

# PAMPANGA RIVER BASIN FLOOD FORECASTING AND WARNING CENTER

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# ANNUAL REPORT 2023

# ***PRBFFWC in 2023***

***(Accomplishments, Activities & Events)***

*Front & back cover concept / edit by M. S. Jason, Jr.*

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## Introduction / Overview

**Barely a week after the start of 2023** and still reeling from the state of pandemic that began 3 years ago, the PRBFFWC unexpectedly started the year on a flood watch status. The Northeast Monsoon or “Amihan” spawned considerable rains over the mid-eastern to southeastern sections of the Pampanga River Basin bringing the main Pampanga River from its midstream to downstream channel sections into Alarm levels. However, the Candaba swamp water level that rime reached Critical level status. The river basin center issued 2 FAs and 5 FBs for that event (Jan 06-09).

**A total of 4 flood events** affected the PRB during the year with one being labelled as a “controversial” event (the SW monsoon enhanced by TCs “Egay” & “Falcon”) as it inundated most parts of the Pampanga Delta area for more than a month. It was an event that has had the greatest number of flood information / warnings issued by the PRBFFWC ever since it relocated to the CSFP in 2009. Aside from that rather notable feat, it was also in that event when almost half of the telemetry stations, all upstream stations, were down throughout that whole flood watch period. This was actually reflected in the river basin center’s annual average hydrological data downtimes for year 2023. Downtimes for rainfall and water level data were at 25.9% and 47.5%, respectively. That is about a fourth of the total number for rainfall and nearly half for total water level data for the year.

**Year 2023 was also a period of struggle** for the PRBFFWC and PAGASA as a whole as the agency went in a state of austerity. With that situation, a lot of the regular activities of the PRBFFWC were stopped such as the quarterly routine maintenance, stream gaging activities, and even the other operational-related FFW activity wherewithal, e.g., the overtime (extended hours / services) pay, field travel allowances, etc. Nonetheless, this situation did not hinder the river basin center to continue its mandated operational activities as it performed its duties beyond monetary deficiencies, often doing emergency check-ups, field validation and hydrological related measurements at their own willingness and personal expenses.

**On the other hand, year 2023 was a special year** for PRBFFWC as it commemorated the 50 years (Golden anniversary) of Flood Forecasting and Warning System in the Philippines. This is quite remarkable for the river basin center being the pilot FFWC in the country with the system being started in the most flood-prone river basin in the country, the Pampanga River Basin. Being in an austere situation and instead of having celebrations or gatherings for this significant occasion, the PRBFFWC have just decided to create a video material for this momentous event which we are very much happy to share through the following link: <https://www.youtube.com/watch?v=2rQRyfKtA8>

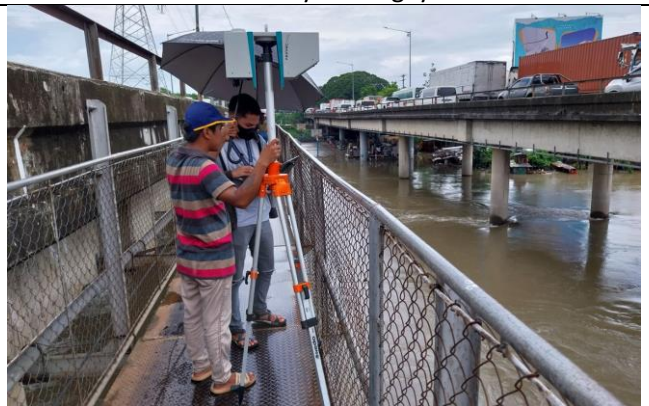
**This report is a summary compilation** of the significant and regular activities, events, programs, accomplishments, including some issues and concerns of the PRBFFWC for the year 2023. In the year 2022 annual report, the adage statement was - *“Life doesn’t require you to be the best but just needs you to do your best”*, and this is precisely what we have been trying to achieve in the PRBFFWC. For this year’s 2023 report, as a guidance in our actions and in our thoughts, our saying goes - *“Whatever you (we) do, work at it with all your heart as working for the LORD and not for men (Colossians 3:23)”*.



## Highlights of Year 2023

### Operational Hydrological Services:

- Hydrological Information:
  - 11 Flood Advisories (FAs) and 40 Flood Bulletins (FBs) were issued in 4 monitored flood events;
  - Year-round issuances and updating of the center’s website ‘*prffwc.synthasite.com*’ with the following breakdown:
    - 365 infographic hydrological forecasts
    - 729 updated “status of rainfall & water level” within PRB (daily at 5AM & 5PM)
    - 30 River Basin Weekly Situational Outlook issuances but only until August 2023; this activity was stopped at the moment for further review and development
- Stream gaging & related activities:
  - A total of 31 stream gaging activities were conducted 10 of which were river cross-sectioning only; part of the river measurements conducted for the year included the Angat River (5 sections) that was requested by the Bulacan PDRRMO, and Pagsanjan River (3 sections) which is actually outside the PRB area of concern and as requested by the National Power Corporation
  - Almost half of the 31 stream gaging activities conducted during year were done during moderate & close to high flow regimes, during the SW monsoon enhanced by TCs “Egay” & “Falcon”



Top left picture shows members of the PRBFFWC stream gaging team taking river surface velocity measurements of the Pampanga River at Arayat station (Aug 03); Top right picture, river surface velocity measurements of the Pampanga River section taken atop the NLEX-Apalit Bridge (Aug 01); Left pic, measuring the river surface velocity of a swollen Pampanga River during the SW Monsoon enhanced by TC “Egay” event with a staff gage reading of 7.90 meters at Arayat station (Jul 31).

- Conducted post-flood survey (event: SW Monsoon enhanced by TCs “Egay” and “Falcon”) with the assistance of HMDAS personnel
- 7 river WL validations were also conducted during the year
- Re-marked with permanent pen markers the established vertical points for river sounding locations at some 8 streamgaging site bridges
- 1 center personnel assisted and supported NWRB-KOICA team in stream gaging activities, mainly river surface velocity measurements only, in at least 9 stations identified in the Project IWRMIS for PRB PII in which the PRBFFWC is a member of the TWG
- Hydrological maintenance:
  - There were only 2 regular maintenance activities of all telemetry stations of the PRBFFWC undertaken throughout the year; the first one, which was in January 2023, was practically carried-out to cover the last quarter of 2022
  - There were 15 emergency trips conducted during the year with some of the trips included the river WL validation of some forecasting points





Above pictures show some of the activities carried-out during Quarterly Maintenance by the PRBFFWC: (top left) Checking & testing the overall telemetry system and communications; (top middle) Cleaning and testing of rain gages; (top right) checking of all other station-related appurtenances such as solar cell batteries, etc.

- 11 resets / transfer of A/C unit operation at San Rafael Repeater station which included partial cleaning of the said A/C units and clearing of grasses around the station
- Assisted and supported the HMTS in 2 major maintenance / repair undertakings: (1) repair & restored the WL sensor at Sulipan station, and installation of inverter at San Rafael Repeater station; (2) emergency maintenance of the PRBFFWC telemetry system
- Hydrological Data Management:
  - Partial data quality-control of 4,814 rainfall station-hours & 973 water level station-hours
  - Collated about 192 RR station-months and some 72 WL station-months of PRBFFWC supervisory system but are still subject for data validation & quality control
  - Encoded and summarized 12 station-months of the river basin center (PRBFFWC) rainfall observations (Jan-Dec 2023)
- Flood Reports & Modelling:
  - Continuing calibration of the RRI model; possible collaboration on the application of HEC-HMS to PRB with HMDAS personnel
  - Updated the rating curve & equation for San Isidro station as per request by the ICHARM Risk team
  - WL correlation method - Initial updating of coefficients at several forecasting points
  - Completed the Post-Flood Reports for the following events:
    - TC “Karding” (Sept 24 to Oct 01, 2022)
    - TC “Paeng” (Oct 28 to Nov 01, 2022)
    - SW Monsoon enhanced by TCs “Egay” & “Falcon” (Jul 24 to Aug 06, 2023)

**DRRM related activities, Information & Education activities, Coordinated programs, trainings & other related center services:**

- 58 event presentations (23 events via VTC) were accommodated with an aggregate estimated participants / attendees of about 3,317 persons



(upper pics) Resource person in the RDRRMC-3 meeting in Pantabangan (Sept 25); (top left) Media interview during a DRRM event in Pampanga (Jul 10); (top right) Resource person in an El Niño summit in the town of Bacolor, Pampanga (Jul 19).

- Attended / participated in some 87 events (30 via VTC) such as meetings, workshops, seminars, forums, conferences, trainings, etc. in various stages (local, regional, national, & international) undertakings mostly related to DRRM and CCA issues, hydrometeorological related matters, and other related river basin issues and concerns
- 25 media related interviews and interactions (Regional Radio, internet TV, phone, news vlogs - prerecorded & live streaming) particularly during flood & weather events affecting the PRB, and even the whole Reg. 3 with more than half of the interviews done via online
- Accommodated the needs of some 182 walk-in clients from various sectors during the whole year
- Provided On-the-Job trainings to a total of 18 university students from various field of concerns.

