Stormwater Impact Assessments

Connecting primary, secondary and cumulative impacts to Hawaii's Environmental Review Process

TRAINING

May 23, 2013

Honolulu

Presented by

PBR HAWAII & ASSOCIATES, INC.

Agenda

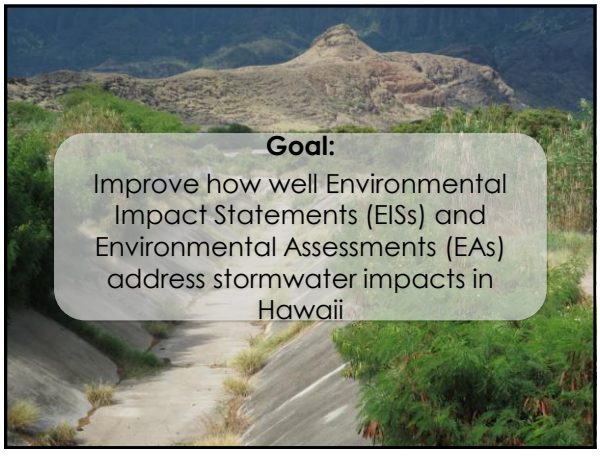
9:00 – 9:10	Introductions
9:10 – 9:15	Background
9:15 – 9:20	Introduction of Five-Step Framework
9:20 – 9:50	Step 1: Gather pertinent data
9:50- 10:15	Step 2: Determine appropriate level of analysis
10:15 – 10:25	BREAK
10:25 – 10:55	Step 3: Analyze data in light of proposed project
10:55 – 11:20	Step 4: Identify mitigation goals & measures
11:20 – 11:25	BREAK
11:25 – 11:35	Step 5: Summarize impacts and mitigation measures
11:35 – 11:45	Review checklist – Exercise
11:45 – 12:00	Conclusion & Questions

Background

- Guidance document purpose & need

> *"Cumulative effects assessment is neither well understood nor well implemented and is not integrated with the planning process"*
> (University of Hawai'i, 2010)

Question 1



Principles

- Clarifying how stormwater impact assessment **relates to the environmental review process**
- Acknowledging how stormwater characteristics in Hawaii's varied environments may **differ from mainland conditions**
- Incorporating Best Management Practices and creative offsite practices that can be **translated to permit conditions**

Primary & Secondary Impact Assumptions

Primary (Direct)

- Occur at **same time** & **place** as cause
- Effects on **project site**
- Pertinent factors:
  - bare soil
  - impervious surface
  - nutrient load
  - peak flow

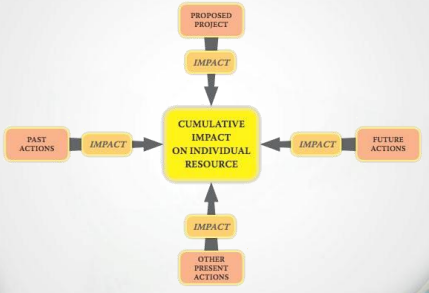
Secondary

- Occur **later in time** or **removed in distance** but reasonably **foreseeable**
- **Offsite** and **down gradient** from project
- Examples:
  - growth-inducing effects
  - ↑ sediment in down stream water body

Cumulative Impacts

- Results from **incremental impact** of the action when **added to past, present, and *reasonably foreseeable* future actions**
- Occurs **within boundaries of a watershed**

Cumulative Impacts



Question 2

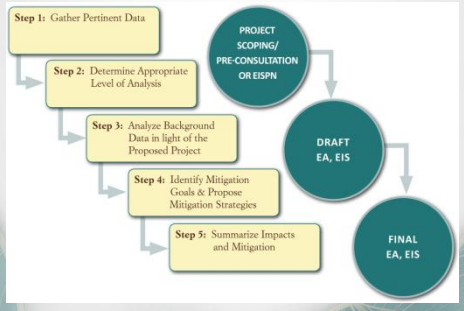
Relationship to State Planning Policies

- Hawaii State Plan Goal (HRS § 226-4 (2))
- Hawaii State Plan Priority Guideline (HRS §226-108)
- Federal Coastal Zone Management Act (HRS §205A-2)
- Significance Criteria (HAR §11-200-12)

Five-Step Framework

1. Gather pertinent data
2. Determine appropriate level of analysis
3. Analyze background information in light of proposed project
4. Identify mitigation goals & propose mitigation concepts
5. Summarize impacts & mitigation

Where does this framework fit in to the EIS process?



