TM REVIEW WORKSHOP 4/13/04

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King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

TM 202.1 Review Workshop

September 13, 2007

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Purpose and Goals of Planning Confirmation Phase

- Common understanding of problem
- Screening of potential solutions
- Identify issues and constraints
- Develop evaluation criteria
- Develop list of alternatives to be developed and evaluated in detail

Purpose of TM202.1

- Identify potential CSO control approaches
- Define planning area boundaries in each basin
- Short list of alternatives in each basin

Evaluation Methodology

- Model combined sewage flow in each basin (Quantify Problem)
- Develop list of CSO control approaches
- Develop list of potential alternatives within each basin
- Screen alternatives using initial evaluation criteria
- Short list alternatives for further development

Screening Criteria

- Screening process modeled after other KCDNRP programs
- Draft criteria proposed at Workshop No. 1
- Refined criteria used at Workshop 2
- Discussion on criteria at close of today's review workshop

King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

Barton & Murray Summary

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Barton CSO Basin

- 1,080 acres
- Mostly combined
- Barton Pump Station pumps to Murray

Murray CSO Basin

- 966 acres
- Basin partially separated
- Well developed storm drainage system

Previous CSO Planning Recommendations for Barton

- Add 7.5 MGD of pumping capacity
- New wet weather pump station located in Vashon/Southworth Ferry Dock parking lot
- Assumed a submersible station with upgraded conveyance capacity to Murray
- 0.5 MG storage option at Fauntleroy School also investigated in 1997 Plan Update

Previous CSO Planning Recommendations for Murray

- 0.8 MG storage tank
- Tank located approximately ¼ mile east of pump station site
- Approximately 500 feet of new 24-inch conveyance piping required for filling and emptying of tank.

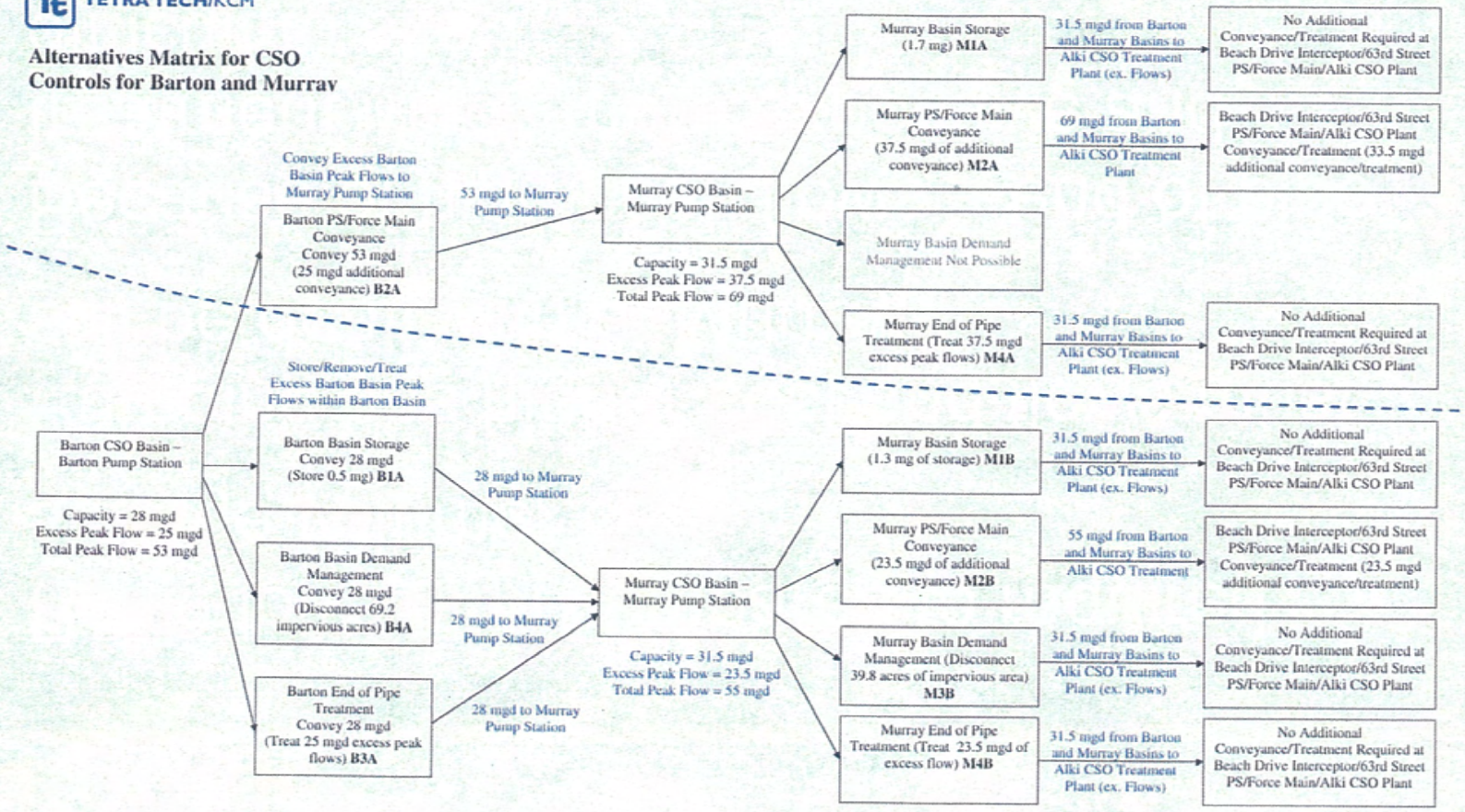
Barton Basin Significantly Favors Storage

