



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
**COMMISSION ON WATER RESOURCE MANAGEMENT**  
P.O. BOX 621  
HONOLULU, HAWAII 96809

STAFF SUBMITTAL

For the meeting of the  
COMMISSION ON WATER RESOURCE MANAGEMENT

December 16, 2009  
Paia, Maui

Petitions to Amend the Interim Instream Flow Standards  
For the Surface Water Hydrologic Units of  
Waikamoi (6047), Puohokamoa (6048), Haipuaena (6049), Punalau (6050),  
Honomanu (6051), Nuaailua (6052), Ohia (6054), West Wailuaiki (6057),  
East Wailuaiki (6058), Kopiliula (6059), Waiohue (6060), Paakea (6061),  
Waiaka (6062), Kapaula (6063), Hanawi (6064), and Makapipi (6065), Maui

PETITIONER:

Na Moku Aupuni O Koolau Hui  
c/o Native Hawaiian Legal Corp.  
1164 Bishop Street  
Honolulu, HI 96813

LOCATION MAP: See Figure 1

SUMMARY OF REQUEST:

Staff is requesting that the Commission consider the recommendations for 19 Petitions to Amend the Interim Instream Flow Standards (Interim IFS) for streams contained within the following 16 surface water hydrologic units in the region of east Maui (See Figure 1).

WAIKAMOI (6047): Waikamoi Stream, Alo Stream, and Wahinepee Stream  
PUOHOKAMOA (6048): Puohokamoa Stream  
HAIPUAENA (6049): Haipuaena Stream  
PUNALAU (6050): Punalau Stream and Kolea Stream  
HONOMANU (6051): Honomanu Stream  
NUAAILUA (6052): Nuaailua Stream  
OHIA (6054): Ohia (Waianu) Stream  
WEST WAILUAIKI (6057): West Wailuaiki Stream

EAST WAILUAIKI (6058): East Wailuaiki Stream  
KOPILIULA (6059): Kopiliula Stream and Puakaa Stream  
WAIOHUE (6060): Waiohue Stream  
PAAKEA (6061): Paakea Stream  
WAIAAKA (6062): Waiaaka Stream  
KAPAUULA (6063): Kapaula Stream  
HANAWI (6064): Hanawi Stream  
MAKAPIPI (6065): Makapipi Stream

## BACKGROUND:

On May 24, 2001, Native Hawaiian Legal Corporation (NHLC), on behalf of Na Moku Aupuni O Koolau Hui (Na Moku), Beatrice Kepani Kekahuna, Marjorie Wallett, and Elizabeth Lehua Lapenia<sup>1</sup>, filed 27 Petitions to Amend the Interim Instream Flow Standards for 27 East Maui streams.

On July 23, 2001, NHLC met with Commission staff to discuss the handling of the 27 petitions. Agreement was reached that efforts would focus on Honopou, Hanehoi, Waiokamilo, Kualani, Piinaau, Palauhulu, and Wailuanui Streams. Subsequent efforts by the Commission to adopt surface water hydrologic units for the purpose of improving surface water resource management resulted in the grouping of the eight petitioned streams into five hydrologic units. The State Water Code (Code), Chapter 174C, Hawaii Revised Statutes (HRS), provides that the Commission may adopt interim IFS on a stream-by-stream basis or a general IFS applicable to all streams within a specified area. This submittal seeks to address the remaining 19 petitions, grouped into 16 hydrologic units, as petitioned by NHLC.

The current interim instream flow standard (interim IFS) for the streams being considered were established by way of Hawaii Administrative Rules (HAR) §13-169-44, which, in pertinent part, reads as follows:

Interim instream flow standard for East Maui. The Interim Instream Flow Standard for all streams on East Maui, as adopted by the commission on water resource management on June 15, 1988, shall be that amount of water flowing in each stream on the effective date of this standard, and as that flow may naturally vary throughout the year and from year to year without further amounts of water being diverted offstream through new or expanded diversions, and under the stream conditions existing on the effective date of the standard.

The current interim IFS became effective on October 8, 1988. Thus, the status quo interim IFS, in effect, grandfathered all existing diversions that were registered with the Commission in subsequent years. Following the initial registration of stream diversions works, any new or modified stream diversion works structure requires a permit for construction.

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<sup>1</sup> The Commission was notified by letter on May 10, 2007, that NHLC “no longer represent Ms. Lapenia and are, therefore, no longer authorized to advance the claim with respect to the parcel identified as TMK: 2-9-008:31 or LCAw-S-1 Claimant: Nao on her behalf.”

Under the Code, the Commission has the responsibility of establishing IFS on a stream-by-stream basis whenever necessary to protect the public interest in the waters of the State. In the Waiahole Ditch Contested Case Decision and Order (Waiahole), the Hawaii Supreme Court emphasized that “instream flow standards serve as the primary mechanism by which the Commission is to discharge its duty to protect and promote the entire range of public trust purposes dependent upon instream flows.”

The Code defines an instream flow standard as a “quantity or flow of water or depth of water which is required to be present at a specific location in a stream system at certain specified times of the year to protect fishery, wildlife, recreational, aesthetic, scenic, and other beneficial instream uses. In considering a petition to amend an interim instream flow standard, the Code directs the Commission to “weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes, including the economic impact of restricting such uses.”

“Instream use” means beneficial uses of stream water for significant purposes which are located in the stream and which are achieved by leaving the water in the stream. Instream uses include, but are not limited to:

- 1) Maintenance of fish and wildlife habitats;
- 2) Outdoor recreational activities;
- 3) Maintenance of ecosystems such as estuaries, wetlands, and stream vegetation;
- 4) Aesthetic values such as waterfalls and scenic waterways;
- 5) Navigation;
- 6) Instream hydropower generation;
- 7) Maintenance of water quality;
- 8) The conveyance of irrigation and domestic water supplies to downstream points of diversion; and
- 9) The protection of traditional and customary Hawaiian rights.

“Noninstream use” means the use of stream water that is diverted or removed from its stream channel and includes the use of stream water outside of the channel for domestic, agricultural, and industrial purposes.

Over the past several years, starting with the establishment of the Stream Protection and Management Branch in July 2002, the Commission has been developing a framework for setting measurable instream flow standards statewide.

On December 13, 2006, the Commission authorized staff to initiate and conduct public fact gathering to solicit more information than what the Code requires for the setting of an interim IFS. Under this adopted process, staff conducts a preliminary inventory of best available information upon receipt of a petition to amend an existing interim IFS. Staff then seeks agency review and comments on the compiled information (compiled in an Instream Flow Standard Assessment Report) in conjunction with issuing a public notice for a public fact gathering meeting. Shortly thereafter (generally within 30 days), staff conducts a public fact gathering meeting in, or near, the hydrologic unit of interest. The Commission staff first employed the

adopted process in assessing the first five petitioned hydrologic units of Honopou, Hanehoi, Piinaau, Waiokamilo, and Wailuanui.

On September 25, 2008, the Commission approved, with amendments, the recommendations to amend the interim IFS for the five surface water hydrologic units (See Table 1). The Commission also approved a number of adaptive management strategies, general and unit-specific in nature, which would guide the staff and the public in the implementation, monitoring, and evaluation of the newly established standards.

**Table 1.** Interim IFS values approved by the Commission on September 25, 2009 for the first five petitioned east Maui surface water hydrologic units.

[cfs = cubic feet per second; mgd = million gallons per day]

Hydrologic Unit	Interim IFS Site	Decision
Honopou (6034)	Honopou Site A	2.00 cfs (1.29 mgd)
	Honopou Site B	0.72 cfs (0.47 mgd)
Hanehoi (6037)	Huelo Site A	0.89 cfs (0.57 mgd)
	Hanehoi Site B	0.63 cfs (0.41 mgd)
	Hanehoi Site C	1.15 cfs (0.74 mgd)
Piinaau (6053)	Piinaau Site A	Status quo
	Palauhulu Site B	5.50 cfs (3.56 mgd)
Waiokamilo (6055)	Waiokamilo Site A	4.9 cfs (3.17 mgd)
	Kualani Site B	Status quo
Wailuanui (6056)	Wailuanui Site A	3.05 cfs (1.97 mgd)

Immediately following the Commission's decision, and over the course of the last year, the Commission staff has initiated the implementation, monitoring, and evaluation of the approved adaptive management strategies. Table 2 provides a summary of implementation actions, by date, completed by Commission staff.

**Table 2.** Summary of implementation actions, by date, taken by Commission staff on the five surface water hydrologic units of Honopou, Hanehoi, Piinaau, Waiokamilo, and Wailuanui.

Date	Description
Oct. 23-24, 2008	East Maui Site Visit, Trip 1 – Accompanied by USGS staff from Maui, the Commission staff selected acceptable sites for stream measurements. Staff also conducted a community meeting at Haiku Community Center to outreach to Honopou and Hanehoi residents on the Commission actions and implementation plans.
Oct. 27-29, 2008	East Maui Site Visit, Trip 2 – Commission staff conducted a 3-day site visit of east Maui and completed interim actions at Honopou, Hanehoi, and Puolua, and conducted multiple interim IFS site flow measurements.
Nov. 17-19, 2008	East Maui Site Visit, Trip 3 – Commission staff conducted a 3-day site visit of east Maui and completed investigations at Lakini taro patch and Kualani Stream, interim actions at Palauhulu, and multiple interim IFS site flow measurements.
Dec. 2, 2008	Commission staff met with staff from the USGS to discuss streamflow monitoring options at the interim IFS sites.

Table 2. Continued. Summary of implementation actions, by date, taken by Commission staff.

Date	Description
Dec. 3, 2008	Commission staff met with representatives from Hawaiian Commercial & Sugar (HC&S), East Maui Irrigation Company (EMI), and the Army Corp of Engineers (COE) to discuss the design of a low-flow bypass channel, and the COE permit requirements regarding diversion structure alterations and performing work in the stream channel.
Dec. 4, 2008	Commission staff met with representatives from the State Department of Agriculture, Hawaii Farm Bureau Federation, Office of Planning, and Department of Business, Economic Development and Tourism to discuss the relationship between the Public Trust Doctrine and the State Water Code, as well as the Interim IFS process.
Dec. 8-10, 2008	East Maui Site Visit, Trip 4 – Commission staff conducted a 3-day site visit of east Maui and completed investigations of Kualani Stream in the upper reaches, Waiokamilo Stream at Koolau Ditch, Kaleiomaui tributary and Piinaau Stream, interim actions at Wailuanui, and multiple interim IFS site flow measurements.
Dec. 12, 2008	Commission staff briefed the Board of Land and Natural Resources on the Commission's September 2008 decision and implementation actions to date.
Dec. 17, 2008	Staff briefed the Commission on implementation actions to date.
Jan. 20, 2009	Commission staff met with representatives from the State Department of Agriculture, Maui County Department of Water Supply, and Maui County Farm Bureau. Staff provided a brief overview of the interim IFS process, and a summary of the Commission's action on the 5 priority hydrologic units in September 2008. Staff also discussed the additional data that is necessary to help staff in determining the interim IFS for the remaining 19 petitioned east Maui streams.
Feb. 2, 2009	Commission staff met with USGS staff to discuss the proposed work for monitoring streamflow at the interim IFS sites in east Maui.
Feb. 9-11, 2009	East Maui Site Visit, Trip 5 – Commission staff conducted a 3-day site visit of east Maui and completed investigations of Wailua Valley and Na Moku project taro patches, the terminal waterfall, diversion dams, and middle reaches of Waiokamilo Stream, Keanae Arboretum on Piinaau Stream, interim action at Haiku Ditch on Hanehoi Stream, and multiple interim IFS site flow measurements.
Mar. 18, 2009	The Commission approved to enter into a joint funding agreement between the Commission and USGS to undertake gage installation, rating development and operation and maintenance activities at five priority stream sites in east Maui, including Honopou (2), Hanehoi (1), Palauhulu (1), and Wailuanui (1). The Commission also authorized the Chairperson to enter into subsequent agreements with USGS for similar activities at up to 10 new stream sites in east Maui (Phase II). Staff provided a quarterly update to the Commission.
Mar. 23, 2009	East Maui Site Visit, Trip 6 – Commission staff conducted a 1-day site visit to observe and document the installation of a low-flow bypass channel by EMI across their Haiku Ditch intake on Honopou Stream.

Table 2. Continued. Summary of implementation actions, by date, taken by Commission staff.

Date	Description
Apr. 6-8, 2009	East Maui Site Visit, Trip 7 – Commission staff conducted a 3-day site visit of water users in central Maui, including: Kula Agricultural Park operated by the Maui County Office of Economic Development and serviced by the Maui Department of Water Supply (Maui DWS); Maui DWS water treatment plants at Olinda, Piiholo, and Kamole; and, HC&S mill operations, sugar processing, field operations, drip irrigation system, and hydroelectric facilities.
Jun. 1, 2009	Commission staff began receiving responses to data needs request from Maui DWS, HC&S, and Maui County Farm Bureau through September 2009. This data is provided as part of the Compilation of Data Submissions (PR-2009-17).
Jun. 10, 2009	The Commission entered into joint funding agreement between the Commission and USGS to undertake gage installation, rating development and operation and maintenance activities at 10 additional stream sites in east Maui. The USGS will continue rating development at the five priority stream sites.
Jun. 22, 2009	At the request of the Maui County Farm Bureau, the Commission staff attended a community meeting at the Hannibal Tavares Center and presented an overview of the interim IFS process. Staff also provided a summary of the Commission's action on the 5 priority hydrologic units in September 2008 and what the staff has done to follow up on the Commission's decision as well as the status of the process for the remaining 19 petitioned streams. The meeting concluded with a question and answer session with the farming community to ensure that future decisions are based on best available information. About 60 people attended the meeting.
Jul. 20-22, 2009	Commission staff accompanied USGS on the first two days of the field visit to install staff gages and take flow measurements at the interim IFS sites on Honopou and Wailuanui Streams.
Sep. 22-24, 2009	USGS installed the remaining staff gages at the interim IFS sites on Hanehoi and Palauhulu Streams, and took flow measurements at all gage sites. Commission staff accompanied USGS on September 23, 2009 to the Hanehoi site.

Table 3 highlights some of the more significant events that took place for each of the five hydrologic units during the Commission staff field investigations from October 2008 to September 2009.

Table 3. Summary of implementation actions for the five surface water hydrologic units of Honopou, Hanehoi, Piinaau, Waiokamilo, and Wailuanui.

Hydrologic Unit	Description
Honopou	<p>In October of 2008, Commission staff requested the help of USGS to select suitable locations for the measurement and monitoring of the recommended interim IFS on Honopou Stream. Two sites were selected on Honopou Stream and both are below EMI's Haiku Ditch. Within the same month, interim actions to release flow downstream took place at the Haiku Ditch and Lowrie Side Ditch on Honopou Stream. At the Haiku Ditch, a berm was build on the mauka side of the ditch structure to raise the water level (pressure head), allowing more water to push through the three existing bypass pipes located on the right bank. The Lowrie Side Ditch bypass sluice gate was opened to a height of 14 inches.</p> <p>In March of 2009, EMI installed a low-flow bypass channel on the Haiku Ditch at Honopou Stream as a temporary means to release more flow to the downstream users. In July 2009, USGS installed a staff gage at both interim IFS sites. USGS is currently taking more streamflow measurements to develop a rating curve for each site.</p>

Table 3. Continued. Summary of implementation actions for the five surface water hydrologic units.

Hydrologic Unit	Description
Hanehoi	In October of 2008, Commission staff and USGS selected suitable locations for the measurement and monitoring of the recommended interim IFS on Hanehoi and Huelo (Puolua) Streams. Two sites were selected on Hanehoi Stream, one upstream of the Lowrie Ditch above the Huelo community intake and another site was selected below the Haiku Ditch. One site was selected below the Haiku Ditch on Huelo (Puolua) Stream. Within the same month, the Haiku Ditch bypass sluice gates at both streams were opened to release flow to the downstream users. Both gate openings were adjusted in February of 2009 to allow EMI to capture the high flow but release all low flows. In September 2009, USGS installed a staff gage at the interim IFS site above Lowrie Ditch on Hanehoi Stream (Site C). USGS is currently taking more streamflow measurements to develop a rating curve for this site.
Piinaau	In October of 2008, Commission staff and USGS selected suitable locations for the measurement and monitoring of the recommended interim IFS on Palauhulu Stream. One site was selected immediately upstream from Hana Highway that is easily accessible. In November, an interim action took place at the Koolau Ditch bypass sluice gate at Kano Stream to release flow downstream. Subsequent streamflow measurements did not show an increase in flow at the interim IFS location. In December, Commission staff viewed and verified that all major and minor diversions on Piinaau Stream were not in operation. Staff also located Kaleomai Stream, a tributary of Palauhulu Stream, and verified that it was not being diverted. In July of 2009, USGS installed a staff gage at the interim IFS site (Site B) on Palauhulu Stream. USGS is currently taking more streamflow measurements to develop a rating curve for this site.
Waiokamilo	In November and December of 2008, Commission staff located Kualani Stream from its headwaters to the Lakini taro patch diversion near Wailoa Road. Staff also visited and verified the major and minor diversions on Waiokamilo Stream were not in operation. In February of 2009, staff visited the losing sections of the stream, the terminal waterfall, and the stream mouth. The losing reaches as well as the blockage upstream of dam 3 have prevented at least half of the flow from reaching the downstream users.
Wailuanui	In October of 2008, Commission staff and USGS selected suitable locations for the measurement and monitoring of the recommended interim IFS on Wailuanui Stream. One site was selected below the Hana Highway that was easily accessible. In December, an interim action took place at the Koolau Ditch bypass sluice gates at West and East Wailuanui Streams to release flow downstream. Based on the flow measurements taken before and after the release, streamflow did not show any significant changes. However, the most recent flow measurement conducted by USGS recorded a flow of 5.9 cubic feet per second. Therefore, the interim IFS of 3.05 cubic feet per second has been achieved. In February of 2009, Commission staff visited and mapped the Wailua Valley taro patches. During the field investigation, the intake to the taro loi was cleared and as a result, flow in the auwai increased significantly. This event demonstrated the importance of auwai maintenance and intake in maximizing water flow to the taro loi. In July of 2009, USGS installed a staff gage at the interim IFS site on Wailuanui Stream. USGS is currently taking more streamflow measurements to develop a rating curve for this site.

On September 23, 2009, the Commission issued a Notice of Public Fact Gathering Meeting to open the public review period for the remaining 16 surface water hydrologic units in east Maui and released the public review drafts for the 16 Instream Flow Standard Assessment Reports (IFSAR). A press release to notice the public fact gathering meeting scheduled for October 15, 2009 at the Paia Community Center was also issued.

On October 15, 2009, the Commission staff conducted a public fact gathering meeting at the Paia Community Center to receive testimony and any additional information to be compiled as part of the 16 IFSARs. The comments and testimony provided at this meeting are included as part of the Compilation of Public Review Comments (PR-2009-18).

On October 21-22, 2009, the Commission conducted a meeting/site visit of the Maui DWS Olinda System, Kula Agricultural Park, various Upcountry water users, and the HC&S sugar mill and plantation operations.

On November 1, 2009, the Commission staff released the Compilation of Data Submissions (PR-2009-17) and the Compilation of Public Review Comments (PR-2009-18), which includes the public testimony from the Oct. 15, 2009 public fact gathering meeting, via the Commission website.

