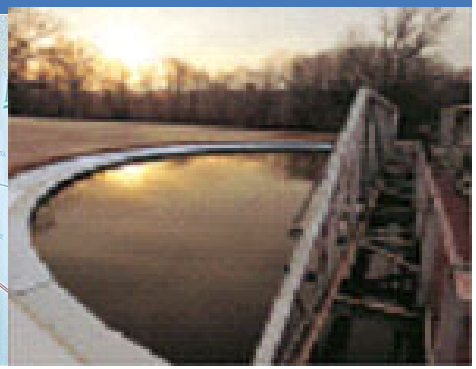
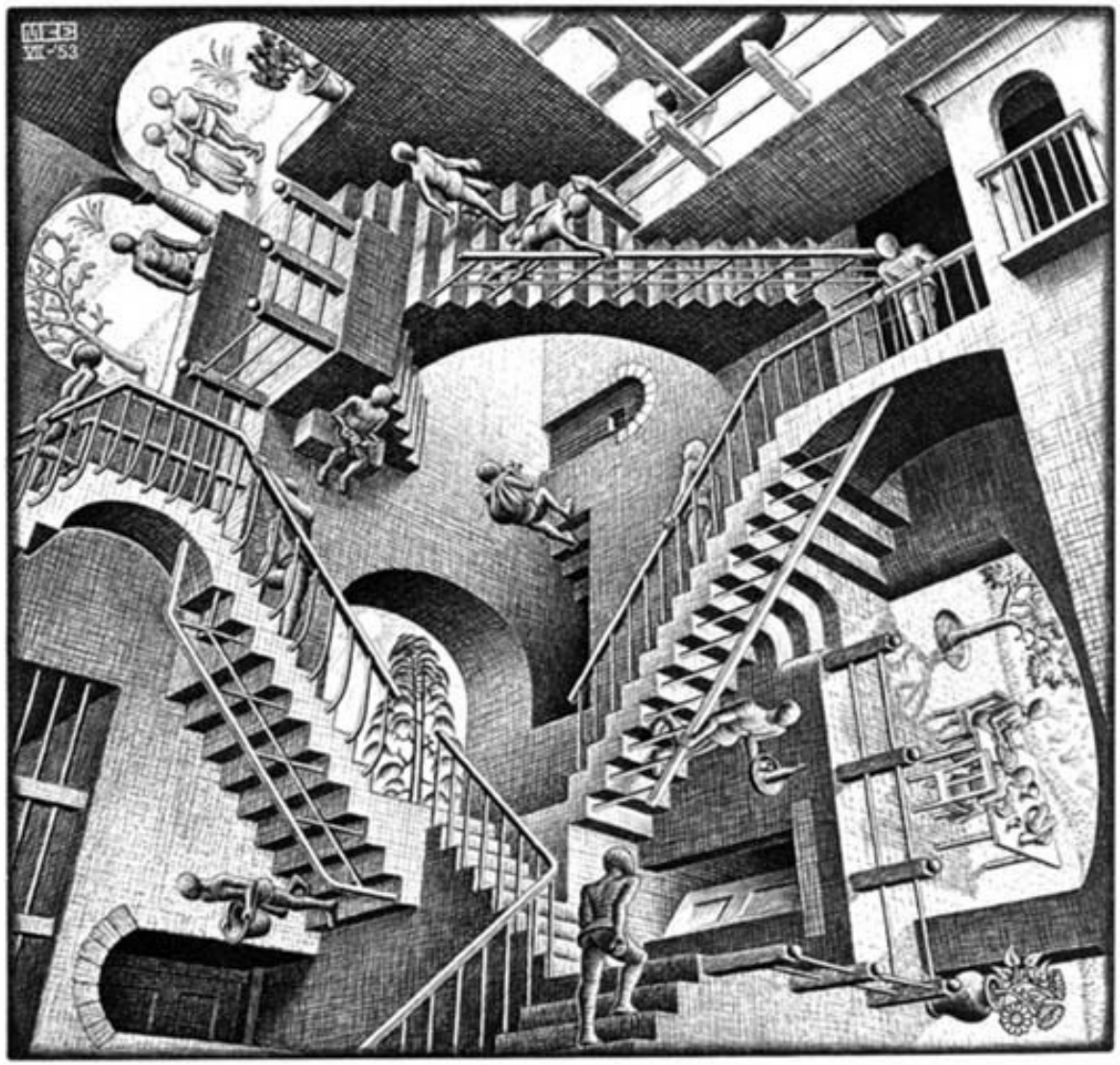
Business Case Evaluation



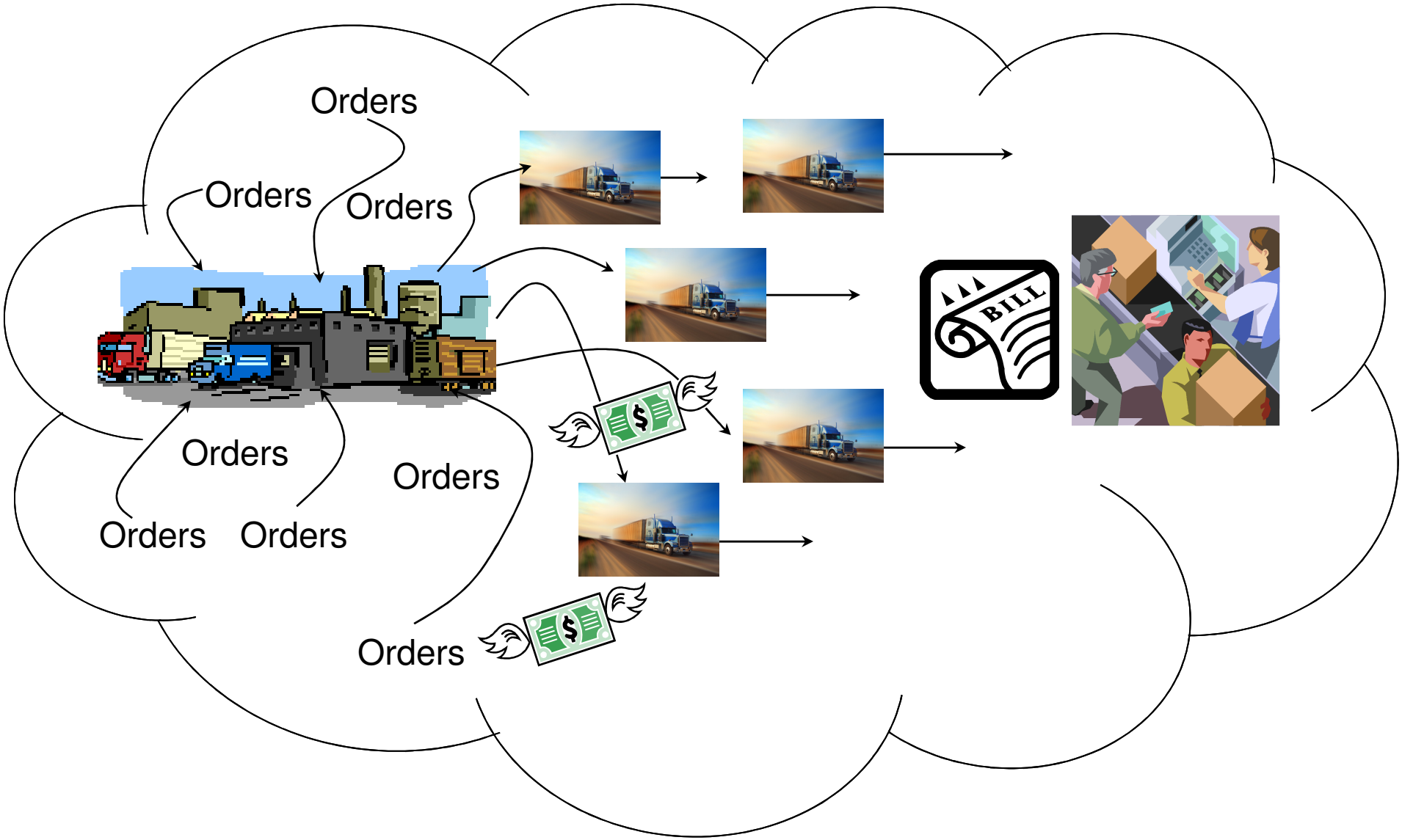
PNWS AWWA Conference
Tacoma, WA
May 14, 2010