- Peak flows high compared to required storage volume
- Pumping has higher cost and flows must still be dealt with at Murray
- Because of high peak flows – end of pipe treatment much more expensive and difficult to site
- Potential for demand management

Barton / Murray Matrix of Alternatives

TETRA TECH/KCM

Alternatives Matrix for CSO Controls for Barton and Murray



Barton and Murray Potential Alternatives

- B1A/M1B – Storage within both Basins
- B1A/M2B – Storage at Barton / Conveyance at Murray
- B1A/M3B – Storage at Barton / Demand Management at Murray
- B1A/M4B – Storage at Barton / End of Pipe Treatment at Murray
- B4A/M1B – Demand Management at Barton / Storage at Murray
- B4A/M2B – Demand Management at Barton / Conveyance at Murray
- B4A/M3B – Demand Management at Barton / Demand Management at Murray
- B4A/M4A – Demand Management at Barton / End of Pipe Treatment at Murray

B1A/M1B: On-Site Storage

Fauntleroy School storage - Lowman Beach Park storage

B1A/M1B: On-Site Storage

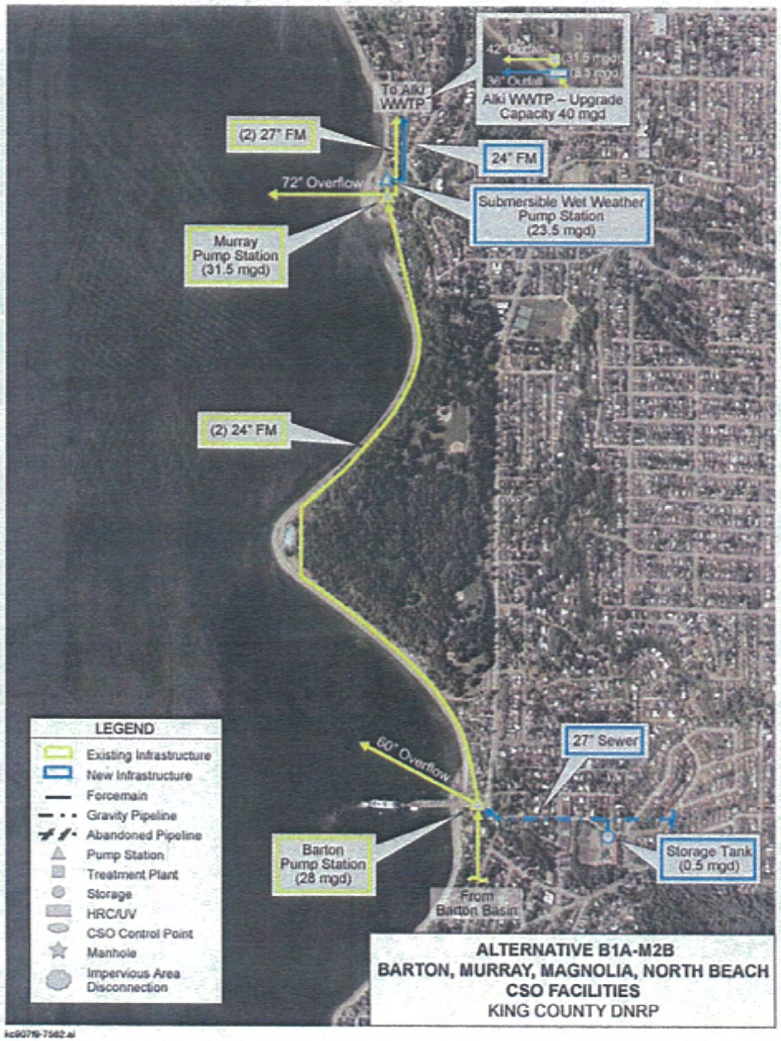
Fauntleroy School storage - Lowman Beach Park storage