On December 1, 2009, the Commission staff released the final versions of all 16 IFSARs (See Exhibits 1 to 16) for the surface water hydrologic units that are currently before the Commission. All exhibits are provided with this submittal electronically, with Exhibits 20 and 21 also provided in hardcopy and attached.

Based upon the best available information, as provided in this submittal, staff has developed a recommendation that seeks to balance the needs of all instream and noninstream uses. The recommendations provided herein have also been developed in consideration of interim IFS values that were adopted by the Commission at its September 24-25, 2008 meeting for the five surface water hydrologic units of Honopou (6034), Hanehoi (6037), Piinaau (6053), Waiokamilo (6055), and Wailuanui (6056). As in that decision, the Commission staff has relied upon the basic tenets of adaptive management, which are to: 1) Establish management objectives; 2) Implement management decisions; 3) Monitor effectiveness of decisions; 4) Evaluate results of management; and 5) Revise management decisions as necessary<sup>2</sup>. Should initial management decisions need further amendment, the decisions can then be revised and the process repeated. This is a learning process that can be repeated over and over, until a sound management decision is reached. Due to the complex and dynamic nature of Hawaii's stream systems, adaptive management affords staff the ability to proceed in making reasonable management decisions and ensuring that impacts are minimized in the face of uncertainty, thus allowing staff to proceed responsibly while advancing the clear intentions of the State Water Code.

#### ISSUES/ANALYSIS:

This section of the submittal begins with general considerations of issues that broadly apply to the development of an interim IFS for all 16 surface water hydrologic units. Table 6 provides a simplified side-by-side comparison of the hydrology, instream and noninstream uses in all 16 units.

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<sup>2</sup> Adapted from The Instream Flow Council, 2004, p.126.



The general considerations are followed by simplified schematic diagrams and assessment summaries for each specific hydrologic unit. Each summary identifies key points from the respective IFSAR and is by no means intended to substitute the information compiled in each report. Likewise, each schematic diagram is a simplified representation of the stream and its hydrologic characteristics and is not intended to substitute the information compiled in each report.

In developing the interim IFS recommendations, staff has attempted to remain consistent in weighing all of the instream and noninstream uses of each stream based upon the best available information presented in the IFSARs, along with the oral and written comments received through the public review process. Needless to say, this process has proved challenging due to the unique nature of each stream, whether in attempting to compare stream characteristics across multiple hydrologic units or within a single one.

The fundamental first step in developing an IFS is assessing hydrology. Streams are largely characterized by the different geologic components that affect flow characteristics, particularly the ground water contribution to streamflow. The amount of water flowing in a given stream is also affected by regional climate variations (e.g. rainfall, fog drip, solar radiation). The quantity and quality of data available for each stream that is reflective of these geologic and hydrologic characteristics varies considerably from stream to stream. For streams with available measured data, the process for developing an interim IFS may be greatly different from that for streams with limited hydrologic data.

The next step is to weigh often-competing instream and noninstream uses of water against the amount of water available to accommodate the needs of these uses. Again, the quantity and quality of information varies from stream to stream. This step is further complicated by the tremendous variability of instream and noninstream uses across and within surface water hydrologic units. For example, one stream may support extensive taro cultivation while another may primarily support domestic uses. The potential of the stream and hydrologic unit to support additional water use in the future has also been considered. Whatever the differences may be, the process must be based upon best available information when weighing the present or potential, instream and noninstream uses.

**Hydrologic Considerations:** The hydrologic characteristics of a stream are critical to determining the IIFS recommendation. These characteristics indicate the effects of geology and soils on the flow of water in the stream. Of great importance is the concept of a gaining and losing stream reach. A gaining reach is typically interpreted as where the streambed intersects the underlying water table and ground water contributes to streamflow as seepage or springs. A losing reach is where the streambed is above the water table and water infiltrates into the streambed and recharges the aquifer, sometimes leaving the stream dry. A stream can also become dry from prolonged periods of little or no rainfall as the water table drops below the streambed. In this case, adequate rainfall is necessary to restore the interaction between surface and ground water, and to return base flow in the stream.

The presence of gaining, losing, and dry reaches in a stream complicates the characterization of streamflow. In east Maui, the streams west of Keanae Valley generally have more losing reaches, and those east of Keanae have considerable ground water gains from springs. A

common misconception is that flow restoration from diversion ditches is immediately followed by continuous flow downstream from the point of release all the way to the coast (analogous to turning on the faucet). When sufficient flow is restored to a stream that normally gains ground water from the point of release to the mouth, streamflow will increase and the stream will probably flow along the entire length. For a stream that is losing, restored flow infiltrates underground once it reaches the losing section. In this case, flow is oftentimes absent downstream of the losing reach. In some cases, flow will become continuous after enough water has infiltrated the streambed and raised the water table, allowing base flow to be maintained by ground water input. In other cases, the restored stream will remain dry at low flow where the water table cannot be raised high enough to allow ground water discharge to the stream.

In determining the recommended interim IFS, a majority of the estimated flow in the stream under current diverted conditions is based on  $TFQ_{95}$ , which represents the total flow that is present in the stream 95 percent of the time.  $TFQ_{95}$  is considered a very low flow because only 5 percent of the time streamflow will be lower than that amount. With decreasing streamflow trends in Hawaii, a more conservative estimate of the current flow condition is warranted. In some instances,  $TFQ_{95}$  flows were not available, so  $Q_{90}$  flows derived from historic gaging records were used instead. Based on common flow durations curves,  $Q_{90}$  flows are normally higher than  $Q_{95}$  flows.

Another factor in the selection of interim IFS sites, though not necessarily hydrologic in nature, is the accessibility of each proposed site for monitoring and regulation by Commission staff. For these 16 hydrologic units, major diversions by the EMI or Maui DWS Systems are situated well above Hana Highway.

**Instream Use Considerations:** The maintenance of instream flows is important for the protection of traditional and customary Hawaiian rights, as they relate to the maintenance of stream resources (e.g., hihiwai, opae, oopu) for gathering, recreation, and the cultivation of taro. While the traditional Hawaiian ahupuaa concept is based on the premise of mauka-to-makai flow, it is difficult to fully represent in words the depth of the cultural aspects of streamflow, including traditions handed down through the generations regarding gathering, ceremonial and religious rites, and the ties to water that are pronounced in Hawaiian legend and lore. The island of Maui has changed considerably in the last several decades, with many Hawaiians on both sides of this issue, as evidenced by the comments received through the Commission's fact gathering process.

The maintenance and restoration of stream habitat would benefit from continuous streamflow. Streams in east Maui are recognized as important habitats for native Hawaiian stream animals. The dry reaches that are often found immediately downstream from the diversions can inhibit species migration. With a few exceptions, the diversions capture almost all base flow and an unknown amount of total streamflow in each stream, decreasing flow downstream of the diversion and sometimes causing streams to go dry. This prevents the upstream migration of native stream animals, restricts surviving adult animals to the disconnected deep pools, and causes postlarvae recruits to be stranded at the stream mouth.

It is also important to note that flow restoration from diversions may not achieve the desired results of mauka-to-makai flow. A critical component that affects streamflow is the condition of

the stream channel and the watershed that contributes to the streamflow within that channel. Streams are often overgrown with alien grasses and shrubs, which are believed to take up large amounts of water when sufficient flow is in the stream. During high flow events, streams that may be normally dry become only partially wetted because invasive plants and water-thirsty roots eventually absorb much of the water. Without proper maintenance of the watershed, restored streamflow in the upper elevations may not reach the ocean.

**Noninstream Use Considerations:** Water from these hydrologic units are primarily diverted for agricultural and municipal water needs. With the exception of Puohokamoa, Ohia (Waianu) and Makapipi, the remainder of the subject hydrologic units are uninhabited and therefore, minimal downstream uses exist. Hawaiian Commercial & Sugar Company (HC&S) is the major agricultural entity that requires a majority of the water from east Maui streams. The EMI System captures streamflow from Makapipi Stream to Maliko Gulch, where water is collected to irrigate the HC&S sugarcane plantation in central Maui (See Exhibit 20 for a simplified schematic of the EMI System). While HC&S continues to be the largest user of the water delivered by the EMI System, other users are also dependent on the system for water. Maui DWS' largest water treatment facility (WTF), Kamole Weir WTF, is served by EMI's Wailoa Ditch and provides for the domestic needs of upcountry Maui. Maui DWS also uses treated water from the Kamole Weir to supplement the water production of the other upcountry WTFs (i.e., Olinda and Piholo) in times of drought (See Exhibit 21 for a simplified schematic of the Maui DWS System, EMI System, and system users). Table 4 provides a summary of average water use of the Maui DWS Upcountry System.

Table 4. Average water use of the Maui DWS Upcountry System.

[mgd = million gallons per day]

Water Users	Average use (mgd)
Upper Kula and Ulupalakua-Kanaio regions (Olinda WTF)	1.5
Lower Kula region (Piholo WTF)	2.2
Makawao, Haliimaile, and Pukalani regions (Kamole WTF)	2
<b>Total Water Use</b>	<b>5.7</b>

With a maximum deliverable capacity of 450 million gallons per day, the EMI System's long-term daily delivery of water is close to 165 million gallons per day. Staff also reviewed EMI water delivery data for the period from July 2003 to May 2009 and found that the cumulative average daily flows were estimated at 138.83 million gallons per day. However, the actual daily flows can also range greatly, from a low of 12.33 million gallons per day (July 16, 2008) to a high of 428.65 million gallons per day (August 16, 2003) during this same period. Table 5 identifies the major water users of the EMI system and provides a summary of their average water use.

Table 5. Average water use of the EMI System.

[mgd = million gallons per day]

Water Users	Average use (mgd)
Hawaiian Commercial & Sugar Company	201
Maui Land & Pineapple Company	4.4
Maui County DWS (includes Kula Agricultural Park)	7.1
<b>Total Water Use</b>	<b>212.5</b>

With the recent announcement of Gay & Robinson, on the island of Kauai, deciding to shut down sugar operations and switch to energy production using ethanol, the common interest is now on the future of the last remaining sugar plantation in Hawaii. HC&S has been part of Maui's history for over 125 years, progressively shaping the landscape of central Maui and keeping the island "green" as emphasized in many public comments. Over the years that HC&S has been in operation, the Maui community and the economy have become dependent on the existence and viability of HC&S. The tourism industry relies on showcasing Maui as a lush green tropical paradise, part of which stems from visitor's appeal to the vast open space of the plantation. The list below summarizes the range of economic impacts of limiting water availability to HC&S. A detailed analysis is included in the IFSARs, section 13.4.3.

- Employment. HC&S provides approximately 800 full-time jobs and currently has 910 retirees, amounting to \$47 million annually in wages and benefits in the Maui economy. HC&S also has an apprenticeship program that provides a training ground for employees that move on to other companies in the public sector.
- Renewable energy. HC&S generates two renewable energy alternatives, hydroelectric and biomass fueled electric power. Part of this energy is sold to MECO, who has requested the help of HC&S to generate backup electricity during power outage.
- Ground water. Limiting surface water resources for irrigation will 1) decrease overall ground water recharge; and 2) induce higher dependence on ground water wells for irrigation, which is already a diminishing resource.
- Suppliers. HC&S spends approximately \$100 million annually in the local economy to support its operations in Maui. Many companies service HC&S; among them are Maui Disposal Company, ChemSystems, Maguire Bearing Company, CWR Hawaii, Maui Petroleum, and BEI Hawaii – Maui. The viability of these suppliers may be challenged with any impacts to HC&S.
- Other users. The source of water for Maui DWS' Makawao System is the EMI System's Wailoa Ditch. Kula Agricultural Park (Park) receives water from HC&S' Hamakua Ditch. Maui Land and Pineapple Co. (MLP) is another entity that is dependent on HC&S for the delivery of water.
- DHHL. A portion of the Native Hawaiian Rehabilitation Fund comes from the sale of sugarcane from State lands and the sale of surface water derived from public lands. In 2009, DHHL received \$289,000 in total revenue from these sources. The DHHL also receives annual revenue of \$65,000 from the use of Hawaiian home lands at Puunene for sugarcane cultivation.
- Landscape and tourism. The tourism industry relies on HC&S keeping Maui green. The Visitor Industry provides 40 percent of all jobs on the island, generates 75 percent of the County's economy, and contributes about 40 percent of the total Real Property Tax collections.

While HC&S is the major agricultural water user of east Maui streams, Maui DWS provides for the domestic and some agricultural needs of upcountry Maui. There are three Upcountry Maui DWS water systems served by east Maui streams: 1) Upper Kula system; 2) Lower Kula system; and 3) Makawao system. Maui DWS diverts the streams for the Upper and Lower Kula pipelines, and it is only the Makawao system whose source is the EMI System. These three potable Upcountry systems are interconnected and rely on each other for backup during maintenance and repair. During drought conditions or times with lower than normal streamflow,

water from the lower systems is frequently pumped to supplement the upper systems. Conversely, water from the upper systems may also be made available to supplement the lower systems during periods of higher than normal rainfall. The following outlines the economic impacts of restricting water to the Maui DWS Upcountry System. A detailed analysis is included in the IFSARs, section 13.5.4.

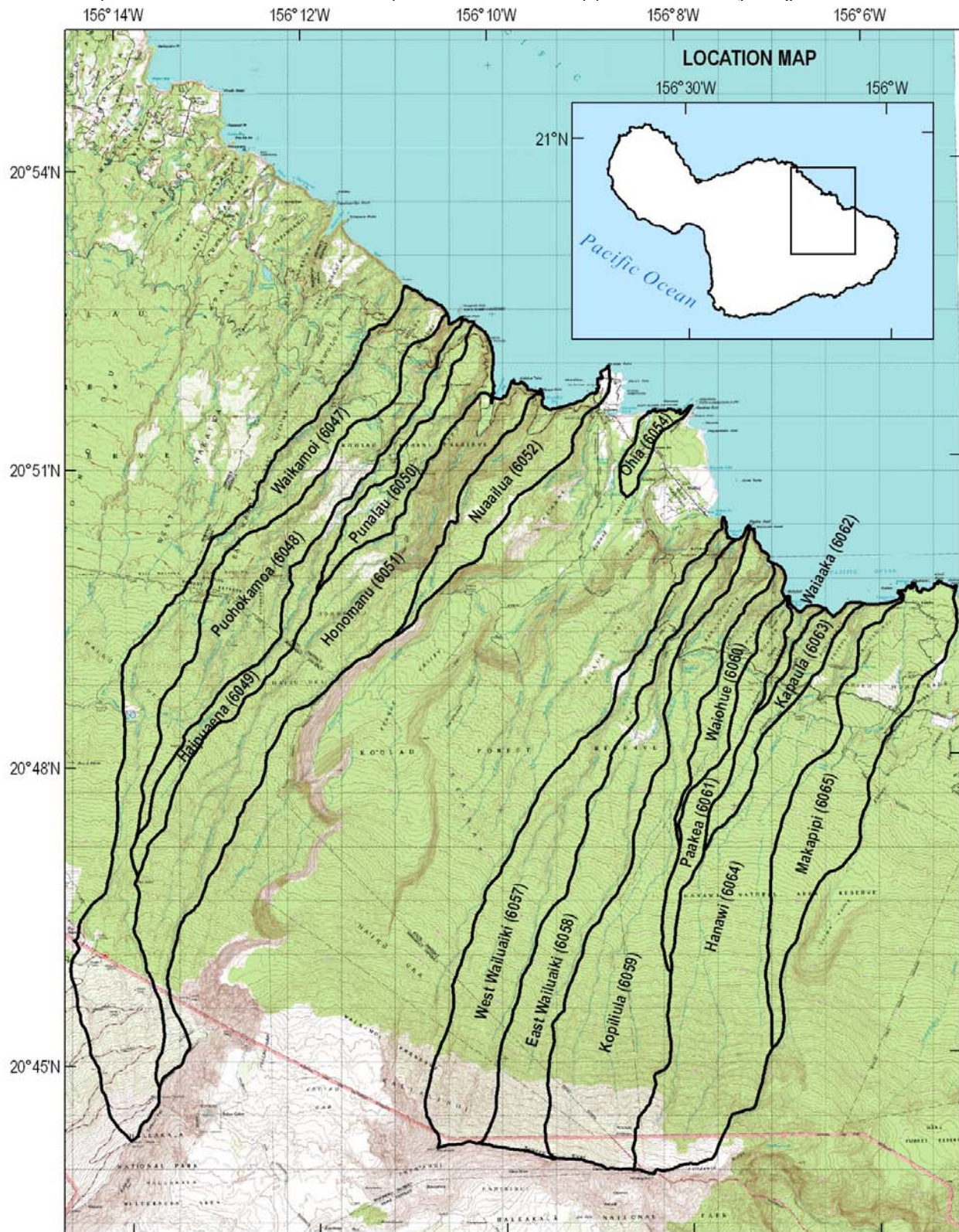
- Power and pumping costs. In 2007, over 26 percent (more than \$10.5 million) of Maui DWS' operating costs were attributed to power and pumping costs associated with pumping water from the lower elevations to supplement the upper regions. By restricting water availability to the Upper and Lower Kula systems, these power and pumping costs would increase.
- Mitigation costs. Mitigation costs are expensive. The option to add a new raw water storage reservoir in the Lower Kula system was proposed to alleviate long term operating costs. A 100 to 300 million gallon reservoir would require total near term capital costs in excess of \$50 million.
- Increasing demand. Growth in water demand on the Upcountry District is very expensive. A new water service costs \$14 to \$19 per gallon per day for the Upcountry System. A typical 600 gallon per day of new service connection averages over \$9,000 of capital costs to provide for system source improvements.
- Existing domestic needs. Under existing conditions, the Upcountry residents are already prone to seasonal restrictions on water use. Further water use restrictions would negatively impact the community, especially those in the Olinda region and DHHL homesites, which do not have an alternate source of water.
- Agriculture. When surface water availability decreases in the drier periods, agricultural production decreases. During the 2000-2002 drought, state-wide cattle losses were projected at \$9 million. Another critical component of agriculture is its impact on the ability of Hawaii to remain self-sufficient and to maintain diversified agriculture.

Also important to note is the recent announcement that Maui Land and Pineapple would cease all pineapple operations by the end of the year. Due to the uncertainty of long term plans for MLP, its land holdings, and water use associated with its operations, the information on water use and economic impact was retained as part of the IFSARs. Further discussions with MLP would need to occur to determine impacts to continued water use and existing infrastructure.

In addition to major diversions that support the noninstream uses identified above, there are a handful of minor diversions located within some of the 16 hydrologic units. These include small diversions by Haleakala Ranch, the Department of Land and Natural Resources' Division of State Parks, and several private landowners. The physical location and present activity for most of these diversions have not been confirmed.



Figure 1: Location map of Waikamoi, Puohokamoa, Haipuaena, Punalau, Honomanu, Nuaailua, Ohia, West Wailuaiki, East Wailuaiki, Kopiliula, Waiohue, Paakea, Waiaaka, Kapaula, Hanawi, and Makapipi Surface Water Hydrologic Units, Maui.



Prepared by the Department of Land and Natural Resources,  
Commission on Water Resource Management.  
Transverse Mercator projection, zone 4, North American Datum 1983



Table 6: Simplified assessment summary and side-by-side comparison of all 16 surface water hydrologic units.

