



KING COUNTY
FLOOD CONTROL
DISTRICT



King County

Advisory Committee Meeting

March 23, 2009

Protecting public safety, the regional economy and critical infrastructure.

Agenda Overview

- Committee Business and Updates
 - Committee Chair
 - Committee By-Laws
 - Subregional Opportunity Fund
 - Howard Hanson Dam
- January 2009 Flood Response
- 2009 Capital Adjustments
- 2010 Work Program

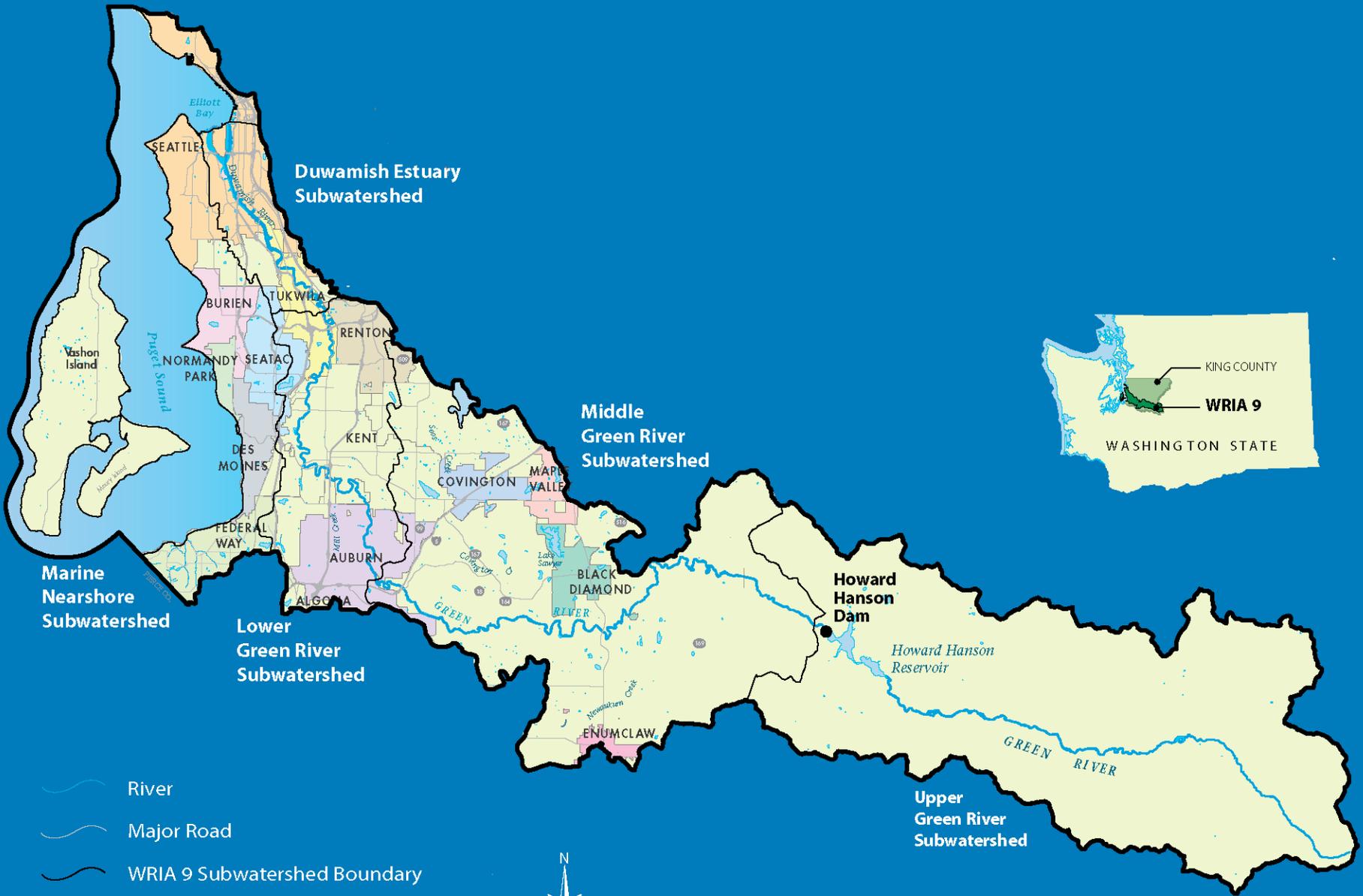
Advisory Committee

Business Items and Update

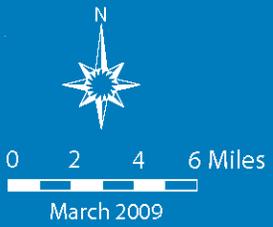
- Committee Chair
- Committee By-Laws
- Subregional Opportunity Fund
- Howard Hanson Dam

Subregional Opportunity Fund

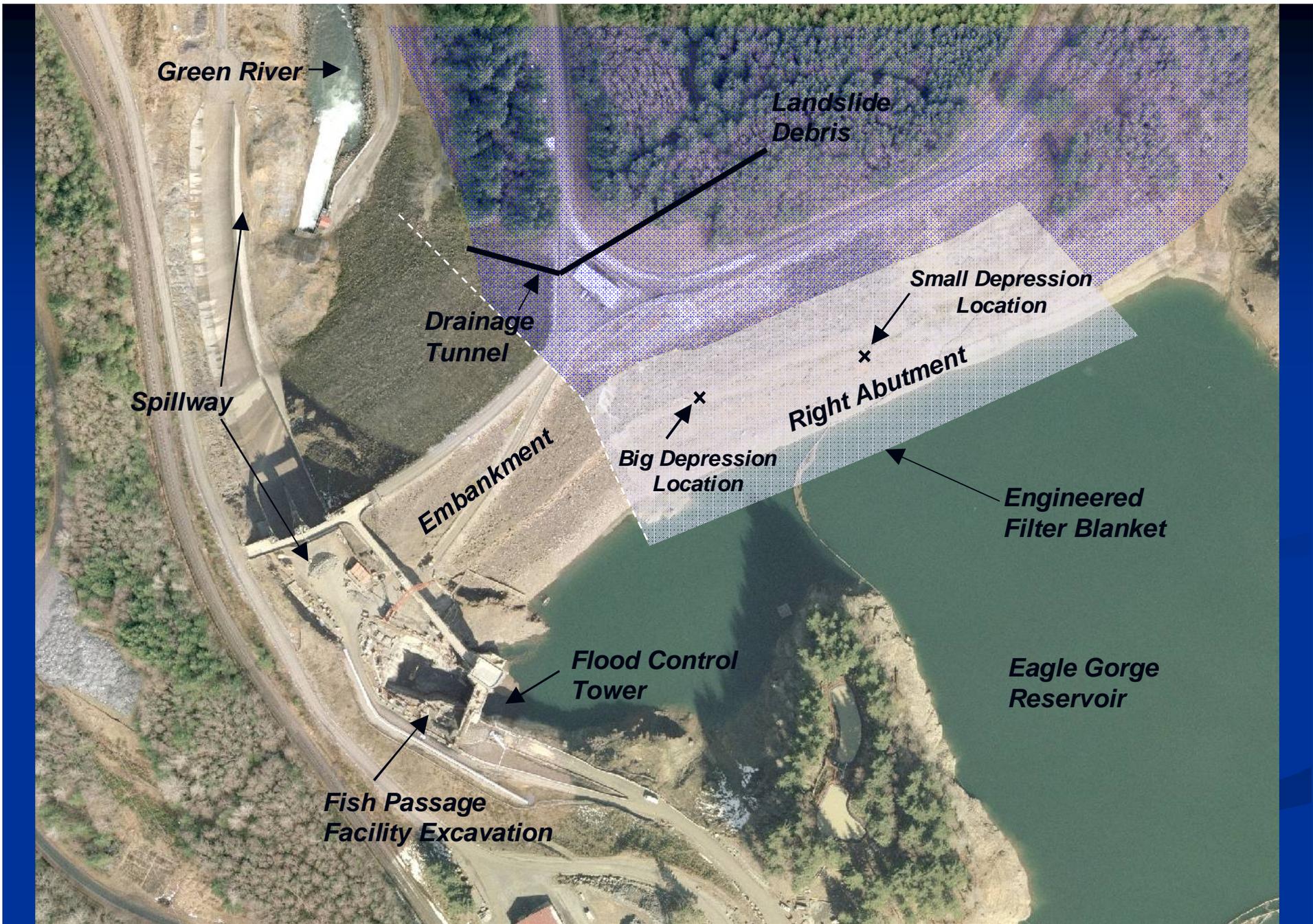
- December 2008: Projects submitted by jurisdictions
- March 2009: Board of Supervisors adopted proposed projects as part of FCD work program
- Next Steps:
 - ILA signed by Executive Director
 - ILA signed by jurisdictions
 - 10% of allocation pre-awarded w/in 30 days of ILA
 - Remainder paid on reimbursable basis



