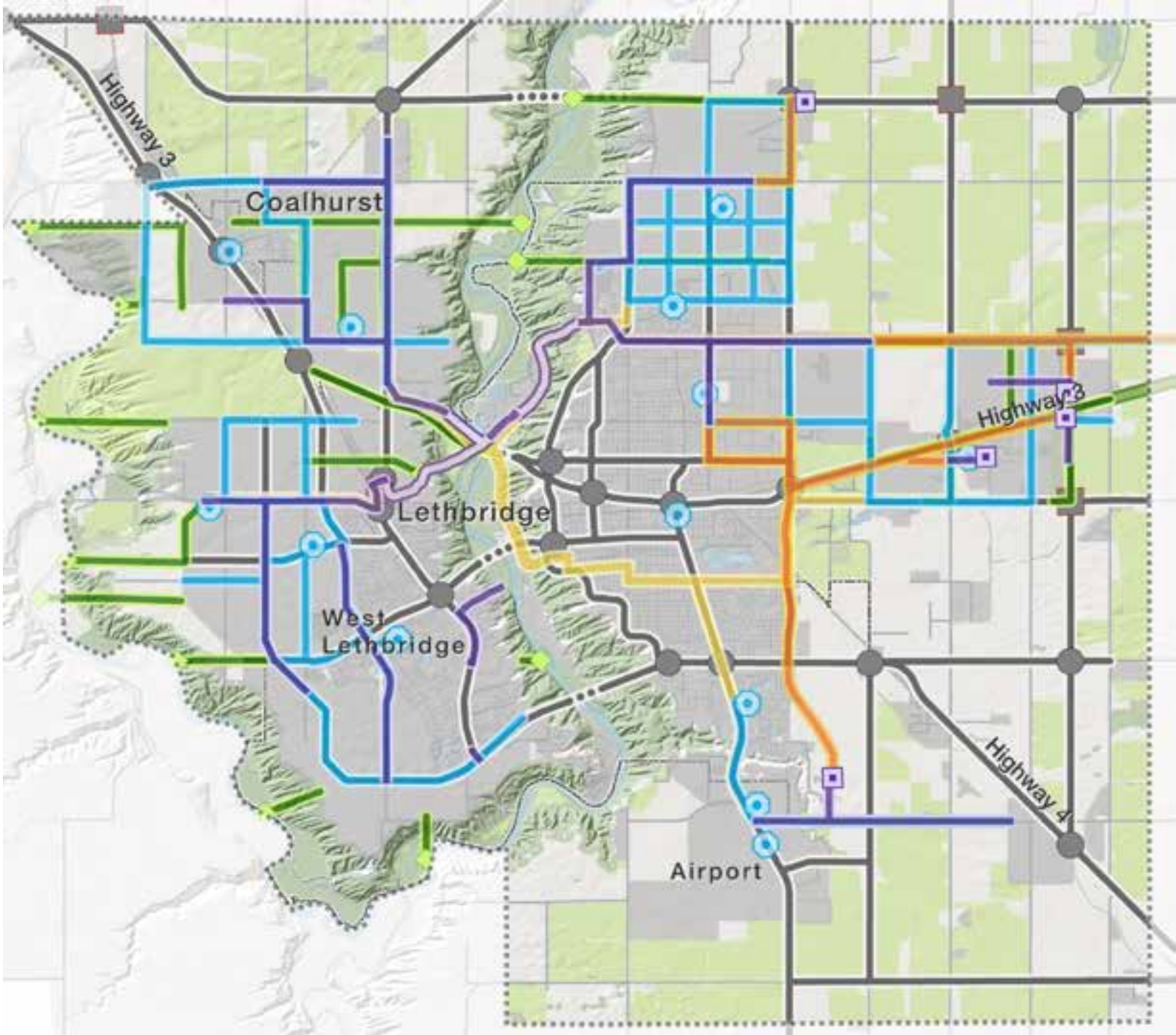
PHASE 2


Highway 3
Coalhurst
Lethbridge
West Lethbridge
Highway 3
Highway 4
Airport

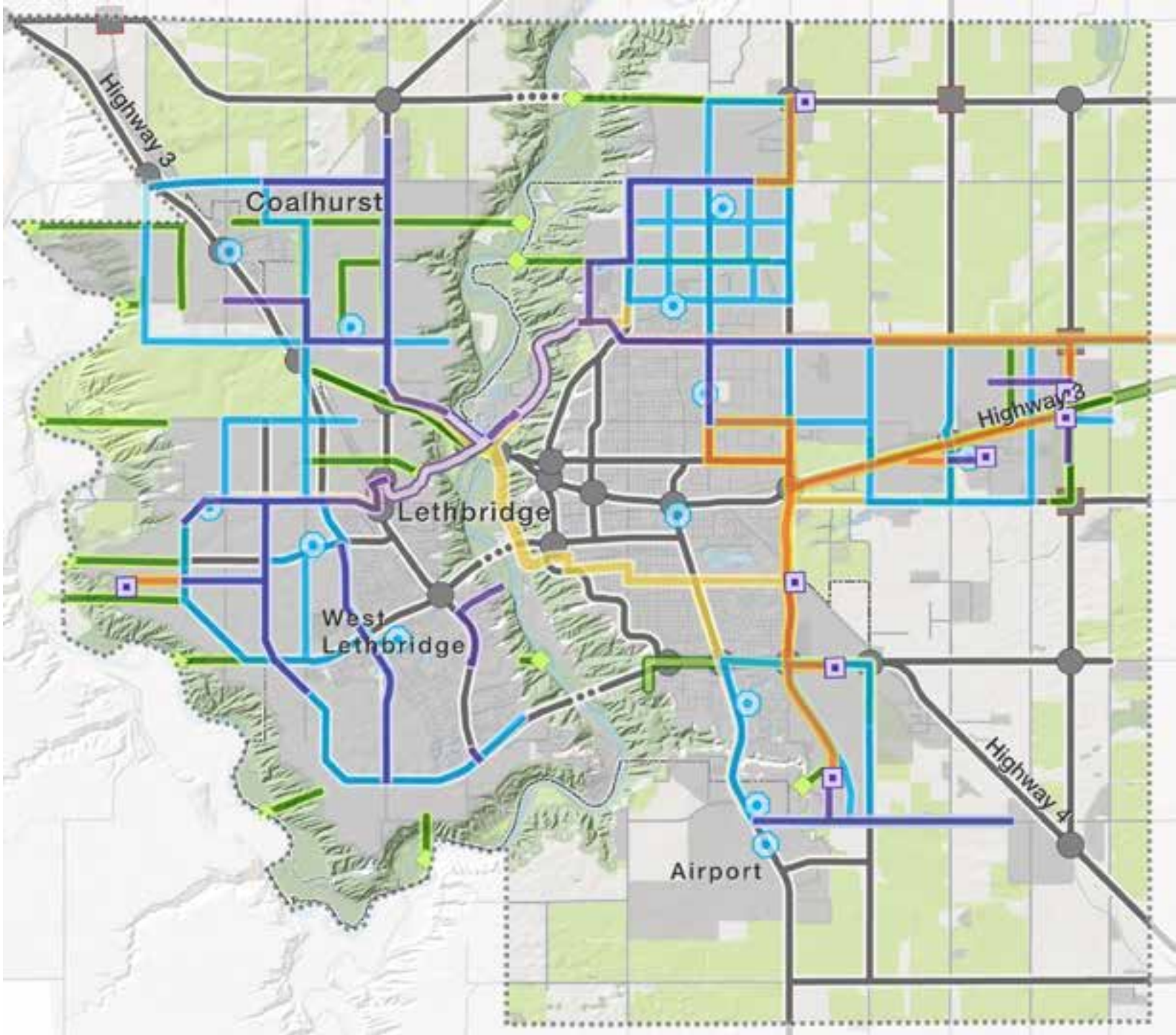
PHASE 3


Highway 3
Coalhurst
Lethbridge
West Lethbridge
Highway 3
Airport
Highway 4

PHASE 4


Highway 3
Coalhurst
Lethbridge
West Lethbridge
Highway 3
Airport
Highway 4

PHASE 5


Highway 3
Coalhurst
Lethbridge
West Lethbridge
Highway 3
Highway 4
Airport

JASPER PLACE, EDMONTON

LEARNING SCENARIOS – RULE BASED FORM MAKING

JASPER PLACE, EDMONTON

LEARNING SCENARIOS

- What kind of development does ***current zoning*** allow in the neighbourhood?
- What kind of development would ***different zoning*** allow in the neighbourhood
- What will the ***impacts*** of those changes be?

JASPER PLACE

ZONING AS PROCEDURAL RULE IN CITY ENGINE

JASPER PLACE

SCENARIO 1

02

JASPER PLACE

SCENARIO 2

02

JASPER PLACE

SCENARIO 3

O2

JASPER PLACE

WHAT ARE THE IMPACTS?