		Waikamoi/Alo	Wahinepee	Puohokamoa	Haipuaena	Punalau/Kolea	Honomanu	Nuaailua	Ohia	W. Wailuaiki	E. Wailuaiki	Kopiilua	Puakaa	Waiohue	Paakea	Waiaaka	Kapaula	Hanawi	Makapipi	
Hydrology <sup>1</sup>	Headwaters	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Above/Between Ditches	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Below Lowest Ditch	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Stream Mouth	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Spring Input	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Fish and Wildlife	Terminal Waterfall	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Estuary	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Biological Rating	4	■	5	5	5	8	7	5	7	7	7	■	8	6	■	4	8	6	
	Oopu except alamoo	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Oopu alamoo	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Opae kalaole	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Hiihiiwai	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Natural Habitat Availability <sup>2</sup>	upper	>	>	>	>	1	1	■	1	1	1	1	1	1	1	1	1	1	1
		middle	<	1	<	<	1	<	>	■	<	<	>	>	<	>	1	>	>	>
		lower	0	>	<	<	<	0	>	■	>	>	>	■	>	>	1	>	>	>
Ratio: Diverted to Natural Baseflow	upper	.2	■	.2	.2	■	■	■	1	1	1	1	1	1	1	1	1	1	1	
	middle	0	1	.1	.1	1	.6	.9	■	.1	.2	.2	.5	.2	.8	1	.4	.7	■	
	lower	0	.5	.2	.2	.1	0	1	■	.2	.2	.3	■	.3	.8	1	.5	.8	■	
Recreation - HSA Rating <sup>3</sup>	S	S	S	M	■	O	S	S	O	O	■	S	O	S	S	S	S	O	S	
Ecosys.	Reserves, Wetlands <sup>4</sup>	.8	.9	.9	.9	.9	.9	.9	0	1	1	.9	.9	.9	.7	0	.4	.9	.5	
	Vegetation Dominance <sup>5</sup>	N	N	N	N	∅	N	∅	A	N	N	N	N	N	N	A	∅	N	∅	
	HSA Rating <sup>3</sup>	S	S	■	■	■	O	■	■	S	O	O	■	■	■	■	■	O	■	
Aes.	Park/Trails/Lookout	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Waterfalls	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Hydropower Potential	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Water Quality - Impaired	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Traditional - HSA Rating <sup>3</sup>	■	■	■	■	■	■	■	■	S	■	■	■	■	■	■	■	■	■	O	
Non-Instream	Kula Pipelines	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Koolau/Wailoa	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	New Hamakua	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Spreckels	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Manuel Luis / Center	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
	Active Taro Diversions	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	EMI Major Diversions	5	1	4	2	3	5	1	0	1	1	1	1	1	2	2	1	2	5	1
	MDWS Major Div.	4	0	4	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
EMI Minor Div.	5	9	3	7	8	5	3	0	5	3	7	1	5	3	0	5	11	2		
MDWS Minor Div.	8	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Other Diversions	0	1	0	1	0	2	0	1	0	0	0	0	0	1	0	0	0	1	2	

<sup>1</sup> Hydrology: ■ = gaining stream reach; ■ = losing stream reach; ■ = dry stream reach; ■ = Uncertain.  
<sup>2</sup> Natural Habitat Availability: "1" is 100%; ">" is greater than 50%; "<" is less than 50%; and "0" is no habitat.  
<sup>3</sup> HSA Rating: O = Outstanding; S = Substantial; M = Moderate; and W = Without.  
<sup>4</sup> Reserves, Wetlands: Value represents the area ratio of reserves and wetlands to that of the hydrologic unit.  
<sup>5</sup> Vegetation Dominance: N = native; A = alien; ∅ = no dominance (i.e., half native, half alien species).





## **Assessment Summary: Waikamoi**

**Hydrology.** Waikamoi appears to be 1) mostly dry in the headwater reach above the Maui DWS Upcountry System; 2) flowing year round between the irrigation ditches; and 3) losing water below the Manuel Luis Ditch to the stream mouth. Tributary Alo Stream and Wahinepee Stream are mostly gaining streams.

**Maintenance of Fish and Wildlife Habitat.** Waikamoi Stream had reduced instream habitat for native species due to low streamflow. The presence of a terminal waterfall has restricted those native species that lack climbing ability from inhabiting the stream; thus, only the native oopu alamoo and opae kalaole were observed. About 50 to 75 percent of the natural habitat for all species in Waikamoi Stream was already maintained below Wailoa and New Hamakua Ditch under diverted conditions. Below the diversions, the stream had shallower water depths and warmer temperatures, providing little habitat. While restoring some stream flow may increase stream connectivity and available instream habitat, only the alamoo and opae would be able to migrate up the terminal waterfall.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Waikamoi as “substantial”. Recreational opportunities included hunting, swimming, and scenic views. The hunting area is about 28 percent of the hydrologic unit and it lies within the lower elevations.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of Waikamoi as “substantial”. Reserves and wetlands occupy about 80 percent of the hydrologic unit, mostly in the upper elevations. Vegetation is dominated by native species.

**Aesthetic.** Among the many waterfalls in Waikamoi Stream is Waikamoi Falls that is about 70-foot high and it can be seen from Hana Highway. Located at Hana Highway between Kolea and Waikamoi Streams is the Waikamoi Roadside Park, which offers great views of the stream and access to the upper reach. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Waikamoi Stream is mostly Class 1b inland waters as parts of the stream lie in forest preserves/reserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d). A majority of Wahinepee Stream is classified as Class 2 inland waters.

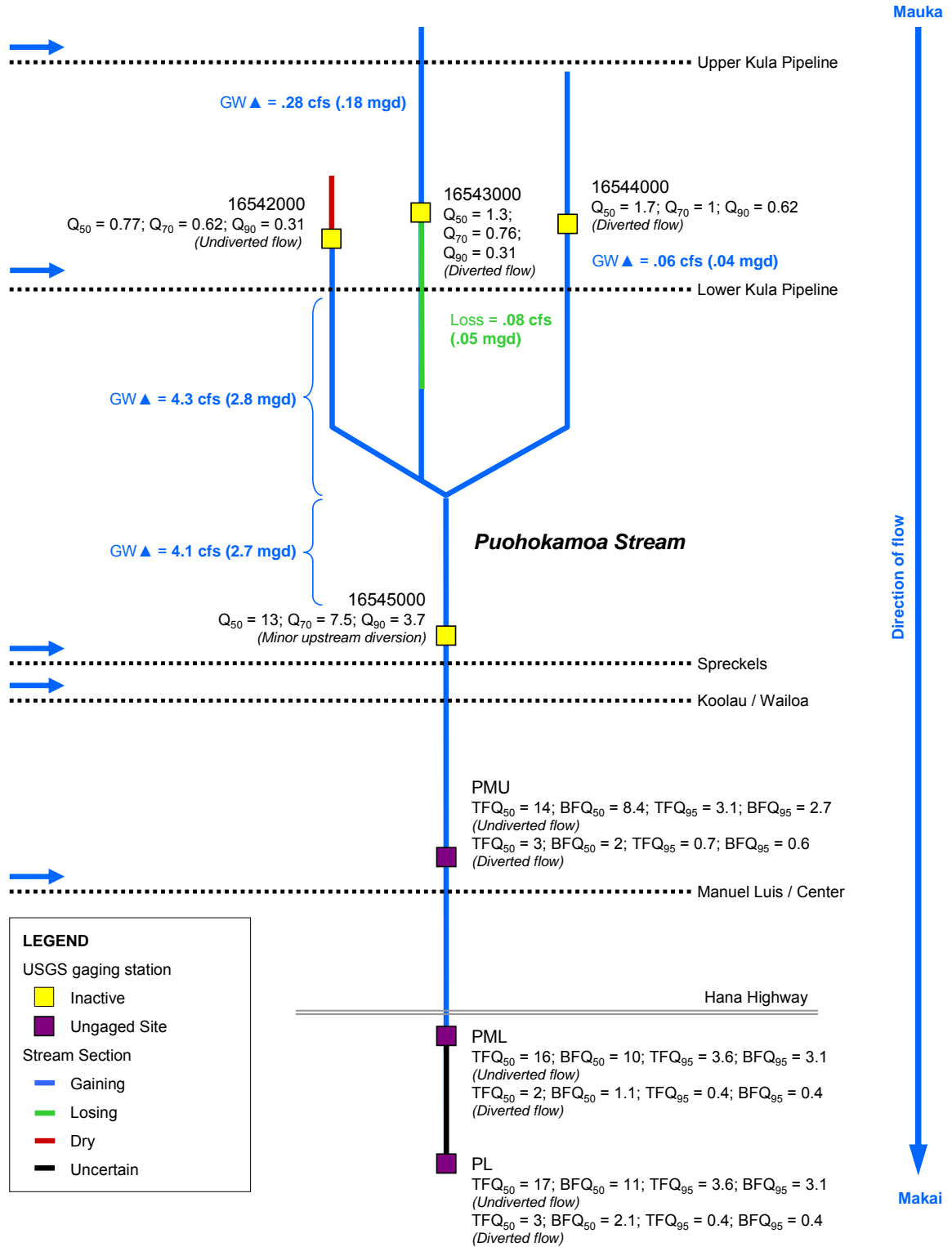
**Conveyance of Irrigation and Domestic Water Supplies.** Waikamoi has a total of 11 registered diversions, of which six are EMI diversions and four were registered by both EMI and Maui DWS. Only one diversion, registered by Puohokamoa Farm, diverts water for domestic purposes as well as watering of livestock, aquaculture, hydroelectric power generation, and irrigation.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Waikamoi does not have any active taro diversions.

**Noninstream Uses.** Waikamoi Stream is diverted at the Upper and Lower Kula Pipelines by the Maui DWS System at 4 major diversions and 8 minor diversions for domestic and agricultural purposes. The stream is also diverted at the Koolau/Wailoa, New Hamakua (Alo Stream only), Spreckels, and Manuel Luis Ditch by the EMI System at 5 major diversions and 5 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation. Wahinepee Stream is only diverted at the Manuel Luis Ditch by the Emi System and has 9 minor EMI diversions.

Figure 3: Simplified schematic diagram for the hydrologic unit of Puohokamoa.

# 6048 Puohokamoa



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Puohokamoa**

**Hydrology.** Puohokamoa Stream appears to be mostly a gaining stream, except a losing and a dry reach in the headwater tributaries near Maui DWS' Lower Kula Pipeline.

**Maintenance of Fish and Wildlife Habitat.** Puohokamoa Stream had reduced instream habitat for native species due to low streamflow. Only the native oopu alamo, oopu nakea, and opae kalaole were observed. About 50 to 75 percent of the natural habitat for all species in Puohokamoa Stream was already maintained below Wailoa and New Hamakua Ditch under diverted conditions. Below the diversion, stream habitat consisted of shallow pools, providing little habitat. Puohokamoa Stream has the potential to sustain larger populations of native species than currently observed if flow is restored to the stream.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Puohokamoa as "substantial". Recreational opportunities included hunting, swimming, and scenic views. The hunting area is about 56 percent of the hydrologic unit and it lies within the lower elevations.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of Puohokamoa as "substantial". Reserves and wetlands occupy about 90 percent of the hydrologic unit, mostly in the upper elevations. Vegetation is dominated by native species.

**Aesthetic.** Among the many waterfalls in Puohokamoa Stream is Puohokamoa Falls that is about 20-foot high and it can be seen from Hana Highway. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where streams cross the highway.

**Maintenance of Water Quality.** Puohokamoa Stream is mostly Class 1b inland waters as parts of the stream lie in forest preserves/reserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

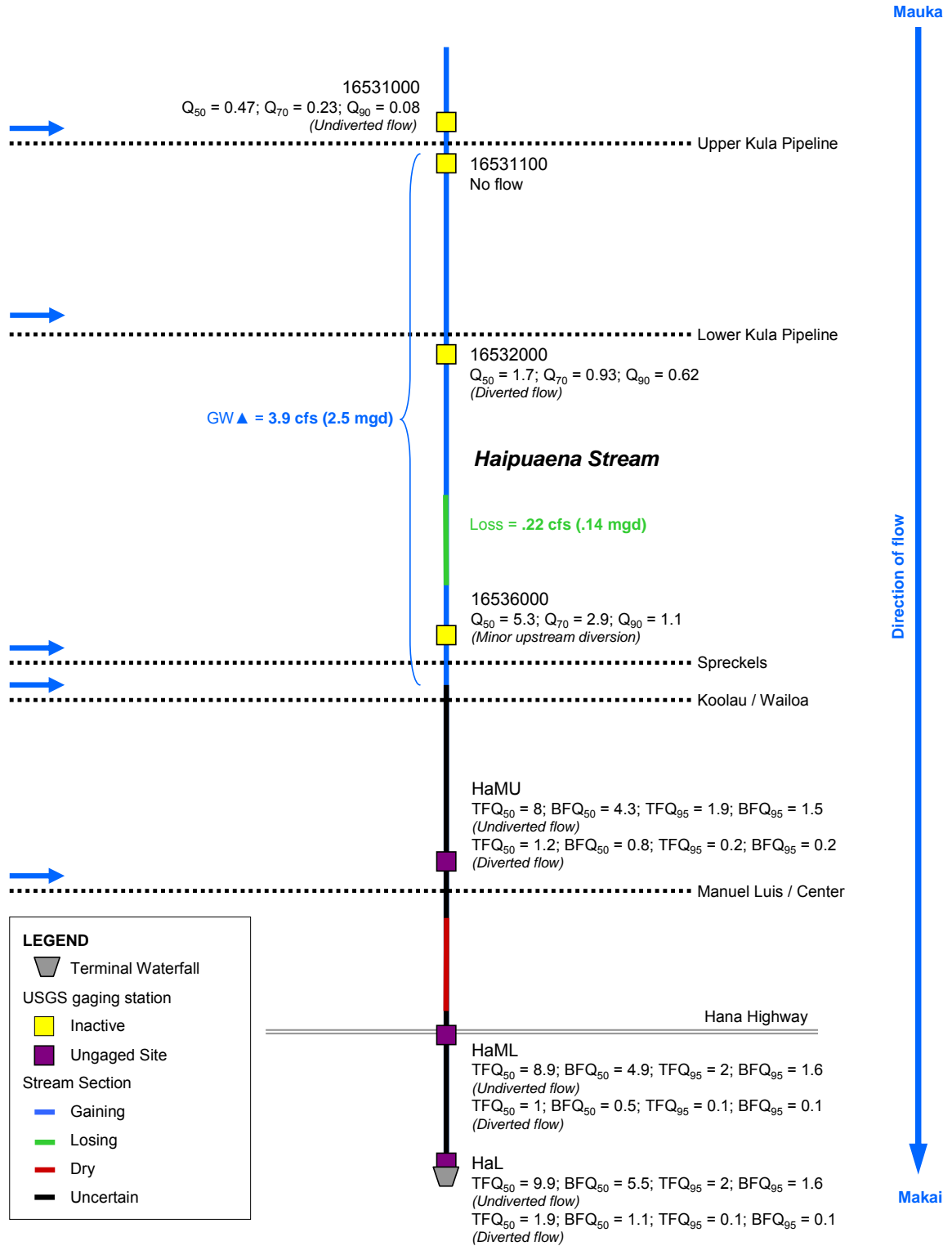
**Conveyance of Irrigation and Domestic Water Supplies.** Puohokamoa has a total of 8 registered diversions, four of which belong to EMI and four were registered by both EMI and Maui DWS. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLHC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Puohokamoa does not have any active taro diversions.

**Noninstream Uses.** Puohokamoa Stream is diverted at the Upper and Lower Kula Pipelines by the Maui DWS System at 4 major diversions and 9 minor diversions for domestic and agricultural purposes. The stream is also diverted at the Spreckels and Manuel Luis Ditch by the EMI System at 4 major diversions and 3 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 4: Simplified schematic diagram for the hydrologic unit of Haipuaena.

# 6049 Haipuaena



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Haipuaena**

**Hydrology.** Haipuaena Stream appears to be mostly a gaining stream, except a losing reach above the Spreckels Ditch and a dry reach downstream from the Manuel Luis Ditch.

**Maintenance of Fish and Wildlife Habitat.** Haipuaena Stream had reduced instream habitat for native species due to low streamflow. Only the native oopu alamoo, oopu nakea, and opae kalaole were observed. The presence of a terminal waterfall has restricted those native species that lack climbing ability from inhabiting the stream. About 50 to 75 percent of the natural habitat for all species in Haipuaena Stream was already maintained below Wailoa Ditch under diverted conditions. Below the diversions, the stream mostly likely had shallower water depths and warmer temperatures, providing little habitat. While restoring some stream flow may increase stream connectivity and available instream habitat, only the alamoo and opae would be able to migrate up the terminal waterfall.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Haipuaena as “moderate”. Recreational opportunities included hunting, swimming, and scenic views. The hunting area is about 53 percent of the hydrologic unit and it lies within the lower elevations.

**Maintenance of Ecosystems.** The riparian resources of Haipuaena Stream were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 90 percent of the hydrologic unit, mostly in the upper elevations. Vegetation is dominated by native species.