B1A/M1B: On-Site Storage

Fauntleroy School storage - Lowman Beach Park storage

B1A/M2B: Barton Storage-Murray Conveyance

Fauntleroy School storage – Murray conveyance & treatment



B1A/M3B: Barton Storage-Murray Demand Management

Fauntleroy School storage – Murray impervious area disconnection

M3B: Murray Demand Management

Murray Impervious Area Disconnection

B1A/M3B: Barton Storage-Murray Demand Management

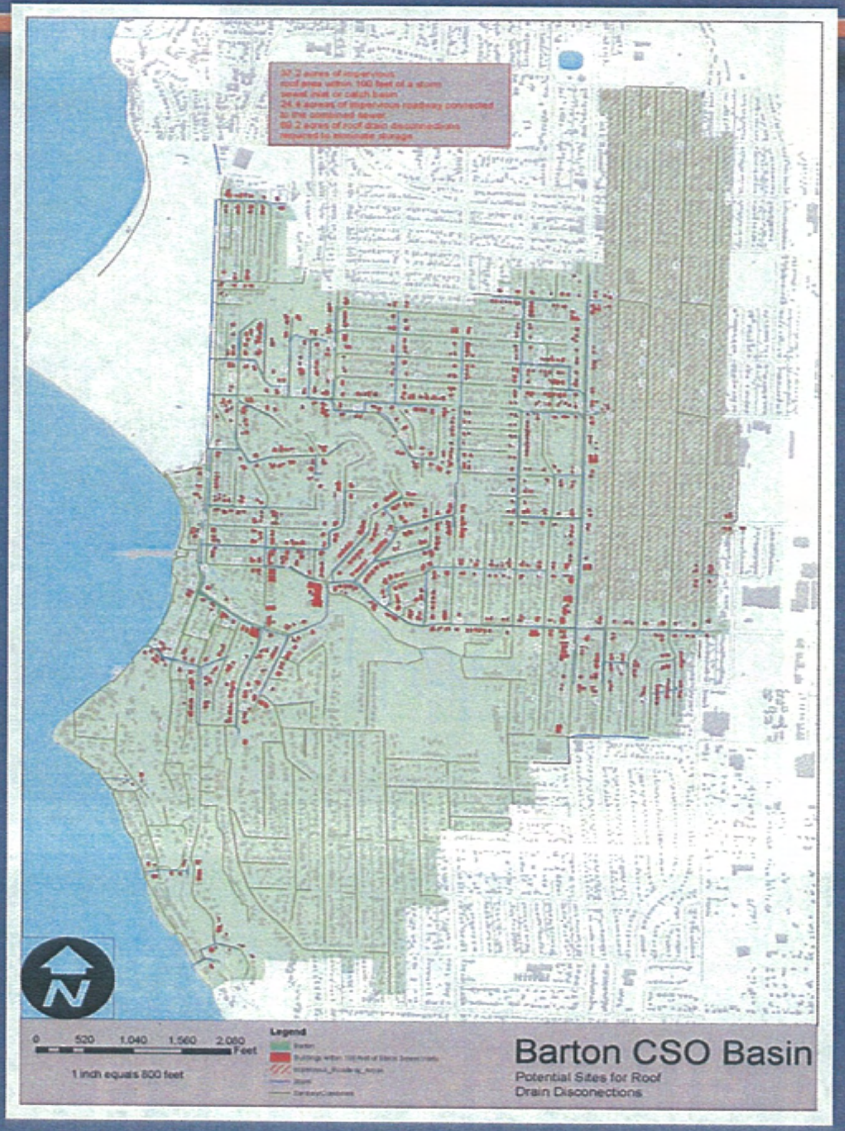
Fauntleroy School storage – Murray impervious area disconnection

B1A/M4B: Barton Storage-Murray End of Pipe Treatment

Fauntleroy School storage – Treatment at Lowman Beach Park

B4A-M1B: Barton Demand Management

Barton Impervious Area Disconnection



Summary and Initial Conclusions

- Questionable whether sufficient impervious area is available for demand management – Investigation to determine feasibility of demand management is proposed for Magnolia Basin. Depending on results in Magnolia, demand management may be further assessed in Barton / Murray.
- Limited storage sites within both Basins may require uplands storage or multiple storage sites.
- It may be necessary to perform some combination of storage, demand management, and conveyance in each of the two basins to achieve control.

