

# Stormwater Impact Assessments

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

## TRAINING

May 23, 2013  
Honolulu

Presented by



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## 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

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## 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)

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### Question 1

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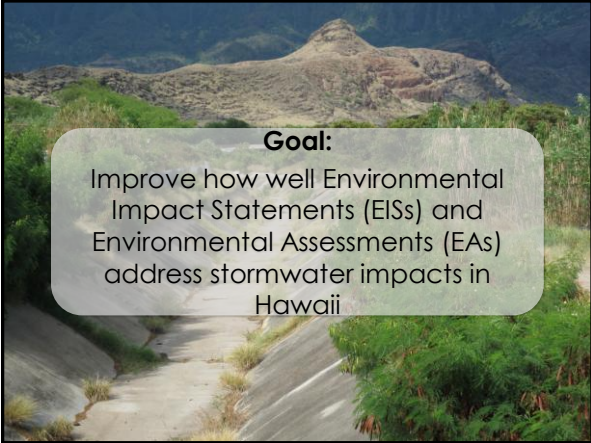
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**Goal:**  
 Improve how well Environmental Impact Statements (EISs) and Environmental Assessments (EAs) address stormwater impacts in Hawaii

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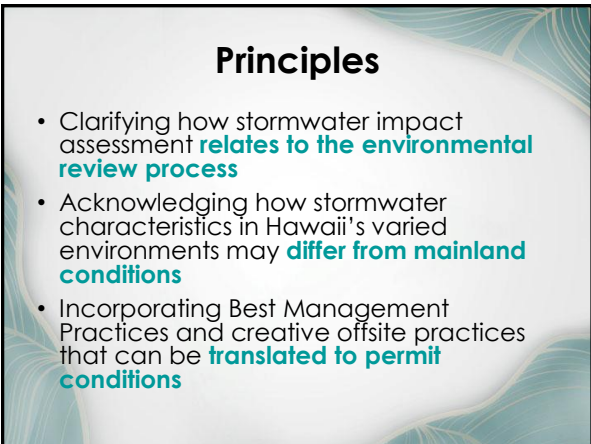
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### Principles

- 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**

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## 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

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## 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**




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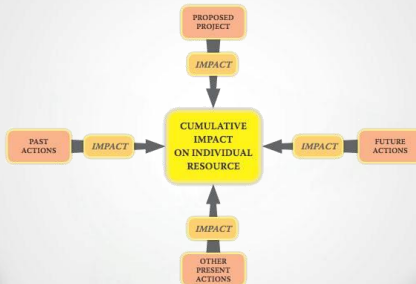
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## Cumulative Impacts




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Question 2

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**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)



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**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

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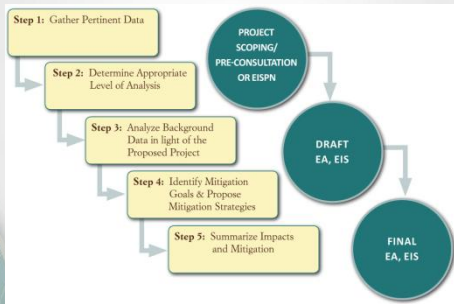
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### Where does this framework fit in to the EIS process?




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### 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

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### 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.

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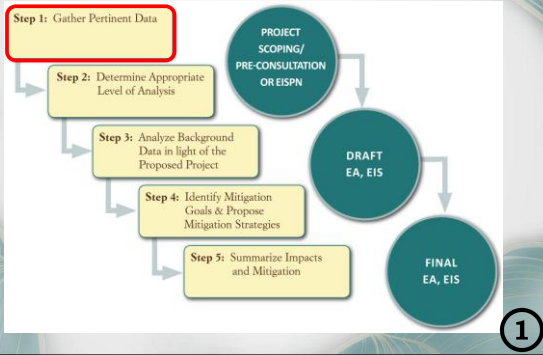
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## Where does this step fit in?