**Aesthetic.** Of the three waterfalls located along Haipuaena Stream, two are located in the middle reach and one is located in the lower reach that can be seen from Hana Highway. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Haipuaena Stream is mostly Class 1b inland waters as parts of the stream lie in forest preserves/reserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

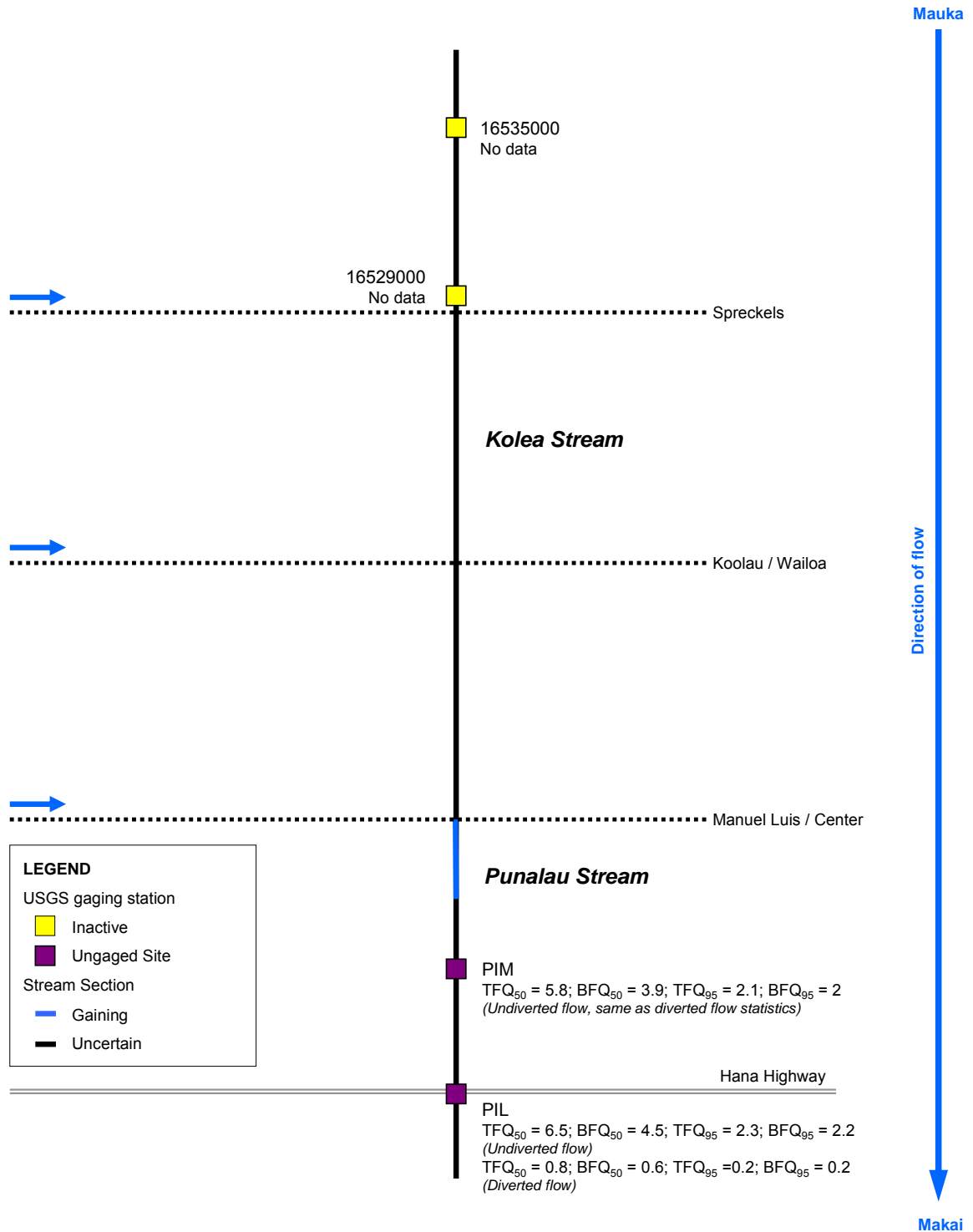
**Conveyance of Irrigation and Domestic Water Supplies.** Haipuaena has a total of 5 registered diversions, of which two belong to EMI and two were registered by both EMI and Maui DWS. One diversion was registered by the Hawaii Division of State Parks for the purpose of providing non-potable water to the comfort station at the Kaumahina State Wayside.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Haipuaena does not have any active taro diversions.

**Noninstream Uses.** Haipuaena Stream is diverted at the Upper and Lower Kula Pipelines by the Maui DWS System at 2 major diversions and 9 minor diversions for domestic and agricultural purposes. The stream is also diverted at the Spreckels and Manuel Luis Ditch by the EMI System at 2 major diversions and 7 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 5: Simplified schematic diagram for the hydrologic unit of Punalau.

# 6050 Punalau



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Punalau**

**Hydrology.** Little is known about Punalau Stream regarding its stream characteristics. Only a section of the stream downstream from Manuel Luis Ditch appears to be gaining an unknown amount of ground water.

**Maintenance of Fish and Wildlife Habitat.** Punalau Stream had reduced instream habitat for native species due to low streamflow. Only the native oopu nakea and oopu nopili were observed. Immediately below the Manuel Luis Ditch, the stream reach was dry until more ground water is gained to provide 25 to 50 percent of the natural habitat for all native species. Instream habitat was limited to stagnant pools of water at the base of a dry waterfall. Punalau Stream has the potential to sustain larger populations of native species than currently observed if flow is restored to the stream to increase stream connectivity and available habitat.

**Outdoor Recreational Activities.** The recreational resources of Punalau Stream were not classified by the Hawaii Stream Assessment. Almost the entire the hydrologic unit is a hunting zone.

**Maintenance of Ecosystems.** The riparian resources of Punalau Stream were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 90 percent of the hydrologic unit, mostly in the upper elevations. The proportion of native and alien vegetation is about equal in the unit.

**Aesthetic.** Punalau Falls is located near Hana Highway, and it is publicly accessible. Located at the west end of the hydrologic unit is Kaumahina State Wayside, which offers great views of the northeast Maui coastline and the Kanae Peninsula. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Punalau Stream is classified as Class 1b inland waters in the upper elevations and Class 1a inland waters in the lower elevations. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

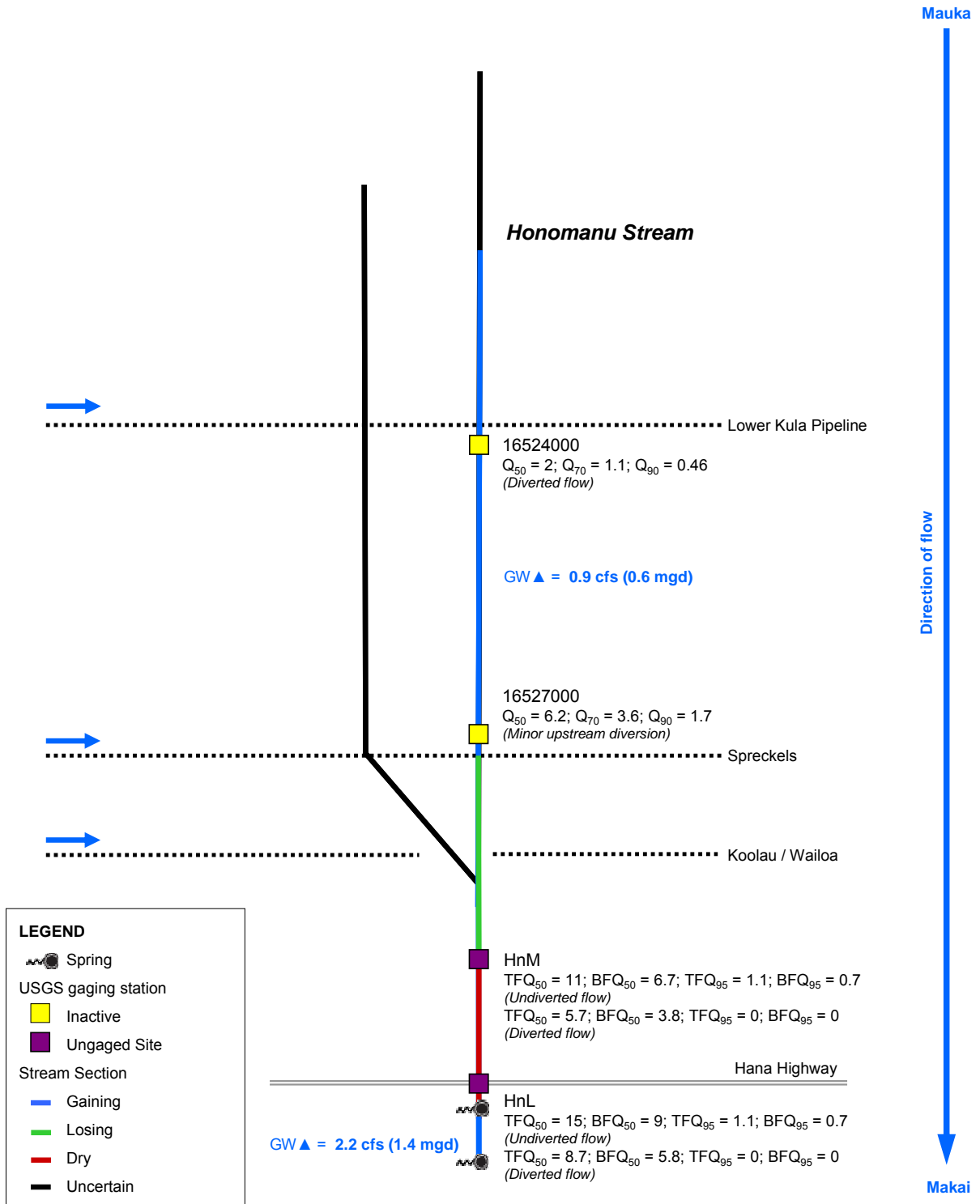
**Conveyance of Irrigation and Domestic Water Supplies.** Punalau has a total of 3 registered diversions, all of which are EMI diversions and two were registered by both EMI and Maui DWS. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Punalau does not have any active taro diversions.

**Noninstream Uses.** Punalau Stream is diverted at the Koolau/Wailoa and Kolea Stream is diverted at Spreckels and Manuel Luis Ditch by the EMI System at 3 major diversions and 8 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 6: Simplified schematic diagram for the hydrologic unit of Honomanu.

# 6051 Honomanu



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.



## **Assessment Summary: Honomanu**

**Hydrology.** Honomanu Stream appears to be a gaining stream upstream from the Spreckels Ditch, and a losing stream downstream from the ditch. Near the coast are two springs that contribute to streamflow into the estuary.

**Maintenance of Fish and Wildlife Habitat.** While the available instream habitats were limited, a number of native stream animals were observed in Honomanu Stream, including oopu nakea, oopu akupa, oopu alamoo, opae kalaole, hihiwai, and hapawai. The lower and middle reaches were dry from upstream diversions that remove most of the water from the stream. Suitable instream habitats were found near the stream mouth that was fed through spring input. Honomanu Stream is mostly dry under diverted conditions, providing little or no habitat for all native species. Flow restoration would likely improve the diversity of biota in the stream.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Honomanu as “outstanding”. Recreational opportunities included camping, hiking, fishing, hunting, swimming, and scenic views. The hunting area is about 45 percent of the hydrologic unit and it lies within the lower elevations.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of Honomanu as “outstanding”. Reserves and wetlands occupy about 90 percent of the hydrologic unit, mostly in the upper elevations. Vegetation is dominated by native species.

**Aesthetic.** A number of waterfalls and plunge pools are located along the middle reach of Honomanu Stream, which provide great scenic spots for the public. The stream empties into Honomanu Bay, where a number of coastal activities are enjoyed by the public in addition to being a popular surf spot. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Honomanu Stream is mostly Class 1b inland waters as parts of the stream lie in forest preserves/reserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

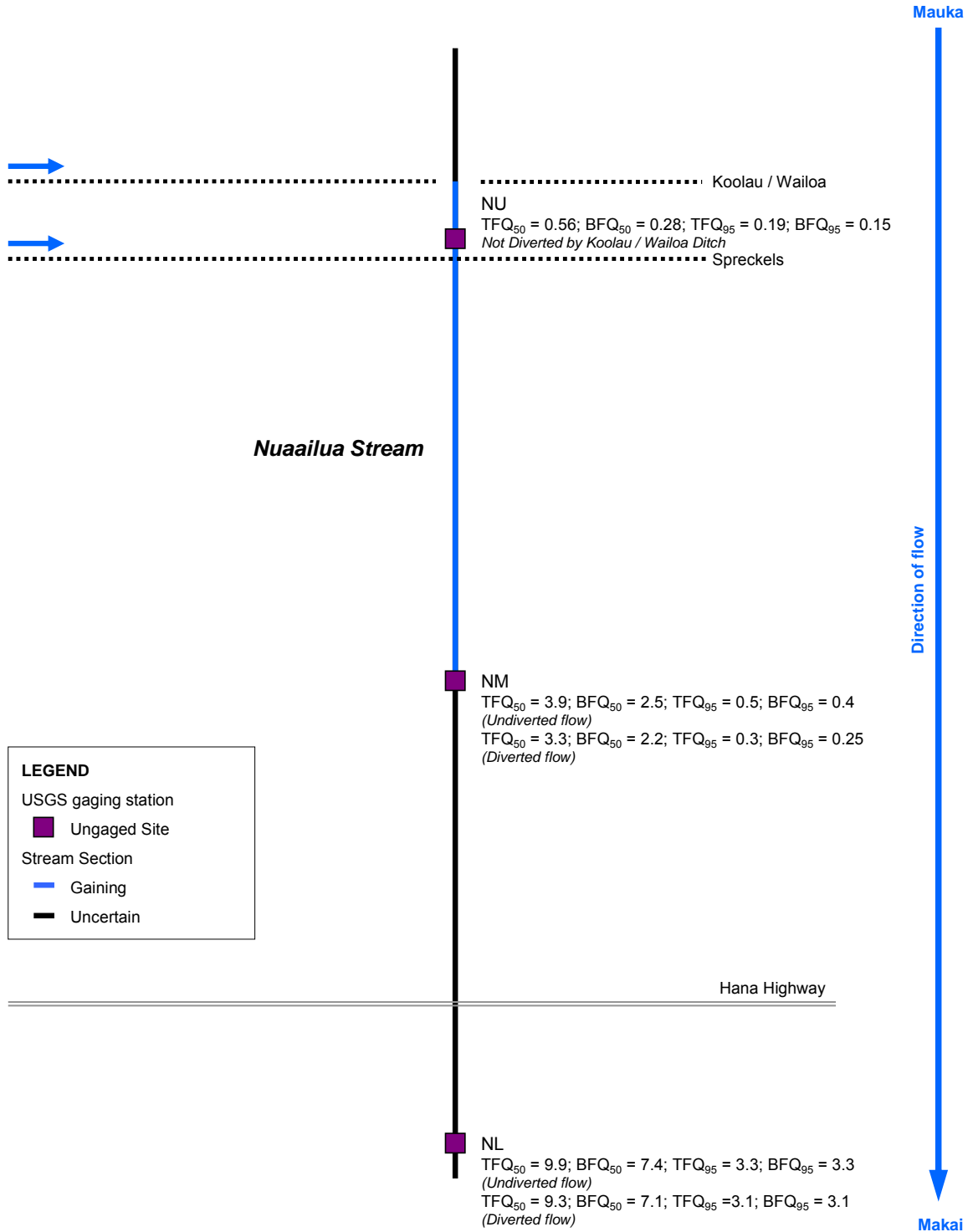
**Conveyance of Irrigation and Domestic Water Supplies.** Honomanu has a total of 8 registered diversions, five of which belong to EMI and one was registered by both EMI and Maui DWS. Two diversions were registered by Haleakala Ranch for the purpose of watering livestock with occasional use for domestic purposes at two cabins on the property.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Honomanu does not have any active taro diversions.

**Noninstream Uses.** Honomanu Stream is diverted at the Lower Kula Pipeline by the Maui DWS System for domestic and agricultural purposes. The stream is also diverted at the Spreckels by the EMI System at 5 major diversions and 5 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation. Two diversions were registered by Haleakala Ranch for the purpose of watering livestock with occasional use for domestic purposes at two cabins on the property.

Figure 7: Simplified schematic diagram for the hydrologic unit of Nuaailua.

# 6052 Nuaailua



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and unengaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Nuaailua**

**Hydrology.** Nuaailua is mostly a gaining stream, with known ground water contribution in the reach below Spreckels Ditch.

**Maintenance of Fish and Wildlife Habitat.** Under diverted conditions, Nuaailua Stream had a fairly good diversity of native stream animals. The native animals observed include oopu nakea, oopu nopili, oopu akupa, oopu alamoo, opae kalaole, hihiwai, and hapawai. The lower and middle reaches of the stream (below diversions) had water depths of 8 to 16 inches, providing 75 to 100 percent of the natural habitat for all native species. Flow restoration would likely improve the diversity of biota in the stream.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Nuaailua as “substantial”. Recreational opportunities included hiking, fishing, and scenic views. Almost the entire the hydrologic unit is a hunting area.

**Maintenance of Ecosystems.** The riparian resources of Nuaailua Stream were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 90 percent of the hydrologic unit, mostly in the upper elevations. The proportion of native and alien vegetation is about equal in the unit.

**Aesthetic.** Two waterfalls are located in the upper reaches of Nuaailua Stream, which are not visible from Hana Highway but do provide great scenic spots for the occasional adventurer. The stream empties into Nuaailua Bay, where a number of coastal activities are enjoyed by the locals as well as the public. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Nuaailua Stream is mostly Class 1a inland waters as parts of the stream lie in the Koolau Forest Reserve. It does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

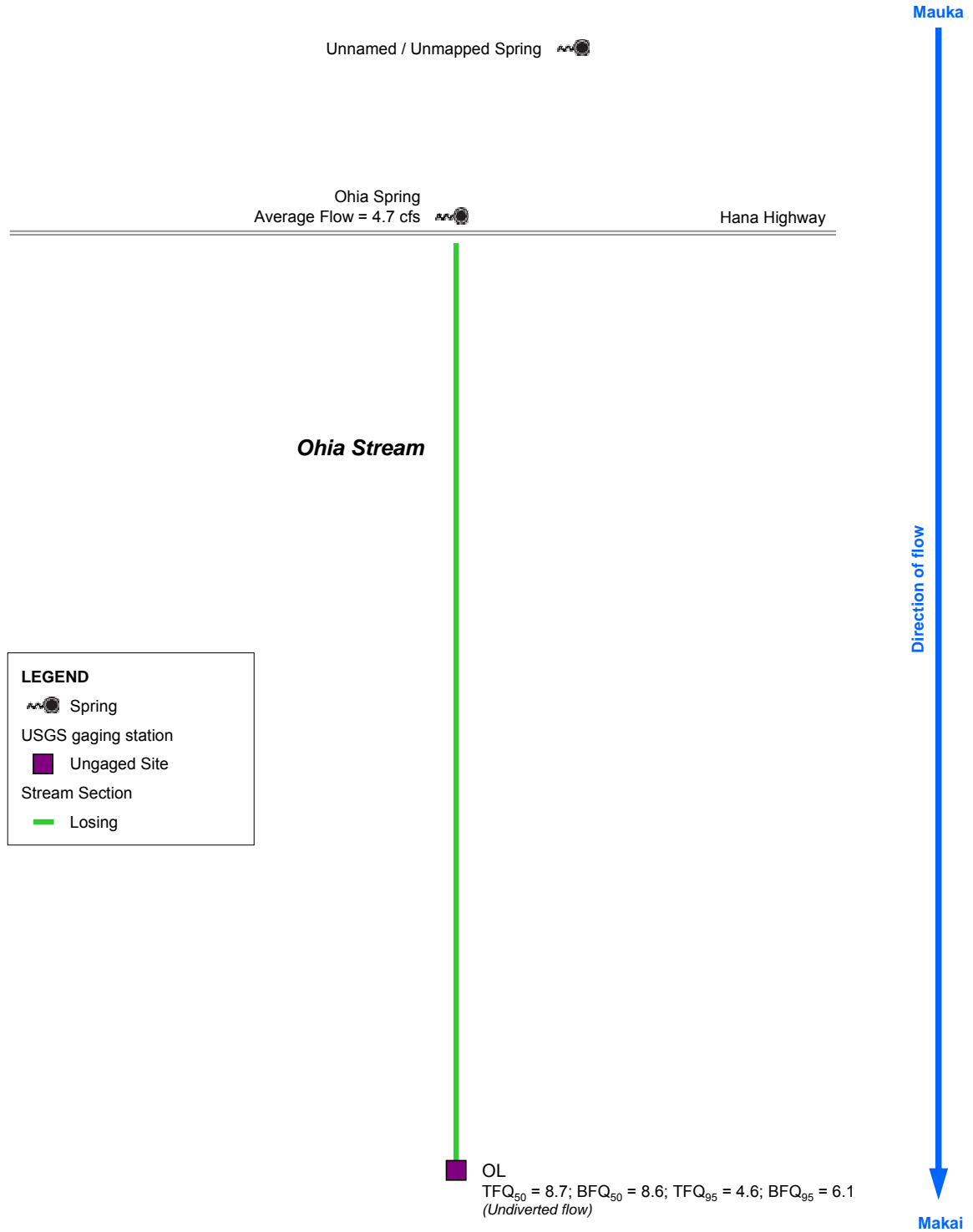
**Conveyance of Irrigation and Domestic Water Supplies.** Nuaailua has a total of 2 registered diversions, one of which belong to EMI. The other diversion was registered by the Maui Family YMCA for the purpose of irrigating taro and flowers; however, the registrant has indicated that the diversion no longer exists and water is currently obtained from the Maui DWS system.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLHC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Nuaailua does not have any active taro diversions.