Summary of Barton/Murray Alternatives Workshop No. 2 Results

BARTON AND MURRAY BASINS
ALTERNATIVES EVALUATION - WORKSHOP 2

ALTERNATIVE		RELATIVE COST	SCREENING CRITERIA																												NOTES
ID	DESCRIPTION		COST EFFECTIVENESS				O & M				TECHNICAL FEASIBILITY / COMPATIBILITY				PUBLIC HEALTH & ENVIRONMENTAL BENEFIT				FLEXIBILITY				COMMUNITY				PROGRAM COMPATIBILITY				
			Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	
B1A - M1B	0.5 MG storage at Fauntleroy and 1.3 MG storage at Murray	1.2																													
B1A - M2B	0.5 MG storage at Fauntleroy and 0.5 mgd conveyance capacity at Murray	2.3																													
B1A - M3B	0.5 MG storage at Fauntleroy and demand management at Murray																														
B1A - M4B	0.5 MG storage at Fauntleroy and 0.5 mgd end of pipe treatment at Murray	1.8																													
B4A - M1B	Demand management in Barton and 1.3 MG storage at Murray																														
B4A - M2B	Demand management in Barton and 0.5 mgd conveyance capacity at Murray																														
B4A - M3B	Demand management in both Barton and Murray																														
B4A - M4B	Demand management in Barton and end of pipe treatment at Murray																														

GENERAL COMMENTS
- Any new facilities must include new staffing requirements (Group 2).
- What about a deep tunnel/one storage under Lincoln Park with portals on both edges of the park? It wouldn't be in anybody's special park areas, plus this could offload more flow from Alki. (Group 2)

SCREENING CRITERIA COMPONENTS						
Cost Effectiveness	Operations & Maintenance	Technical Feasibility/ Compatibility	Public Health & Environmental Benefit	Flexibility	Community	Program Compatibility
Capital Cost	Reliably meet CSO objectives	Compatible with Existing System	Meet CSO Requirements	Future Regulations	Neighborhood Equity	Seattle Parks, SPU, Transportation
Life Cycle Costs	WTD Automation	Technically Feasible	Minimize Public Exposure	Climate Change	Cost Allocation	~~Sediment Management Plan~~
Use of Existing Facilities	Ease of Start-up / Shut-Down	Can be Permitted	Minimal Environmental Footprint	~~CSO Program Objectives~~	Minimal Shoreline Impacts	~~County Planning Policies~~
Grants/Loan Ranking	Ease of Maintenance	Land is Obtainable	Maximizes Environmental Gains	Implementation	Minimal Property Disruption	Stormwater Management Responsibilities
	No Adverse Impacts - County	Minimize Federal / State Permit Constraints	Endangered Species		Minimal Implementation Impacts	~~Conveyance System Improvement Policies~~
	No Adverse Impacts - Seattle		Consistency with Puget Sound Goals		Minimal Operations Impacts	WTD Productivity Initiative
	Ease of Regulatory Reporting				Minimal Disturbance of Archeological Areas	~~Puget Sound Restoration~~
						~~WTD Balanced Scorecard~~
						~~WTD CSO Program~~

Summary of Barton / Murray Alternatives Moving Forward

SHORT LISTED ALTERNATIVES

- B1A/M1B – Storage within both Basins – Evaluate other potential storage locations
- B1A/M3B – Storage at Barton / Demand Management at Murray – Evaluate potential storage locations and feasibility of Demand Management
- B4A/M1B – Demand Management at Barton / Storage at Murray – Evaluate potential storage locations and feasibility of Demand Management
- B4A/M3B – Demand Management at Barton / Demand Management at Murray – Evaluate feasibility of Demand Management
- Some Combination of these approaches within the Basins

SCREENED ALTERNATIVES

- Conveyance / End of Pipe Treatment at Barton Alternatives – High peak flows at Barton PS make these alternatives cost prohibitive.
- Conveyance / End of Pipe Treatment at Murray Alternatives – New modeling results at Murray indicate high peak flows to the Pump Station making these approaches cost prohibitive.

King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

South Magnolia Summary

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South Magnolia CSO Basin

- 751 acres total
- Mostly combined
- Well developed storm drainage system

Previous CSO Planning Recommendations for Magnolia

- 1.3 MG storage Tank
  - $6 million in $1997

Or, alternatively

- Rooftop separation of 900 homes
  - $3 million in $1997.

Magnolia Potential Alternatives

- Alt 1: 2.6 MG storage
- Alt 3: End of Pipe Treatment
- Alt 4: Demand Management
- Alt 5: Combinations

- Alt 2: Convey to IBPS not feasible (Downstream capacity limited at peak)

1A: Magnolia Upper Basin Storage

Pump and gravity to storage site, gravity sewer to ex. interceptor

MAGNOLIA BASIN ALTERNATIVE 1A
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

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1B: Magnolia storage at CSO site

Move storage down the hill, gravity sewer to ex. interceptor

MAGNOLIA BASIN ALTERNATIVE 1B
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

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1C: Magnolia storage near Marina

Pump to storage east of Marina

3A: Magnolia End of Pipe Treatment

Pump and gravity to treatment

MAGNOLIA BASIN ALTERNATIVE 3A
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