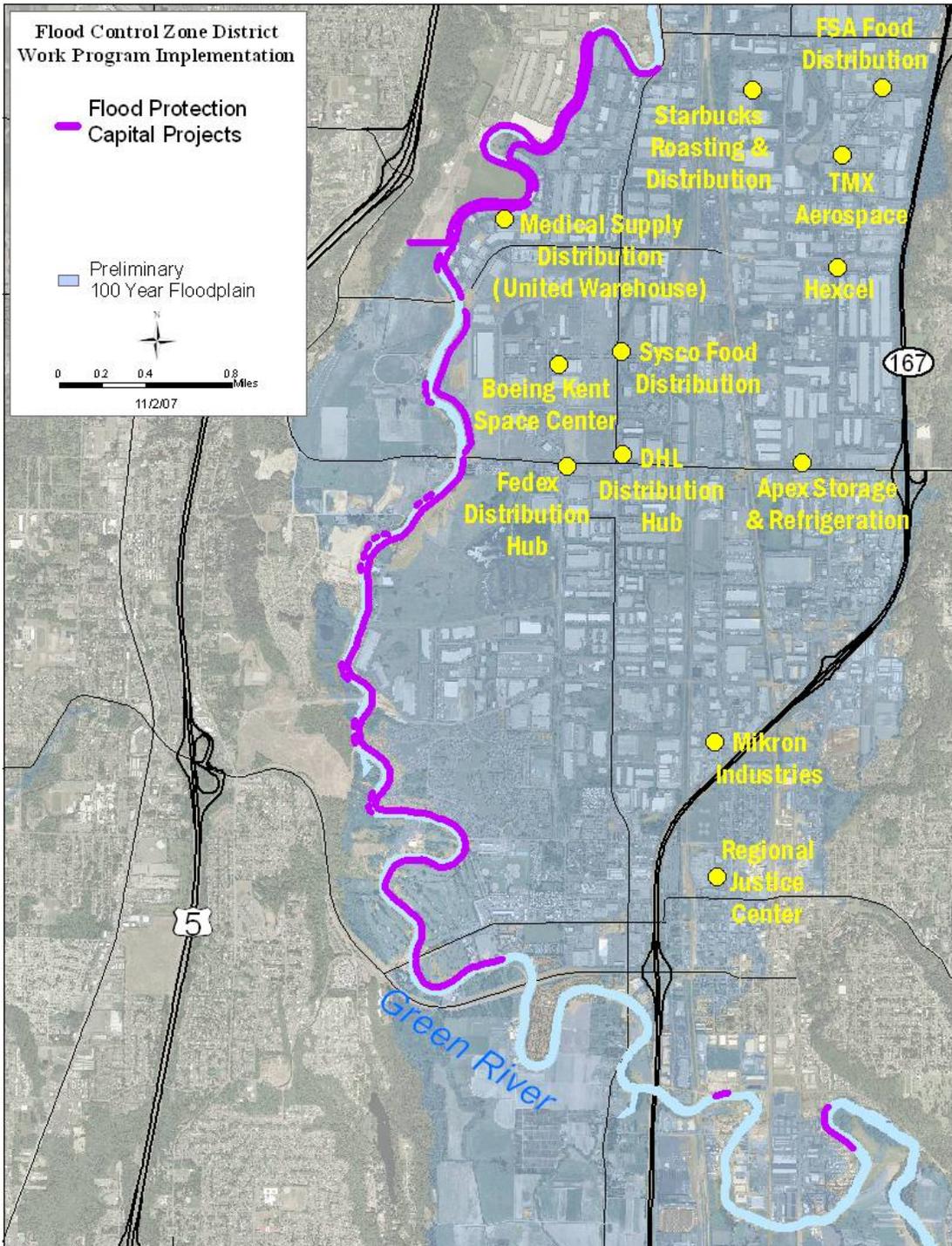
-  River
-  Major Road
-  WRIA 9 Subwatershed Boundary
-  WRIA 9 Boundary
-  Open Water
-  Unincorporated King County



 **King County**
 Department of
 Natural Resources and Parks



Army Corps Howard Hanson Dam



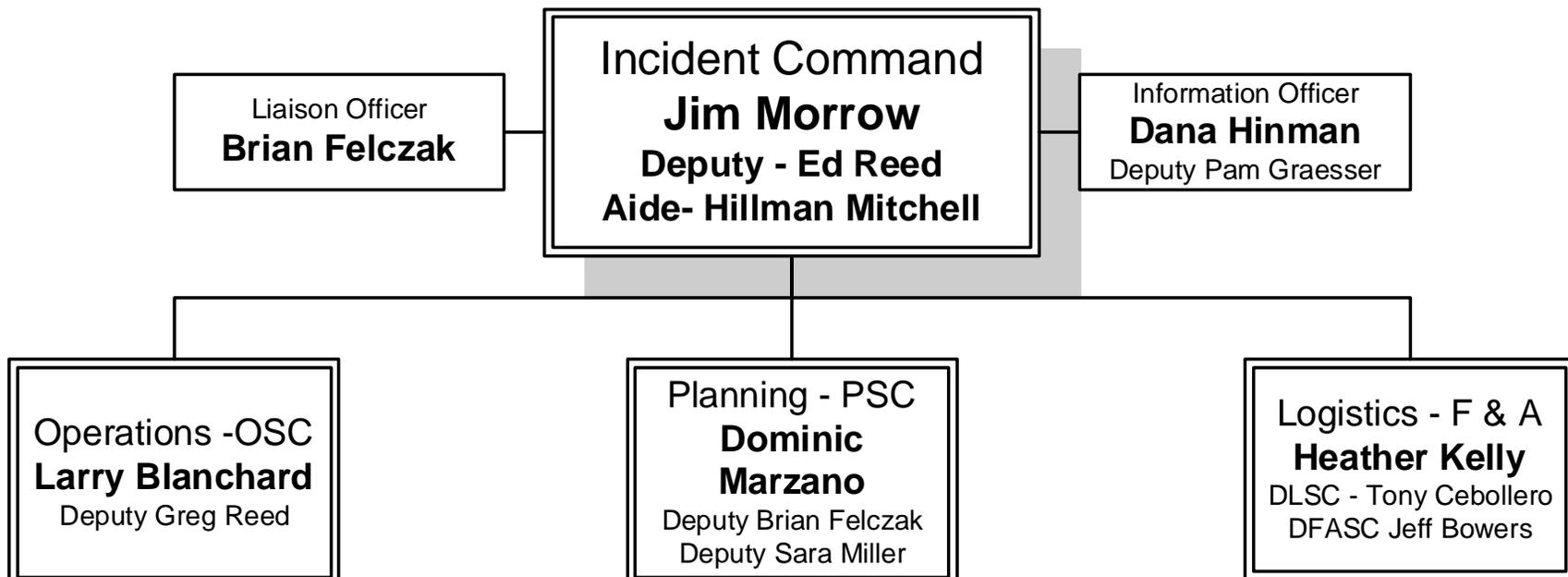
Protecting the Region's Lifeline
Select Manufacturing and Distribution Centers and Public Facilities in the Lower Green Floodplain