**Other Initiatives, Special Activities & Notable events during the year:**

- Attended the 158<sup>th</sup> National, 73<sup>rd</sup> World Meteorological Day celebration (Mar 22 & 23);
- Supported NCR PRSD Virtual Tours in relation to the previous stated event (Mar 22)
- Attended and actively participated, as a resource person, in the 5<sup>th</sup> PAGASA River Basin Flood Forecasting & Warning Center’s Conference (May 08-12)
- Participated in the DRRM Fun Run organized by OCD-3 and the other regional government offices of Reg. 3 in celebration of the National Disaster Resiliency Month (Jul 01)
- Conducted river channel measurements along Pagsanjan River to determine the river flow capacity of said river as requested by the NPC (Nov 21-24)
- Attended and participated actively in the RDRMC-3 Rehabilitation & Recovery Thematic area discussions on the Flood Management & Resiliency Plan for Central Luzon: A post-Disaster Rehabilitation & Recovery Plan for Areas affected by the SW Monsoon enhanced by TCs “Egay” & “Falcon” (Nov 30);
- Guest and as a resource person in the 15<sup>th</sup> School Hydrological Information Network (SHINE) Conference for the Province of Bulacan (Dec 12);
- Attended the 1<sup>st</sup> Pampanga DREAM Assessment & Awarding Ceremony for Pampanga LGUs (Dec 18)



(above pic) PRBFFWC participated as resource person in the 5<sup>th</sup> PAGASA River Basin Flood Forecasting & Warning Center’s Conference (May 08-12); (above right) As a guest and resource person in the 15<sup>th</sup> School Hydrological Information Network (SHINE) Conference for Bulacan (Dec 12); (left pics) PRBFFWC personnel conducted river cross-sectioning surveys along the Pagsanjan River as requested by NPC (Nov 21-23); (below pic) Participated in the “Run for Resiliency” Fun Run during the celebration of National Disaster Resiliency Month (Jul 01); (below right) and also in the regular monthly Flag raising ceremonies in the D.M. Government Center



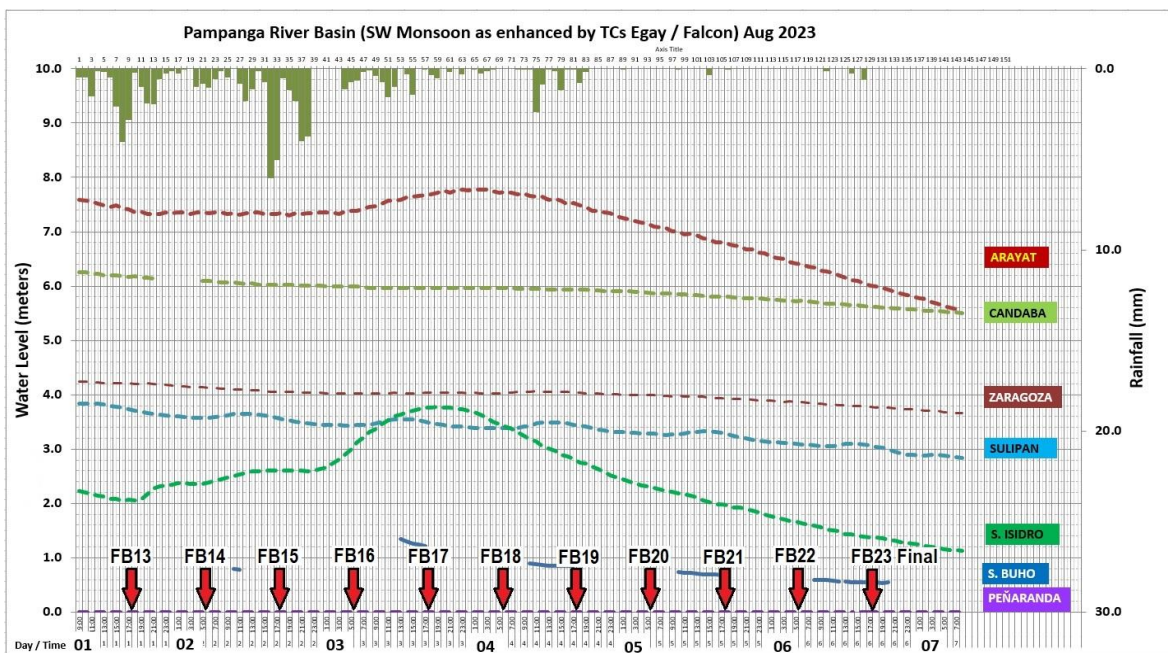
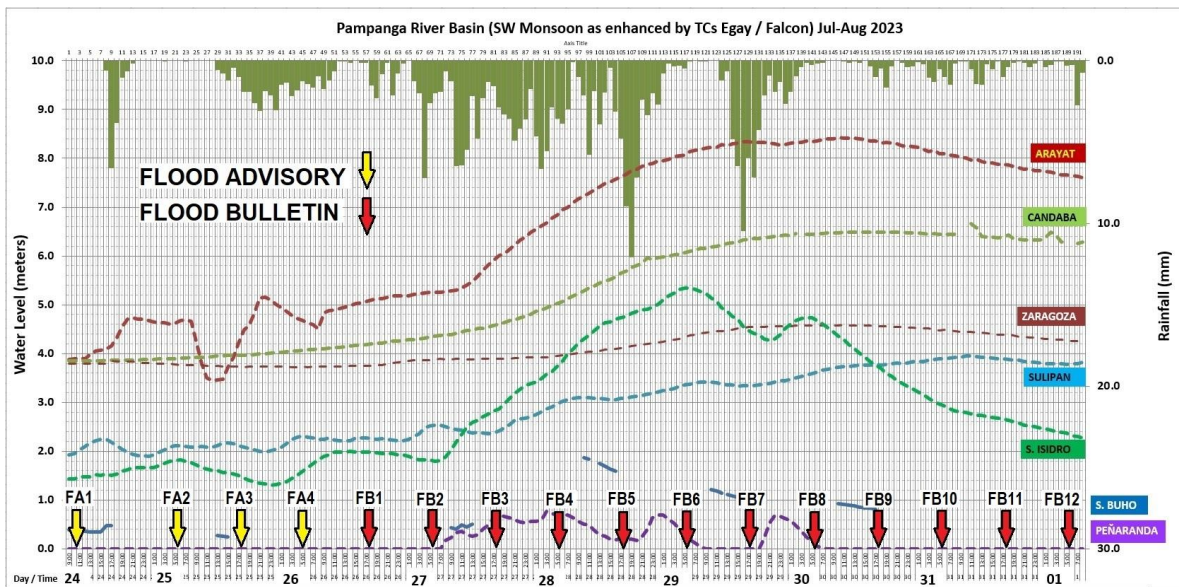


## I. Operational Activities

### 1.1 Flood Monitoring and Warning Activities

3 flood events affected the PRB in 2023 with one having been indirectly caused by 2 successive TCs:

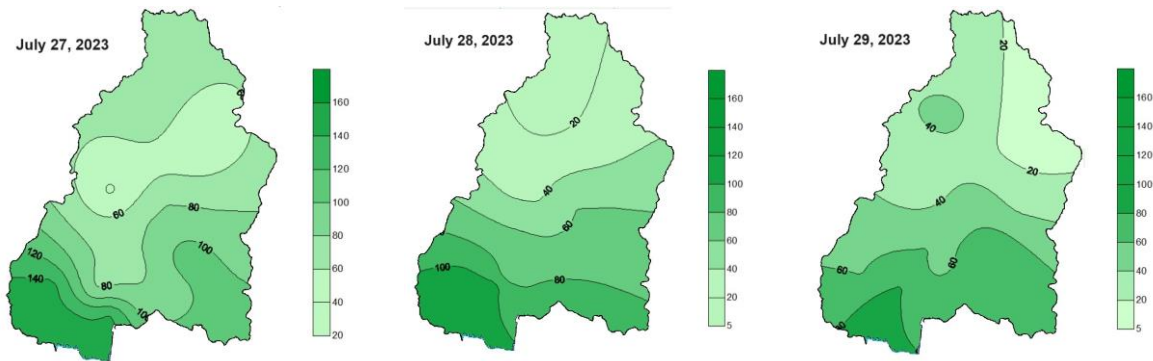
2023 Events	Highest TC Category reached	Period	FA issued	FB issued
NE MONSOON		Jan 06 to 09	2	5
TC "DODONG"	Tropical Depression	Jul 16 to 19	4	
SW MONSOON enhanced by TC "EGAY" (DOKSURI) & TC "FALCON" (KHANUN)	Super Typhoon / Typhoon	Jul 24 to Aug 06	4	23
SW MONSOON enhanced by TC "HANNAH" (HAIKUI)	Typhoon	Sept 02 to 08	1	12
		<b>Total</b>	<b>11</b>	<b>40</b>



The 2 figures above are the river basin hyetograph and various hydrographs (as per forecasting points) during the event SW Monsoon enhanced by TC's "Egay" & "Falcon" (Jul 24 to Aug 06) & showing the estimated time



/ day of issuances of FAs (yellow arrows) & FBs (red arrows); more than 3 days of lead time from the first issuance of information (FA1) to the eventual rise of rivers is clearly manifested in the upper top figure.