- Calculate critical statistics using
  - Population
  - dwelling unit types
  - Employment
  - Etc.
- Performed spatial analysis in ArcGIS to measure:
  - Accessibility of parks, commercial uses, schools
  - Composition of catchments (e.g., people per park)

- Used CityEngine to create visualizations of different scenario parameters

JASPER PLACE

BASELINE

02

1.0 People + Families

1.1 Population
- BRITANNIA YOUNGSTOWN
- CANORA
- GLENWOOD
- WEST JASPER PLACE

1.2 School-Age Children (estimated)
- BRITANNIA YOUNGSTOWN
- CANORA
- GLENWOOD
- WEST JASPER PLACE

2.0 Housing Choices

2.1 Residential Land Area (ha)
- BRITANNIA YOUNGSTOWN
- CANORA
- GLENWOOD
- WEST JASPER PLACE

2.2 Dwelling Units (by Neighbourhood)
- BRITANNIA YOUNGSTOWN
- CANORA
- GLENWOOD
- WEST JASPER PLACE

Dwelling Units (by Type)
- Single-detached
- Single-detached Secondary Suite*
- Semi-detached/duplex
- Apartments - 5+ storeys
- Apartments - 1-4 storeys
- Row house
- Other

2.3 Residential Density (units/ha)
- BRITANNIA YOUNGSTOWN
- CANORA
- GLENWOOD
- WEST JASPER PLACE

2.4 Housing Type Diversity
- BRITANNIA YOUNGSTOWN
- CANORA
- GLENWOOD
- WEST JASPER PLACE

JASPER PLACE

5% REDEVELOPMENT RATE

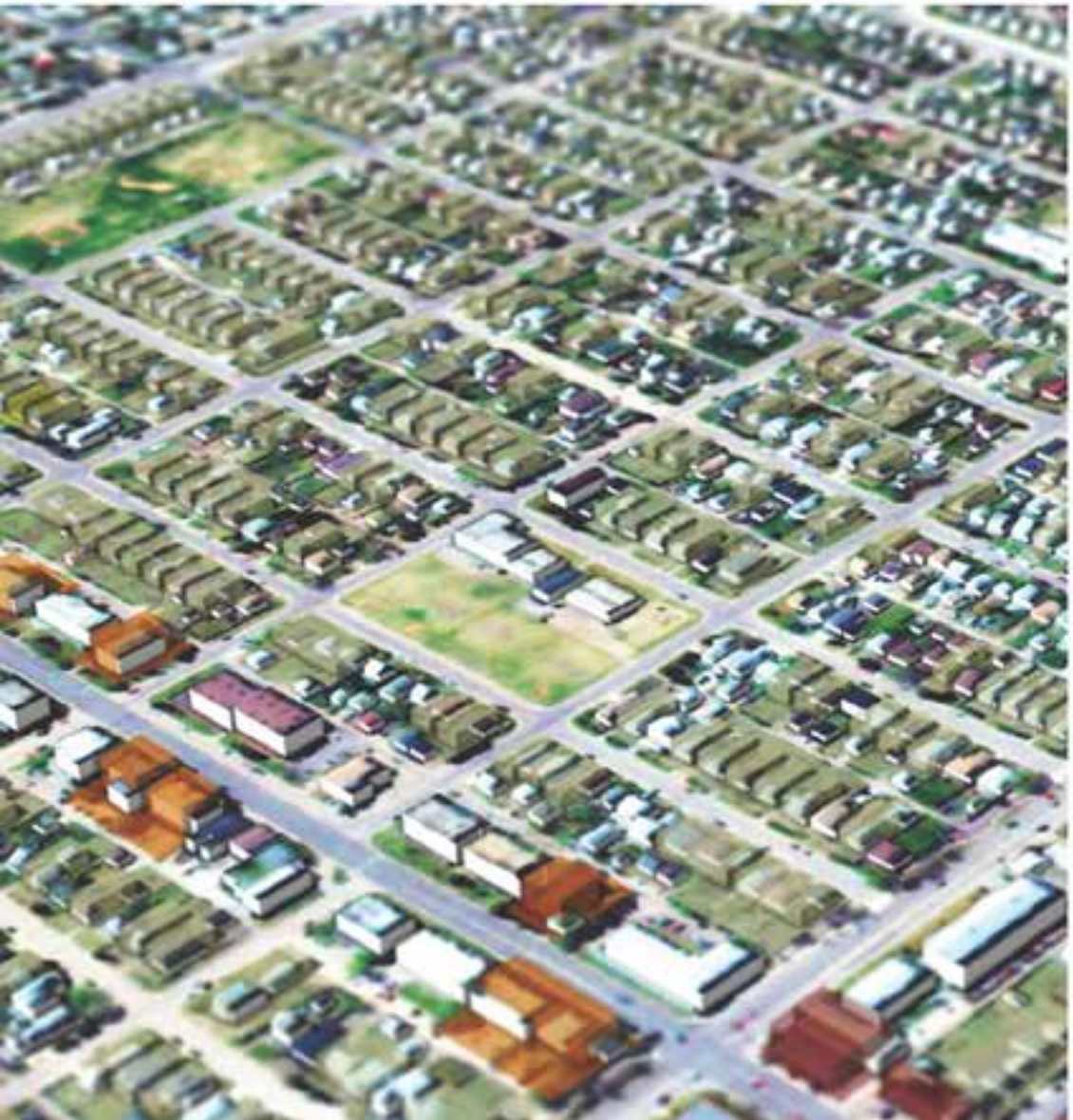
02

1.0 People + Families		
1.1	**Population**	**16,528**
	BRITANNIA YOUNGSTOWN	4,865
	CANORA	3,419
	GLENWOOD	5,177
	WEST JASPER PLACE	3,062
1.2	**School-Age Children (estimated)**	**881**
	BRITANNIA YOUNGSTOWN	244
	CANORA	106
	GLENWOOD	251
	WEST JASPER PLACE	170
2.0 Housing Choices		
2.1	**Residential Land Area (ha)**	
	BRITANNIA YOUNGSTOWN	
	CANORA	
	GLENWOOD	
	WEST JASPER PLACE	
2.2	**Dwelling Units (by Neighbourhood)**	**8,606**
	BRITANNIA YOUNGSTOWN	2,471
	CANORA	1,882
	GLENWOOD	2,494
	WEST JASPER PLACE	1,759
	Dwelling Units (by Type)	**8,606**
	Single-detached	2,877
	Single-detached Secondary Suite*	100
	Semi-detached/duplex	811
	Apartments - 5+ storeys	423
	Apartments - 1-4 storeys	4,179
	Row house	183
	Other	32
2.3	**Residential Density (units/ha)**	**34.6**
	BRITANNIA YOUNGSTOWN	34.7
	CANORA	42.7
	GLENWOOD	29.7
	WEST JASPER PLACE	36.7
2.4	**Housing Type Diversity**	**0.59**
	BRITANNIA YOUNGSTOWN	0.60
	CANORA	0.60
	GLENWOOD	0.56
	WEST JASPER PLACE	0.52

JASPER PLACE

30% REDEVELOPMENT RATE

02



1.0 People + Families		
1.1	**Population**	**17,286**
	BRITANNIA YOUNGSTOWN	4,893
	CANORA	3,713
	GLENWOOD	5,274
	WEST JASPER PLACE	3,386
1.2	**School-Age Children (estimated)**	**931**
	BRITANNIA YOUNGSTOWN	252
	CANORA	337
	GLENWOOD	271
	WEST JASPER PLACE	170
2.0 Housing Choices		
2.1	**Residential Land Area (ha)**	
	BRITANNIA YOUNGSTOWN	
	CANORA	
	GLENWOOD	
	WEST JASPER PLACE	
2.2	**Dwelling Units (by Neighbourhood)**	**9,880**
	BRITANNIA YOUNGSTOWN	2,765
	CANORA	2,216
	GLENWOOD	2,535
	WEST JASPER PLACE	2,364
	Dwelling Units (by Type)	**9,880**
	Single-detached	2,985
	Single-detached Secondary Suite*	617
	Semi-detached/duplex	1,059
	Apartments - 5+ storeys	423
	Apartments - 1-4 storeys	5,191
	Row house	100
	Other	32
2.3	**Residential Density (units/ha)**	**40.0**
	BRITANNIA YOUNGSTOWN	38.8
	CANORA	50.3
	GLENWOOD	30.2
	WEST JASPER PLACE	49.3
2.4	**Housing Type Diversity**	**0.67**
	BRITANNIA YOUNGSTOWN	0.59
	CANORA	0.58
	GLENWOOD	0.53
	WEST JASPER PLACE	0.45

JASPER PLACE

STATISTICS

02

Table 5 5% Scenario Comparison	Scenario 1 (5%)	Scenario 2 (5%)
1.0 People + Families		
1.1 Population	**18,523**	**18,606**
BRITANNIA YOUNGSTOWN	4,865	4,803
CANORA	3,419	3,412
GLENWOOD	6,177	6,359
WEST JASPER PLACE	3,062	3,034
1.2 School-Age Children (estimated)	**861**	**863**
BRITANNIA YOUNGSTOWN	244	239
CANORA	196	194
GLENWOOD	261	249
WEST JASPER PLACE	170	170
2.0 Housing Choices		
2.1 Residential Land Area (ha)		
BRITANNIA YOUNGSTOWN		
CANORA		
GLENWOOD		
WEST JASPER PLACE		
2.2 Dwelling Units (by Neighbourhood)	**8,605**	**8,719**
BRITANNIA YOUNGSTOWN	2,471	2,450
CANORA	1,882	1,896
GLENWOOD	2,494	2,634
WEST JASPER PLACE	1,759	1,760
Dwelling Units (by Type)	**8,605**	**8,719**
Single-detached	2,877	2,823
Single-detached Secondary Suite*	100	78
Semi-detached/duplex	811	792
Apartments - 5+ storeys	423	423
Apartments - 1-4 storeys	4,179	4,393
Row house	183	189
Other	32	32
2.3 Residential Density (units/ha)	**34.8**	**36.3**
BRITANNIA YOUNGSTOWN	34.7	34.1
CANORA	42.7	43.0
GLENWOOD	29.7	31.4
WEST JASPER PLACE	36.7	36.7
2.4 Housing Type Diversity	**0.59**	**0.58**
BRITANNIA YOUNGSTOWN	0.60	0.60
CANORA	0.60	0.59
GLENWOOD	0.56	0.54
WEST JASPER PLACE	0.52	0.52