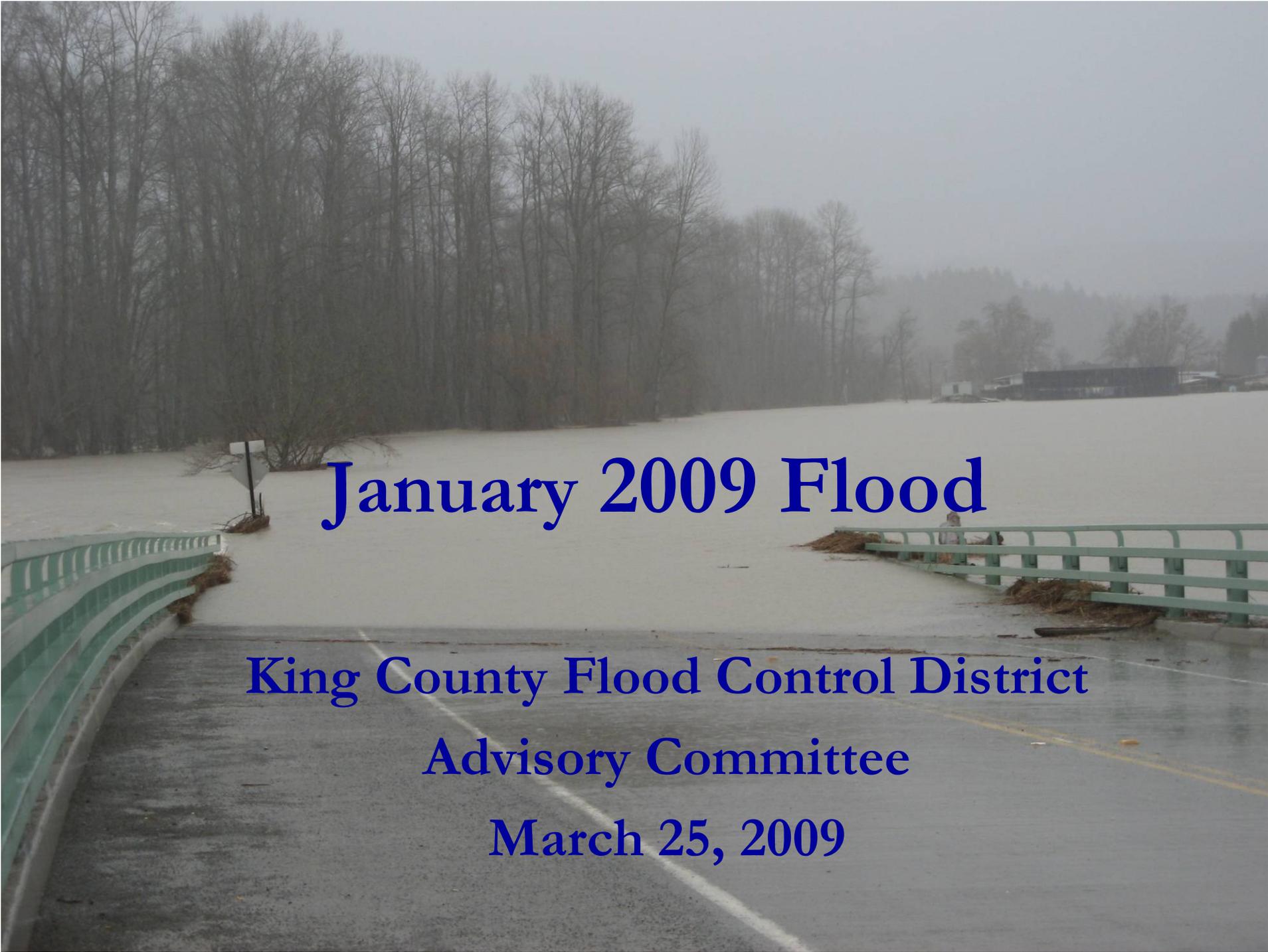
Response to Howard Hanson Dam Operational Changes

- Open Flood Warning Center earlier in response to major storm forecasts
- Flow thresholds based on dam releases rather than observed flows at Auburn. Result is that thresholds are reached 7 hours earlier
- Reduce Phase 4 threshold to 10,000 cfs
- Increased Flood Patrols (King County, Corps, and City staff)
- Automated callouts for next flood season
 - Subscription list underway; outreach to floodplain residents once system is established
- Incident Management Plan with Green River Valley cities for next flood season

Howard Hanson Dam Planning Group Operation Action Plan (OAP)

Org Chart



A photograph showing a road that has been completely inundated with floodwater. The water is a murky, greyish-brown color. In the foreground, a green metal guardrail runs along the left side of the road. The road surface is visible in the lower portion of the frame, showing a white dashed line. In the background, there is a dense line of bare trees under a grey, overcast sky. A few buildings are visible in the distance through the haze.

January 2009 Flood

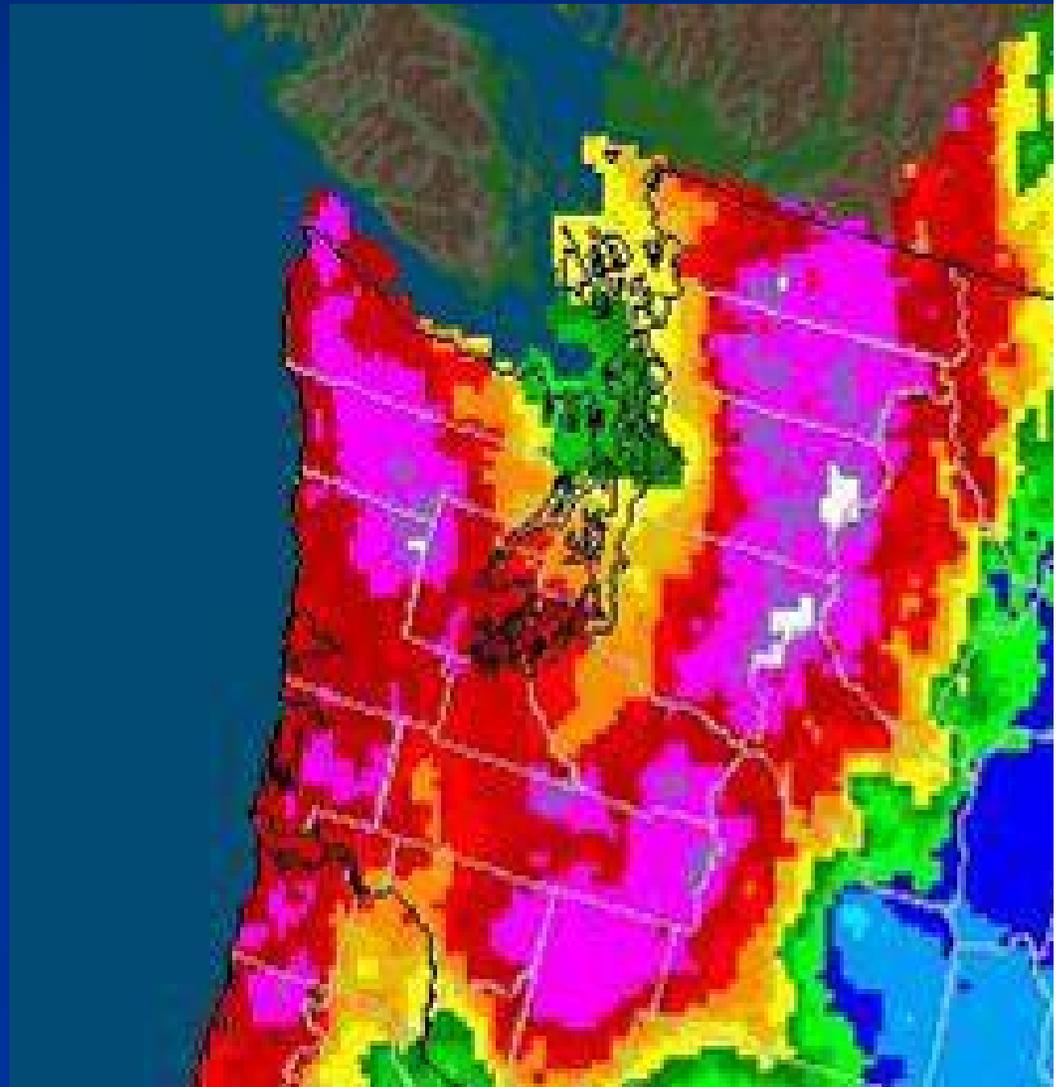
King County Flood Control District

Advisory Committee

March 25, 2009

January 2009 Flood: Contributing Factors

- Record December snowstorm
- Saturated ground
- Heavy rainfall over 4 days
 - Seattle 2.7"
 - 19-22" Tolt and Snoqualmie Headwaters
- Localized rainfall up to 1"/hr in headwaters
- Warm temps lead to rain and snowmelt in mountains
- Reservoirs filled to capacity, several days of high flows to lower reservoir levels



January 2009 King County River Flows

“CFS” in Context: How much water is a cubic foot per second (cfs)?

