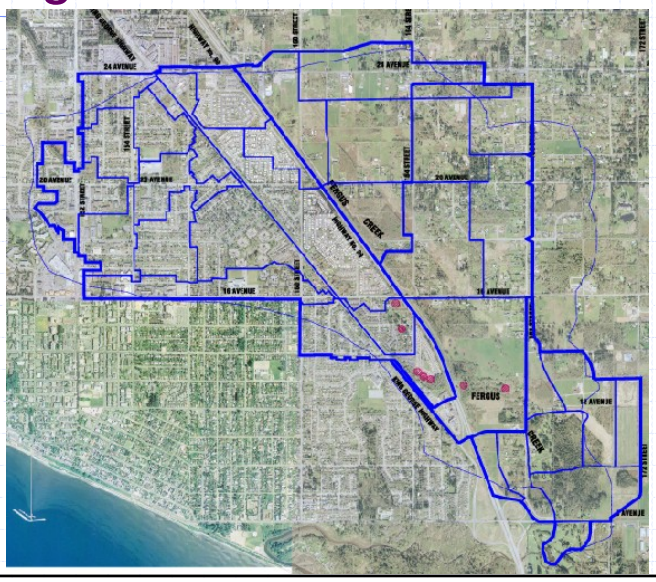
Fergus Creek Innovations

June 16, 2006

Fergus Creek Watershed



Goal

- No environmental impacts
- Allow redevelopment
- Have sustainable neighbourhoods
  - Housing
  - Recreation
  - Etc, etc

ENGINEERING

- Only a part of the puzzle

Engineering Requirements

- Flood protection
- Level of drainage service
- Minimize maintenance costs
- Minimize capital cost
- Known and accepted risks
- Quantifiable performance

McElhanney

Environmental Requirements

- Riparian habitat protection
- Water quality protection
- DFO Goal - Fish Habitat Conservation
  - Maintain the current productive capacity of fish habitats supporting Canada's fisheries resources, such that fish suitable for human consumption may be produced.

McElhanney

Challenge

- Integrate
  - Engineering
  - Environmental protection
  - Development / Redevelopment
  - Recreation
- Cost effective
- Cannot increase risks and liabilities

McElhanney

DFO Guides

- Criteria have been documented in
  - Land Development Guidelines for the Protection of Aquatic Habitat, 1992
  - Urban Stormwater Guidelines And Best Management Practices For Protection Of Fish And Fish Habitat, Draft Discussion Document, Revision 4

McElhanney

Hydrologic Design - DFO

- "Runoff will be modelled using continuous simulation"
- "Single event models are acceptable for preliminary sizing of BMP's and conveyance systems if multiple event scenarios are modelled"

McElhanney

Real World Operation, Jones

Bioassessment of BMP Effectiveness in Mitigating Stormwater Impacts on Aquatic Biota, Jones, 1997

- Biological communities degraded below BMP's as compared to reference watersheds
- No difference in BDI above or below BMP's

McElhanney

Real World Operation, MacRae

Experience from Morphological Research on Canadian Streams, MacRae, 1997

- Stream channels below detention basins designed to control to 2 year discharges experienced accelerated erosion at 3 times the predevelopment rates
- Do not use this criteria to prevent erosion

McElhanney

Real World Operation, Maxted

The Use of Retention Basins to Mitigate Stormwater Impacts on Aquatic Life, Maxted, 1997

- A study of 8 watersheds with and without BMP's
- Concluded that BMP's did not mitigate the impacts of development when total impervious values exceeded 20%

McElhanney

Learn From Others

- Do not repeat mistakes of the past
- Start where the others left off
- We need a new approach

McElhanney

To Date

- Focus on rainfall
- No real and defined connection to the stream and the environment
- Many documented problems
- Changing rules

McElhanney

Design / Assessment Basis

- Two Paths that initially appear similar
- Rainfall Based
  - Control of a fixed volume, i.e. 30mm
  - Control of discharge rates
- Runoff Based
  - Address impacts on streams
  - Quantifiable and measurable

McElhanney

Rainfall Basis

- Simple
- Capture volumes from impervious areas
  - Create some detention / infiltration
- Maintain predevelopment rates
  - Use design storms
  - Use retention ponds
- **Assume** works mitigate impacts
  - No way to test before construction

McElhanney

Runoff Basis

- Flow duration for habitat availability
- Maintain flow durations
- Tractive force to measure potential erosion
- Sediment washoff to evaluate water quality
- Optimize systems to manage the impacts of the altered hydrologic cycle
- **Test** mitigation works **prior** to construction