Five-Step Framework

1. **Gather pertinent data**
2. Determine appropriate level of analysis
3. Analyze background information in light of proposed project
4. Identify mitigation goals & propose mitigation concepts
5. Summarize impacts & mitigation

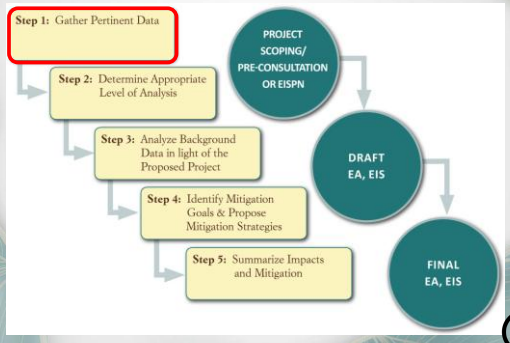
Step 1: Gather pertinent data

Objective: Collect & document pertinent data about existing site & watershed conditions

Methodology: Use best available data and early consultation to document site and watershed hydrology, stressors and sensitivity. Document anticipated stormwater permit requirements as well as management programs that pertain to site and watershed resources.

①

Where does this step fit in?



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Step 1: Gather pertinent data

"How much and where does the water flow?" (hydrology)

"What are the potential sources of water pollutants?" ("stressors")

"How resilient are the down gradient resources to pollutants?" ("sensitivity")

1

How much & where does the water flow?

Site	Watershed
Site size	Watershed or sub-watershed name, boundary and area
Existing land use and land cover, including impervious surfaces and vegetation types	Land uses and existing land cover, including impervious surfaces and vegetation
Soil (s) type(s); hydrological soils group(s); presence of soils categorized by NRCS as highly erodible	Soil (s) type(s); hydrological soils group (s); presence of soils categorized by NRCS as highly erodible
Drainageways, perennial, intermittent and ephemeral stream channels within site	Perennial, intermittent and ephemeral stream channels that receive drainage from site either directly or indirectly
Wetlands, embayments, ponds	Wetlands, embayments, ponds
Coastal waterbodies that directly receive waters from site	Watershed's coastal receiving waters
Site State land use designation(s) General Plan Designations (s) and zoning designations	State land use designation(s) General Plan Designations (s) and zoning designations
Slope and topography	Slope and Topography
Depth to water table	Direction of subsurface flows
Underground injection control line	Aquifer Name and sustainable yield. Sole Source aquifer?
Existing stormwater intrastructure	
Floodplain and FEMA flood hazard zones	Floodplain and FEMA flood hazard zone
Average annual rainfall and seasonal distribution	Existing data on peak flows; Existing data on stream flows
Evapotranspiration & interception transpiration (vegetation)	Evapotranspiration & interception transpiration (vegetation

1

What are the potential sources of water pollutants?

Site	Watershed
Existing and proposed land uses	Existing and proposed land uses
Soil(s) type(s); hydrological soils group(s); presence of soils categorized by NRCS as highly erodible	Soil(s) type(s); hydrological soils group(s); presence of soils categorized by NRCS as highly erodible
Presence of contaminated soils	Is there a brownfield or CERCLA site in the watershed?
Are any waterbodies immediately adjacent to the site impaired or threatened (303(d) list? Have TMDL's been developed for the water body?	Is the watershed's receiving water body impaired? Have TMDL's been developed for the water body?
Quality and classifications of drainageways, streams or other waterbodies within or immediately adjacent to site	Classification of the receiving waters

1

How resilient are the down gradient resources to pollutants?