A flow of 2,000 cfs would fill one semi truck per second

River	Provisional Peak Flow (cfs)	Record Peak Flow (cfs) (Year)	100-Year Flood (based on FEMA Studies)	Average Annual Flow (cfs)
Cedar (at Renton)	11,600	10,600 (1990)	12,000	662
Tolt (at Carnation)	17,900	17,400 (pre-dam 1959)	18,800	571
North Fork Snoqualmie	17,100	15,800 (1932)	18,000	500
Middle Fork Snoqualmie	31,200	31,700 (2006)	37,100	1,223
Snoqualmie (at Carnation)	84,100	71,800 (2006)	91,800	3,669
Green (at Auburn)	11,100	12,400 (1996)	12,800 (Corps target is 12,000)	1,324
White (Mud Mtn Dam releases)	11,700	11,700 (2006)	12,350 (Corps max target flow)	1,436

Yellow = record peak flows based on provisional USGS data

January 2009 Flood Impacts

- At least **\$39M** in flood facility damages at more than **70** sites totaling over **26,800** feet
- Over **500** damaged homes across King County
- Over **200** homeowners interested in selling or elevating their homes
- Damages to Howard Hanson Dam (Army Corps of Engineers)

How did we respond?

Flood Warning Actions

- Annual **pre-flood season coordination** with cities and first responders in each basin (October 2008)
- **6 days (144 hours)** of continuous flood warning operations (Tues 1/6 thru Sun 1/11; Mon 1/12-Tues 1/13)
- **Priority Call Lists** of citizens, city officials and emergency response agencies as rivers enter Phases 2-4
- **Around the clock** flood patrols until river levels receded
- Flood Warning Center web pages accessed **122,642** times
- New river information hotline accessed by over **1,986** callers.
- Constant coordination with emergency responders and local governments

Flood Recovery Outreach

- Support FEMA Disaster Recovery Center
- Public Meetings – Pacific, Carnation, Cedar River Council
- ‘Kitchen Table’ neighborhood meetings
- Mailings to all floodplain residents
- Field tours and briefings with elected officials and residents
- Howard Hanson Dam Outreach meetings in each valley city

What Worked Well?

- Flood Warning Center and flood patrols
- 24 levee repairs completed summer 2008
- Emergency repairs (e.g., Tolt breaches)
- Home elevations
- Farm pads in agricultural areas



Downtown Snoqualmie



North Bend/Shamrock Park

- S. Fork
Snoqualmie levee
overtopped
- Tributaries
flooded
- Expecting FEMA
grant to elevate 9
homes



South Fork Snoqualmie Levee - Marum Residence





SR 202 Fall City



Damaged homes along SR 202

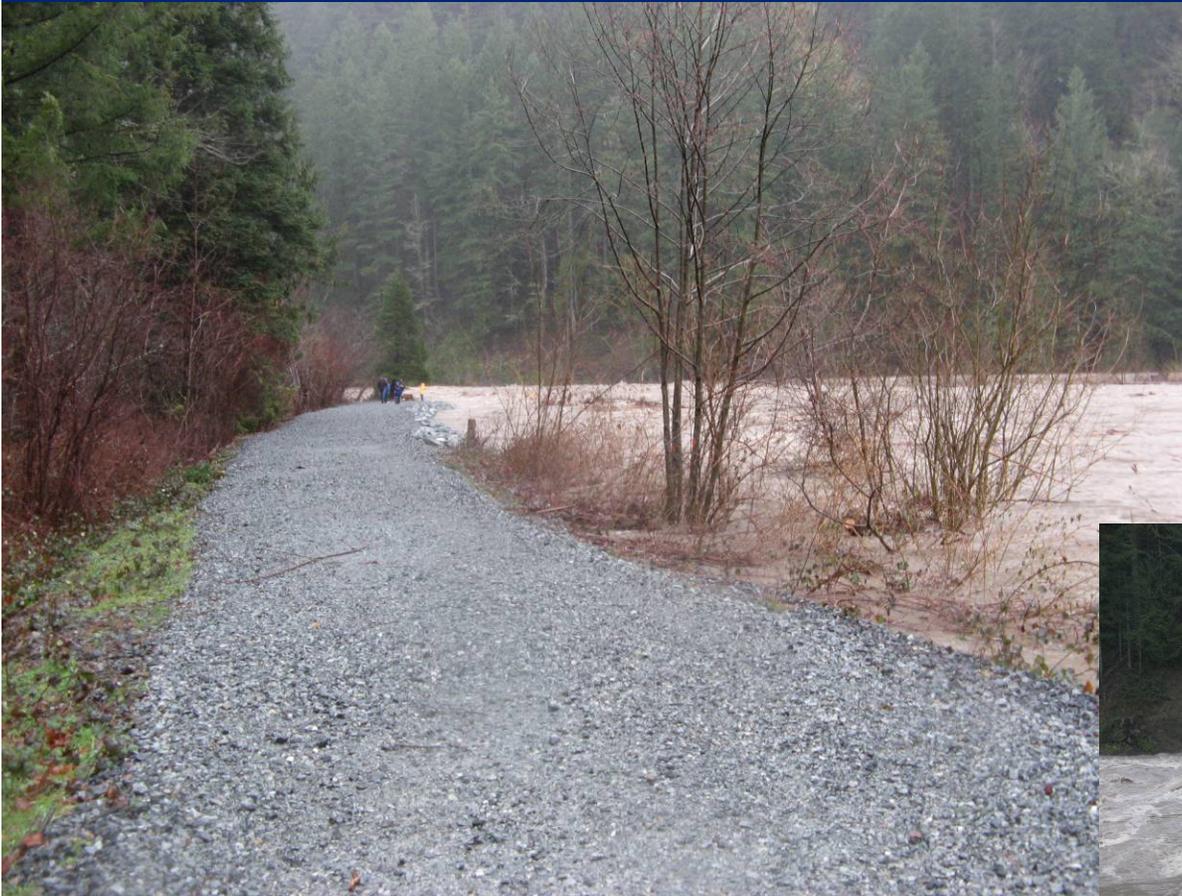


Tolt River Levee Breach

Tolt River Emergency Repairs



Middle Fork Snoqualmie: Mason Thorson Ells Levee Repair 2008



Farm Pads – Jan 2009



Duvall dairy



Equipment/animals on pad at dairy

- After 11/06 floods, KC made code changes
- Some farmers able to take advantage by building farm pads
- More pads are needed

Carnation – Home Elevated Summer 2008





SNOHOMISH CO.
KING CO.

SHORELINE
SEATTLE
KIRKLAND
REDMOND
BELLEVUE
SAMMAMISH
RENTON
KENT
FEDERAL WAY
AUBURN
KING CO.
PIERCE CO.

Snoqualmie/
South Fork
Skykomish Basin

Cedar
River
Basin

Green
River
Basin

White
River
Basin



Elliott Bridge Acquisition and Levee Setback

RM 5 Left and Right Bank



January 2009

Cedar Rapids Floodplain Reconnection and Levee Setback

RM 7.5 Left and Right Bank

- Flooding reduced for downstream properties.
- Insufficiently ballasted logs moved beyond project area.



Cedar Emergency Repair - Belmondo



Scour threatened the trail, a regional fiber optic line, and SR-169.