© CH2M HILL 2007

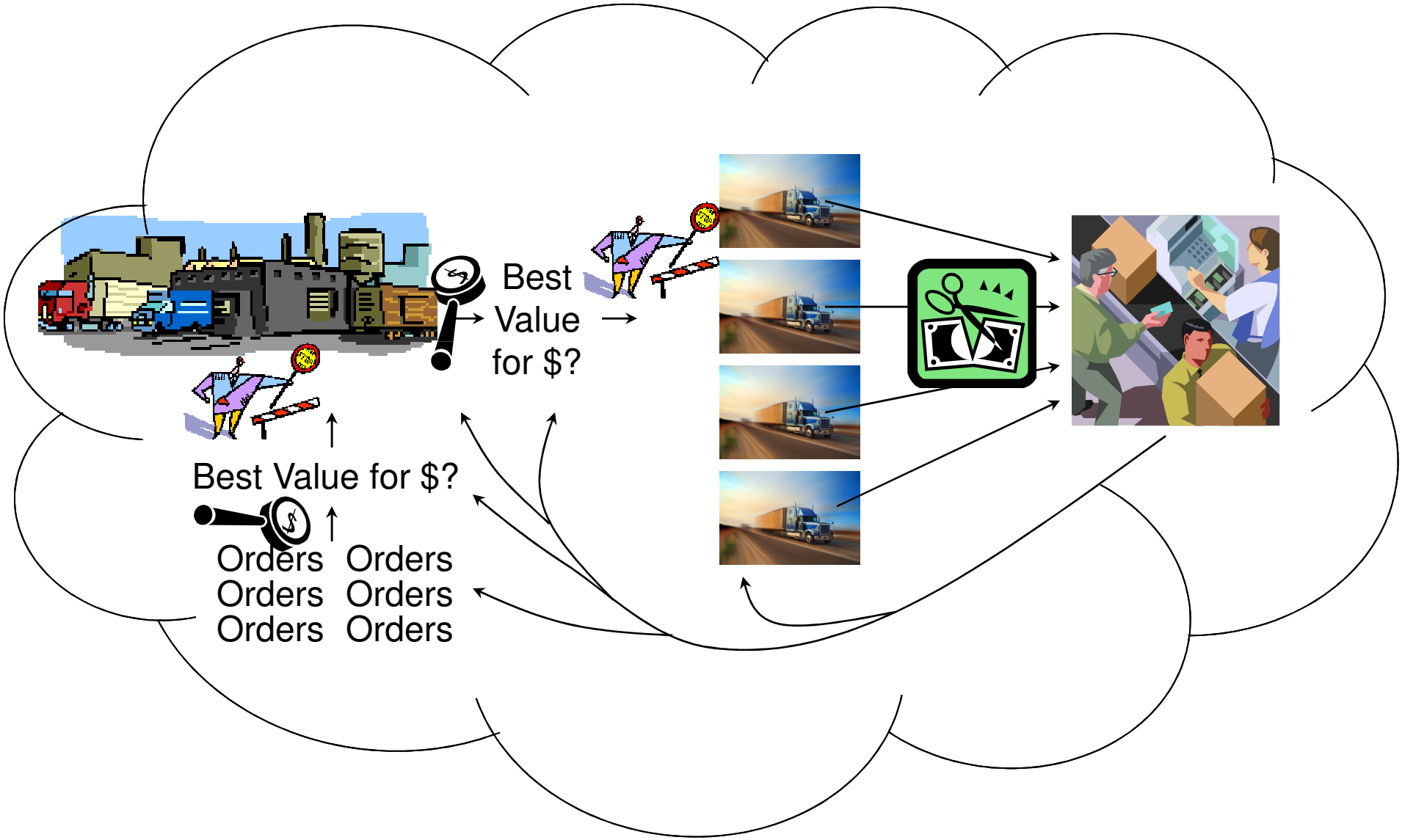
Expenditure Decision Process?



How Customers Get Served Now



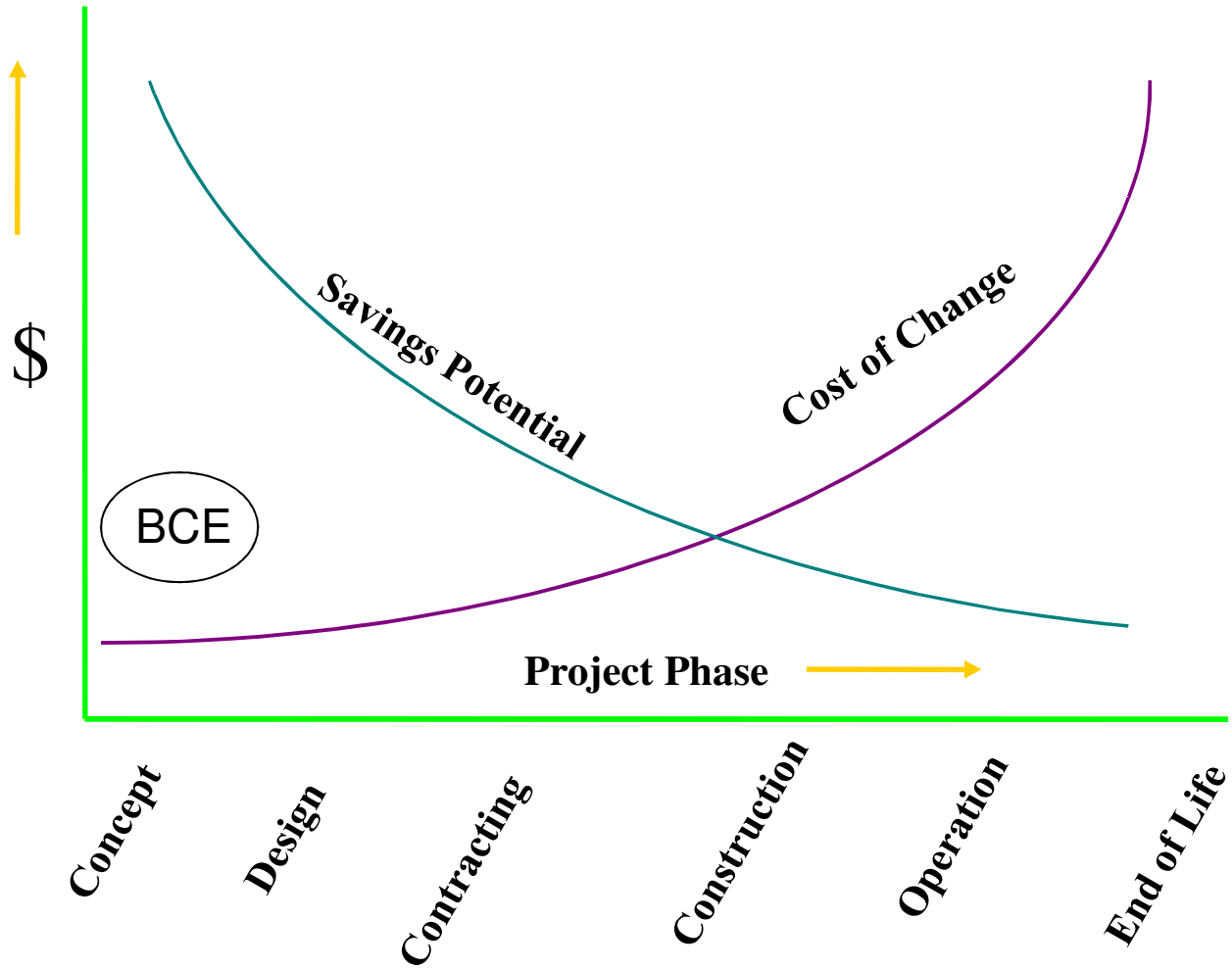
How Customers Should Get Served



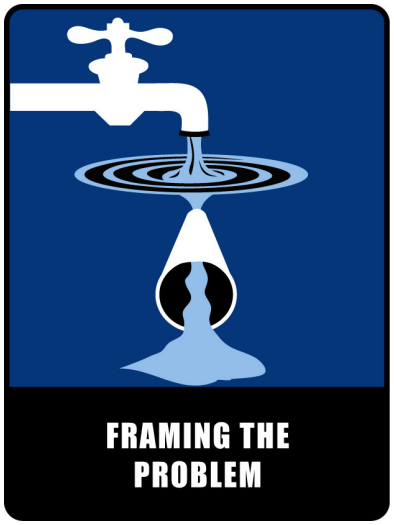
Value of BCE's

- Improve Expenditure Decisions – Better Value for Money
- Provide Transparent Documentation for Decisions
- Make Decisions Corporate – Risk and Accountability becomes Executives'

Savings Potential – Earlier is Better



BCE's:
3 Steps


FRAMING THE
PROBLEM

Cap+O&M
$
DATA AND
ANALYSIS

BCE
PRESENTING
RESULTS

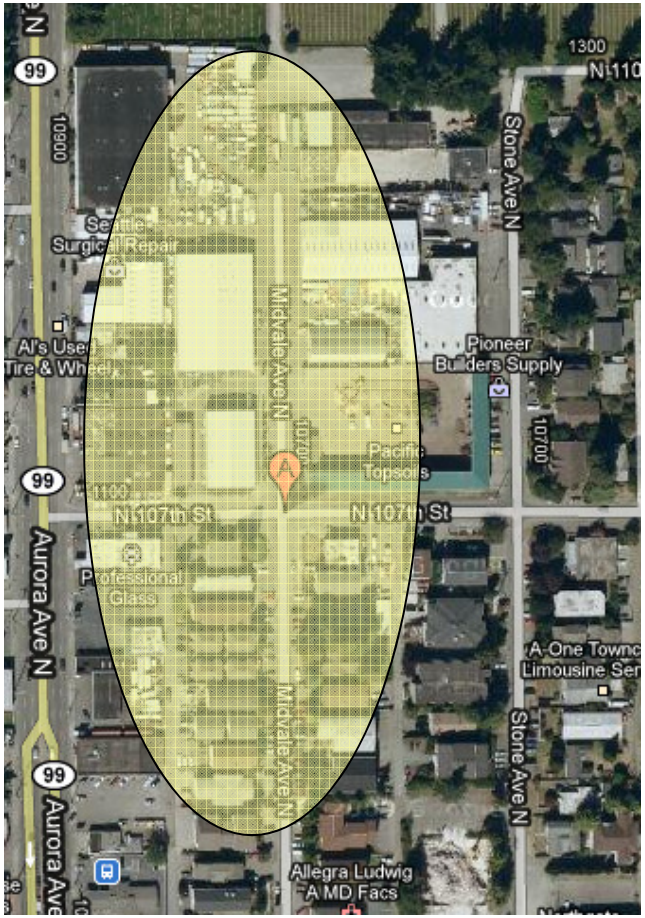
BCE Example 1

Local Flood Control

Timeout: Spending Someone Else's Money

- Business cases demonstrate that customers will receive best value for their money to:
  - 1) maintain or improve utility service, and/or
  - 2) reduce long-run life-cycle cost
  - 3) reduce financial/social/environmental risk
  - 4) meet regulatory requirements
  - 5) improve social/environmental outcomes