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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”)

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## 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 type(s); hydrological soil group(s); presence of soils categorized by NRCS as highly erodible	Soil type(s); hydrological soil 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
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 infrastructure	
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)

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## What are the potential sources of water pollutants?

Site	Watershed
Existing and proposed land uses Soil(s) type(s); hydrological soil group(s); presence of soils categorized by NRCS as highly erodible	Existing and proposed land uses Soil(s) type(s); hydrological soil 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

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## How resilient are the down gradient resources to pollutants?

### Potentially Impacted Resources

Site/Watershed	Potential Resources
Aquatic resources	Native fish ('o'opu, 'ama'ama); mollusks (hihawai, hapawai, 'opih), 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 'auwai 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

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## 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 Hawaii Department of Transportation)
Is the site subject to City and County of Honolulu stormwater LD 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 Hawaii Department of Health, Clean Water Branch
Will the action be subject to a County Grading Permit?	County Governments
How is 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)

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### 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

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### 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




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## 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




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## 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




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## 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**.

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## 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	✓	

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## 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

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




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## 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

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## Standards for Stormwater Quality

### Water Quality Criteria – Infeasibility Criteria

Exemption Criteria	Difficulties	Highly Difficult	Very Difficult	Very Difficult	Very Difficult	Very Difficult	Very Difficult	Very Difficult	Very Difficult
Soils beneath basin invert have measured infiltration rates less than 1/2 inch	*	*	*	*	*	*	*	*	*
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 pollutants/chemical spills	*	*	*	*	*	*	*	*	*
Site is up gradient of openwater stream (i.e. habitat type change down stream)	*	*	*	*	*	*	*	*	*
Site is up gradient of known shallow karstlike open 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 15 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-gradient 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	*	*	*	*	*	*	*	*	*
Facilities would disturb riparian 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	*	*	*	*	*	*	*	*	*

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## Standards for Stormwater Quality

### Water Quality Criteria – Infeasibility Criteria

Exemption Criteria	Regional	Forest Road	Backyard	Development	Highway	Public Works	Flow Lines	Flow Lines
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 riparian or other archeological 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 mowing/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	*	*	*	*	*	*	*	*

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# EXERCISE – STEP 1

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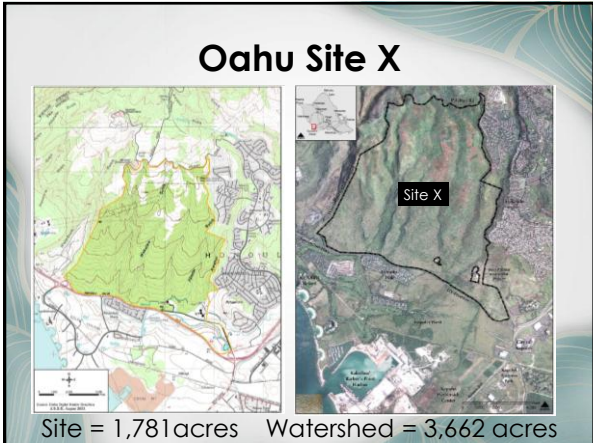
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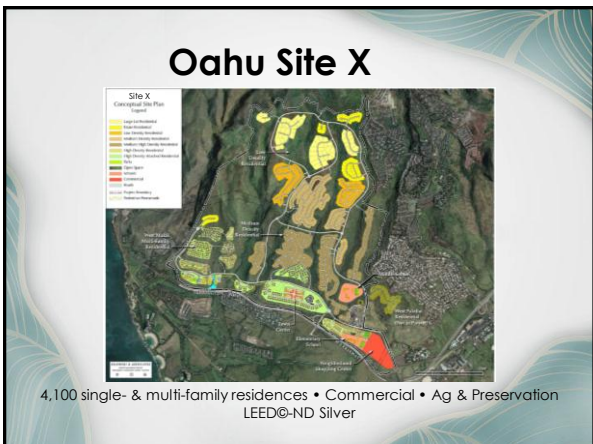
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**Step 1 – Hydrology**  
*How much & where does the water flow?*



