CHAPTER 4: HYDROGRAPHY

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Theme Description:

A hydrography dataset refers to several data layers that map hydrologic features and locations of hydrologic data sampling sites, as well as linked attribute databases. Through various federal and state programs there is a growing need to study the environment by way of a holistic approach. To this end, the proposed Hawai`i hydrography dataset will integrate surface-water, ground-water and water-quality spatial and attribute data in a watershed framework.

The National Hydrography Dataset (NHD) provides the framework for the surface-water part of the hydrography dataset. The NHD combines digital spatial data for surface water features such as rivers, streams, ponds and springs with river-reach information that allows analysis and display of water-related data in a stream segment order, from headwaters to watershed outlet. This NHD framework supports the linkage of additional databases maintained by various government agencies in Hawai`i.

In addition to surface-water features, there are several other hydrologic data layers that address ground-water features such as ground-water development wells, ground-water monitoring sites, and aquifer system boundaries.

The third aspect of the integrated hydrography dataset addresses both surface- and ground-water quality through the mapping of data collection sites and establishing links with water-quality databases.

A final aspect of the hydrography dataset will support the study of crosscutting issues of a regulatory nature such as zoning and habitat protection, through the delineation of wetlands. The Hawai`i integrated hydrography dataset will support federal, state and county government programs.

Status:

Table B

Theme	Source	Standards	Status
Hydrologic Unit Boundari (watershed 5th level and subwatershed 6th level)	USDA Natural Resources Conservation Service	National Map Accuracy Standards for 1:24,000 scale maps	Complete
National Hydrography Dataset	U.S. Geological Survey	National Map Accuracy Standards for 1:24,000 scale maps	Complete

Wells	State of Hawai`i Commission on Water Resource Management (CWRM)	Locations by GPS and/or generated from latitude and longitude from 1:24,000 scale maps	Complete, continuously updated by CWRM
Aquifer system boundaries – administrative	State of Hawai`i Commission on Water Resource Management	digitized from maps of various scales exceeding 1:24,000	Complete
Aquifer system boundaries – water resource protection	State of Hawai`i Department of Health	National Map Accuracy Standards for 1:24,000 scale maps	Complete
Drainage basin areas for stream gauging stations	U.S. Geological Survey	National Map Accuracy Standards for 1:24,000 scale maps	Complete for Kauai, unknown for remainder of State
Wetland delineation	National Wetlands Inventory U.S. Fish and Wildlife	National Map Accuracy Standards for 1:24,000 scale maps	Complete
Attribute databases:			
Surface-water diversion database: Point layer of withdrawal locations and database of withdrawal volumes	State of Hawai`i Commission on Water Resource Management	Database to be linked to watershed and National Hydrography Dataset themes	Withdrawal volumes, approximately 20% verified Database linkage 0% complete
Aquatic survey database Survey locations by stream segment Database of biologic information and habitat conditions	State of Hawai`i Department of Land and Natural Resources, Aquatic Resources Division	Database to be linked to watershed and National Hydrography Dataset themes	Database linkage 0% complete
Stream discharge measurements	U.S. Geological Survey http://waterdata.usgs.gov/HI/nwis	Stream discharge data to be linked to watershed and National Hydrography Dataset themes	Database linkage 0% complete
Drinking water quality database	State of Hawai`i Department of Health and City and County of Honolulu Board of Water Supply	Database to be linked to watershed and wells themes	Database linkage 0% complete
Stream water quality data	U.S. Geological Survey http://waterdata.usgs.gov/HI/nwis	Stream water quality data to be linked to watershed and National Hydrography Dataset themes	Database linkage 0% complete
Ground-water quality data	U.S. Geological Survey http://waterdata.usgs.gov/HI/nwis City and County of Honolulu Board of Water Supply	Ground-water quality data to be linked to watershed and wells themes	Database linkage 0% complete

	Maui County Department of Water Supply Hawai`i County Department of Water Supply Kauai County Department of Water Supply		
Ground-water quality data	EPA STORET http://www.epa.gov/STORET/dbtop.htm/	Ground-water quality data to be linked to watershed and wells themes	Database linkage 0% complete

Data Source:

There are multiple sources for the proposed Hawai`i integrated hydrography dataset as listed by theme in above. Most datasets are publicly available except where noted below.

