UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

EDGAR ABLAN, ET AL.,
Plaintiffs

CHRISTINA BANKER, TODD BANKER,
Plaintiffs-Appellees

v.

UNITED STATES,
Defendant-Appellant

2023-1363

Appeal from the United States Court of Federal Claims in No. 1:17-cv-01409-CFL, 1:17-cv-09001-CFL, Senior Judge Charles F. Lettow.

SANDRA ABDOU, ET AL.,
Plaintiffs

ELIZABETH BURNHAM,
Plaintiff-Appellee

v.

UNITED STATES,
Defendant-Appellant

2023-1365

Appeal from the United States Court of Federal Claims in No. 1:17-cv-01786-CFL, 1:17-cv-09001-CFL, Senior Judge Charles F. Lettow.

CHRISTINA MICU, AND ALL OTHERS SIMILARLY SITUATED,
SCOTT HOLLAND, CATHERINE POPOVICI, KULWANT SIDHU,
Plaintiffs-Cross-Appellants

ELISIO SOARES, SANDRA GARZA RODRIGUEZ,
ERICH SCHROEDER, MARINA AGEYEVA,
GLENN PETERS, VIRGINIA HOLCOMB,
Plaintiffs

v.

UNITED STATES,
Defendant-Appellant

2023-1366, 2023-1412

Appeals from the United States Court of Federal Claims in No. 1:17-cv-01277-CFL, 1:17-cv-09001-CFL, Senior Judge Charles F. Lettow.

OPENING BRIEF FOR THE UNITED STATES

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STATEMENT OF RELATED CASES

No other cases pending before this Court are appeals from individual judgments based on the same underlying opinion at issue in the present appeals.

The proceedings pending before the U.S. Court of Federal Claims for the following cases could be directly affected by this Court's decision in the pending appeal:

- *In re Upstream Addicks & Barker Reservoirs*, No. 1:17-cv-01277-CFL, 1:17-cv-09001-CFL, which is the master docket associated with claims by non-bellwether plaintiffs in the same set of cases as the present appeal (which arises from bellwether plaintiffs' claims);
- *In re Downstream Addicks & Barker Reservoirs*, No. 1:17-cv-9002 (Fed. Cl.), which includes consolidated claims for the taking of private properties located downstream from the government project at issue here, *see infra* (pp. 10-13).

INTRODUCTION

The United States appeals from judgments of the Court of Federal Claims ("CFC") awarding compensation under the Fifth Amendment to owners of Houston-area property located upstream from the Addicks and Barker Dams and Reservoirs ("Project"). The CFC held that, in operating this flood-control project in response to unparalleled rainfall and runoff related to Hurricane Harvey, the United States Army Corps of Engineers ("Corps") appropriated permanent "natural-disaster flowage easements" across Plaintiffs' properties for which the United States must pay compensation.

In August 2017, Harvey, a storm of unprecedented severity, dropped a record amount of rainfall on the Houston area over a four-day period, causing extensive flooding throughout the region. The Project reservoirs were empty when the storm made landfall. Following direction in its operating manual to reduce flood damage, the Corps closed the reservoir gates. The reservoir flood-pools rose rapidly due to the unprecedented rainfall and resulting runoff. About 48 hours after closing the gates, with the pools still rising rapidly toward record heights, the Corps started releasing some of the retained floodwater through the gates, as the manual directed. Subsequent to the storm, thousands of property owners filed takings claims seeking compensation for property losses allegedly caused by the Corps' operation of the Project. Claimants downstream allege that

the Corps released too much floodwater from the dams; upstream owners allege that the Corps retained too much water floodwater behind the dams. The claims were initially consolidated but later assigned to different judges based on whether the properties at issue were upstream or downstream of the Project.

These appeals concern upstream properties.[1] After a trial, the CFC held the government liable for a taking of flowage easements as to 13 bellwether properties, and, following a second trial, it awarded compensation and entered final judgments for six of those properties. The CFC erred by ruling that the Corps was liable for a taking in responding to a storm of unprecedented severity that has occurred only once in the 70-year lifetime of the Project. Hurricane Harvey was a unique and catastrophic disaster, in which widespread flooding of private property both upstream and downstream from the Project was inevitable and could not be entirely prevented by the Corps' operation of the Project.

The CFC's judgments should be reversed.

STATEMENT OF JURISDICTION

Plaintiffs invoked the CFC's jurisdiction under 28 U.S.C. § 1491(a)(1) for claims alleging Fifth Amendment takings of property, and the CFC held the

[1] Separate proceedings about whether the government is liable for a taking of property downstream of the Project are pending before a different CFC judge. *See infra* (pp. 10-13). Dispositive motions in those cases have been fully briefed since May 2023 and are awaiting decision.

government liable for takings and awarded compensation to the owners of six bellwether properties. On October 28, 2022, the CFC entered partial judgments as to those Plaintiffs under CFC Rule 54(b). Appx91. On December 27, 2022, the United States filed notices of appeal, Appx1058-1059, Appx5008-5009, Appx5174-5175, Appx5342-5343, which were timely under Fed. R. App. P. 4(a)(1)(B)(i). The Court has jurisdiction under 28 U.S.C. § 1295(a)(3).

STATEMENT OF THE ISSUES

1. Whether the CFC erred by holding the United States liable for inverse condemnation because (a) the application of the multifactor test from *Arkansas Game and Fish Commission v. United States*, 568 U.S. 23 (2012), does not support liability, (b) the police powers doctrine and related necessity doctrine apply, and (c) the Flood Control Act of 1928 limits the scope of Plaintiffs' property interests and reasonable expectations.

2. Whether, if there is liability, the CFC erred by awarding Plaintiffs consequential damages.

STATEMENT OF THE CASE

A. Factual background

1. Buffalo Bayou and Tributaries Project

The Houston area has a long history of flooding recorded from the late nineteenth and early twentieth centuries. Appx8252-8254. The City's main

waterway, Buffalo Bayou, lies within the Gulf Coast Prairie. That broad plain slopes gently southeastward toward the coast and features poorly drained soils that do not allow much surface water percolation. Appx8395-8396 (Project report). As a consequence of the area's topography and geology, streams that have little-to-no flow throughout much of the year are subject to flooding from runoff during storms. Appx8396. Particularly devastating floods occurred along Buffalo Bayou in 1929 and 1935, resulting in extensive property damage and loss of life. *See* Appx8786, Appx8252-8254, Appx8397.

Congress enacted the first nationwide flood-risk management program through the Flood Control Act of 1936 (1936 Act), which directed the Corps to study flood control for Buffalo Bayou. Pub. L. No. 74-738, ch. 688, § 6, 49 Stat. 1570, 1593. Section 8 of the 1936 Act, *id.* at 1596, expressly preserved the Flood Control Act of 1928, ch. 569, § 3, 45 Stat. 536 (codified as 33 U.S.C. § 702c ("Section 702c")), which states that the United States shall not be liable "for any damage from or by floods or flood waters at any place," *id.* Two years later, Congress authorized the Buffalo Bayou and Tributaries Project for the sole purpose of reducing downstream flood-risk. Pub. L. No. 75-685, 52 Stat. 802, 804 (1938); *see also* H. Doc. No. 456, 75th Cong., at 2-3 (1937); Appx8450, Appx8790. The Corps developed the Project jointly with the Harris County

Flood Control District, a Texas agency established in 1937 to assist with managing flood-risk. *See* Appx5889, Appx8393-8394.

The Project consists of Addicks Dam and Reservoir, Barker Dam and Reservoir, their associated outlet works, and several miles of downstream improvements to the stream channel. Appx8450-8451; *see also* Appx8434-8437 (photographs). The two dams are similarly sized earthen embankments, about 12-14 miles long and 100-120 feet in elevation. Appx8450-8451. The dams detain floodwater in two separate reservoirs that are normally dry, except during heavy rainfall when they detain water temporarily to manage and reduce flooding. Appx8476, Appx8483, Appx8489. The dams were built between 1942 and 1948 and are federally owned and operated. Appx8454-8455, Appx8492.

At the time of Hurricane Harvey, each dam's outlet works consisted of five rectangular conduits, about 8 feet long by 6 feet wide, opening to a spillway and stilling pool that flows through a riprap-lined channel downstream. Appx8450-8451; *see also* Appx8435, Appx8437 (photographs). As originally designed, only one of the five conduits on each dam included a gate. Appx8455. The dams thus detained water in the reservoirs to reduce the possibility of downstream flooding only if inflows exceeded the uncontrolled, combined outfall (through the four ungated conduits) of 15,000 cubic feet per second (cfs). *See id.* Two more gates were added to each dam in 1948, reducing the

uncontrolled flow to 7,900 cfs, the estimated capacity of the channel at that time. *Id*. The Corps built gates on the remaining conduits in 1963 to reduce the possibility of flooding on the downstream residential development increasingly encroaching on the floodplain along the channel. *Id.* By the late 1970s, outflows over 3,000 cfs could reach the first floor of some downstream residences. *Id*.

2. Project operations

At the time of Harvey, the Corps operated the Project according to a 2012 Water Control Manual (Manual). Appx8432-8589. An earlier version of the manual was adopted in 1962. Appx8433; *see also* https://water.usace.army.mil/a2w/CWMS_CRREL.cwms_util_api.download_dcp?p_dcp_document_id=2884 (2019). Generally, the reservoirs are operated to use available storage "to the maximum extent possible" to protect areas downstream of the dams from damaging floods. Appx8480. There are two modes of flood-control regulation: "Normal" and "Induced Surcharge." Appx8480-8481.

During normal operations, when downstream flooding is not expected, the gates are opened to heights that allow low flows (100-250 cfs) to pass through the outlet works. Appx8480. If an inch of rain falls within a 24-hour period or if downstream flooding is expected, the gates on both reservoirs are closed and kept under surveillance as long as necessary to reduce the risk of flooding below the dams. *Id*. If the water in the reservoirs reaches set heights (101 feet in Addicks

or 95.7 feet in Barker) and is expected to keep rising, the Manual's "Induced Surcharge" provision then applies. Appx8480-8481.

During surcharge operations, the Corps monitors the reservoirs for whether inflow is causing flood-pool elevation to keep rising. Appx8481. "If inflow and pool elevation conditions dictate, reservoir releases will be made" according to preset schedules in the Manual. *Id.* (referencing Appx8577-8578). The gates stay open until the reservoir levels fall below the heights that first triggered the surcharge provision. *Id.* Then, if the flow downstream is greater than the channel's capacity, the gates are adjusted to reduce the flow, and the reservoirs return to normal operations and are gradually emptied. Appx8480-8481. In general, surcharge releases help maximize reservoir storage for better flood protection, and they prevent uncontrolled flow around the ends of the dams that could create structural damage. *See*, *e.g.*, Appx5989.

3. Hurricane Harvey

Harvey was "the largest storm in the recorded history of the United States." Appx18. After making landfall along the Texas Coast as a Category 4 hurricane on August 25, 2017, Harvey weakened into a tropical storm and stalled over Houston for several days before leaving Texas on August 30, 2017. Appx1045. As a result, Harvey dropped record amounts of rain on the region, including about 31-35 inches on the Project area over four days. Appx8188,

Appx8197, Appx8203, Appx8209 (Kappel expert report); Appx8764; *see also* Appx8694 (discussing historical context), Appx8716 (stream gage data). Throughout Harris County, the storm flooded around 150,000 homes and businesses, caused $125 billion in damages (including $80 million sustained in Harris County Flood Control District), and led to 36 deaths. Appx8266. The President declared the State of Texas a major disaster area. *See* 82 Fed. Reg. 42,691 (Sep. 11, 2017).

Before Harvey's landfall, the Corps was operating the Project reservoirs under the Water Control Manual's normal procedures discussed above (pp. 6-7). Both reservoirs were empty on the afternoon of Friday, August 25, 2017, and the gates were set at a standard height that allows inflow to the reservoirs to pass downstream. Appx5659, Appx8676; *see also* Appx8480 (Manual § 7-05.a(1)). That evening, the Corps closed the gates on the dams to reduce the risk of downstream flooding. Appx8011, Appx8245, Appx5989; *see also* Appx8480 (Manual § 7-05.a(2)). The pools behind the dams then rose quickly, ultimately exceeding the government-owned land behind Addicks Dam on August 27, and behind Barker Dam by August 28. Appx8017, Appx8023.

The gates on both dams were kept closed until the pool heights and the volume and rate of water flowing into the reservoirs reached the levels requiring the Corps to release water under the Manual's "Induced Surcharge" provision.

Appx5602. The Corps began releasing water from behind both dams after midnight on Monday, August 28, 2017. *Id.*, Appx8246. The record-breaking volume of continuing rainfall nonetheless caused water behind the dams to continue rising. Appx8017, Appx8023. Water began flowing around the north end of Addicks Dam on August 29. Appx8023. The Corps gradually increased the amount of water released from about 8,000 cfs to 13,000 cfs on August 30, a few hours after reservoir flood-pool heights had peaked. Appx8246-8249. For comparison to the amounts released, the peak inflows to the reservoirs recorded on August 27 over a three-hour period were approximately 70,000 cfs into Addicks and 77,000 cfs into Barker. Appx8689-8690.

A few days later, after inflows abated, the Corps began reducing releases from the reservoirs (Barker on September 3; Addicks on September 7). Appx8250-8251. The uncontrolled flows around Addicks Dam ceased around September 2. Appx8030. Waters receded to the government-owned land at Addicks Reservoir on September 7, and at Barker around September 10. *See* Appx8622, Appx8670 (stream-gage data); Appx7 (stating elevation of government-owned land as 103 feet behind Addicks and 95 feet behind Barker); Appx8244 (elevations, flood durations on Plaintiffs' properties). Although the outlets returned to non-surcharge releases (3,000 cfs) on September 16, *see id.*, the reservoirs were not completely drained until mid-October 2017. Appx8706.

Although the Corps could not prevent all flooding from this storm, its operation of the reservoirs "prevent[ed] an estimated $7 billion in projected losses downstream in Houston." Appx19.

In response to Hurricane Harvey, Congress appropriated over one hundred billion dollars in aid to the storm's victims. *See, e.g.*, Appx8384-8387 (summarizing housing assistance in Texas); Appx8388 (identifying emergency aid to bellwether Plaintiffs); *see also* Pub. L. No. 115-56, Div. B, 131 Stat. 1129, 1136-38 (2017) (appropriating $15.25 billion for emergency, small business, housing assistance); Pub. L. No. 115-63, Title V, 131 Stat. 1168, 1173-86 (2017) (providing tax relief); Pub. L. No. 115-72, Div. A, Title I, 131 Stat. 1224, 1224-26 (2017) ($18.6 billion in aid for declared disasters); Pub. L. No. 115-123, Div. B, 132 Stat. 64, 65-122 (2018) (over $80 billion in disaster relief).

B. Proceedings below

Thousands of claims were filed in the CFC alleging takings of property from flooding during Harvey. The court sorted the claims into two dockets—upstream and downstream—based on the location of the claimants' properties in relation to the Project. *See* Appx1000-1001 (consolidating upstream cases).

1. Downstream litigation

Although the present cases are part of the upstream litigation, a brief overview of the downstream litigation provides helpful context. In the

downstream litigation, Judge Loren A. Smith granted the government summary judgment primarily on the ground that the plaintiffs sought compensation for a "right" that is not included in the "bundle of sticks" constituting their property interests. *In re Downstream Addicks & Barker (Tex.) Flood-Control Reservoirs*, 147 Fed. Cl. 566, 580 (2020). Specifically, Judge Smith held that the plaintiffs had no right to perfect flood protection from a flood-control project in the wake of an unprecedented natural disaster, or "Act of God." First, Judge Smith held that any such property right did not exist as a matter of state law because it was subject to the government's police power. *Id.* at 578. State law also did not require perfect mitigation, whether in tort or in taking, for flooding caused by an Act of God. *Id.* at 579. Also, the plaintiffs had acquired their properties after the Project's construction, subject to the Corps' superior right to mitigate flooding according to its manual. Next, Judge Smith held that federal law did not confer upon plaintiffs a property right to perfect flood control, considering Section 702c, the 1928 Flood Control Act's provision immunizing the government from damages from flood waters, as well as precedent rejecting takings claims from flooding that the government did not cause and could not control. *Id.* at 582-83.

On appeal, this Court reversed Judge Smith's award of summary judgment on the downstream bellwether properties. *See Milton v. United States*, 36 F.4th 1154, 1158 (Fed. Cir. 2022). Construing the government's citations to

the Flood Control Act as an "argument that it is immune from suits alleging takings based on its flood control measures" (an argument that was not actually made by the United States), the Court relied on *California v. United States*, 271 F.3d 1377 (Fed. Cir. 2001), as having held that the Flood Control Act did not withdraw Congress's grant of Tucker Act jurisdiction. 36 F.4th at 1160. Next, the Court held that plaintiffs had identified a cognizable property interest in a flowage easement as one of the rights in the bundle of sticks. *Id.* The Court distinguished cases on which the government (and Judge Smith) had relied, because in the Court's view, those cases concerned only whether a taking had occurred, not whether claimants possessed a property right (the threshold question on which Judge Smith dismissed the case). *Id.* at 1160-62. And although the Court acknowledged the police-power qualification on property rights, it construed that doctrine together with the necessity doctrine and noted that the government could still assert a defense on remand that the operation of the Project was an "actual necessity" to forestall a threat to lives and property of others. *Id.* at 1162.

The Court remanded for Judge Smith to consider whether a taking occurred, whether claimants had established causation, and whether the government can invoke the necessity doctrine as a defense. *Id.* at 1163. On remand, the parties have briefed summary judgment motions, with the

government also asserting an additional argument (not advanced in the upstream cases) that the relative benefits of the Project to the downstream property owners outweigh any detriments. Briefing concluded on May 12, 2023.

2. Upstream proceedings

In the upstream litigation, the government filed a motion to dismiss raising both arguments similar to those in the downstream case (except not raising causation) and additional arguments that (i) the claims were not cognizable because they challenged the Corps' failure to acquire additional land, an omission that does not give rise to a taking, and (ii) the claims were time-barred because they pertained to features of the Project's construction and operating manuals, which were substantially unchanged for many decades.

Judge Charles F. Lettow issued an opinion that deferred ruling definitively on some of the government's arguments but generally rejected them. Appx1015-1030. Judge Lettow held that: the claims by Plaintiffs were not time-barred or based on inaction, Appx1022; the complaint plausibly alleged a valid property interest in which Plaintiffs held reasonable investment-backed expectations, Appx1024-1026; the government's police power did not limit Plaintiffs' rights to avoid flooding on their property absent compensation, Appx1026; and further fact-finding after trial was needed to make definitive rulings on whether Plaintiffs' injuries constituted a taking or a tort, Appx1029-1030.

After conducting a trial, in December 2019 Judge Lettow denied the motion to dismiss and held the government liable for a Fifth Amendment taking of a flowage easement on 13 "test properties" upstream of the Project. Appx3; *see also* Appx5500-6602 (transcript). First, Judge Lettow held that Plaintiffs possess cognizable property interests that are not restricted by the Corps' right to mitigate floodwater or by the Flood Control Act. Appx27-29. Judge Lettow concluded that all the factors from *Ridge Line, Inc. v. United States*, 346 F.3d 1346 (Fed. Cir. 2003), and *Arkansas Game* weighed in favor of Plaintiffs: the time, duration, and severity of the invasion, Appx29-33; the government appropriating a benefit to *itself* from the flooding directly at Plaintiffs' expense, Appx34; intent and foreseeability, Appx34-41; and "severe interference" with Plaintiffs' reasonable investment-backed expectations, Appx41-44. Finally, Judge Lettow rejected the government's defenses based on the police power and necessity doctrines. Appx45-46. He concluded that the government "through its construction, maintenance, and operation of the [Project] in the past, present, and future, has taken a permanent flowage easement on [P]laintiffs' properties." Appx29 (footnote omitted).

Judge Lettow conducted a second trial on compensation for six bellwether upstream properties, selected from the 13 test properties for which liability was resolved in the first trial. *See* Appx7000-7732 (transcript). In October 2022, Judge

Lettow issued a written opinion on compensation (Appx47-90) and entered final judgment for those bellwether Plaintiffs in amounts ranging from $1,401.49 to $195,549.86, for a total of $454,535.03, plus interest from the date of taking. Appx91. Over Plaintiffs' objections, Judge Lettow offset the compensation awards by the amounts that several Plaintiffs had received through direct payments by the Federal Emergency Management Agency ("FEMA") to assist in their recovery from the storm due to flooding damage to their properties. Appx83-85. The total reductions amounted to $58,992.42, or approximately 8% to 20% reductions in the gross compensation for each Plaintiff who received the payments. Appx85.