2.5 Dwelling Units (by Neighbourhood, by Type)	Scenario 1 (5%)	Scenario 2 (5%)
BRITANNIA YOUNGSTOWN	***2,471***	***2,450***
Single-detached	913	909
Single-detached Secondary Suite*	11	8
Semi-detached/duplex	135	138
Apartments - 5+ storeys	-	-
Apartments - 1-4 storeys	1,248	1,210
Row house	157	159
Other	7	7
CANORA	***1,882***	***1,896***
Single-detached	319	319
Single-detached Secondary Suite*	-	-
Semi-detached/duplex	528	496
Apartments - 5+ storeys	99	99
Apartments - 1-4 storeys	921	958
Row house	-	-
Other	18	18
GLENWOOD	***2,494***	***2,634***
Single-detached	1,009	961
Single-detached Secondary Suite*	55	38
Semi-detached/duplex	89	91
Apartments - 5+ storeys	235	235
Apartments - 1-4 storeys	1,067	1,247
Row house	32	36
Other	7	7
WEST JASPER PLACE	***1,759***	***1,760***
Single-detached	637	615
Single-detached Secondary Suite*	34	32
Semi-detached/duplex	60	59
Apartments - 5+ storeys	89	89
Apartments - 1-4 storeys	943	966
Row house	-	-
Other	-	-

Blue represents increases above the original baseline

Red represents decreases below the original baseline

JASPER PLACE

AND EVEN MORE STATISTICS!!

		Scenario 1 (5%)	Scenario 2 (5%)
3.0 Vibrant Businesses			
3.1	**Employment**	**8,411**	**8,479**
	BRITANNIA YOUNGSTOWN	3,663	3,728
	CANORA	626	661
	GLENWOOD	1,462	1,463
	WEST JASPER PLACE	721	727
3.2	**Commercial Floor Area**	**205,585**	**206,335**
	BRITANNIA YOUNGSTOWN	68,863	71,186
	CANORA	36,829	37,768
	GLENWOOD	63,309	62,593
	WEST JASPER PLACE	35,894	35,772
3.3	**Retail Floor Area**	**164,284**	**164,235**
	BRITANNIA YOUNGSTOWN	54,568	54,566
	CANORA	29,603	29,613
	GLENWOOD	38,496	38,477
	WEST JASPER PLACE	31,647	31,633
3.4	**Commercial Floor Area Ratios**	**0.62**	**0.62**
	BRITANNIA YOUNGSTOWN	0.36	0.37
	CANORA	0.66	0.68
	GLENWOOD	0.37	0.37
	WEST JASPER PLACE	0.61	0.61
3.5	**Commercial Floor Area Per Resident**	**12.5**	**12.5**
	BRITANNIA YOUNGSTOWN	14.2	14.8
	CANORA	10.8	11.1
	GLENWOOD	12.2	11.7
	WEST JASPER PLACE	12.0	12.1
4.0 Transportation + Accessibility			
4.1	**Transit Pedshed - Residential (residents)**	**74.4%**	**74.5%**
	BRITANNIA YOUNGSTOWN	67.1%	67.1%
	CANORA	63.4%	63.5%
	GLENWOOD	84.7%	85.3%
	WEST JASPER PLACE	79.9%	79.1%
4.2	**Transit Pedshed - Non-Residential (jobs)**	**98.1%**	**98.1%**
	BRITANNIA YOUNGSTOWN	98.5%	98.5%
	CANORA	89.1%	89.0%
	GLENWOOD	99.7%	99.7%
	WEST JASPER PLACE	99.5%	99.9%
4.3	**Cycling Infrastructure Access**	**34.4%**	**35.3%**
	BRITANNIA YOUNGSTOWN	0.0%	0.0%
	CANORA	0.0%	0.0%
	GLENWOOD	59.2%	60.9%
	WEST JASPER PLACE	80.2%	79.5%
4.4	**On-Street Parking Spaces per Resident**	**0.71**	**0.71**
	BRITANNIA YOUNGSTOWN	0.67	0.68
	CANORA	0.64	0.64
	GLENWOOD	0.80	0.77
	WEST JASPER PLACE	0.70	0.71

		Scenario 1 (5%)	Scenario 2 (5%)
5.0 Parks + Open Space			
5.1	**Park Space per Capita (sq m/sq)**	**12.3**	**12.3**
	BRITANNIA YOUNGSTOWN	8.3	8.4
	CANORA	17.9	18.0
	GLENWOOD	16.5	16.0
	WEST JASPER PLACE	5.5	5.5
5.2	**Parks Proximity**	**59.6%**	**59.9%**
	BRITANNIA YOUNGSTOWN	61.5%	61.4%
	CANORA	73.6%	73.9%
	GLENWOOD	63.0%	63.6%
	WEST JASPER PLACE	39.4%	39.0%
5.3	**Residential Amenity Space (sq m)**	**2,636,813**	**2,636,813**
	BRITANNIA YOUNGSTOWN	876,382	876,382
	CANORA	405,685	405,685
	GLENWOOD	860,311	860,311
	WEST JASPER PLACE	396,534	396,534
6.0 Walkability			
6.1	**Housing and Jobs Proximity**	**60.0%**	**60.7%**
	BRITANNIA YOUNGSTOWN	59.1%	58.6%
	CANORA	66.9%	66.8%
	GLENWOOD	54.4%	56.1%
	WEST JASPER PLACE	66.3%	66.4%
6.2	**Schools Proximity**	**33.0%**	**32.8%**
	BRITANNIA YOUNGSTOWN	29.9%	30.3%
	CANORA	36.4%	36.4%
	GLENWOOD	46.0%	43.2%
	WEST JASPER PLACE	13.6%	14.2%
6.3	**Community / Institutional Proximity**	**74.6%**	**74.6%**
	BRITANNIA YOUNGSTOWN	68.4%	67.9%
	CANORA	73.9%	74.4%
	GLENWOOD	82.2%	82.1%
	WEST JASPER PLACE	71.4%	71.5%

Blue represents increases above the original baseline

Red represents decreases below the original baseline

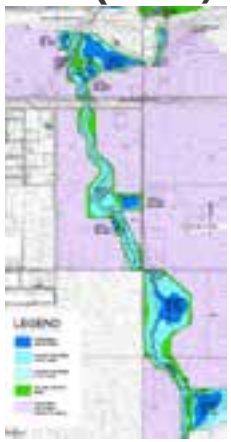
FOREST LAWN CREEK DESIGN CHARRETTE AND OUTLINE PLAN

Forest Lawn Creek

FOREST LAWN CREEK

Multiple Plans
No Consensus

Area Structure Plan (2010)



Legacy Park Concept (2010)

Master Drainage Plan (2010)

A PROCESS FOR COLLABORATION

GEODESIGN CHARRETTE

- Stakeholder-selected indicators helped to focus the conversation on measurable criteria

- Process helped stakeholders to understand the range of possibilities and get to feasible solution

- Charrettes are typically visual, with little analysis; GeoDesign made charrette rigorous and information-focused

  …and CityEngine took care of the visuals.

Values and Mandatory Elements

DEVELOPMENT - Cost of development and infrastructure must make project economically feasible.

STORMWATER - Must incorporate adequate stormwater storage as well as provide Low Impact Development (LID) stormwater techniques. (Regulatory requirements)

TRANSPORTATION - Connectivity and capacity of key roads through the site

ENVIRONMENTAL - Maintain minimum ecological infrastructure. Enhance ecological functioning