The estimated Basin Rainfall distribution maps (isohyets) from July 27 to 29 (left to right) showing the effects of the SW monsoon rains over the Pampanga River Basin as enhanced by TC's "Egag" & "Falcon".



**PAMPANGA RIVER BASIN FLOOD FORECASTING & WARNING CENTER (PRBFFWC)**  
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 websites: bagong.pagasa.dost.gov.ph / prffwc.synthasite.com

**FLOOD BULLETIN NO. 3**  
**PAMPANGA RIVER BASIN & ALLIED RIVERS**  
 ISSUED AT 5:30 AM, 08 JANUARY 2023  
 (VALID UNTIL THE NEXT BULLETIN AT 5:30 PM TODAY)

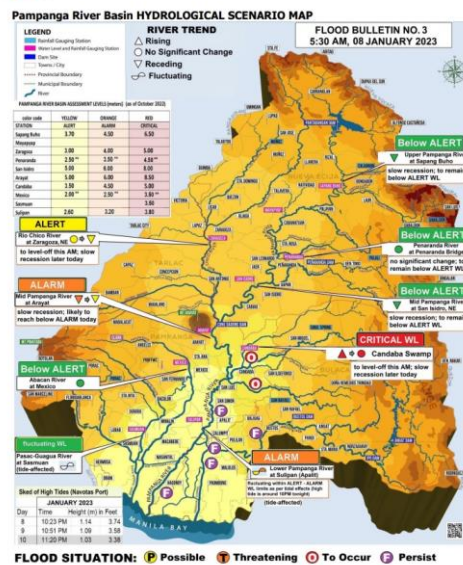
Average Basin Rainfall as of 5:00 AM today	Past 24-hr observed <b>Less than 10 millimeters</b>	Forecast 24-hr basin rainfall <b>Less than 5 millimeters</b>
--------------------------------------------	--------------------------------------------------------	-----------------------------------------------------------------

**BASIN'S LIKELY RESPONSE / RELATED IMPACTS**

WATER LEVEL STATION	RIVER / SWAMP WATER LEVEL (WL) TREND AT STATION	POSSIBLE FLOOD SITUATION MESSAGE (POSSIBLE IMPACTS) & AREAS LIKELY TO BE AFFECTED
Tributary Rio Chico River at Zaragoza Station (Nueva Ecija)	Now at 3.09m, above 3.00m Alert WL, has leveled-off last night & now a very slow recession is in progress; likely to reach below Alert WL by afternoon today	Remnants of Pluvial flooding (partly submerged roads, croplands) to last for a few days – La Paz, Licab, Alaga, Zaragoza, San Antonio
Candaba Swamp Area at Candaba station (Pampanga)	Now at 5.04m, above 5.00m Critical WL; further slight rise above critical WL and likely to level-off before noon today; to remain just above critical WL until this afternoon	Pluvial flooding (partly submerged roads, croplands) & Fluvial flood along waterways (possible riverside erosions) – San Miguel, San Ildefonso, Candaba, San Luis, San Simon, Apalit
Pampanga River at Arayat Station (Pampanga)	Now at 6.81m, above 6.00m Alarm WL; continued slow recession since last night; likely to reach below Alarm WL this afternoon	Remnants of Pluvial floods (partly submerged roads, croplands) & Fluvial flood (possible riverside erosions) – Arayat, San Simon, San Luis, Apalit, Calumpit
Pampanga River at Sulipan Station; Tributary Angat River & Pampanga Delta areas	Now still fluctuating between the 3.20m Alarm WL & 2.6 Alert WL (tide-influenced); Angat River still to maintain a considerable flow until this afternoon	Remnants of the Fluvial floods along the Angat River (possible riverbank erosion / overflowing) at some sections of the riverside areas of the towns of: Norzagaray, Angat, Bustos, San Rafael, Piedad, Pulilan, Baliuag; & some sections of Lower Main Pampanga River at riverside areas of: Apalit, Macababe, Masantol, Calumpit, Paombong and Hagonoy

The public and the Local Disaster Risk Reduction & Management Councils (LDRRMOs) within the Pampanga River Basin are advised to continue all necessary measures to mitigate the adverse impacts of the hazards associated with the effects of NE Monsoon particularly in the above-mentioned areas; to keep monitoring for heavy rainfall warnings & other severe weather information specific to your area, other related products issued by PAGASA.

Prepared by: RPY / GHH Checked by: HTH

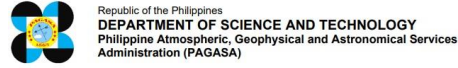
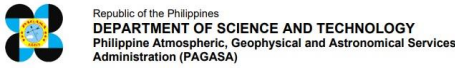


The PRBFFWC maintained the usual Flood Bulletin format as shown above with the issuance of FB No. 3 in the NE Monsoon event (Jan 06 to 09) with the following features: 1<sup>st</sup> page (top left) shows the flood bulletin text format while the 2<sup>nd</sup> page (top right) is an illustrative map showing the present color-coded water level station status with a trend forecast icons and statement just below the said WL status.

**PAMPANGA RIVER BASIN ASSESSMENT LEVELS (meters) (as of October 2022)**

color code	YELLOW	ORANGE	RED
<b>STATION</b>	<b>ALERT</b>	<b>ALARM</b>	<b>CRITICAL</b>
Sapang Buho	3.70	4.50	6.50
Mayapyap			
Zaragoza	3.00	4.00	5.00
Penaranda	2.50 **	3.50 **	4.50 **
San Isidro	5.00	6.00	8.00
Arayat	5.00	6.00	8.50
Candaba	3.50	4.50	5.00
Mexico	2.00 **	2.50 **	3.50 **
Sasmuan			3.50
Sulipan	2.60	3.20	3.80

The latest River Assessment Levels (as of October 2022) for the various forecasting points of the PRBFFWC are shown on the left table. These assessment levels will be adjusted / updated accordingly as per reports of flood in the channel sections for which the said forecasting points are focused and will be further validated by river cross-section surveys whenever possible.



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 websites: [bagong.pagasa.dost.gov.ph/prffwc.synthasite.com](http://bagong.pagasa.dost.gov.ph/prffwc.synthasite.com)

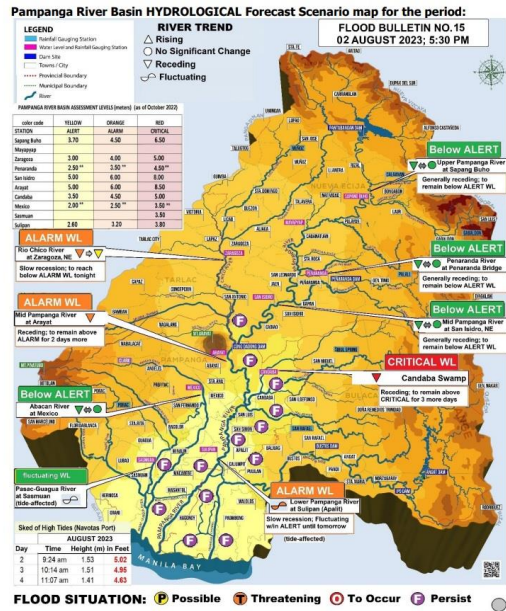
**FLOOD BULLETIN NO. 15**  
**PAMPANGA RIVER BASIN & ALLIED RIVERS**  
 ISSUED AT 5:30 PM, 02 AUGUST 2023  
 (VALID UNTIL THE NEXT BULLETIN AT 5:30 AM TOMORROW)

Average Basin Rainfall as of 5:00 PM today	15 millimeters	Between 5 to 15 millimeters
Forecast 24-hr basin rainfall	Between 5 to 15 millimeters	