Before determining the compensation owed, Judge Lettow addressed the scope of the easement that he had already held the government liable for taking. Judge Lettow held that the easement encompassed a right to flood the bellwether properties only "if meteorological conditions and the authorized operation and maintenance of the [Project] so require," Appx88, and he ordered that a specific easement be recorded with the title records once the litigation concludes, Appx86. Addressing the parties' dispute over the frequency with which the government would use the easement, Judge Lettow declined to decide when flooding would occur again at the same levels as during Harvey, stating that it fell "somewhere between the parties' estimates." Appx73. Plaintiffs estimated

recurrence of flooding to the Harvey pool levels at 35 to 100 years; the government estimated about 1000 years. *Id.* But Judge Lettow stated that "the government will use its easement only in the event of a natural disaster." *Id.*

As part of the compensation award to the bellwether Plaintiffs, Judge Lettow allowed recovery of various categories of expenses that the government contended were consequential damages that are not compensable as part of the just compensation owed for a taking, namely: costs of repairing damages to structures and replacing personal property, Appx70, Appx77-81; "displace[ment]" damages for the lost rental income one Plaintiff did not require his tenant to pay when the property was inaccessible due to flooding, *id.* at 36; the loss of a favorable, below-market lease, Appx76-77; and other lost rental profits, Appx82; *cf.* Appx1053 (ruling that the taking "encompassed—as a *consequential result* of the flowage easement taken—plaintiffs' personal property, fixtures, and improvements damaged or destroyed by the flood") (citing Appx26 n.17 (emphasis added)). Judge Lettow found no just reason for delay and directed entry of final judgment for the bellwether Plaintiffs. Appx86, Appx91.

SUMMARY OF ARGUMENT

1. The CFC erred in holding the government liable for a Fifth Amendment taking of Plaintiffs' properties as a result of the Corps' operation of the Project in response to the emergency circumstances resulting from the

rainfall and runoff from Harvey—the largest storm ever recorded in the Nation's history. The severity of the flooding due to Harvey was unique in the more than 70-year existence of the Project, and the Corps' management of the Project in response to the massive, record-setting rainfall from Harvey at most could be assessed as a possible one-time trespass, not a permanent taking of property.

After Harvey made landfall, water rapidly filled the Project reservoirs. Additional water had to flow onto property *somewhere*: the Corps was forced into either releasing more of the excess retained water downstream or allowing inundation upstream, or a combination of the two. That circumstance reflects a classic police-power dilemma in response to actual necessity. To be sure, the Project dams as constructed could and did hold back water to a level that flooded Plaintiffs' properties. But that feature of the Project is a matter of sound engineering and responsible planning—the Project was constructed to ensure structural integrity and protect against downstream devastation in a highly populated urban area. In that extreme situation, over and above the baseline against which the dams were constructed, the Corps was confronted with an inevitable tradeoff. If it released water to the extent necessary to prevent upstream flooding (if that were even possible), far greater damage would have resulted downstream.

The CFC relied heavily on the perception that individual property owners might not have subjectively known about the flooding risk. This was erroneous. The existence of the dams was an obvious physical fact; the Corps operated them under a publicly available manual and for the evident purpose of preventing downstream flooding; the Corps undertook public engagement on the Project over the years; and the local governments, which are responsible for coordinating with FEMA on flooding potential in connection with eligibility for flood insurance, knew about the significant implications of the Project. These considerations, along with the singular, isolated nature of the flooding of Harvey's magnitude and the dilemma the Corps faced in these urgent circumstances, further support concluding that no taking occurred.

That conclusion is confirmed by background principles recognizing the government's police power to act in emergencies, as well as the 1928 Flood Control Act's provision that the United States shall not be liable "for any damage from or by floods or flood waters at any place." This provision was enacted as part of the government's first large-scale endeavor to provide flood protection after the great Mississippi flood of 1927. Congress was reluctant to authorize the construction of large-scale flood-control projects only to be held liable for flooding that might occur as a result. The provision does not create a categorical exception to takings liability—e.g., if the government designs a

project so that land will be overflowed by the increased level of a reservoir on an intermittent but predictable basis. Nor is it a jurisdictional bar, as the CFC incorrectly thought the government was arguing. But it is an essential part of the background in place when this Project was undertaken, and which Plaintiffs reasonably should have understood when purchasing their properties adjacent to and after the construction of the Project.

For these reasons, the CFC erred in holding the Corps liable for a taking.

2. The CFC also erred in awarding Plaintiffs consequential damages. Just compensation for a permanent taking of a property includes the difference between the fair market value before and after of the date of taking—here, the cresting of the reservoir flood-pools during the flooding from Harvey on August 30, 2017. But the CFC also awarded Plaintiffs other expenses incidental to the flooding of their properties, including lost profits, a leasehold advantage, displacement costs, and damages to personal property and structures. A proper valuation of a permanent taking should exclude all these items as consequential.

The CFC's judgments should be reversed.

ARGUMENT

I. Standard of review

Whether a Fifth Amendment taking has occurred is a "question of law with factual underpinnings." *St. Bernard Parish Government v. United States*,

887 F.3d 1354, 1359 (Fed. Cir. 2018) (citing *Ridge Line*, 346 F.3d at 1352). The Court reviews de novo the CFC's legal conclusion whether a taking occurred, and its associated factual findings for clear error. *Id*. A factual finding "is clearly erroneous when although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed." *Renda Marine, Inc. v. United States*, 509 F.3d 1372, 1378 (Fed. Cir. 2007) (cleaned up).

II. The CFC erred in holding the United States liable for a taking.

A. The Corps' operation of the Project in response to unprecedented rainfall was a singular event that does not constitute a taking.

Under *Ridge Line*, a plaintiff bears the burden of proving that "treatment under takings law, as opposed to tort law, is appropriate" by establishing, at minimum, that "the government intends to invade a protected property interest or the asserted invasion is the direct, natural, or probable result of an authorized activity," and the "nature and magnitude" of the invasion are such as to constitute a taking rather than a tort. 346 F.3d at 1355-56. *Ridge Line*'s factors overlap to an extent with, but are distinct in some respects from, the factors that the Supreme Court identified in *Arkansas Game* to determine if temporary, government-induced flooding constitutes the taking of property. Under *Arkansas Game*, courts consider: (1) the "duration" of the restriction, (2) the "degree to

which the invasion is intended or is the foreseeable result of authorized government action," (3) the "character of the land at issue," (4) "the owner's reasonable investment-backed expectations regarding the land's use," and (5) the "[s]everity of the interference." 568 U.S. at 38-39 (cleaned up).

Plaintiffs fail to establish that they suffered a taking, as opposed to, at most, a trespass, under *Ridge Line*. But even if they have made that showing, they do not satisfy the requirements of *Arkansas Game*. Several aspects of the singular catastrophe here at issue—the extraordinary magnitude and unprecedented nature of Harvey; the absence of any basis to conclude that the flooding of Plaintiffs' properties was the direct, natural, and predictable result of the Corps' ordinary operation of the Project; and Plaintiffs' lack of reasonable investment-backed expectations in protection by the Corps against flooding in the wake of an unparalleled storm—compel a conclusion that the flooding on Plaintiffs' properties amounts to, at most, an isolated trespass, not the appropriation of a permanent flowage easement.[2]

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[2] The Tucker Act provides that the CFC "shall have jurisdiction" over certain monetary claims "not sounding in tort." 28 U.S.C. § 1491(a)(1); *see Jentoft v. United States*, 450 F.3d 1342, 1349-50 (Fed. Cir. 2006) (affirming that the CFC "lacked subject matter jurisdiction" to consider a claim to the extent it "sound[ed] in tort" (cleaned up)). Because the CFC addressed the merits of Plaintiffs' claims after trial, whether *Ridge Line*'s requirements for distinguishing torts from takings go to the CFC's jurisdiction makes no difference to the outcome here. *Cf. Morrison v. National Australia Bank Ltd.*, 561 U.S. 247, 254

1. The unprecedented nature of upstream flooding of Harvey's magnitude establishes that it was, at most, a trespass.

As the Supreme Court has explained: "Isolated physical invasions, not undertaken pursuant to a granted right of access, are properly assessed as individual torts rather than appropriations of a property right. This basic distinction is firmly grounded in our precedent." *Cedar Point Nursery v. Hassid*, 141 S. Ct. 2063, 2078 (2021); *see also Portsmouth Harbor Land & Hotel Co. v. United States*, 260 U.S. 327, 329-30 (1922) ("[W]hile a single act may not be enough, a continuance of them in sufficient number and for a sufficient time may prove [the intent to take property]. Every successive trespass adds to the force of the evidence."); 1 P. Nichols, The Law of Eminent Domain § 112, p. 311 (1917) ("[A] mere occasional trespass would not constitute a taking."). That conclusion is reinforced by *Arkansas Game*, whose factors represent "an application of the traditional trespass-versus-taking distinction" to the flooding context. *Cedar Point*, 141 S. Ct. at 2079.

In treating the flooding after Hurricane Harvey as a taking, the CFC failed to give sufficient weight to its own factual findings about the storm's extreme

(2010) ("Since nothing in the analysis of the courts below turned on the mistake [about whether a dismissal was properly characterized as one for lack of subject matter jurisdiction], . . . we proceed to address whether petitioners' allegations state a claim.").

rarity. The court found that Harvey was "a record-setting storm," Appx37, indeed, "the largest storm in the recorded history of the United States." Appx18. And although the nature and magnitude of the asserted invasion of Plaintiffs' property interests bear upon whether the claim is at most a trespass, the CFC's liability ruling made no findings on the probability that flooding similar to Harvey would recur. The only evidence presented at the liability trial on the return-frequency of a storm of Harvey's magnitude was the government-expert's testimony that the probability of such rainfall occurring over a four-day period for the same watersheds in a given year is about once every 700 to 900 years. Appx8193, Appx8200, Appx8206, Appx8212 (meteorologist's report); Appx6036-6037 (meteorologist's testimony).

Nor did the CFC make specific findings about the recurrence of flooding of the same magnitude as Harvey at the valuation stage. During that trial, all parties presented evidence on return-frequency as it related to the scope of the easement for which compensation was owed. The CFC rejected both sides' estimates of how frequently reservoir-pool-flooding of Harvey's magnitude would recur. Appx73 (noting that the "evidence suggests that the frequency of a Harvey-level flooding event will be somewhere between the parties' estimates" of 10-to-100 years and about 1,000 years). But the CFC still did not make specific findings about the future flood-frequency, stating that "[s]imilarly large storms

will likely occur in the future, but it remains uncertain when or how frequently." *Id.*; *see also* Appx31 ("[T]he likelihood of recurrent flooding is high…."). Despite the CFC's inability to determine the flood-pool-recurrence interval with any more precision than a "high likelihood," the court nevertheless called the Corps "heedless of the recurrent nature of the flooding involved here." Appx33.

What is more, the CFC concluded in its compensation ruling that the government would use its "atypical" flowage easement "only in the event of a natural disaster," mentioning the President's national disaster declaration as support. Appx72-73. Likewise, in the text of these "non-standard" easements that the court directed the government to file in the title records for Plaintiffs' properties, Appx51, the CFC stated that "[f]uture flooding is not expected to occur regularly or frequently but is instead subject to particular meteorological conditions under which the operation of the dams may result in temporary flood pools that extend beyond government-owned land." Appx88; Appx1055 (stating that the easement's scope is "far from standard" and Corps policies for standard easements "should not, and do not apply").

The CFC's determination that the government acquired easements for use during only the most extreme natural disasters cannot be squared with the Supreme Court precedents discussed above (p. 22) that isolated trespasses are not takings. That the CFC held the United States liable for acquiring such a

peculiar easement to be used only in the rare event of a natural disaster illustrates why the Corps' response to Harvey was not a taking.

Comparing flooding from Harvey to past events, the CFC looked to storms in the region from 1899, 1921, and 1935, and also storms occurring after the Project's construction. Appx31 (listing the Hearne storm, Taylor storm, 1929 and 1935 storms, Tropical Storm Claudette in 1979, 1992 storms, Tropical Storm Allison in 2001, and the Tax Day Storm of 2016). But unlike Harvey, no other storm occurring since the Project was built has resulted in flooding of the upstream structures or bellwether properties due to the Project's operations. *See*, *e.g.*, Appx17 (Tax Day Storm). And all of those post-Project storms, apart from one whose flooding of upstream property did not result from the reservoir flood-pools, occurred outside the Project area. *See id.* (discussing Claudette, "50 miles southeast of the reservoirs"; Allison, "50 miles northeast of the Addicks and Barker watershed"); *id.* n.12 (noting that flooding from the Tax Day Storm "may have been attributable to local stream flooding or other local circumstance").[3]

To be sure, flooding of the type that occurred here, even with very low probability recurrence, measurably affected the value of upstream properties

[3] The CFC relied on the nonbinding decision in *Quebedeaux v. United States*, 112 Fed. Cl. 317 (2013), for the notion that "even a single flooding event may give rise to a taking." Appx30. But as already discussed (p. 22), *Cedar Point* and *Portsmouth Harbor* suggest otherwise.

within the design-flood pool. But property damage alone does not amount to an invasion of property rights sufficient to support a taking by the government. *See supra* (p. 22). And even large diminutions in value do not necessarily result in takings, either. *See*, *e.g.*, *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1019 n.8 (1992) ("[I]n at least some cases the landowner with 95% loss will get nothing."); *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365, 384 (1926) (~75 percent diminution not a taking); *Hadacheck v. Sebastian*, 239 U.S. 394, 405 (1915) (92.5 percent). The Fifth Amendment cannot reasonably be understood as requiring the government to pay for an easement that is used only for a contingency such as an extraordinarily infrequent event constituting a natural disaster—at least on the scope of Harvey, as already discussed (pp. 7-8, 22).

Nor may Plaintiffs properly rely for their takings claims on the Supreme Court's descriptive statement that the "Fifth Amendment's guarantee that private property shall not be taken for a public use without just compensation was designed to bar Government from forcing some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole." *Armstrong v. United States*, 364 U.S. 40, 49 (1960), *quoted by* Appx25. The CFC cited *Armstrong* in ruling that the government "received a notable benefit" by protecting downstream property owners "at the expense" of those upstream. Appx33. Any such benefit accrued to downstream property owners, not to the

government. But in any event, it does not follow from *Armstrong*'s statement of a general proposition that when the United States chooses to build flood-risk management projects, nearby property owners thereby acquire a private property interest in flood control for which the government must pay compensation, if and when such projects are operated in a manner, consistent with other public interests, that cannot protect *all* property owners from flooding when the largest storm in the Nation's history strikes.

2. Flooding of Plaintiffs' properties was not the direct, natural, and probable result of the Corps' actions.

Flooding damage from this singular, unprecedented storm is not a taking because it was the direct, natural, and probable result of the storm, not the Corps' actions. That the Corps operated the Project—leading to flooding Plaintiffs' properties according to the Project's design and contingency plan for a conceivable but extremely rare storm—does not alter that conclusion.

a. Flooding from detaining rainfall and runoff in an unprecedented storm is the direct result of the storm, not the government's actions.

Takings liability does not result where the property damage at issue is the direct result of a singular natural disaster. A physical taking occurs only if "the government intends to invade a protected property interest or the asserted invasion is the direct, natural, or probable result of an authorized activity." *Ridge Line*, 346 F.3d at 1355-56; *see also In re Chicago, Milwaukee, St. Paul & Pac. R. Co.*,

799 F.2d 317, 326 (7th Cir. 1986) ("Accidental, unintended injuries inflicted by governmental actors are treated as torts, not takings."), *cited by Arkansas Game*, 568 U.S. at 39. That principle forecloses a conclusion that flooding from a catastrophic storm such as Harvey is "foreseeable" for takings purposes, as such flooding is the necessary result of an unprecedented amount of rainfall and resultant water runoff that inevitably must flow *somewhere*. *See*, *e.g.*, *Sanguinetti v. United States*, 264 U.S. 146, 147 (1924) (rejecting taking-by-flooding claim at federally built canal where "a flood of unprecedented severity" occurred, followed by "recurrent floods of less magnitude in subsequent years"); *Bartz v. United States*, 633 F.2d 571, 577 (Ct. Cl. 1980) (holding no taking where "[e]xcessive precipitation was the root cause of the flooding" and "[t]he government's [action] played only a secondary role"); *Wilfong v. United States*, 480 F.2d 1326, 1329 (Ct. Cl. 1973) (taking cannot arise from "simply a random [flood] event induced more by an extraordinary natural phenomenon than by Government interference"); *Columbia Basin Orchard v. United States*, 132 F. Supp. 707, 709 (Ct. Cl. 1955) (no taking due to flooding from "unprecedented rainfall" (distinguished by *Ridge Line*, 346 F.3d at 1355)).

Flooding damage to Plaintiffs' properties from the Corps' operation of the Project during Harvey is thus "incidental or consequential injury" that is compensable, if at all, only in tort. *Ridge Line*, 346 F.3d at 1355; *see also Keokuk*

& Hamilton Bridge Co. v. United States, 260 U.S. 125, 126-27 (1922) (rejecting takings claim by owner of a pier unintentionally destroyed by the government's blasting activity, whose injury was "incidental damage" that "might be a tort but which could be nothing else"); *Bedford v. United States*, 192 U.S. 217, 224-25 (1904) (flooding from federally built revetment was at most "an incidental consequence" of the government action).

The CFC's ruling that the flooding of Plaintiffs' properties was "at a minimum, objectively foreseeable" is neither accurate nor determinative of the matter. Appx37. Even assuming it was foreseeable that the pools behind the dams might flow onto nonfederal land during a storm of Harvey's scope, that conclusion does not mean that such flooding was the "direct, natural, and probable result" of the Corps' actions. Flood management must, within reason, plan for improbable situations that conceivably might arise. But that does not mean the government is responsible for *perfect* flood control when unprecedented storms occur; it would be perverse to discourage planning for these improbable, but theoretically possible, contingencies. Indeed, as already discussed (pp. 23-24), the CFC did not make findings about whether and when a storm of Harvey's magnitude might recur. *See* Appx73. If even *after* Harvey the CFC could at best find that flooding would recur only at some point during the next millennium,

it cannot be said that *before* Harvey it was "objectively foreseeable" that such flooding would occur within a lifetime after the Project's construction.

Moreover, Plaintiffs acquired their properties upstream of the Project after it was built and were therefore on constructive notice that their properties might be flooded if a massive storm led to the pooling of water temporarily on their properties. The notion that the Corps *should have known* it had to acquire a flooding easement for that remote, even if theoretically possible, contingency is problematic because it disregards the nature of flood-risk management. When building a flood-control structure, the Corps always confronts trade-offs between protection and cost. It strikes the balance by modeling a project-design storm that is developed by examining the region's history of flooding and by estimating the likelihood of future flooding of various magnitudes. *See*, *e.g.*, Appx5857 (testimony by Corps employee agreeing that it is "typical" for Corps to design dams to survive storms greater than those used to determine land acquisition boundaries). This exercise of engineering expertise is necessarily based on the best data available at the time. Larger floods are always *conceivable*, no matter how large a flood the Corps selects as the basis for acquiring property. From an engineering and public policy standpoint, the government must optimize the cost of achieving a desired level of flood management. *See* Appx6007 (testimony that designing to the "worst ever" storm would be cost-prohibitive).

Here, the Corps based the amount of land it preemptively purchased on the 1935 storm that caused the worst flood to have hit the Project's watersheds, acquiring property to an elevation three feet above the estimated flood-pool for that storm. Appx7-8. That elevation was nevertheless lower than the estimate the Corps used (based on the 1899 Hearne and 1921 Taylor storms) for designing the dam embankments. Appx7. Thus, "the dams were designed to contain more water than the acquired land could hold." *Id*. The Corps reasonably believed that the 1899 storm was the "upper limit of possible storms that could occur in the region," and so it designed the dams to survive such a storm to avoid a catastrophic failure. *Id*. But at the time, the Corps believed that a storm of the same magnitude as the 1899 storm would not occur "more than once in the lives of these structures." *Id.* (quoting Appx8417). By contrast, the 1935 storm could occur "several times" during the Project's lifetime. *Id.* And purchasing land to the maximum *possible* storm on every project would have been cost-prohibitive, *see id.* (citing testimony by Corps employee Robert Thomas, Appx6007, especially during World War II, Appx5858 (discussing availability of funds at that time); *see also* Appx8400 (acknowledging that possibility of another storm of the same magnitude as the 1899 Hearne storm was "very remote").