Vacated lands safely convey flood Cedar Grove / Rainbow Bend

2009



1990

Flood Response

- Set up emergency shelter
- Voluntary evacuation



- Protect vital infrastructure
- Repair damages

Rhode Levee

RM 14 Left Bank



Rhode Levee Overtopping

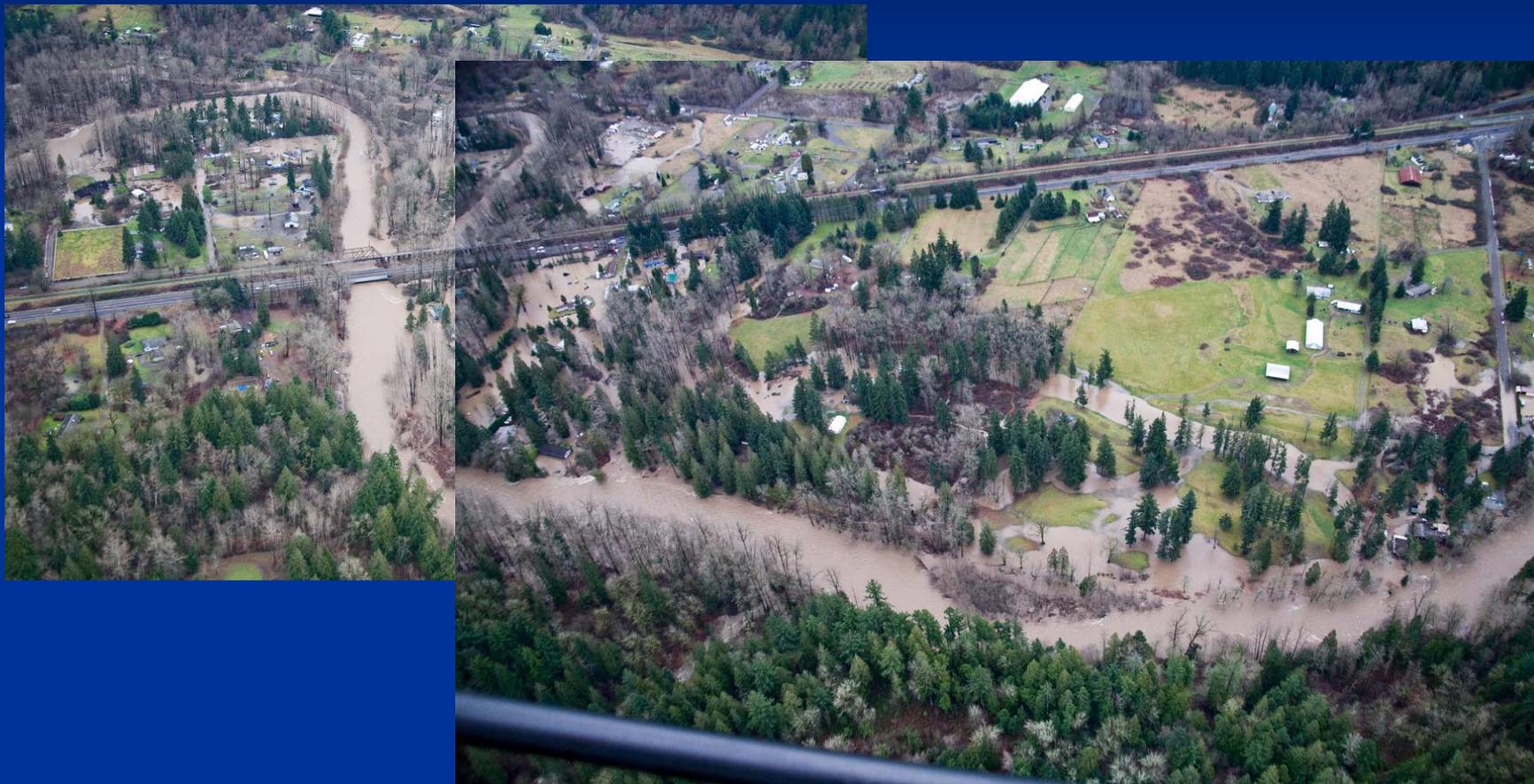


High flows cross neighborhood, cut-off access, and flood several homes



Royal Arch

RM 14.5 Right Bank



Remnant side-channel was reclaimed, cutting off access and flooding up to 11 homes

Royal Arch - Aftermath of Flood



Washed out driveway

Frequently Flooded Properties



Bain Road 2009



Orchard Grove 2009



Byers Bend 2009



Green River Basin

-  River/Stream
-  Other Basin Boundaries
-  Lake
-  Incorporated Area
-  Green River Basin



Produced by: King County DNRP
 GIS, Visual Communications & Web Unit
 File Name: 0901_KCwriasPPT.ai Ipre





Green River – Myers Golf Repair site, Kent 2008 Repair



SNOHOMISH CO.
KING CO.

SHORELINE
SEATTLE
KIRKLAND
REDMOND
BELLEVUE
SAMMAMISH
RENTON
KENT
FEDERAL WAY
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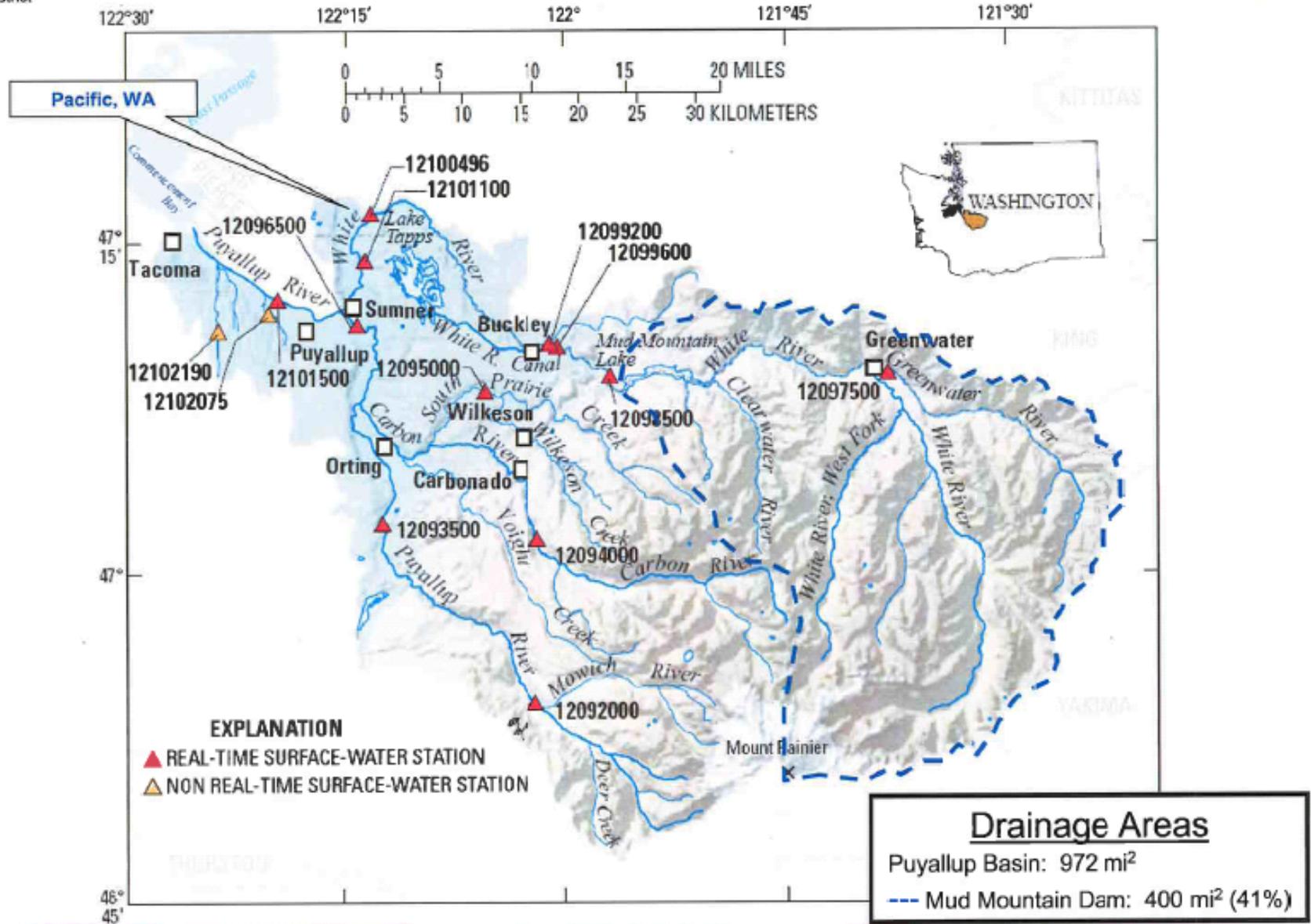