Background

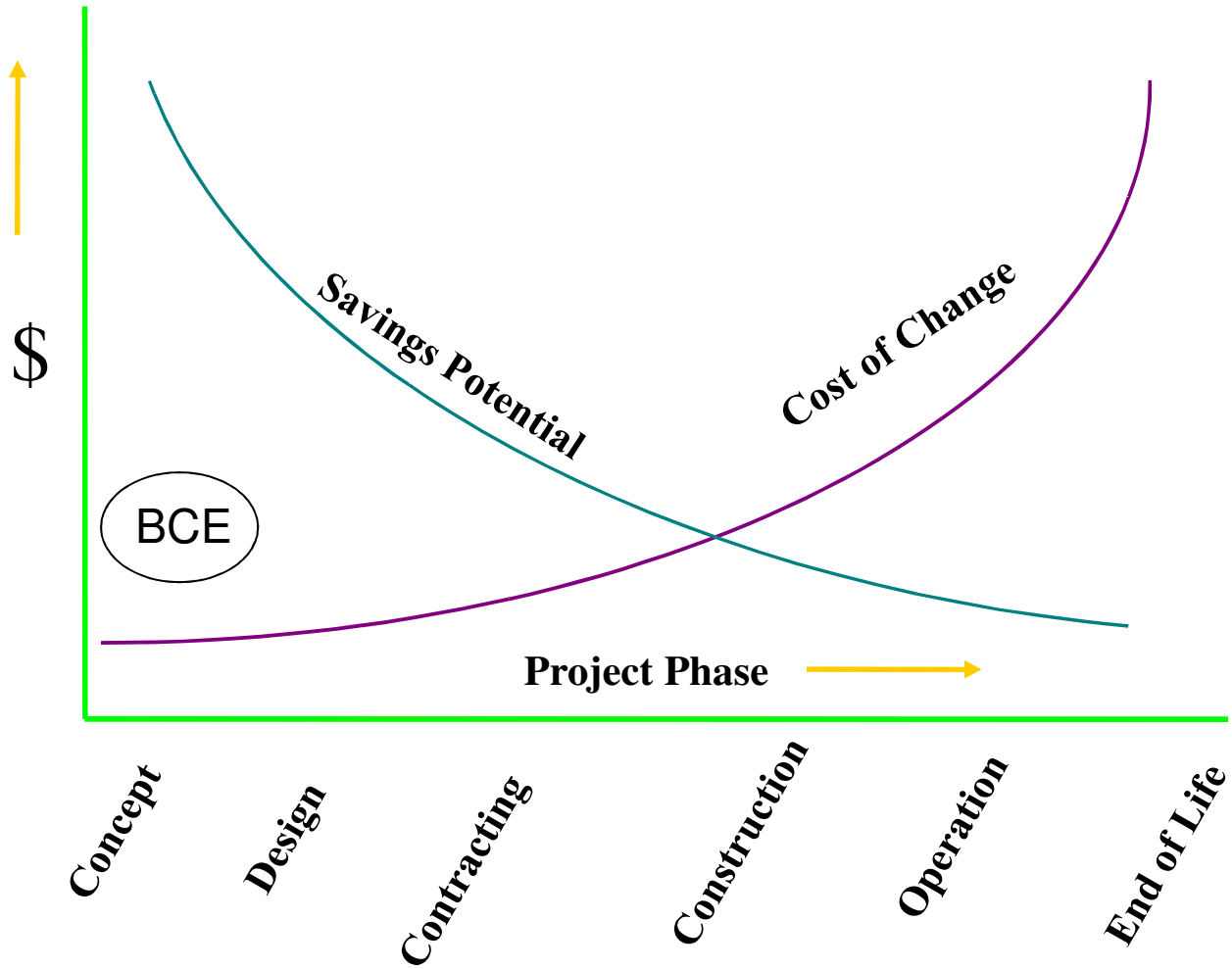


- Development has increased peak storm water flows
- Flooding occurs with 5 year + events
- Service levels: no flooding to 25 year event
- Damage and safety hazards high during extreme events

Problem

- 25 year event service levels are not being met in local area – flooding protection only to 5 year event
- Extreme (25-100+ year) storm events result in significant property damage and public safety risk from severe flooding
- (NOT: Insufficient System Capacity)

Timeout: Savings Potential – Earlier is Better



Potential Solutions

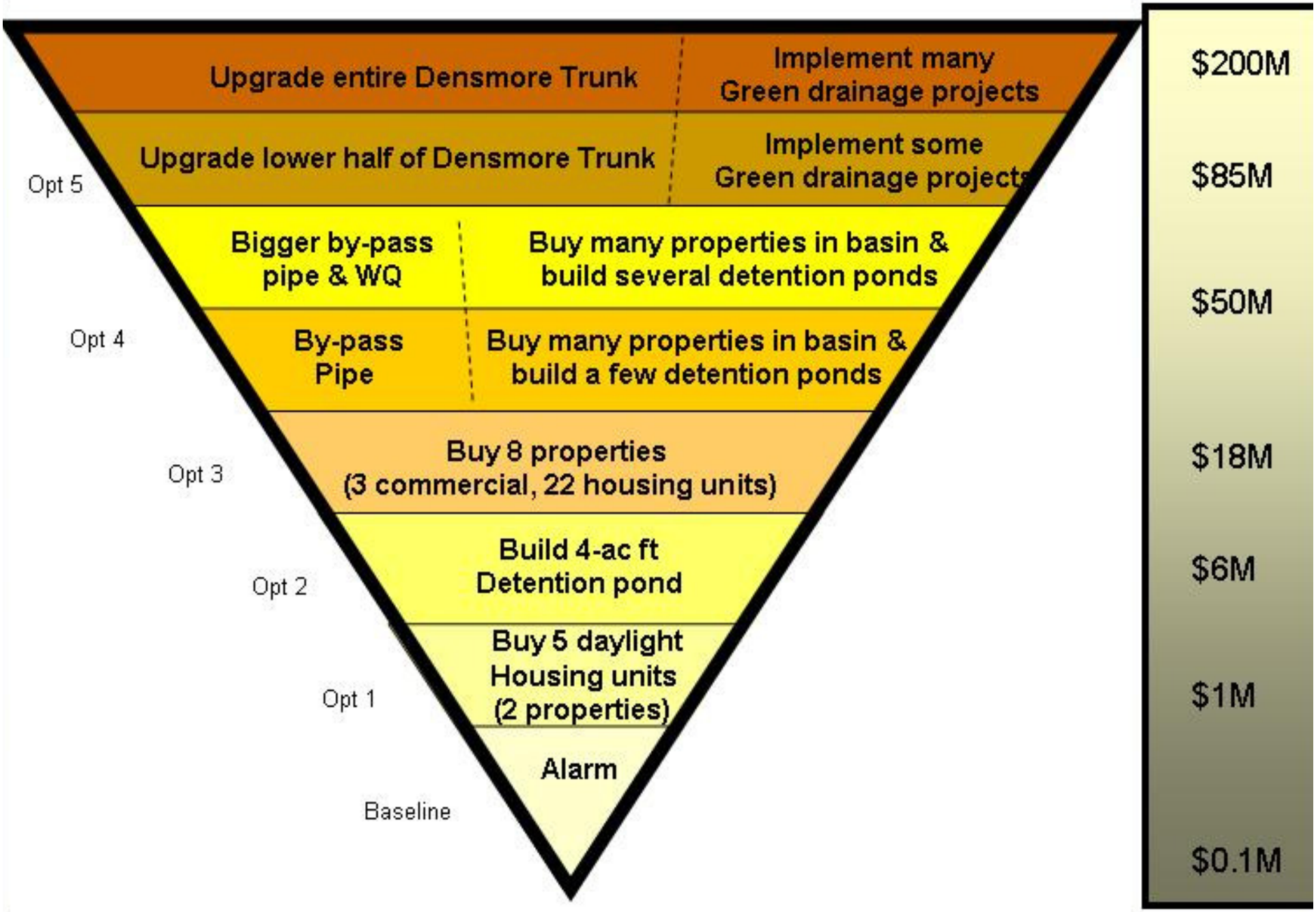
1. Reduce frequency and severity of flooding by increasing storage and/or flow capacity
2. Reduce cost of flooding by removing or protecting vulnerable structures and residents
3. A combination of storage, capacity and/or reduced cost of flooding

Options

- Reduce flooding by increasing storage and/or flow capacity
  - Replace existing storm pipe with higher capacity pipe
  - Install new bypass storm pipe
  - Build new detention facility
  - Create natural or “green” storm infrastructure