The Corps thus acquired land considerably beyond the extent of the largest storm reasonably likely to occur during the Project's existence, as was consistent

with the Corps' guidelines in effect when the Project was designed and built. *See*, *e.g.*, Appx5624-5625, Appx5674-5675, Appx5824, Appx5857 (discussing "probable maximum flood" design). Those regulations did not require the Corps to acquire additional lands that would be subject to flooding if a much larger storm unexpectedly hit the Project area. But the Corps' discretionary judgment about how much land to acquire does not mean that the government intended to invade—at all, let alone on a recurring basis—Plaintiffs' properties during an extraordinary storm like Harvey. It is always conceivable that a larger storm than the project-design storm might strike the region. But that does not mean that future, ever-larger flooding on Plaintiffs' properties is the direct, natural, or probable result of activity by the Corps. It is a result of the severity of the storm.

When the Project was built, nonfederal upstream land was undeveloped and used for ranching and rice farming and could have been acquired at less cost than it would after unanticipated decades of development. Appx7. The Corps determined that damages from a rare, one-time flooding of that land were less costly than acquiring the property. Appx8-9 (citing Appx5699). The CFC deemed it "significant[]" that the Corps made a "calculated decision" to design the Project's embankments to withstand the largest storms then on record (1899 Hearne, 1921 Taylor Storms) but acquired property to an elevation a little more than the less severe 1935 Storm. Appx7. As the CFC acknowledged, however,

id., and as already discussed (p. 31), a Corps employee testified that the agency could not have carried out its nationwide flood-management program safely and cost-efficiently had it pursued a policy of doing otherwise.

Moreover, nobody anticipated the dramatic degree of development that would occur in the Project area over the ensuing decades. But even while acknowledging the government's evidence that such "urban development was not anticipated in this bar[ren] prairie land remote from Houston," Appx7 (cleaned up), the CFC deemed *irrelevant* the dramatic changes in development of the surrounding land over the decades after the Project was built: "[J]ust because the nature of the invaded land has changed from farm land to residential does not bear on the question of whether an invasion of such land should have been foreseen." Appx37.

That dramatic, "[un]anticipated" urban development cannot be disregarded in that manner. If Congress were authorizing the Corps to build the Project today, the Corps' consideration of the speculative nature of possible flood-damage to nearby property when deciding what easements to acquire would be dramatically different. *See*, *e.g.*, Appx8756 (stating that the Corps would acquire additional realty if the Project were built today). For example, the cost of acquiring flowage easements on residential developments built since the 1940s might weigh against constructing the Project at all.

Additionally, the CFC's liability ruling ignores that once the Project was completed, the Corps must seek Congress's authorization and appropriation to acquire additional land. Failure to undertake such distinctly sovereign acts is an omission that is not actionable as a taking. *See St. Bernard Parish*, 887 F.3d at 1357-58, 1360-62. It is also the prerogative of the Executive that may not be second-guessed by courts. *Cf. Lincoln v. Vigil*, 508 U.S. 182, 193 (1993) (holding unreviewable an agency's "allocation of funds from a lump-sum appropriation to meet permissible statutory objectives"); U.S. Const. art. II § 3 (authorizing the President to "recommend to [the] Consideration [of Congress] such Measures as he shall judge necessary and expedient").

The fact that the nature of the property that might be at risk in an unprecedent storm has changed upstream since the Project was built significantly undercuts the propriety of a conclusion that the Corps intended the Project, at the time of construction, to invade Plaintiffs' properties subsequently approved and developed properties. The area has been heavily developed since the Project was originally constructed, and downstream development has reduced the amount of flow that the downstream channel may receive before

adjacent structures are flooded. Those after-arising developments were wholly outside the Corps' control and responsibility.[4]

b. The government action as a whole includes the Corps' operating the Project in response to a rare storm to protect downstream properties.

While the CFC believed that it was considering the challenged government action as a whole (which it must), the CFC did not actually do so. Rather, the CFC *constrained* its view of the pertinent government conduct by failing to consider the Project's construction and operation as to *all* affected landowners, whether located upstream or downstream. The Project's purpose is to protect downstream areas from flooding. And as the CFC found, the Corps' operation of the Project during Harvey "did prevent an estimated $7 billion in projected losses downstream in Houston." Appx19.

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[4] Foreseeability must be determined as of some fixed date. The government argued that foreseeability should be measured at the time the Project's construction began in the 1940s. Although the CFC rejected the government's view of foreseeability as too "constrained," the CFC ultimately held it "irrelevant" whether foreseeability was measured "in the 1940s, 1970s, or even in the 2000s, because at all of these points," the CFC concluded, the government "should have objectively foreseen that the pools [behind the dam] could and would exceed government-owned land." Appx36. However, the CFC's conclusions about foreseeability of upstream flooding were untethered to any factual assessment of when a future storm might again result in such flooding, as already demonstrated (pp. 23-25), and erroneously disregarded the role of subsequent development by Plaintiffs and others, *see supra* (pp. 32-33).

The Project's reservoirs were empty on the afternoon of Friday, August 25, 2017. Appx5659, Appx8676. The Corps closed the reservoir gates that evening, thereby detaining floodwater behind the dams until the Corps began surcharge releases after midnight on Monday, August 28, 2017. Appx5602. Indeed, even as the Corps increased the flow of the releases over the next several days in an attempt to bring the reservoir flood-pools within the limits of the government-owned land behind the dams, those pools were still *rising* behind the dams. Appx8017, Appx8023.

All that water came from the storm. Uncontrolled water was also flowing around the north end of Addicks Dam for several days (August 29–September 2). Appx8023. At its maximum, the combined flow of storm water into the two reservoirs was more than ten times the flow released below the dams. *See* Appx6460 (Dr. Nairn's testimony); Appx8238 (expert report). Once the pools stopped rising, it took six more weeks for the Corps to release all the floodwater from behind the dams. Appx8706.

The temporary detention and gradual release of floodwater saved downstream landowners' properties from flooding far worse than they experienced. Operating the dam according to the manual's provisions was intended to protect downstream properties from flooding while using the reservoirs' storage capacity to avoid the Project's catastrophic failure. The

floodwater had to go *somewhere*, and the Corps' actions determined merely how to allocate where the inevitable burdens of flooding would land, not whether those burdens, imposed by the storm, would occur at all.

c. Record rainfall from Harvey broke the typical chain-of-events for upstream temporary floodwater detention.

Hurricane Harvey was an intervening act outside the government's control that broke the chain of causation necessary for Plaintiffs to establish a taking. Foreseeability, while necessary, is not *sufficient* to satisfy the first prong of the *Ridge Line* test. "Foreseeability and causation are separate elements that must both be shown when intent is not alleged." *Cary v. United States*, 552 F.3d 1373, 1379 (Fed. Cir. 2009) (parentheses omitted). *Cary* held that no taking resulted when a fire arising on a national forest spread to private lands because even assuming that property damage was foreseeable, a hunter's ignition of the fire was an intervening cause that broke the chain of causation leading to the injury. *See id*. Like the fire in *Cary*, Hurricane Harvey occurred outside the government's control and broke the causal link between the Project's normal operation and the property damage that resulted from flooding during and after a storm of unprecedented magnitude. Water caused by Harvey had to flow somewhere, and the Corps' operation of the Project in response to the storm merely allocated where, not whether those inevitable burdens would fall.

Nor is the first prong of the *Ridge Line* test satisfied whenever property damage is foreseeable, i.e., in the sense of such damage being *conceivable* rather than actually *expected*. If that were true, *Ridge Line*'s first prong would cease to be a tool for "distinguishing physical takings from possible torts." 346 F.3d at 1355. Even in tort law, parties are generally liable only for harms that are the result of *reasonably* foreseeable risks. *See Paroline v. United States*, 572 U.S. 434, 445 (2014) (in the tort context, "[p]roximate cause is often explicated in terms of foreseeability or the scope of the risk created by the predicate conduct"); *CSX Transp., Inc. v. McBride*, 564 U.S. 685, 703 (2011) (negligence is "measured by what is reasonably foreseeable under the circumstances"); *cf.* Restatement Third of Torts §1 cmt. E (2009); Restatement Second of Torts § 8A Ill. A (1965). Takings liability demands more: The invasion must have been the direct, natural, or probable result of the government's authorized actions, such that it is fair to conclude that appropriating a property interest was an intended feature of the government project as it would be used in the ordinary course of events. Because of the intervening, unprecedented amount of rainfall and runoff from Harvey, Plaintiffs cannot make that showing.

3. The nature of Plaintiffs' reasonable investment-backed expectations also support concluding there was no taking.

The CFC also erred in concluding that flooding of Plaintiffs' properties in a storm of Harvey's magnitude was outside their reasonable, investment-backed expectations. Its ruling on the issue is inconsistent with its factual findings.

Bellwether Plaintiffs purchased their properties decades after the Project's construction, and some either held or were required to hold flood insurance. *See* Appx1032-1041 (purchase dates). They could and, objectively, *should* have known about the susceptibility of those properties and improvements to flooding from FEMA flood-insurance-rate maps and recorded plat maps. *See* Appx13-14 (factual findings). And the Corps discussed upstream flood-risk with developers and county officials who approved the development of these lands for residential subdivisions in the 1980s and 1990s. Appx14. Beginning around that time, Fort Bend County began requiring warnings on subdivision plats that the properties were located adjacent to the Barker reservoir and subject to "extended controlled inundation" by the Corps. Appx14-15. The Corps also engaged in public outreach to inform the community about upstream flooding risk. Appx15.

The CFC minimized the significance of its factual findings about the repeated disclosures of the upstream flooding risk to the property owners by characterizing those disclosures as ineffective or not well understood by the

general public. Appx43-44 & n.24. Initially, the CFC's focus on the general public is misplaced. Plaintiffs are not merely part of the general public. They own property that may be affected by flooding risk, and they have a heightened burden beyond the general public of understanding such risks to their properties.

The CFC's statements do not give even the average property owner in this exceptionally flood-prone region sufficient credit for being a rational decisionmaker. For example, the CFC stated that it is "highly tenuous to suggest that the average citizen should know how to read and understand the information in [FEMA or similar] maps or recognize that the map annotations refer to government-induced flooding rather than naturally occurring flooding." Appx43. But the disclosures on recorded subdivision plats in Fort Bend County that are incorporated into the property owners' deeds by reference specifically mention the Corps reservoirs and "controlled inundation." Appx14-15 (quoting Appx8000). And FEMA's floodplain maps are specifically intended to inform communities and affected property owners about flood-risk in connection with the sale of insurance. *See*, *e.g.*, 44 C.F.R. §§ 64.3 (discussing rate maps), 59.24(a) (allowing FEMA to suspend communities' eligibility to sell flood insurance for not submitting adequate flood-management measures after FEMA provides pertinent data), 60.3(d), (e) (setting forth measures' minimum standards). There

is nothing "tenuous" about attributing knowledge of possible flooding to these landowners.

Also, the upstream flooding is "government-induced" only in the sense that it occurred as an incident of the Corps' operating the Project in the context of record-shattering volumes of rainfall. That the character of the flooding Plaintiffs experienced was different from so-called "natural flooding" is true only because the Corps was operating the Project in response to that rare, record-breaking storm. Harvey and its resultant flooding were different in character than past events, and the CFC understated the extent to which that difference stemmed from factors not attributable to the government—namely, increased development near the channel downstream and at the reservoirs' edges upstream, plus meteorological conditions like rainfall volume and frequency. The United States should not be held responsible for the consequences of development decisions subsequent to Project construction.

The CFC perceived an "irony" in the government arguing that flood-risk was foreseeable to Plaintiffs but not to the Corps. Appx43 n.24. But the difference stems from the different nature and timing of the two inquiries. First, no matter the CFC's shorthand, the two "foreseeability" tests are fundamentally distinct. The *Ridge Line* inquiry is an objective inquiry into whether the damage about which Plaintiffs complain was the "direct, natural, or probable result" of

an authorized government action at the time the action was taken. That is simply not the same question as whether a property owner has "reasonable, investment-backed expectations" that the property will not suffer that damage, so the answer to both questions can be "no." Moreover, the latter question contains both a subjective and an objective component—a claimant must have *actually* relied on a particular state of affairs about the government action; also, that reliance must have been objectively "reasonable" in the claimant's circumstances. *See Cienega Gardens v. United States*, 503 F.3d 1266, 1288 (Fed. Cir. 2007).

Second, the timing of the two inquiries differs. The *Ridge Line* predictability factor should be evaluated at the time of the government action. But the CFC misconstrued that action as extending from the initial construction of the Project throughout its entire existence, operation during Harvey. *See* Appx36. As discussed above (pp. 33-35), that approach fails to account for the decades of unanticipated development in the region and erroneously holds the government liable for failing to secure authorization or spend appropriations to acquire more property after it was developed. At any rate, reasonable investment-backed expectations are evaluated "at the time of the acquisition of the property" by the claimant. *Love Terminal Partners, L.P. v. United States*, 889 F.3d 1331, 1345 (Fed. Cir. 2018) (cleaned up). What is more, in accounting for extremely improbable events, courts should assume the event's occurrence in

asking whether, if forced to contemplate the event, an owner could reasonably think the government action would interfere with the property right.

Thus, the extraordinary upstream flooding from Harvey could be *both* the consequential (rather than natural and predictable) damage from the Corps' operation of the Project to protect downstream properties in response to the record-shattering amount of rainfall, *and* within the reasonable expectations of the claimants when they acquired property upstream of a Project that temporarily detains floodwater during storms. By contrast, if the occurrence was not within the claimants' reasonable expectations when they acquired the properties, it plainly cannot have been "objectively foreseeable" by the government for decades prior in the sense required for takings liability.

A reasonable property owner appreciates the implications of acquiring property in a development on the fringes of federal land that serves as a detention basin for a flood control Project. Moreover, the facts found by the CFC about the notice actually provided by publicly available maps, plats, and outreach meetings, *see supra* (pp. 39-40), support a conclusion that Plaintiffs lacked any reasonable expectation that their property would remain flood-free when the Corps must operate the Project in response to record-shattering amounts of rainfall. If the Court concludes that it was objectively foreseeable to the Corps that operation of the Project could result in water backing up onto Plaintiffs'

properties in a large but rare storm, the same should have been foreseeable to Plaintiffs when they acquired title. *See*, *e.g.*, *Chancellor Manor Ltd. v. United States*, 331 F.3d 892, 904 (Fed. Cir. 2003) ("The subjective expectations of the Appellants are irrelevant. The critical question is what a reasonable owner in the Appellants' position should have anticipated.").

The Project's existence at the time Plaintiffs acquired their properties prevented formation of any pertinent reasonable, investment-backed expectations. The Project was fully constructed many decades before the bellwether Plaintiffs acquired their current titles. The Project and the possibility of controlled flooding were mentioned in notations on various plats and maps, and the Corps raised the issue in public information sessions, as the CFC found. Appx13-15. By expressing skepticism about whether the meetings were "heavily attended," "well publicized," or "effective" at making the average resident aware of flooding risk, the CFC placed an improper burden on the government. Appx44. The Corps did not have to mount an "especially aggressive public [outreach] campaign," *id.*, for the owners' reasonable expectation to be that the readily apparent, nearby Project—operated solely to detain water temporarily

for flood control purposes—might result in flooding beyond government owned land during a storm of unprecedented dimensions.[5]

B. The Corps acted to protect life and private property during Harvey, and all real property is subject to such core exercises of governmental police powers.

In assessing whether government action effects a taking of property under the Fifth Amendment, courts must first determine whether the claimant has a "cognizable property interest." *Sharifi v. United States*, 987 F.3d 1063, 1068 (Fed. Cir. 2021) (cleaned up). Because the Constitution does not define such property interests, courts look to "'existing rules and understandings' and 'background principles' derived from an independent source, such as state, federal, or common law," to decide if a property interest exists. *Maritrans Inc. v. United States*, 342 F.3d 1344, 1352 (Fed. Cir. 2003) (quoting *Lucas*, 505 U.S. at 1030); *see Colvin Cattle Co., Inc. v. United States*, 468 F.3d 803, 806-07 (Fed. Cir. 2006).

Emergency flood control is within the government's traditional police powers in relation to public protection. Federal law recognizes that private

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[5] In appeals from the dismissal of takings claims by property owners in the downstream cases, this Court in *Milton* rejected the view that "[owners'] property rights are limited by the owners' expectations as of the date they acquired their properties." 36 F.4th at 1162 (quotation marks omitted). But that case examined threshold questions about conditions on Plaintiffs' property interests; it did not involve a full-blown reasonable-investment-backed-expectations analysis conducted after a trial.

property is held subject to this inherent authority. That the Corps operated the reservoirs in a manner to mitigate catastrophic flooding to the extent possible during a historic storm does not diminish that authority.

1. Plaintiffs' property rights are subject to the Corps' police power to protect public safety and welfare.

All private property is held subject to certain core exercises of the government's police power. *See*, *e.g.*, *Bennis v. Michigan*, 516 U.S. 442, 452 (1996) (holding, in a forfeiture case, that "[t]he government may not be required to compensate an owner for property which it has already lawfully acquired under the exercise of governmental authority other than the power of eminent domain"); *Lech v. Jackson*, 791 Fed. Appx. 711, 715-19 (10th Cir. 2019), *cert. denied*, 141 S. Ct. 160 (2020); *cf. Hurtado v. United States*, 410 U.S. 578, 588-89 (1973) (ruling that the detention of material witnesses was not a taking because the government need not "pay for the performance of a public duty it is already owed"). For example, the government is not liable "for the destruction of 'real and personal property, in cases of actual necessity, to prevent the spreading of a fire' or to forestall other grave threats to the lives and property of others." *Lucas*, 505 U.S. at 1029 n.16 (quoting *Bowditch v. Boston*, 101 U.S. 16, 18-19 (1880)); *see also National Board of YMCA v. United States*, 395 U.S. 85, 93 (1969) (holding that the "temporary, unplanned occupation of petitioners' buildings" due to military necessity was not a taking). Traditional police power is defined as "the authority

to provide for the public health, safety, and morals." *Barnes v. Glen Theatre, Inc.*, 501 U.S. 560, 569 (1991).

Although other constitutional provisions may constrain that power, *see*, *e.g.*, *Lambert v. California*, 355 U.S. 225, 228 (1957) (regarding due process), the Just Compensation Clause does not impose such limitations. *See Chicago, Burlington & Quincy Railway Co. v. Illinois*, 200 U.S. 561, 593-94 (1906); *Mugler v. Kansas*, 123 U.S. 623, 667-70 (1887) (statute restricting the sale of beer without a permit was not a taking), *cited in Bachmann v. United States*, 134 Fed. Cl. 694 (2017) (identifying the "distinction on the one hand between the exercise of the police power to enforce the law … and, on the other hand the government 'taking property for public use' "). So, for example, in *Monongahela Bridge Co. v. United States*, it was not a taking for the United States to require a private company, upon pain of criminal penalty, to modify a bridge that was obstructing navigation. 216 U.S. 177, 193 (1910). And in *Miller v. Shoene*, it was held constitutional for a State to destroy diseased cedars without compensating their owner because they were located near an apple orchard to which it was feared the disease would spread. 276 U.S. 272, 277-79 (1928).

Hurricane Harvey was a disastrous storm of historic dimensions. *See supra* (pp. 7-8); *see also*, *e.g.*, Appx8692-8695. As that catastrophe unfolded, the Corps operated the Project according to the Water Control Manual. *See* Appx1045

(stipulation); Appx5989 (Thomas testimony). The sole purpose of the Project is flood control, and the reservoirs were empty before Hurricane Harvey began. Appx5659, Appx8676. All of the water filling the reservoirs came from the storm. Hour by hour, the Corps evaluated weather conditions in consultation with other federal, state, and local responders, and responded to those changing conditions by operating the Project in accordance with the Manual to protect human lives, Project infrastructure, and private property. *See supra* (pp. 8-9). As the CFC found, at the outset of the storm on August 25, 2017, "the Corps declared a general emergency, which included a dam safety emergency." Appx18 (citing Appx5617-5618); *see also* Appx5987.

The Corps' operation of the Project during a catastrophic storm of unprecedented dimensions—whether to close the dam-gates and allow water to accrue so high as to flow around the dams and undermine their structure, or to open them to allow floodwater to pass downstream—is a traditional exercise of protecting public safety, a pre-existing limitation on property ownership that "inhere[s] in the title itself." *Lucas*, 505 U.S. at 1029. Had the Corps not temporarily detained floodwater behind the dams, catastrophically worse flooding would have occurred downstream.