Theme	Source	Contact	Remarks
Hydrologic Unit Boundaries	USDA Natural Resources Conservation Service	Patricia Shade (808) 541-2600 x120	In review for publication approval
National Hydrography Dataset (NHD)	U.S. Geological Survey	http://nhd.usgs.gov/index.html	
Wells	State of Hawai`i Commission on Water Resource Management (CWRM)	(808) 587-0265	For homeland security, data not available on-line
Aquifer system boundaries-administrative	State of Hawai`i Commission on Water Resource Management (CWRM)	http://www.state.hi.us/dbedt/gis/dlnraq.htm	
Aquifer system boundaries	State of Hawai`i Department of Health	(808) 586-4258	
Drainage areas for stream-gaging stations	U.S. Geological Survey	(808) 587-2400	
Wetland delineations	U.S. Fish and Wildlife, National Wetlands Inventory	http://www.state.hi.us/dbedt/gis/wetlnds.htm	
Surface-water diversion database: Point layer of withdrawal locations and database of withdrawal volumes	State of Hawai`i Commission on Water Resource Management	(808) 587-0265	
Aquatic survey	State of Hawai`i Department of Land	(808) 587-0100	

database Survey locations by stream segment Database of biologic information and habitat conditions	and Natural Resources, Aquatic Resources Division		
Stream discharge measurements	U.S. Geological Survey http://waterdata.usgs.gov/HI/nwis	(808) 587-2400	
Drinking water quality database	State of Hawai`i Department of Health and City and County of Honolulu Board of Water Supply Maui County Department of Water Supply Hawai`i County Department of Water Supply Kauai County Department of Water Supply	(808) 586-4258 (808) 527-6124 (808) 270-7550 (808) 961-8670 (808) 245-5446	
Stream water quality data	U.S. Geological Survey	(808) 587-2400	
Ground-water quality data	U.S. Geological Survey City and County of Honolulu Board of Water Supply Maui County Department of Water Supply Hawai`i County Department of Water Supply Kauai County Department of Water Supply EPA STORET	(808) 587-2400 (808) 527-6124 (808) 270-7550 (808) 961-8670 (808) 245-5446 http://www.epa.gov/STORET/dbtop.htm/	

Standards:

The key base data layers were developed following National Map Accuracy Standards for 1:24,000 scale maps (http://mapping.usgs.gov/standards/).

The two standards for the National Hydrography Dataset will be applicable to the Hydrography theme. These standards are described in "USGS Technical Instructions for the National Hydrography Dataset-High Resolution,", November 1997, and the "USGS National Mapping Program Technical Instructions: Standards for National Hydrography Dataset" July 1999.

Stream naming conventions will follow those reported in Geographical Names Information System (GNIS) (http://geonames.usgs.gov/).

Hydrologic unit naming conventions will follow those outlined in the Federal Geographic Data Committee (FGDC) proposal, version 1.0, March 1, 2002 Federal Standards for Delineation of Hydrologic Unit Boundaries (http://www.fgdc.gov/standards/status/huc.html).

Priority:

The first task is to create a current and representative dataset by validating the attribute coding of stream and ditch segments in the National Hydrography Dataset (http://nhd.usgs.gov/index.html). As remnants of plantation agriculture, many ditches are in a state of disrepair and/or abandoned. Thus, an attribute code to reflect ditch condition should be added.

The second task is to continue updating/validating the National Wetland Inventory layer. Because wetland determinations require the skills of soil scientists, biologists and hydrologists, this is a major undertaking that will require cooperation between the United States Fish and Wildlife Service (USFWS) and the Natural Resources Conservation Service (NRCS) to guide the project. Currently, (FY03), the USFWS is updating the wetlands mapping on the island of Oahu. This effort required site visits by a coordinated team of scientists from USFWS, NRCS and several State agencies. Recently there have been new wetland determinations on military lands that may be incorporated into the updated wetland layer. The availability of these military area determinations is not known at this time, but they would substantially lessen the workload.