McElhanney

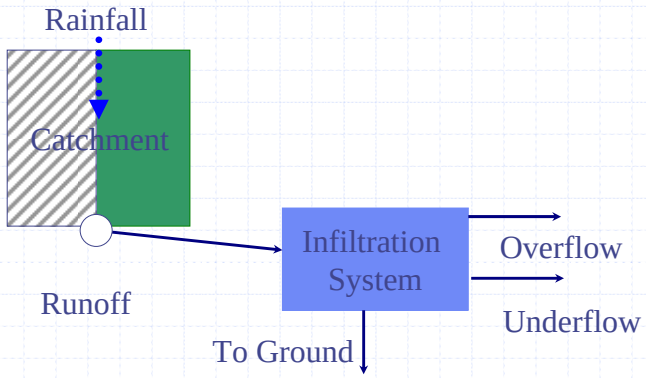
Duration of Discharge

- Critical to aquatic health
  - Discharge is linked to stream health
- It can be measured and verified
- Estimate durations of:
  - Flood discharge
  - Base flow
  - Fish habitat availability (depth vs duration)

McElhanney

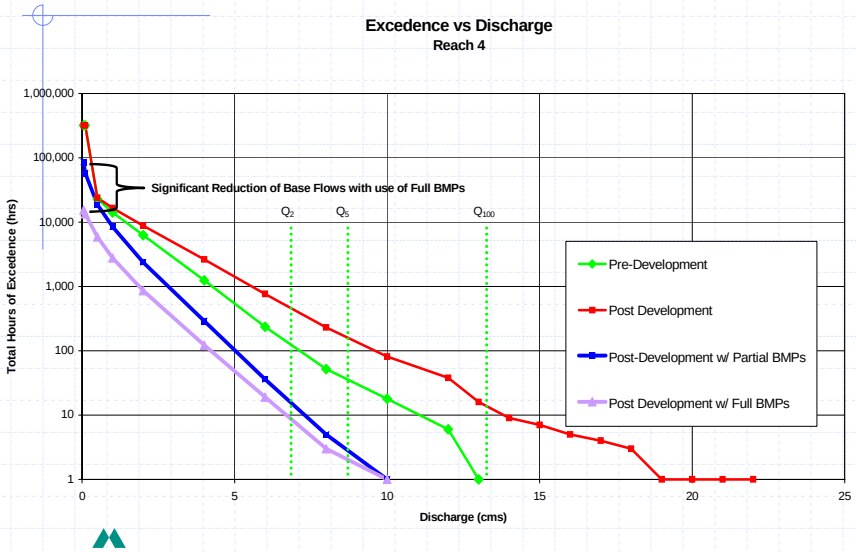
Modelling Infiltration Systems

- A storage system with 3 outlets



McElhanney

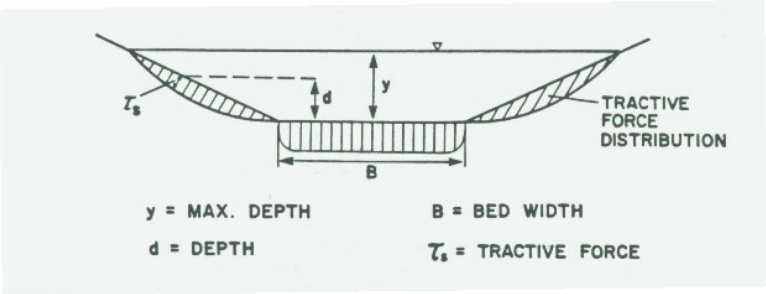
Discharge Exceedance



McElhanney

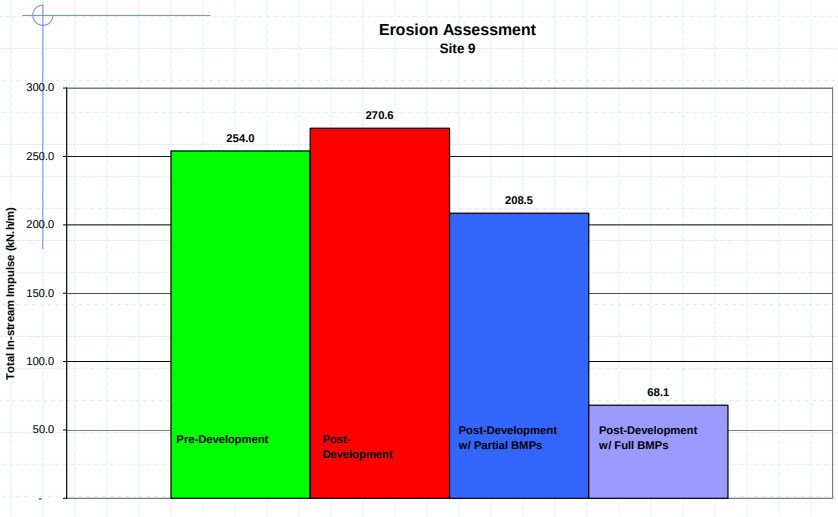
Potential Erosion

Based upon Tractive Force calculations



McElhanney

Stream Erosion Assessment