**BASIN'S LIKELY RESPONSE / RELATED IMPACTS**

WATER LEVEL STATION	RIVER / SWAMP WATER LEVEL (WL) TREND AT STATION	POSSIBLE FLOOD SITUATION MESSAGE (POSSIBLE IMPACTS) & AREAS LIKELY TO BE AFFECTED
Rio Chico River at Zaragoza station (Nueva Ecija)	Estimated to be just within the 4.00 m Alarm WL; slow recession to continue & likely to recede below Alarm WL tonight	Pluvial (ponding of rainwater causing several inches of floodwater along roadways & croplands) & partly some Fluvial flooding (river overflowing) to remain for a few days – riverside areas of La Paz, Concepcion, Tarlac City, Zaragoza, San Antonio, Aliaga, Licab & other adjacent towns
Pampanga River at Arayat Station (Pampanga)	Now at 7.32 m, still above 6.00 m Alarm WL; slow recession to continue & likely to reach below Alarm WL by Friday (04 August)	Pluvial floods (partly submerged roads, croplands) & partly some Fluvial flooding (river overflowing / possible riverbank erosion) to persist for a few days – along riverside areas of Cabiao, Arayat, San Simon, San Luis
Candaba Swamp Area at Candaba station (Pampanga)	Now at 6.02 m, still above 5.00 m Critical WL; very slow recession to continue & likely to remain above Critical WL for the next 3 days	Flooding persists and to remain for several days in the flood-prone areas w/in the swamp - San Miguel, San Idefonso, San Rafael, Candaba, San Luis, San Simon, Apalit
Pampanga River at Sulipan Station; Pampanga Delta areas (Pasac-Guagua Sub-Basin)	Now at 3.57 m, below the 3.80 m Alarm WL; slow fluctuating rise and fall (tide-influenced) within & above the 3.20 m Alarm WL; to coincide with the high tide occurring tomorrow morning until noon; Floods persists along riverside areas of Lower Main Pampanga River, within the Pasac-Guagua Sub-Basin & the Pampanga Delta areas	Pluvial floods (partly submerged roads, croplands) in the areas of Plaridel, Pullian, & Baliuag, Lubao, Sasmanan, Guagua, Sta. Rita, Minalin, Sto. Tomas, City of San Fernando, Mexico, Bacolor, Pluvial & Fluvial Flooding (river overflowing; possible riverbank erosions) to remain for several days - at the lower sections of Main Pampanga River along riverside areas of Apalit, Macabebe, Masantol, Calumpit, Paombong and Hagonoy & other adjacent areas

The public and the Local Disaster Risk Reduction & Management Councils (LDRRMCs) within the Pampanga River Basin (PRB) are advised to maintain their preparedness & continue their response activities to mitigate the impacts of the hazards associated with the SW Monsoon, which will continue to bring occasional rainshowers & thunderstorms over PRB; to keep monitoring for heavy rainfall warnings, other severe weather information, & other related products issued by PAGASA.



Prepared by: RPY / JRD / GHM Checked by: HTH

Flood Bulletin No. 15 (above) issued by the PRBFFWC during the SW Monsoon enhanced by TC's "Egay" & "Falcon" flood event. The 1<sup>st</sup> page (Top left) discusses a more specific forecast of WL trend and a list of towns affected by floods; while the 2<sup>nd</sup> page is a map showing the present WL status at every forecasting point with a summarized expected reaction at that point including flood situation in the map represented by letters as to P for possible, T – Threatening, O – to Occur, and F – Persist (below the map).

**1.2 Daily Hydrological Forecast / other issued information materials**

The daily hydrological forecast issued by the PRBFFWC remained in its infographic format (left pic below) and has been a daily output by the center every 5:00 in the morning. The center was able to issue 365 hydrological forecasts for the year 2023. The Status of RR and WL in the PRB is, likewise, updated and uploaded daily at 5 am and 5 pm by the PRBFFWC in its website (right pic below). For this year, there were 729 updates of status of RR & WL for PRB.

For Daily Hydrological Forecast link: <http://prffwc.synthasite.com/hydro-forecast.php>  
 For Status of RR-WL of the PRB: <http://prffwc.synthasite.com/status-of-pampanga-river-basin.php>

**PAMPANGA RIVER BASIN FLOOD FORECASTING AND WARNING CENTER (PRBFFWC)**  
 DMGC, at the back of 2051-3, Brgy. Malimpis, City of San Fernando, Pampanga 2000

**PAMPANGA RIVER BASIN & ALLIED RIVER SUB-BASIN OF PASAC-GUAGUA**  
**HYDROLOGICAL FORECAST**

DATE: January 9, 2024 as of 05:00 AM

Forecast 24-hr Average Basin Rainfall	Light (40)	Moderate (60 to 100)	Heavy (100)
WEATHER FORECAST	Partly Cloudy to Partly Cloudy with Rainshowers (and/or Thunderstorms)		
RIVER TREND / WATER LEVEL STATUS	Rising		
POSSIBLE IMPACTS	Pluvial floods (partly submerged roads, croplands) & partly some Fluvial flooding (river overflowing) to remain for a few days – along riverside areas of Lower Main Pampanga River, within the Pasac-Guagua Sub-Basin & the Pampanga Delta areas		

**WATER LEVEL STATUS**  
 CRITICAL ALARM ALERT BELOW ALERT

BASIN-SUB-AREA	GENERAL WEATHER SITUATION (FORECAST)	FORECAST RIVER TREND / WATER LEVEL STATUS	POSSIBLE IMPACTS
Upper Pampanga River Basin (Coronel-Santor, Digmala, Penaranda, Rio Chico River)	Partly Cloudy to Partly Cloudy with Rainshowers (and/or Thunderstorms)	Pampanga River	
Middle to Lower Pampanga River Basin (Candaba swamp area, Pampanga Delta, Angat River)	Partly Cloudy to Partly Cloudy with Rainshowers (and/or Thunderstorms)	Pampanga River	
Pasac-Guagua Allied Sub-basin (Abacan, Porac-Gumain, Pasig-Potrero Rivers)	Partly Cloudy to Partly Cloudy with Rainshowers (and/or Thunderstorms)	Candaba Swamp	
Tide-influenced Areas (Macabebe, Masantol, Lubao, Guagua, Sasmanan, Apalit, Hagonoy, Paombong, Calumpit, Mexico City & other riverside tidal flats of adjacent towns)	Partly Cloudy to Partly Cloudy with Rainshowers (and/or Thunderstorms)		

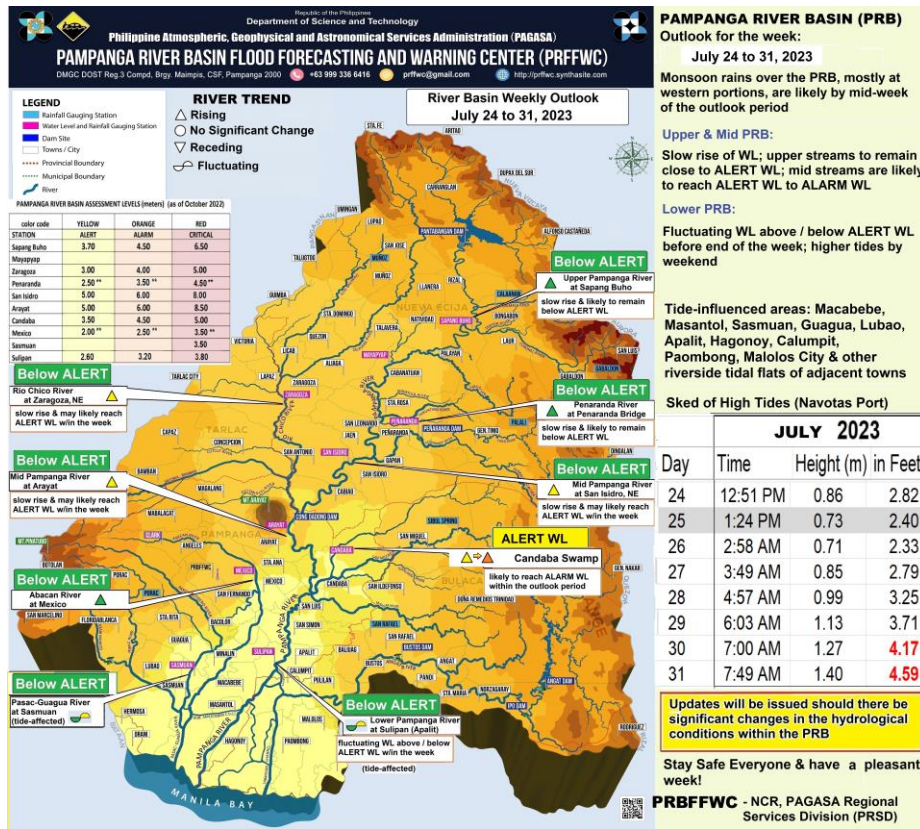
**HIGH TIDE TODAY (PAGKATI NG ARIANG ARIANG)**  
 07:54 PM / 1.13 m / 3.71 ft.  
**HIGH TIDE TOMORROW (PAGKATI NG ARIANG)**  
 08:32 PM / 1.24 m / 4.07 ft.