Potentially Impacted Resources

Site/Watershed	Potential Resources
Aquatic resources	Native fish ('o'opu, 'amaʻamaʻ); mollusks (hihiwai, hapawai, ʻopihi), crustaceans ('o'pae) and insects (i.e. damselfly) Exceptional habitat quality i.e. coral reefs or high quality perennial streams; Low flushing capacity or high freshwater input i.e. embayments; anchialine ponds, or low-salinity nearshore coastal waters)
Riparian resources	Wetlands; bird habitat; native plants
Cultural resources	Archaeological resources such as ʻauwai and fishponds, historic sites, taro cultivation (historical and on-going)
Recreational resources	Boating, camping, fishing, hiking, hunting, nature study, parks, scenic views, swimming
Agricultural demand	Water diversions and volume diverted
Aquifer	Aquifer name and sustainable yield; sole source aquifers

1

How resilient are the down gradient resources to pollutants?

Management Considerations

Management or Regulatory Requirements	Implementing Agency
Marine Reserves and Protected Areas (Marine Managed Area, Fisheries Management Area, Marine Protected Area, Marine Life Conservation District, Hawaiian Islands Humpback Whale National Marine Sanctuary, Community-Based Subsistence Fishery)	Department of Land and Natural Resources Division of Aquatic Resources
Water Quality Standards/Classification Inland waters: Class 1, 2 Marine waters: Class AA, A	DOH Clean Water Branch (HAR 11-54)
Within jurisdiction of a public entity subject to an NPDES Municipal Separate Storm System (MS-4) permit?	Various (i.e. City and County of Honolulu, State of Hawai'i Department of Transportation)
Is the site subject to City and County of Honolulu stormwater LID requirements?	City and County of Honolulu, Department of Environmental Services
Is the site subject to Maui County stormwater quality requirements?	Maui County Department of Public Works
Will the action be subject to an NPDES Permit?	State of Hawai'i Department of Health, Clean Water Branch
Will the action be subject to a County Grading Permit?	County Governments
Hawai'i Coral Reef Strategy/Local Action Strategy Priority Site	Department of Land and Natural Resources Division of Aquatic Resources
Presence of threatened or endangered species or their critical habitat	USFWS, NMFS (marine endangered species)

1

Pertinent Data: County Requirements

- City and County of Honolulu Overview
  - Grading Permits
    - Erosion and Sediment Control BMPs
  - Storm Drainage Standards
    - Flood Control (Quantity)
    - Stormwater Quality

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County Grading Permits

ROH Chapter 14, Articles 13-16

- Exclusions to permit
- Erosion & sediment control BMPs
  - Height
  - Cut slopes
  - Fill slopes
  - Distance from property line
  - Area opened
  - Fills
  - Vegetation
  - Drainage provisions
  - Debris prohibited
  - Work days
  - Dust control
  - Water quality stds
  - Special req's

Standards for Flood Control

Rules Relating to Storm Water Drainage, §1-4.2

Design Criteria

- Runoff must be limited to pre-development conditions unless…
  - Safely conveyed through existing structures
  - Increased volume would not have adverse downstream impacts
  - Open coastal receiving waters
- Design computations for flood control measures

Storm Drainage Standards

Dept. of Planning & Permitting Rules (Sec 14-12.31 ROH)

Standards for Storm Water Quality (§1-5)

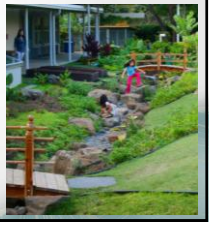
- Criteria
  - Applicability
- Design Standards
  - Volume based facilities
  - Flow based facilities
  - Area based facilities
  - Demand based facilities
  - Infeasibility criteria

Standards for Stormwater Quality

Water Quality Criteria – Requirements

Rules Relating to Storm Water Drainage, §1-5.1

- ≥ 1 ac. must address stormwater quality to MEP using:
  - LID site design & post-construction treatment control BMPs
  - Site design strategies
  - Source control BMPs
- Regulated Projects
  - Priority A
  - Priority B



Standards for Stormwater Quality

Water Quality Criteria – Requirements

Rules Relating to Storm Water Drainage, §1-5.1

- Management practices – Priority A1
  - Incorporate appropriate **LID Site Design Strategies** to the MEP.
  - Incorporate appropriate **Source Control BMPs** to the MEP.
  - Unless determined to be infeasible, retain on-site with appropriate **LID Retention Post-Construction Treatment Control BMPs**.
  - Unless determined to be infeasible, biofilter with appropriate **LID Biofiltration Post-Construction Treatment Control BMPs**.