**Existing land use/cover:**

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**Step 1 – Hydrology**  
*How much & where does the water flow?*



**Soil type:**

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**Step 1 – Hydrology**  
*How much & where does the water flow?*



**Drainage pattern:**

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**Step 1 – Hydrology**  
*How much & where does the water flow?*



**Wetlands or embayments?**

**Receiving waterbodies:**

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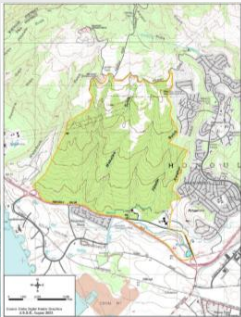
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**Step 1 – Hydrology**  
*How much & where does the water flow?*



**Slope & topography:**

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**Step 1 – Hydrology**  
*How much & where does the water flow?*



**Flooding hazard:**

**Annual rainfall and seasonal distribution:**

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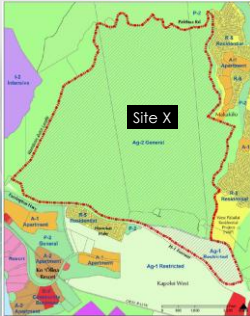
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### Step 1 – Hydrology

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

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### 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

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### Step 1 – Sensitivity

How resilient are down gradient resources to pollutants?



**Potentially impacted resources:**

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## Step 1 – Sensitivity

How resilient are down gradient resources to pollutants?



**Management considerations:**

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## 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

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## 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?

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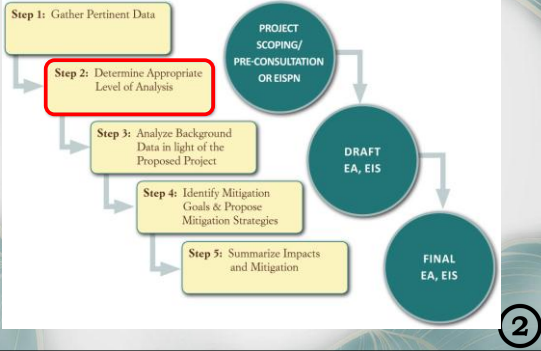
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## Where does this step fit in?



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## Analysis Considerations



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## EXERCISE – STEP 2

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### 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?

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### 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?

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### 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?

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### 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)?

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### 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)?

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### 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?

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### 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

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### 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

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### 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

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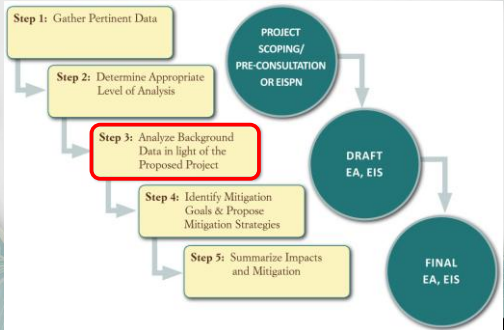
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## Where does this step fit in?



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## Step 3a: Primary impacts

**Objective:** Discuss impacts & proposed mitigation during construction.

Discuss anticipated direct impacts from the proposed action



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## Step 3a: Primary impacts

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



Image source: www.bluewaterballroom.org

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### 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

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### 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.



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Question 3

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### 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

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### 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



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### Step 3c: Cumulative impacts

**Methodology:** Watershed modeling for unique circumstances

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

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## EXERCISE – STEP 3

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- ### 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

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### 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.



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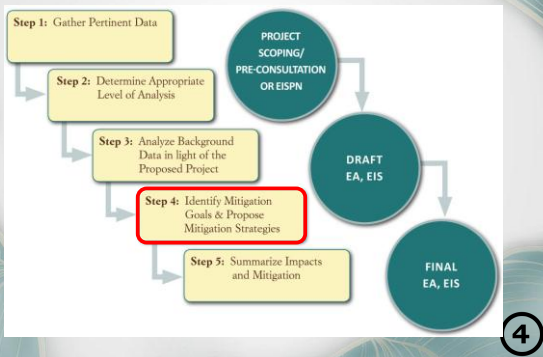
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## Where does this step fit in?