DATE: January 09, 2024  
 TIME UPDATE: 5:00 PM (LST)

Observed Values (Past 24-hr Rainfall Ending at 4:00 PM (LST) (Instantaneous Water Level Data at 4:00 PM (LST))

PRBFFWC Telemetry Stations							
Station	Rainfall(mm)	WL (meters)	WL Status	Station	Rainfall(mm)	WL (meters)	WL Status
Muñoz	0			Sibul Spring	4		
Sapang Buho	0	0.00	Below Alarm	Arayat	2	0.20	Below Alarm
Calaanan	0			Candaba	2	0.94	Below Alarm
Mayaypao	0			Porac	0		
Gabalidon	9			Mexico	3	**	**
Palali	0			San Rafael	0		
Zaragoza	0	0.12	Below Alarm	Sasmanan	0	**	Tide-affected
Peñaranda	2	0.00	Below Alarm	Sulipan	0	1.45	Below Alarm
San Isidro	2	0.59	Below Alarm	PRFFWC	2.75		





Another graphical information issued by the PRBFFWC is the Weekly River Basin Situation Outlook. For now, this material has been temporarily stopped for further review and development. The last issuance was on the 2<sup>nd</sup> week of August 2023.

### 1.3 PRB stations data summary

Data from the telemetry station’s loggers are used to supplement, validate, and fill-in the data gaps and breaks in the supervisory terminal dataset of the PRBFFWC. The supervisory terminal dataset is the main database that is subject for buildup by the river basin center. The data from the station’s loggers are downloaded at every quarterly maintenance. Unfortunately, there were only 2 quarterly maintenance activities carried-out in 2023. The first one was actually to complement the maintenance activities for year 2022. Practically, only one major datalogger downloading was carried-out in 2023. At the present, the state of the database of the PRBFFWC is quite pathetic with about only a month of observations being validated so far and this was for the month of July, the event SW monsoon enhanced by TC “Egay”.

#### Highest Water Level observed during the Year 2023 (for updating)

Station	Max WL observed for the year (meters) *	Time / Day of Max WL	Remarks (event of maximum WL for the year)
Sapang Buho	4.00 (Above Alert)	1800H / 06 Jan	NE Monsoon event
Zaragoza	4.59 (Above Alarm)	1100H / 30 Jul	SW Monsoon enhanced by TCs “Egay” & “Falcon”
Peñaranda	1.65 (Below Alert)	1500H / 06 Jan	NE Monsoon event
San Isidro	5.93 (Above Alert)	0900H / 07 Jan	NE Monsoon event
Arayat	8.43 (Above Alarm)	1000H / 30 Jul	SW Monsoon enhanced by TCs “Egay” & “Falcon”
Candaba	6.66 (Above Critical)	1100H / 31 Jul	SW Monsoon enhanced by TCs “Egay” & “Falcon”
Sasmuan	3.64 (Above Critical)	2200H / 05 Jan	NE Monsoon event
Sulipan	3.95 (Above Critical)	1000H / 31 Jul	SW Monsoon enhanced by TCs “Egay” & “Falcon”

\*As per available received data (still for validation & quality control)

Below are the initial and partially validated monthly and annual rainfall totals for year 2023. Significant changes to these values are likely to happen once supplemented by downloaded data from the telemetry station’s loggers.

Monthly Rainfall Summary for 2023 (partially received data and subject for updating)																
PRB Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total for the year	Number of RR days	Max 24-hr RR (Met day)	
Muñoz	113	4	0	0	0	0	515	63	152	50	8	0	905	119	100	
Sapang Buho	115	5	0	1		0	331	120	90	152	13	29	856	119	93	
Gabalдон	327	10	1	0	15	16		183	179	135	34	99	999	195	218	
Zaragoza	24		0	0	4		303	152	182	76	9	1	751	107	60	
Mayapyap	72	17	0	0	3	16	267	49	282	61	3	11	781	116	109	
Peñaranda	67	5	0	0			407		52	69	3	7	610	128	146	
Calaanan	158	1	0	0	5	1	420	205	205	142	16	29	1182	117	83	
Palali	92	8	0	0	6	10	609	146	324	119	5	11	1330	133	108	
San Isidro	7	32	0	5	24	88	387	150	264	60	4	8	1029	103	112	
Arayat	96	121	0	14	105	90	583	165	261	80	5	23	1543	95	134	
Candaba	93	41	0	5	67	110	460	92	288	46	16	11	1229	111	70	
Sibul Spring	154	14	0	41	350	190	773	281	457	81	18	36	2395	148	166	
Sasmuan	75	47	0	6	13	41	475	84	2	7	9	2	761	107	104	
Sulipan	98	84	2	31	134	179	580	108	258	100	28	9	1611	130	86	
Mexico	84	60	0	28	49	153	578	150	252	56	7	21	1438	122	96	
Porac	60	39	0	34	151	167	820	213	311	92	5	5	1897	108	85	
San Rafael	115	4	0	42	184	142	612	135	200	88	26	27	1575	130	101	
PRFFWC	72.4	17.0	0.0	61.5	105.2	147.8	669.0	198.4	312.2	90.4	9.7	5.8	1689.4	116	118.0	

Table above represents the initial monthly RR totals for each of the RR telemetry stations of PRBFFWC which were received at the supervisory terminal of the center. The summary totals in red text, with the exception of PRFFWC station, are yet to be validated and quality-controlled.

An Annual Hydrological Data Summary (AHDS) report covering the year 2023 will be prepared to give an updated data analyses of the dataset for year 2023. This will be done once all the data from telemetry station’s loggers have already been downloaded.

### 1.4 Telemetry System and Station Physical Maintenance

The telemetry data transmission downtimes, as always, have been a continuing problem for PRBFFWC particularly for the year 2023. The data transmission downtimes for RR and WL were at 25.9% and 47.5%, respectively. This downtime percentages constitutes about a fourth of the total number for rainfall and nearly half of total water level data for the year. From February to July of the year, downtimes were at 50% or higher for WL. On the other hand, RR downtimes were at 50% or more from April to July. During the event SW Monsoon enhanced by TCs “Egay” and “Falcon”, almost half of the river basin’s monitoring system were down and this were at the upstream stations of the PRB; RR downtime was about 53% and WL downtimes 68% during that month. It was one of the challenging periods for the PRBFFWC as flood warnings were being issued with half of the system down. Furthermore, another issue of telemetry data is the validity of the info being received. So far as of this writing, the percentage error for the PRBFFWC dataset determined for year 2023 is only at 0.01%. Verification of the PRBFFWC dataset for year 2023 is still ongoing.