To illustrate the dilemma the Corps faced, another CFC judge is considering whether the Corps caused a taking of property located *down*stream

from the dams as a result of the detention and release of floodwater from Project operations during Harvey. No matter how the Corps operated the Project, the volume of rainfall meant that floodwater would have ended up on *someone*'s property. In these circumstances, background principles of the Corps' police power should obviate any possible taking. *See Miller*, 276 U.S. at 279 ("It will not do to say that … the misfortune of apple growers may not be shifted to cedar owners by ordering the destruction of their property.").

The Corps' choice of how to exercise its discretion necessarily impacted private property. To the extent that Plaintiffs suffered property losses greater than they would have suffered had the Project been operated differently, those losses were incidental to the unavoidable government decisions to manage risks from inevitable flooding and protect the public during a natural disaster of historic dimensions. *See*, *e.g.*, Appx5989 (Project has "the highest risk dams in the Corps of Engineers' inventory"). That exercise of emergency police power cannot effectuate the taking of property.

In *Milton*, this Court rejected reliance on police powers as a limitation on an owner's property interest and ruled that the government may raise a "doctrine of necessity" only as a defense. 36 F.4th at 1162. We note the government's disagreement with that view to preserve the issue for further review. In any event, the doctrine of necessity applies here. The Corps' operation of the Project

as an emergency response to rainfall and runoff from Harvey qualifies as actually necessary to minimize flood damage and to maintain the integrity of the Project's earthen-fill dams so as to avoid an even greater catastrophe if those dams collapsed. *Cf. Lucas*, 505 U.S. at 1030 n.16 (*citing Bowditch v. Boston*, 101 U.S. 16, 18-19 (1880)). That the procedures followed by the Corps were developed ahead of time in anticipation of a conceivable, but low-probability, occurrence does not make their exercise any less of an emergency response.

To hold otherwise would create a perverse disincentive to plan for emergencies in operating flood-control projects at all levels of government. A flowage easement that is used only for natural disasters is by definition *necessary* in emergencies. The Project included the highest-risk dams in the agency's inventory. Appx5989. And the Corps could not have operated the Project during Harvey to further minimize upstream damage without resulting in additional damage downstream. Appx5983-5984 (Thomas testimony); Appx8834 (August 26, 2017 email considering other options to reduce upstream flooding).

The CFC is incorrect that the "government [was] responsible for creating the emergency" here. Appx45. The water had to go somewhere; the Corps merely allocated where the inevitable burden would likely fall. And it did so consistently with its longstanding manual, as well as publicly available maps and

presentations. Whether conceptualized as a limitation on Plaintiffs' property interests or as a necessity defense, the principle defeats these takings claims.

2. The Flood Control Act of 1928 embodies a background limitation on title that forecloses Plaintiffs' takings claims.

Plaintiffs' property interests must be construed in light of the absence of any constitutional right to government protection from flooding. *See United States v. Sponenbarger*, 308 U.S. 256, 266-68 (1939). That is so because the Just Compensation Clause has no role to play "if the logically antecedent inquiry into the nature of the owner's estate shows" that the asserted property rights "were not part of his title to begin with." *Lucas*, 505 U.S. at 1027-28. As *Lucas* explained, restrictions that background principles of existing law "already place upon land ownership" "inhere in the title itself." *Id.* at 1029. Where government acts within the confines of a "pre-existing limitation" on a landowner's title, no compensation is owed, even for a *permanent* physical occupation. *Id.* at 1028; *accord Maritrans Inc. v. United States*, 342 F.3d 1344, 1352 (Fed. Cir. 2003) (courts look to "'existing rules and understandings' and 'background principles' derived from an independent source, such as state, federal, or common law," to determine whether a property interest exists (quoting *Lucas*, 505 U.S. at 1030)).

One such background principle is found in Section 702c. *See supra* (p. 4). When Congress authorized the building of federal flood control projects in the

1928 Act, it expressly disclaimed any intent to assume liability for flood waters those structures could not control. Specifically, when authorizing the construction of flood-control works for the Mississippi Valley following the catastrophic Mississippi floods of 1927, *see United States v. James*, 478 U.S. 597, 606 (1986), Congress specified that "[n]o liability of any kind shall attach to or rest upon the United States for any damage from or by floods or flood waters at any place." 33 U.S.C. § 702c. That provision "safeguard[s] the United States against liability of any kind for damage from or by floods or flood waters in the broadest and most emphatic language." *James*, 478 U.S. at 608 (citation omitted); *see id.* at 604, 612.

The 1928 Act displayed "a consistent concern for limiting the Federal Government's financial liability to expenditures directly necessary for the construction and operation of [flood-control] projects." *James*, 478 U.S. at 606-07. Section 702c, which was critical to the Act's passage, reflects Congress's intent "to ensure beyond doubt" that the United States would be protected "from 'any' liability associated with flood control." *Id*. "Undoubtedly that absolute freedom of the government from liability for flood damages is and has been a factor of the greatest importance in the extent to which Congress has been and is willing to make appropriations for flood control and to engage in costly

undertakings to reduce flood damage." *National Manufacturing Co. v. United States*, 210 F.2d 263, 271 (8th Cir. 1954).

Congress's authorization of the Nation's flood control projects—including the Buffalo Bayou Project—was premised on an understanding, reflected in Supreme Court precedents, that incidental consequences of such projects' operations would not lead to government liability. Congress authorized the Buffalo Bayou Project based on a study prepared under the 1936 Act, which affirmed Section 702c's validity. Pub. L. No. 74-738, ch. 688, § 6, 49 Stat. 1570, 1593; *see also id.* at 1596. Accordingly, Plaintiffs' asserted property interests must be understood against the backdrop of Section 702c.

In enacting Section 702c, Congress understood that "[d]amages to land by flooding" that are "consequential * * * do not constitute a taking of the land flooded." 69 Cong. Rec. 7,106 (1928) (remarks of Rep. Cox) (quoting headnote to *Bedford v. United States*, 192 U.S. 217, 217 (1904)). As President Coolidge observed when the 1928 Act was passed: "it would be very unwise for the United States * * * to render itself liable for consequential damages" from such projects. *Id.* at 7,126. Thus, the Fifth Amendment's prohibition on uncompensated takings "was kept in view" during the 1928 Act's enactment. *National Manufacturing Co.*, 210 F.2d at 270-71.

Imposing takings liability for hurricane-induced flooding would substantially impede the government's willingness—and perhaps its ability—to undertake beneficial flood- control projects. Congress has appropriated to the Corps almost $45 billion in response to flood disasters since 2005, of which almost $24 billion was for constructing flood-control projects. Carter, Nicole T., *Army Corps of Engineers Annual and Supplemental Appropriations: Issues for Congress*, Congressional Research Service Report No. R45326, 4 (2018), https://crsreports.congress. gov/product/pdf/R/R45326/2. Indeed, the Corps manages over 700 dams and more than 14,000 miles of levees across the Nation. U.S. Army Corps of Engineers & U.S. Bureau of Land Management, *State of the Infrastructure*, 6, 13 (2019), https://www.usbr.gov/infrastructure/docs/jointinfrastructurereport.pdf; *accord* 33 C.F.R. 222.5 Appx. E. The Bureau of Reclamation also manages hundreds of dams across the arid West. *Id.* at 6.

Those federal works could not function to maximize public health and safety, and minimize losses to private property, if project decisions were made in the shadow of takings liability to numerous landowners for consequential damages from flooding during hurricanes and other natural disasters. *Cf. Tahoe-Sierra Preservation Council, Inc. v. Tahoe Regional Planning Agency*, 535 U.S. 302, 324 (2002) (warning against an interpretation of the Takings Clause that "would transform government regulation into a luxury few governments could afford").

That the Corps provided long-term benefits to property owners in the region by building and operating the Project does not mean the United States should be liable under the Fifth Amendment merely because it did not acquire property for an even *bigger* Project that could prevent all flooding of private property in a large but singularly rare event such as Harvey.

Here, the CFC misunderstood the government to be arguing that the Flood Control Act withdrew Tucker Act jurisdiction over takings claims for flooding. Appx29. The CFC held that the Flood Control Act did not "supersede or bar" the court's "jurisdiction" over the taking-by-flooding claims. *Id.*; *see also Milton*, 36 F.4th at 1160 ("Section 702c … does not preclude [CFC] jurisdiction over this case"). But that ruling does not address the government's argument that Section 702c is a background principle limiting the scope of Plaintiffs' expectations and property rights. To the extent, if any, that *Milton* rejected this principle, the government disagrees with that position, and we note that disagreement to preserve the issue for further review.

III. Any compensation should exclude consequential damages.

The CFC also erred in its award of compensation. Just compensation under the Fifth Amendment is the fair market value of the property interest taken on the date of its appropriation. *Kirby Forest Industries v. United States*, 467 U.S. 1, 10 (1984). Just compensation does not include "consequential damages the

owner suffers as a result of the taking." *Yuba Natural Resources, Inc. v. United States*, 904 F.2d 1577, 1582 (Fed. Cir. 1990) (citing *Kimball Laundry Co. v. United States*, 338 U.S. 1, 7 (1949)).

Here, the CFC found that the United States liable for taking a "permanent flowage easement" on Plaintiffs' property up to the maximum level of Hurricane Harvey flooding. If such a taking had occurred (it did not), the measure of compensation would be the difference in the market value of each Plaintiff's real property before and after the taking. *See United States v. Virginia Electric & Power Co.*, 365 U.S. 624, 632 (1961). The CFC erred in awarding Plaintiffs additional consequential losses, including among other things lost profits, the monetary advantage of a below-market lease, displacement costs, and damaged personal property and structural repairs. Even if the CFC's liability ruling is not reversed, this Court should vacate the judgment and instruct the CFC to recalculate just compensation in accordance with settled just compensation principles.

A. Lost profits and leasehold advantage

The CFC awarded $3,300 to Plaintiff Scott Holland that was calculated to be the "leasehold advantage" he held from his below-market lease. The CFC justified that award on the ground that the Corps interfered with Holland's contract rights. That result is incorrect. When the government acquires private property, the correct measure of compensation is "the fair market value of the

property on the date it is appropriated." *Kirby Forest Industries*, 467 U.S. at 10. The owner of a property interest may not sidestep the long-established measure of compensation by resort to idiosyncratic value that only he could obtain.

Although the CFC correctly stated that Holland held an advantage because of his contract with a third party, the award of that idiosyncratic value is not a fair measure of compensation, and it awards something more like damages for a breach of contract rather than a taking. *See*, *e.g., Sun Oil Co. v. United States*, 572 F.2d 786, 818 (Ct. Cl. 1978) ("[T]he concept of a taking as a compensable claim theory has limited application to the relative rights of party litigants when those rights have been voluntarily created by contract. In such instances, interference with such contractual rights generally give rise to a breach claim not a taking claim." (citation omitted)); *see also Palmyra Pacific Seafoods, L.L.C. v. United States*, 561 F.3d 1361, 1365 (Fed. Cir. 2009) ("[A] showing that the subject matter of a contract has been taken is not sufficient to demonstrate that the contract itself has been taken." (discussing *Omnia Commercial Co. v. United States*, 261 U.S. 502 (1923)). Mere disappointment of a private party's expectations under a contract with a third party is not compensable.

The CFC also erred by awarding another Plaintiff, Kulwant Sidhu, lost income and utility payments while his first-floor housing unit remained vacant and could not be leased during the time it was flooded, as well as the discount

in rent Sidhu offered the tenant of a second-floor apartment that did not flood. *See* Appx82-83. That award was in addition to, not instead of, the property's diminution in value due to the flooding. The CFC erroneously determined that "[l]ost profit and damage cause to business assets" are compensable if they are the direct and natural consequence of the government's taking. Appx82. The inability to rent a vacant housing unit is even more of a consequential loss than the damage to the property as a whole; the former reflects not merely the diminishment in the value of the underlying fee (or a corresponding value of the permanent easement) but rather the temporary consequence of flooding in the unit. Likewise, the discounted rent Sidhu offered the tenant of his upstairs unit resulted from acts of his own accord based on his best business judgment.[6] Such expenses are the ordinary losses experienced by a business and are not a proper component of just compensation for a taking. *See Georgia-Pacific Corp. v. United States*, 226 Ct. Cl. 95, 151-53 (1980) (denying business-management and travel costs from a taking); *R.J. Widen Co. v. United States*, 357 F.2d 988, 994 (Ct. Cl. 1966) (business expenses incurred as a result of a taking are "non-compensable under long-established legal principles"). Indeed, the situation resembles lost

[6] Underscoring the remoteness of these expenses from any taking, the CFC clarified that Sidhu's upstairs unit is not even "covered by the [flowage] easement" that the court held the government had taken. Appx1057.

profits, which are generally not compensable. *See*, *e.g.*, *United States v. General Motors Corp.*, 323 U.S. 373, 379 (1945) (compensation for a fee interest "does not include future loss of profits").

Also misplaced is the CFC's reliance on *Kimball Laundry*. Appx82. That case held that just compensation includes a business's "demonstrable loss of going-concern value," the value contributed by non-physical assets like management or client development skills. 338 U.S. at 14-15. But there, the intangible "trade routes" required compensation only for "whatever transferable value their temporary use may have had." *Id.* at 16. Here, the lost rent is not tantamount to the intangible assets of a business that have transferable value; rather, lost rent is a measure of consequential damages resulting from the taking. *Cf. Causby v. United States*, 75 F. Supp. 262, 264 (Ct. Cl. 1948) (awarding compensation for destruction of chickens raised on a farm subject to overflights).

B. Displacement costs

The CFC awarded several bellwether Plaintiffs "displacement" or "dislocation" costs for the amounts they spent renting alternative housing while their property was inaccessible or unrepaired from the flooding. Appx82 (concerning Burnham and Micu); *see also* Appx66-67 (discussing Plaintiffs' evidence of such costs). That ruling overcompensates Plaintiffs by impermissibly

awarding damages that are merely consequential because they do not flow directly from the Corps' actions in operating the Project.

Citing the Supreme Court's ruling in *General Motors*, the CFC decided to "tak[e] into consideration" dislocation costs "actually and necessarily incurred" when determining just compensation. Appx82. But *General Motors* is inapposite. It concerned condemnation proceedings to procure the *temporary* use of a warehouse that a company held under long-term lease, and the parties offered proof of the property's fair rental value for about one year. 323 U.S. at 375-76. The trial court denied the company's offer to prove various "removal" costs, e.g., for shipping the building's contents elsewhere during the displacement period. *Id.* at 376. The Supreme Court allowed such evidence but *only* to establish the temporary rental's market value: "Such items may be proved, not as independent items of damage but to aid in the determination of what would be the usual—the market—price for such temporary occupancy of the building …. Proof of such costs as affecting market value is to be distinguished from proof of value peculiar to the respondent … which, in this case, as in the case of the condemnation of a fee, must be excluded from the reckoning." *Id.* at 383.

Here, the CFC awarded compensation for a flowage easement based on market value. And it did so for a *permanent* taking, not a temporary rental. But the CFC did not limit its use of "dislocation" evidence to calculating market

value for the taking. Instead, although it was purportedly "tak[ing] into consideration dislocation costs," Appx82, in fact it actually awarded those amounts (as offset by FEMA payments). That award was erroneous.

C. Personal property and structures

Finally, the CFC erred by awarding compensation for miscellaneous personal property and repairs to structures. Appx77-78. As much as the Corps did not intend the Project's operations during a catastrophic storm to appropriate Plaintiffs' real property, it intended to appropriate Plaintiffs' personal property even less. The CFC stated that the taking of personal property was "simply the consequential result" of taking the realty. Appx26 n.17, *cited in* Appx1053 (the flowage easement "encompassed—as a consequential result of the flowage easement taken—plaintiffs' personal property, fixtures, and improvements damaged or destroyed by the flood"). As already discussed, consequential damages are not a proper component of just compensation for a taking. Here, the personal property and structures are too attenuated from the Corps' operation of the Project to be anything other than consequential. *See*, *e.g.*, *Jackson v. United States*, 230 U.S. 1, 8-9 (1913) (concerning damages to "cotton, mules, corn, cattle, and sheep"). Compensation for personal property and structures is especially inappropriate given the "permanent" nature of the easement. If similar flooding on Plaintiffs' properties ever occurred in the future,

it would hardly make sense for the government to compensate Plaintiffs for such damages again, and there would be no basis for such a result.

CONCLUSION

For all of the foregoing reasons, the CFC's judgment should be reversed.

Respectfully submitted,

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June 2023
90-1-23-15153

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/s/ Brian C. Toth

Attorney for Defendant-Appellant the United States

Dated: June 12, 2023

Addendum

Judgments, Orders, and Opinions

In the United States Court of Federal Claims

Sub-Master Docket No. 17-9001L

(Filed: December 17, 2019)

**********	
IN RE UPSTREAM ADDICKS AND BARKER (TEXAS) FLOOD-CONTROL RESERVOIRS	Post-trial decision; government-induced flooding on private property; application of factors identified in *Arkansas Game & Fish*; liability for a taking of a flowage easement
**********	
THIS DOCUMENT APPLIES TO:	
ALL UPSTREAM CASES	
**********	

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OPINION AND ORDER

LETTOW, Senior Judge.

This case brings to the court the occasionally recurring question of the extent and the nature of government-induced flooding on private property necessary to rise to the level of a Fifth Amendment taking of a flowage eastment. Particularly, this post-trial decision assesses whether the government may be liable to private property owners in the Houston, Texas

metropolitan area for takings compensation following Tropical Storm Harvey.[1] Thirteen property owners were selected to serve as bellwethers for the hundreds of property owners who have filed suit raising similar claims against the government.

After making landfall in August 2017, Tropical Storm Harvey ("Harvey") doused Houston with an average of 33.7 inches of rain over a four-day period. Many properties, including over 150,000 homes, flooded during the storm. Those affected included private property owners within the Addicks and Barker Reservoirs, west of Houston, upstream of the federally designed, built, and maintained Addicks and Barker Dams. During Harvey, the Addicks and Barker Dams collected storm water in their respective reservoirs causing properties within the reservoir to flood from the impounded water. At issue in this bellwether trial is the liability of the government under the Tucker Act, 28 U.S.C. § 1491, and the Takings Clause of the Fifth Amendment of the Constitution, for the damage to thirteen of these properties.[2]

The thirteen bellwether properties are representative of the hundreds of owners of "upstream" properties who brought suit against the United States in this court after Harvey. The property owners claimed that the United States was liable to them for an uncompensated taking, that is, the government-controlled inundation of their properties by the impounded floodwater from Harvey. The first complaint relating to Harvey and the Addicks and Barker Dams was filed on September 5, 2017. *See Y and J Props., Ltd. v. United States*, No. 17-1189L. Hundreds of such cases followed. Using case management techniques comparable to those employed in multi-district litigation, the Chief Judge of the court issued Management Order No. 1, consolidating these cases, and all related later-filed cases, within one master docket. *See In re Addicks and Barker (Texas) Flood-Control Reservoirs*, No. 17-3000L; *Y and J Props., Ltd. v. United States*, 134 Fed. Cl. 534 (2017). The Chief Judge then bifurcated the issues of liability and damages, initially setting a schedule to deal with liability. *See* Order Regarding Judicial Assignment and Scheduling (Nov. 20, 2017), Master Docket No. 17-3000L, ECF No. 70. Subsequently, the Chief Judge divided the Master Docket into two sub-master dockets, *see In re Addicks and Barker (Texas) Flood-Control Reservoirs v. United States*, No. 17-3000L, 2017 WL 6334791 (Fed. Cl. Dec. 5, 2017)—one for downstream properties, *In re Downstream Addicks and Barker (Texas) Flood-Control Reservoirs*, Sub-Master Docket No. 17-9002L, and, pertinent here, one for upstream properties, *In re Upstream Addicks and Barker (Texas) Flood-Control Reservoirs*, Sub-Master Docket No. 17-9001L.

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[1]When Harvey first made landfall on the Texas mainland on August 26, 2017, it was classified as a Category 4 hurricane. *See* Eric S. Blake & David A. Zelinsky, Nat'l Hurricane Center, *Tropical Cyclone Report: Hurricane Harvey* 3 (January 23, 2018), available at https://www.hsdl.org/?view&did=807581. But "Harvey rapidly weakened over land to a tropical storm" within the first twelve hours and to a tropical depression by August 30, 2017. *Id.* Because the majority of the five-day downpour that the Houston area experienced coincided with *Tropical Storm* Harvey, the opinion will use this designation.