Standards for Stormwater Quality
Water Quality Criteria – Requirements
Rules Relating to Storm Water Drainage, §1-5.1

- Management practices – Priority B
  - Consider appropriate **LID Site Design Strategies**.
  - Incorporate appropriate **Source Control BMPs** to the MEP.

Priority	Document	Submittal Requirements	
		Building Permit Apps	Const. Plan Approvals
A1	SWQR		✓
A2	SWQC		✓
B	SWQC	✓	

Standards for Stormwater Quality
Water Quality Criteria – Design Criteria
Rules Relating to Storm Water Drainage, §1-5.2

- Volume based facilities
  - Infiltration Basins
  - Infiltration Trenches
  - Subsurface Infiltration Systems
  - Dry Wells
  - Bioretention Basins
  - Permeable Pavement
  - Green Roofs
  - Vegetated Bio-Filters
  - Enhanced Swales
  - Detention Basins
  - Sand Filters

Standards for Stormwater Quality
Water Quality Criteria – Design Criteria
Rules Relating to Storm Water Drainage, §1-5.2

- Flow based facilities
  - Vegetated swales
  - Vegetated filter strips
  - Manufactured treatment devices

Image source: lowimpactdevelopment.org

- Area based facilities
  - Downspout disconnection
- Demand-based facilities
  - Harvesting/reuse

Standards for Stormwater Quality
Water Quality Criteria – Design Criteria
Rules Relating to Storm Water Drainage, §1-5.2

- Landscaped areas
- Auto irrigation systems
- Storm drain inlets
- Vehicle/equipment fueling
- Vehicle/equipment repair
- Vehicle/equipment washing/cleaning
- Loading docks
- Outdoor trash storage
- Outdoor material storage
- Outdoor work areas
- Outdoor process equipment operations
- Parking areas

Standards for Stormwater Quality
Water Quality Criteria – Infeasibility Criteria

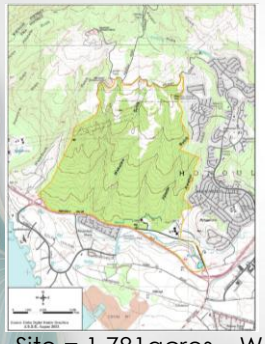
Exemption Criteria	Infiltration Basin	Infiltration Trench	Subsurface Infiltration	Dry Well	Bioretention Basin	Permeable Pavement
Soils beneath basin invert have measured infiltration rates less than 0.5 in/hr	•	•	•	•	•	•
Unable to maintain a distance of at least 3 ft from BMP invert to seasonally high groundwater table	•	•	•	•	•	•
Site has known man-made plumes or contaminated soils	•	•	•	•	•	•
Site has high potential for concentrated pollutant/chemical spills	•	•	•	•	•	•
Site is up-gradient of ephemeral streams (i.e. habitat topic change downstream)	•	•	•	•	•	•
Site is up-gradient of known shallow landslide-prone area	•	•	•	•	•	•
Unable to maintain a distance of at least 50 ft to the nearest groundwater well used for drinking water	•	•	•	•	•	•
Unable to maintain a distance of at least 35 ft to the nearest septic system	•	•	•	•	•	•
Unable to maintain a distance of at least 20 ft to the nearest building foundation	•	•	•		•	
Unable to maintain a distance of at least 10 ft to the nearest building foundation				•		
Unable to maintain a distance of at least 100 ft to the nearest down-gradiant building foundation	•	•	•	•	•	
Unable to maintain a distance of at least 10 ft to the nearest property line	•	•	•	•	•	
Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS	•	•	•		•	
Excavation would disturb iwi kupuna or other archaeological resources	•	•	•		•	
Site has high potential for oil and/or grease spills						•
Site has high potential to receive sand and/or sediment loads						•
Unable to maintain a pavement slope no greater than 5%						•
Pavement would be above a utility vault						•
Pavement is expected to receive more than 1,000 average daily trips						•
Other justification for an exemption proposed by the developer/agent and is acceptable to the City	•	•	•	•	•	•