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4A: Magnolia Demand Management

Reduce impervious area to reduce storage by 50%

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4A: Magnolia Demand Management

Reduce impervious area to reduce storage by 50%

- Assumptions:
  - 29 ac roofs can be disconnected (50%)
  - 3,000 ft, 8-ft. diameter tunnel storage in lieu of tank.
  - SPU PS must be upgraded for higher head.
- Key Issues
  - Easement must be acquired from Seattle Parks.
  - Neighborhood impacts.
  - Need to upgrade SPU pump station.
- May not be sufficient alone to control CSOs

Summary of Magnolia Alternatives Workshop No. 2 Results

MAGNOLIA BASIN
ALTERNATIVES EVALUATION - WORKSHOP 2

ALTERNATIVE		RELATIVE COST	SCREENING CRITERIA																														NOTES
			COST EFFECTIVENESS				O & M				TECHNICAL FEASIBILITY / COMPATIBILITY				PUBLIC HEALTH & ENVIRONMENTAL BENEFIT				FLEXIBILITY				COMMUNITY				PROGRAM COMPATIBILITY				
ID	DESCRIPTION		Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	
1A	Storage: Offsite Tank at W Lynn St., Treat at West Point	2.0																													
1B	Storage: Tank near Magnolia CSO Control Point	1.5																													
1C	Storage: Offsite Tank east of Marine, Treat at West Point	1.9																													Check microtunnel feasibility (Group 2)
2A	Convey and Treat	1.0																													
2B	Convey and Treat	1.2																													
3A	End of Pipe Treatment	1.3																													May have to extend outfall (Group 3) Need new outfall? (Group 2)
4A	Demand Management	2.1 +																													Due to geotech and topography, demand management is questionable (Group 3) Capacity of SPU storm system? Treatment needs? (Group 1) Check slope stability with extra surface water (Group 2)
5A	Combinations																														Multiple small storage and option, interested in looking at northwest south area, may capture more flow than 2Ac/s (Group 3)
5B	Combinations																														
5C	Combinations																														

GENERAL COMMENTS

- Any new facilities must include new staffing requirements (Group 3)
- Look at geotech for all options, evaluate constructability (slip ravine) and slope stability (Group 1)
- Evaluate land ownership and land use in area, it's more than Seattle Parks. Also SDOT, SPU, PSE and multiple private owners (Group 1)
- Need to evaluate impacts of options on SPU system (Group 1)

SCREENING CRITERIA COMPONENTS

Cost Effectiveness	Operations & Maintenance	Technical Feasibility/ Compatibility	Public Health & Environmental Benefit	Flexibility	Community	Program Compatibility
Capital Cost	Reliably meet CSO objectives	Compatible with Existing System	Meet CSO Requirements	Future Regulations	Neighborhood Equity	Seattle Parks, SPU, Transportation
Life Cycle Costs	WTD Automation	Technically Feasible	Minimize Public Exposure	Climate Change	Cost Allocation	~~Sediment Management Plan~~
Use of Existing Facilities	Ease of Start-up / Shut Down	Can be Permitted	Minimal Environmental Footprint	~~CSO Program Objectives~~	Minimal Shoreline Impacts	~~Growth Planning Patterns~~
Grants/Loan Ranking	Ease of Maintenance	Land is Obtainable	Minimize Environmental Risks	Implementation	Minimal Property Disruption	Stormwater Management Responsibilities
	No Adverse Impacts - County	Minimize Federal / State Permit Constraints	Endangered Species		Minimal Implementation Impacts	~~Conveyance System Improvement Patterns~~
	No Adverse Impacts - Seattle		Coordinated with Puget Sound Goals		Minimal Operations Impacts	WTD Productivity Initiative
	Ease of Regulatory Reporting				Minimal Disturbance of Archeological Areas	~~Puget Sound Partnership~~
						~~WTD Sediment Dashboard~~
						~~WTD CSO Program~~

Summary of Magnolia Alternatives Moving Forward

SHORT LISTED ALTERNATIVES

- Alt 1A – Carry forward as basis
- Alt 1B, 1C – Evaluate potential sites
- Alt 3A – Lowest cost of feasible alts
- Alt 4 – Pursue monitoring & field investigation
- Alt 5 – Combinations to optimize cost

SCREENED ALTERNATIVES

- Alt 2A/B – Not technically feasible

King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

North Beach Summary

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North Beach CSO Basin

- 691 acres total
- Collection system largely "separated"
- Wet weather flow primarily caused by infiltration

Previous CSO Planning Recommendations for North Beach

- Install 140,000 gal storage adjacent to existing pump station
- Expand pump station - upgrade firm pumping capacity to 4.2 mgd
- Build new forcemain – 2,060 LF
- Other sewer improvements