US Army Corps
Of Engineers
Seattle District



Puyallup River Basin



White River

- Flows controlled by Mud Mountain Dam
(Corps' single-purpose flood control dam)
- 41% drainage area is controlled by MMD
- Primary flow control is Lower Puyallup (< 45k cfs)
- Secondary flood control benefits to the White
- White River flow control target is MMD release of 12k cfs when feasible
- Timing of releases lags behind peaks of non-regulated rivers

White River Flood Events

Flood Event	MM Dam max flow release (cfs)	Auburn gage (real-time)	Auburn Gage (provisional)
Jan 2009	11,700	18,000	12,300
Nov 2006	11,700	19,000	14,700
Jan 2006	10,400		12,400
Feb 1996	10,700		15,000
Nov 1995	13,200		15,100

White River – City of Pacific Flooding



Approximate Area
of Inundation
shown in Blue

January 9, 2009 at flood peak



January 13, 2009 ~ 9k cfs



White River Estates





White River Estates, City of Pacific, White River



Looking South, Butte Ave, Pacific, White River Basin

Corps Berm along Park

(January 15, 2009)



How Can Our Response Be Improved?

- Enhanced flood warning notification through automated system:
 - *Can be made available to public in addition to first responders*
 - *Faster, less labor intensive*
- Sandbags available for pick up at several locations

2009 Flood Damage Repairs and Capital Program Adjustments

Damage Assessments

- Teams dispatched to all major river systems in King County
- Approximately 500 facilities
- Over 120 miles of river
- Over 26,800 linear feet of damages

Summary of Flood Facility Damages

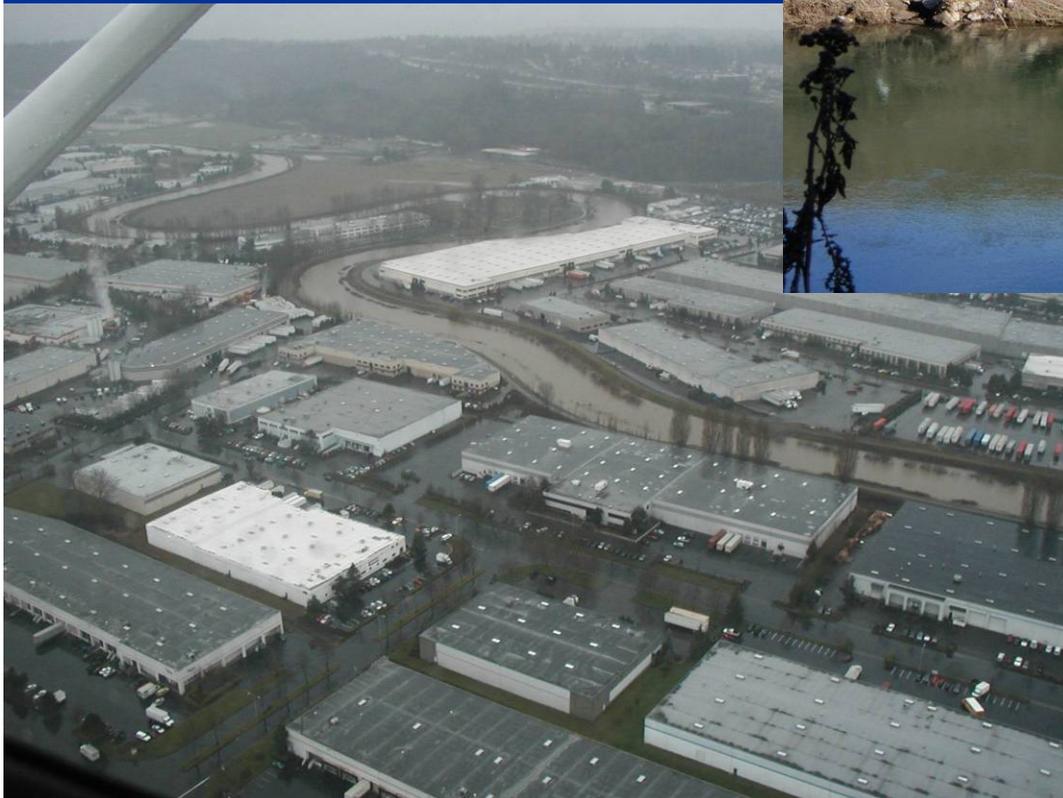
Basin	Medium Priority Capital Damages	High Priority Capital Damages
Snoqualmie / SF Sky	\$1,265,000 (12 projects)	\$8,995,000 (20 projects)
Cedar	\$1,767,500 (9 projects)	\$2,372,500 (10 projects)
Green	\$5,265,000 (5 projects)	\$19,510,000 (10 projects)
White	0	0
Total	\$8,297,500 (26 projects)	\$30,877,500 (40 projects)

NOTE: All numbers approximate as of 3/20/09. Capital facility repair needs only, does not include new acquisition needs, new capital projects, or new programmatic needs

High Priority: Green R Stoneway Lower - Kent Emergency Repair to Force Main for Midway Landfill Leachate



High Priority: Green River Ratolo – Tukwila 205 Comm'l and Industrial Development at Risk (potl Corps)



High Priority: Green R. Briscoe – Kent Comm'l and Industrial Land at Risk (Existing 2009 CIP)