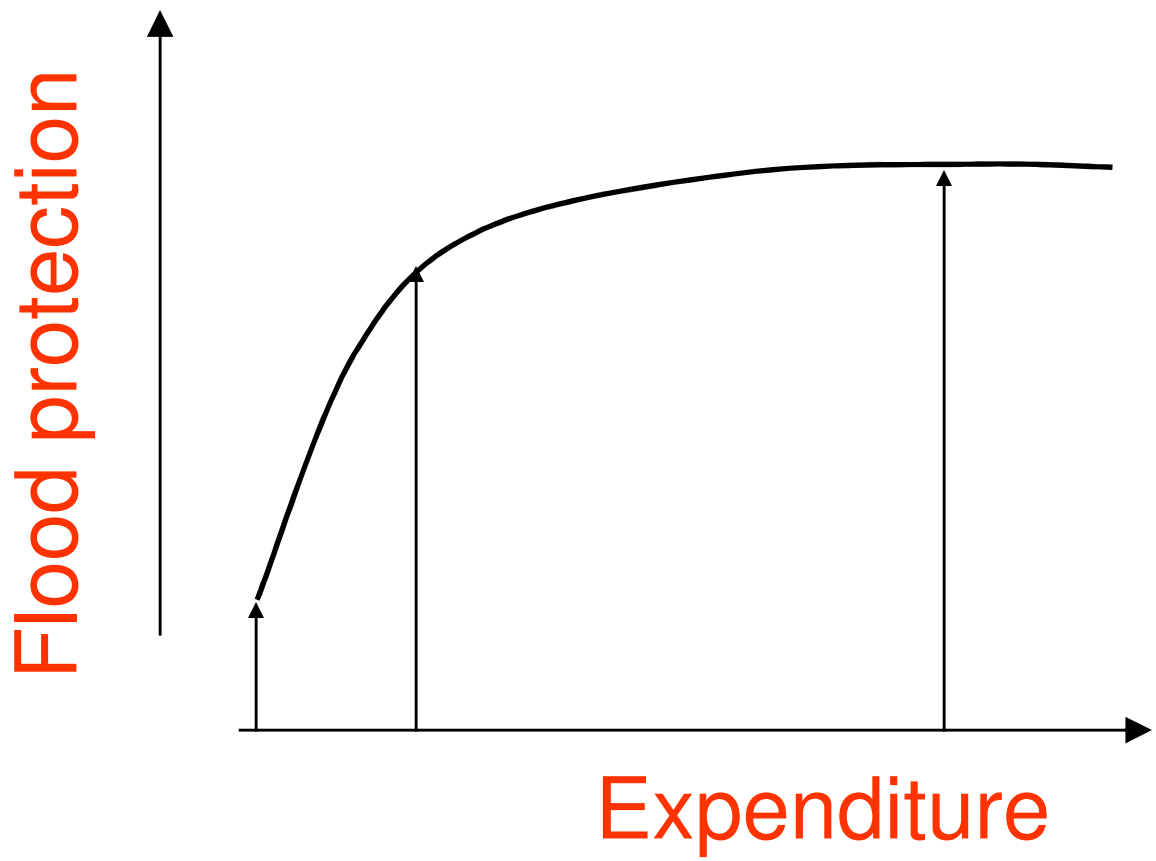
Options

- Reduce flood damage to at-risk buildings, property and residents
  - Remove/protect structures, create “flooding compatible” open space
  - Create early warning and flood response actions


Upgrade entire Densmore Trunk
Implement many Green drainage projects
Upgrade lower half of Densmore Trunk
Implement some Green drainage projects
Opt 5
Bigger by-pass pipe & WQ
Buy many properties in basin & build several detention ponds
Opt 4
By-pass Pipe
Buy many properties in basin & build a few detention ponds
Opt 3
Buy 8 properties (3 commercial, 22 housing units)
Opt 2
Build 4-ac ft Detention pond
Opt 1
Buy 5 daylight Housing units (2 properties)
Alarm
Baseline
$200M
$85M
$50M
$18M
$6M
$1M
$0.1M

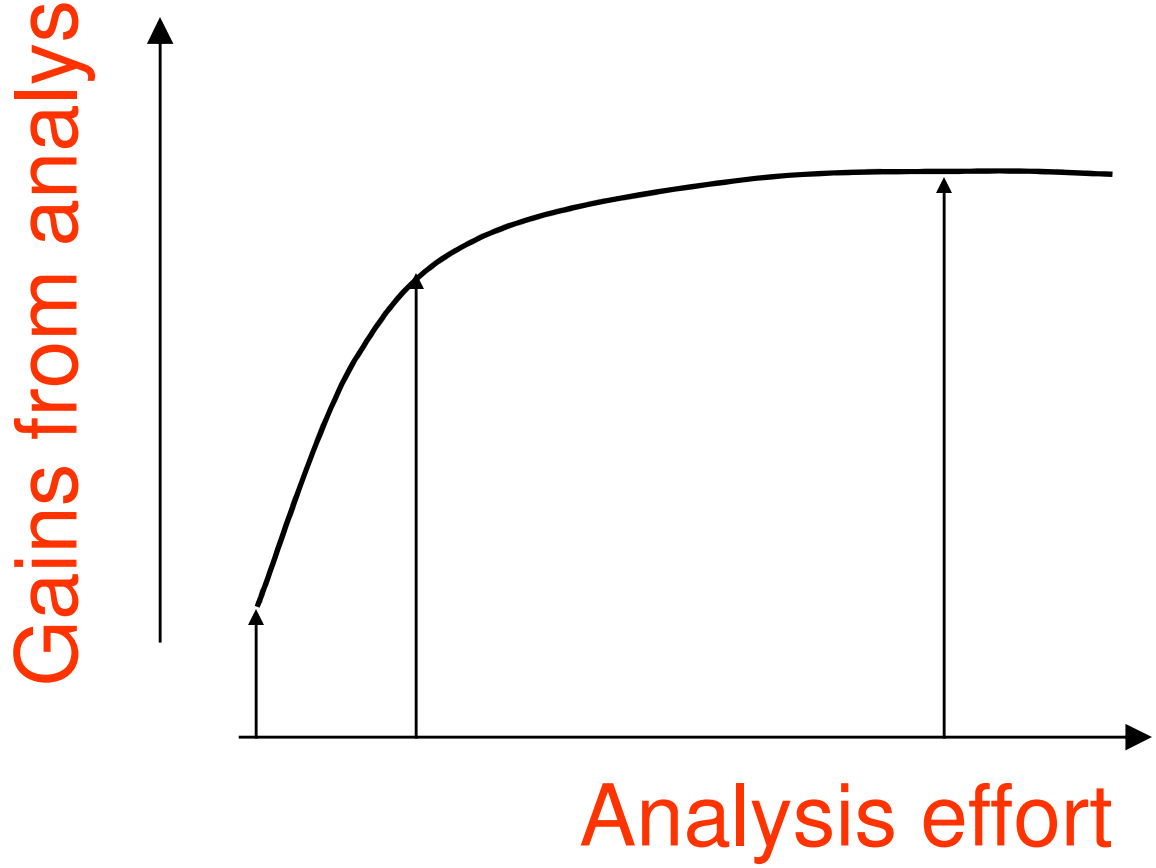
Time-out: 80-20 Rule

How much flood protection?



Time-out: 80-20 Rule

How much analysis?



Cost of Options

Option	Property Acquisition Costs	Construction Costs	Present Value O&M Costs*	Present Value Total Costs
1 – Remove/Protect "Most Vulnerable" Structures	$1,133	$475	$948	$2,556
2 – Build Detention Facility	$3,300	$3,892	$1,422	$8,614
3 – Remove/Protect "Highly Vulnerable" Structures	$12,000	$2,000	$1,422	$15,422
4 – Install New Bypass Pipe	$0	$62,000	$474	$62,474
5 – Replace & Upsize Existing Pipe	$0	$84,000	$0	$84,000
* 100 years at 3% real discount rate				

Benefits of Options

- Reduced Property Damage
- Reduced Business Loss
- Reduced Residential Disruption
- Reduced Public Safety Risk
- Creation of Public Open Space (secondary benefit of some options)

Property and Public at Risk

- 18 living spaces
- 15 vehicles
- 125,000 square feet of business space
- 75 residents, workers and visitors at safety risk

Flood Damage Values

- $35,000 per flooded living space
- $25,000 per 1,000 square feet of flooded business space

