Item F-2 Exhibit B

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

September 22, 2020

MEMORANDUM

TO: Brian J. Neilson
DAR Administrator

FROM: Troy Sakihara, Aquatic Biologist

CC: Brian Kanenaka, Program Manager
Ryan Okano, Program Manager
David Sakoda, Program Manager

SUBJECT: Pahe'ehe'e Stream Inspection

On September 10, 2020, a visual rapid bioassessment was conducted in the middle reach of Pahe'ehe'e Stream on Hawaii Island. The purpose of this survey was to assess the current biological condition and recovery of a section of Pahe'ehe'e Stream where a reported stream animal kill occurred on July 13, 2020. Visual surveys recording species composition, size and density estimates were conducted across a 250-meter span of stream habitat. A report summarizing these findings have been provided here.

Please contact me at 808 937 1161 or troy.s.sakihara@hawaii.gov if you have any questions or would like to discuss the information and details presented in the report.

Attachment:
Pahe'ehe'e Stream Trip Report, Honomu, Hawaii Island

Pahe‘ehe‘e Stream Trip Report

Honomu, Hawaii Island

September 10, 2020

Prepared by:

Troy Sakihara, DAR Aquatic Biologist
Division of Aquatic Resources
Department of Land and Natural Resources
State of Hawai‘i

DAR Visual Survey Conducted in Pahe‘ehe‘e Stream on the Island of Hawaii

For Surveys Conducted on 09/10/20

Summary

A visual survey in the middle reach of Pahe‘ehe‘e Stream was conducted on the morning of September 10, 2020, located in Pahe‘ehe‘e Watershed in the area of Honomu on Hawaii Island. Visual ID, size and density estimates of stream fauna were recorded along with general observations on habitat conditions. Visual surveys were conducted at 15 stations along a stretch of 250 meters of stream habitat within the middle reach of Pahe‘ehe‘e watershed. Only two species were observed throughout the entire survey area, Tahitian prawn *Macrobrachium lar*, and guppies *Poecilia reticulata,* which are both introduced and considered invasive in Hawaiian stream habitats. No native stream animals were observed during the survey. Further, considerable differences in *M. lar* densities were observed from three portions of the surveyed stream habitat with relatively low densities at stations 1-9, no prawns at stations 10-13 and notably higher densities above station 14 and throughout station 15. These density characteristics are believed to be residual effects from a prawn kill incident in July 2020 and also driven by natural migratory behavior or *M. lar* and physical barriers present in the stream.

DAR watershed code: 82034

Watershed Name: Pahe‘ehe‘e

Number of surveys: 15

Time in: 10:15:00 AM

Time Out: 11:45:00 AM

Surveyor

DAR: Sakihara, Troy

Field Assistance: Officer Edwin Shishido, DOCARE

Background and Methods

A visual survey was conducted in Pahe‘ehe‘e Stream to assess the current biological condition of a portion of said stream that was recently the site of a stream animal kill reported on July 13, 2020 (Figure 1). A total of fifteen visual surveys approximately 16 meters apart (30 paces) were conducted across a 250 meter portion of Pahe‘ehe‘e Stream. All animal species observed were recorded. Counts and estimates of size (cm) and density (N m^{-2}) for Tahitian prawns *Macrobrachium lar* were recorded at each station. Due to the small size and abundance of Guppies *Poecilia reticulata* and time constraints, presence/absence was recorded for this species only. Visual underwater footage was also recorded to verify visual observations using a Sony HDR AS100V digital camera. These observations were repeated at each survey station.