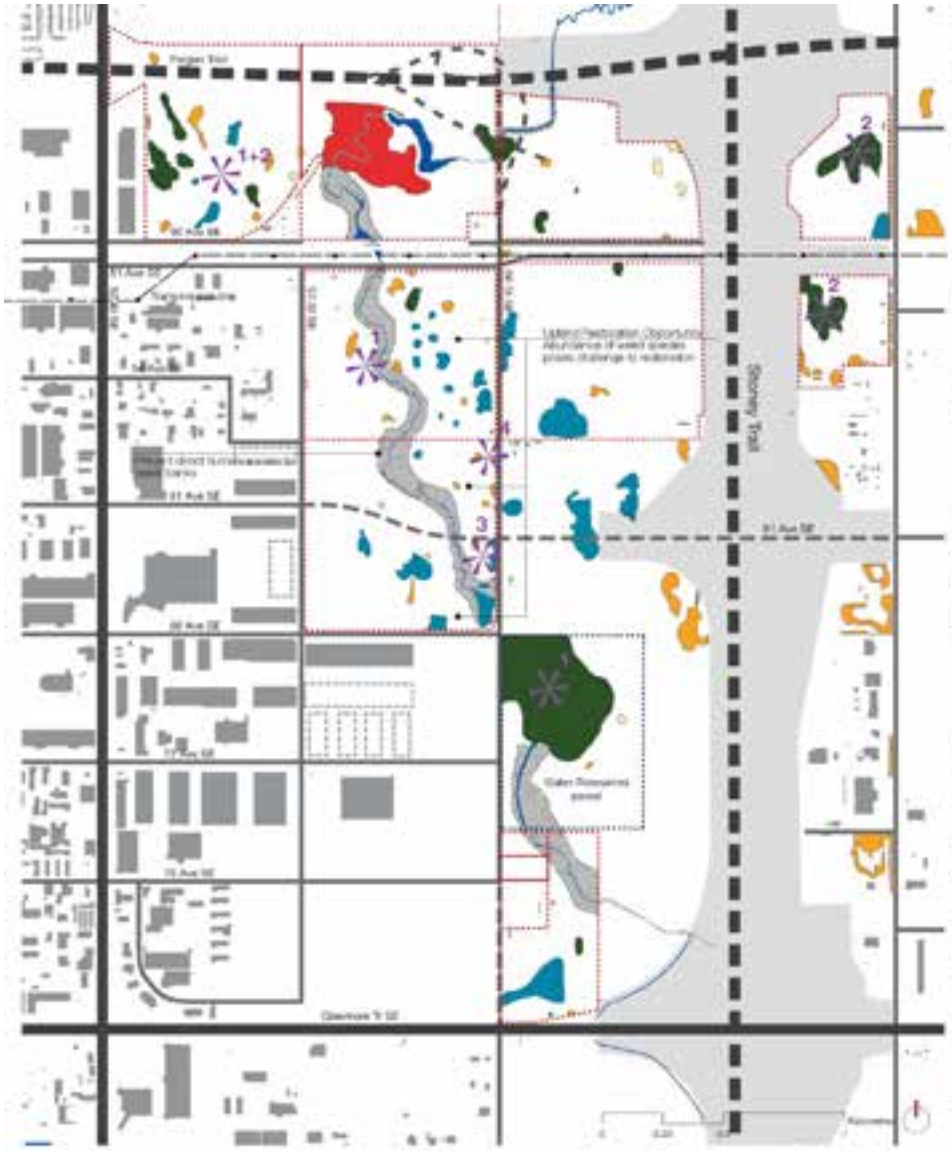
PARKS AND RECREATION - A large, connected open space c/w pathways, trailheads and park entry nodes

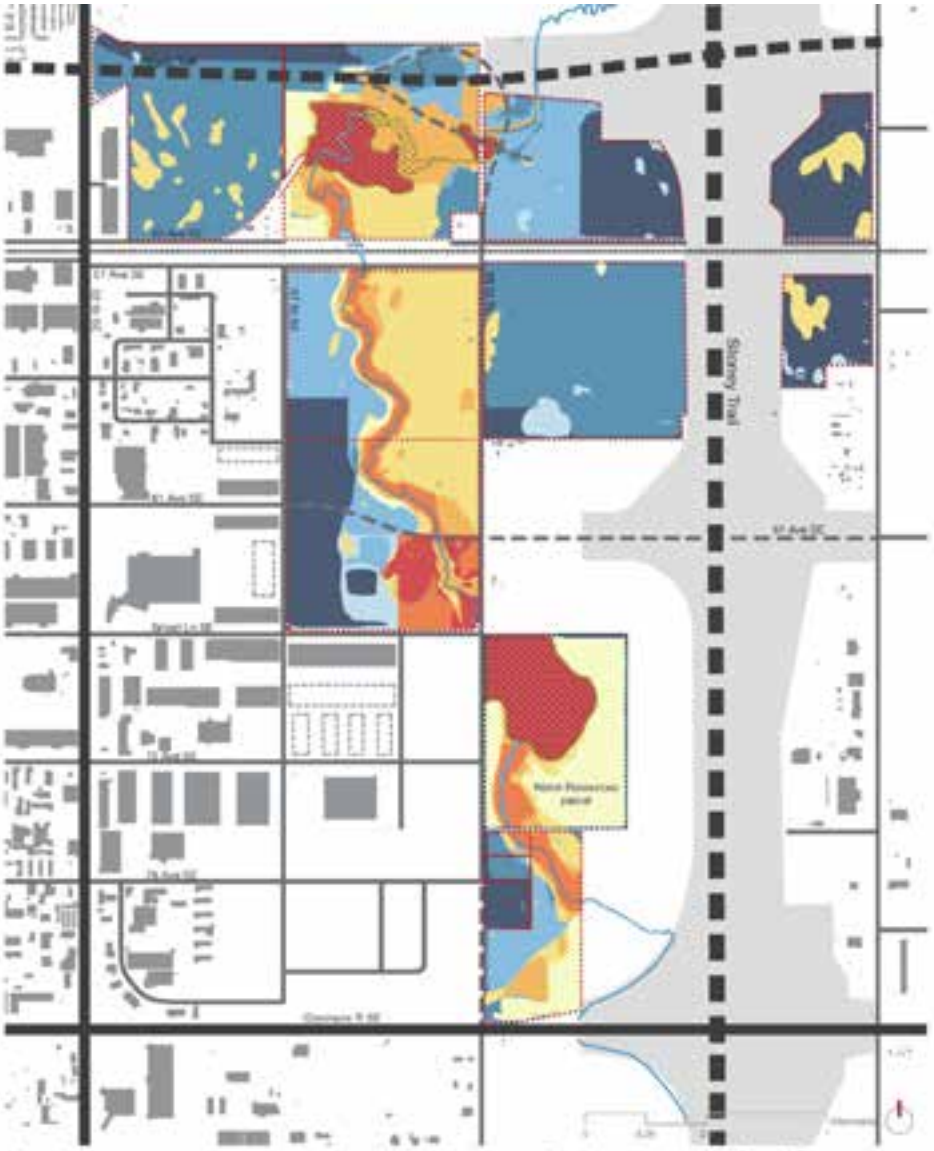
Agreement on Measurable Indicators

- Indicators identified by stakeholders prior to Charrette
- Modelling package developed for ArcMap, CityEngine
- Modular, extensible
- Models run for each design iteration

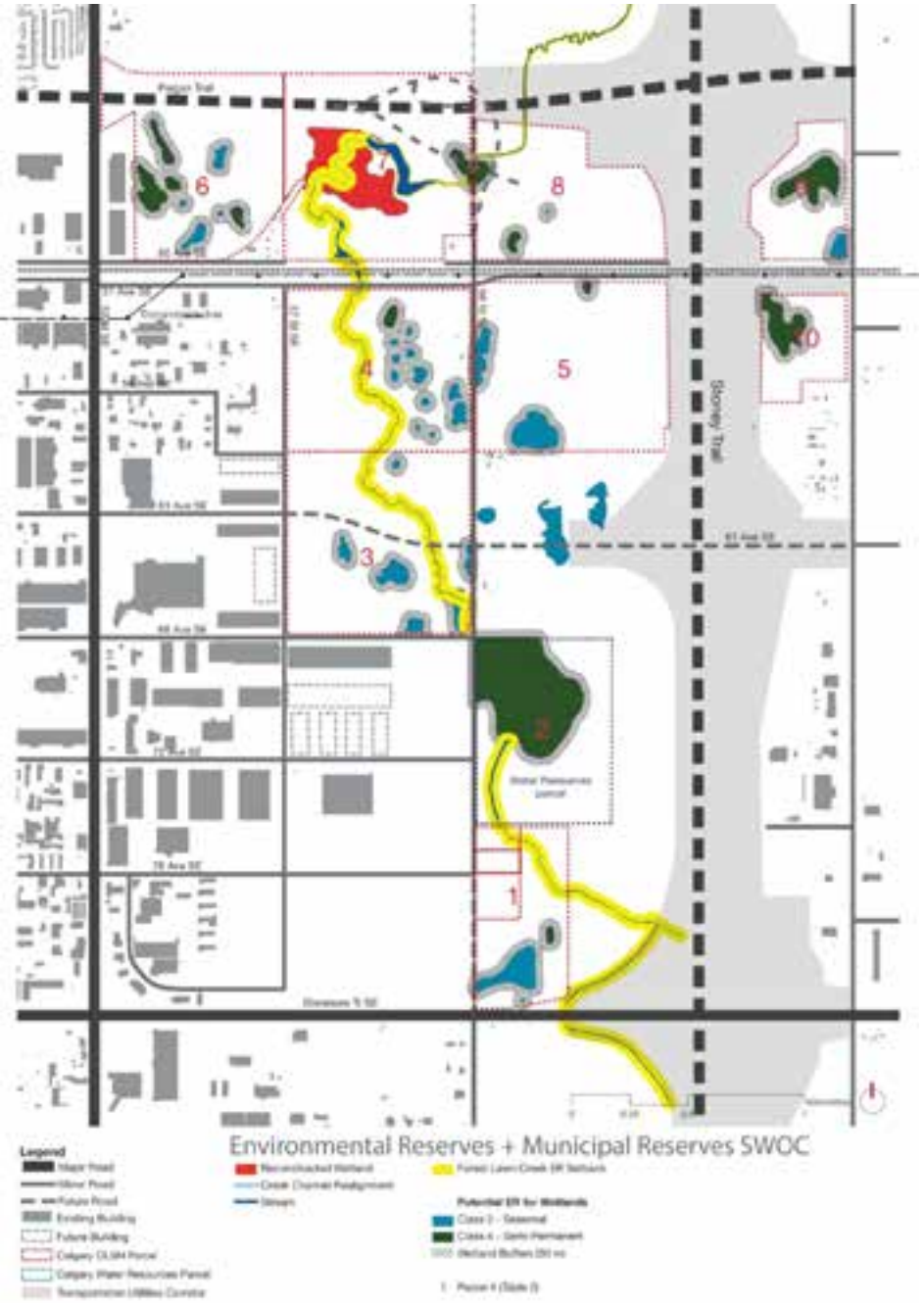
Theme	# of Indicators	Example
Development	4	Return on Investment
Transportation	4	Transit Accessibility
Water Resources	6	Total Annual Discharge
Biodiversity	11	Class 3 + 4 Wetlands Avoided
Recreation + Open Space	4	Accessibility of Open Spaces