Standards for Stormwater Quality
Water Quality Criteria – Infeasibility Criteria

Exemption Criteria	Vegetated Roof Filter	Green Roof	Enhanced Swale	Downspout Disconnect	Vegetated Swale	Vegetated Filter Strip	Tree Box Filter
Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS	•		•		•	•	
Excavation would disturb iwi kupuna or other archaeological resources	•		•		•	•	•
Invert of underdrain layer is below seasonally high groundwater table	•		•				
Site does not receive enough sunlight to support vegetation	•				•	•	
Site lacks sufficient hydraulic head to support BMP operation by gravity	•		•				•
Roof is for a single family residential dwelling		•					
Space is unavailable due to renewable energy, electrical, and mechanical systems		•					
Slope on roof exceeds 20% (11 degrees)		•					
Slope of receiving vegetated area exceeds 5%				•			
Diverted runoff drains within 10 feet of a retaining wall				•			
Diverted runoff drains within 10 feet of property line				•			
Concentrated flow cannot be established naturally					•		
Sheet flow cannot be established naturally						•	
Entrance at surface not possible							•
Residential and no planting strip							•
No curb and gutter							•
Other justification for an exemption proposed by the developer/agent and is acceptable to the City	•	•	•	•	•	•	•

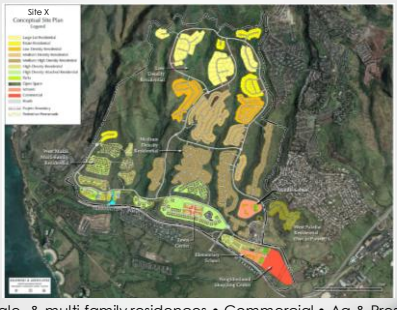
EXERCISE – STEP 1

Oahu Site X



Site = 1,781acres Watershed = 3,662 acres

Oahu Site X



4,100 single- & multi-family residences • Commercial • Ag & Preservation
LEED©-ND Silver

Step 1 – Hydrology

How much & where does the water flow?

Existing land use/cover:

Step 1 – Hydrology

How much & where does the water flow?

Soil type:

Step 1 – Hydrology

How much & where does the water flow?

Drainage pattern:

Step 1 – Hydrology

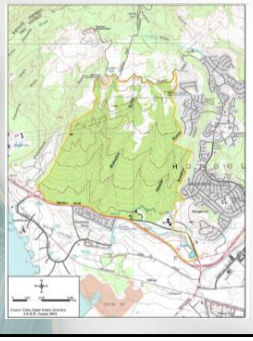
How much & where does the water flow?

Wetlands or embayments?

Receiving waterbodies:

Step 1 – Hydrology

How much & where does the water flow?



Slope & topography:

Step 1 – Hydrology

How much & where does the water flow?

Flooding hazard:

Annual rainfall and seasonal distribution:

Step 1 – Hydrology

How much & where does the water flow?

State LUD: Urban

General Plan: Secondary Urban Center

Zoning: AG-1 & -2

Aquifer: Ewa Kunia Aquifer, caprock forces water down and mixes with seawater 100s ft below surface. Sole source.

Existing infrastructure: 17 culverts under Farrington Hwy drain to facilities at Honokai Hale, Campbell Industrial Park, Ko Olina

Step 1 – Stressors

What are the potential sources of water pollutants?

303(d) waterbodies? Yes, most western gulch*.

Waterbody classification:

- Inland waters - Class 2
- Marine waters – Class A

*NOTE: fictionalized for training purposes

Step 1 – Sensitivity

How resilient are down gradient resources to pollutants?