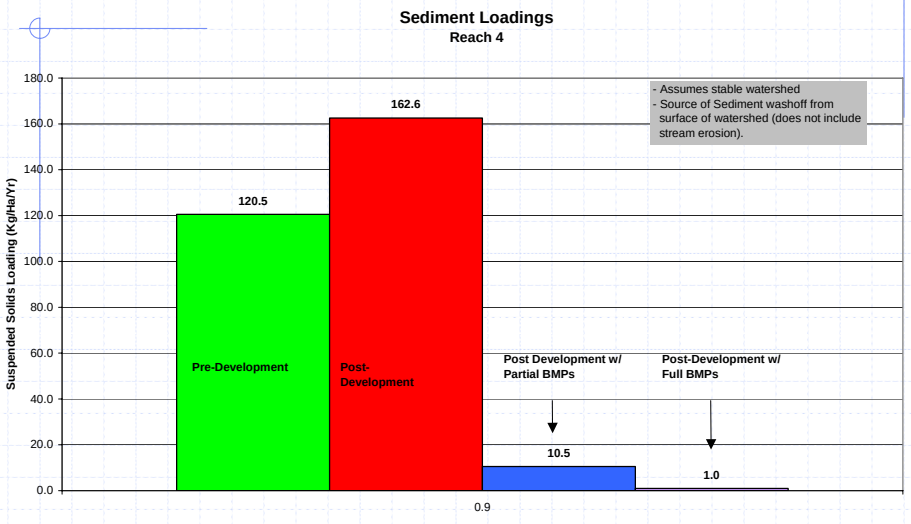
McElhanney

Sediment Supply

Type of Land Use	Sediment Yield (tonnes/ha/yr)
Natural Forest	0.66
Agricultural	0.11 to 2.2
Urban Construction	1.8 - 73.5
Stable Watershed	0.039 to 0.367
Urban Areas	0.10 to 0.61

McElhanney

Sediment Assessment

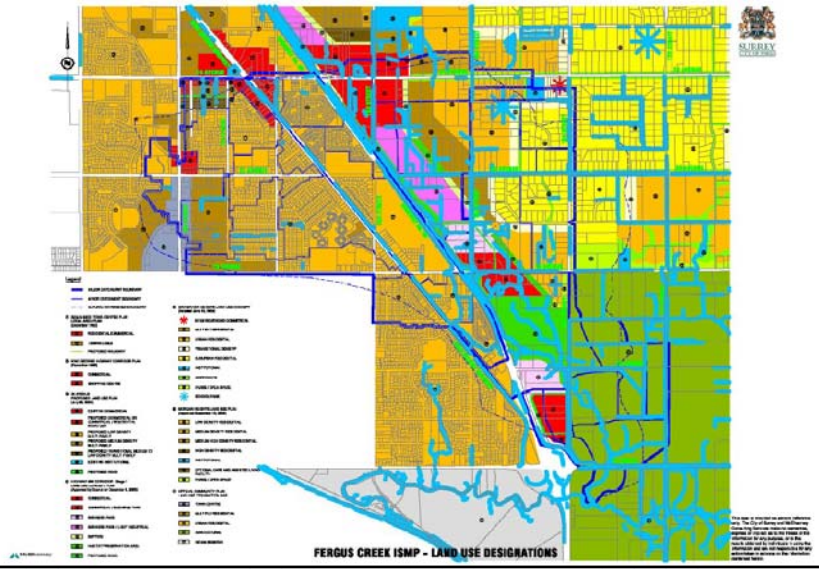


McElhanney

PLANNING

- Engineering Input

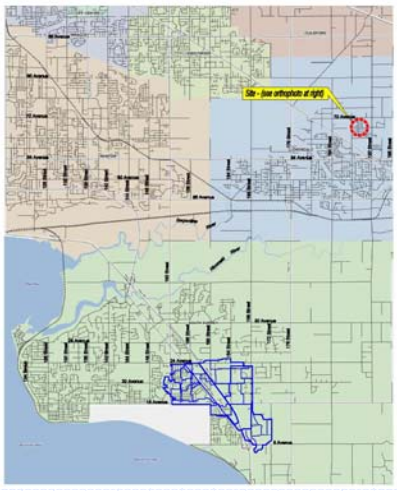
Land Use



Watershed Vision

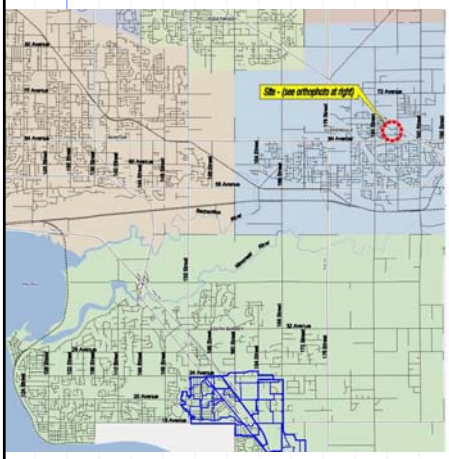
- Proactive or reactive?
- Impacts
  - Engineering
  - Land use
  - Building form and function
  - Recreation opportunities
  - Environment