**Noninstream Uses.** Nuaailua Stream is diverted at the Spreckels Ditch by the EMI System at 1 major diversion and 3 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 8: Simplified schematic diagram for the hydrologic unit of Ohia.

# 6054 Ohia



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Ohia**

**Hydrology.** Ohia Stream is one of the shortest streams in east Maui. Its headwaters begin just above Hana Highway at Ohia Spring. The stream is mostly losing and very little flow reaches the ocean.

**Maintenance of Fish and Wildlife Habitat.** Ohia Stream had excellent instream habitat for native species due to the spring input at the head of the watershed. However, only oopu alamo, opae kalaole, and hihiwai were observed. The limited diversity of native species observed in the stream may be a result of heavy vegetation (i.e., hau) blocking streamflow. Removal of the vegetation in the stream to allow for continuous flow would help to improve the recruitment and migration of juvenile species, as well as the diversity of stream animals.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Ohia as “substantial”. Recreational opportunities included fishing and scenic views. The hydrologic unit of Ohia does not lie within a hunting area unit.

**Maintenance of Ecosystems.** The riparian resources of Ohia Stream were not classified by the Hawaii Stream Assessment. Since the hydrologic unit is small and is located in the lower elevations, there are no reserves or wetlands in the unit. Vegetation is dominated by alien species.

**Aesthetic.** The east end of the Ohia hydrologic unit is Pauwla Point, which offers great views of the Hahaha Bay, and two islets of the Mokumana State Seabird Sanctuary. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** The entire length of Ohia Stream is classified as Class 2 inland waters in which the stream is protected for uses such as recreational purposes, support of aquatic life, and agricultural water supplies. Ohia Stream is a newly listed stream on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d). Trash was found in the stream that impairs water quality.

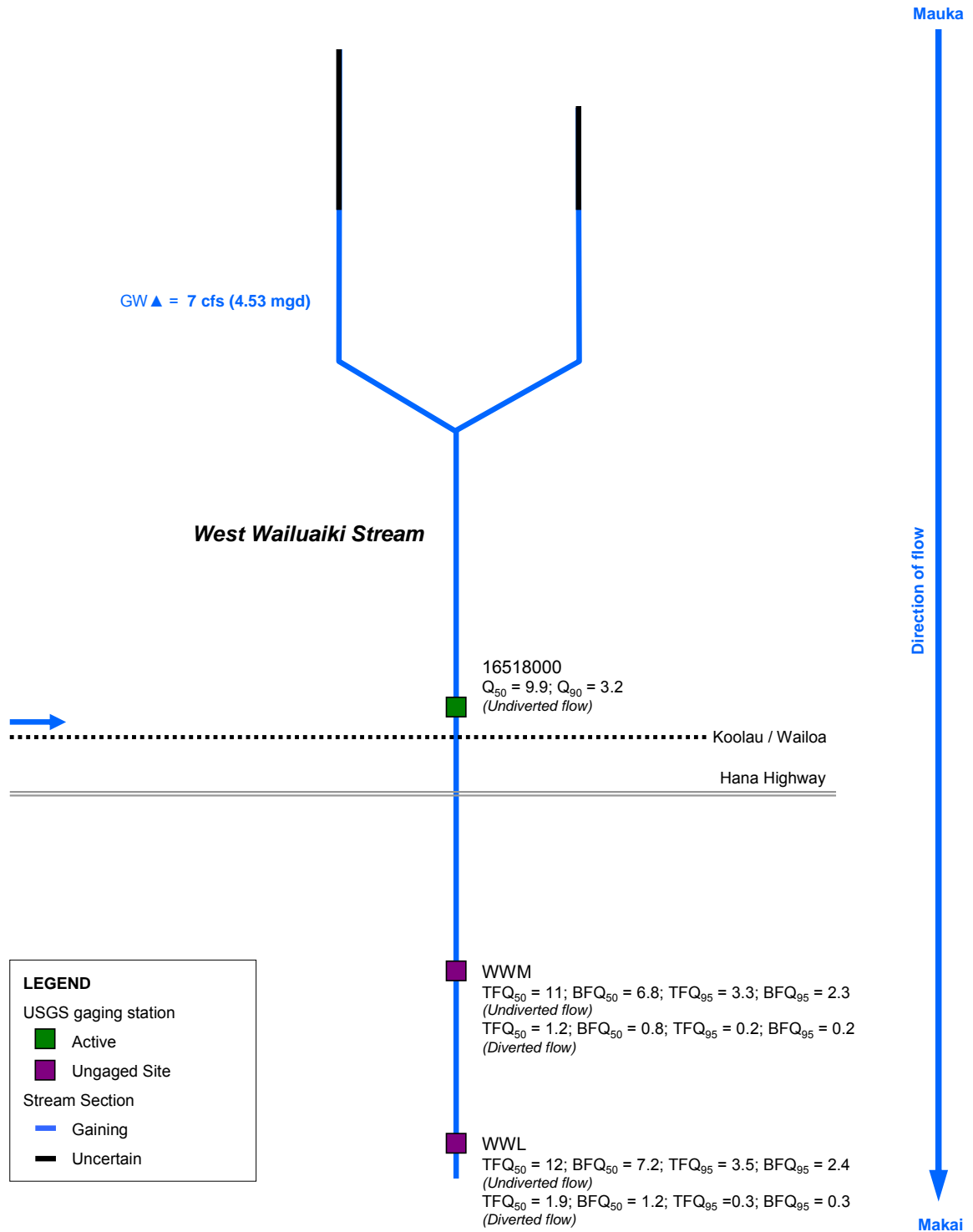
**Conveyance of Irrigation and Domestic Water Supplies.** One diversion was registered for the purpose of irrigating 2.09 acres of taro, along with domestic and landscaping uses for a house on the property.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Ohia has one active taro diversion.

**Nonstream Uses.** Ohia Stream is not diverted by the Maui DWS or the EMI System.

Figure 9: Simplified schematic diagram for the hydrologic unit of West Wailuaiki.

# 6057 West Wailuaiki



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and unengaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: West Wailuaiki**

**Hydrology.** West Wailuaiki is mostly a gaining stream, with average annual ground water gains of 4.5 million gallons per day above the Koolau/Wailoa Ditch level.

**Maintenance of Fish and Wildlife Habitat.** Despite the limited available instream habitat downstream of the ditch, West Wailuaiki Stream had a fairly good diversity of native stream animals. The native biota observed include oopu nakea, oopu nopili, oopu akupa, oopu alamoo, opae kalaole, and hihiwai. The reach above the ditch had moderate streamflow and cooler water temperatures. Below the ditch, about 25 to 50 percent of the native instream habitat was available. The abundance of aholehole in the estuary could be an indicator for a healthy stream since this species of fish was commonly found in estuaries with flowing streams and open stream mouths to the ocean. West Wailuaiki Stream has the potential to sustain larger populations of native species than currently observed if flow is restored to the downstream reach to increase stream connectivity.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of West Wailuaiki as “outstanding”. Recreational opportunities included hiking, fishing, hunting, swimming, and scenic views. The hunting area is about 65 percent of the hydrologic unit and it lies within the lower elevations.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of West Wailuaiki as “substantial”. Reserves and wetlands occupy almost the entire hydrologic unit. Vegetation is dominated by native species.

**Aesthetic.** A number of waterfalls are located along the lower reaches of the West Wailuaiki Stream, one of which can be seen from Hana Highway. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Instream Hydropower Generation.** West Wailuaiki stream was identified to have good hydropower potential. Both West and East Wailuaiki Streams could contribute a single plant capacity of 2,750 kilowatts of hydropower.

**Maintenance of Water Quality.** West Wailuaiki Stream is mostly Class 1b inland waters as parts of the stream lie in forest reserves/preserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

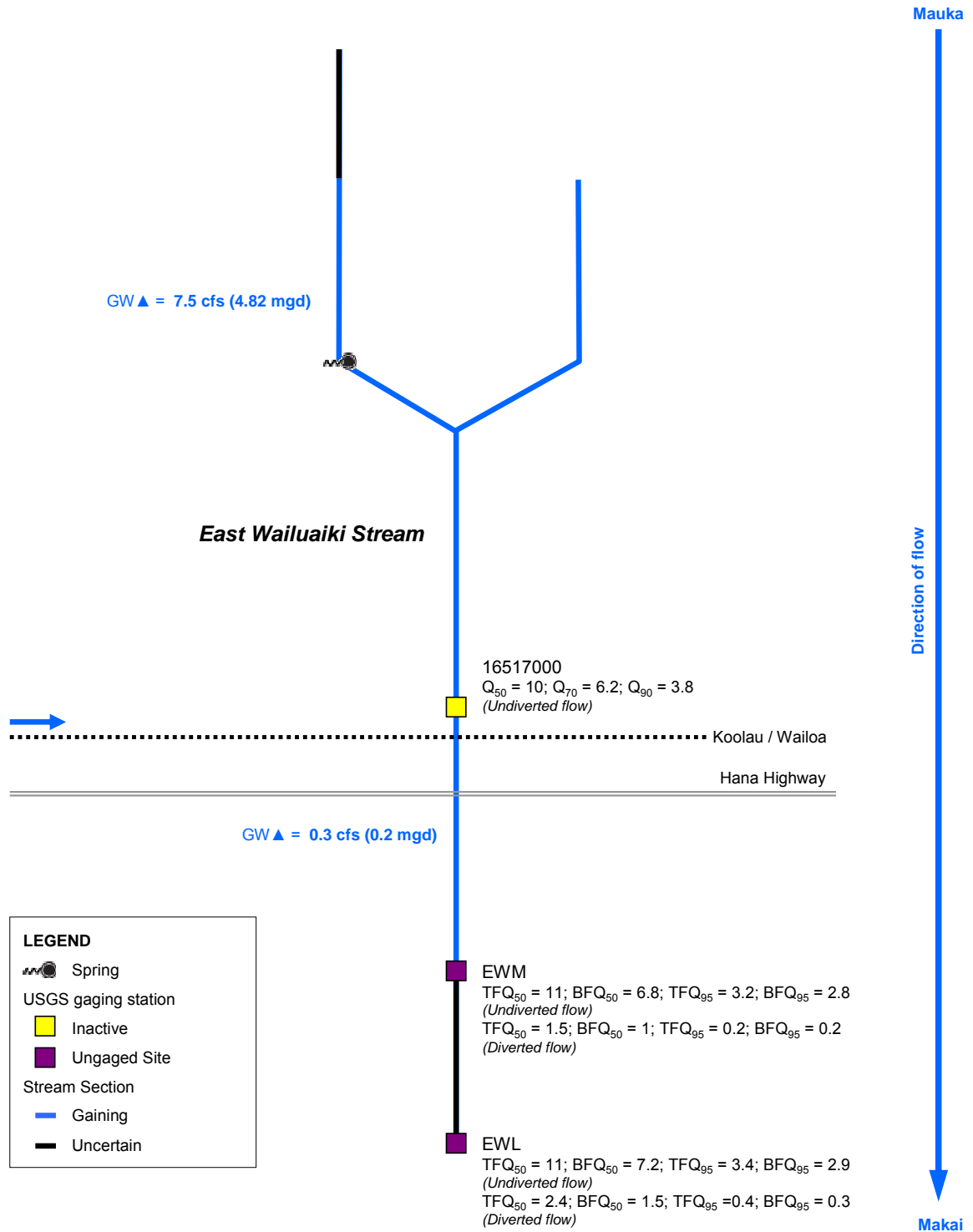
**Conveyance of Irrigation and Domestic Water Supplies.** West Wailuaiki has only one registered diversion which belongs to EMI. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, West Wailuaiki does not have any active taro diversions.

**Noninstream Uses.** West Wailuaiki Stream is diverted at the Koolau Ditch by the EMI System at 1 major diversion and 5 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 10: Simplified schematic diagram for the hydrologic unit of East Wailuaiki.

# 6058 East Wailuaiki



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.



## **Assessment Summary: East Wailuaiki**

**Hydrology.** East Wailuaiki is mostly a gaining stream, with average annual ground water gains of 4.8 million gallons per day above the Koolau Ditch level.

**Maintenance of Fish and Wildlife Habitat.** Despite the limited available habitat downstream of the ditch, East Wailuaiki Stream had a fairly good diversity of native stream animals. The native biota observed include oopu nakea, oopu nopili, oopu akupa, opae kalaole, and hihiwai. The reach above the ditch had moderate streamflow and cooler water temperatures. Below the ditch, about 25 to 50 percent of the native instream habitat is available. The abundance of aholehole in the estuary could be an indicator for a healthy stream since this species of fish was commonly found in estuaries with flowing streams and open stream mouths to the ocean. East Wailuaiki Stream has the potential to sustain larger populations of native species than currently observed if flow is restored to the downstream reach to increase stream connectivity.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of East Wailuaiki as “outstanding”. Recreational opportunities included hiking, fishing, hunting, swimming, and scenic views. The hunting area is about 71 percent of the hydrologic unit and it lies within the lower elevations.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of East Wailuaiki as “outstanding”. Reserves and wetlands occupy almost the entire hydrologic unit. Vegetation is dominated by native species.

**Aesthetic.** A number of waterfalls are located along the lower reaches of the East Wailuaiki Stream, one of which can be seen from Hana Highway. The easternmost end of the hydrologic unit is Papiha Point, which offers a great view of Wailua Iki Bay and Makoloaka Island. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Instream Hydropower Generation.** East Wailuaiki stream was identified to have good hydropower potential. Both West and East Wailuaiki Streams could contribute a single plant capacity of 2,750 kilowatts of hydropower.

**Maintenance of Water Quality.** East Wailuaiki Stream is mostly Class 1b inland waters as parts of the stream lie in forest reserves/preserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

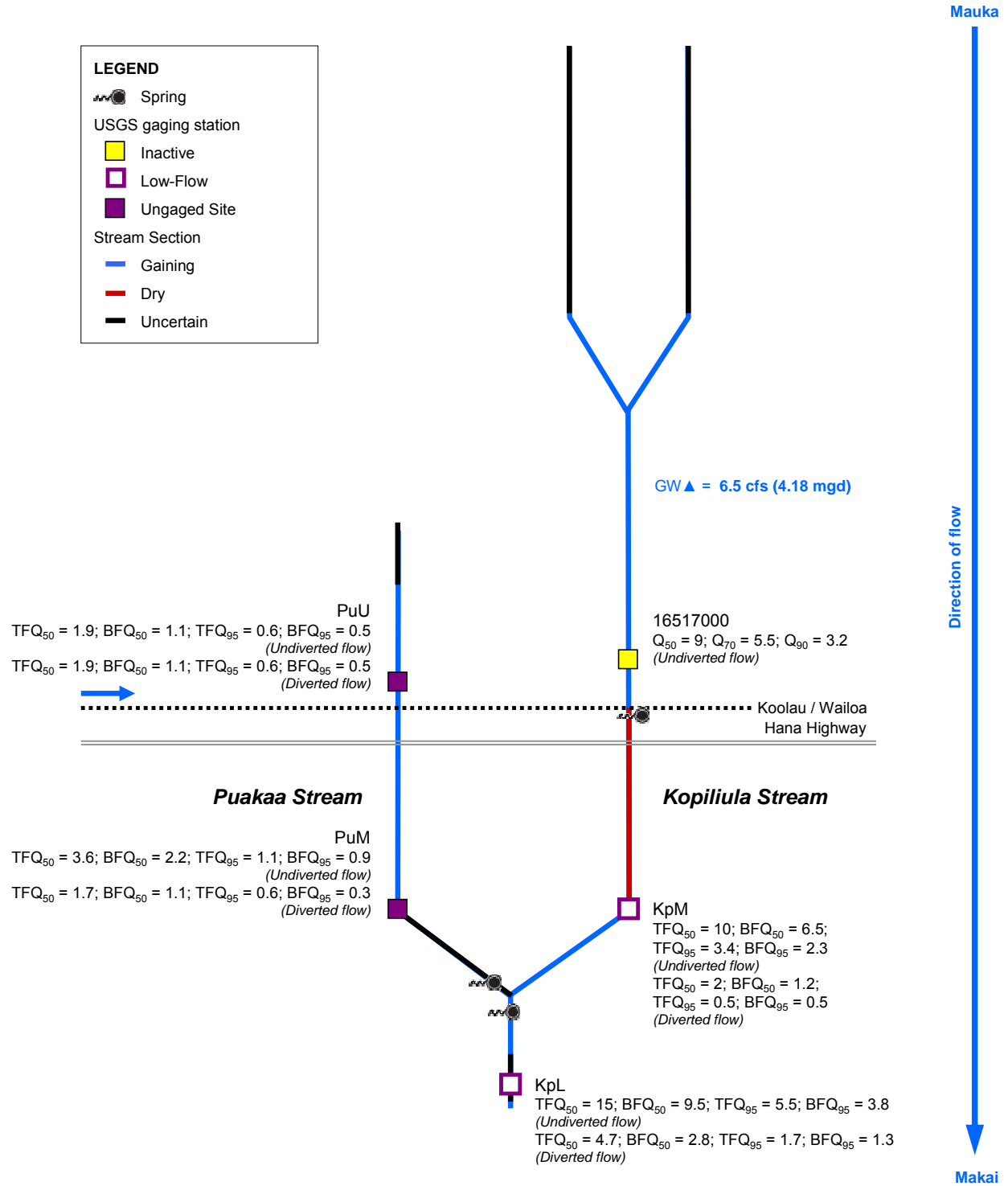
**Conveyance of Irrigation and Domestic Water Supplies.** East Wailuaiki has only one registered diversion which belongs to EMI. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, East Wailuaiki does not have any active taro diversions.

**Noninstream Uses.** East Wailuaiki Stream is diverted at the Koolau Ditch by the EMI System at 1 major diversion and 3 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 11: Simplified schematic diagram for the hydrologic unit of Kopiliula.

# 6059 Kopiliula



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

**Assessment Summary: Kopiliula**

**Hydrology.** Kopiliula Stream is gaining ground water flow above the Koolau Ditch and near the coast. Downstream from Koolau Ditch, the stream is losing flow to ground water sources. Puakaa Stream is mostly a gaining stream.

**Maintenance of Fish and Wildlife Habitat.** Kopiliula Stream provided excellent instream habitats and a diversity of native stream animals exists in the stream. The native biota observed include oopu nakea, oopu nopili, oopu akupa, oopu alamoo, opae kalaole, and hihiwai. The middle reach below Hana Highway and the ditch had water depths greater than 20 inches, providing 75 to 100 percent of the available instream habitat. Due to the small size of the estuary, flow restoration would not result in substantial increases in estuarine habitats.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Kopiliula as “substantial”. Recreational opportunities included fishing, hunting, swimming, and scenic views. The total hunting area is about 80 percent of the hydrologic unit.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of Kopiliula as “outstanding”. Reserves and wetlands occupy about 90 percent of the hydrologic unit. Vegetation is dominated by native species.