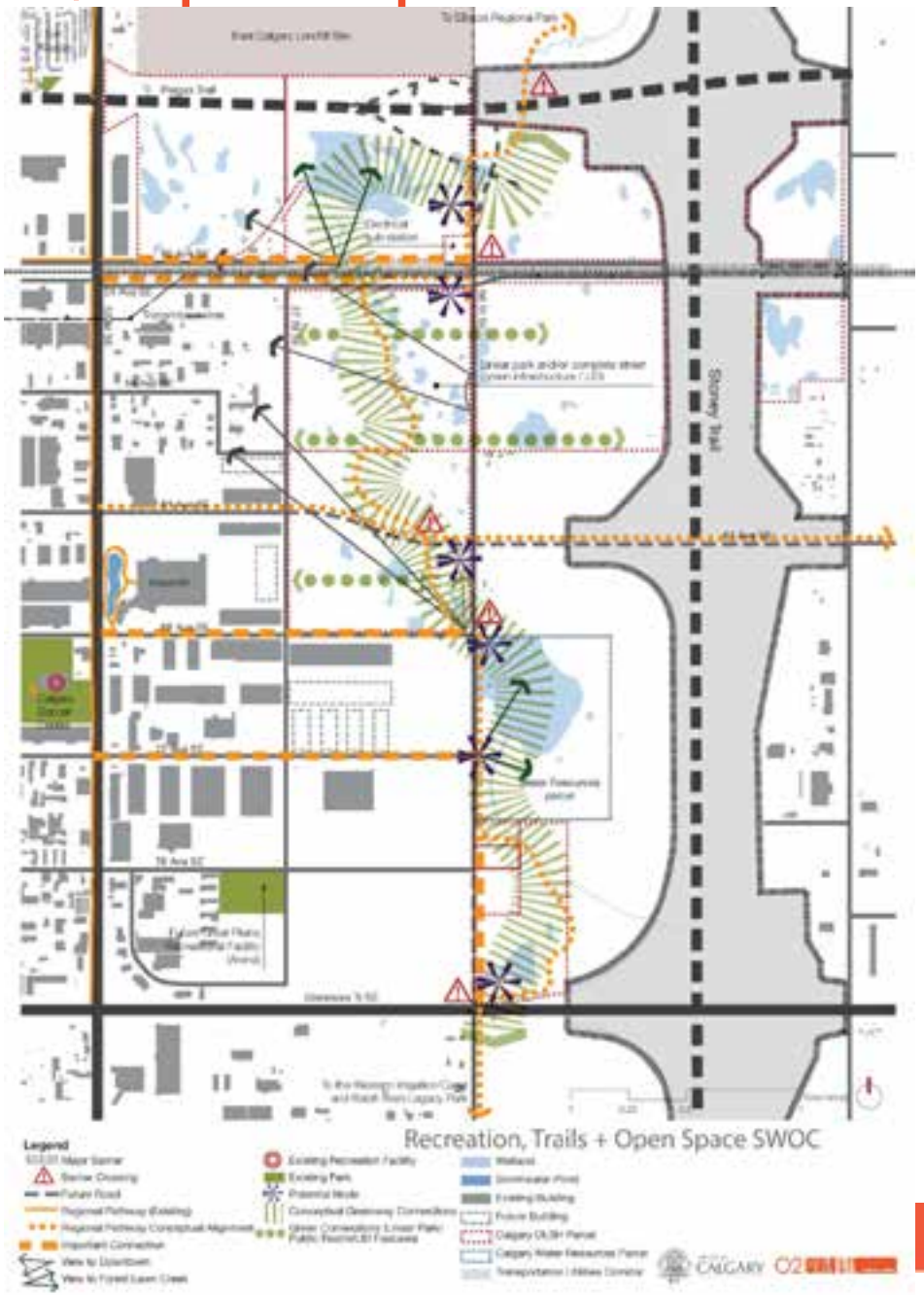
SWOC: Habitat Conservation + ESA



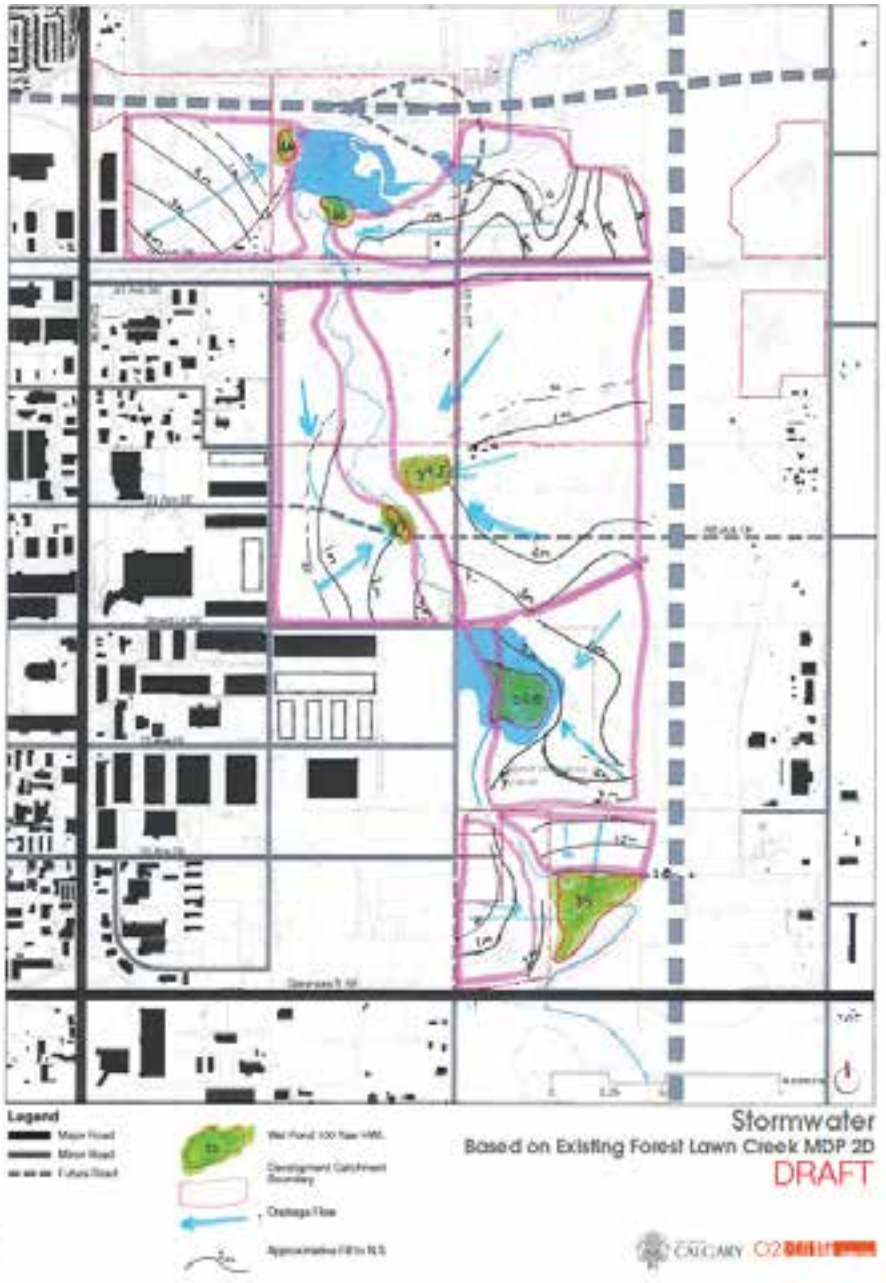


SWOC: Parks, Recreation, Open Space





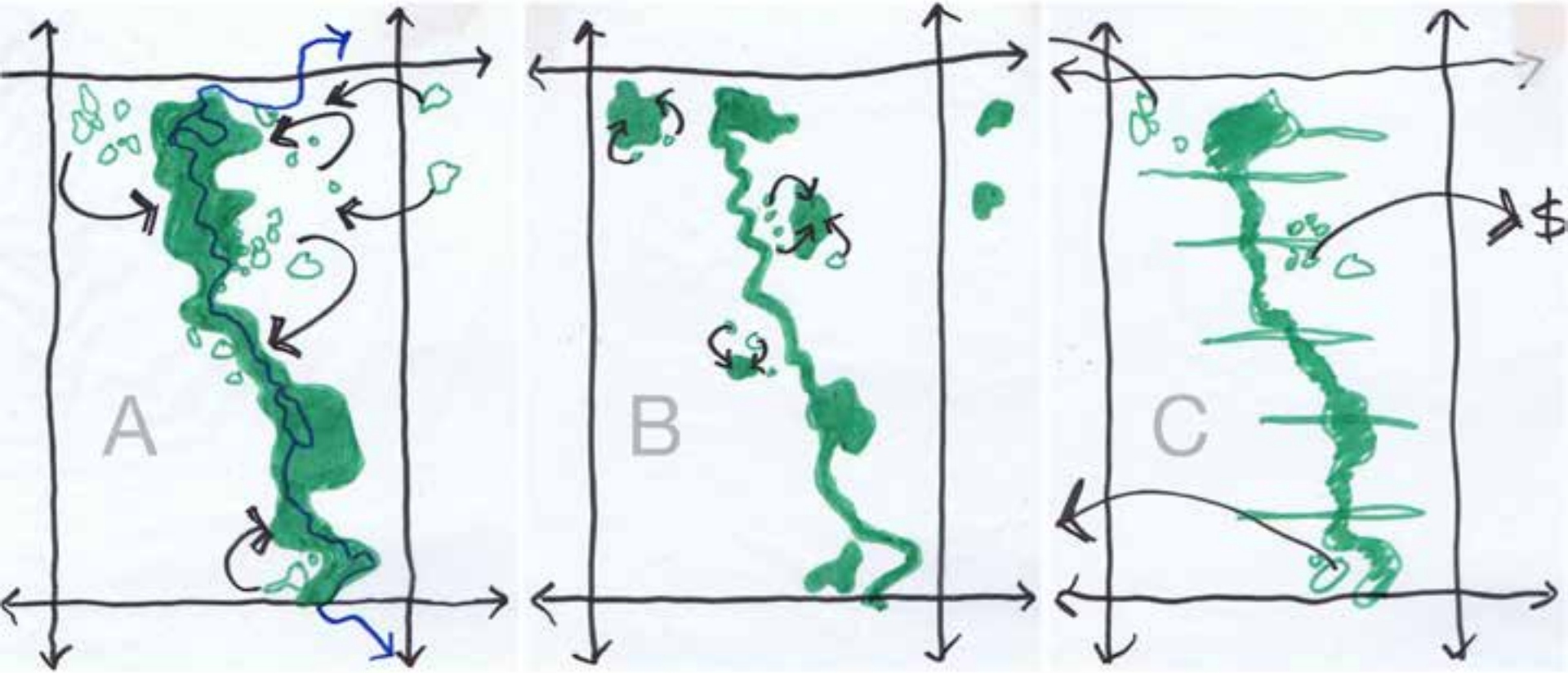
SWOC: Grading, Stormwater and LID Potential



FOREST LAWN CREEK

GEODESIGN CHARRETTE

- GeoDesign in a charrette environment:
  rapid iteration and analysis over several days


A
B
C
$

CONCEPT A

02

CONCEPT B

02

CONCEPT C

02

CONCEPT A

CONCEPT B

CONCEPT C

Concept A

Concept B

Concept C