[2]The named defendant, the United States, is representative of all relevant government actors, including the United States Army Corps of Engineers (the "Corps"). Thus, references to the "United States," the "government," and the "Corps" all refer to defendant and its collective entities and actions.

Since the division, proceedings have moved apace in the upstream docket. In the spring of 2018, thirteen plaintiff properties were designated to serve as bellwethers for the cases.[3] In February 2018, the government filed a motion to dismiss under the Rules of the Court of Federal Claims ("RCFC") 12(b)(1) for lack of subject-matter jurisdiction and 12(b)(6) for failure to state a claim upon which relief can be granted. *See* Motion to Dismiss (Feb. 16, 2018), Sub-Master Docket No. 17-9001L, ECF No. 59. Although the court made some preliminary rulings in addressing that motion, resolution of the government's motion to dismiss was deferred until trial, pursuant to the court's authority under RCFC 12(i), in light of the fact-intensive inquiry this case required. *See In re Upstream Addicks and Barker (Texas) Flood-Control Reservoirs*, 138 Fed. Cl. 658, 672 (2018).

A ten-day trial was held in Houston, Texas, commencing on May 6, 2019, regarding the liability of the United States for the thirteen test properties. During the course of trial, on the afternoon of May 8, 2019, the court conducted a site visit of the dams that included the spillways and end points of both dams as well as the drainage canals that feed into the reservoirs, as well as seven of the test properties. Following post-trial briefing, *see* Plaintiffs' Post Trial Brief ("Pls.' Br."), ECF No. 235; Defendant's Post Trial Brief ("Def.'s Br."), ECF No. 242; Plaintiffs' Post Trial Brief Reply ("Pls.' Reply"), ECF No. 246, the court heard closing arguments on September 13, 2019, in Washington, D.C. The issue of liability pertaining to the thirteen test properties and the government's motion to dismiss are ready for disposition.

Overall, based on the facts and circumstances at hand, the government's motion to dismiss is denied and the court finds the government to be liable for a taking of a flowage easement on the properties.

FACTS[4]

A. The Addicks & Barker Flood Control Project

1. The impetus for flood control measures.

Buffalo Bayou originates in eastern Waller County and western Harris County and flows in a generally eastward direction through a circuitous channel approximately 75 miles long.

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[3]Originally, the court directed the parties to come to an agreement on ten test properties. *See* Case Mgmt. Order (Feb. 1, 2018) at 2-3, Sub-Master Docket No. 17-9001L, ECF No. 37. At the behest of the parties, the number was later increased to fourteen properties. *See* Order Approving Test Prop. Selection (Mar. 13, 2018), Sub-Master Docket No. 17-9001L, ECF No. 91. One of these fourteen plaintiffs voluntarily dismissed his suit, *see* Notice of Voluntary Dismissal (Aug. 24, 2018), Sub-Master Docket No. 17-9001L, ECF No. 136, and therefore thirteen plaintiff test properties remain.

[4]This recitation of facts constitutes the court's principal findings of fact in accord with RCFC 52(a). Other findings of fact and rulings on questions of mixed fact and law are set out in the analysis.

Joint Stip. ¶ 84.[5] After its confluence with South Mayde Creek in western Harris County, the bayou winds through downtown Houston, where it converges with the White Oak Bayou and continues east, eventually reaching the Houston Ship Channel and pouring into San Jacinto Bay, Galveston Bay, and the Gulf of Mexico. Joint Stip. ¶¶ 84, 85. The city of Houston is situated at the confluence of the two bayous and at the base of a fan-shaped system of streams that flow through a flat and "almost featureless plain," contributing to the creation of a major flood hazard in the region. JX5 at 4.[6] For much of the year, little or no water flows through the narrow streams in the Buffalo Bayou watershed, but during heavy rainfall the small stream channels cannot hold the water and "a general overflow along the banks" results. JX5 at 5. The soil composition in the region and the foliage it supports do not allow much water seepage and result in exceedingly poor natural percolation and drainage. *See id*. at 4-5. Close proximity to the Gulf of Mexico yields regular hurricanes and tropical storms, rendering the region susceptible to especially heavy rainfall events and attendant flooding. *See* Tr. at 614:7-23 (Test. of Jeff Lindner).[7] Due to this combination of factors, between 1854 and 1935 six major floods occurred in the Buffalo Bayou watershed, including the City of Houston. JX5 at 6. Two particular storms and the flood devastation they created, one in May 1929 and the other in December 1935, prompted congressional action that led to the construction of the Addicks and Barker Dams. Joint Stip. ¶ 81.

In May 1929, a storm ("the 1929 storm") produced rainfall ranging from six to twelve inches over the White Oak Bayou and Buffalo Bayou basins, causing flooding in downtown Houston and resulting in property damage within the city of $1,392,000. Joint Stip. ¶ 82. About six years later, in December 1935, another storm ("the 1935 storm") produced three days of rainfall dropping approximately fifteen inches throughout the basin. Joint Stip. ¶ 83. That storm generated flooding that killed eight people and caused property damage estimated at $2,528,000. Joint Stip. ¶ 83.

The real possibility of a storm even larger than these events raised serious concern. The Corps noted in its 1940 Definite Project Report about the then-proposed dams that the Buffalo Bayou watershed was situated "in an area subject to all of the circumstances making possible large storms." JX5 at 7.[8] That same report stated that had the 1935 storm centered directly over

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[5]On April 23, 2019, the parties entered into stipulations of fact "for the purposes of the trial of the thirteen claims in the Upstream Sub-Docket only, and [specifying that the stipulations] are not intended to be binding as to any other claim that falls within Master Docket No. 17-3000L, the Upstream Sub-Docket No. 17-9001L, or the Downstream Docket No. 17-9002L, or in any other action or proceeding." Stipulations of Fact for Trial at 1, ECF No. 211. The stipulations number 116 and will be cited as "Joint Stip." followed by the paragraph number.

[6]Citations to plaintiffs' exhibits are identified as "PX___," defendant's exhibits are identified as "DX___," and the parties' joint exhibits are identified as "JX___."

[7]The transcript of the trial will be cited as "Tr. ___:___;" showing the pertinent page and line number and the name of the pertinent witness.

[8]The Definite Project Report was issued in 1940 in connection with plans to construct the Addicks and Barker Dams.

the basin—rather than where it did over Westfield, Texas, about eighteen miles from Houston—it would have resulted in even more severe flooding. *See id.* Nor was there any "evident meteorological reason why the storm could not have centered over the basin." *Id.* It was also recognized at the time that, due to the topographic and meteorological features of the region, any flood control system constructed for Houston could be subjected to storms equal to any of record in Texas, and greatly in excess of any so far experienced over the basin. *See id*. "[O]nly chance," the Corps observed, had "prevented the occurrence of a storm over the basin much larger than the 1935 storm." *Id*. The largest rainfall of record in the United States at the time Addicks and Barker were constructed occurred only ninety miles northwest of Houston at Hearne, Texas in 1899—under meteorological conditions that the Corps noted "could be approximated closely over the Buffalo Bayou watershed." *Id*. The Hearne storm generated a maximum 31.4 inches of rain in a period of three days, with an average depth over an area of 1,000 square miles of 25.8 inches. PX777 at 4. A hydrology report prepared by the Corps in 1938 concluded that the 1899 Hearne storm was the "maximum probable storm" that might arise over the Buffalo Bayou watershed, also noting that should such a storm occur the average rainfall would be "almost twice the average of 15 inches that produced the record flood of 1935." JX5 at 8. While conceding that the probability of the occurrence of a storm as severe as the Hearne storm in the Buffalo Bayou basin was "very remote," the Corps also noted in its Definite Project Report that "ultimate protection against such a storm is desirable" though perhaps not feasible in "the initial stage" of flood control construction. *Id.* at 9-10. Without flood control measures, the Corps predicted "[c]onsiderable overflow" from storms that would produce "disastrous peak flows." *Id.* at 8.

Another storm that occurred at Taylor, Texas in 1921 ("the Taylor storm") constituted the greatest single-day rainfall ever recorded in the United States at that time, producing 23.11 inches in 24 hours. PX777 at 4. The Taylor storm did not cover as large an area as the Hearne storm, but the rainfall was more intense over a shorter period of time and the Corps noted in the 1940s that such depths of accumulated rain over a basin as small as Buffalo Bayou would be considerable. *Id.* at 5.

Against this background, Congress acted to initiate the implementation of flood control measures. Pursuant to the River and Harbor Act of 1938, Congress authorized the Corps to design and build the Addicks and Barker Dams as part of the Buffalo Bayou and Tributaries, Texas Project. *See* Pub. L. No. 75-685, 52 Stat. 802 (codified mainly at 33 U.S.C. §§ 540, 558(b), 558(c), 571, 701(k)). The purpose of the project, as defined by the Corps' Definite Project Report published on June 1, 1940, was "to provide for complete control of floods on the Buffalo Bayou watershed and the protection of the city of Houston, Texas, and the Houston Ship Channel against the estimated probable maximum storm." JX5 at 3.

At critical junctures in the ensuing lifespan of the dams, the Corps consistently echoed that the whole purpose for the construction and operation of the project was to prevent downstream flooding, especially in downtown Houston. *See, e.g.*, PX59 at 8 (USACE464077) ("The sole authorized purpose for [the] Addicks and Barker Reservoirs is to reduce potential flood damage along the downstream reach of Buffalo Bayou."); PX59 at 21 (USACE464090) ("The dams are operated strictly to prevent downstream flooding."); JX110 at 3-1 (USACE016311) ("The existing project, as authorized, provides for flood risk management, the protection of the City of Houston from flood damages, and the prevention of excessive velocities and silt deposits in the Houston Ship Channel Turning Basin.").

2. Project design.

The original design of the project consisted of three detention reservoirs, a system of canals and levees, and channel improvements along Buffalo Bayou below the reservoirs. *See* JX5 at 12-13. The three detention reservoirs were to be built on White Oak Bayou and at the Addicks and Barker watersheds on Buffalo Bayou, which are seventeen miles west of downtown Houston and upstream of the confluence of Buffalo Bayou and South Mayde Creek. *Id.*; Joint Stip. ¶ 100. The Barker Dam would be located on Buffalo Bayou about 1.5 miles above its confluence with South Mayde Creek and the Addicks Dam would be located on South Mayde Creek about one mile above its confluence with Buffalo Bayou. *See* JX110 at 4-1 (USACE016316). North of and adjacent to the Addicks Reservoir watershed lies the 130 square mile watershed of Cypress Creek, which flows in an eastward direction toward its outlet into the San Jacinto River. *See id*. To prevent overflow from the Cypress Creek watershed into the Addicks Reservoir, an upstream levee was to be built. JX5 at 13. Additionally, approximately 7.4 miles of the Buffalo Bayou channel immediately downstream of the Addicks and Barker Dams was to be rectified and enlarged. JX110 at 3-3 (USACE016313). This channel rectification and enlargement was completed in 1948. *Id.*

Aspects of the original design, however, were not completed. Tr. 473:8-18 (Test. of Robert Charles Thomas, III). Neither the detention reservoir on White Oak Bayou nor the Cypress Creek levee were ever built, nor was a south canal that would divert the surcharge releases into the Houston Ship Channel. Tr. 191:16 to 193:5 (Thomas). Notably, the failure to complete the reservoir on White Oak Bayou has apparently had little effect on the Addicks and Barker Reservoirs, *see* Tr. 193:19-21 (May 6, 2019) (Thomas), but because the Cypress Creek levee was never completed, run-off can still flow from the Cypress Creek watershed into the Addicks watershed during major rain events, increasing the size of the flood pool in the Addicks reservoir, *see* Tr. 1539:3-11 (Test. of Richard Long). And, importantly, the deletion of the south diversion canal was also a major change from the original design because surcharge releases from the Addicks and Barker Reservoirs now have no place to go except down Buffalo Bayou or in the reservoirs themselves. Tr. 193:23 to 194:7 (Thomas).

The completed Addicks and Barker Dams are parallel u-shaped earthen embankments that rise almost imperceptibly over a distance of miles. *See* JX15 at 9-10 (noting that the Addicks and Barker embankments slope at a rate of about two to seven feet per mile). The size of the reservoir embankments was determined by reference to the rainfall produced by two previous storms: the Hearne storm and the Taylor storm. The Hearne storm, modified to account for the rainfall intensity rates in the Taylor storm, was used as "a basis of design," the so-called "design storm." PX777 at 5. The design storm would produce a maximum rainfall depth of 31.4 inches and served as the basis for the specifications of the dams that were ultimately constructed—meaning that the dams were built to contain the amount of water the design storm was projected to produce. *Id.*

Construction on the Barker Dam and Reservoir began in February 1942 and finished in February 1945. Joint Stip. ¶ 95. The Barker Dam consists of an earthen embankment that measures approximately 13.6 miles long and rises 36.5 feet above the stream bed at its highest point. Joint Stip. ¶ 97; JX23 at 3 (USACE318524). Its outlet at the time of completion consisted of five conduits which were 9-feet wide by 7-feet high and 190.5-feet long. JX23 at 3 (USACE318524). The Corps began construction on the Addicks Dam, located just north of the

Barker Dam, in May 1946. Joint Stip. ¶ 90. Completed in December 1948, the Addicks Dam consists of an earthen embankment that measures approximately 11.6 miles long and rises 48.5 feet above the stream bed at its highest point. Joint Stip. ¶¶ 90, 92; JX23 at 3 (USACE318524). When completed, its outlet consisted of five conduits which were 8-feet wide by 6-feet high and 252-feet long. JX23 at 3 (USACE318524). The dams were designed to release water through these outlet conduits, which could be controlled by gating, making it possible to limit discharges from the reservoirs and thereby reduce downstream flooding. JX22 at 1-2. The original design of both dams called for four of the five outlet conduits to be uncontrolled. *Id.*

Importantly, the embankment design of the Addicks and Barker Dams required the government to acquire land behind (upstream of) the dams, thus partitioning off the reservoirs that would hold the water held back by the dams. Behind the Addicks Dam, the United States acquired all land at and below an elevation of approximately 103 feet, which amounts to about 12,460 acres of property. Joint Stip. ¶¶ 94, 102. For the Barker Dam, the government acquired all land at and below an elevation of approximately 95 feet, amounting to 12,060 acres. Joint Stip. ¶¶ 99, 104. The Corps calculated the amount of land it purchased behind each dam by adding "[three] feet above the pools which would be produced by the 1935 storm transposed over each watershed." JX5 at 26. At the time, the property behind the dams was almost exclusively used for ranching and rice farming. *See* Tr. 455:4-19 (Thomas). The government purchased much of it at prices between five to ten dollars per acre, and "[m]ore lands could have been purchased upstream for reservoir storage at relatively low prices, but urban development was not anticipated in this baron [*sic*] prairie land remote from Houston." JX52 at 17 (USACE015146).

Significantly, the Corps calculated the amount of land it purchased based on a historical storm metric (the 1935 storm) that was different—and, notably, smaller—than the design storm metric (which combined the Hearne and Taylor storms) it used for engineering the dam embankments. *See* Tr. 199:12 to 200:25 (Thomas). In other words, the embankment design storm would generate more water than would the land-acquisition model storm. Put simply, the dams were designed to contain more water than the acquired land could hold. These differing metrics were not an oversight; rather, they were driven by a calculated decision. The Corps noted at the time that storms of intensities similar to the 1935 storm—which was used for calculating the land acquisition—were "expected" to "occur several times during the lives of these structures." JX5 at 26. While observing that the land purchased was inadequate to contain the pool elevation which would be produced by the embankments' design storm, it noted that "[a]lthough the design of the embankments is based upon the design storm rainfall of 31.4 inches, the occurrence of such a storm in the basin [can not] be expected to occur more than once in the lives of these structures." *Id.* The Corps viewed the Hearne storm as representing the upper limit of possible storms that could occur in the region, *see* Tr. 1029:13-20 (Thomas), so when setting the land acquisition line it looked for a large storm "but not the worst ever, because [then the Corps] wouldn't be able to afford all [its] projects," Tr. 1060:22-25 (Thomas). If, however, the Corps did not design the project to survive the upper limit storm and such a storm did occur, it would create the possibility that the dams "could [] fill[] all the way up and catastrophically fail[]." Tr. 1061:7-10 (Thomas). While the Corps designed the project consistent with a much larger design storm, it considered it "unnecessary to acquire lands to the pool elevation which would be produced by the design storm." JX5 at 26.

Several documents dating from 1938 provide further insight into the Corps' contemporary understanding of the likely recurrence of a storm akin to the Hearne storm.[9] In one document evaluating an alternative flood control project that was never authorized or built (the so-called Triple Corridor Plan), the Corps observed that "[t]ransposition of [the Hearne storm] to the Houston area does not appear to be unreasonable" because such a storm "has already occurred but a short distance away." Pls.' Mot. to Reopen the Trial R. Ex. A at USACE2019_0000014. The Corps stated that it considered such a storm "likely to occur with a frequency of once every 50 years." *Id.*[10] Likewise, the Galveston District engineer's office, in another of these 1938 documents, recognized that the primary meteorological criteria required for the occurrence of significant storms were satisfied in the Houston area, cautioning that "the susceptibility of the Buffalo Bayou area to a storm as great as the 1899 storm must be considered in designing any flood control works in the Houston area." *Id.* Ex. B at USACE2019_0000252.

Ultimately, in 1940, after conducting a cost-benefit analysis, *see generally* JX52, the Corps concluded that "[a]cquisition to a taking-line, [three] feet above the computed pool elevations for the 1935 storm centered above each reservoir, [wa]s considered advisable, since the savings in annual interest would be in excess of the probable damage from storms producing

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[9]These documents did not come to light until several months after trial, through no apparent fault of either party. When they were discovered, the Department of Justice transmitted the documents to plaintiffs in the interest of transparency, all the while maintaining that it was not legally obligated to do so. Upon receipt, plaintiffs moved to reopen the trial record to include the documents as additional evidence. *See* Pls.' Mot. to Reopen the Trial R. to Include Additional Evidence from Late-Produced Documents, ECF No. 245 ("Pls.' Mot. to Reopen the Trial R."). The government opposed the motion, asserting that these documents had not been sought during discovery and that they lacked probative value because they concerned a flood control plan that was never authorized or constructed and were preliminary parts of an iterative review and analysis process. *See* Def.'s Opp'n to Pls.' Mot. to Reopen the Trial R. to Include Additional Evidence at 4-5, ECF No. 254 ("Def.'s Opp'n to Mot. to Reopen the Trial R."). The government also moved contingently, if the court were to admit the documents, that the court also admit a sworn statement of Mr. Robert Thomas providing "critical context" for the documents. Def.'s Opp'n to Mot. to Reopen the Trial R. at 2.

The decision of whether to reopen the record to submit additional proof is within the trial court's discretion. *See Zenith Radio Corp. v. Hazeltine Research, Inc.*, 401 U.S. 321, 331 (1971); *Confederated Tribes of the Warm Springs Reservation of Or. v. United States*, 101 Fed. Appx. 818, 822 (Fed. Cir. 2004). Upon consideration of the probative value of the evidence and the circumstances of its identification, the court GRANTS plaintiffs' motion to include the additional evidence. To prevent any undue prejudice, defendant's motion to admit the statement of Mr. Thomas providing context for the documents is also GRANTED.

[10]As noted in the statement of Mr. Thomas regarding these documents, this 50-year prediction as used by the Corps at the time does not necessarily refer to the expected return frequency of the storm, but to the 50-year planning horizon for the project. In other words, it means that the Corps believed the Hearne storm "was the worst rainfall that could occur during the 50-year planning horizon for the [Triple Corridor Plan] project." Def.'s Opp'n to Mot. to Reopen the Trial R. Ex. A ¶ 11.

pools greater than the taking-line limits," JX5 at 26-27. The decision to acquire less land than that required to store the runoff contained and controlled by the dams was "considered an acceptable low-frequency risk because of the relatively remote rural project location." JX52 at 5 (USACE015134). Thus, the Corps based its land-purchase decision, at least in part, on a calculation that "the expected damages of inundating pastures and rice fields" would be less than the cost of buying additional land. Tr. 200:21-24 (Thomas).

After its initial land purchase based on the 1935 storm calculations, the government made one last additional purchase at some time before 1945 during the preconstruction planning for the Addicks Dam. JX22 at 2. By that time, it had become evident that the levee on Cypress Creek would not be built, and the Corps determined that it would "be more economical to increase the capacity of Addicks Reservoir to accommodate Cypress Creek overflow and delete the diversion levee." *Id.* To that end, the Corps acquired an additional three to four vertical feet of property in the Addicks watershed to contain the anticipated overflow from Cypress Creek. *See* Tr. 474:11 to 475:7 (Thomas).