**Aesthetic.** A number of waterfalls are located along the lower reaches of the Kopiliula and Puakaa Streams, and one of the waterfalls on Kopiliula Stream can be seen from Hana Highway. Located in the westernmost end of the hydrologic unit is Papiha Point, which offers a great view of Makoloaka Island. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Kopiliula Stream is mostly Class 1b inland waters as parts of the stream lie in forest reserves/preserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

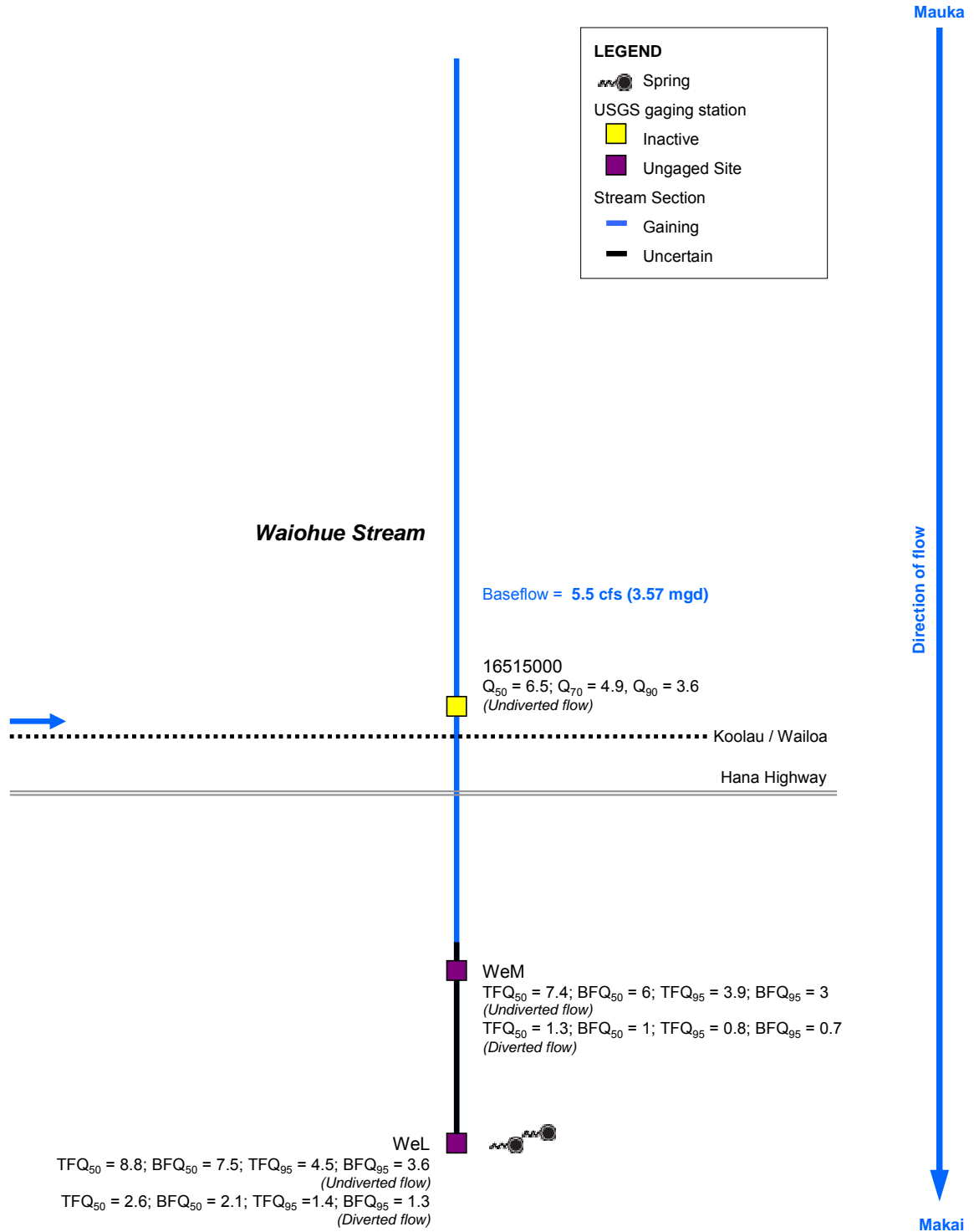
**Conveyance of Irrigation and Domestic Water Supplies.** Kopiliula has two registered diversions, both of which belong to EMI. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Kopiliula does not have any active taro diversions.

**Noninstream Uses.** Kopiliula Stream is diverted at the Koolau Ditch by the EMI System at 1 major diversion and 7 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation. Tributary Puakaa Stream is also diverted at the Koolau Ditch by the EMI System.

Figure 12: Simplified schematic diagram for the hydrologic unit of Waiohue.

# 6060 Waiohue



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Waiohue**

**Hydrology.** Waiohue is mostly a gaining stream, with average annual ground water gains of 3.6 million gallons per day.

**Maintenance of Fish and Wildlife Habitat.** Despite the limited available habitat downstream of the ditch, Waiohue Stream had a fairly good diversity of native stream animals. The native biota observed include oopu nakea, oopu nopili, oopu akupa, opae kalaole, and hihiwai. Below the ditch, about 25 to 50 percent of the native instream habitat was available. The abundance of aholehole in the estuary could be an indicator for a healthy stream since this species of fish was commonly found in estuaries with flowing streams and open stream mouths to the ocean. Waiohue Stream has the potential to sustain larger populations of native species than currently observed if flow is restored to the downstream reach to increase stream connectivity. Due to the small size of the estuary, flow restoration would not result in substantial increases in estuarine habitats.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Waiohue as “outstanding”. Recreational opportunities included camping, hiking, fishing, swimming, parks, and scenic views. The total hunting area is about 52 percent of the hydrologic unit.

**Maintenance of Ecosystems.** The riparian resources of Waiohue Stream were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 90 percent of the hydrologic unit. Vegetation is dominated by native species.

**Aesthetic.** A number of waterfalls are located along the lower reach of the Waiohue Stream, and one of the waterfalls can be seen from Hana Highway and one can be seen from the Puaa Kaa State Wayside. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

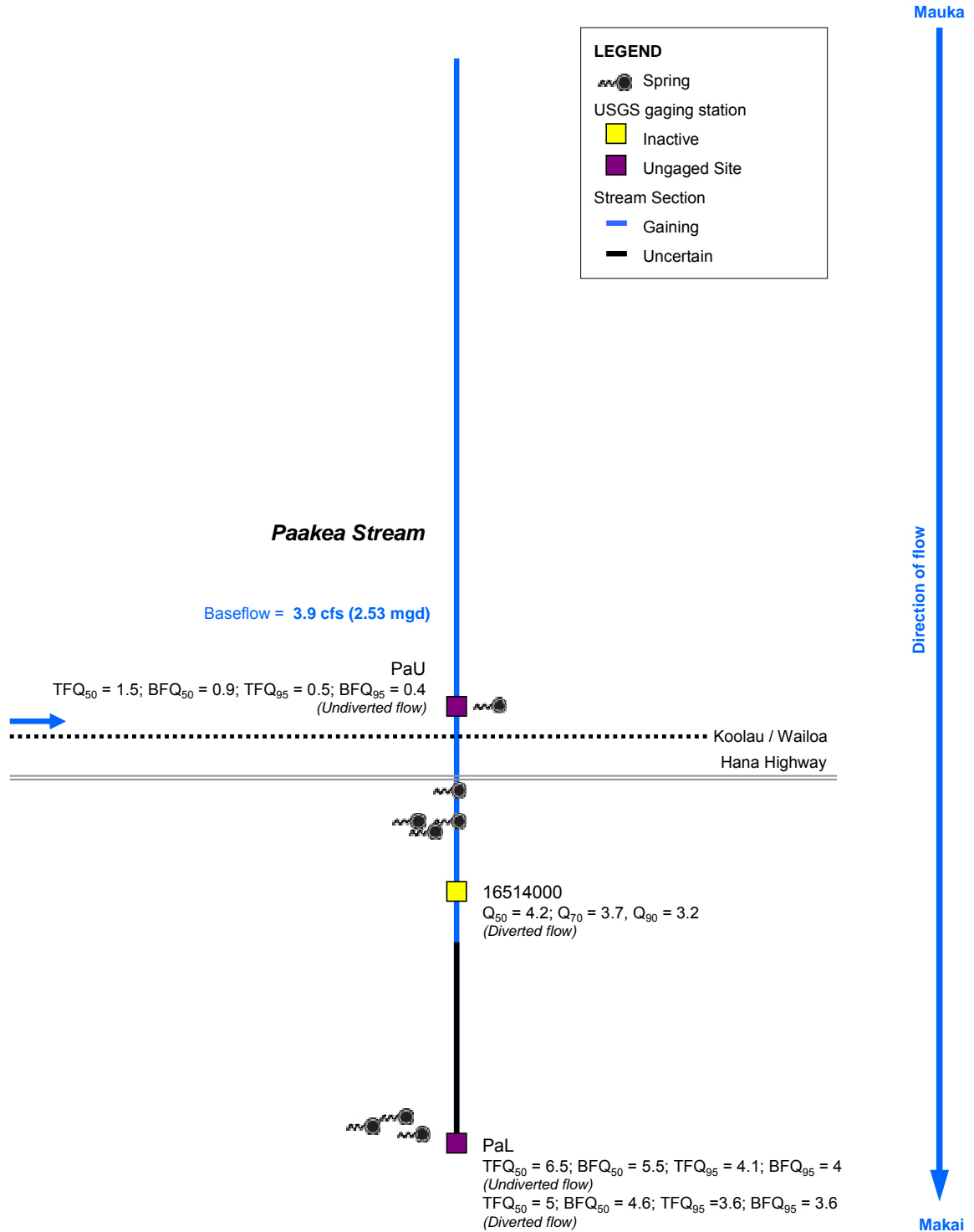
**Maintenance of Water Quality.** Waiohue Stream is classified as Class 1b inland waters in the upper elevations and Class 1a inland waters in the lower elevations. It does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

**Conveyance of Irrigation and Domestic Water Supplies.** Waiohue has three registered diversions, two of which belong to EMI. The remaining diversion was registered by the State Division of State Parks for the purpose of providing non-potable water to the comfort station at the Puaa Kaa State Wayside.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLIC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Waiohue does not have any active taro diversions.

**Noninstream Uses.** Waiohue Stream is diverted at the Koolau Ditch by the EMI System at 2 major diversions and 5 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 13: Simplified schematic diagram for the hydrologic unit of Paakea.  
**6061 Paakea**



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Paakea**

**Hydrology.** Paakea Stream is mostly a gaining stream with most of the ground water gains attributed to springs located in the lower half of the hydrologic unit.

**Maintenance of Fish and Wildlife Habitat.** Paakea Stream had poor instream habitats due to reduced flow in the upper reach and below the diversion. However, the lower reach of the stream had good streamflow, mostly likely a result of spring input. Most of the native stream animals were observed in the plunge pool by the first waterfall near the stream mouth. The native biota observed include oopu nakea, oopu nopili, oopu akupa, oopu alamoo, opae kalaole, and hihiwai. While flow restoration may increase flow continuity, it would not enhance overall productivity of the stream or any substantial increases in estuarine habitats.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Paakea as “substantial”; although the only recreational opportunity identified was fishing. The total hunting area is about 73 percent of the hydrologic unit.

**Maintenance of Ecosystems.** The riparian resources of Paakea Stream were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 70 percent of the hydrologic unit. Vegetation is dominated by native species.

**Aesthetic.** While no waterfall in Paakea Stream can be seen from Hana Highway, the scenic Hana Highway route to Hana town is a popular tourist attraction in which visitors take photos of waterfalls and the valley where other streams cross the highway.

**Maintenance of Water Quality.** Paakea Stream is classified as Class 1b inland waters in the upper elevations and Class 2 inland waters in the lower elevations. It does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

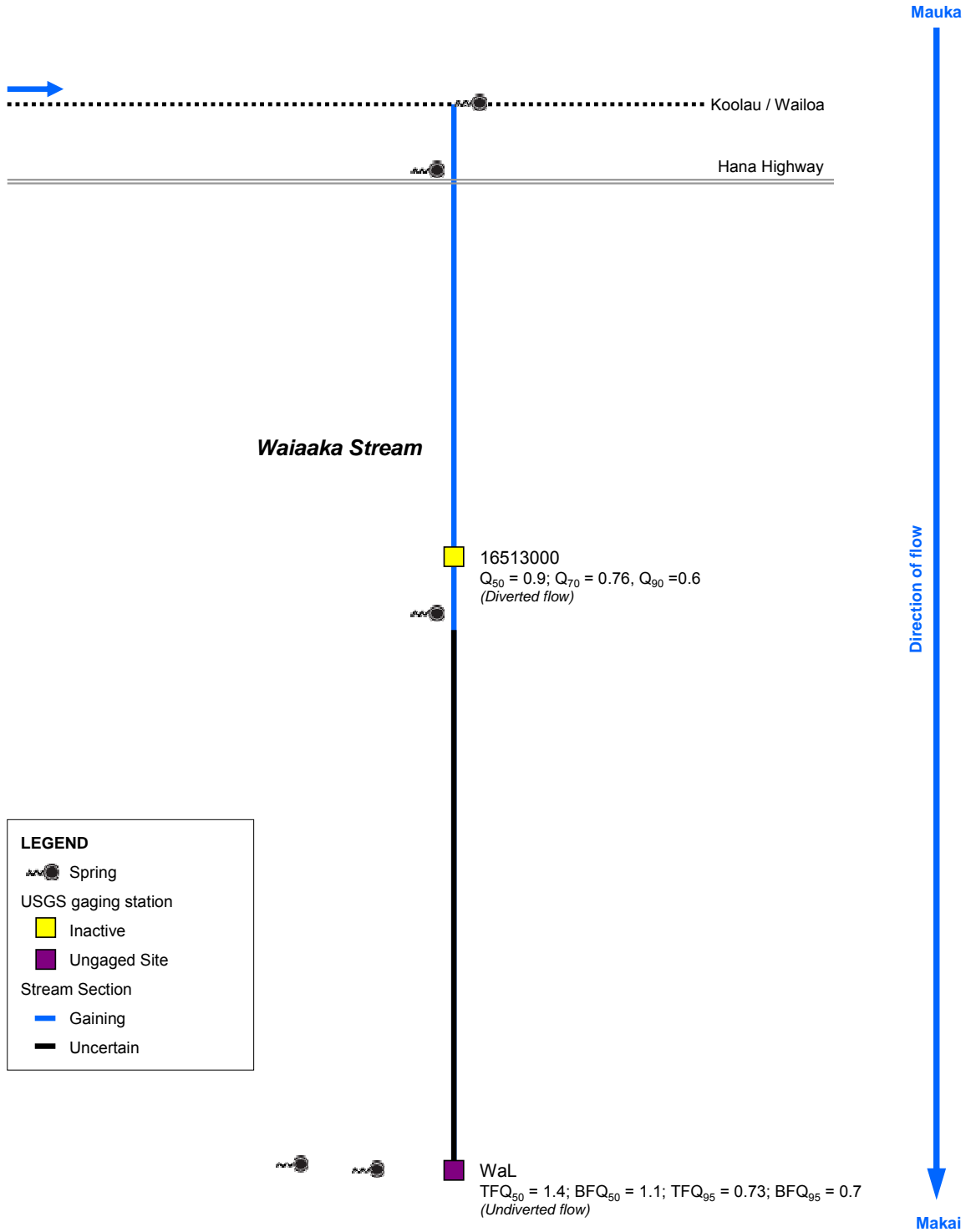
**Conveyance of Irrigation and Domestic Water Supplies.** Paakea has two registered diversions, both of which belong to EMI. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLHC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Paakea does not have any active taro diversions.

**Noninstream Uses.** Paakea Stream is diverted at the Koolau Ditch by the EMI System at 2 major diversions and 3 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 14: Simplified schematic diagram for the hydrologic unit of Waiaaka.

# 6062 Waiaaka



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.



**Assessment Summary: Waiaaka**

**Hydrology.** Waiaaka Stream is mostly a gaining stream with most of the ground water gains attributed to spring input.

**Maintenance of Fish and Wildlife Habitat.** While DAR has yet to survey Waiaaka Stream, according to USGS, Waiaaka Stream retains almost all of the natural base flow under diverted conditions because most of the hydrologic unit lies below the Koolau Ditch diversion. For this reason, the stream provides 100 percent of the expected natural habitat availability for all native species.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Waiaaka as “substantial”; although the only recreational opportunity identified was fishing. The hydrologic unit of Waiaaka does not lie within a hunting area unit.

**Maintenance of Ecosystems.** The riparian resources of Waiaaka Stream were not classified by the Hawaii Stream Assessment. Since the hydrologic unit is small and is located in the lower elevations, there are no reserves or wetlands in the unit. Vegetation is dominated by alien species.

**Aesthetic.** The Na Ala Hele trail is located in the lower basin and crosses the stream where the public can access. While no waterfall in Waiaaka Stream can be seen from Hana Highway, the scenic Hana Highway route to Hana town is a popular tourist attraction in which visitors take photos of waterfalls and the valley where other streams cross the highway.