Potentially impacted resources:

Step 1 – Sensitivity

How resilient are down gradient resources to pollutants?

Management considerations:

Five-Step Framework

1. Gather pertinent data
2. **Determine appropriate level of analysis**
3. Analyze background information in light of proposed project
4. Identify mitigation goals & propose mitigation concepts
5. Summarize impacts & mitigation

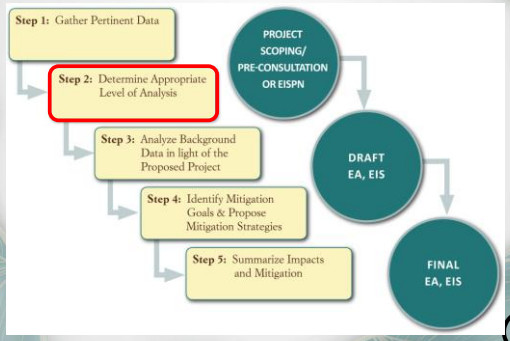
Step 2: Determine appropriate level of analysis

Objective: Determine what level of analysis is sufficient to give stormwater concerns appropriate consideration in the planning phase.

Methodology: Stormwater volume generated on site. Does the stressors + sensitivity + intensity = need for an estimate of volume of pollutants?

②

Where does this step fit in?



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Analysis Considerations

2

EXERCISE – STEP 2

Step 2 – Watershed Impairment/Stressors

Has a TMDL been established for any stream segment in the sub-watershed or for the receiving waterbody?

Is there an impaired stream or waterbody in the sub-watershed that is classified as category 5 under §303(d) of the Clean Water Act?

Step 2 – Watershed Impairment/Stressors

Is there an impaired stream or waterbody in the sub-watershed that is classified as category 4a, 4b, 4c, or 3 under §303(d) of the Clean Water Act?

Step 2 – Watershed Sensitivity

Is the receiving waterbody:

- Designated Class 1 or Class AA?
- Subject to Hawaii's Local Action Strategy to Address Land Based Pollution Threats to Coral Reefs?
- Identified as sensitive on Hawaii Watershed Priority Project?

Step 2 – Watershed Sensitivity

Do site conditions or combination of site conditions lend themselves to excessive runoff?

Is the site subject to the City and County of Honolulu Stormwater standards (effective June 1, 2013)?

Step 2 – Development Intensity

Is the site located in a small urban watershed or sub-watershed (measuring no more than 1 square mile in area and anywhere between 25% and 100% impervious surfaces)?

Step 2 – Development Intensity

Is the action subject to an NPDES permit?

Is LEED® certification desired?

Is the action subject to a County Grading, Grubbing, Tree removal or Erosion and Sediment Control Permit?

Step 2 – Summary

- Analyze pre- and post-development volumes of pollutants of concern (impaired stream)
- Analyze pre- and post-development runoff, pre- and post-development pollutant volume (excessive runoff)
- Sufficient to prepare for applicable NPDES, grading, and LEED req's

Five-Step Framework

1. Gather pertinent data
2. Determine appropriate level of analysis
3. **Analyze background information in light of proposed project**
4. Identify mitigation goals & propose mitigation concepts
5. Summarize impacts & mitigation

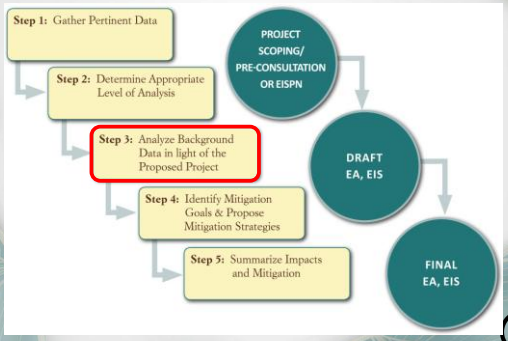
Step 3: Analyze background information in light of the proposed action

3a. Analyze primary (direct) impacts at the project scale

3b. Secondary impacts (offsite, down gradient)

3c. Cumulative impacts

Where does this step fit in?



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Step 3a: Primary impacts

Objective: Discuss impacts & proposed mitigation during construction.