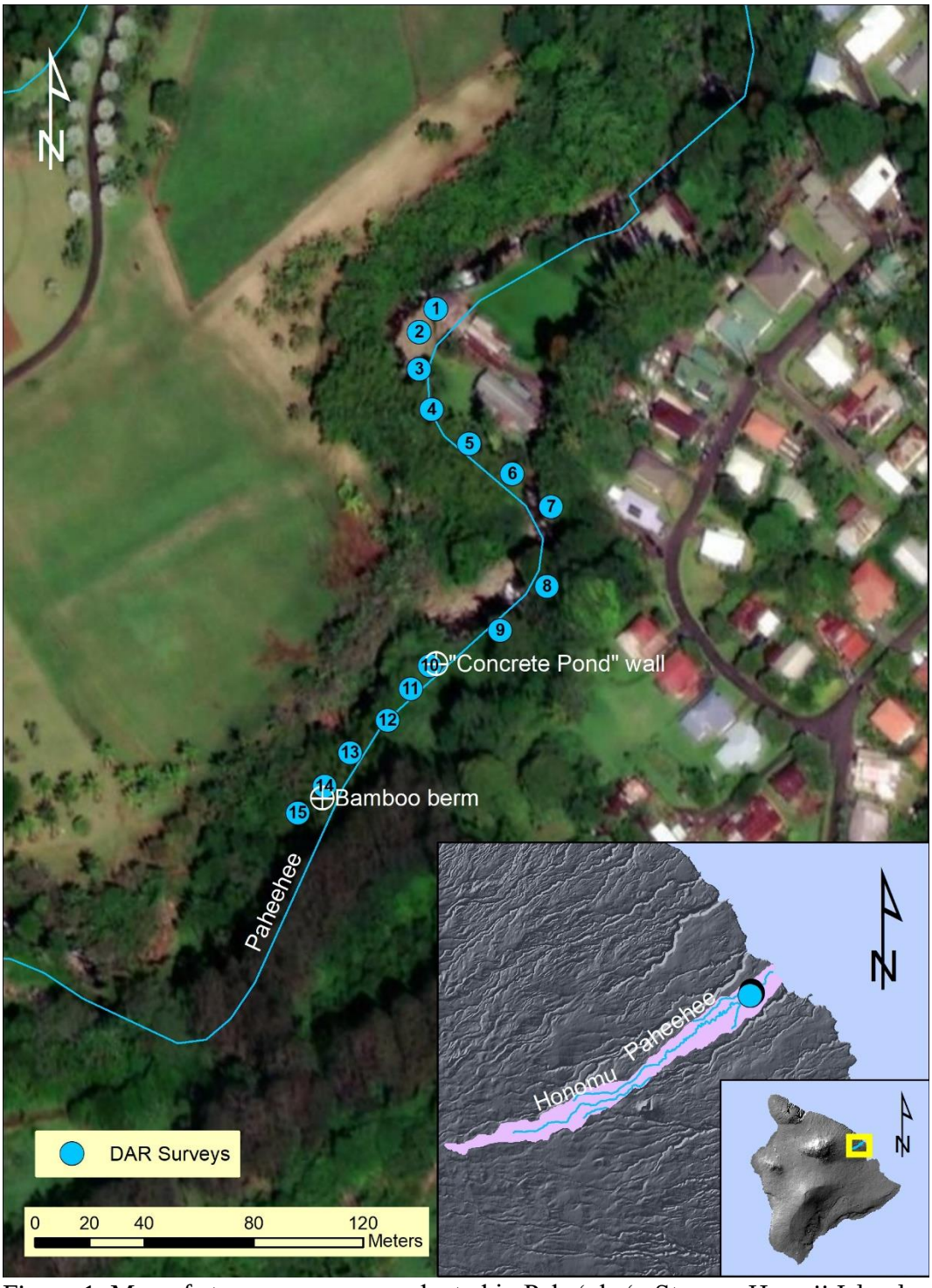

Figure 1. Map of stream surveys conducted in Pahe‘ehe‘e Stream, Hawaii Island on September 10, 2020.

Results and Discussion

Habitat

Four stream habitat types, run, riffle, cascading pool and pool, were recorded across 15 survey stations (Table 1). The stream habitat consisted almost entirely of natural boulder and cobble (Figure 2), except for a concrete weir running across the stream width immediately below survey station 10 (Figure 1 and 3). Overall, stream flow, visibility and observed habitat conditions were considered typical of streams in East Hawaii.

Table 1. Survey station coordinates and habitat type

Survey Station	Latitude	Longitude	Habitat Type
1	19.87036	-155.11775	Riffle
2	19.87028	-155.11781	Run/Riffle
3	19.87016	-155.11782	Run
4	19.87003	-155.11778	Run
5	19.86991	-155.11765	Run
6	19.86981	-155.11750	Run
7	19.86970	-155.11737	Riffle
8	19.86943	-155.11739	Cascading pool
9	19.86929	-155.11756	Run/Riffle
10 "Concrete Pond"	19.86918	-155.11780	Pool
11 "Concrete Pond"	19.86911	-155.11787	Pool
12 "Concrete Pond"	19.86901	-155.11796	Pool
13 "Concrete Pond"	19.86890	-155.11809	Pool
14 below bamboo berm	19.86879	-155.11818	Riffle
15 above bamboo berm	19.86871	-155.11828	Pool

Figure 2. Photo of Pahe‘e he‘e Stream facing upstream near survey station 4, taken on September 10, 2020.