**Maintenance of Water Quality.** The entire length of Waiaaka Stream is classified as Class 2 inland waters in which the stream is protected for uses such as recreational purposes, support of aquatic life, and agricultural water supplies. It does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

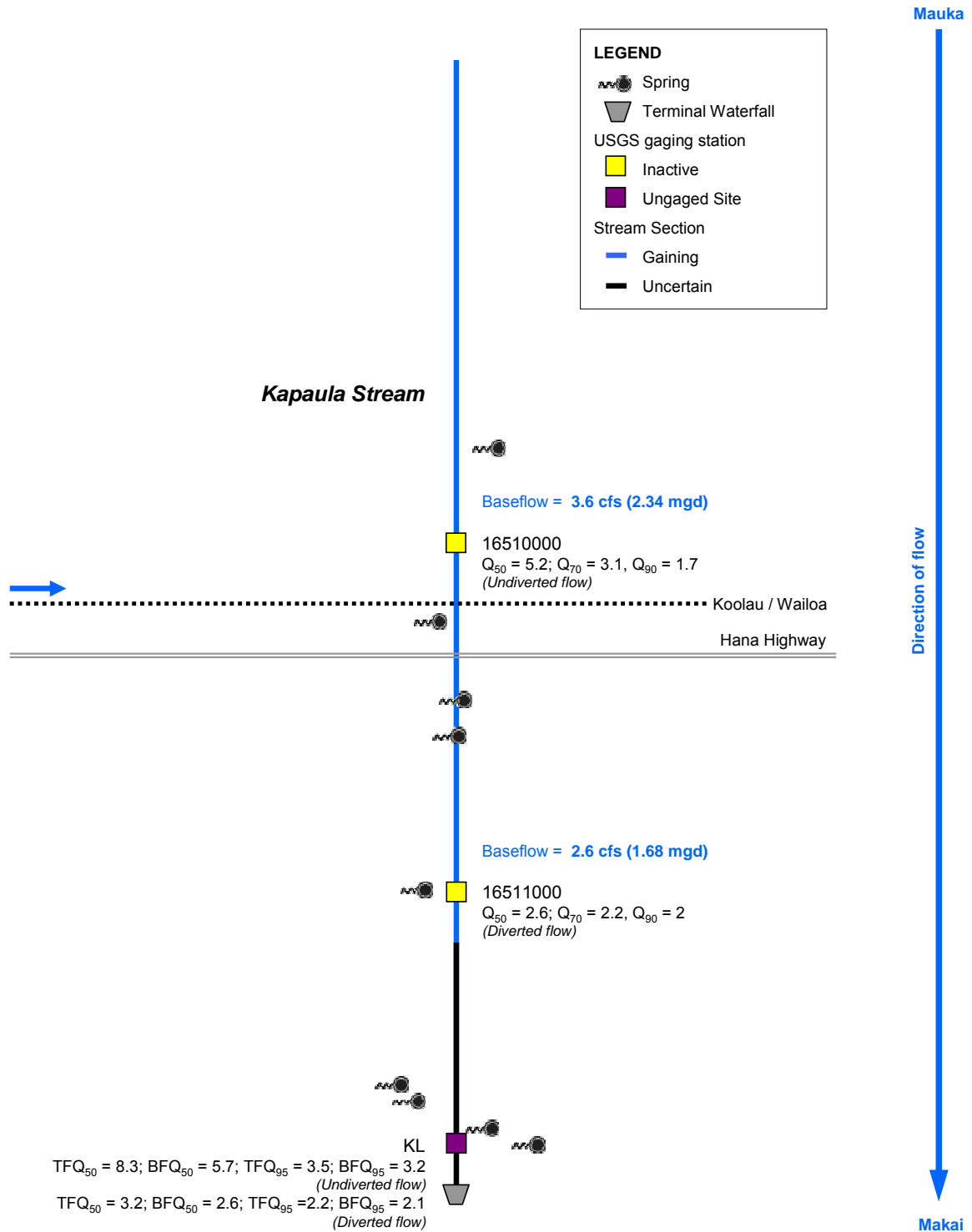
**Conveyance of Irrigation and Domestic Water Supplies.** Waiaaka Stream has only one registered diversion which belongs to EMI. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLHC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Waiaaka does not have any active taro diversions.

**Nonstream Uses.** Waiaaka Stream is diverted at the Koolau Ditch by the EMI System mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 15: Simplified schematic diagram for the hydrologic unit of Kapaula.

# 6063 Kapaula



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Kapaula**

**Hydrology.** Kapaula Stream is mostly a gaining stream with most of the ground water gains attributed to spring input.

**Maintenance of Fish and Wildlife Habitat.** Kapaula Stream had poor instream habitat for native species due to a terminal waterfall, reduced streamflow, and overall substrate of the streambed in the lower reach. Only the opae kalaole was observed in the stream. Below the diversion, the stream had little flow and warmer temperatures, providing little habitat. While restoring streamflow may increase stream connectivity and available instream habitat in the lower reach, it would not enhance overall productivity of the stream or any substantial increases in estuarine habitats.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Kapaula as “substantial”; although the only recreational opportunity identified was fishing. The total hunting area is about 37 percent of the hydrologic unit.

**Maintenance of Ecosystems.** The riparian resources of Kapaula were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 40 percent of the hydrologic unit, mostly in the upper elevations. The proportion of native and alien vegetation is about equal in the unit.

**Aesthetic.** Several waterfalls are located along the lower reach of Kapaula Stream near the stream mouth. While no waterfall in Kapaula Stream can be seen from Hana Highway, the scenic Hana Highway route to Hana town is a popular tourist attraction in which visitors take photos of waterfalls and the valley where other streams cross the highway.

**Maintenance of Water Quality.** Kapaula Stream is classified as Class 1b inland waters in the upper elevations and Class 2 inland waters in the lower elevations. It does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

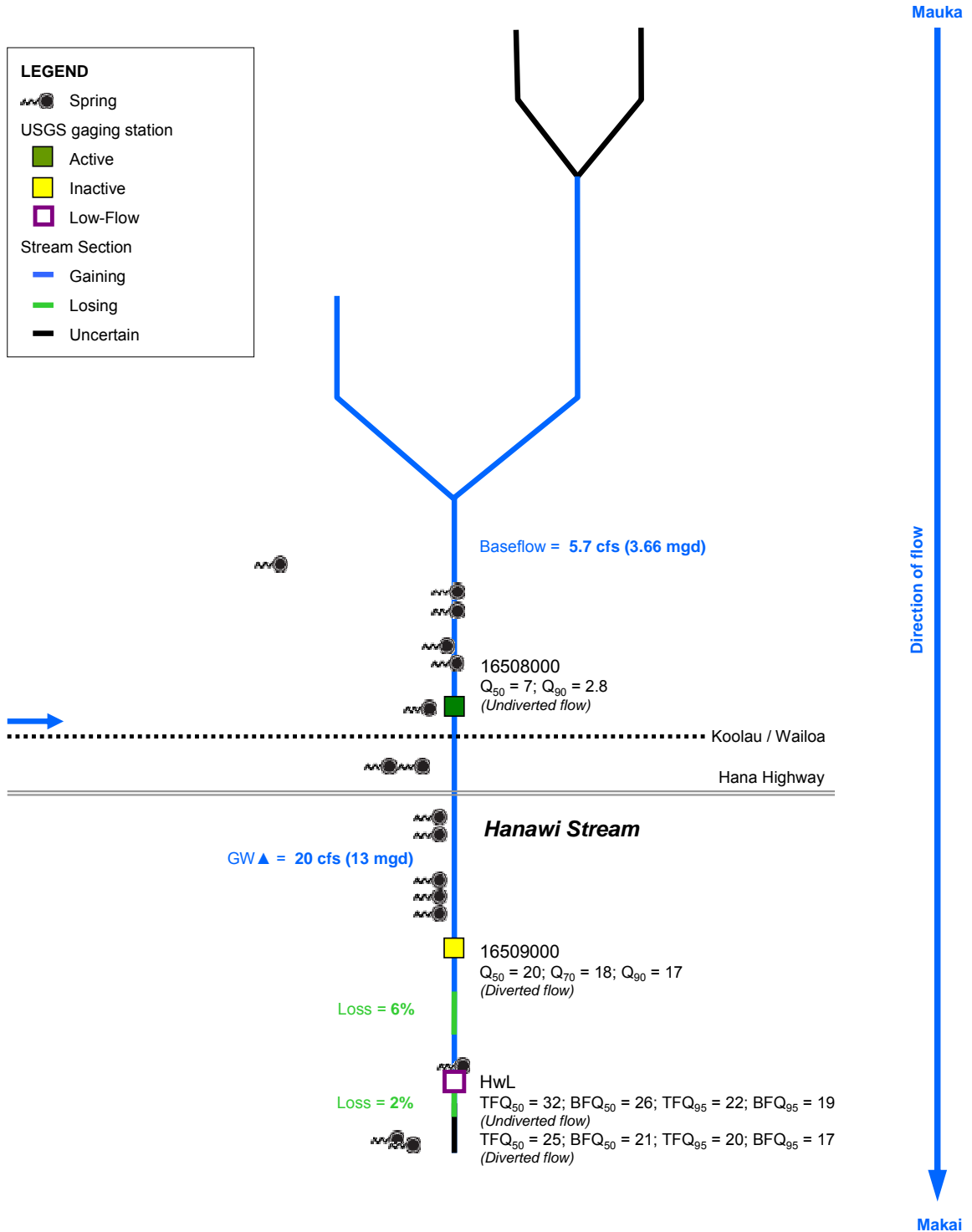
**Conveyance of Irrigation and Domestic Water Supplies.** Kapaula has two registered diversions, both of which belong to EMI. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLHC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Kapaula does not have any active taro diversions.

**Noninstream Uses.** Kapaula Stream is diverted at the Koolau Ditch by the EMI System at 2 major diversions and 5 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 16: Simplified schematic diagram for the hydrologic unit of Hanawi.

# 6064 Hanawi



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Hanawi**

**Hydrology.** Hanawi Stream is mostly a gaining stream with most of the ground water gains attributed to spring input.

**Maintenance of Fish and Wildlife Habitat.** Hanawi Stream provided excellent instream habitats and a diversity of native stream animals exists in the stream. The native animals observed include oopu nakea, oopu nopili, oopu akupa, oopu alamoo, opae kalaole, and hihiwai. High water depths below the ditch level provide 50 to 75 percent of natural instream habitats. Near the coast, enough ground water is gained to provide 75 to 100 percent of the natural instream habitats.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Hanawi as “outstanding”. Recreational opportunities included camping, hiking, fishing, hunting, swimming, and scenic views. The total hunting area is about 80 percent of the hydrologic unit.

**Maintenance of Ecosystems.** The Hawaii Stream Assessment classified the riparian resources of Hanawi as “outstanding”. Reserves and wetlands occupy about 90 percent of the hydrologic unit. Vegetation is dominated by native species.

**Aesthetic.** Among the many waterfalls on Hanawi Stream, one of them is above Hana Highway, and another waterfall is located immediately downstream from the highway. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Instream Hydropower Generation.** Hanawi Stream was identified to have good hydropower potential. The stream could contribute a single plant capacity of 1,000 kilowatts of hydropower.

**Maintenance of Water Quality.** Hanawi Stream is mostly Class 1b inland waters as parts of the stream lie in forest reserves/preserves. It appears on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

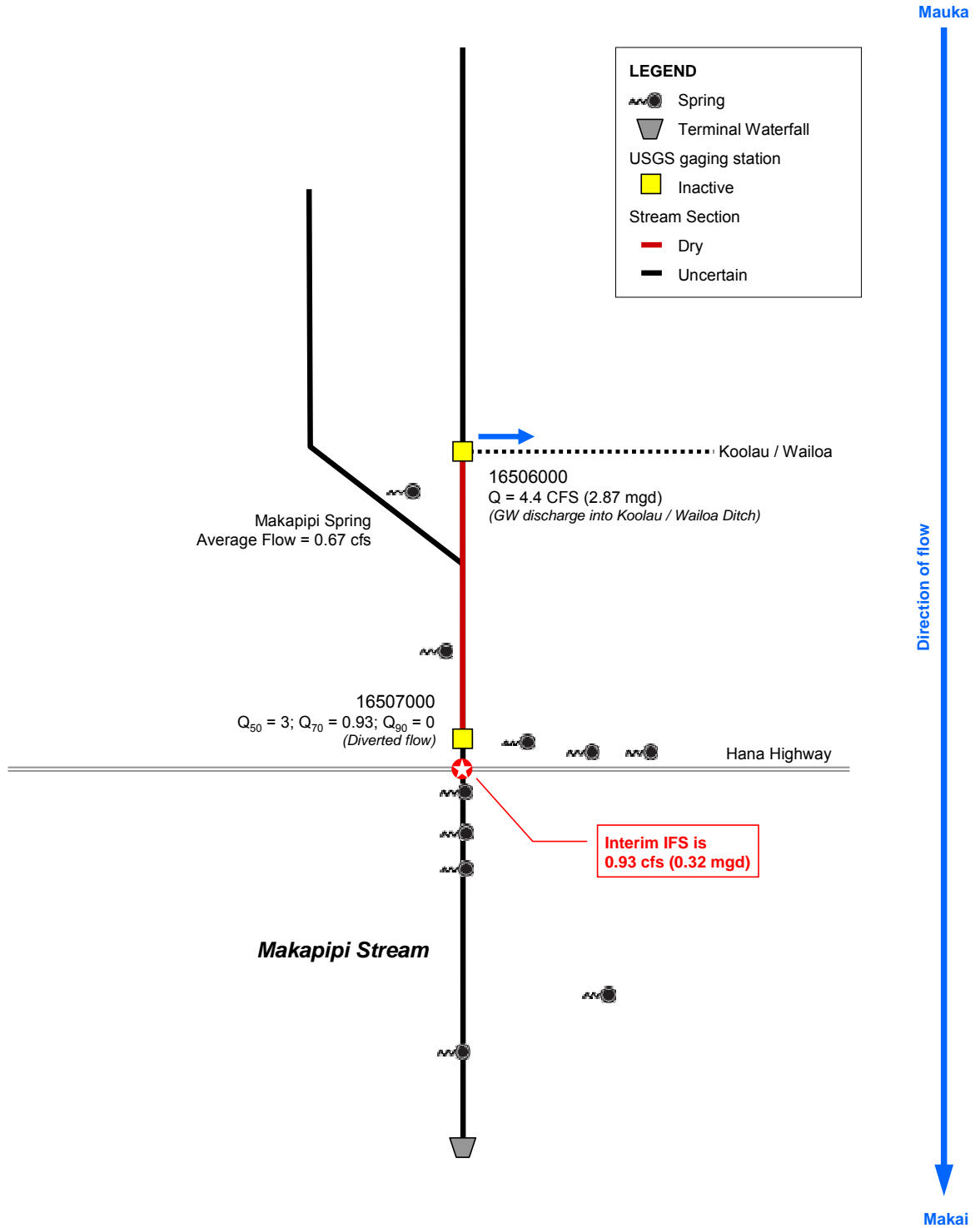
**Conveyance of Irrigation and Domestic Water Supplies.** Hanawi has a total of six registered diversions, five of which belong to EMI. The one remaining diversion is the Nahiku Pump which was registered by Maui Land & Pine for the purpose of irrigating pineapple fields. No diversions divert water for domestic or irrigation purposes within the hydrologic unit.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLHC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Currently, Hanawi does not have any active taro diversions.

**Noninstream Uses.** Hanawi Stream is diverted at the Koolau Ditch by the EMI System at 5 major diversions and 11 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

Figure 17: Simplified schematic diagram for the hydrologic unit of Makapipi.

# 6065 Makapipi



**DIAGRAM NOT TO SCALE**

NOTE: Statistics of gages at low flow and ungaged sites are estimated from regression equations. Statistics of active and inactive gages are derived from historic data.

## **Assessment Summary: Makapipi**

**Hydrology.** Little is known about Makaipi Stream in regards to its streamflow characteristics. Based on the available information, the stream reach below Koolau Ditch is dry.

**Maintenance of Fish and Wildlife Habitat.** Makapipi Stream provided poor instream habitats due to reduced streamflow and losing sections where water flowed subsurface. The native animals observed include oopu naniha, oopu nakea, oopu akupa, oopu alamoo, and opae kalaole. The middle and upper reaches were dry, providing no instream habitat. Isolated pools of water had lower water temperatures, which was indicative of spring water input. Only the native opae kalaole was observed in the upper reach where flow was minimal, but not dry.

**Outdoor Recreational Activities.** The Hawaii Stream Assessment classified the recreational resources of Makapipi as “substantial”. Recreational opportunities included hiking, fishing, hunting, swimming, and scenic views. The total hunting area is about 51 percent of the hydrologic unit.

**Maintenance of Ecosystems.** The riparian resources of Makapipi were not classified by the Hawaii Stream Assessment. Reserves and wetlands occupy about 50 percent of the hydrologic unit. The proportion of native and alien vegetation is about equal in the unit.

**Aesthetic.** With sufficient rainfall, Makapipi Stream can be seen flowing over a waterfall (i.e., Makapipi Falls) just below Hana Highway. Nahiku is located off of Hana Highway where the occasional tourist makes a stop to enjoy the lush tropical forest that engulfs the small and quaint town. At the end of Lower Nahiku Road is Nahiku Cove, a secluded beach that may not be an ideal swimming spot but it definitely offers breathtaking views of the ocean. The scenic Hana Highway route to Hana town is also a popular tourist attraction in which visitors take photos of waterfalls and the valley where the streams cross the highway.

**Maintenance of Water Quality.** Makapipi Stream is classified as Class 1b inland waters in the upper elevations and Class 2 inland waters in the lower elevations. It does not appear on the 2006 List of Impaired Waters in Hawaii, Clean Water Act §303(d).

**Conveyance of Irrigation and Domestic Water Supplies.** Makapipi Stream has a total of three registered diversions, one of which belongs to EMI. Of the two remaining registered diversions, one registrant declared water use for domestic purposes and landscaping, along with the irrigation of 3 acres of rice, watercress, taro, and aquaculture. The other registrant declared water use for domestic purposes and irrigation of crops and landscaping.

**Protection of Traditional and Customary Hawaiian Rights.** Testimonies submitted by NHLC addressed insufficient flow that is affecting taro cultivation and traditional gathering in the east Maui streams. Although on diversion was registered for the purpose of taro cultivation, a recent field investigation revealed that no taro was grown.

**Noninstream Uses.** Makapipi Stream is diverted at the Koolau Ditch by the EMI System at a major diversion and 2 minor diversions mainly for the irrigation needs of the HC&S sugarcane plantation.

**RECOMMENDATION:****WAIKAMOI (6047) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Waikamoi and Alo Streams weighs heavily on the importance of diverted streamflow for the Maui DWS Upcountry System and the EMI System. With both streams generally gaining from their headwaters and the presence of a terminal waterfall, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petitions to Amend the Interim Instream Flow Standard for Waikamoi and Alo Streams, staff recommends that one measurable interim IFS be established with no modifications to existing diversions on Waikamoi and Alo Streams:

- **Proposed Interim IFS A:** The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 550 feet, shall remain as designated on October 8, 1988. This location is downstream of the confluence of Waikamoi and Alo Streams. This is equivalent to an estimated flow of 0.2 cubic feet per second (0.13 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

The balance of instream and noninstream uses for Wahinepee Streams weighs heavily on the importance of diverted streamflow for the EMI System. Unlike Waikamoi and Alo Streams, the drainage area for Wahinepee is small and short with one major EMI diversion located near its headwaters. With the stream generally gaining along most of its course to the ocean and the presence of a terminal waterfall, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Wahinepee Stream, staff recommends that one measurable interim IFS be established for Wahinepee Stream:

- **Proposed Interim IFS B:** The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 575 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.5 cubic feet per second (0.32 million gallons per day) cfs based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

In addition to the General Recommendations listed below, staff recommends approval of the following adaptive management strategies for the hydrologic unit of Waikamoi:

- Maui DWS, in coordination with Commission staff, shall work towards system improvements of the Upper and Lower Kula Systems to reduce system inefficiencies and waste that is currently occurring. Of considerable concern is the loss of water from the wooden Upper Waikamoi Flume.

**PUOHOKAMOA (6048) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Puohokamoa Stream weighs heavily on the importance of diverted streamflow for the Maui DWS Upcountry System and the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.



In the matter of the Petition to Amend the Interim Instream Flow Standard for Puohokamoa Stream, staff recommends that one measurable interim IFS be established for Puohokamoa Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 565 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.4 cubic feet per second (0.26 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

In addition to the General Recommendations listed below, staff recommends approval of the following adaptive management strategies for the hydrologic unit of Puohokamoa:

- Maui DWS, in coordination with Commission staff, shall work towards system improvements of the Upper and Lower Kula Systems to reduce system inefficiencies and waste that is currently occurring. Of considerable concern is the loss of water from the wooden Upper Waikamoi Flume.