Discuss anticipated direct impacts from the proposed action

3

Step 3a: Primary impacts

- Construction impacts
  - NPDES permit?
  - Grading permit?
- Pre- vs. Post-development Long-term impacts

Image source: www.bluewaterbaltimore.org

3

Step 3b: Secondary impacts

Objective: The analysis of secondary impacts should assess:

- Potential for down gradient flooding
- Impacts to down gradient sensitive resources

Image source: NOAA Restoration Center

3

Step 3c: Cumulative impacts

Objective: The analysis of cumulative impacts should assess the impacts on sensitive resources from all parts of the watershed relative to existing conditions and potential buildout.

3

Question 3

Step 3c: Cumulative impacts

Methodology: Minimum planning-level assessment

- Assess existing status of sensitive resources
  - Discuss past actions
  - Discuss present actions
  - Discuss reasonably foreseeable future impacts

3

Step 3c: Cumulative impacts

Methodology: Small, urban watershed assessment

- Assess existing buildout relative to potential buildout
  - Existing impervious area
  - State LUD "Urban" as indicator of future imperviousness

3

Step 3c: Cumulative impacts

Methodology: Watershed modeling for unique circumstances

- Necessity determined in Step 2
- Review for appropriate calculations and summarized results

3

EXERCISE – STEP 3

Five-Step Framework

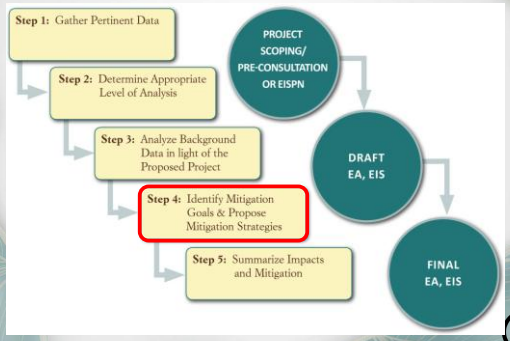
1. Gather pertinent data
2. Determine appropriate level of analysis
3. Analyze background information in light of proposed project
4. **Identify mitigation goals & propose mitigation concepts**
5. Summarize impacts & mitigation

Step 4: Identify mitigation goals & propose mitigation strategies

Objective: Integrate the primary, secondary, and cumulative impacts to determine the desired extent of mitigation, while considering site and watershed conditions to formulate mitigation strategies.

4

Where does this step fit in?



4

Identify mitigation goals

- Robust enough to support a FONSI
- Anticipate required permits
- Acknowledge role of engineering in design development

Clear in concept, but not overly prescriptive!