Indicator Results: Development

Return on Investment

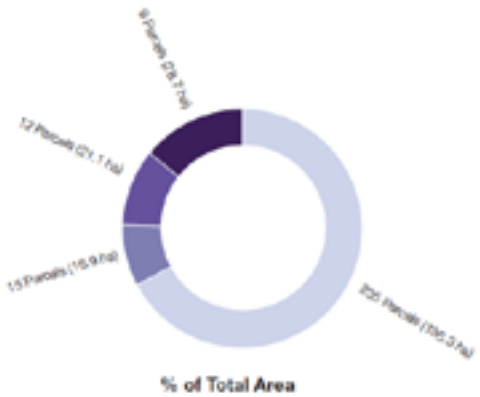
-3%

-7%

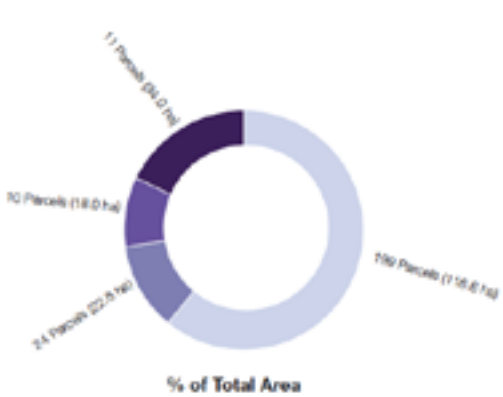
2%

Indicator Results: Development

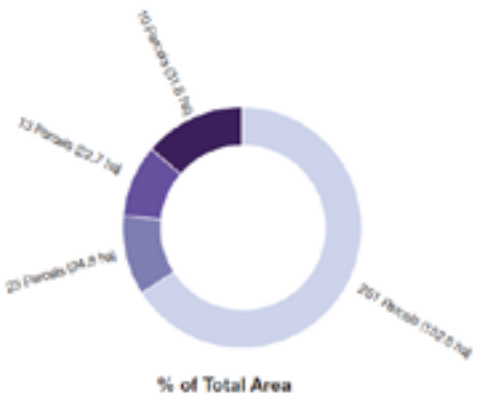
Total Amount of Developable Land + Diversity of Lot Sizes



202.9 ha



191.4 ha



232.1 ha

Employment

(Jobs within study area | Density of 10-20 jobs / net ha)

3,055 Jobs

2,880 Jobs

3,480 Jobs

Accessible Retail

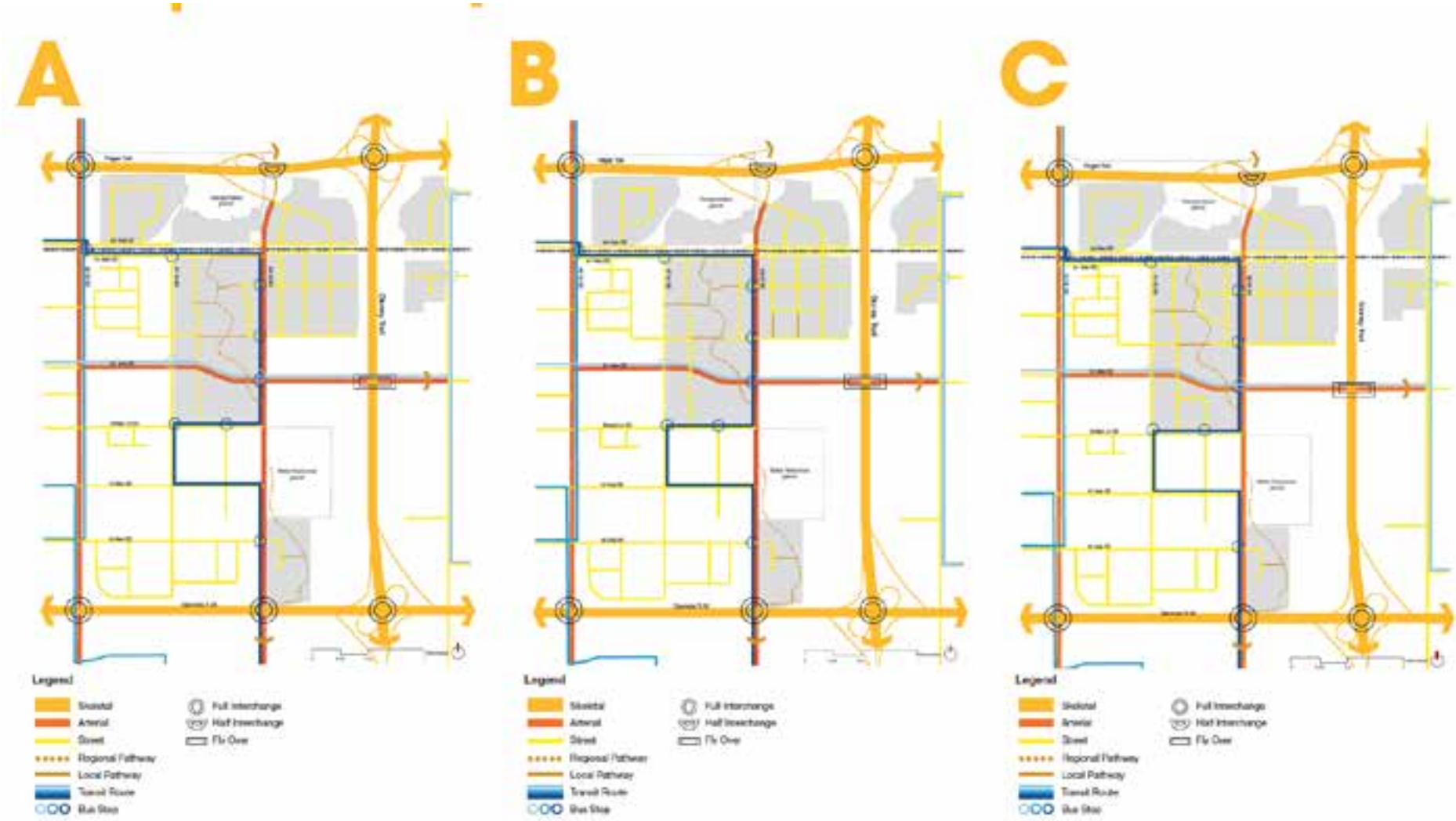
(Jobs within 400 m of retail location)