8 UPA – 60% Impervious



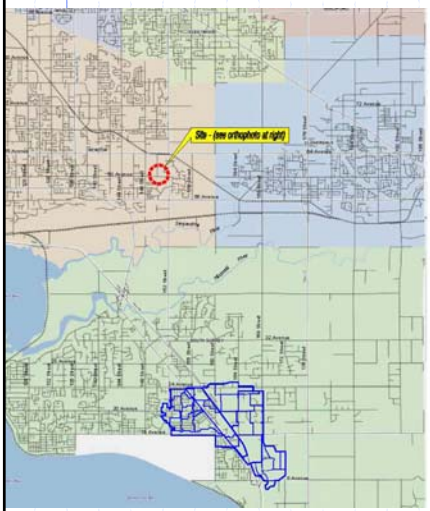
60% Neighbourhood

14 UPA – 75% Impervious



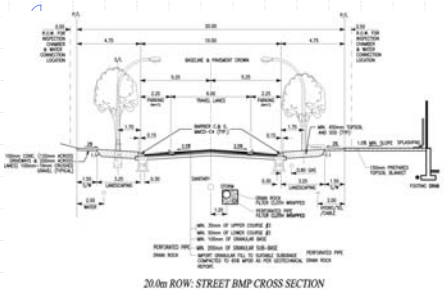
75% Neighbourhood

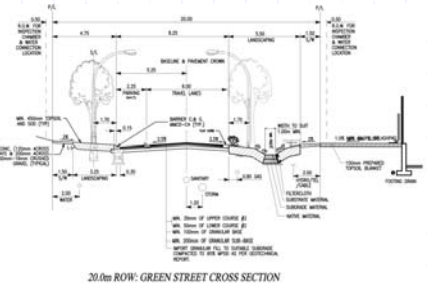
14 UPA – 55% Impervious

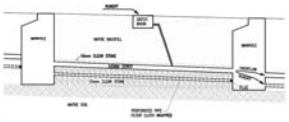


55% Neighbourhood

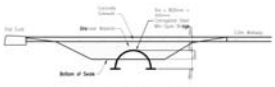
A Green Street

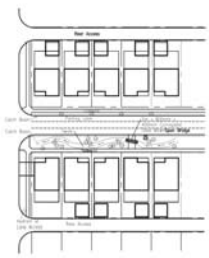

20.0m ROW: STREET BMP CROSS SECTION


20.0m ROW: GREEN STREET CROSS SECTION


TYPICAL STORM SEWER PROFILE


TYPICAL OIL-GRIT TRAPPING CATCH BASIN


ELEVATION MINI-SPAN BRIDGE

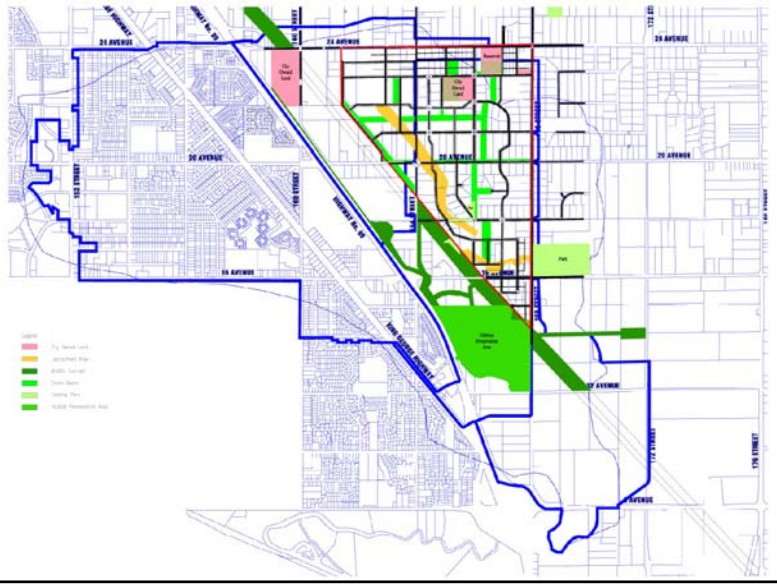

20.0m ROW: GREEN STREET PLAN

20.0m ROW: ROADWAY BMP Rear Access Lots

Scale: NTS

McElhanney

Greenways



Fergus Creek Innovations

SURREY
CITY OF PARKS

McElhanney