Figure 3. Photo of Pahe‘e he‘e Stream and concrete weir, facing upstream near survey station 9, taken on September 10, 2020.

Stream animals

Two introduced invasive stream animal species, Tahitian prawn *Macrobrachium lar* and guppies *Poecilia reticulata* were observed throughout the survey. *M. lar* densities from station 1 to 9 below the concrete weir ranged from 0 to 1.4 per square meter, averaging 0.6 per square meter, whereas *M. lar* were notably absent immediately above the weir in an area referred to as "concrete pond" by residents (Table 2). At station 14 and 15, approximately 45 meters above "concrete pond", a berm consisting of fallen tree branches and bamboo (see "bamboo berm" in Figure 1) created a natural barrier and physical separation from "concrete pond". *M. lar densities* were considerably higher above the "bamboo berm" at 5 per square meter at station 15 located immediately above the berm.

P. reticulata presence was recorded in 12 out of the 15 surveys. Juveniles and adults of both males and females were consistently present throughout the survey. Due to the high abundance of individuals, small size and time constraints, observations were limited to presence/absence. Also, no native stream animals were observed during the survey.

Table 2. Stream animal observations at each station

Survey Station	Survey area (m^2)	*M. lar* count	*M. lar* density (N m^{-2})	*M. lar* size range	*P. reticulata* observed
1	5	1	0.2	5 to 15 cm	Yes
2	5	2	0.4	5 to 15 cm	Yes
3	5	2	0.4	5 to 15 cm	Yes
4	5	1	0.2	5 to 15 cm	Yes
5	5	0	0	0	Yes
6	5	7	1.4	5 to 15 cm	Yes
7	5	0	0	0	No
8	5	0	0	0	Yes
9	5	0	0	0	No
10 "Concrete Pond"	5	0	0	0	Yes
11 "Concrete Pond"	5	0	0	0	Yes
12 "Concrete Pond"	5	0	0	0	Yes
13 "Concrete Pond"	5	0	0	0	Yes
14 below bamboo berm	5	1	0.2	5 to 15 cm	No
15 above bamboo berm	5	25	5	6 to 15 cm	Yes

It is important to note that the habitat conditions within "concrete pond" and above the "bamboo berm" were very similar (Figure 4 and 5), consisting of shallow, calm water with a thick layer of sediment and decaying organic matter (leaf litter and branches), which is preferred and ideal habitat for *M. lar.* As expected, *M. lar* was prevalent and in relatively higher densities above the

"bamboo berm". In contrast, having no *M. lar* observed in "concrete pond" is considered highly unusual and atypical of biological compositions found in these types of stream habitat in Hawaii. This was also verified by a resident in the area that regularly observed prawns in abundance in "concrete pond" prior to the animal kill incident on July 13, 2020 (K. Masaoka pers. comm.). These observations indicate that some significant and unnatural form of disturbance occurred somewhere below the "bamboo berm" and above "Concrete Pond", which extirpated *M. lar* in "concrete pond", and impacted the biological community downstream as indicated by lower *M. lar* densities at survey stations 1 through 9. Also, as *M. lar* display natural upstream migrations and a tendency to move in this direction, it is highly likely that the prawns observed from stations 1 through 9 are slowly repopulating this section of stream from areas further downstream. This may also explain why *M. lar* from above the "bamboo berm" have not repopulated "Concrete Pond" downstream. Furthermore, it is also highly plausible that the lack of recruitment into "Concrete Pond" from downstream is a result of the physical barrier that the concrete weir presents. On the other hand, *P. reticulata* are considerably more mobile and less sedentary in their behavior than *M. lar*, which may explain their consistent prevalence across the entire survey.

Overall, significant differences in *M. lar* densities throughout the survey suggest a slow upstream recruitment of *M. lar* is taking place with impeding recruitment into certain sections of the stream caused by physical barriers. These surveys have also pinpointed a small portion of stream where the cause of the July 13 stream animal kill incident likely occurred. Unfortunately, no native stream animals were observed as in previous surveys circa 1980s-1990s. Although with longer term prevention of unnatural stream disturbances and human impacts, maintained stream flow and a natural recovery of habitat conditions, these native species may return to Pahe‘e he‘e Stream.

Figure 4. Photo taken upstream of “Concrete Pond” in Pahe‘e he‘e Stream near survey station 10, taken on September 10, 2020.

Figure 5. Photo taken upstream above the “bamboo berm” in Pahe‘e he‘e Stream near survey station 15, taken on September 10, 2020.