The third task is to determine the methodology for linking all the attribute databases to the hydrography theme. The Commission on Water Resource Management is currently developing methods to link the aquatic survey and streamflow diversion databases to a watershed theme. Much of the water-quality data maintained by USGS as well as the Environmental Protection Agency‘s Storage and Retrieval database (STORET - http://www.epa.gov/storet/) data are available on-line. The State of Hawai`i Department of Health (DOH) and the counties’ Department of Water Supply also maintain water-quality data. It is likely that a contract through the private sector will have to be implemented to compile these water-quality data from the various agencies, and to download data that are available on-line, and then link these data to the hydrography theme.

Estimated total investment in this theme:

TBD

Estimated current state and local contributions:

TBD

What is needed:

There are three major tasks to complete the integrated hydrography dataset.
1) Validate and code additional attributes for stream and ditch segments
2) Update the National Wetland Inventory mapping for the islands of Niihau, Kauai, Molokai, Maui, Kahoolawe, Lanai and Hawai`i
3) Link water-quality data to well and stream segments and to watershed attributes

Task 1 can be contracted through the private sector, to be accomplished in the first year. The activities would include:
- reviewing all line segments in the NHD dataset for attribute accuracy regarding ditch or stream coding and editing as necessary and
- researching the current condition and use of all ditch segments and coding attributes.

Task 2 will require heads-up digitizing from image analysis and on-site visits to delineate wetland areas. The timeline estimated to accomplish these tasks for Niihau, Kauai, Molokai, Lanai, Kahoolawe, Maui and Hawai`i is 3 years.

Task 3 can be contracted through the private sector, to be accomplished in the first year. The activities include:
- compiling water-quality data from various State and County agencies,
- downloading water-quality data from various on-line sites and
- developing a method to link these data to the hydrography dataset.

What is the likely source:

The Hawai`i Water Resources Division of USGS could accomplish task 1 as part of their water resources data collection program that is cooperatively funded by the State of Hawai`i Commission on Water Resource Management.

The FWS and NRCS Hawaii cooperatively fund the work to accomplish task 2. FWS would provide all digitizing map services, and NRCS Hawaii can provide color infrared ortho-rectified quarter quadrangle imagery. NRCS also can provide scanning, ortho-rectifying, and mosaics of older photography where current, digital imagery are not available. Scientists from both agencies can collaborate during site visits.

The work to accomplish task 3 could be contracted through the private sector funded by the agencies currently maintaining these data including the State of Hawai`i Department of Health, the U.S. Geological Survey and the County Departments of Water Supply.

Total investments needed to complete this theme:
The estimated total investment to complete this theme is $467,500**.**

Estimated current allocation of funding:
The State Commission on Water Resource Management is currently working on linking the aquatic survey and streamflow diversion databases to attributes in a watershed theme. This contribution can be estimated at $100,000 of in-kind services. U.S. Fish and

Wildlife is updating the National Wetland Inventory dataset for the island of Oahu in FY03. FWS is funding this work at a cost of approximately $37,500.

Estimated budget shortfall:

$330,000
Task 1 can be completed for a cost of $10,000.
Task 2 can be completed for a cost of $245,000
Task 3 can be completed for a cost of $75,000

Possible ways to overcome this gap:

For task 1 it is possible that in FY04 the USGS Hawai`i and the State of Hawai`i Commission on Water Resource Management could cooperatively fund the effort as part of their water-resource data collection program.

For task 2, the FWS currently has funding mechanisms in place for wetland mapping. By NRCS cooperatively supplying digital imagery, scanning and ortho-rectification services, and on-site scientific collaboration, the FWS Hawai`i wetland mapping project can more successfully compete for internal FWS funds. By competing for funding each year to update 1 county at a time, it is estimated completion costs are:

Kauai County - $32,500
Maui County - $65,000
Hawai`i County - $147,500

It is estimated that $75,000 will be needed to fund the linking and continuous update of linked attribute databases in the first year by a private contractor. After the methodology is established, it is assumed that agencies providing the attribute data would, as part of their data collection programs, include the continuous updating of the integrated hydrography theme. Perhaps the Hawai`i Geographic Information Coordinating Council (HIGICC) can write a grant proposal to raise these funds.

Most appropriate data steward:

The State of Hawai`i Commission on Water Resource Management

Maintenance Process:

The maintenance costs and update frequencies have not been determined. However, once the process of linking updated attribute data has been programmed, the effort by each data steward would be minimal to maintain the hydrography dataset.

Estimated Maintenance Costs:

TBD