

U.S. DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration NATIONAL WEATHER SERVICE ALASKA REGION 222 West 7th Avenue, #23 Anchorage, Alaska 99513-7575

August 16, 2024

Juneau/Mendenhall River Flooding Suicide Basin Glacier Dammed Lake Release

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<u>Overview</u>

A glacial dam outburst flood (GLOF) occurred in the Mendenhall Valley, approximately 10 miles northwest of downtown Juneau, on August 5-6, 2024. The flood originated from <u>Suicide Basin</u> (*Map #1*), a side basin located less than one mile from the terminus of the Mendenhall Glacier. Suicide Basin was once filled with ice from Suicide Glacier, but as the glacier has receded, ice is no longer deposited into the basin. Now, water from annual snowmelt, ice melt, and rainfall fills the basin. In addition to a calving face of the glacier that holds back water in the basin, floating icebergs from ice calving off the main trunk of the Mendenhall Glacier further complicate the understanding of this dynamic system, along with other factors.

Suicide Basin fills up annually and has drained multiple times per year, with some events producing minor or moderate flooding impacts and others producing no impacts along Mendenhall Lake and River. The U.S. Geological Survey (USGS) stream gauge was installed



Map #1: Map of Mendenhall Valley with downtown Juneau to the SE of this image

in 1965. There were no documented impactful glacier outburst events recorded by the stream gauge until July 2011. The Mendenhall Glacier and River system has experienced approximately 39 glacial-dammed lake release events since July 2011. Release volumes of GLOFs vary considerably. Many releases are relatively small, less than 10,000 AC-FT. Three releases, occurring in 2016, 2020, and 2022, were between 24,500 and 29,000 AC-FT. On August 5, 2023, Suicide Basin nearly fully drained, releasing approximately 44,500 AC-FT and causing the Mendenhall River to reach a new record crest of 14.97 FT (gauge datum). This August, the basin fully drained again, releasing a preliminary amount of approximately 49,000 AC-FT and causing the Mendenhall River to set yet another preliminary record crest of 15.99 FT (gauge datum), almost a foot higher than last year. The 2023 and 2024 releases were so much larger than the previous releases because the basin drained nearly completely in





these two cases; prior releases only accounted for a portion of the basin's dammed volume. GLOF release volumes are based on measured flow at the <u>Mendenhall River USGS stream gauge</u> located in Mendenhall Lake.

This year, Suicide Basin filled to the top of the Mendenhall Glacier on August 1st, reaching a maximum pool height of approximately 1,381 FT (gauge datum) and began to flow over the side drainage channel. On the morning of Sunday, August 4th, Suicide Basin began dropping quickly as the drainage started subglacially, and Mendenhall Lake slowly began to respond, causing a Flood Warning to be issued by the NWS's Juneau Weather Forecast Office (WFO). The pre-GLOF release stage at the Mendenhall Lake gauge was approximately 5 FT (gauge datum), rising to minor flood stage of 9 FT by August 5th at 9:15 AM, moderate flood stage of 10 FT by August 5 at 12 PM, major flood stage of 14 ft by August 5th at 9 PM, cresting at 15.99 FT on August 6 at 3:15 AM, and falling back to a baseflow of 5.7 FT by the afternoon of August 7th. The Mendenhall River remained above flood stage for approximately 28 hours.



Figure #1: Hydrograph of the Mendenhall River pulled from the USGS website. The river was above minor flood stage of 9 FT from approximately August 5th at 9 AM to August 6th at 1 PM.

This record event produced flooding along Mendenhall Lake and River that has not been seen in the past. Multiple areas experienced major flooding with about 290 homes being impacted with some seeing 4 to 6 FT of water in them.



Map #2: Map of Mendenhall Valley overlaid with the 16 FT Flood Inundation Map developed in 2014 showing widespread flooding over the Mendenhall Valley west of Riverside Drive, along View Drive, and around the Mendenhall Lake impacting Forest Service infrastructure.

River Flooding

The flood on the Mendenhall River from August 5-6, 2024, was caused by the release of a glacial-dammed lake adjacent to the Mendenhall Glacier. The preliminary peak stage was 15.99 FT (gauge datum), measured at the USGS stream gauge. The preliminary estimate of the release volume for this event is approximately 49,000 AC-FT. The previous record peak stage was 14.97 FT (gauge datum) on August 5, 2023, during last year's near-full Suicide Basin release. The record major flooding from this event was a result of the volume that came out of the basin at one time and the rate of rise. From Monday morning to the crest early Tuesday morning, the rate of rise on the river was around 0.4 FT per hour. The rate of rise was faster this year than last year, which could be due to a more efficient subglacial conduit drainage system, primed by a previous atmospheric river.