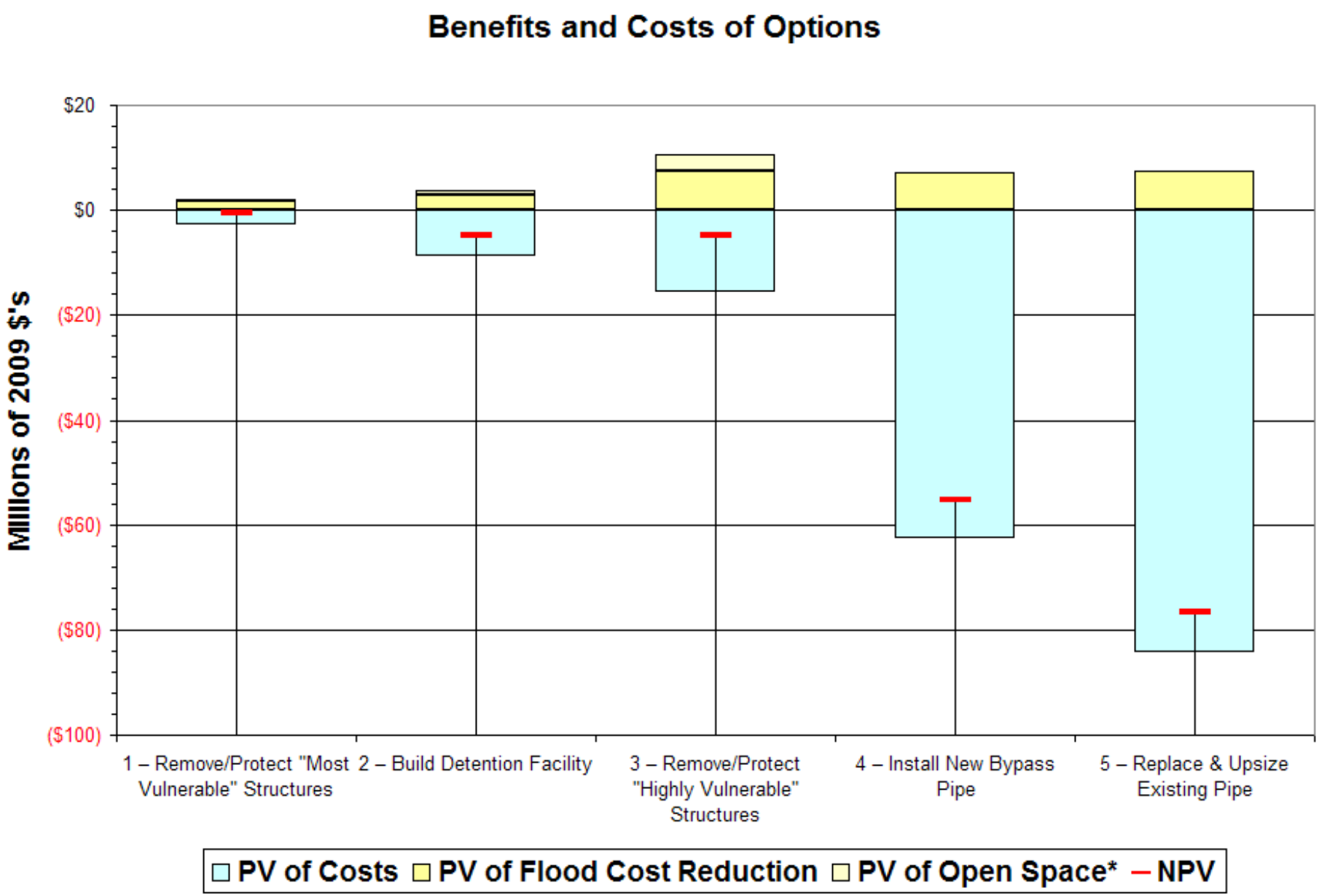
  (costs above account for property loss, damage, decreased access, disruption and business losses)
- $5,000 per flooded vehicle
- $250,000 per serious public safety incident

Base-case Likelihood of Flooding and Public Safety Incident

- Significant Costs occur in > 25 Year Flooding Event (4% annual likelihood)
- 1-in-10 Flooding Events have potential Public Safety Incident (0.4% annual likelihood)

NPV of Options

Option	Present Value of Costs	PV of Benefits: Flood Cost Reduction	PV of Other Benefits: Open Space*	Net Present Value
1 – Remove/Protect "Most Vulnerable" Structures	($2,556)	$1,800	$283	($473)
2 – Build Detention Facility	($8,614)	$3,000	$825	($4,789)
3 – Remove/Protect "Highly Vulnerable" Structures	($15,422)	$7,500	$3,000	($4,922)
4 – Install New Bypass Pipe	($62,474)	$7,200	$0	($55,274)
5 – Replace & Upsize Existing Pipe	($84,000)	$7,400	$0	($76,600)
* Valued at Appraised Value less Value of Structures				


Benefits and Costs of Options
Millions of 2009 $'s
$20
$0
($20)
($40)
($60)
($80)
($100)
1 – Remove/Protect "Most Vulnerable" Structures
2 – Build Detention Facility
3 – Remove/Protect "Highly Vulnerable" Structures
4 – Install New Bypass Pipe
5 – Replace & Upsize Existing Pipe
PV of Costs
PV of Flood Cost Reduction
PV of Open Space*
NPV

Recommendation

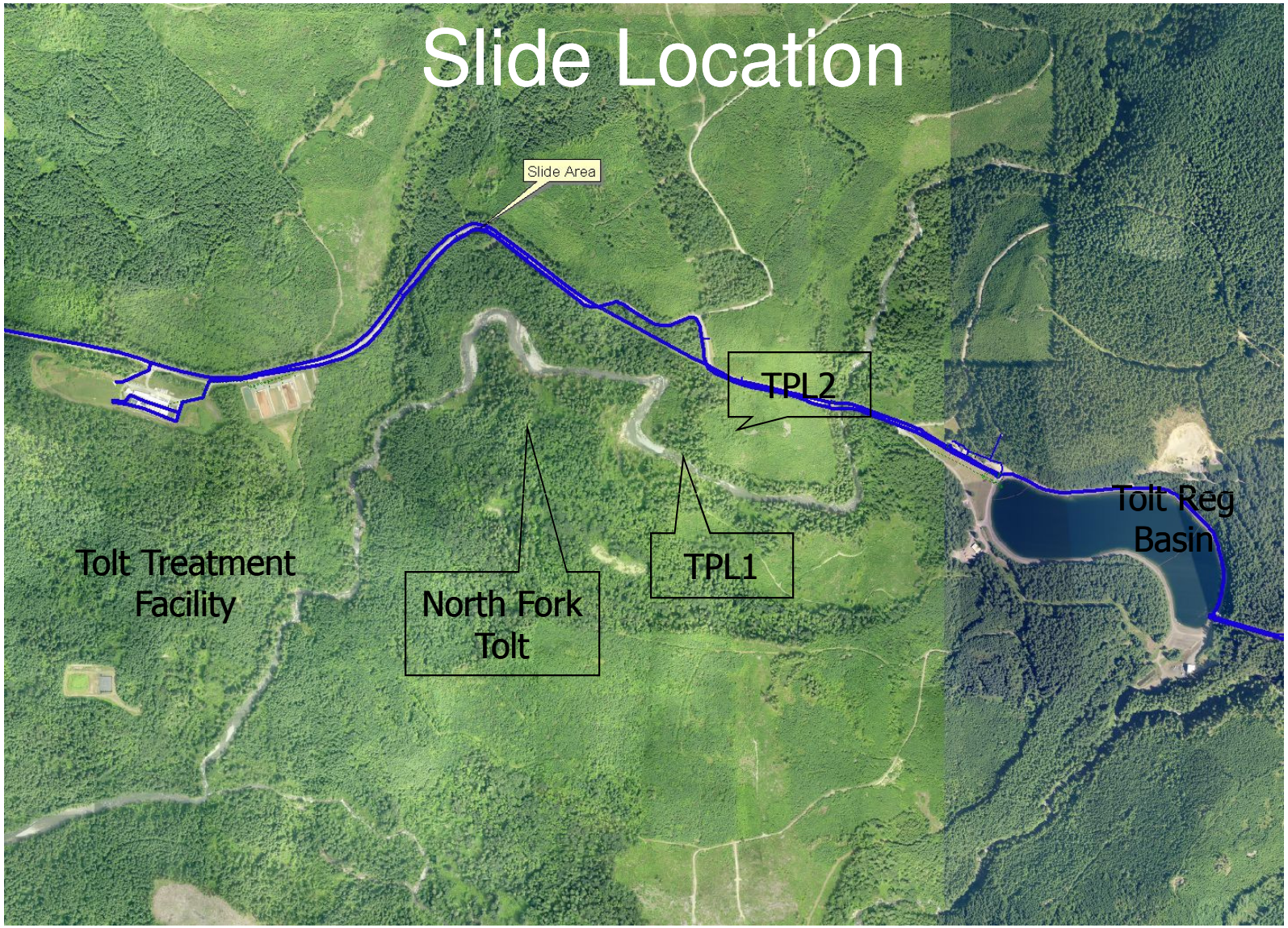
- Combination of Options 1 and 3 – meet 25 year event service level in area, greatest reduction in damage in > 25 year event, find economies in using properties for detention storage, creating public open space
- Authorize $250K design and negotiation to go forward – come back with BCE-2 prior to project implementation

BCE Example 2

Background

30% of water supply for 1.3 million people
Slide Area
Edmonds
Lynnwood
Kenmore
Bothell
Kirkland
Redmond
Seattle, WA
Sammamish
Bellevue
Mercer Island
Issaquah
Renton
King
525
522
520
405
90
509
599
518
167
18
2
© 2009 Europa Technologies
Image USDA Farm Service Agency
© 2009 Tele Atlas
Image © 2009 DigitalGlobe
©2009 Google
Imagery Date: Jun 24, 2006
47°39'48.16" N 122°03'49.47" W elev 45 ft
Eye alt 33.29 mi