10 Jobs (<1%)

40 Jobs (1%)

10 Jobs (<1%)

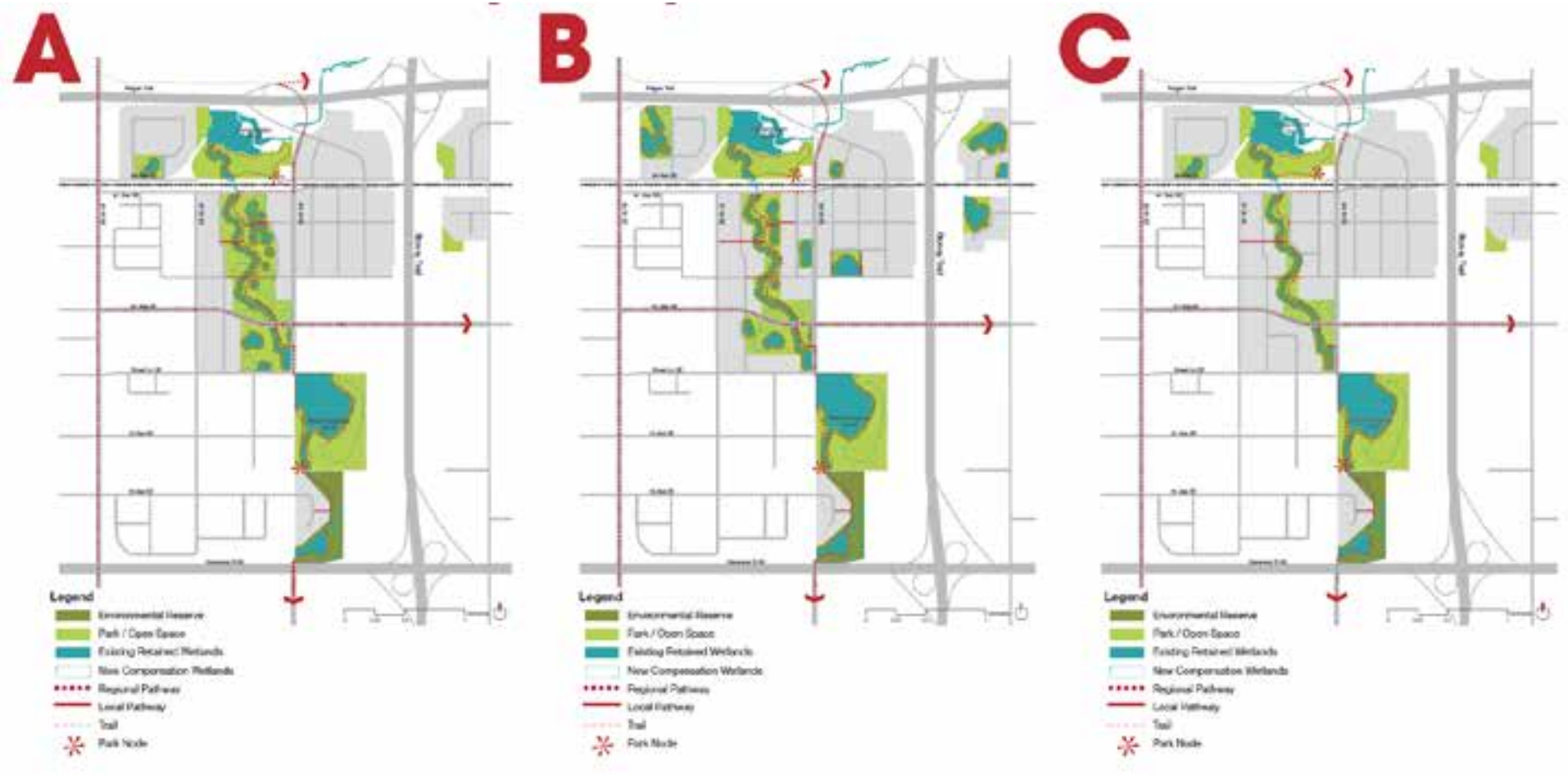
Indicator Results: Transportation



Indicator Results: Transportation

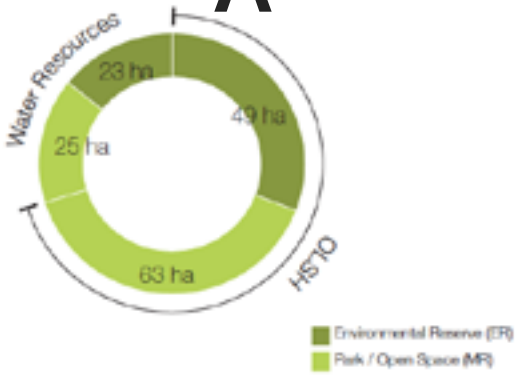
	A	B	C
Traffic Analysis (Level of Service - High Level | Base connectivity index 1.27)	Connectivity Index 1.39	Connectivity Index 1.38	Connectivity Index 1.39
Transit Accessibility (Jobs within 400 m of transit stop)	1,440 Jobs (47%)	1,190 Jobs (41%)	1,805 Jobs (52%)
Non-Vehicular Mode Accessibility (Jobs within 400 m of pathways - exclude trails)	860 Jobs (28%)	1,070 Jobs (37%)	1,090 Jobs (31%)
Creek Crossings	3 - Arterial (68 St SW) (1) - Pathway (2)	3 - Arterial (68 St SW) (1) - Pathway (2)	3 - Arterial (68 St SW) (1) - Pathway (2)

Indicator Results: Parks and Open Space

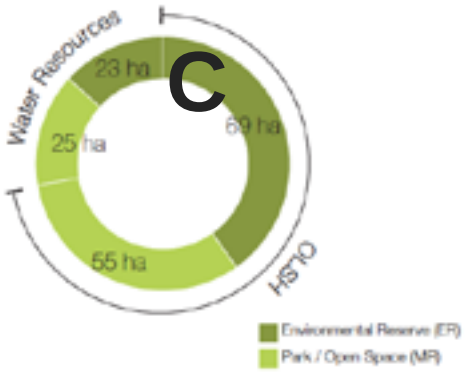


Total Area of Open Space per Type

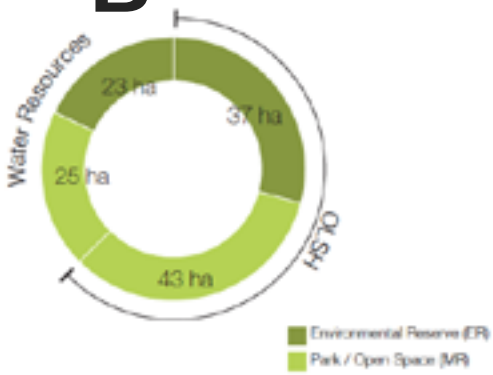
A



C



B



Accessibility of open spaces from development

(Jobs within 400 m of parks)

A	C	B
1,790 Jobs (59%)	2,530 Jobs (88%)	2,030 Jobs (58%)

Length of dedicated pedestrian/cycling pathways (off-street)

(Regional + local pathway - exclude trails)

A	C	B
4.9 km	5.3 km	4.6 km

Pedestrian Connectivity

(base connectivity index: 1.11)

A	C	B
Connectivity Index 1.34	Connectivity Index 1.35	Connectivity Index 1.34

Indicator Results: Biodiversity

Wetlands Avoided (Class 1+2)
(% of baseline)

A	B	C
42 %	35 %	29 %

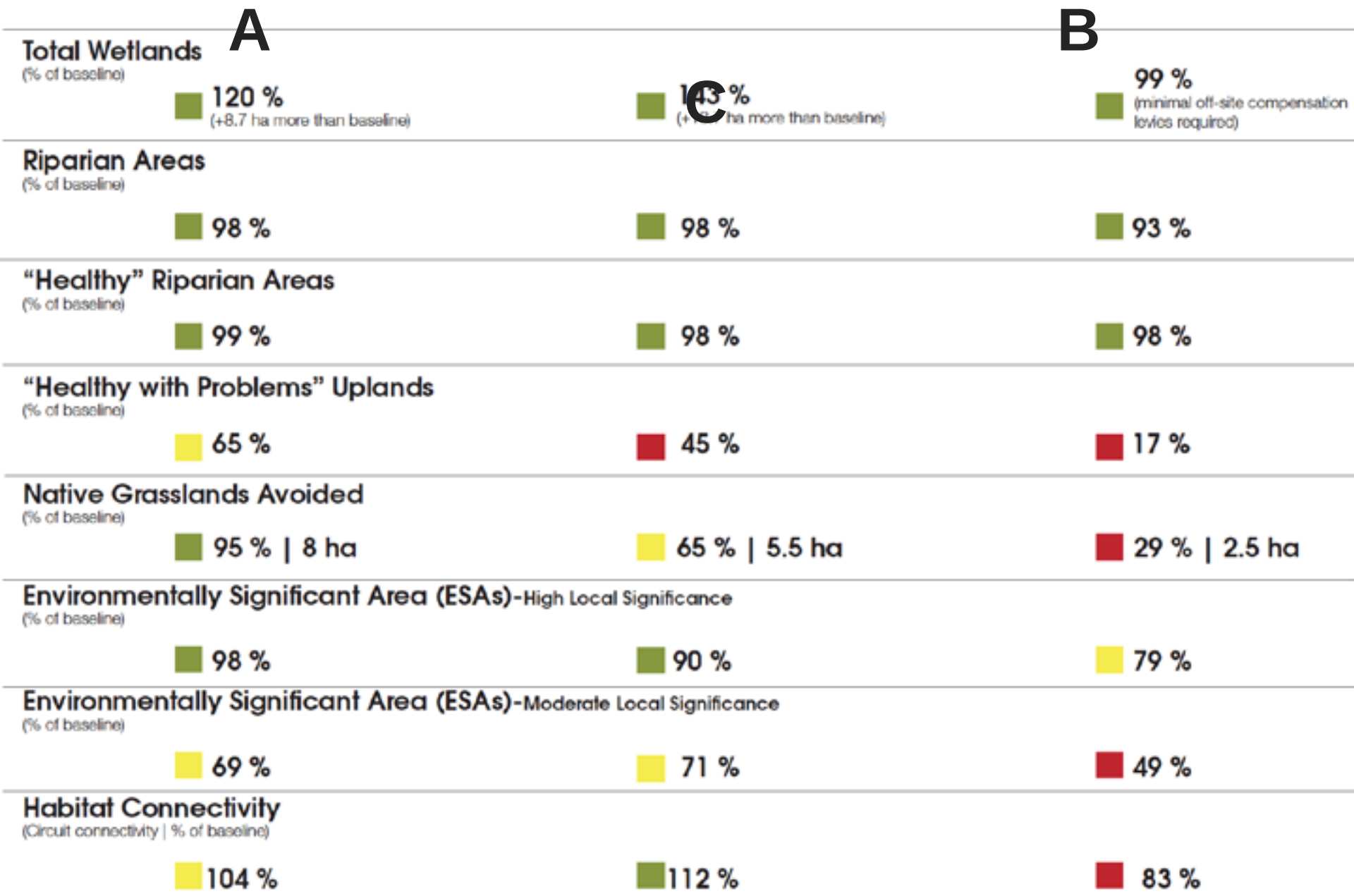
Wetlands Avoided (Class 3+4)
(% of baseline)