B. Post-Construction Improvements and Operations

1. Dam modifications, evaluations, and safety reviews.

a. 1940s, 1950s, and 1960s: Additional gates added to both dams.

Due to development in the Houston area and opposition concerned with aesthetic effects, the original plans for the south discharge canal were shelved and the canal was not constructed. *See* JX22 at 2; PX42 at 1-2 (USACE541550-1); *see also* Tr. 208:4-11 (Thomas). This led to concerns about a potential flood threat in downtown Houston, as the area adjacent to Buffalo Bayou saw significant urban development during the 1940s and 1950s, and the Bayou could no longer sustain a large uncontrolled flow without flooding. *See* JX22 at 2. The original design of the Addicks and Barker Dams called for the inclusion of five outlet conduits at each dam, with four of the five allowing uncontrolled water flows. JX22 at 1-2. The fifth conduit was controlled using a gate included originally for emergency purposes. Tr. 197:20 to 198:6 (Thomas). With four conduits uncontrolled on each reservoir, a combined uncontrolled discharge of about 15,700 cubic feet per second would flow into Buffalo Bayou. JX44 at 4. To alleviate what appeared at the time to be temporarily, any possible resulting issues in Buffalo Bayou, two additional gates were installed on the conduits, marking a total of three gated conduits out of five in each reservoir. *See* JX22 at 2-3. By the time these additional gates were installed in 1949, the combined uncontrolled discharge from the reservoirs in the four total remaining conduits was 7,900 cubic feet per second, which was considered to be the maximum channel capacity at the time for Buffalo Bayou. *See* JX44 at 4; JX16 at 4. Additional development around Buffalo Bayou led to a lower calculated maximum channel capacity, and as a result, the two remaining uncontrolled conduits in each reservoir were gated in 1963. *See* JX22 at 2; JX16 at 4. This gating, while beneficial for the downstream protection of downtown Houston, also forces the prolonged storage of water in the reservoirs and increases each

reservoir's pool size. *See* JX15 at 44; JX16 at 4.[11] After all the gates were added, the Corps calculated that the maximum design spillway in Addicks and Barker was 114.6 feet (Addicks) and 106.4 feet (Barker), exceeding the government-owned land by 6.6 vertical feet in Addicks and 8.1 vertical feet in Barker. *See* JX16 at 1.

b. 1970s: Land development, outgrants, and increased concerns.

"Beginning in the late 1970's, private land developers upstream from the reservoirs sought permission to extend channel improvements onto [government-owned land]." JX52 at 15 (USACE015144). Around 1981, the Corps began granting several of these easement requests, limited to a maximum flow capacity. *Id.* Presently, several upstream tributaries flow into Addicks and Barker extending onto government-owned land as a means to facilitate the movement of water off upstream property. Tr. 383:9-15 (Thomas); Tr. at 868:20-23 (Test. of Johnson-Muic). These easements—known as "outgrants"—while beneficial to the development of the upstream area generally, had a number of negative consequences for the Addicks and Barker Reservoirs. These effects included: (1) "increase[d] [] inflow of sediment into the reservoirs resulting in the loss of flood storage capacity," JX52 at 15 (USACE015144); (2) "faster flood runoff into the reservoirs . . . [that] would result in more frequent impoundments," *id.* at 16 (USACE015145); (3) "larger impoundments," *id.*; and (4) "increase[d] flood damages resulting from reservoir impoundments," *id.*

As one consequence of the outgrants, the late 1970s and early 1980s saw the beginning of rapid urbanization in the upstream areas, as the population of the Houston metropolitan area grew. The character of the land upstream of the Addicks and Barker Dams was beginning to shift from that of barren grazing lands and rice fields to a more urban-suburban development. *See generally* JX52 at 17 (reporting in 1995 how over the last 50 years, "extensive urbanization has occurred" in the upstream area). Additionally, scientific advances in hydrology and meteorology prompted the Corps to issue new policies and procedures pertaining to the determination of spillway capacities. *See generally* PX34 (referencing updated criteria such as 1966 Engineer Circular No. 1110-2-22).

These developments, *i.e.*, advances in science, changing meteorological forecasts, general wear and tear on the reservoirs, and upstream urbanization, collectively raised concerns with the Corps that flooding beyond the extent of government-owned land was highly probable, if not inevitable, during a severe storm. In 1973, the Corps lamented that the possibility of flooding lands in the reservoirs beyond the government-owned land was soon expected to become a public issue. *See* PX37 at 1. In a 1973 memorandum from the Corps' Engineering Division Chief in the Galveston, Texas area, the Chief noted, "It is suggested that the project engineer research the background of the existing situation and develop a history and rationale for our operating concept of imposing flooding on private lands without benefit of flowage easement or other legal right." *Id.* A 1974 Corps inspection report echoed similar thoughts. *See* PX38 at 5 (USACE233674) (1974 Buffalo Bayou Inspection Report) ("Development of the area will eventually place the Government in the position of having to flood the area within the reservoir

[11]The Corps, in a 1960 study, had even recommended not adding additional gates, noting that "[t]hese gates would only provide a negligible amount of increased flood protection" and "would have more undesirable effects than benefits." JX15 at 44.

with the accompanying damages in order to protect downstream improvements in the event of a severe future storm.").

c. Late 1970s: Hydrology investigation.

Based upon the increased scrutiny, the Corps completed an extensive hydrology study on Addicks and Barker in 1977. *See* JX23 (1977 Hydrology Report). The study was deemed necessary "because it [was] apparent that urbanization of the subject watersheds will soon reach levels in excess of those considered in the original design[,] and updated hydrologic criteria prescribe more severe design standards than those addressed in the original." *Id.* at 1 (USACE318522). The 1977 report calculated a dramatic increase to the maximum design spillway, *see* Tr. 497:15-21 (Thomas), and developed a higher probable maximum precipitation value, *see* Tr. 499:8 to 500:2 (Thomas). Both of these circumstances reflect the notion that then-current calculations (in 1977) for the possible amount of rain in the Addicks and Barker watershed and the potential size of the reservoir pools in each dam were significantly higher than originally calculated when the dams were built. The report also revealed serious safety issues with the dams, putting both upstream and downstream properties at risk. *See* Tr. 257:21 to 258:1 (Thomas).

d. 1980s: Embankment strengthening & dam modifications.

These concerns led the Corps to consider various measures. The first major modification of the dams came as a result of the permanence of the conduit gates. The Corps noted that one negative result of the added conduit gates was the prolonged storage of rainfall runoff behind the dams that resulted in the need for "emergency seepage control measures" at the pervious sections of the embankments and foundations of the dams. JX44 at 4. This seepage threatened the stability of the embankments and created a potential for failure of the dams in the event of a high reservoir pool. JX15 at 44. Emergency modifications to strengthen the embankments of the reservoirs were completed between 1977 and 1979. JX44 at 4. These improvements, however, were not the final time the embankments were modified.

Around the time of the completion of the improvements addressing seepage, the Corps' concerns about the current embankment heights as not "safe" in both Addicks and Barker grew. PX42 (1978 Water Control Plan) at 1 (USACE541550). Specifically, the report noted that a recent study showed that "the spillway design flood would overtop the dam embankment with possible embankment failure" for both Addicks and Barker. PX42 at 2 (USACE541551) (Addicks), 2 (USACE541562) (Barker). Additionally, the report noted that scientific advances showed an even higher increased maximum size for the reservoir pool in each reservoir, both of which would exceed the reservoirs' respective capacities. *Id.* (explaining that a reservoir pool of 118.1 feet was possible under existing conditions in Addicks and a pool of 110.3 feet was possible under existing conditions in Barker).

In the 1980s, the Corps considered a number of potential solutions to address these concerns. Seventeen alternative plans were considered, seven of which were developed more thoroughly. *See* PX51 at 5 (USACE013572) (1984 General Design Memorandum). These options included taking no action, degrading the ends of the dams to reduce maximum flood pools, diverting water to other channels, and raising and extending the embankments to impound more water. *Id.* Plan I, which consisted of increasing the existing spillway capacities and raising

low portions of the dam crests, was recommended first, *see* JX26 (1980 Corps Mem.), and included a plan to consider the purchase of real estate upstream of the reservoirs, *see id.* The Corps, however, deferred any decision to purchase upstream real estate. *See* PX48 (1980 Corps Telephone Record).

Consistent with the original purpose of the project, a 1981 Corps environmental assessment highlighted the Corps' focus on alleviating the risk for *downstream* flooding. *See generally* PX87. Emphasizing the great risk downstream to Houston, the report deemphasized the upstream risk by simply noting that "should this [standard size] storm occur, flooding would extend beyond the [g]overnment owned land upstream of the embankments." PX87 at 4 (USACE012909). The report also explained that "[t]he inadequacy of [g]overnment owned land upstream . . . to contain the water from the [standard size storm] was recognized in the original design of the reservoirs. However, it was considered at the time to be a limited problem, because the land's primary use at that time was for agricultural purposes and any damages . . . would be infrequent and relatively minor." *Id.* Ultimately, the Corps concluded that "[t]his problem does not affect the safety of the dams." *Id.*

Thus, despite potential risks upstream and because of the grave consequences downstream of dam failure, *see* Tr. 89:22 to 90:8 (Thomas), the Corps adopted a new alternative plan, Plan V(b), to raise the main embankments and to add additional erosion protections to the dams' auxiliary spillways, *see* PX51 at 8 (USACE013575) (1984 General Design Mem.). This work was completed in the late 1980s and did not increase the effective storage of the dams. *See* PX2284 at 2 (FB0000633) (1989 Mem.).

e. 1990s: Storms in the area and subsequent evaluations.

In the period leading up to and during March of 1992, a series of storms resulted in then-record flood pools in both the Addicks and Barker Reservoirs. *See* Tr. 363:20 to 364:2 (Thomas). A large portion of Houston suffered major flooding, and public concern for flooding of privately-owned land inside the reservoirs grew. *See* JX52 at II-1 (USACE015195) (1995 Reconnaissance Report). As a result, the Corps prepared a special report in May of 1992 to provide general background and an overview of anticipated flooding damages which could occur beyond government-owned property in Addicks and Barker. JX44 at 1 (USACE015073). One conclusion from the report calculated that, "[T]he Possible Maximum Flood would affect over 4,000 structures valued at approximately $725 million and cause damages of $245 million." *Id.* at 9 (USACE015081). The report detailed a number of options to consider as potential solutions for this upstream flooding problem, *see id.* at 10-16 (USACE015082-88), and suggested further evaluation of the options for their economic, environmental, and engineering feasibility, *see id.* at 16 (USACE015088). Concerned for public safety, one potential option included the creation of a public awareness program, noting that, "In the absence of a public awareness program, residents are likely to forget or ignore the flood threat. Turnover in home ownership could also result in a significant proportion of residents being unaware of the risk." *Id.* at 11 (USACE015083).

The year 1995 saw the completion of the Corps' Addicks and Barker Reconnaissance Report evaluating the options, ordered after the completion of the 1992 study. *See generally* JX52. The area surrounding the government-owned land was now "densely populated" and full of "residential and commercial urban developments." *Id.* at 7 (USACE015136). After

considering the various recommendations, including taking no action, purchasing flowage easements, land buyouts, channel enlargements, excavating the government-owned land, and/or adopting a flood warning and evacuation plan, *see id.* at 7-8 (USACE015136-37), the Corps decided to take no action upstream, finding "insufficient economic benefits to justify project modification," *id.* at 19 (USACE015148).

f. 1990s and 2000s: Home elevation surveys.

Throughout the 1990s and 2000s, the Corps completed surveys of capital investments located within the standard project floodplain for the purpose of determining potential flood-damage estimates. *See* JX52 at 4 (USACE015224) (1995 Reconnaissance Report Appendix). The surveys looked at homes, businesses, and other structures, *see* Tr. 390:20 to 391:2 (Thomas), with over 95% of the structures inventoried in each reservoir being residential, *see* JX52 at 4 (USACE015224). "Information recorded during the field survey included the location of structures (*i.e.*, street address), ground elevations of structures, the flooding threshold of individual structures[,] and structure category types." *Id.* In other words, the government was aware of where and at what elevation water could or would enter each property. *See* Tr. 100:5-10 (Thomas). One such field study was conducted and completed in July 1994. JX52 at 4 (USACE015224). Another study was completed in the early 2000s, when the Corps hired a private contractor to do elevation surveys for over 10,000 structures in the potential impoundment area. *See* Tr. 100:11-16 (Thomas). The Corps also prepared internal "Reservoir Structure" maps that depicted the elevations of these surveyed upstream structures. *See* PX268. As a result, the government gained an appreciation of the specific risks upstream in Addicks and Barker associated with a severe storm.

2. Community engagement about proximity to the dams.

Long before Harvey occurred, information about the possibility of flooding upstream of the dams and beyond the borders of the government-owned land was well known to the Corps and accessible by the public. At a basic level, it could be obtained in publicly available maps. Moreover, the Corps had discussed upstream flood risks with developers in the 1980s and 1990s. Harris County began warning the community about flood risks years before Harvey, and Fort Bend County began including warning language in upstream subdivision plats in the early 1990s. The Corps also engaged in public outreach efforts to inform the community about the risk of upstream flooding.

a. Publicly available maps.

Several types of publicly accessible maps graphically illustrated the flood threat long before Harvey occurred. For example, the Houston and Harris County Atlas Key Maps contain information enabling an astute map reader to understand the elevation of maximum flood pools at each reservoir, *see* DX795, and Key Maps are prevalent enough to be referenced by page on real estate listings in the Houston area, *see, e.g.*, JX76.

Likewise, the Federal Emergency Management Agency ("FEMA") prepares Flood Insurance Rate Maps, showing areas expected to flood during storms of various intensities, based on data generated by a hydrologic modeling program. *See* Tr. 1904:12-21 (Test. of Philip Bedient). The maps denote zones expected to flood during storms with one percent or less

annual chance of occurrence, *see* Tr. 2353:6 to 2354:14 (Test. of Michael Nakagaki), and all the test properties fell within one of these zones at the time they were acquired by plaintiffs, *see* Def.'s Br. at 26-27 (identifying the map flood zone for each test property both at the time it was acquired and under the current flood zone maps). Additionally, topographic maps, known as "quadrangle maps," produced by the United States Geological Survey have identified areas upstream of the dams as subject to controlled inundation since the early 1970s. Tr. at 2283:10 to 2285:18 (Test. of Leslie Hansmann). These maps have been publicly accessible online since 2010 and were readily available for purchase or at universities and public libraries prior to that time. Tr. 2285:21 to 2286:7 (Hansmann).

b. Discussions with developers.

Throughout the 1980s and 1990s, representatives of the Corps interacted with various developers of the properties surrounding the reservoirs. *See, e.g.*, PX2284 at 1-3 (FB0000632-34) (documenting exchanges between the developer of subdivisions upstream of the reservoirs, noting the possibility of upstream flooding). The Corps compiled a fact sheet, *see id*. at 2 (FB0000633), to share with developers of the adjacent property to ensure that they "were fully aware of the capabilities of the project and size of the pools that could occur behind [the dams]," Tr. 1507:5-10 (Long). The fact sheet indicated that the design flood pool boundary exceeded the government-owned land. *See* PX2284 at 2 (FB0000633).

c. Harris County flood risk studies.

Flooding in the early 1990s resulted in increased public awareness of the flooding potential, *see* Tr. at 2397:5 to 2400:18 (Test. of Steven D. Fitzgerald), and prompted several studies by the Harris County Flood Control District, s*ee generally* JX54; JX60. The studies noted growing concern among "residents, business owners[,] and government representatives . . . regarding the level of protection [*sic*] that the reservoirs provide to the property upstream of the dams," JX60 at 1 (USACE795732), and concluded that the "primary flood threat" in the area was "the inability to drain the Addicks and Barker [R]eservoirs in an efficient manner," JX54 at 2 (USACE686046). One report emphasized that "[t]he maximum flood pool levels of the Addicks and Barker [R]eservoirs extend far beyond the limits of the government[-]owned land," noting that "more than 8,000 acres [are] within the reservoir 'fringe' areas between the limits of the government[-]owned land and the . . . maximum flood pools." *Id*. Harris County also engaged in public outreach, seeking to educate the public about flood risk through public meetings, where information about the potential for flooding from the reservoirs was included. *See* Tr. 595:16-23 (Lindner).

d. Subdivision plat warnings.

The risk of upstream flooding that could be produced by the reservoirs filling to their maximum pool level was well known to Fort Bend County officials. *See* Tr. 719:15 to 720:10 (Test. of Mark Vogler). During a meeting with the Corps in the early 1990s, a county engineer discussed "[t]he issue of intermittent inundation or flooding within the Corps' Barker Reservoir." JX45 at 1 (FB0006378). The Corps informed the engineer "that the Barker Dam was designed and/or modified to contain 8.7 more feet of water than was purchased by the Corps," which could "translate[] into the flooding of approximately 4,769 acres of land, not under jurisdiction of the Corps of Engineers." *Id.* In 1992, a Fort Bend Engineering Department report included a

"notice that this subdivision is subject to controlled inundation from Barker Reservoir." DX122 at 2 (FB0000611).

Around this time, Fort Bend County began requiring the addition of warning language on subdivision plats to inform purchasers about the possibility, already known to developers, of upstream flooding due to Barker Dam operations. *See* Tr. 736:9 to 737:15 (Vogler). For example, the plat for one of the trial properties (Giron) stated that "[t]his subdivision is located adjacent to the Barker Reservoir and . . . [is] subject to extended controlled inundation under the management of the U.S. Army Corps of Engineers." DX557 at 1 (FB0025541).

e. Public outreach discussing upstream flood risk.

The Corps began its own public-outreach efforts regarding the dams in the mid-1980s, directing its focus toward interested communities, businesses, and governmental entities. *See* Tr. 1498:20 to 1499:4 (Long). Thereafter, the Corps conducted "dozens and dozens" of public presentations in the greater Houston area, during which it discussed the project's purpose, history, operations, and operational limitations. *See* Tr. 1498:20 to 1500:10 (Long). These public presentations also "included information on the storage capacity of the projects, and that, in severe storm events where [the reservoirs] stored large pools, that those pools could exceed the limits of government-owned land," Tr. 1501:12-19 (Long), noting that "[w]ater stored behind . . . the dams [] would result in floodwaters in [] homes," Tr. 1501:25 to 1502:2 (Long). After a series of storms caused flooding in the early 1990s, the Corps released a report to publicly emphasize the "order of magnitude of the anticipated flooding damages which could occur off of Government property assuming different flood events." JX44 at 1 (USACE015073). Various documents published by the Corps during the 1990s identified the possibility of future flooding and the "potential threat of property damage upstream of the reservoir lands." *E.g.*, JX52 at 7 (USACE015136).

The Corps continued to discuss and inform the public about the possibility of upstream flooding in the decade and a half leading up to Harvey. In the mid-2000s, it created an emergency coordination team to organize better with local agencies in the event of an emergency concerning reservoir operations. *See* Tr. 2406:3 to 2407:9 (Fitzgerald). Members of that team discussed the possibility of upstream flooding on multiple occasions. *See, e.g.*, Tr. 598:14-21 (Lindner) (discussing drills that were conducted in the event of flooding upstream); DX206 at 2 (USACE467209) (stating that "it is only a matter of time before the reservoirs flood off government-owned land"). In 2009, the Corps prepared presentation slides for public meetings which showed upstream flooding during large storms. *See* PX1597 at 18-29 (USACE755528-39). Again in 2010, the Corps held a series of public meetings where it showed slides illustrating the possibility of upstream flooding. *See* JX94 at 74-77 (USACE594433-36). Similar public meetings, where like information was displayed, were sponsored by Corps in the following years leading up to Harvey. *See, e.g.*, Tr. 1558:6-14 (Long); DX238.

3. Operating conditions and meteorological setting for Harvey.

a. Standard Operating Procedures & the Water Control Manual.

The general operations of the Addicks and Barker Reservoirs are governed by a Water Control Manual issued in 2012 (the "Manual"), *see generally* JX110, with the Corps serving as

the regulating agency, *see id.* at 1-2 (USACE016306). The Manual was prepared pursuant to a Corps regulation entitled "Water Control Management" dated 1982, *see* Tr. 63:24 to 64:3 (Thomas), and it explains the guiding procedures for how the Addicks and Barker Reservoirs should be controlled in varying situations. The 2012 Water Control Manual was in effect when Harvey made landfall. *See* Tr. 58:24 to 59:5 (Thomas).