Slide Location

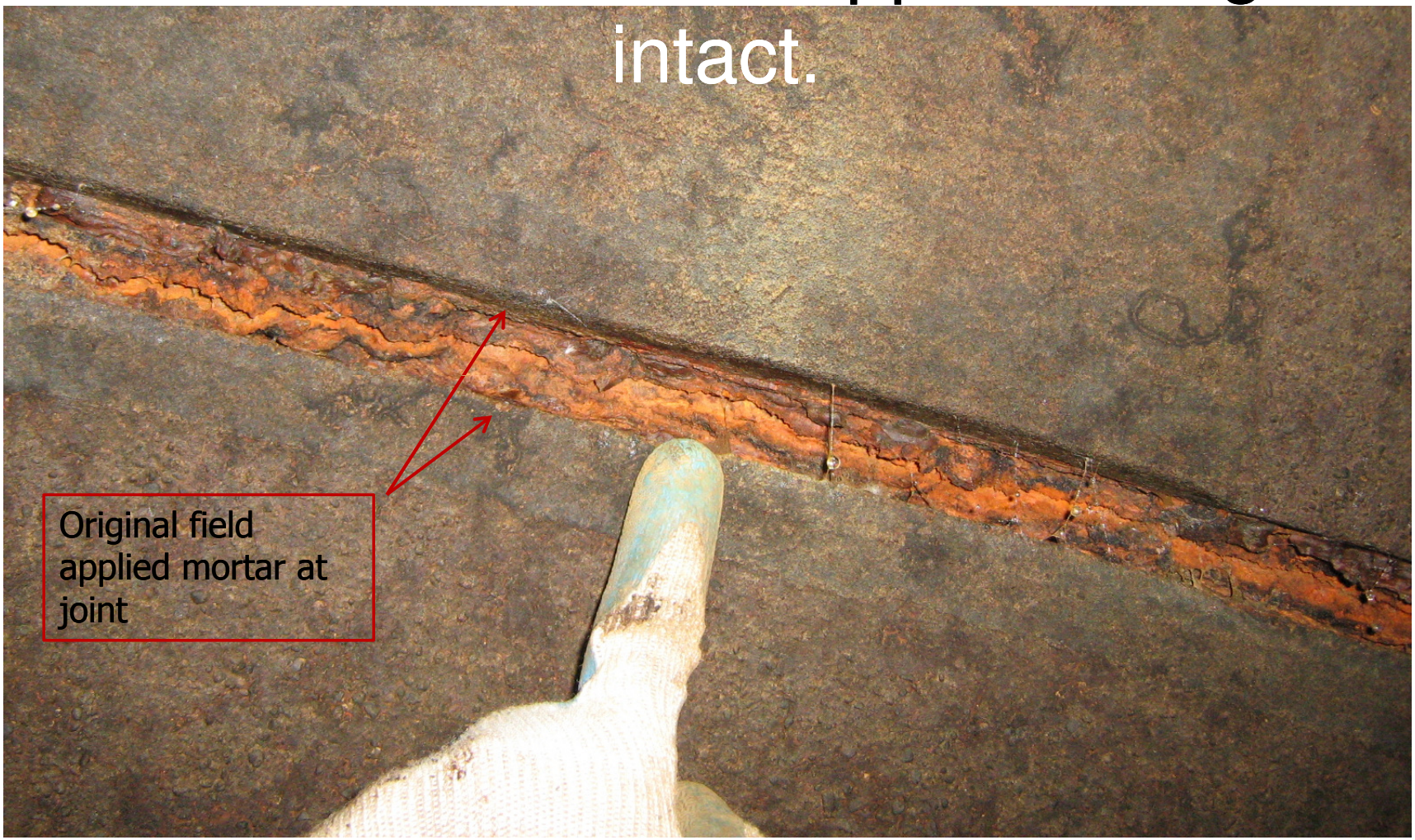


The Slope Is Slowly Moving…

Early April 2009

Crack can now be traced beyond asphalt

Open joint in slide area. Note recent crack in rust and field applied lining still intact.



Problem

Emergent Risk Cost – Increased Likelihood of Pipeline Failure Resulting in:

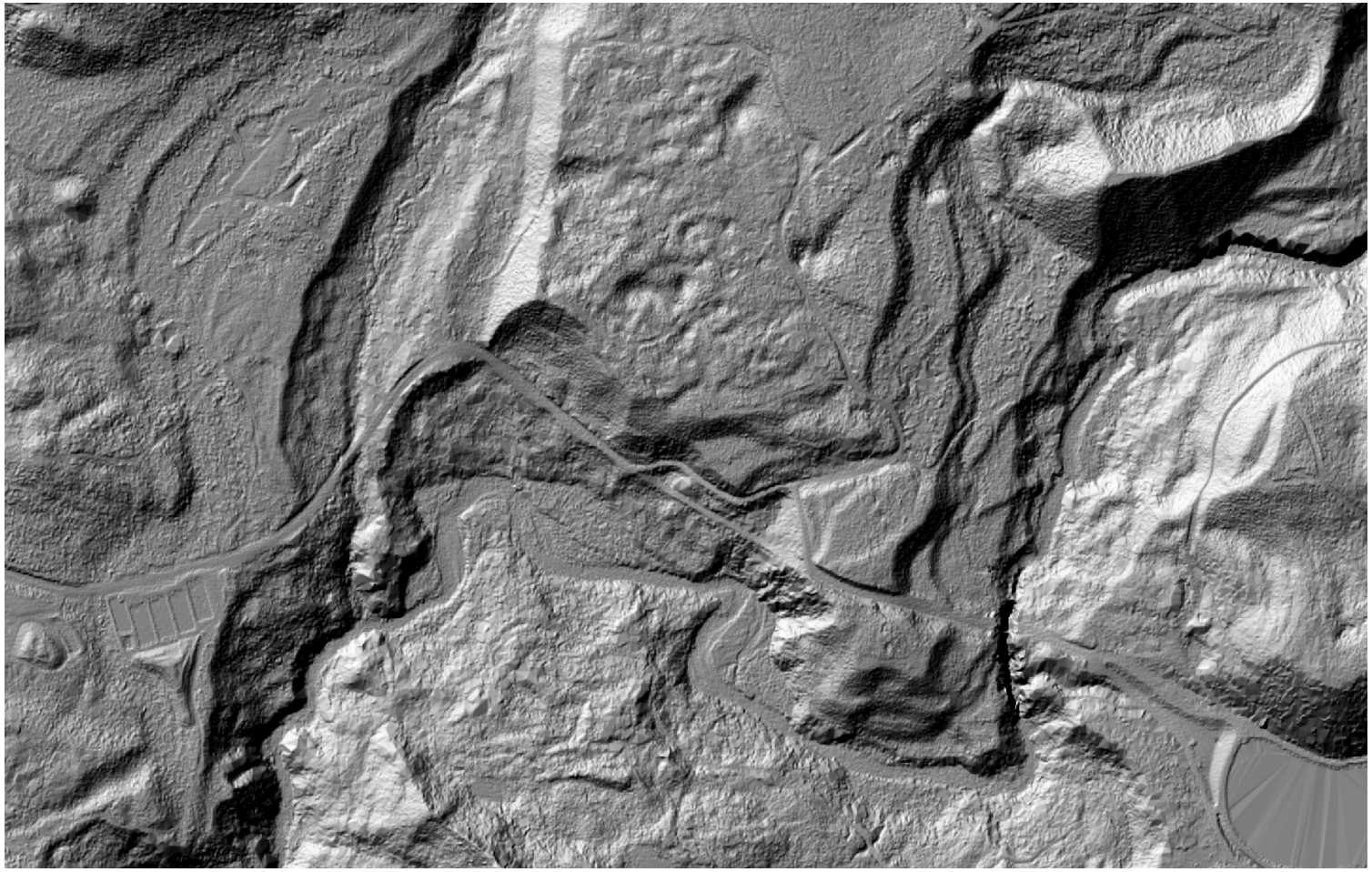
- Water outage: Summer: 133,000 customers restricted to indoor use only for 1 week
- Repair and Restoration Work
- Environmental Damage: 100% chance minor impact (silt and debris); 10% chance major impact (channel alteration)

Potential Solutions

- A slide that <u>can</u> be stabilized
  - Build a retaining wall
  - Dewatering/runoff control?

- A slide that <u>can not</u> be stabilized
  - Relocate pipeline around/under/over slide area
  - Buried pipeline engineered to move with slide

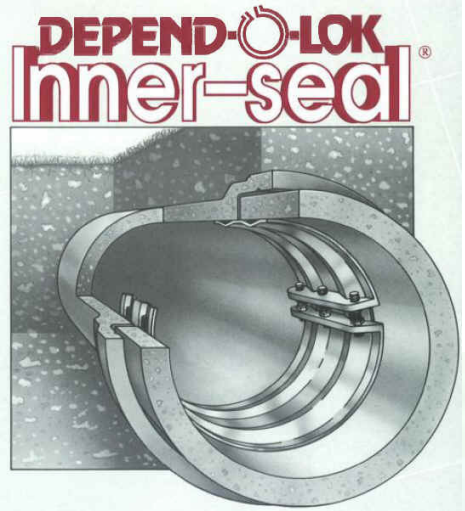
Geo-tech Study Indicates a Large, Slow Moving Slide



Potential Solutions

- ~~A slide that can be stabilized~~
  - ~~Build a retaining wall~~
  - ~~Dewatering/runoff control?~~

- A slide that can not be stabilized
  - Relocate pipeline around/under/over slide area - $$$$$$$$$
  - **Buried pipeline engineered to move with slide**



Internal Joint Seals

Expansion Sleeves in 89-inch Size

Options

1. Do nothing – decommission leaking pipe
2. Repair joint leaks, add expansion joints
3. Replace affected pipe, add expansion joints
   - **Use ½-inch plate welded steel pipe**
   - Ductile iron, “river crossing” pipe
   - Above ground welded steel pipeline supported on shallow piles or grade beams