Soames-Dolan / Russell Upper – Kent

Risk to residential and commercial areas, access to S. 228th



High Priority : Cedar River Trail Site 1

Risk to SR 169, fiberoptics, trails



**High Priority: MF Snoqualmie, Mason Thorson
Extension (Potential Corps)
Risk to Residential Area**

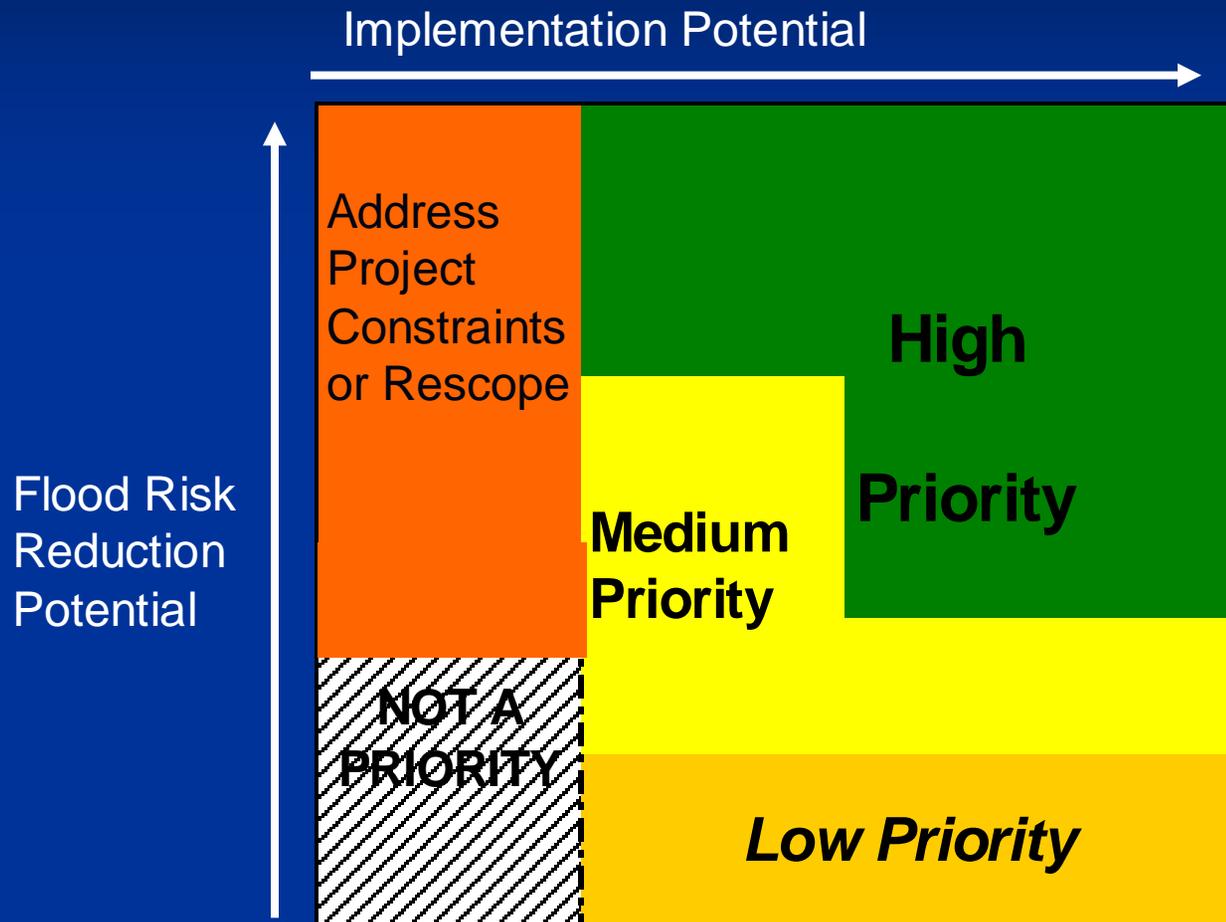


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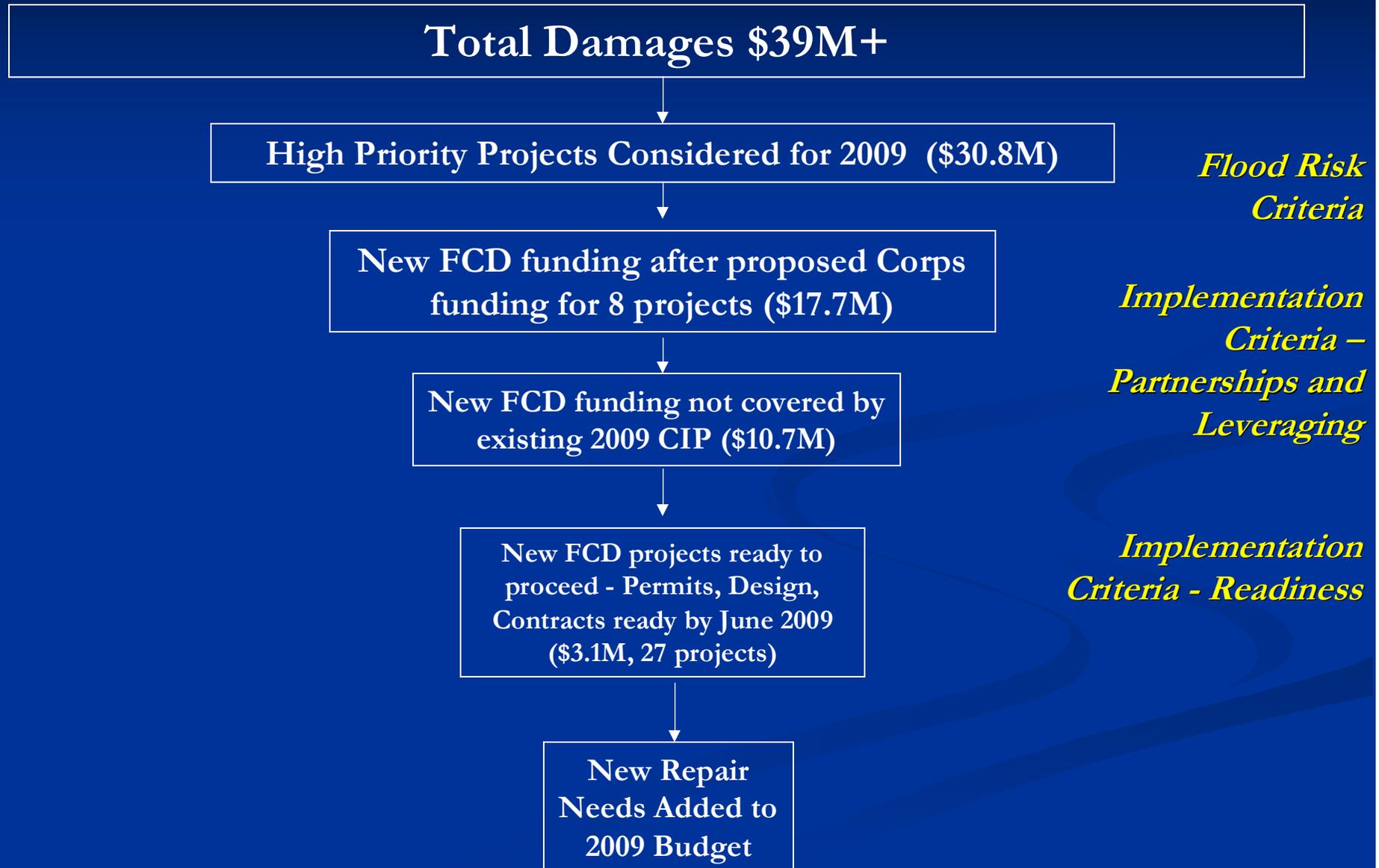
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Evaluation Criteria: Project Evaluation Approach



NOTE: This is a conceptual diagram and is not intended to imply clear and distinct thresholds between these categories.

Process and Rationale for Identifying New 2009 Flood Facility Repair Needs



Identifying FCD Funds that could Address New 2009 Repair Needs

- Project can be delayed due to implementation factors
 - Partnerships and Coordination (e.g. Neal Road \$1.5M)
 - Grants and Leveraging (e.g. Lower Tolt Acquisition \$893K)
 - Feasibility Studies (e.g. Dorre Don and Maplewood Flood Mitigation Studies \$350,000)
- Fund balance for completed project (e.g. Segale Levee \$100,000, 2007 Briscoe repair \$110,000)
- Total: @ \$3.2 million

Timelines for Adjusting 2009 CIP

- March 23 – Executive Committee Review of New Damages
- March 25 – Advisory Committee Review of Damages and Process for Making Adjustments
- April 6 – Recommendations on Specific 2009 Repair Projects, Distribute to BTCs for discussion
- April 16 – Advisory Committee Recommendations on 2009 Adjustments
- April 27 – Recommendations to Executive Committee
- May 4 – Board of Supervisors Adopt CIP Adjustments

External Resources

- Disaster response funding
 - FEMA public assistance for repairs (request TBD)
 - FEMA hazard mitigation grants (up to \$3M)
 - Economic Development Admin grant (up to \$1M)
- Corps PL 84-99 repairs
 - Structural Repairs
 - Request “Non-Structural Alternatives” to acquire land and set back levees
- Stimulus Funding
 - NOAA floodplain reconnection
 - NRCS floodplain easements
 - Corps of Engineers
- Annual Grants
 - Department of Ecology (FCAAP – May)
 - FEMA (Pre-Disaster Mitigation – June)
 - Conservation Futures

Questions for Advisory Committee

“Temperature Read”

- Do you support the approach used to identify 2009 capital repair needs?
- Do you support the process used to identify potential project reallocations to fund these repair needs?
- What additional information would you like to have to make a recommendation in April?
- Do you have any recommendations on how we can strengthen our response in future flood events?