The Addicks and Barker Reservoirs are normally dry, as they do not impound water except to alleviate flood risk. JX110 at 6-3 (USACE016334). The reservoirs and dams are part of a flood risk project and do not serve any other main purpose such as navigation or hydroelectric power. *See* Tr. 63:7-13 (Thomas). "In keeping with the primary objective of flood control for Addicks and Barker Reservoirs, the general plan for reservoir regulation will be to operate the reservoirs in a manner that will utilize to the maximum extent possible, the available storage to prevent the occurrence of damaging stages on Buffalo Bayou." JX110 at 7-4 (USACE016338). This plan for storage includes all of the land in the reservoirs behind the embankments, including land the government does not own. *See* Tr. 67:12 to 68:3 (Thomas).

Under normal conditions, the reservoirs "operate with two gates set at one-foot openings to pass normal low flows . . . limit[ing] the discharge on each reservoir to approximately 100-250 [cubic feet per second]." JX110 at 7-4 (USACE016338). "The gates on both reservoirs will be closed when 1 inch of rainfall occurs over the watershed below the reservoirs in 24 hours or less, or when flooding is predicted downstream." *Id.* The gates are kept closed until the gauging station on Piney Point Road, about eight-to-ten miles downstream of the outlets, is reading less than 2,000 cubic feet per second. *See* Tr. 989:13 to 990:8 (Thomas). At times, the Manual recommends instances of induced surcharges. *See* JX110 at 7-5 (USACE016339). An induced surcharge is "a release made to optimize the available [reservoir] storage and protect the integrity of the dams." Tr. 103:6-9 (Thomas). That is, when the reservoir pools rise to a certain elevation, releases from the reservoir will be made gradually according to the induced surcharge schedule. JX110 at 7-5 (USACE016339).

b. The Addicks & Barker Dams and Reservoirs immediately prior to Harvey.

During Tropical Storm Harvey, the Corps operated the dams consistent with the instructions of the 2012 Water Control Manual. Joint Stip. ¶ 109. When Harvey hit the Addicks and Barker watershed, the reservoirs for each were empty. *See* Tr. 160:21-25 (Thomas). At the time, the Addicks Reservoir had a storage capacity for the government-owned land of 127,591 acre-feet of water, Joint Stip. ¶ 105, and the Barker Reservoir had a storage capacity for the government-owned land of 82,921 acre-feet of water, Joint Stip. ¶ 106. The Addicks Reservoir had a maximum capacity of 199,643 acre-feet of water, *see* JX118 at E-2 (USACE019883), and the Barker Reservoir had a maximum capacity of 209,600 acre-feet of water, *see* JX118 at E-4 (USACE019885), if the reservoirs were to fill to their highest elevations where the reservoirs meet the natural ground. The Addicks watershed is approximately 50% developed and the Barker watershed is about 60% developed, most of which is residential or related commercial and office use. *See* JX110 at 4-8 (USACE016323). The undeveloped areas of the watershed are primarily used for pasture land and general mixed agricultural purposes. *Id.*

c. Major storms prior to Harvey.

Several storms of substantial scope occurred in the region during the decades preceding Harvey. After listing a series of major storms, an operational assessment report issued by the Corps in 2009 observed that "had some of these events been centered over Addicks and Barker Reservoirs or the Upper Buffalo Bayou Watershed, the combined rainfall and runoff could have resulted in flood pools exceeding the limits of government[-]owned land and possibly exceeding the capacity of Addicks and Barker Dams." PX59 at 5 (USACE464074).

In 1979, Tropical Storm Claudette dropped 43 inches of rain in 24 hours on Alvin, Texas—50 miles southeast of the reservoirs. *Id.* at 4 (USACE464073). The rainfall produced by Claudette was the highest recorded in the United States during a twenty-four hour period, *id*., causing the Corps to conclude in 1984 that "[t]he [Projected Maximum Flood] on an empty pool is considered a probable occurrence when compared with the 1979 Claudette rainfall event," JX31 at 2 (USACE487626). The Corps likewise acknowledged in 2009 that "[i]f this event had occurred over the Addicks and Barker watersheds, their reservoir capacities may have been exceeded." PX59 at 4 (USACE464073). The Corps calculated that if Addicks or Barker were to receive the amount of rain dropped by Claudette, it would take between approximately 53 and 55 days to remove enough water to get it back on government-owned land. PX1597 at 40-42 (USACE755551-53).

Tropical Storm Allison struck about 50 miles northeast of the Addicks and Barker watershed in 2001, dropping almost 36 inches of rain in five days, and "could have potentially exceeded reservoir capacity had the storm event occurred directly over the reservoirs." PX59 at 5 (USACE464074). In light of Claudette and Allison, the Corps recognized in 2009 that, although the reservoirs had never previously flooded off government-owned land, "we know it can and probably will happen at some point in time." PX1597 at 46 (USACE755557).

Water in the reservoirs exceeded government-owned land for the first time when the April 2016 "Tax Day Storm" produced record flood pools. Tr. 166:6-10 (Thomas); *see also* DX295 at 10 (DEPO_0053700) ("At its peak Barker Reservoir occupied 102.5% of its government[-]owned land and 40.5% of its total storage capacity."). The Tax Day Storm generated ten-to-sixteen inches of rainfall over a twelve-hour period, *see* JX134 at VII-4 (USACE869254), and although the flood pools exceeded government-owned land, the reservoir water did not inundate any structures, *see* Tr. 978:17-22 (Thomas).[12] Nonetheless, in the Corps'

[12]Even so, at least one of the test properties suffered flooding during the Tax Day Storm, *see* Tr. 1764:11-18 (Test. of Elizabeth Burnham), and some streets flooded during the storm, *see* JX134 at VII 3-4 (USACE869253-4). This result may have been attributable to local stream flooding or other local circumstance rather than conditions in the reservoirs themselves.

Additional uncontrolled flows occurred on the road surfaces, which act as part of the drainage system in Houston, being specifically built at lower elevations than buildings such that gravity naturally pulls the water down to the roads where they can push flows downstream. *See* Tr. 25:20 to 26:2 (Site Visit, May 8, 2019) (Test. of Captain Charles Ciliske).

assessment, for Buffalo Bayou at the time it "may have been the worst storm of record." JX134 at VII-3 (USACE869253). A year later, Harvey exceeded that record.

C. Operation of the Addicks & Barker Dams During Harvey

1. Tropical Storm Harvey.

Harvey made landfall along the coast, near Rockport, Texas, around 10:00 p.m. on August 25, 2017, as a Category 4 hurricane (130 mile per hour winds), Joint Stip. ¶ 107; DX737 at 12 (FEMA078357), but weakened into a Tropical Storm within twelve hours of making landfall, Joint Stip. ¶ 108. Harvey, however, stalled over the Houston metropolitan area for four more days, maintaining its intensity, dumping record amounts of water on the area. *See* Joint Stip. ¶¶ 108, 113, 115. Over the five days, Harvey dropped an average of more than 43 inches of rain in a 2,000 square mile area, DX737 at 12 (FEMA078357), becoming the largest storm in the recorded history of the United States, *see* Tr. 2030:14-17 (Bedient).[13] Within Harris County, Harvey poured an average of 33.7 inches of rain over a four-day period. DX682 at 5.

2. Corps' response to Harvey.

During Harvey, the Corps operated the Addicks and Barker Dams according to the 2012 Water Control Manual. *See* Tr. 982:1-3 (Thomas). The gates on all five conduits were closed for Addicks and Barker at the beginning of the storm, as called for by the Manual. *See* Tr. 1446:10-15 (Long). On August 25, 2017, the Corps declared a general emergency, which included a dam safety emergency. Tr. 118:25 to 119:1 (Thomas). As a result, the Corps followed the Manual's instructions for the initial emergency levels. Tr. 119:15-17 (Thomas).

With the forecasted impending rain, the Corps knew that flooding "beyond the government[-]owned land limits" in Addicks and Barker was imminent. JX146 at 2 (DOJ0008154) (Corps' internal letter dated August 25, 2017 at 2:26 p.m.). On August 28, shortly after midnight, the Corps initiated releases of impounded water in both reservoirs, pursuant to the induced surcharge regulation in the Manual. DX649 at 1. At that point, the flood pools in the reservoirs had reached at least 101 feet in Addicks and 94.9 feet in Barker. *See* Tr. 983:11-16 (Thomas). Because these releases were limited, however, by the guidelines in the Manual to protect downstream Houston from additional flooding, the Corps was unable to release water fast enough to decrease the pool size given the high rate of incoming water. *See* Tr. 991:8-19 (Thomas). During Harvey, uncontrolled releases also flowed around the ends of the auxiliary spillway at the northeast end of the Addicks Reservoir onto private land. See Tr. 24:8 to 27:12 (Site Visit) (Ciliske); *see also* PX25 at 1 (USACE016691) ("Uncontrolled release[s] around the Addicks north[-]end emergency spillway w[ere] observed on August 29, 2017 when the reservoir reached [] 108 ft.").[14]

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[13]Tropical Storm Claudette in 1979 was roughly comparable in total rainfall, and was more intense but more localized. *See supra*, at 17.

[14]Testimony about the flows at the north-end auxiliary spillways of Addicks was ostensibly inconsistent due to the imprecise vocabulary used when describing spillway functions, *i.e.*, whether water flowed over or around at both the northwest and northeast auxiliary spillways

The flood pools in the reservoirs crested at a record pool elevation of 101.6 feet in Barker and 109.1 feet in Addicks on August 30, 2017. Joint Stip. ¶¶ 110, 111. When the threat subsided and flood pools dropped to safer levels, the Corps developed a drawdown plan to fully drain the reservoirs while still maintaining their integrity. *See* Tr. 992:4 to 993:4 (Thomas). The plan went into effect on September 3, 2017, and the Corps resumed normal operations on September 16, 2017. DX649 at 6-7. The reservoir water elevations far exceeded the extent of government-owned land in both Addicks and Barker. *See* DX683 at 1. Of the approximately one million homes in the Harris County, around 154,000 of them flooded from the impounded water. *See* Tr. 2451:19-24 (Fitzgerald). The Addicks and Barker flood control project, though, did prevent an estimated $7 billion in projected losses downstream in Houston. *See* Tr. 164:24 to 165:8 (Thomas).

D. Background of the Thirteen Upstream Test Properties

The thirteen upstream test properties provide a sampling of the conditions at various locations inundated by the Addicks and Barker Reservoirs during and after Tropical Storm Harvey.

1. Banker residence.

The land owned by plaintiffs Christina and Todd Banker is a residential property situated within the Barker reservoir in Katy, Texas at 4614 Kelliwood Manor Lane. Joint Stip. ¶ 4. The finished first floor of the home is set at a 100.7-foot elevation. Joint Stip. ¶ 9. Flooding within the home attendant to Harvey reached approximately 1.1 feet. *See* PX526 at 46. The Bankers evacuated their home on the morning of August 28 and returned on September 4. Tr. 1709:23 to 1712:20 (Test. of Todd Banker). During that period, flood water was present in the home for approximately four days. DX608 at 164. In addition to structural damage to the home, much of the Banker's personal property was destroyed by the flooding, *see, e.g.*, Tr. 1717:24 to 1718:21 (Banker), and the home was uninhabitable for about seven months while it underwent remediation, Tr. 1717:12-18 (Banker).

2. Burnham residence.

The land owned by plaintiff Elizabeth Burnham is a residential property situated within the Addicks Reservoir in Houston, Texas at 15626 Four Season Drive. Joint Stip. ¶ 10. The finished first floor of the home is set at a 105.4-to-105.5-foot elevation. Joint Stip. ¶ 18. Flooding within the home attendant to Harvey reached approximately four to five feet. *See* PX526 at 46; Tr. 1773:21-24 (Test. of Elizabeth Burnham). Flood water was present in the home for at least seven days. *See* DX608 at 164; Tr. 1771:20-22, 1773:25 to 1774:5 (Burnham). Ms. Burnham's personal property as well as the home suffered substantial damage. *See, e.g.*, Tr.

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of Addicks Reservoir. At the northwest auxiliary spillway, there was no flow around or over the ends, *see* Tr. 21:18-22 (Site Visit) (Ciliske), however, at the northeast auxiliary spillway, water flowed *around* the spillway, *see* Tr. 24:15-18 (Site Visit) (Ciliske), but not *over* it, *see* Tr. 24:8-14 (Site Visit) (Ciliske). The spillways are intentionally designed to have water flow over them, but not around. *See* Tr. 35:19 to 36:4 (Site Visit) (Ciliske).

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1775:24 to 1776:21 (Burnham). The home was uninhabitable for a period of months, at which time Ms. Burnham sold the property "as is." *See* Tr. 1780:15 to 1781:18 (Burnham).

3. Giron residence.

The land owned by plaintiff Juan Giron is a residential property situated within the Barker Reservoir in Katy, Texas at 4310 Cassidy Park Lane. Joint Stip. ¶ 19. The finished first floor of the home is set at a 101.5-foot elevation. Joint Stip. ¶ 23. Flooding within the home attendant to Harvey reached approximately one foot at the high-water mark. *See* Tr. 1675:7-11 (Test. of Juan Giron). Flood water was present in the home for approximately five days. *See* DX608 at 164. The Giron property suffered substantial damage to the home and much of what was inside was unsalvageable. *See, e.g.*, Tr. 1678:19-22, 1680:3-5 (Giron). At the time of trial, Mr. Giron was still living in a trailer parked in his driveway. *See* Tr. 1646:20-21 (Giron).

4. Holland residence.

The land leased by plaintiff Scott Holland is a residential property situated within the Addicks Reservoir in Houston, Texas at 1923 Wingleaf Drive. Joint Stip. ¶ 24. The finished first floor of the home is set at an elevation between 107.8 and 107.9 feet. Joint Stip. ¶ 26. Flooding within the home attendant to Harvey reached approximately 1.5 feet. *See* PX526 at 46; Tr. 1845:23 to 1846:1 (Holland). Mr. Holland evacuated his home on August 28, a daunting process due to sutures in his stomach and chest still healing from a recent kidney surgery. Tr. 1836:7 to 1838:11 (Holland). Flood water was present in the home for about 3.5 days. DX608 at 164. The home suffered severe structural damage and much of Mr. Holland's personal property was destroyed by the flooding. *See, e.g.*, Tr. 1842:1 to 1844:4 (Holland). Because the home was uninhabitable and he was unable to afford repairs, Mr. Holland was forced to move away from Houston and reside in a small trailer, where he still lived at the time of trial. Tr. 1844:15 to 1845:11 (Holland).

5. Lakes on Eldridge Homeowners Association.

Lakes on Eldridge is a homeowners association that acquired its real property from the developer or builder of the Lakes on Eldridge residential subdivision, a gated community in Harris County situated within the Addicks Reservoir. Joint Stip. ¶¶ 27, 28. The property at issue includes a clubhouse and its associated amenities, a swimming pool, tennis court, volleyball court, and playground. Tr. 1386:3-16 (Test. of Sue Strebel). Flood water rose to about six feet above the volleyball courts, Tr. 1398:17-22 (Strebel), approximately six inches in the clubhouse, PX526 at 46, and was present on the property for at least four days, *see* Tr. 1401:22 to 1402:11 (Strebel). The clubhouse and various amenities required extensive repairs, *see, e.g.*, Tr. 1390:19 to 1391:21 (Strebel), requiring the clubhouse facility and its amenities to close for eight months, Tr. 1390:5-12 (Strebel).

6. Micu residence.

The land owned by plaintiff Christina Micu is a residential property situated within the Barker Reservoir in Katy, Texas at 6411 Canyon Park Drive. Joint Stip. ¶ 31. The finished first floor of the home is set at a 99.8-foot elevation. Joint Stip. ¶ 36. Flooding within the home attendant to Harvey reached approximately two feet. *See* PX526 at 46. Ms. Micu and most of

her family evacuated the home prior to Harvey. Tr. 1296:11-25 (Test. of Christina Micu). Her husband gained access to the home via kayak on September 2 and she returned on September 5, Tr. 1298:22 to 1299:1 (Micu), finding mold growth and extensive destruction of personal property, *see, e.g.*, Tr. 1299:25 to 1300:10 (Micu). Flood water was present in the home for about ten days. Tr. 1300:24 to 1301:1 (Micu). The Micu family was forced to reside with a friend and then rent an apartment before moving back into their home a year after Harvey. Tr. 1306:21 to 1305:7 (Micu).

7. Popovici residence.

The land owned by plaintiff Catherine Popovici is a residential property situated within the Barker Reservoir in Katy, Texas at 19927 Parsons Green Court. Joint Stip. ¶ 37. The finished first floor of the home is set at a 102.2-foot elevation. Joint Stip. ¶ 42. No water entered inside the home, but it rose to the foundation and was within a couple inches of entering, Tr. 1239:2-5 (Test. of Catherine Popovici), and remained on the property between four and six days, Tr. 1242:2-12 (Popovici). The flooding around the home prevented ingress or egress and damaged wooden beams in the structure of the home. Tr. 1243:1-9 (Popovici).

8. Sidhu residence.

Plaintiff Kulwant Sidhu is the joint owner of 29 condominium units used as residential rental properties and situated within the Addicks Reservoir in Houston, Texas at 16111 Aspenglenn Drive. Joint Stip. ¶ 43. The property at issue in Mr. Sidhu's claim at trial consists of two of his 29 units: Unit 603 (a first-floor, downstairs unit) and Unit 604 (a second-floor, upstairs unit directly above Unit 603). Joint Stip. ¶¶ 44, 46. The finished first floor of the condominium building in which the two units are located is set at an elevation of 107.0 to 107.1 feet. Joint Stip. ¶ 49. No flood water reached the upstairs unit, Joint Stip. ¶ 48, and it was not damaged, Tr. 1748:5-7 (Test. of Kulwant Sidhu). Flooding within the downstairs unit attendant to Harvey reached approximately 2.4 feet, PX526 at 46, and remained for about 4.5 days, DX608 at 164. The flood damage required gutting and renovating Unit 603—a process that took nearly a year, during which time the unit could not be rented. Tr. 1741:23 to 1742:25 (Sidhu).

9. Soares residence.

The land owned by plaintiff Elisio Soares is a residential property situated within the Barker Reservoir in Katy, Texas at 20526 Indian Grove Lane. Joint Stip. ¶ 50. The finished first floor of the home is set at a 101.1-foot elevation. Joint Stip. ¶ 55. The Soares family was on vacation when Harvey happened, Tr. 1080:12-16 (Test. of Elisio Soares), and they could only access their home by kayak when they returned on August 31, Tr. 1080:17 to 1081:10 (Soares). Flooding within the home attendant to Harvey reached approximately 8.4 inches, PX526 at 46, and was present in the home for approximately four days, Tr. 1086:22-24 (Soares). In addition to structural damage to the home, a significant amount of the Soares family's personal property was destroyed. *See, e.g.*, Tr. 1091:12 to 1092:4 (Soares). The family was forced to live with friends for two weeks and then in the upstairs of the home, unable to cook meals, until January of the following year, and the home could not be repaired until May 2018. Tr. 1092:18 to 1093:23 (Soares).

10. Stewart residence.

The land owned by plaintiff Mitchell Stewart is a residential property situated within the Addicks Reservoir in Houston, Texas at 4719 Eagle Trail Road. Joint Stip. ¶ 56. The finished first floor of the home is set at a 108.9- to 109.0-foot elevation. *Id.* ¶ 61. Flooding within the home attendant to Harvey reached at least six inches, *see* PX526 at 46; Tr. 1600:13-15 (Test. of Mitchell Stewart), and the water was present in the home for approximately four-to-five days, *see* Tr. 1607:13-18 (Stewart). The Stewart family suffered damage to much of their personal property and their home required significant renovations including removing and replacing the first four feet of the home's sheetrock. Tr. 1603:25 to 1604:4 (Stewart). The Stewarts were displaced from their home for about five months. Tr. 1609:17-20 (Stewart).

11. Turney residence.

The land owned by plaintiff Robert Turney is a residential property situated within the Addicks Reservoir in Houston, Texas at 15910 Red Willow Drive. Joint Stip. ¶ 62. The finished first floor of the home is set at a 104.5- to 104.7-foot elevation. Joint Stip. ¶ 69. Flooding within the home attendant to Harvey was about five feet, *see* PX526 at 46, with the high-water mark reaching about six feet, *see* Tr. 2134:18-23 (Test. of Robert Turney). Flood water was present in the home for over a week. *See* DX608 at 164. The Turney property suffered great damage that required the entire interior to be gutted and rebuilt. *See* Tr. 2136:8-11 (Turney).