North Beach Potential Alternatives

- Alt 1: 3.5 MG storage
- Alt 2: Convey to Carkeek
- Alt 3: End of Pipe Treatment
- Alt 4: Demand Management
- Alt 5: Combinations

1A: Storage at NBPS Site

Store peak flows at NBPS site, pump to Carkeek following event

LEGEND

- Existing infrastructure
- New infrastructure
- Forcemain
- Gravity Pipeline
- Pump Station
- Treatment Plant
- Storage
- HRC/UV

NORTH BEACH ALTERNATIVE 1A
MAGNOLIA BASIN
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

Footprint of Storage at North Beach

Kc307_

1B: Storage at Alternate NB Site

Pump to storage site, pump to Carkeek following event

LEGEND

- Existing infrastructure
- New infrastructure
- Forcemain
- Gravity Pipeline
- Pump Station
- Treatment Plant
- Storage
- HRC/UV

NORTH BEACH ALTERNATIVE 1B
MAGNOLIA BASIN
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

1C: Storage at Alternate NB Site

Pump to storage site, transfer to West Point following event

LEGEND

- Existing infrastructure
- New infrastructure
- Forcemain
- Gravity Pipeline
- Pump Station
- Treatment Plant
- Storage
- HRC/UV

NORTH BEACH ALTERNATIVE 1C
MAGNOLIA BASIN
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