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## 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!*

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## Identify mitigation goals

### Mitigation performance criteria

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

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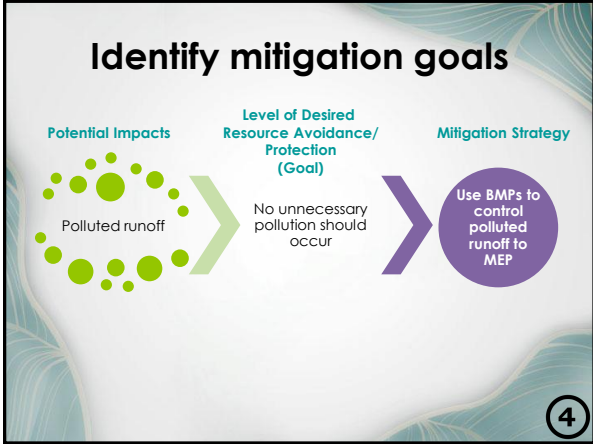
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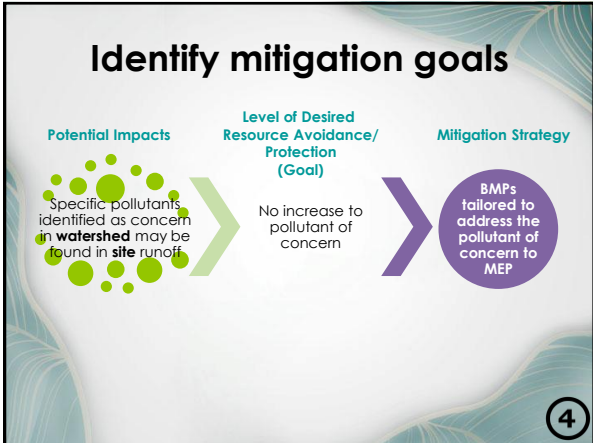
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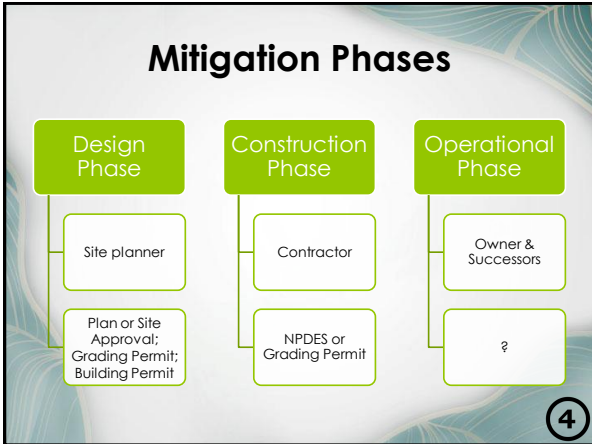
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Question 4

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### BMP Strategy Considerations

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



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## EXERCISE – STEP 4

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- ### 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

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### 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.)

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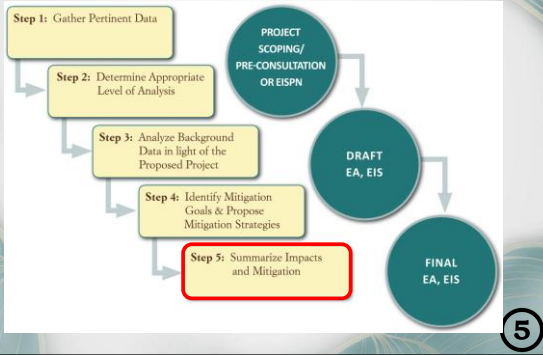
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## Where does this step fit in?



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## Reviewer's Checklist Exercise

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

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## Conclusion

Time for questions or comments

MAHALO!

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The Guidance Document and Training  
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Coastal Zone Management Program by:



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