Status Quo – No Action

Risk Cost

Description of Consequence if Pipeline Fails 1-in-10 Chance of failure		Dollar Valuation of Consequence	Annual Probability	Annual Risk Cost
Curtailment	1 week lost value of outdoor use to 133,000 customers x $20-25/customer WTP*	$3,000,000	3%	$99,000
Repair	$100 - 250k	$175,000	10%	$17,500
Environmental Damage Level 1	Some debris and water into river - $50 - $200k	$125,000	10%	$12,500
Environmental Damage Level 2	Calamitous spill, Tolt course re-routed - $5 - 10 mill	$7,500,000	1%	$75,000
Total Annual Risk Cost				$204,000

* water "not used" because of curtailment = 2.25 ccf/customer x $10/ccf; 2x peak rate

Options to Reduce Risk Cost

Risk Cost of Options

Consequence if Pipeline Fails		Annual Probability*		Annual Risk Cost	
		Fix Leaks, Add Exp Joints	Replace Pipe, Add Exp Joints	Fix Leaks, Add Exp Joints	Replace Pipe, Add Exp Joints
Curtailment	$3,000,000	0.3%	0.2%	$9,900	$5,000
Repair	$175,000	1.0%	0.5%	$1,750	$875
Environmental Damage Level 1	$125,000	1.0%	0.5%	$1,250	$625
Environmental Damage Level 2	$7,500,000	0.1%	0.1%	$7,500	$3,750
Total Annual Risk Cost				$20,400	$10,250

* Fix Leaks, Add Exp Joints = 1-in-100 Chance of Failure

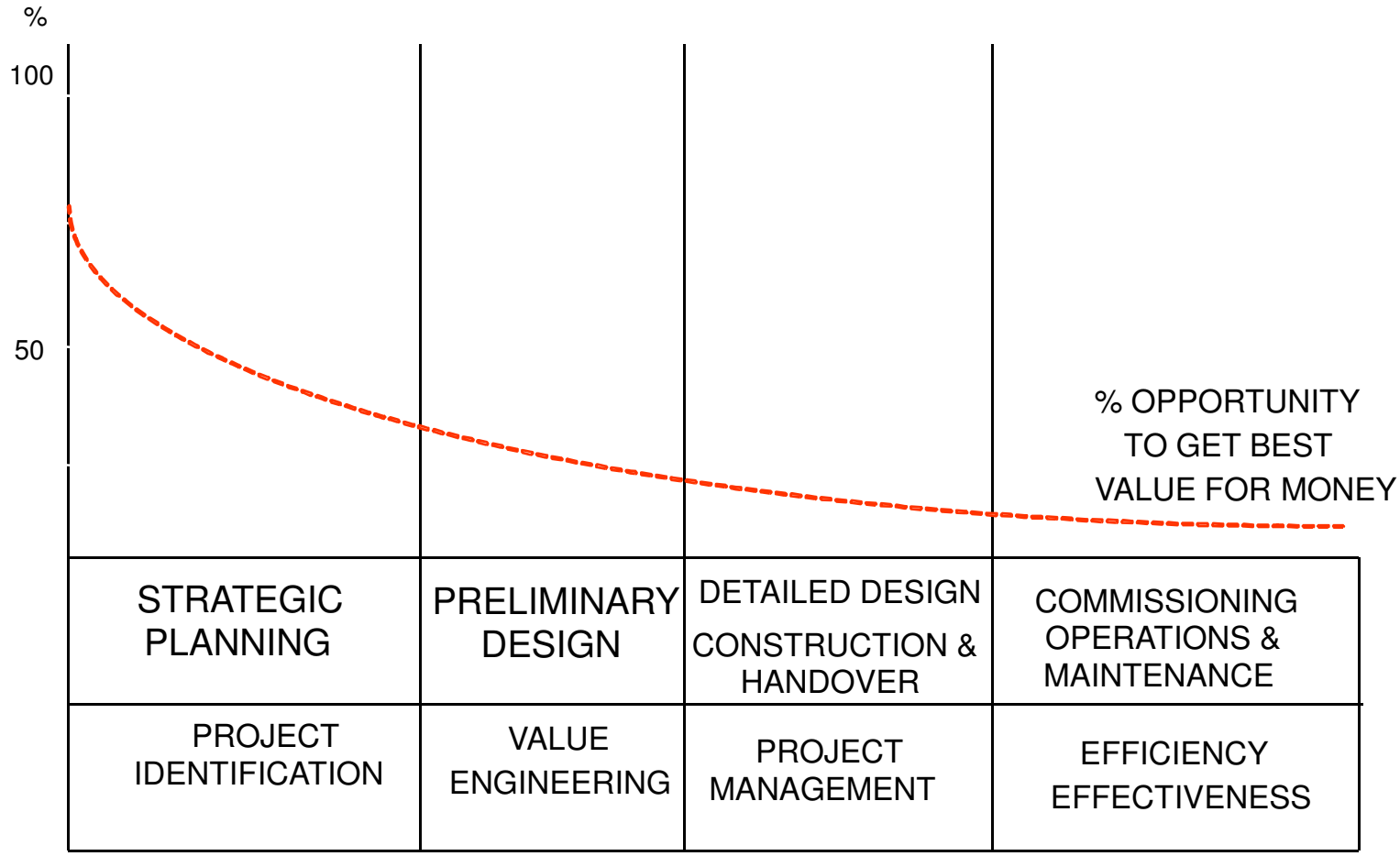
* Replace Pipe, Add Exp Joints = 1-in-200 Chance of Failure

Cost of Reducing Risk

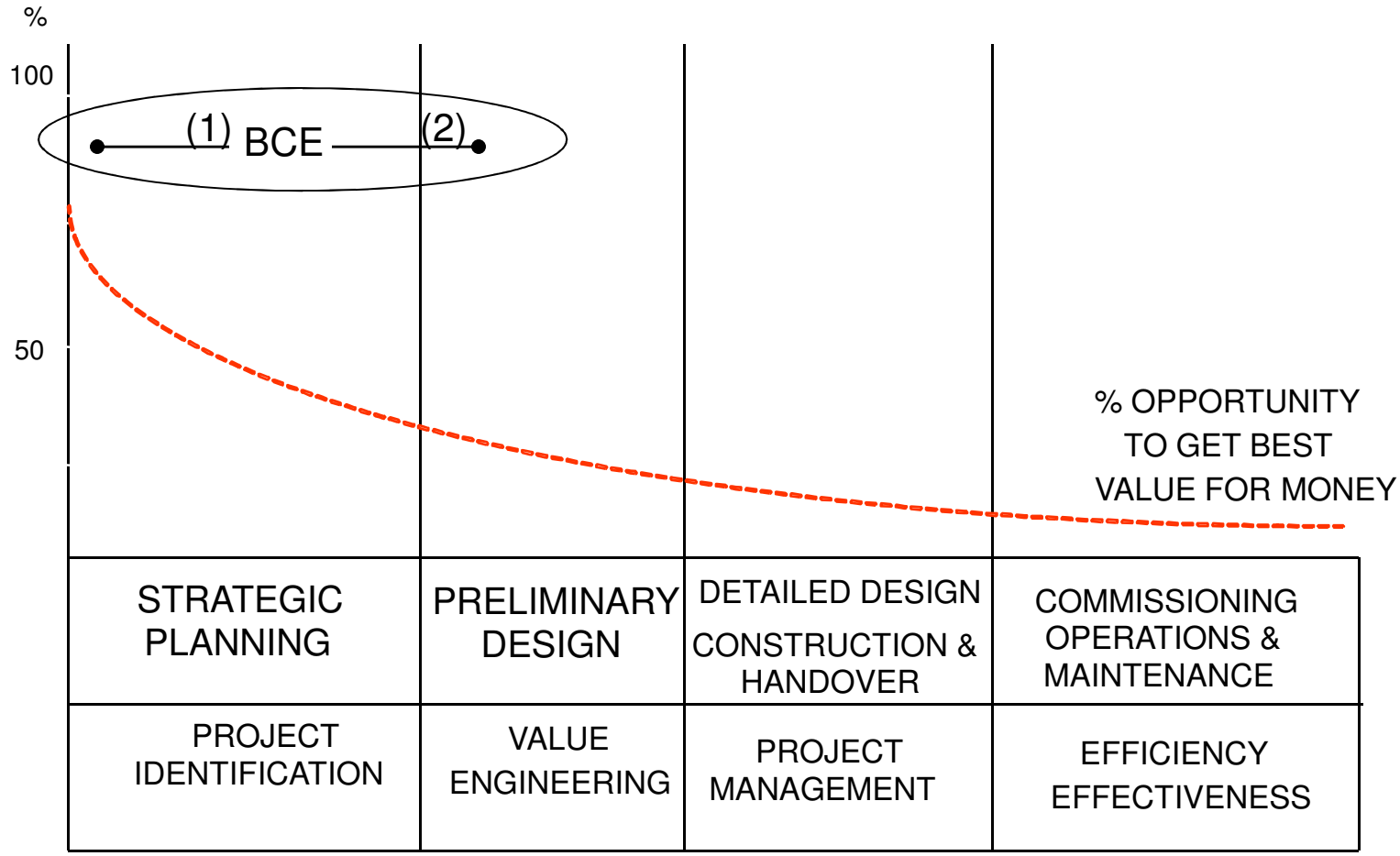
Risk Mitigation

Description of Risk Mitigation	Cost of Mitigation Strategies		Mitigation Frequency		Annualized Cost of Mitigation	
	Fix Leaks, Add Exp Joints	Replace Pipe, Add Exp Joints	Fix Leaks, Add Exp Joints	Replace Pipe, Add Exp Joints	Fix Leaks, Add Exp Joints	Replace Pipe, Add Exp Joints
Monitoring	$50,000	$25,000	every few weeks	less than monthly	$50,000	$25,000
Leak Repair, Expansion Joints	$350,000	$175,000	every 5-10 yrs	every 10-15 yrs	$46,667	$14,000
Replace Affected Pipe	$0	$2,000,000	not in next 30 years	once - min 30 year life	$0	$130,103
Total Annualized Risk Mitigation Cost					$96,667	$169,103