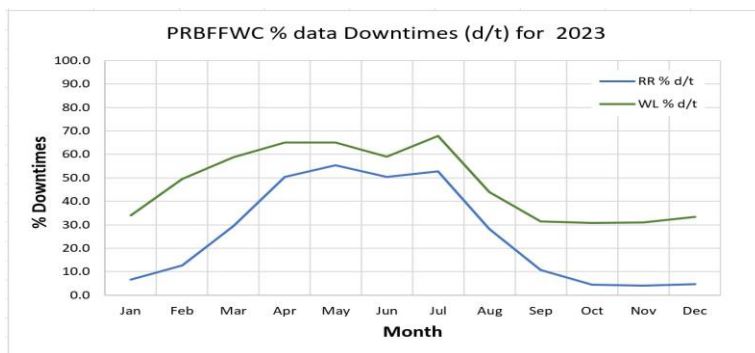


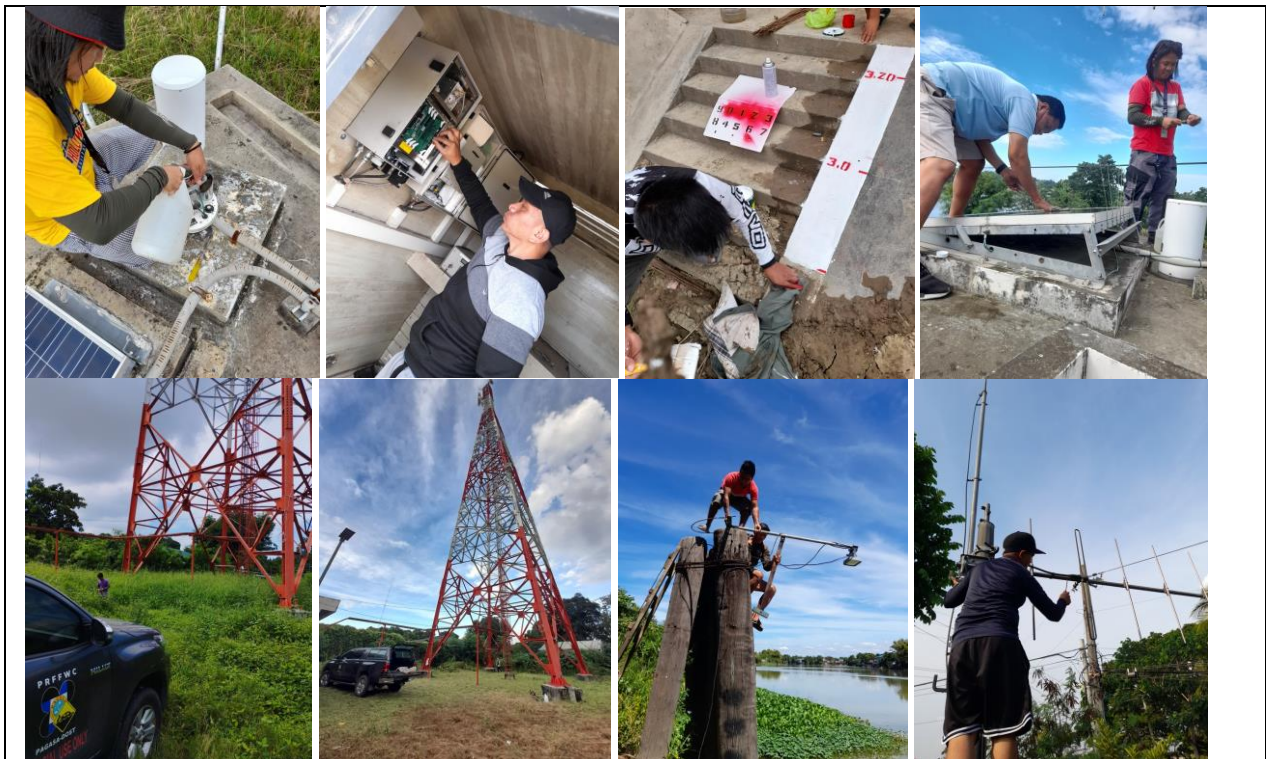
Figure on the left represents the monthly data transmission downtimes for both RR and WL for the year 2023. WL data d/t were already at 50% starting February until July. Data errors are yet to be identified and quantified once the data from the telemetry loggers have been downloaded.

The PRBFFWC, being a big river basin at more than 10,400 km<sup>2</sup>, is greatly dependent on the hourly data received from all of its stations especially during inclement weather conditions affecting the basin. Therefore, it is important that the received telemetry data be adequate (quantity) and valid (quality) for the center to be able to issue correct, timely and accurate hydrological information.



Considering the austerity measures that were imposed by the Agency in 2023 which included a temporary halt of the river basin center’s fieldwork, still several maintenance and emergency activities were conducted by the PRBFFWC and these included the following:

- Performed 2 general quarterly maintenance of all telemetry stations by the PRBFFWC technician team, the first one on Jan 18 to 24 and the second, from Apr 18 to 24; the first one was just to complement the year 2022 quarterly maintenance activity;
- Supported and assisted the HMTS personnel in the repair and restoration of the Sulipan WL and also the installation of an inverter in the San Rafael repeater station (Feb 22 & 23);
- Assisted the HMTS in the emergency maintenance of the PRBFFWC system (May 23 & 24)
- 11 resets / transfer of operation of A/C units at San Rafael Repeater station
- Several emergency trips as follows:
  - Adjusted the TAKUWA converter at Sulipan station (Mar 02)
  - Checked the telemetry system in San Rafael Repeater station regarding data transmission D/T (May 05)
  - Adjusted WL sensor position and its reading at Candaba Telemetry station (May 31)
  - Validated river WL in 3 forecasting stations (Arayat, San Isidro and Zaragoza stations) in preparation for the effects of SW Monsoon as enhanced by TC Egay in the PRB (Jul 24)
  - Retrieved logger data in 7 upstream stations of the center and replaced solar batteries in 4 of these stations, Zaragoza, Peñaranda, Mayapyap, Palali, Sapang Buho, Munoz, & Calanan (Sept 27 to 29)
  - Retrieved logger data of the following stations: San Rafael, Sulipan, & Sasmuan (Oct)
- Assisted ETSD technicians in the repair, maintenance and cleaning of center’s 8 A/C units (Jun 19 to 23)



Various telemetry related maintenance activities being carried-out in year 2023 are as follows: (upper pics from left to right) cleaning and testing of rain gage; checking of telemetry communication systems and downloading of data from loggers; repainting of staff gages such as in Sulipan station; cleaning of solar cell panels on top of the station housing’s roof; (above pics from left to right) grasses abounds at San Rafael Repeater station surroundings upon arrival of the maintenance team and (next pic) the San Rafael Repeater station surroundings after clearing of the grasses; installation and adjustment of WL radar-type sensor in Sulipan station; Checking and inspection of station antennae and outside wire connections.

Up to this year, 2023, the PRBFFWC telemetry system has been continuously operating 24/7, 365 days in a year for almost 15 years now considering a quite minimal system shutdown during that whole period. Hence, it is imperative that the periodic (quarterly) maintenance of the river basin telemetry system be conducted as planned. Downtimes / erroneous data transmission of the system is more likely to happen with the present status of the system if the regular maintenance is not carried-out.

**To state plainly, the main objective of a telemetry system maintenance is really to prevent and mitigate the downtimes and to lessen or totally eliminate the transmission of erroneous information.**

### 1.5 Stream gaging / other hydrological related measurements and activities

The stream gaging activities in PAGASA is probably the most neglected hydrological activity in almost all of the River Basin Centers of the agency. Mainly because most of the PAGASA River Basin Centers do not have the proper equipment for streamgaging, lack of manpower to carry-out the activity, or simply do not have the appropriate knowledge in conducting the activity. **Other issues could be that the activity is not openly supported by the PAGASA management or their respective regional divisions because of lack of awareness and understanding for the need of such activity.** Flood forecasts are formulated using river flow models, by trends using present and past hydrological data values, forecast by use of prevailing and previous weather conditions, etc. One of the basic requirements in running and calibrating river flow models is a rating curve or a stage-discharge relationship. Stream gaging results are also required in updating the water level assessment levels, i.e., Alert, Alarm, and Critical water levels, at forecasting points in the river basin.

For year 2023, stream gaging has been one of the main activities of the PRBFFWC with about 31 related measurements conducted throughout the year.



Various stream gaging activities in pictures:

(above left) taking river surface velocity measurements of Pampanga River at San Agustin Bridge in Arayat, Pampanga (Sept 08); (above right) river surface velocity measurements of the Tributary Rio Chico River taken from the Zaragoza-La Paz Bridge in Zaragoza, Nueva Ecija (Aug 02); (right) orienting HMDAS personnel in the stream gaging activities particularly taking river surface velocity using the Radar Profiler (RP30) instrument in Zaragoza, Nueva Ecija (Aug 17)

The following is a summary rundown of the stream gaging and other hydrological related activities of the PRBFFWC for the year 2023:

- Conducted 31 stream gaging activities 10 of which were river cross-sectioning only; part of the river x-sect measurements conducted for the year included Angat River (5 sections) as requested by the Bulacan Province PDRRMO, and Pagsanjan River (3 sections) which is actually outside the PRB area of concern and requested by the NPC;
- Conducted 7 WL validations;
- Re-marked with permanent pen markers the established vertical points for river sounding locations at some 8 streamgaging site bridges;
- Assisted and supported the NWRB-KOICA team in stream gaging activities, purely river surface velocity measurements only, in at least 9 stations identified in the Project IWRMIS for PRB PII;



- Updated the rating curve equation of San Isidro as requested and a coordinated activity with the ICHARM Risk team.
- Initial rapid survey during the flood event (July 29) SW Monsoon enhanced by TCs “Egay” & “Falcon” at several station points of PRBFFWC and post-flood survey about a week and 2 weeks after the event as follows, Aug 16-18 and Aug 22-27

## II. Public Information, Trainings, Data provision and other related Center Functions

### 2.1 Presentations & lectures in events, various occasions and functions

A total of 58 event presentations and / or lectures were rendered by the PRBFFWC throughout the whole year with an aggregate total of 3,317 participants / attendees. At least 23 of the total event presentations provided by the river basin center were done via online or VTC platform. The usual presentations that were provided during these events covered various topics that included as follows:

- 23 presentations on the Latest Climate / Weather / El Niño / River Basin Outlook
- Hydrometeorological Hazards Awareness & Mitigation
- Climate Change and Early Warning System
- Tropical Cyclones updates during Pre-Disaster Risk Analysis (PDRA) meetings. There were 8 PDRA meetings participated by PRBFFWC



- El Niño & Rainfall Observation presented in the 15th SHIne Conference (Dec 12)
- “PRBFFWC Activities, Projects & Plans in the PRB” in the 1st Stakeholders consultation meeting for the IWRMIS for PRB (Feb. 10)
- “Capacitating RBFFWCs in their operational FFWS” in the 5<sup>th</sup> PAGASA RBFFWCs’ Conference (May 11)
- “CL: Effects of SW Monsoon as enhanced by TCs Egay & Falcon” in the emergency meeting of the Rehab & Recovery Cluster of the RDRRMC3 (Aug 08)
- “Dynamics of rivers / tributaries in the PRB” in the coordination meeting of various regional agencies of RDRRMC3 as organized by OCD3 (Sept 25)
- “Brief on Rainwater Harvesting issues” in the 1<sup>st</sup> Q full council meeting of RDRRMC-3 (Mar 23)
- “The PRB and the PRBFFWC” in the series of IECs organized by NPC in the Angat River area of concern (Apr 25 to 27, May 3 & 4)

### 2.2 Public Information and Briefings (Multi-media)

Numerous media interviews were addressed by the PRBFFWC during the year 2023. More than half of these were done online (mostly via zoom platform). A total of 25 interviews were responded to during the year with topics mostly covering the status of the main Pampanga River particularly during the events SW Monsoon enhanced by TCs “Egay” & “Falcon”. The PRBFFWC regarded media interviews and briefing as a part of its enhancement on its information and dissemination campaigns within the Pampanga River Basin and, therefore, all requests for interviews has always been accommodated.