2A: Convey and Treat Peak Flow

Pump to Carkeek through new beachside FM, upgrade Carkeek capacity by 10 mgd

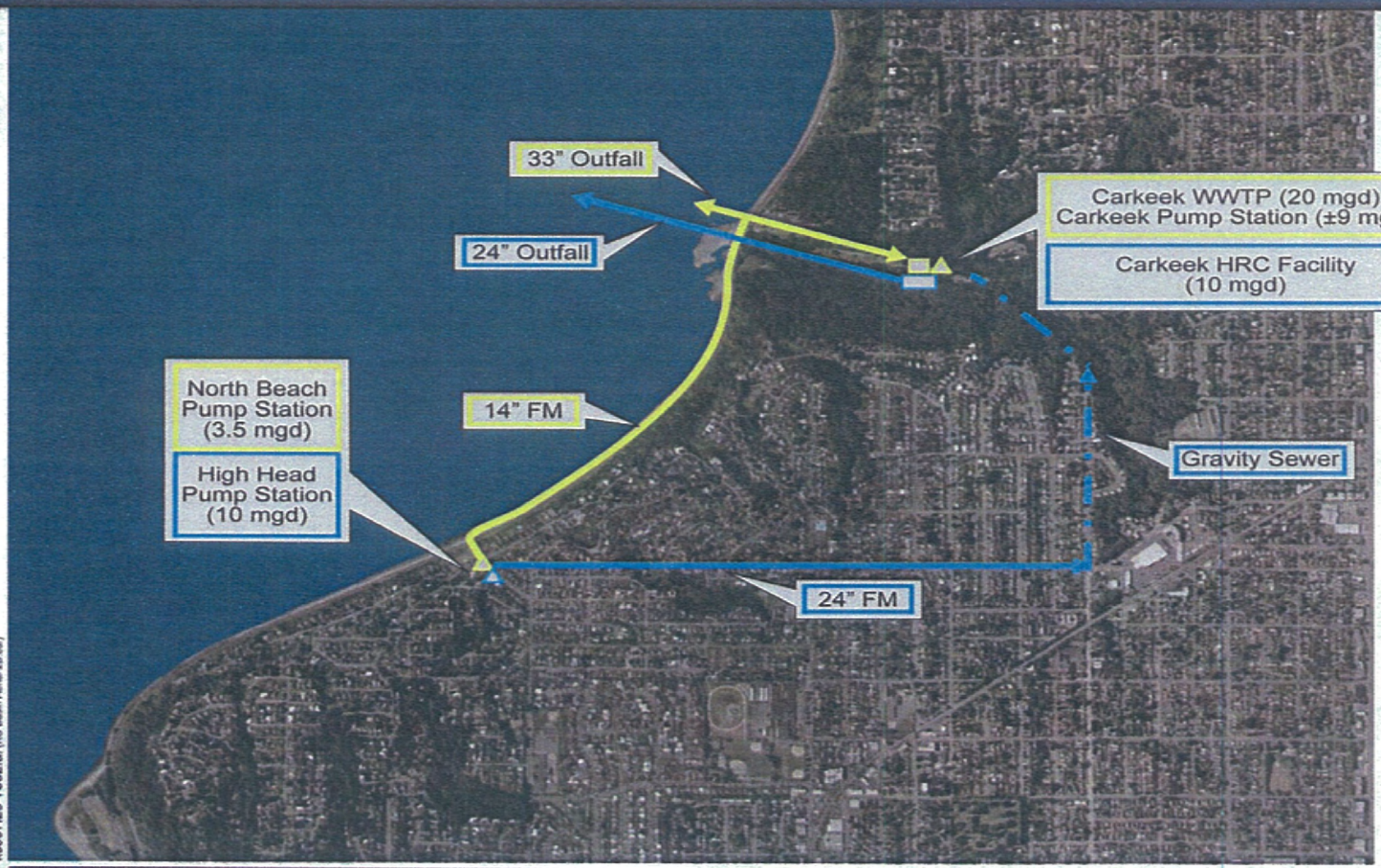
LEGEND

- Existing infrastructure
- New infrastructure
- Forcemain
- Gravity Pipeline
- Pump Station
- Treatment Plant
- Storage
- HRC/UV

NORTH BEACH ALTERNATIVE 2A
MAGNOLIA BASIN
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

2B: Convey and Treat Peak Flow

Pump to Carkeek through new FM in residential alignment, upgrade Carkeek capacity by 10 mgd



LEGEND

- Existing infrastructure
- New infrastructure
- Forcemain
- Gravity Pipeline
- Pump Station
- Treatment Plant
- Storage
- HRC/UV

NORTH BEACH ALTERNATIVE 2B
MAGNOLIA BASIN
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

3A: End of Pipe Treatment

Treat and discharge peak flows (10 mgd) at NBPS site

LEGEND

- Existing infrastructure
- New infrastructure
- Forcemain
- Gravity Pipeline
- Pump Station
- Treatment Plant
- Storage
- HRC/UV

NORTH BEACH ALTERNATIVE 3A
MAGNOLIA BASIN
BARTON, MURRAY, MAGNOLIA, NORTH BEACH
CSO FACILITIES
KING COUNTY DNRP

Footprint of Storage at North Beach

Kc307_

Footprint of HRC/UV at North Beach

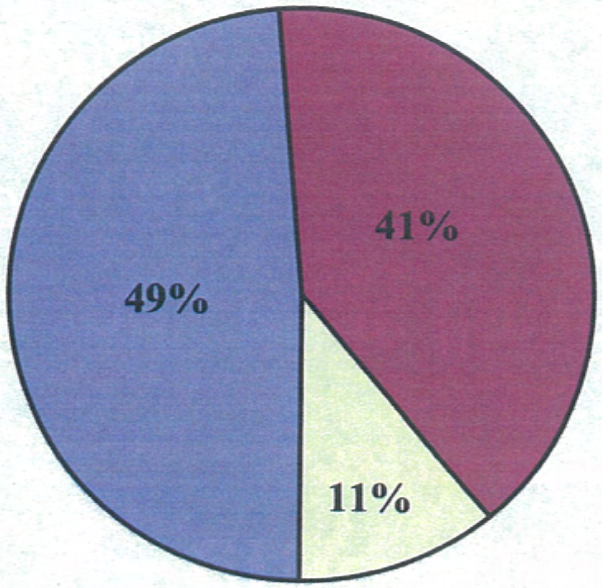
Kc307_

4A: Demand Management

- Manage peak flows through I/I reduction
- Sources
  - Inflow
    - –Roof drains
    - –Catch basins
    - –Other direct connections
  - Infiltration
    - –Laterals
    - –Side sewers
    - –Foundation drains
    - –Sewer main
    - –Manholes

4A: I/I Quantification

- Estimated I/I flow: 13.5-15.5 mgd
- Flow per source:



Fast Response (Inflow)

Rapid Infiltration

Slow and Base Infiltration

I/I Reduction Study, Brown and Caldwell, 1988

Approach 5: Combinations

- Previous study identified that storage of <0.2MG will fit on NBPS site
  - This would require about 70% I/I reduction
    - No significant decrease in costs for I/I reduction
  - Storage at NBPS site not reasonable alternative with I/I
- Lowest infrastructure cost alternative is End of Pipe Treatment
  - Consider End of Pipe and I/I Reduction?
    - More costly than End of Pipe Treatment alone
    - Would require coordination with SPU
    - Would require flow monitoring for 1 year