The total water level rise at the USGS Mendenhall Lake gauge from the onset of the glacier-dammed lake release to the peak was around 11 FT and occurred over 36 hours. The rate of rise of Mendenhall Lake and the Mendenhall River, which flows six miles from Mendenhall Lake into Fritz Cove, was similar to the event almost exactly a year ago; however, the peak stage this year was one foot higher. These two large GLOF events were unprecedented compared to GLOFs before August 2023. The preliminary peak discharge from this event at the Mendenhall Lake gauge was 33,400 cubic FT per second (CFS) versus the 26,000 CFS crest last year and the 16,300 CFS record from July 2016. The outburst event increased discharge into Mendenhall Lake and River by approximately 30,500 CFS.

The flooding impacts were much worse in some areas but less severe in others. This was due to two factors:

- The section of the river above the Back Loop Bridge was able to hold more water within its banks. This
 was due to large amounts of "river scouring" from last year's event, and the high water marks along the
 south side of View Drive were about 6 inches lower than last year (which saved one house from flood
 damage). Meanwhile, residents on the north side of View Drive experienced more water flowing across
 their property, causing increased road and home damage.
- 2. The amount of water that flowed over Killewich Drive was much higher than last year, causing water to move like a strong river down Riverside Drive and Killewich into Emily Way, Sharon Street, Gee Street, Long Run, and Northland—areas that had not seen such flooding before. Additionally, the water that came over into Meander Way was also much greater than last year. Residents in those areas saw water not just coming from the river to the west but also from the north, as water made its way through the community from Killewich. This water produced major flooding impacts, with 1 to 4 FT of water in homes, causing significant damage.

As the floodwaters moved through homes west of Riverside Drive, the water flowed down Rivercourt Way and returned to the Mendenhall River. After the Mendenhall River breached the banks around Marion Drive, Riverside Drive, Killewich Drive, and Meander Way, it entered the storm sewer drains but could not flow into the Mendenhall River due to the high velocity and pressure from the flood flow. This caused water pressure to build up in the storm sewer system, leading to flooding in areas around the Mendenhall Valley Library and other nearby locations as water emerged from the manholes. This also occurred near the back of the Safeway by the Mendenhall River at Brotherhood Bridge. Last year, significant erosion occurred along the banks of the Mendenhall River. Residents, along with the city, implemented bank stabilization improvements, and by all accounts, most of the armoring held with minimal erosion, though some damage to the armoring will require repair.



Figure #2: Hydrograph of the Mendenhall River showing NWS official forecast after crest

Timeline of Events

- **August 1st:** Suicide Basin reached a maximum pool elevation of approximately 1,381 FT (gauge datum). WFO Juneau issued a special weather statement.
- August 4th: The pool at Suicide Basin began to drop, and water levels at Mendenhall Lake began to rise, confirming that the basin was draining subglacially. The RFC issued a hydrograph forecasting a crest of 15.1 FT at 4:00 AM on August 6. WFO Juneau issued a Flood Warning at 10:48 AM.
- August 5th, 6:00 AM: Mendenhall Lake reached the action stage of 8 FT (gauge datum).
- August 5th, 9:15 AM: Mendenhall Lake reached minor flood stage of 9 FT (gauge datum).
- August 5th, 12:00 PM: Mendenhall Lake reached moderate flood stage of 10 FT (gauge datum).
- August 5, 2:49 PM: WFO Juneau updated the Flood Warning with a new crest forecast of 15.7 FT at 1:00 AM on August 6.
- August 5, 9:15 PM: Mendenhall Lake reached major flood stage of 14 FT (gauge datum); major impacts began with large areas starting to see water overflow the banks.
- August 6, 1:00 AM: Reports of significant major flooding along Riverside Drive, Killewich Drive, Meander Way, and all other roads west of Riverside. Flooded roads near Division and Julep Street, with water in the Safeway parking lot from manholes.
- August 6, 3:15 AM: Mendenhall Lake crested at a record stage of 15.99 FT (gauge datum).
- August 6, 4:45 AM: Mendenhall Lake dropped below major flood stage.
- August 6, 10:45 AM: Mendenhall Lake dropped below moderate flood stage.
- August 6, 12:00 PM: Mendenhall Lake dropped below minor flood stage.
- August 6, 4:30 PM: Mendenhall Lake dropped below action stage.

Storm Report Summary

See Appendix A.