4

Identify mitigation goals

Mitigation performance criteria

- Maximum extent practicable
- Best available technology
- Range of outcomes

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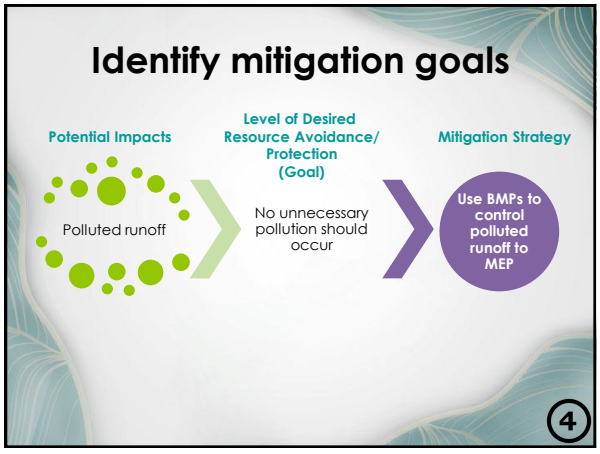
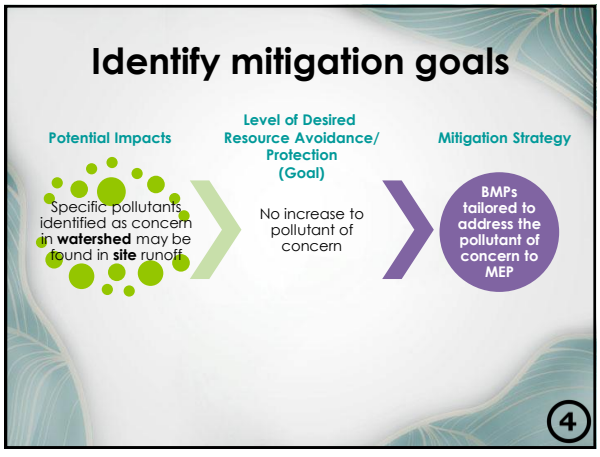
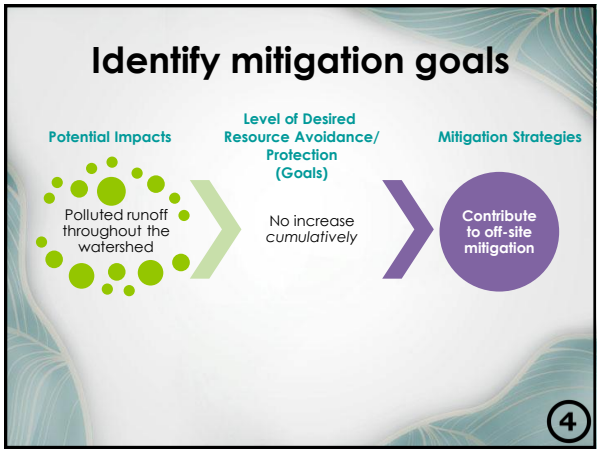

Identify mitigation goals
Potential Impacts
Level of Desired Resource Avoidance/ Protection (Goal)
Mitigation Strategy
Polluted runoff
No unnecessary pollution should occur
Use BMPs to control polluted runoff to MEP
4


Identify mitigation goals
Potential Impacts
Level of Desired Resource Avoidance/ Protection (Goal)
Mitigation Strategy
Specific pollutants identified as concern in **watershed** may be found in **site** runoff
No increase to pollutant of concern
BMPs tailored to address the pollutant of concern to MEP
4


Identify mitigation goals
Potential Impacts
Level of Desired Resource Avoidance/ Protection (Goals)
Mitigation Strategies
Polluted runoff throughout the watershed
No increase *cumulatively*
Contribute to off-site mitigation
4

Mitigation Phases

Design Phase	Construction Phase	Operational Phase
Site planner	Contractor	Owner & Successors
Plan or Site Approval; Grading Permit; Building Permit	NPDES or Grading Permit	?

4

Question 4

BMP Strategy Considerations

- Low Impact Development Concepts
- LEED© Standards
- Innovative
- Permanent vs. Temporary

4

EXERCISE – STEP 4

Five-Step Framework

1. Gather pertinent data
2. Determine appropriate level of analysis
3. Analyze background information in light of proposed project
4. Identify mitigation goals & propose mitigation concepts
5. **Summarize impacts & mitigation**

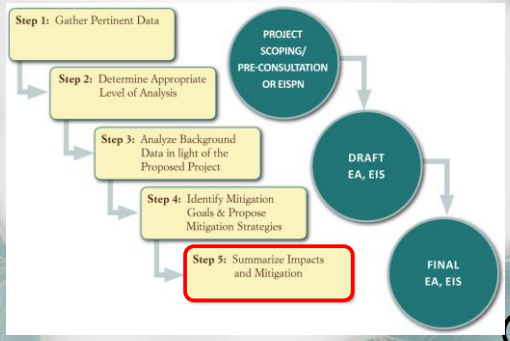
Step 5: Summarize impacts & mitigation applicable to project

Objective: Documentation of impacts, mitigation measures and their projected results.

Methodology: The Draft EA or EIS should summarize all anticipated impacts as described in HAR §200-11(I.) as well as proposed mitigation strategy as described in HAR §200-11(M.)

5

Where does this step fit in?



5

Reviewer's Checklist Exercise

- Using the Reviewer's Checklist in Appendix C, analyze the provided example for completeness.

Conclusion

Time for questions or comments

MAHALO!

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