2010 Work Program Development Process

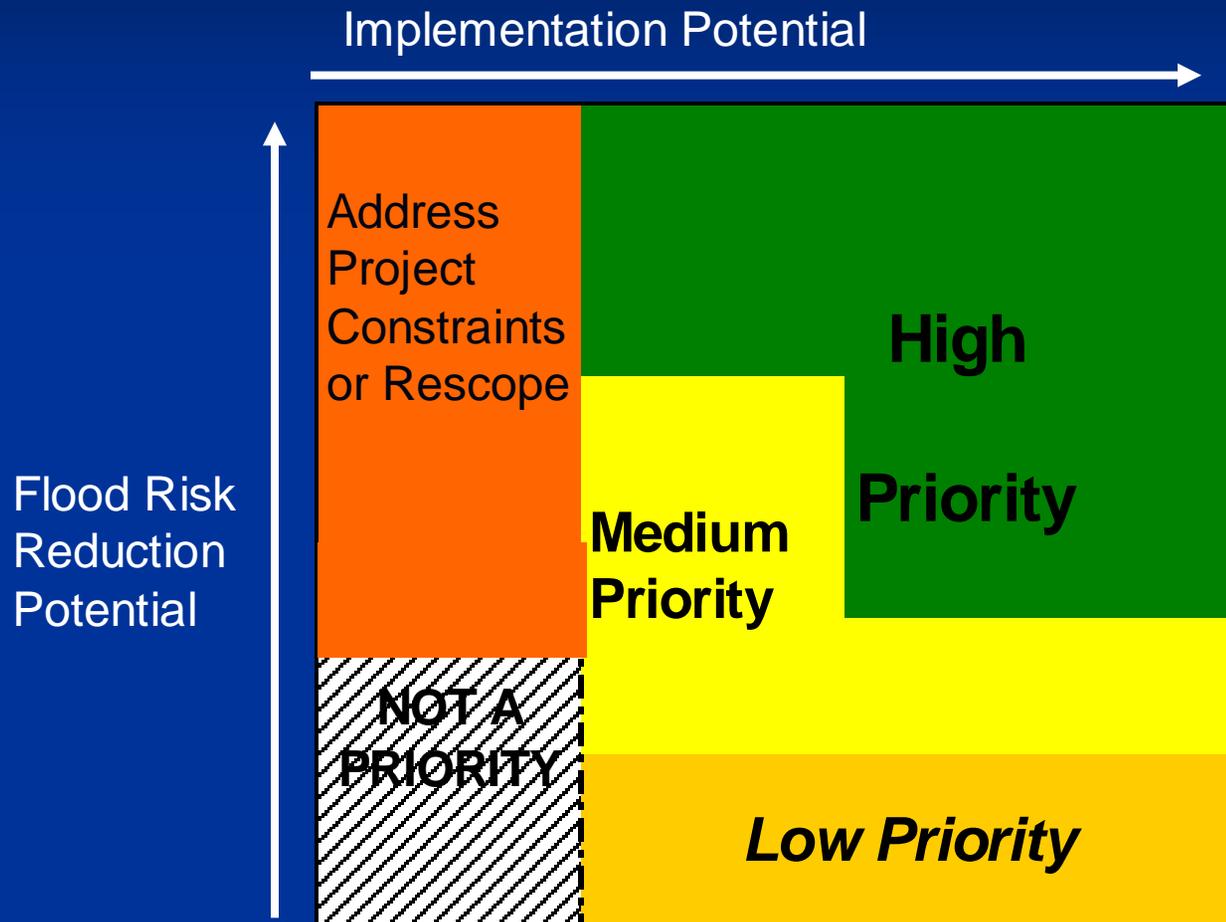
Flood Risk Reduction Potential

- Consequences: What would happen if no action were taken?
 - Critical facilities, residential land, regional economic benefits, etc
- Severity: How serious is the impact?
 - Human injury or death vs little or no damage
- Extent of Impact: What is the scale of the problem?
 - Impacts beyond the area of flooding vs. localized
- Urgency: How soon will the impacts occur?
 - Next high flow event vs. Risks are not rapidly increasing

Implementation Potential

- Project Readiness – willing landowner, design, permits
- Partnerships / Leverages Funds
- Supports multiple objectives
- Cost-Effectiveness
- Programmatic Activities
 - Community Rating System
 - Meet or exceed NFIP
 - Active CIP program
 - Active O&M program

Evaluation Criteria: Project Evaluation Approach



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Schedule for 2010 Work Program Recommendations

- November – Board and Council adopt budget
- October – Advisory Committee meeting on 2009 Progress
- August – Advisory Committee recommendations due to Board
- May – King County Budget developed
- May 6 – Advisory Committee Recommendations
- April 16 – Advisory Committee ‘Temperature Read’ on 2010 Work Program and Budget
- March-April – Basin Technical Committee Meetings

Future Agenda Items

- 2009 Capital Adjustments
- 2010 Work Program Recommendations
- 2010 Budget, 6-yr CIP
- Policy Recommendation - Eminent Domain
- National Flood Insurance Program – FEMA
Implementation of Biological Opinion
- Levee Vegetation Management Coordination
with the Corps of Engineers, NMFS/USFWS,
FEMA

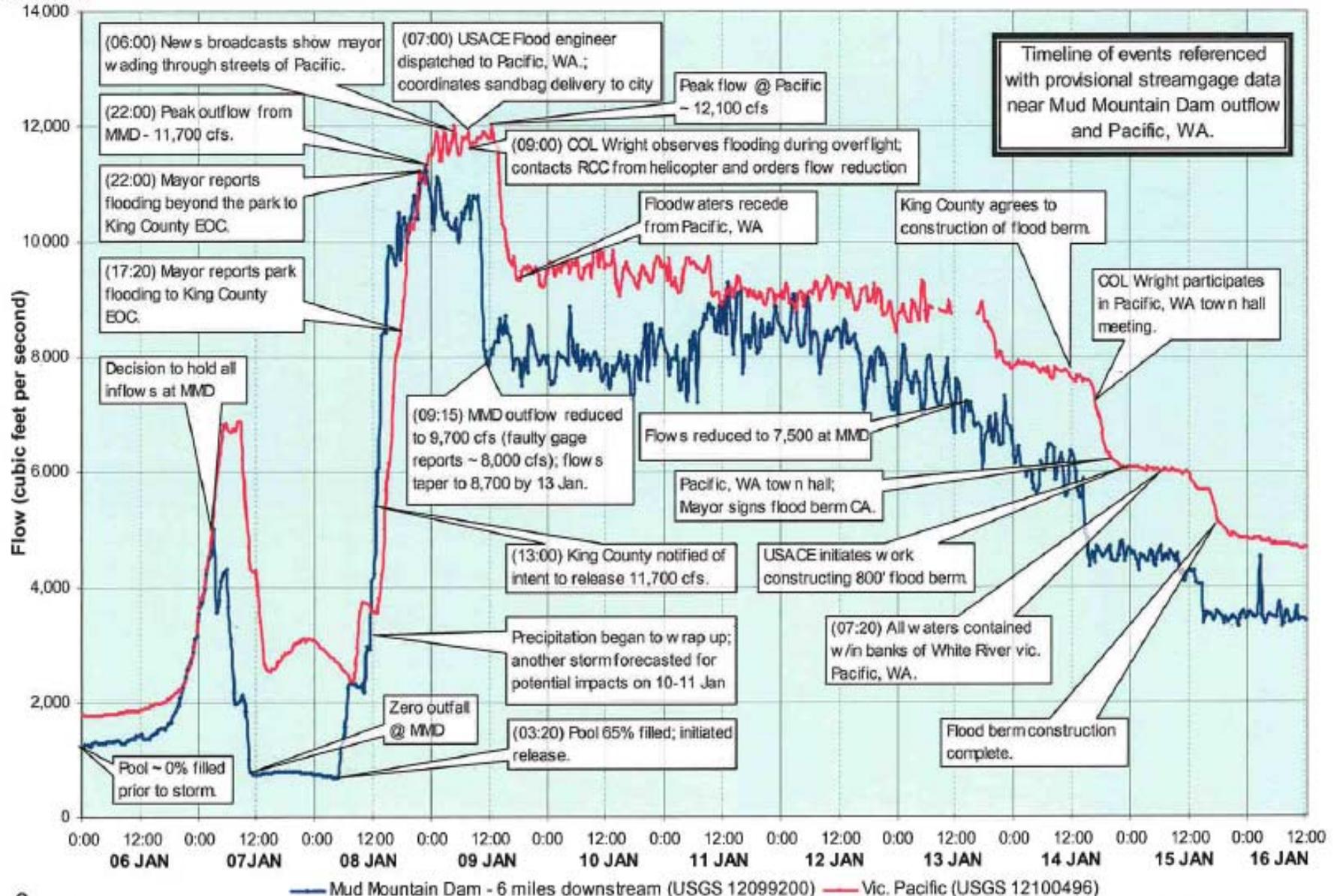




US Army Corps
Of Engineers
Seattle District



Event Timeline



Addressing Constraints: Capital Project Phasing