Photos



Image #1: Multiple areas experienced major flooding with about 290 homes being impacted with some seeing 4 to 6 FT of water in them. (Photo Credit - Alaska Senator Lisa Murkowski, via <u>Facebook</u>)



Image #2: Major Flooding of Killewich Drive, Melvin Park, Cemetery, Emily Way, Sharon Street, Riverside Drive



Image #3: Minor Erosion of bank along Rivercourt Drive from flood water draining back into the river



Image #4: Major flooding along Emily Way







Image #6: Flood waters from backed up storm drains near the Valley Library



Image #7: Major Flooding along Riverside Drive.



Image #8: MajorFlooding along Meander Way

Appendix A - Storm Reports

Time & Date	City Location	County Location	Source	Remarks
1:30 PM 08/06/2024	1 NNE Mendenhall Valley	Juneau, AK	NWS Storm Survey	NWS Storm Survey found that along Sharon Street to Riverside Drive there was 2 FT of water in multiple homes during the peak of the event.
1:30 PM 08/06/2024	2 N Mendenhall Valley	Juneau, AK	NWS Storm Survey	NWS Storm Survey found that along Marion Drive there was about 1 foot of water during the peak of the flooding.
1:30 PM 08/06/2024	1 N Mendenhall Valley	Juneau, AK	NWS Storm Survey	NWS Storm Survey found that along Killewich Drive there was 2-3 FT of water over the road during the peak of the event and up to 3 FT of water along one house.
1:30 PM 08/06/2024	1 NNE Mendenhall Valley	Juneau, AK	NWS Storm Survey	NWS Storm Survey found that along Emily Way there was 2-3 FT of water in multiple homes during the peak of the event.
4:30 AM 08/06/2024	1 NE Mendenhall Valley	Juneau, AK	Public	Public reported that the north, west, and south sides (yard) of house flooded. Water crested and receded before entering home.
4:16 AM 08/06/2024	Juneau	Juneau, AK	Public	Gee Street near the stop sign at Killewich - Water is up to the top of the bottom step for the front and back doors, and seeping into the garage. Power is out on Gee, but still on on Long Run.
3:15 AM 08/06/2024	4 N Mendenhall Valley	Juneau, AK	Other Federal	USGS station at Mendenhall Lake, MNDA2, crested at a peak, new record level, of 15.99 FT at 3:15 AM Tuesday.
6:11 AM 08/06/2024	1 N Mendenhall Valley	Juneau, AK	Public	Emily Way still under 2-3 FT of water post glacial outburst flood.
2:21 AM 08/06/2024	Mendenhall Valley	Juneau, AK	NWS Employee	An NWS Employee reports flood water is moving up behind Safeway, and is rising through manhole covers.
2:10 AM 08/06/2024	2 N Mendenhall Valley	Juneau, AK	NWS Employee	Marion Dr closed and impassable due to water over roadway.
2:07 AM 08/06/2024	1 NNE Mendenhall Valley	Juneau, AK	Local Official	A local official reports flooding on Division Street and Taku Blvd.

12:48 AM 08/06/2024	1 N Mendenhall Valley	Juneau, AK	Local Official	Per a local official, flooding has begun to approach the Mendenhall Community School, and is around places like Killewich Drive, Stephen Richards Drive, and that flood water near Meander Way is now at or above the height of the fire hydrants.
12:36 AM 08/06/2024	1 NNE Mendenhall Valley	Juneau, AK	Dept of Highways	Water has begun to overtop Riverside Drive at Melvin Park, with a current water level of about 6 inches.
11:56 PM 08/05/2024	1 N Mendenhall Valley	Juneau, AK	NWS Employee	AN NWS Employee reports that flood water along Meander Way has reached 2 - 3 FT in depth, and that there is likely a foot of water in one house along the street, and that water is approaching the garage of another house.
11:34 PM 08/05/2024	1 N Mendenhall Valley	Juneau, AK	NWS Employee	An NWS Employee has reported that flooding is occurring along Meander Way.
10:02 PM 08/05/2024	2 N Mendenhall Valley	Juneau, AK	Public	Major flooding. There is water into homes. Road is impassable. Power has been cut to the area.
9:15 PM 08/05/2024	4 N Mendenhall Valley	Juneau, AK	Other Federal	USGS station MNDA2 Mendenhall Lake rose above Major Flood Stage 14 FT.
9:44 AM 08/05/2024	Mendenhall Valley	Juneau, AK	Public	Public reported the first big trees starting to float down the Mendenhall River.
12:00 PM 08/05/2024	3 NE Auke Bay	Juneau, AK	Park/Forest Srvc	Skaters Cabin Road closed to traffic due to water over the road.
12:00 PM 08/05/2024	4 N Mendenhall Valley	Juneau, AK	Other Federal	USGS station MNDA2 Mendenhall Lake rose above the moderate flood stage of 10 FT.