Summary of North Beach Alternatives Workshop No. 2 Results

NORTH BEACH BASIN
ALTERNATIVES EVALUATION - WORKSHOP 2

ALTERNATIVE		RELATIVE COST	SCREENING CRITERIA																												NOTES
			COST EFFECTIVENESS				O & M				TECHNICAL FEASIBILITY / COMPATIBILITY				PUBLIC HEALTH & ENVIRONMENTAL BENEFIT				FLEXIBILITY				COMMUNITY				PROGRAM COMPATIBILITY				
ID	DESCRIPTION		Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	Group 1	Group 2	Group 3	Group 4	
1A	Storage Tank at NBPS site	1.2																													- Permitting Risk High (Group 4) - Community impacts high (Group 4) - Lower replacement costs for equipment (Group 2)
1B	Storage Offsite Tank, Treat at Carkeek	1.7																													- Lower replacement costs of equipment (Group 2) - O&M issues (Group 4)
1C	Storage Offsite Tank, Treat at West Point	1.9																													- Concern about impacts to SPU collection system that discharge to 6th Ave (?) (Group 1)
2A	Convey and Treat: Submersible Pump Station, Treat at Carkeek	2.3																													- High cost (Group 4) - Permitting - Services may not allow (Group 4) - Energy high (Group 2) - Carkeek outfall with permitting issues (Group 1)
2B	Convey and Treat: High Head Pump Station, Treat at Carkeek	2.2																													- Energy high (Group 2) - Carkeek outfall with permitting issues (Group 1)
3A	End of Pipe Treatment: HRCUV at NBPS site	1.8																													- O&M: As going off at once - one more site (Group 4) - End of pipe treatment was technically this group due to simplicity - we know what would be built, only use it when needed, most straightforward, provides flexibility - more capacity in conveyance and West Point Treatment for City to pursue storage projects in Ballard and Fremont/Wallingford for future CSO reduction projects (but for all alternatives that do not convey flows to West Point) (Group 2) - Snow grade would get a "green dot" for Community (Group 3)
4A	Demand Management: Reduce Id. Flows to Eliminate Storage or Pumping																														
5A	Combinations: Storage Plus Demand Management																														- Investigate further - Smoke test. (Group 2)
5B	Combinations: Convey & Treat Plus Demand Management																														
5C	Combinations: Convey & Treat Plus Storage																														

GENERAL COMMENTS
- Any new facilities must include new staffing requirements (Group 3)
- Create treatment combined with demand management option: Green dots for Cost Effectiveness, Technical Feasibility/Compatibility, Public Health & Environmental Benefit. Yellow dots for O&M, Flexibility, Community, Program Compatibility. (Group 3)

SCREENING CRITERIA COMPONENTS

Cost Effectiveness	Operations & Maintenance	Technical Feasibility/ Compatibility	Public Health & Environmental Benefit	Flexibility	Community	Program Compatibility
Capital Cost	Reliably meet CSO objectives	Compatible with Existing System	Meet CSO Requirements	Future Regulations	Neighborhood Equity	Seattle Parks, SPU, Transportation
Life Cycle Costs	WTD Automation	Technically Feasible	Minimize Public Exposure	Climate Change	Cost Allocation	~~Sediment Management Plan~~
Use of Existing Facilities	Ease of Startup / Shut-Down	Can be Permitted	Minimize Environmental Footprint	~~CSO Program Operations~~	Minimal Shoreline Impacts	~~County Planning Policies~~
Grants/Loan Planning	Ease of Maintenance	Land is Obtainable	Minimize Environmental Risks	Implementation	Minimal Property Disruption	Stormwater Management Requirements
	No Adverse Impacts - County	Minimize Federal / State Permit Constraints	Endangered Species		Minimal Implementation Impacts	~~Conveyance System Improvement Program~~
	No Adverse Impacts - Seattle		Coordinates with Puget Sound Goals		Minimal Operations Impacts	WTD Productivity Initiative
	Ease of Regulatory Reporting				Minimal Disturbance of Archeological Areas	~~Puget Sound Restoration~~
						~~WTD Balanced Scorecard~~
						~~WTD CSO Program~~

Summary of North Beach Alternatives Moving Forward

SHORT LISTED ALTERNATIVES

- Alt 1A – Carry forward as basis
- Alt 1C – Evaluate potential sites / FM alignments
- Alt 3A – Apparent low cost (technology pilot)
- Alt 4 – Flow monitoring & smoke testing
- Alt 5 – Combinations to optimize cosT

SCREENED ALTERNATIVES

- Alt 1B – Drop in favor of 1C
- Alt 2A/B – Low priority for further evaluation

King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

Summary : Next Steps

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Summary and Next Steps

- Short list of alternatives on Page 43
- Further develop feasibility of Demand Management approach
- Incorporate findings of CSO treatment pilot testing
- Proceed with Task X05 – Alternatives Development
  - Selected approach in each basin
  - Basis for Facilities Planning

King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

TM 203 Review Workshop

September 13, 2007

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Screening Criteria

- Main Categories
  - Cost Effectiveness
  - O&M Feasibility
  - Technical Feasibility
  - Public Health and Environmental Benefit
  - Flexibility
  - Community Issues
  - Program Compatibility
- Sub-categories as listed in the TM

King County

Barton, Murray, Magnolia, and North Beach

CSO Facilities

Questions : Discussion

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