A	B	C
63 %	90 %	55 %

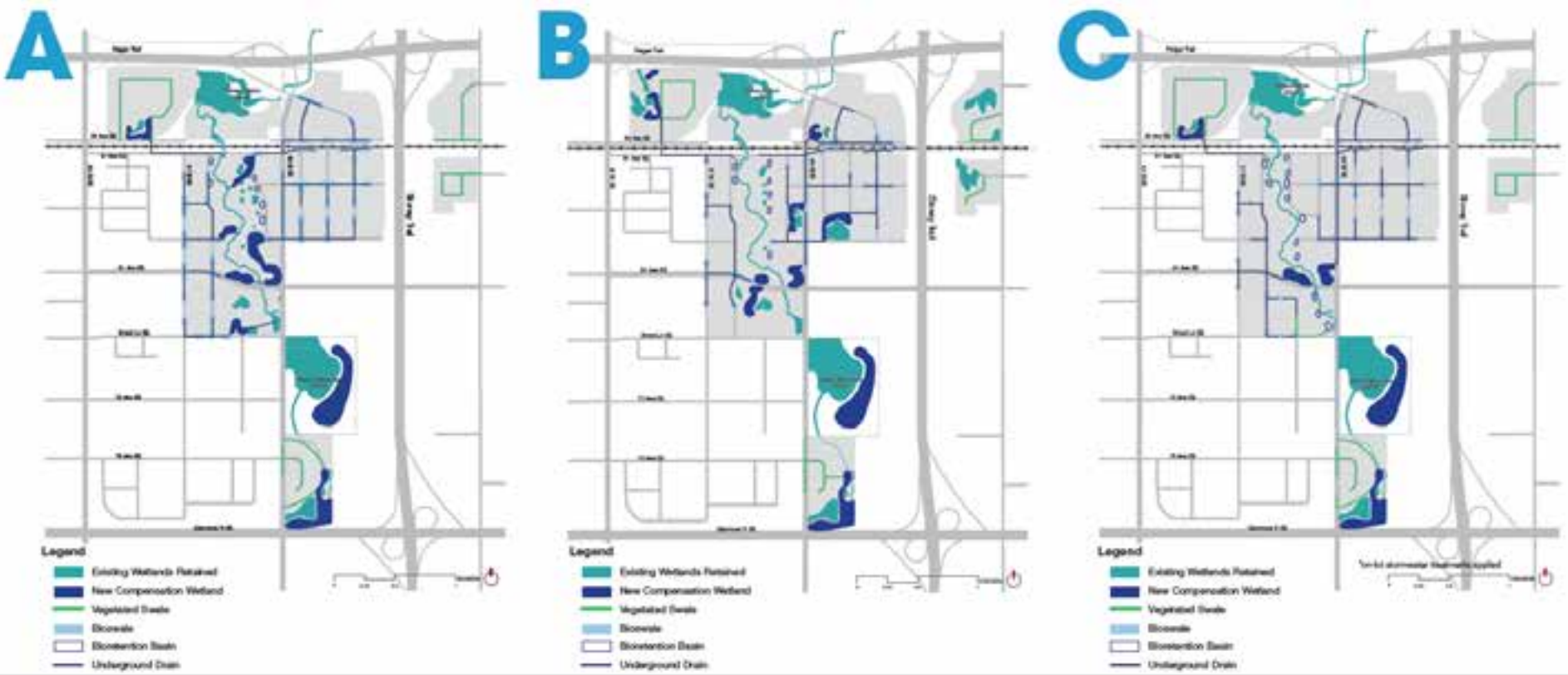
New Constructed Wetlands
(ha)

A	B	C
26 ha	26 ha	20 ha

Indicator Results: Biodiversity



Indicator Results: Water Resources



Impervious Areas

(% of study area)

42 %

42 %

49 %

Total Annual Stormwater Discharge
(mm/ha average annual discharge)

A	C	B
90 mm	68 mm	65 mm

Total Suspended Solids (TSS) Annual Discharge
(kg/ha/year)

A	C	B
98	86	24

Total Phosphorus (TP) Annual Discharge
(kg/ha/year)

A	C	B
0.40	0.34	0.1

Area Covered by Gravity Drainage
(% of study area)

A	C	B
100 %	100 %	100 %

1:100 Year Floodplain Conserved
(% of all floodplain)

A	C	B
100 %	100 %	100 %

PREFERRED V2

02

PREFERRED ALTERNATIVE V2

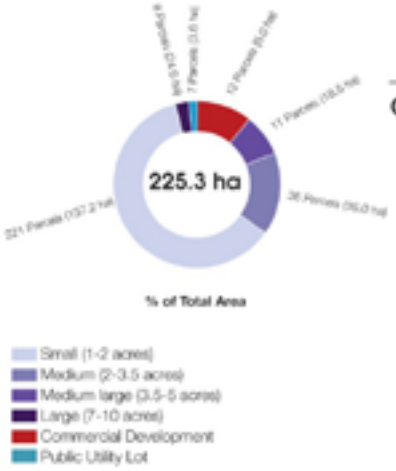
Preferred Alternative 2 Performance Measures

Development Opportunities

Return on Investment

TBD

Total Amount of Developable Land + Diversity of Lot Sizes



Employment

(Jobs within study area | Density of 10-20 jobs / net ha)

3,410 Jobs

Accessible Retail

(Jobs within 400 m of retail location)

660 Jobs (19%)

Transportation

Traffic Analysis

(Level of Service - High Level | Base connectivity index 1.27)

Connectivity Index
1.43

Transit Accessibility

(Jobs within 400 m of transit stop)

1,270 Jobs (37%)

Non-Vehicular Mode Accessibility

(Jobs within 400 m of pathways - exclude trails)

870 Jobs (26%)

Creek Crossings

3
- Arterial (68 St SW) (1)
- Pathway (2)

Water Resources

Impervious Areas

(% of study area)

45%

Total Annual Stormwater Discharge

(mm/ha average annual discharge)

87

Total Suspended Solids (TSS) Annual Discharge

(kg/ha/year)

36.4

Total Phosphorus (TP) Annual Discharge

(kg/ha/year)

0.2

Area Covered by Gravity Drainage

(% of study area)

100 %

1:100 Year Floodplain Conserved

(% of all floodplain)

100 %

Biodiversity

Wetlands Avoided (Class 1+2)

(% of baseline)

8 %

Wetlands Avoided (Class 3+4)

(% of baseline)

54 %

New Constructed Wetlands

(ha)

22 ha

Total Wetlands

(% of baseline)

101 %
(+0.3 ha more than baseline)

Riparian Areas

(% of baseline)

94 %

"Healthy" Riparian Areas

(% of baseline)

99 %

"Healthy with Problems" Uplands

(% of baseline)

53 %

Native Grasslands Avoided

(% of baseline)

53 % | 4.5 ha

ESAs-High Local Significance

(% of baseline)

84 %

ESAs-Moderate Local Significance

(% of baseline)

59 %

Habitat Connectivity

(Circuit connectivity | % of baseline)

106 %

Recreation + Open Space

Total Area of Open Space per Type

Accessibility of open spaces from development

(Jobs within 400 m of parks)

2,310 Jobs
(68%)

Length of dedicated pedestrian/cycling pathways (off-street)

(Regional + local pathway - exclude trails)

4.3 km

Pedestrian Connectivity

(base connectivity index: 1.11)

Connectivity Index
1.42

PREFERRED CONCEPT

FOREST LAWN CREEK


QUESTIONS?