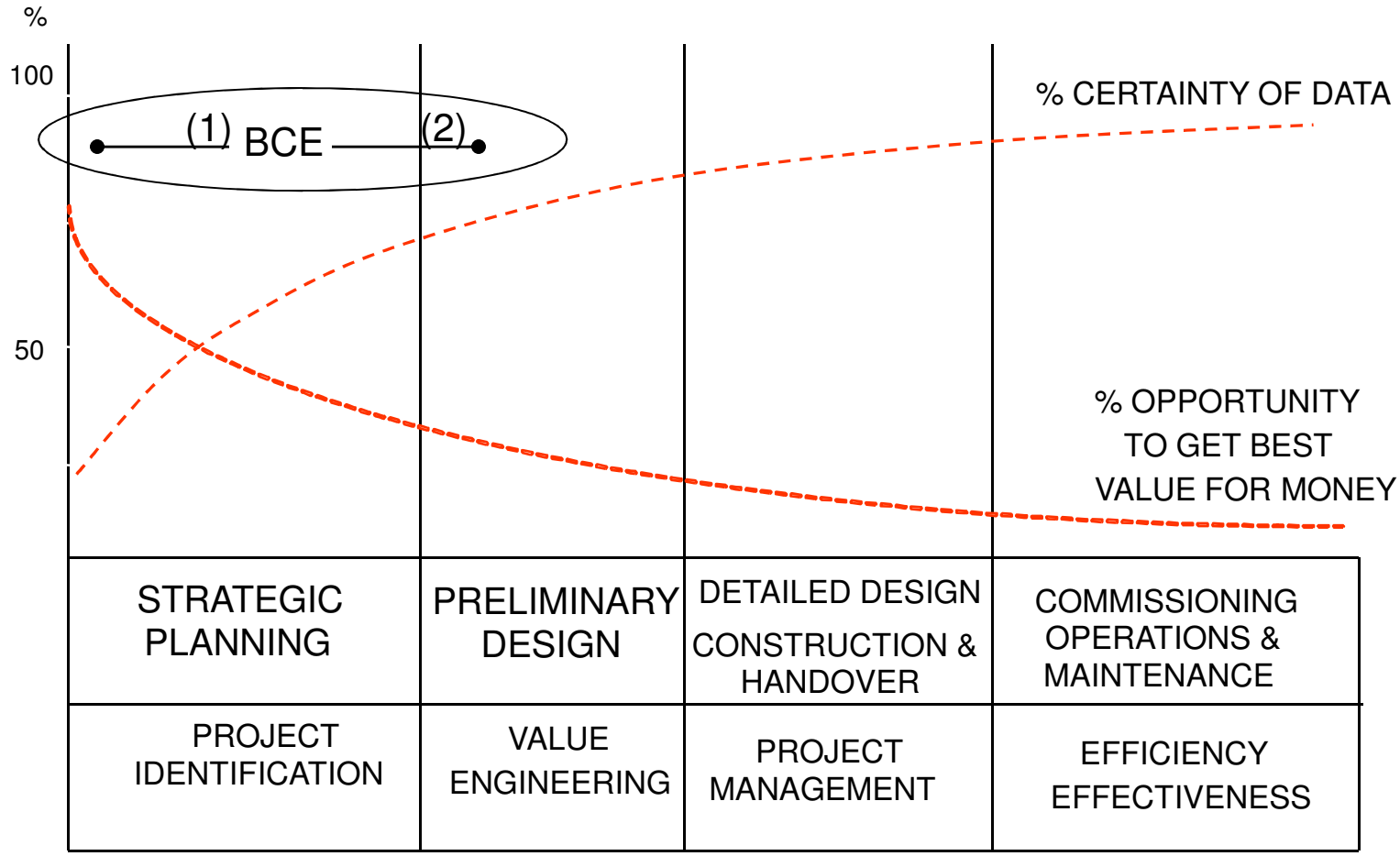
Time Out: Importance of Early Analysis

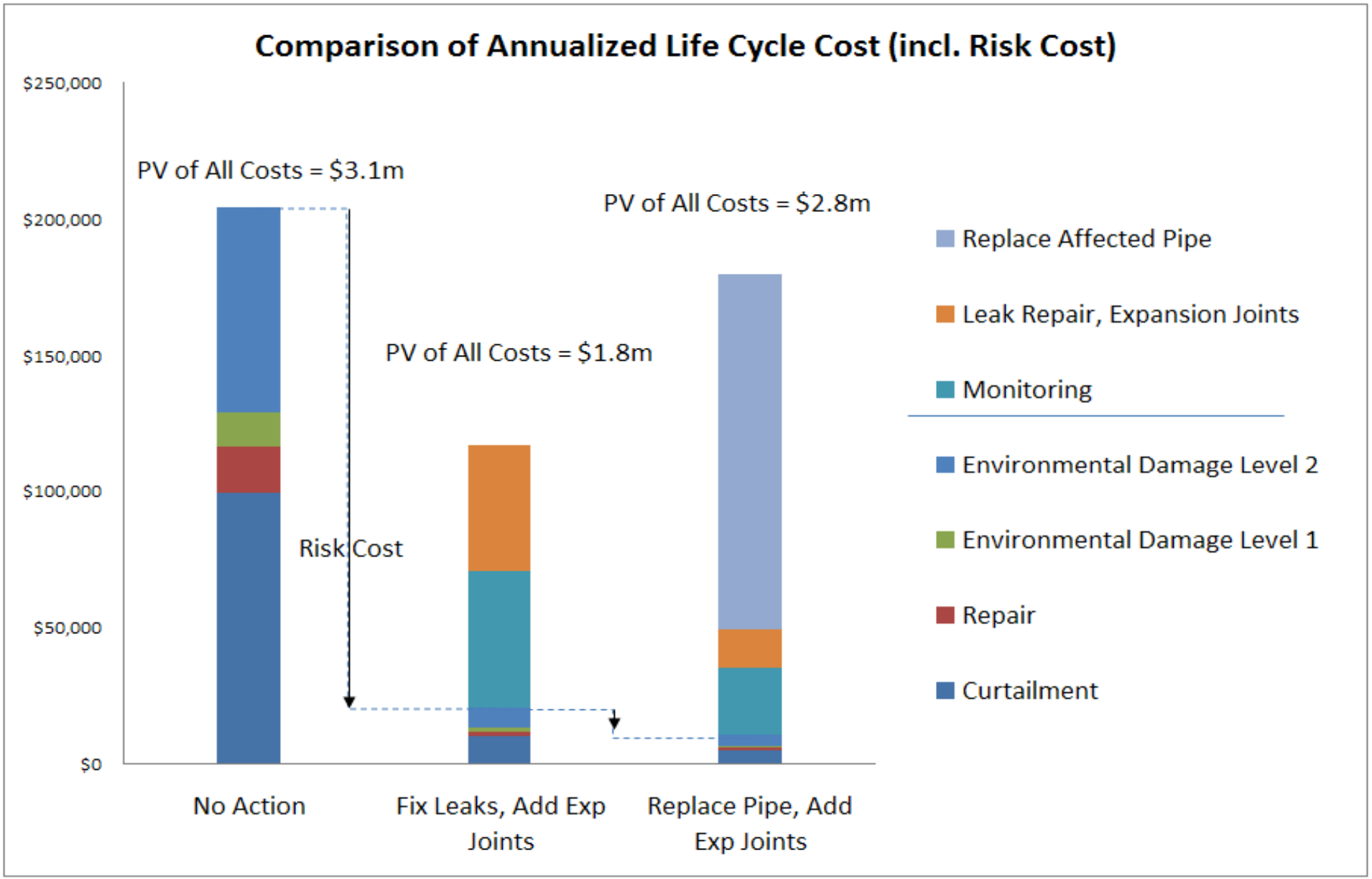


Time Out: BCE's Come Early in Project Life



Time Out: Get Comfortable with Available Data




Comparison of Annualized Life Cycle Cost (incl. Risk Cost)
$250,000
$200,000
$150,000
$100,000
$50,000
$0
PV of All Costs = $3.1m
PV of All Costs = $2.8m
PV of All Costs = $1.8m
Risk Cost
No Action
Fix Leaks, Add Exp Joints
Replace Pipe, Add Exp Joints
Replace Affected Pipe
Leak Repair, Expansion Joints
Monitoring
Environmental Damage Level 2
Environmental Damage Level 1
Repair
Curtailment

Recommendation

- Option 2 – $300-$400k capital, $50k annual monitoring
    - Install internal joint seals (specialty contractor)
    - Retain access hole for future use
    - Install expansion sleeves
    - Monitor slide and pipe condition
    - Prepare for ongoing strain relief once or twice a decade

Value of BCE's

- Improve Expenditure Decisions – Better Value for Money
- Provide Transparent Documentation for Decisions
- Make Decisions Corporate – Risk and Accountability becomes Executives'