Rainwater Management

- Treatment / Detention Options
- An evening with EMCO
- Presented by: Rick Lloyd, P.Eng
- ***RCL*** Consulting Ltd June 8, 2006

Confucius said:

- Balance is the perfect state of still water.
- Let that be our model.
- It remains quiet within and is not disturbed on the surface.
- We must strive for balance.

Rainwater at its best
Tsusiat Falls, June 1, 2006

This is Rain Water

- Big storms cause major devastation
- But what about small rain events?
- Are things changing?

Who Cares About Rainwater?

Neu-Ulm Germany, Aug 2005

McLean's Sept 5/05

Climate Change & Rain Water

- Over the next 10 years, the models prepared by Dr. Francis Zweirs of Earth and Ocean Sciences, show a 10% increase in storm rainfall intensity

Is This Part of Climate Change?

- According to Dr. Zwiers, it is.
- The gasses stored in the stratosphere will take 750 years to dissipate
- And that is with no additional gasses.

What Does That Mean?

- That means a 1 in 10 year storm will now be a 1 in 8 year storm
- A 100 mm rainfall will be a 110 mm event.

Does that matter?

- You BET !
- Urban design criteria are generally based on a 10 year rainfall.
- Pipes larger than 900 mm are designed for a 25 year rain fall

Impacts

- Streets and urban infrastructure will flood regularly
- Flood related damage will occur more often
- The municipal infrastructure is just too small
- Rain water is greater

Is That The Only Problem?

- Sadly, no
- We still legislate wide roads with curb and gutter
- We pipe road and municipal drainage directly to streams
- We allow high impermeability on development

We hike in wetter weather

Here is a typical wide road

Increased Impermeable Area = Increased Runoff

- Buildings, roads and parking lots create impermeable areas.

Who Requires These Standards?

- Fire Departments
- Maintenance Staff
- Engineers
- Residents

What Impact Do The Standards Create?

- Well, first we get high runoff
- Our cities are warmer
- We have less green space
- We design for drivers in a hurry

What are the Problems?

- Hot cities (big pavement surfaces)
- Lots of hot water (big pavement surfaces)
- Lots of Cars (big pavement surfaces)
- Reduced Green Space

What About Streams

- Stream are damaged by small rain events and rapid runoff
- If the 1 year event is now a 2 year event, then we get down cutting and in-stream erosion

Serious Head Cut

Creek Erosion from One Heavy Rain Event and Several Small Events

So What Are The Solutions

- We've heard many before but let's go over this again

- Make the city multi-modal
- Enhance the green space
- Reduce overall runoff
- Replenish the ground water

Permeable green space

Narrow Roads, Bioswales

Fire truck, small cul d sac

Grass and Gravel Pave

Site Designs Really Matter

- Innovative Building Design
- Integrated Stormwater Management
  e.g. green roofs, bioswales, water reuse, permeable paving, detention, recharge, evapotranspiration, vertical gardens

Bad Construction Practice

Big Paved Surfaces

Great Construction Practice?

What are the Options?

- Reduce hard surfaces
- Alternate travel modes
- Natural drainage systems
- More aware people
- Increase vegetated areas
- Smart design

Storm Drainage

- Let the water flow naturally
- Leave streams open
- Reduce peaking effects on streams
- Huge savings in future costs
- What if you had to treat your drainage? San Francisco does!

Can we do this ?

- Absolutely, YES!
- We need to look at the cost of standards from not just capital cost but maintenance, longevity and livability
- What is the impact on our families if our street is all pavement and sidewalk?

Our Costs Are:

- Capital
- Maintenance
- Operations
- Replacement
- Aesthetics

So what are the real costs?

- A narrower road 6m vs 8.5 saves $250.00 per metre
- Reduced water demand saves finding another source (millions)
- Reduced sewer flows result in keeping your STP longer (hundreds of thousands)

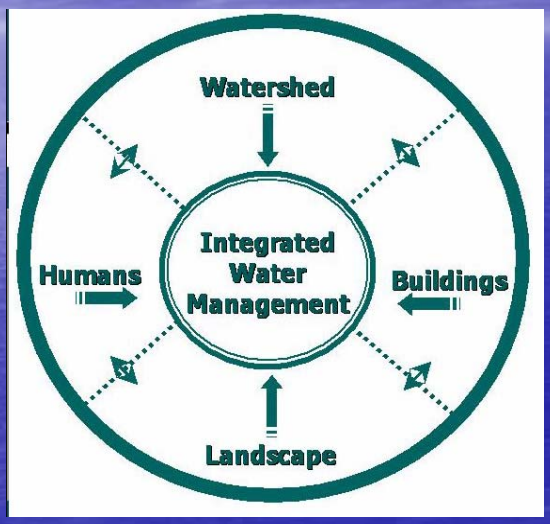
Smarter Subdivisions

- Land
- Water
- Roads
- Sewer
- Drainage
- Utilities
- Landscaping

We need to densify

- Smaller lots
- Narrower paved streets
- More boulevard
- More pedestrian walkways
- More trees
- More concentrated community conveniences

Integration is Essential



Landscaping

- Modify our designs to increase shade and reduce water demand
- Create pretty streets and walkways
- Make the place livable!

Savings?

- Stormwater management (Priceless!)
- You conserve the natural landscape, streams, road edges, natural biodiversity, groundwater, heat losses due to overheating, ponds and viewscapes

Convert to sustainability

- Convert raised parking islands into bioswales.

Benefits:

- Reduced runoff
- Lower water temperature
- Improved water quality

This is Seattle's option

A 20 year old grass roof

Parking lot swale

Road Base Detention

Flat Curbs, Base Detention

Flat Curbs and Bioswales

Urban School Access

How can we detain the rainwater?

- In ground storage,
- Site detention
- Volume storage
- Rain gardens with bio filters

Detention facilities and gardens

Oversized Rock Pit

Atlantis detention systems

Rain Garden overflow

Preparing the excavation

Placing the Atlantis boxes

The Sidewalk Superintendent

Wrapping the geotextile

Back fill with drain rock

Detention in place

Natural Water Features

To quote a friend

If you are thinking a year ahead, sow seed. If you are thinking ten years ahead, plant trees. If you are thinking 100 years ahead, educate the people.

-Chinese proverb

We can still enjoy our natural beauty

Thank You

- For educating yourself
- Educating your community

And just plain listening