### **HAIPUAENA (6049) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Haipuaena Stream weighs heavily on the importance of diverted streamflow for the Maui DWS Upcountry System and the EMI System. With the stream generally gaining along most of its course to the ocean and the presence of a terminal waterfall, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Haipuaena Stream, staff recommends that one measurable interim IFS be established for Haipuaena Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 510 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.1 cubic feet per second (0.07 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

In addition to the General Recommendations listed below, staff recommends approval of the following adaptive management strategies for the hydrologic unit of Haipuaena:

- Maui DWS, in coordination with Commission staff, shall work towards system improvements of the Upper and Lower Kula Systems to reduce system inefficiencies and waste that is currently occurring. Of considerable concern is the loss of water from the wooden Upper Waikamoi Flume.

### **PUNALAU (6050) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Punalau Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining below the lowest major diversion, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Punalau Stream, staff recommends that one measurable interim IFS be established for Punalau Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 40 feet, shall remain as designated on October 8, 1988. This

is equivalent to an estimated flow of 0.2 cubic feet per second (1.36 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

No unit-specific adaptive management strategies for Punalau are proposed at this time.

### **HONOMANU (6051) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Honomanu Stream weighs heavily on the importance of diverted streamflow for the Maui DWS Upcountry System and the EMI System. With the stream generally losing below the EMI System, suitable instream habitats were limited to the stream mouth that is fed through spring input. It is also likely that restored flow would not result in continuous streamflow from the headwaters to the stream mouth. The current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Honomanu Stream, staff recommends that one measurable interim IFS be established for Honomanu Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 20 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0 based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

In addition to the General Recommendations listed below, staff recommends approval of the following adaptive management strategies for the hydrologic unit of Honomanu:

- Maui DWS, in coordination with Commission staff, shall work towards system improvements of the Lower Kula Pipeline to reduce system inefficiencies and waste that may be occurring. Of considerable concern is the loss of water from the wooden Upper Waikamoi Flume.

### **NUAAILUA (6052) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Nuaailua Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Nuaailua Stream, staff recommends that one measurable interim IFS be established for Nuaailua Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 110 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.3 cubic feet per second (0.19 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

No unit-specific adaptive management strategies for Nuaailua are proposed at this time.

### **OHIA (6054) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Ohia Stream considers that the stream is not diverted by the EMI System. With the stream generally losing below Hana Highway, and only one small registered diversion, the current streamflow believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Ohia (Waianu) Stream, staff recommends that one measurable interim IFS be established for Ohia Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 195 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 4.6 cubic feet per second (2.00 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TF $Q_{95}$ ).

No unit-specific adaptive management strategies for Ohia are proposed at this time.

#### **WEST WAILUAIKI (6057) RECOMMENDATIONS:**

The balance of instream and noninstream uses for West Wailuaiki Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for West Wailuaiki Stream, staff recommends that one measurable interim IFS be established for West Wailuaiki Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,185 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.2 cubic feet per second (0.13 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TF $Q_{95}$ ).

No unit-specific adaptive management strategies for West Wailuaiki are proposed at this time.

#### **EAST WAILUAIKI (6058) RECOMMENDATIONS:**

The balance of instream and noninstream uses for East Wailuaiki Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for East Wailuaiki Stream, staff recommends that one measurable interim IFS be established for East Wailuaiki Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,235 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.2 cubic feet per second (0.13 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TF $Q_{95}$ ).

No unit-specific adaptive management strategies for East Wailuaiki are proposed at this time.

#### **KOPIILIULA (6059) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Kopiliula and Puakaa Streams weighs heavily on the importance of diverted streamflow for the EMI System. With both streams generally gaining along most of their course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Kopiliula Stream, staff recommends that one measurable interim IFS be established for Kopiliula Stream:

- Proposed Interim IFS A: The interim IFS below all EMI diversions and just below Hana Highway, near an altitude of 1,270 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.5 cubic feet per second (0.32 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

In the matter of the Petition to Amend the Interim Instream Flow Standard for Puakaa Stream, staff recommends that one measurable interim IFS be established for Puakaa Stream:

- Proposed Interim IFS B: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,235 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.6 cubic feet per second (0.39 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

No unit-specific adaptive management strategies for Kopiliula are proposed at this time.

### **WAIOHUE (6060) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Waiohue Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Waiohue Stream, staff recommends that one measurable interim IFS be established for Waiohue Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,195 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.8 cubic feet per second (0.52 million gallons per day) based on USGS estimates of total flow at  $Q_{95}$  (TFQ<sub>95</sub>).

No unit-specific adaptive management strategies for Waiohue are proposed at this time.

### **PAAKEA (6061) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Paakea Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Paakea Stream, staff recommends that one measurable interim IFS be established for Paakea Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,265 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 3.2 cubic feet per second (2.07 million gallons per day) based on USGS estimates of total flow at  $Q_{90}$  (TFQ<sub>90</sub>).

No unit-specific adaptive management strategies for Paakea are proposed at this time.

**WAIAAKA (6062) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Waiiaaka Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Waiiaaka Stream, staff recommends that one measurable interim IFS be established for Waiiaaka Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and at Hana Highway, near an altitude of 1,235 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 0.6 cubic feet per second (0.39 million gallons per day) based on USGS estimates of total flow at  $Q_{90}$  (TFQ<sub>90</sub>).

No unit-specific adaptive management strategies for Waiiaaka are proposed at this time.

**KAPAUOLA (6063) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Kapaula Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Kapaula Stream, staff recommends that one measurable interim IFS be established for Kapaula Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,194 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 2.0 cubic feet per second (1.29 million gallons per day) based on USGS estimates of total flow at  $Q_{90}$  (TFQ<sub>90</sub>).

No unit-specific adaptive management strategies for Kapaula are proposed at this time.

**HANAWI (6064) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Hanawi Stream weighs heavily on the importance of diverted streamflow for the EMI System. With the stream generally gaining along most of its course to the ocean, the current streamflow below existing major diversions is believed to be sufficient to support existing instream uses.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Hanawi Stream, staff recommends that one measurable interim IFS be established for Hanawi Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 1,045 feet, shall remain as designated on October 8, 1988. This is equivalent to an estimated flow of 17.0 cubic feet per second (10.99 million gallons per day) based on USGS estimates of total flow at  $Q_{90}$  (TFQ<sub>90</sub>).

In addition to the General Recommendations listed below, staff recommends approval of the following adaptive management strategies for the hydrologic unit of Hanawi:

- In response to the announcement that MLP will end pineapple production, Commission staff shall seek to meet with MLP officials to determine the disposition of surface water

diversions and ground water wells. Of particular concern is the Nahiku pump (REG.772.6) and the Kuhiwa well (4806-48).

### **MAKAPIPI (6065) RECOMMENDATIONS:**

The balance of instream and noninstream uses for Makapipi Stream considers both the importance of diverted streamflow for the EMI System and the Nahiku community which relies on the stream for cultural practices, recreation, and other instream uses. With the uncertainty of gaining and losing reaches along most of the stream's course to the ocean, it is not known whether restored flow would result in continuous streamflow from the headwaters to the stream mouth. A coordinated study of a short-term release of water past the one major EMI diversion should be sufficient to determine the sustainability of the proposed standard.

In the matter of the Petition to Amend the Interim Instream Flow Standard for Makapipi Stream, staff recommends that one measurable interim IFS be established for Makapipi Stream:

- Proposed Interim IFS: The interim IFS below all EMI diversions and just above Hana Highway, near an altitude of 935 feet, shall be established at an estimated flow of 0.93 cubic feet per second (0.32 million gallons per day) based on USGS estimates of total flow at  $Q_{70}$  ( $TFQ_{70}$ ). Due to the uncertainty of existing hydrogeologic conditions of Makapipi Stream, this interim IFS will be subject to a conditional release of water by EMI and monitoring by Commission staff. Should an estimated flow of 0.93 cubic feet per second be unattainable, the interim IFS may be revised by a future Commission action.

In addition to the General Recommendations listed below, staff recommends approval of the following adaptive management strategies for the hydrologic unit of Makapipi:

- In response to the announcement that MLP will end pineapple production, Commission staff shall seek to meet with MLP officials to determine the disposition of surface water diversions and ground water wells. Of particular concern is the Nahiku pump (REG.772.6) and the Kuhiwa well (4806-48).
- EMI, in coordination with Commission staff, shall allow water to bypass the Makapipi Stream diversion (REG. 298.6) to determine the attainability of the proposed interim IFS of 0.93 cubic feet per second for Makapipi Stream. Adjustments to ground water development tunnels will not be required.

**GENERAL RECOMMENDATIONS:**

Staff recommends approval of the following adaptive management strategies for all sixteen of the hydrologic units being considered:

**IMPLEMENTATION**

- Staff shall seek to enforce the provisions of the State Water Code should any unauthorized, non-registered or non-permitted diversions be discovered in the course of its fieldwork. Staff recommends that all owners of unauthorized diversion works structures contact staff to file the necessary applications to seek compliance with all permitting requirements set forth by the Code.
- Staff shall continue to coordinate with EMI to identify and determine appropriate actions with regard to attaining the proposed interim IFS values downstream of existing diversion structures.
- Staff shall continue to assess existing conditions and the status of all EMI diversions, in coordination with EMI and the Division of Aquatic Resources (DAR), to determine if any modifications are possible to improve habitat conditions for stream biota.
- Any party diverting water from a stream shall be responsible to maintain system efficiencies, minimize offstream water losses, and minimize impacts to the natural stream resource.

**MONITORING**

- EMI and Maui DWS, on forms provided by the Commission, shall notify Commission staff when any considerable repairs or maintenance to existing stream diversions structures are performed in the future. Any alterations to existing stream diversions that will substantially change the divertible capacity will still be subject to the provisions of the State Water Code, Chapter 174C, HRS.
- Within one year, EMI, in coordination with Commission staff, shall develop a monitoring plan to provide data on the amount of water diverted by the EMI system from east Maui streams. This shall include identifying existing gaging stations and the possible installation of additional gaging stations.
- Within one year, Maui DWS, in coordination with Commission staff, shall develop and implement a monitoring plan to accurately determine system losses on the Waikamoi Upper Flume. This may include installing gaging stations to measure flow of water into and at the terminus of the Upper Flume.
- EMI and Maui DWS, in consultation with Commission staff, shall regularly report monthly water use or related monitoring data (e.g., ditch flow, reservoir levels, pumpage amounts, etc.) on forms provided by the Commission.
- Staff shall monitor streamflow by taking periodic flow measurements, subject to available funding, at the proposed interim IFS locations, as weather permits. These will be point-in-time measurements; however, the installation of stream gaging stations remains an option for long-term management.
- Periodic biological surveys shall be conducted, subject to available funding, to monitor the response of stream biota to post-interim IFS implementation.
- Any party claiming to be negatively impacted as a result of the adopted interim IFS shall monitor and document, in cooperation with staff, the impact upon instream or noninstream uses, including economic impacts. Data shall be provided to staff to substantiate any claims.

- Likewise, any party claiming that negative impacts are a direct result of actions (i.e., diverting too much water, violating the interim IFS) caused by another party, shall monitor and document the impact upon instream or noninstream uses, including economic impacts. Data shall be provided to staff to substantiate any claims.
- All claimants shall cooperate with staff in conducting appropriate investigations and studies, particularly with regard to granting access to stream channels and private property related to such investigations, subject to the provisions of the State Water Code, Chapter 174C, HRS.

#### EVALUATION

- Within one year from the date of adoption of an interim IFS, staff shall report to the Commission on the progress of implementing the interim IFS and the application of the adaptive management strategies outlined above, and the impacts of the interim IFS upon instream and noninstream uses.
- Within one year, EMI shall report to the Commission on the status and implementation of their monitoring plan, the locations of the gaging stations, and provide data on the volume and end uses of water delivered through the EMI system.
- Within one year, the Maui DWS shall report to the Commission on the status and implementation of their monitoring plan, the condition of the Upper and Lower Kula Systems, results of monitoring system losses, steps being taken to improve system inefficiencies, and continue to provide data on volume and end uses of water delivered through the Maui DWS system.
- Staff shall assess the implementation of these strategies on an as-needed basis, as may be necessary upon consultation with the affected parties.
- Staff shall continue to provide quarterly updates to the Commission during the course of the year.
- Should there be changes to the operational status of HC&S, changes to the current water uses declared by HC&S, and/or any substantial changes in water needs as determined by the Commission or Commission staff, staff shall reassess the interim IFS for streams affected by the EMI System.

Respectfully submitted,



KEN C. KAWAHARA, P.E.  
Deputy Director

Note: Exhibits 1 to 21 are provided electronically on an accompanying CD or are available from the Commission website at [http://hawaii.gov/dlnr/cwrm/currentissues\\_Petition27EastMaui.htm](http://hawaii.gov/dlnr/cwrm/currentissues_Petition27EastMaui.htm).

Exhibit 1	Instream Flow Standard Assessment Report for Waikamoi Unit 6047, PR-2009-01
Exhibit 2	Instream Flow Standard Assessment Report for Puohokamoa Unit 6048, PR-2009-02
Exhibit 3	Instream Flow Standard Assessment Report for Haipuaena Unit 6049, PR-2009-03
Exhibit 4	Instream Flow Standard Assessment Report for Punalau Unit 6050, PR-2009-04
Exhibit 5	Instream Flow Standard Assessment Report for Honomanu Unit 6051, PR-2009-05
Exhibit 6	Instream Flow Standard Assessment Report for Nuaailua Unit 6052, PR-2009-06









- Exhibit 7 Instream Flow Standard Assessment Report for Ohia Unit 6054, PR-2009-07
- Exhibit 8 Instream Flow Standard Assessment Report for West Wailuaiki Unit 6057, PR-2009-08
- Exhibit 9 Instream Flow Standard Assessment Report for East Wailuaiki Unit 6058, PR-2009-09
- Exhibit 10 Instream Flow Standard Assessment Report for Kopiliula Unit 6059, PR-2009-10
- Exhibit 11 Instream Flow Standard Assessment Report for Waiohue Unit 6060, PR-2009-11
- Exhibit 12 Instream Flow Standard Assessment Report for Paakea Unit 6061, PR-2009-12
- Exhibit 13 Instream Flow Standard Assessment Report for Waiaka Unit 6062, PR-2009-13
- Exhibit 14 Instream Flow Standard Assessment Report for Kapaula Unit 6063, PR-2009-14
- Exhibit 15 Instream Flow Standard Assessment Report for Hanawi Unit 6064, PR-2009-15
- Exhibit 16 Instream Flow Standard Assessment Report for Makapipi Unit 6065, PR-2009-16
- Exhibit 17 Compilation of Data Submissions, PR-2009-17
- Exhibit 18 Compilation of Public Review Comments and Appendix, PR-2009-18
- Exhibit 19 Compilation of Public Testimony, PR-2009-19
- Exhibit 20 Simplified Schematic of the EMI System
- Exhibit 21 Simplified Schematic of the Maui DWS Upcountry System, EMI System, and System Users

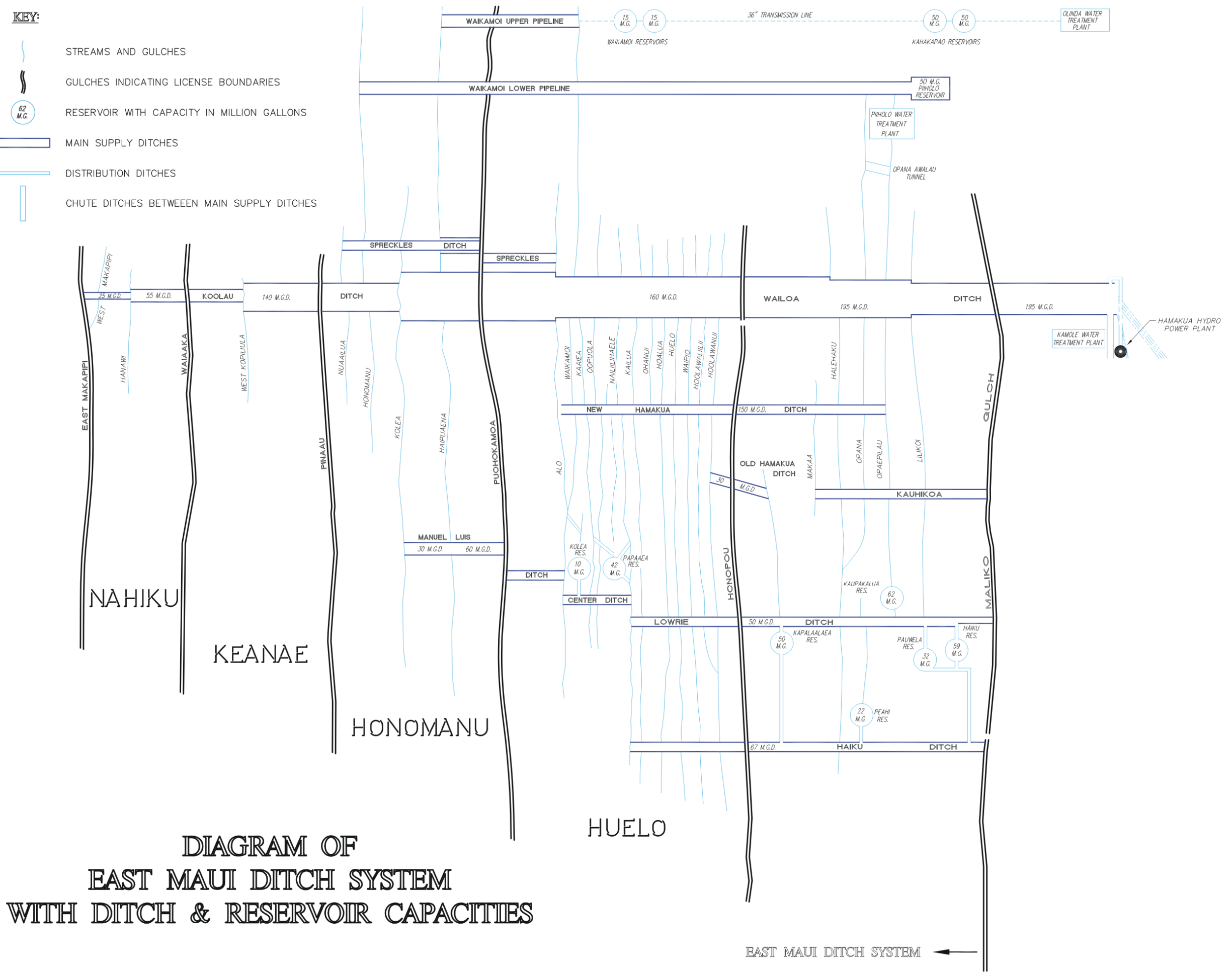
APPROVED FOR SUBMITTAL:



LAURA H. THIELEN  
Chairperson

**KEY:**

-  STREAMS AND GULCHES
-  GULCHES INDICATING LICENSE BOUNDARIES
-  RESERVOIR WITH CAPACITY IN MILLION GALLONS
-  MAIN SUPPLY DITCHES
-  DISTRIBUTION DITCHES
-  CHUTE DITCHES BETWEEN MAIN SUPPLY DITCHES



**DIAGRAM OF  
EAST MAUI DITCH SYSTEM  
WITH DITCH & RESERVOIR CAPACITIES**

EAST MAUI DITCH SYSTEM ←



Civil No. 19-1-0019-01 (JPC)

**Defendant A&B/EMI's Exhibit AB-127**

FOR IDENTIFICATION \_\_\_\_\_

RECEIVED IN EVIDENCE \_\_\_\_\_

CLERK \_\_\_\_\_