Live interview via online by CLTV36 anchor Justin Dizon on the status of Pampanga River during the SW monsoon enhanced by TC “Egay” (Jul 31)

Radio guesting via online in the Bulacan Province radio program, Radyo Kapitolyo, regarding the latest climate, weather and river basin outlook (Jun 13)

Zoom platform interview by CLTV36 anchor Jen Salenga on the status of the Pampanga River and the dams within the basin (Sept 01)

(far left pic) CLTV36 anchor Jodie Mercado interview via online on the status of the PRB and Dams within the basin; (left pic) Face-to Face interview with CLTV36 reporter / blogger Paulo Gee Santos on the participation of PRBFFWC in the KALASAG validation for the Province of Pampanga (Jul 10)

(far left pic) CLTV36 anchor Jodie Mercado interview via online on the status of the PRB and Dams within the basin; (left pic) Face-to Face interview with CLTV36 reporter / blogger Paulo Gee Santos on the participation of PRBFFWC in the KALASAG validation for the Province of Pampanga (Jul 10)

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**III. Participation and interaction in various events, occasions, other inter-agency undertakings (meetings, seminars, workshops, conferences, trainings, etc.)**

Some 87 various events / occasions (meetings, seminars, conferences, trainings, summits, workshops, etc.) were attended and participated to by the PRBFFWC throughout the whole year of 2023 some of which were done via online.

- Around 49 DRRM-related meetings (PDRA, Regional /Provincial / Local DRRMC meetings, briefings during Tropical Cyclone events, etc.; e.g., Kick-off Ceremonies during the National Disaster Resiliency Month, DRRM exhibits, involvement in the updating of DRRM Plans for the Region 3, and other similar related activities within the PRB area;
- More than 26 other occasions involving workshops, summits, and the like;
- Some 12 coordination meetings and activities with project-based entities such with the NWRB-KOICA Project on Integrated Water Resource Information System for PRB Phase II (IWRMIS PII), UPLB-ICHARM collaboration project on HYDEPP-SATREPS, and with the HMD-KISTERS project on Hydromet Data Management System (HDMS)



Formulation of the Rehabilitation & Recovery plan for areas affected by SW Monsoon enhanced by TCs “Egay” & “Falcon” (Nov 07)

Resorve person in the 4<sup>th</sup> Q full council meeting of the RDRRMC3 held in Angeles, Pampanga (Nov 21)

Attended the 158<sup>th</sup> / 73<sup>rd</sup> World Meteorological Day Celebration in PAGASA Central Office (Mar 23)

(right pic) Active participation in the workshop on Flood & Agri Damage in the project HYDEPP-SATREP organized by UPLB-ICHARM (Jun 30); (far right pic) 1<sup>st</sup> Stakeholders meeting on the IWRMIS in PRB PII as organized by NWRB-KOICA (Feb 10)

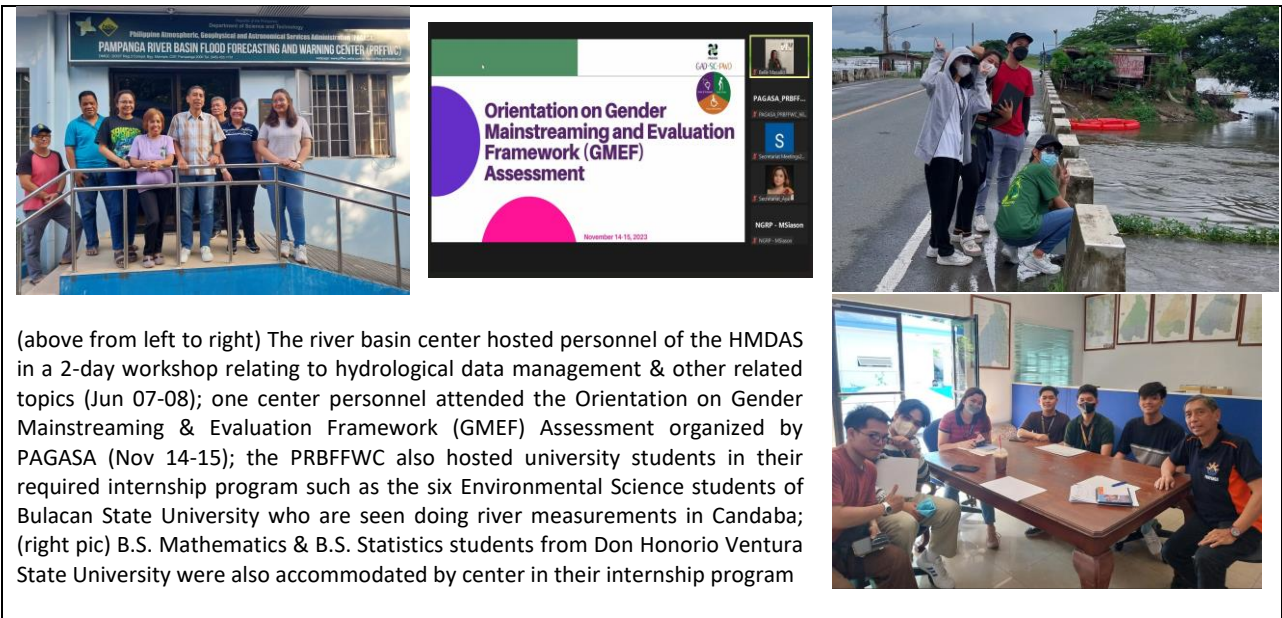
(right pic) Active participation in the workshop on Flood & Agri Damage in the project HYDEPP-SATREP organized by UPLB-ICHARM (Jun 30); (far right pic) 1<sup>st</sup> Stakeholders meeting on the IWRMIS in PRB PII as organized by NWRB-KOICA (Feb 10)

(right pic) Active participation in the workshop on Flood & Agri Damage in the project HYDEPP-SATREP organized by UPLB-ICHARM (Jun 30); (far right pic) 1<sup>st</sup> Stakeholders meeting on the IWRMIS in PRB PII as organized by NWRB-KOICA (Feb 10)



There were several trainings that were attended and participated to by PRBFFWC personnel during the year as well including one international program:

- Central Luzon Instructors' Virtual Forum organized by RDRRMC-3 (Mar 31; 1 personnel)
- Overseas training regarding the HDMS-WISKI project conducted by KISTERS in Germany (May 01-06; 1 personnel)
- Workshop on "Flood & Agricultural Damage Monitoring Technology for Supporting Rapid Recovery as part of the project HYDEPP-SATREP organized by UPLB-ICHARM (Jun 20; 3 personnel)
- Workshop on "The 5 practice of Exemplary Leadership" (Aug 8-9; 1 personnel)
- Training of Trainers on ENSO related information for NCR-PRSD personnel via zoom (Aug 11; 3 personnel)
- Gender Sensitivity Training & Mid-year assessment via zoom (Aug 16-17; 1 personnel)
- Online Training Workshop on Strategic Communication conducted by TPIS, RDTD in collaboration with UPLB College of Development Communication (Nov. 6 – 9; 1 personnel)
- Orientation on Gender Mainstreaming & Evaluation Framework (GMEF) webinar (Nov 14-15; 1 personnel)



(above from left to right) The river basin center hosted personnel of the HMDAS in a 2-day workshop relating to hydrological data management & other related topics (Jun 07-08); one center personnel attended the Orientation on Gender Mainstreaming & Evaluation Framework (GMEF) Assessment organized by PAGASA (Nov 14-15); the PRBFFWC also hosted university students in their required internship program such as the six Environmental Science students of Bulacan State University who are seen doing river measurements in Candaba; (right pic) B.S. Mathematics & B.S. Statistics students from Don Honorio Ventura State University were also accommodated by center in their internship program

Finally, the PRBFFWC hosted 18 university students in their On-the-Job Trainings in the river basin center and are as follows:

- 6 B.S. Environmental Science students from Bulacan State University (250 hours)
- 6 B.S. Information Technology students from Don Honorio Ventura State University (486 hours)
- 3 B.S. Statistics students from Don Honorio Ventura State University (200 hours)
- 3 B.S. Math students from Don Honorio Ventura State University (200 hours)

#### IV. Center Reports (In-house), features and other hydrological-related materials

Reports (with links) that were completed by the PRBFFWC for the year 2023:

- Angat River Assessment Values (results by river cross-sections), March 2023  
<http://prffwc.synthasite.com/resources/angat-assessment-prop-feb2023.pdf>
- Pampanga River Basin Flood events 2022 (April 2023)  
<http://prffwc.synthasite.com/resources/PRB%20flood-2022-Karding-Paeng.pdf>
- Pampanga River Basin Flood event 2023 (October 2023)  
<http://prffwc.synthasite.com/resources/PRB%20flood-2023-SW-Egay-Falcon.pdf>
- Annual Hydrological Data Summary of PRBFFWC, Yearbook 2021 (November 2023)
- Annual Hydrological Data Summary of PRBFFWC, Yearbook 2022 (November 2023)



**PRFFWC Post-Flood Report 2022<sup>1</sup>**

**PAMPANGA RIVER BASIN Flood Events:**

- Tropical Cyclone “KARDING” (International Name: NORU)  
Flood watch coverage: September 24 to October 01, 2022
- Tropical Cyclone “PAENG” (International Name: NALGAE)  
Flood watch coverage: October 28 to November 01, 2022



<sup>1</sup> PRBFFWC Survey team: HTH, NBN, RPI, PTH, GHH and JRD (email add: prffwcfb2009@gmail.com)

PRBFFWC-hth-Apr-2023

Post-Flood Report for 2022: TC “Karding” and TC “Paeng” which was completed on April 2023



**PRFFWC Post-Flood Report 2023<sup>1</sup>**

**PAMPANGA RIVER BASIN Flood Event**

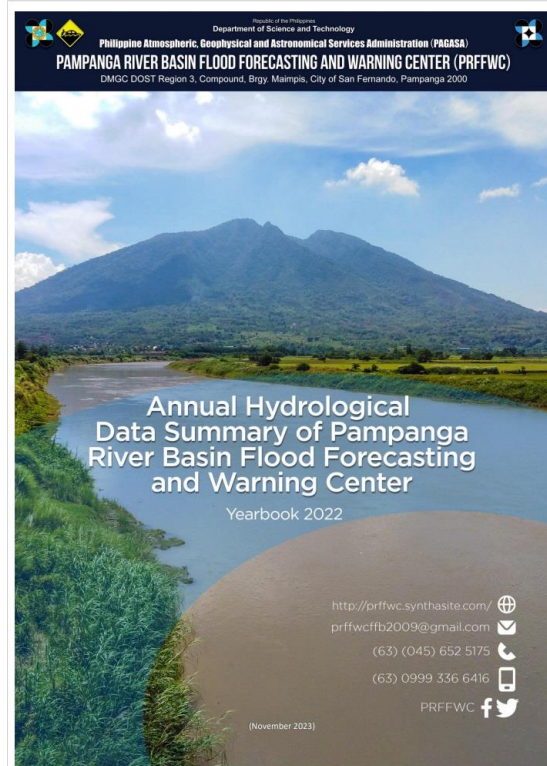
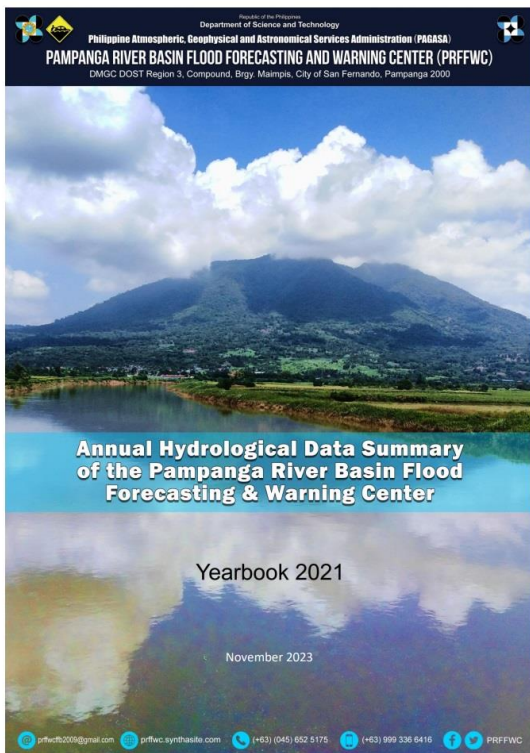
Southwest Monsoon enhanced by Tropical Cyclones “EGAY” (DOKSURI) and “FALCON” (KHANUN)  
July 24 to August 06, 2023



<sup>1</sup> PRBFFWC Survey team: HTH, NBN, RPI, and GHH (email add: prffwcfb2009@gmail.com / prffwc@gmail.com)

PRBFFWC-hth-Oct-2023

Post-Flood Report for 2023: SW Monsoon enhanced by TCs “Egay” & “Falcon” completed on October 2023



Annual Hydrological Data Summaries (AHDS) for years 2021 and 2022 were both completed on November 2023



## Acronyms / Abbreviations

Bul . . . . .	Bulacan
CL . . . . .	Central Luzon
CSFP . . . . .	City of San Fernando, Pampanga
cms / cumecs . . . . .	Cubic meters per second
DMGC . . . . .	Diosdado Macapagal Government Center
DRRM . . . . .	Disaster Risk Reduction & Management
D/S . . . . .	Downstream
D/T . . . . .	Downtime
FA . . . . .	Flood Advisory
FB . . . . .	Flood Bulletin
HMD . . . . .	Hydro-Meteorology Division
HMDAS . . . . .	Hydro-Meteorological Data Applications Section
HMTS . . . . .	Hydro-Meteorological Telecommunication Section
kph or km/h . . . . .	kilometers per hour
km <sup>2</sup> . . . . .	square kilometers
LB . . . . .	left bank
LDRRMO . . . . .	Local Disaster Risk Reduction & Management Office
LGU . . . . .	Local Government Unit
LPA . . . . .	Low Pressure Area
LST . . . . .	Local Standard Time
Met . . . . .	Meteorological
mps . . . . .	meters per second
NCR-PRSD . . . . .	National Capital Region – PAGASA Regional Services Division
NE . . . . .	Nueva Ecija / Northeast
NIA-UPRIIS . . . . .	National Irrigation Administration – Upper Pampanga River Integrated Irrigation System
NLEX . . . . .	North Luzon Expressway
OCD . . . . .	Office of Civil Defense
PAR . . . . .	Philippine Area of Responsibility
Pamp . . . . .	Pampanga
PRB . . . . .	Pampanga River Basin
PRBFFWC / PRFFWC . . . . .	Pampanga River Basin Flood Forecasting & Warning Center
PAGASA . . . . .	Philippine Atmospheric, Geophysical & Astronomical Services Administration
Q . . . . .	Discharge
RB . . . . .	right Bank
RR . . . . .	Rainfall
SG or S.G. . . . .	Staff Gauge or staff gage
SW monsoon . . . . .	Southwest monsoon (or Habagat)
STS . . . . .	Severe Tropical Storm
Tar . . . . .	Tarlac
TCB . . . . .	Tropical Cyclone Bulletin
TC / TCWS . . . . .	Tropical Cyclone / Tropical Cyclone Wind Signal
TD . . . . .	Tropical Depression
TS . . . . .	Tropical Storm
T / Ty . . . . .	Typhoon
STy . . . . .	Super Typhoon
UTC . . . . .	Universal Time Coordinated
U/S . . . . .	Upstream
WD . . . . .	Weather Division
WL . . . . .	Water Level
WMO . . . . .	World Meteorological Organization
Wx or wx . . . . .	Weather
N/R/P/C/M DRRM	National / Regional / Provincial / City / Municipal
O/C . . . . .	Disaster Risk Reduction & Management Office / Council

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The PRBFFWC year-end activity ....



*Celebrating the 5 decades of Operational FFWS in the Pampanga River Basin Flood Forecasting & Warning Center with our friends & colleagues (December 27, 2023):  
OCD-3 RD Atty. P. Pineda, MGB-3 OIC RD N. Lacadin, DHVSU IT OJT batch year 2017-18, HMD personnel – Nids, Larry C., & Joe P., Jun Narito of NIA-UPRIIS, D. Lazatin of NE Irrigators Association, and PRBFFWC recent retiree Sir Pete... thank you very much for joining us in this momentous occasion.*

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PRBFFWC production 2023-24

Annual reports are available at the following link:  
[prffwc.synthasite.com/annual-reps.php](http://prffwc.synthasite.com/annual-reps.php)

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  PRFFWC