12. West Houston Airport.

The West Houston Airport Corporation is the owner of a commercial property situated within the Addicks Reservoir in Houston, Texas at 18000 Groschke Road. Joint Stip. ¶ 76. The finished first floor of the terminal building at the West Houston Airport is set at a 108.6-foot elevation. Joint Stip. ¶ 78. Flooding within the terminal reached a maximum of about 9.6 inches. *See* PX526 at 46. The flood water reached the terminal on August 29 and receded from the terminal by September 1. *See* Tr. 1885:17 to 1886:13 (Test. of Stacey Lesikar-Martin). Flood water remained on the runways until September 5, with the water receding from the property line on approximately September 7. *See* Tr. 1886:17-24 (Lesikar-Martin). The terminal itself suffered substantial damage, and damage occurred to numerous aircraft, service apparatus, and vehicles present at the airport at the time of the flooding. *See* Tr. 2121:6-25, 2124:8-14 (Test. of Woody Lesikar). The airport was not fully operable for seven-to-ten days' time, and repairs on the property took about a year. *See* Tr. 2121:6 to 2123:8 (Lesikar).

13. Wind residence.

The land owned by plaintiffs Kurt and Jean Wind is a residential property situated within the Addicks Reservoir in Houston, Texas at 5306 Sunbright Court. Joint Stip. ¶ 70. The finished first floor of the home is set at a 109.2-to-109.3-foot elevation. Joint Stip. ¶ 75. Flooding within the home attendant to Harvey reached approximately two inches. *See* PX526 at 46; DX608 at 164; Tr. 1633:12-14 (Test. of Kurt Wind). Flood water was present in the home for about two-to-three days. *See* Tr. 1635:10-11 (Wind). In addition to significant structural damage to the home, much of the Winds' personal property was destroyed by the flooding. *See* Tr. 1635:11 to 1636:24 (Wind). Due to the damage and necessary repairs, the home was uninhabitable for 11 months. *See* Tr. 1637:5-7 (Wind).

E. Expert Reports about the Storm

1. Dr. Bedient.

An expert in hydrology, hydraulics, and floodplain analysis, Dr. Philip Bedient testified on behalf of plaintiffs regarding the cause of flooding at each of the test properties during Harvey. *See generally* PX526; Tr. 1934:11-13 (Bedient).[15] Dr. Bedient reached his conclusions by reference to a number of data sources, including slab elevations of the test properties, ground elevation data, water level gauges for creeks and the reservoir pools, aerial images from the National Oceanic and Atmospheric Administration, and eyewitness photographs and videos. *See* Tr. 1910:1 to 1911:17 (Bedient). Dr. Bedient's methodology compared the reservoir pool elevation data obtained from United States Geological Survey gauges to the slab elevation survey data of each test property, and then confirmed those findings by reference to aerial images taken on August 30 and LiDAR data (technology for determining ground elevation at numerous points). *See id*. He concluded that the flooding at each test property was caused by the water impounded behind the Addicks and Barker Dams. Tr. 1948:3-12 (Bedient); PX526 at 46.

Dr. Bedient also addressed whether any of the test properties would have flooded without the dams impounding the rainfall waters or whether any of the properties flooded during Harvey independently of the reservoir pool levels entering onto the properties. He identified, and rejected, two other possible causes of the flooding: local drainage systems and riverine flooding. *See generally* PX526 at 47-54. His examination of the relevant local drainage systems' capacities led him to the conclusion that they were capable of adequately handling rainfall much more intense than Harvey. *See* PX526 at 49. Likewise, Dr. Bedient concluded that "the riverine flooding that occurred during Harvey did not cause and would not have caused any of the [t]est [p]roperties to flood." PX526 at 54. He reached this conclusion by estimating the flood level along each of the creeks in the vicinity of the test properties, and then comparing that elevation to the slab elevation of each test property, except the airport. *See* Tr. 1984:11-25 (Bedient). He noted that the airport was a unique situation because of the size of the property but nonetheless he concluded that because of a high bank attendant to a creek in that location, creek water did not cause the flooding. *See* Tr. 1985:18 to 1989:14 (Bedient). He confirmed this observation by reference to eyewitness testimony and by comparison to the Tax Day flood, which likewise did not produce airport flooding. *Id.* In sum, Dr. Bedient concluded that "[n]one of the test properties' structures would have flooded but for the impoundment of rainfall runoff waters behind Addicks and Barker Dams." PX526 at 7-8.

2. Dr. Nairn.

Dr. Robert Nairn, an expert in coastal and riverine engineering, with a specialty in numerical modeling across actual and hypothetical conditions, testified on behalf of the government using a numerical model of the storm and relevant waterflows. *See generally*

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[15]Dr. Bedient is a professor of engineering at Rice University and teaches and performs research in hydrology. Tr. 1901:7-9 (Bedient).

DX608; *see also* Tr. 2628:22 to 2629:3 (Test. of Robert Nairn).[16] Dr. Nairn looked at the water surface elevations at each of the test properties, specifically examining the rise and drop over time. Tr. 2636:14-21 (Nairn). Using various input data sets, including, *e.g.*, topography maps and a land cover data set, *see* Tr. 2647:15-20 (Nairn), and taking into account various water runoff impacts and parameters, *see, e.g.*, Tr. 2648:11-23 (Nairn), Dr. Nairn built a modeling system that applies mathematical principles of hydrodynamic equations to simulate rainfall and water movement, *see, e.g.*, Tr. 2655:10-16 (Nairn). Subsequently, after calibrating the model and relevant coefficients, *see* Tr. 2656:19 to 2657:20 (Nairn), Dr. Nairn ran the model for each of the properties and analyzed the outcomes of four different scenarios for Addicks and Barker: (1) the actual Harvey scenario; (2) the no-dam ("no project") scenario; (3) the gates-closed scenario; and (4) the gates-open scenario, *see* Tr. 2636:14-24 (Nairn); *see also* DX608 at 92-93. Dr. Nairn's main conclusion was that three out of the thirteen test properties (Burnham, Giron, and Micu) would have flooded even had the Addicks and Barker Dams not been built, due to the sheer amount of rainfall and riverine flooding, thus positing that the flooding of at least those three properties was not the result of the government's actions relating to Addicks and Barker. *See* DX608 at iii, 129.

3. Other testifying experts.

Several expert witnesses testified at trial regarding the severity of the impact that flood damage had on the test properties. Dr. Glen Randall Bell, an expert in real estate damage and economics and real estate valuation (including severity), testified on behalf of plaintiffs about severity of the impact of the flooding on the valuation of plaintiffs' properties. *See generally* PX660; *see also* Tr. 1360:5 to 1361:15 (Bell). His testimony and report focused on the severity of impact rather than on the specific quantification of any lost value. PX660 at 4; Tr. 1362:6-15 (Bell).

Additionally, Matthew Deal, an expert in real estate market studies and real estate valuation, conducted a market study appraisal analyzing supply, demand, and prices for specific property types in the area. *See generally* PX2205; Tr. 2188:4-15 (Deal). His research concluded "that properties that were inundated by flood waters suffered significant and immediate impairment that resulted in precipitous price reductions after flood waters had receded." PX2205 (report cover letter).

David Hooper, a microbiologist who is an expert in preparing scopes of work for property damaged by water, was retained by the government to create models of the scopes of work that would be required on five of the test properties after the flooding. *See generally* DX602-607. His report considered "the overall quality of water; the amount of waters present within a residence; the duration of flooding; the ability for water to move via capillary action within a wall; as well as the presence of microbiological growth; and, lastly, application of industry standards in construction guidelines." Tr. 2876:2-7 (Hooper). He developed estimates of the scope of work that would be required under various scenarios, such as if the reservoirs had not been in place at all, *see, e.g.*, DX602 at 17-18 (considering the Burnham property),

[16]Dr. Nairn is an engineer who works at Baird & Associates, Oakville, Ontario, Canada, on river and coastal engineering projects worldwide. Tr. 2625:15 to 2626:1 (Nairn).

concluding that the scopes of work would be very similar in the actual Harvey scenario and in the alternative scenarios, *see, e.g.*, 2922:2-4 (Hooper).

Andrew Ickert, an expert in hydrology, testified on behalf of the government about the character of the land in the Addicks and Barker watershed and greater Houston area. *See generally* DX600; *see also* Tr. 3083:21 to 3084:7 (Ickert). Mr. Ickert explained how development could impact the watershed overall, giving particular regard to increasing runoff flow rates and size, and the impact of this circumstance on the overall flood pool size. *See* Tr. 3084:11 to 3085:14 (Ickert).

William Kappel, an expert in meteorology, was called to testify by the government, regarding the magnitude of Harvey and the meteorological setting. *See generally* DX601 at 38-222; *see also* Tr. 1156:6-22 (Kappel). Specifically, Mr. Kappel testified about "the methodology and results of a detailed analysis of the storm precipitation in and around the region of [] Houston[,] Texas during the month of August 2017[, when Harvey hit]." DX601 at 44.

STANDARDS FOR DECISION

Under the Takings Clause of the Fifth Amendment, "private property [shall not] be taken for public use, without just compensation." U.S. Const. amend. V. The Takings Clause applies the fundamental notion that the government cannot "forc[e] some people alone to bear public burdens which, in all fairness and justice, should be borne by the public as a whole." *Armstrong v. United States*, 364 U.S. 40, 49 (1960). Thus, "[w]hen the government physically takes possession of an interest in property for some public purpose, it has a categorical duty to compensate the former owner." *Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency*, 535 U.S. 302, 322 (2002) (citing *United States v. Pewee Coal Co.*, 341 U.S. 114, 115 (1951)).

In a takings case, the plaintiff must establish two elements to have a viable claim. First, plaintiff must establish that he or she holds "a property interest for purposes of the Fifth Amendment." *Caquelin v. United States*, 140 Fed. Cl. 564, 572 (2018), *appeal docketed*, No. 2019-1385 (Fed. Cir. Jan. 9, 2019) (citing *Members of the Peanut Quota Holders Ass'n v. United States*, 421 F.3d 1323, 1330 (Fed. Cir. 2005)) (additional citations omitted). After identifying a valid property interest, "the court must determine whether the governmental action at issue amounted to a compensable taking of that property interest." *American Pelagic Fishing Co., L.P. v. United States*, 379 F.3d 1363, 1372 (Fed. Cir. 2004) (citations omitted).

"[N]o magic formula enables a court to judge, in every case, whether a given government interference with property is a taking." *Arkansas Game & Fish Comm'n v. United States*, 568 U.S. 23, 31 (2012). And while there are some bright-line rules, *see id.*, the inquiry into whether a taking has occurred ultimately is a question of law based on factual underpinnings, *Caquelin*, 140 Fed. Cl. at 572, requiring the court to engage in "ad hoc, factual inquiries," *Kaiser Aetna v. United States*, 444 U.S. 164, 175 (1979); *see also Arkansas Game & Fish*, 568 U.S. at 32 ("[M]ost takings claims turn on situation-specific factual inquiries.").

A government taking can occur in many forms, ranging from the classic example of a permanent physical occupation of property, *see Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. 419, 426 (1982), to regulation which permanently deprives a property owner of all

economically viable uses of his or her land, *see Lucas v. South Carolina Coastal Council*, 505 U.S. 1003, 1019 (1992), or one that bars most such uses, *see Penn Cent. Transp. Co. v. City of New York*, 438 U.S. 104, 124 (1978). More specifically, takings can be broken down by their means, duration, and impact. That is, takings can be either (1) physically or by regulation; (2) permanent or temporary; and (3) categorical or non-categorical. *See Caquelin*, 140 Fed. Cl. at 573.

At the outset, to apply the proper analysis, the court must determine the type of taking alleged. *See American Pelagic*, 379 F.3d at 1372. Physical takings, as opposed to those by regulation, involve physical occupation, and can occur when the "owner [is] deprived of valuable property rights, even [if] title ha[s] not formally passed." *Caldwell v. United States*, 391 F.3d 1226, 1235 (Fed. Cir. 2004). The distinction between permanent and temporary is a narrower one, in that on a sufficiently long timeline, every government action could be considered temporary. *See Caquelin*, 140 Fed. Cl. at 575. Generally, the word temporary "refers to those governmental activities which involve an occupancy that is transient and relatively inconsequential," *Hendler v. United States*, 952 F.2d 1364, 1377 (Fed. Cir. 1991), while permanent refers to those governmental activities more substantial in nature, though they need not be "exclusive, or continuous and uninterrupted," *id.* For example, the Supreme Court in *Nollan* concluded that a "permanent physical occupation" had occurred when the government essentially took an easement for public access across plaintiffs' property that granted a "permanent and continuous right to pass to and fro, so that the real property may continuously be traversed." *Nollan v. California Coastal Comm'n*, 483 U.S. 825, 832 (1987). Lastly, a categorical taking occurs when the government seizes the entirety of a landowner's property, *see Caquelin*, 140 Fed. Cl. at 573, whereas a non-categorical taking occurs when the landowner is not completely deprived of all economic value, *see id.* at 574 (citing *United States v. Causby*, 328 U.S. 256 (1946)).

At issue here is whether the government's actions constitute a physical, permanent, non-categorical taking for a flowage easement.[17] The alleged taking is physical, in the sense that actual flood waters physically entered the property; permanent, in the sense that the government retains the rights to this flowage easement on a permanent basis with a continual right of re-entry; and non-categorical, in the sense that the property owners are not deprived of all economically viable use of their property as a result of the flowage easement. Further, this case presents a scenario of inverse condemnation, *i.e.*, where the landowner seeks to "recover[] just compensation for a taking of his [or her] property when condemnation proceedings have not been instituted." *United States v. Clarke*, 445 U.S. 253, 257 (1980).

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[17]Plaintiffs have alleged three separate takings: (1) a temporary, categorical, physical taking for the temporary flooding; (2) a permanent, categorical, physical taking for the destruction of plaintiffs' personal property; and (3) a permanent, non-categorical, physical taking for the flowage easements on each property. *See* Pls.' Br. at 59. The court, however, finds these distinctions unnecessary, as the first two alleged takings are simply the consequential result of the third. Thus, the court here will apply its analysis to the consideration of whether the government's actions constituted a physical, permanent, non-categorical taking for a flowage easement.

Inverse condemnation cases in the flooding context, particularly those resulting from government-induced flooding either of a permanent or temporary nature, are not new to this court or others. *See, e.g.*, *Arkansas Game & Fish*, 568 U.S. at 32-33 (citing *Pumpelly v. Green Bay Co.*, 80 U.S. (13 Wall.) 166 (1872), *United States v. Cress*, 243 U.S. 316 (1917), and *United States v. Dickinson*, 331 U.S. 745 (1947)). In 2003, the Federal Circuit decided *Ridge Line*, addressing the scenario of whether government-induced increased water runoff onto private property constituted a taking of a flowage easement by inverse condemnation. *Ridge Line, Inc. v. United States*, 346 F.3d 1346, 1355 (Fed. Cir. 2003). In *Ridge Line*, the Federal Circuit applied a multi-pronged test to determine whether a taking, and specifically not a tort, had occurred. *Id.* The first prong evaluates whether "the government intends to invade a protected property interest" or whether "the asserted invasion is the direct, natural, or probable result of an authorized activity and not the incidental or consequential injury inflicted by the action." *Id.* (quoting *Columbia Basin Orchard v. United States*, 132 F. Supp. 707, 709 (Ct. Cl. 1955)). In other words, the government must intend to invade the property *or* the injury must be the foreseeable result of the action. *See Caquelin*, 140 Fed. Cl. at 576 n.18 (citing *Cary v. United States*, 552 F.3d 1373, 1377 (Fed. Cir. 2009), and *Ridge Line*, 346 F.3d at 1346). Second, "the nature and magnitude of the government action must be considered." *Ridge Line*, 346 F.3d at 1356. This factor includes a requirement that "an invasion must appropriate a benefit to the government at the expense of the property owner, or at least preempt the owner[']s right to enjoy his property for an extended period of time, rather than merely inflict an injury that reduces its value." *Id.*

With this background, the Supreme Court decided *Arkansas Game & Fish* in 2012, expounding a list of six factors to consider when determining the existence *vel non* of a compensable taking. *See* 568 U.S. at 38-40. The factors, subsuming the considerations of the *Ridge Line* test, include: (1) "time;" (2) "inten[t];" (3) "foreseeab[ility];" (4) "character of the land;" (5) "reasonable investment-backed expectations;" and (6) "severity." *Id.* Although *Arkansas Game & Fish* concerned a taking which was temporary in nature, the same considerations remain relevant to the inquiry here, that is, whether the government's actions with regard to Addicks and Barker constitute a compensable taking, albeit a permanent one.

ANALYSIS

The court will begin its assessment by determining if each plaintiff has established a cognizable property interest. Following this, the court will turn to the more fact-intensive examination of the *Arkansas Game & Fish* considerations to evaluate whether plaintiffs have met their burden of showing that they have suffered a compensable taking. Finding that the government's actions in this case constitute a taking, the court will then consider whether defendant has any potential defenses to liability. The government argues that its actions do not constitute a taking because the Corps was acting under the police power and under the doctrine of necessity. The court concludes that these defenses are not applicable; therefore, the government is liable for the taking of plaintiffs' properties.

A. The Takings Analysis

1. Property interests.

Plaintiffs must have a valid property interest at the time of the taking to be entitled to compensation. *See Wyatt v. United States*, 271 F.3d 1090, 1096 (Fed. Cir. 2001) (citing primarily *Almota Farmers Elevator & Warehouse Co. v. United States*, 409 U.S. 470, 473-74 (1973)). Plaintiffs are owners of private properties not subject to flowage easements.[18] Ownership of the properties by each plaintiff respectively and the lack of a previous flowage easement are not in dispute. *See generally* Def.'s Br. at 93-97. The government, however, disagrees that plaintiffs hold compensable property interests under principles of both state and federal law. Namely, the government argues that: (1) the government has the right to mitigate against floodwaters under Texas law; (2) that plaintiffs have no right to be free from invasions because their ownership post-dates the dams' construction; and (3) that the federal Flood Control Act of 1928, ch. 569, § 3, 45 Stat. 534 (codified as amended in relevant part at 33 U.S.C. § 702c), limits plaintiffs' rights to compensation. *See id.*; *see also In re Upstream Addicks & Barker*, 138 Fed. Cl. at 667.

The government misstates the interplay of these laws with the Takings Clause. While the law cited in support of the government's first contention, Tex. Water Code Ann. § 11.086(c), exempts the government from liability for diversions of water caused by the "construction and maintenance of levees and other improvements to control floods," a conscious diversion of water by the government onto private properties in a reservoir by a flood-control dam is not within this exception. *Cf. Harris Cty. Flood Control District v. Kerr*, 499 S.W.3d 793, 807 (Tex. 2016) ("This is not a case where the government made a conscious decision to subject particular

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[18]This description, *i.e.*, that plaintiffs are owners of private properties not subject to flowage easements, is in a nutshell a finding respecting the character of the land at issue. In other cases, the character of the land may be more complicated or may factor more heavily in the takings determination. What is most relevant to the takings inquiry here is that defendant had no legal right to cause flood waters to enter the properties. The character of the land in government flooding cases is usually defined by whether, inherently, the property is "especially susceptible to flooding." *See, e.g.*, *Caquelin*, 140 Fed. Cl. at 581. In this case, whether the private property is used as farm land, as a residence, or commercially does not bear on liability. *Id.* at 581 n.22. Defendant contends that the character of the land at issue is land that has always been "susceptible to flooding during extreme weather events" including "possible inundation associated with the pools impounded by the [Addicks and Barker] Project." Def.'s Br. at 100-01. The government thus appears to be arguing that the character of plaintiffs' lands is property located within a reservoir in an area of the country susceptible to storms. That plaintiffs' properties may be susceptible to flooding during extreme weather events is of some relevance, but it is independent from the fact that plaintiffs' properties are privately-owned land within a reservoir that only flooded in this case because of the government's construction of the Addicks and Barker Dams (for a discussion on causation, see *infra*, at 35-39). Even if this geographical area is generally susceptible to flooding during extreme weather events, the character of plaintiffs' land would not be *especially* susceptible to flooding without the construction of the dams. Therefore, the character of the land at issue in this case is most simply described as private property not subject to a flowage easement.

properties to inundation so that other properties would be spared, as happens when a government builds a flood-control dam knowing that certain properties will be flooded by the resulting reservoir. In such cases of course the government must compensate the owners who lose their land to the reservoir."); *see also In re Upstream Addicks & Barker*, 138 Fed. Cl. at 667. The government's second contention, that plaintiffs' claims fail because they acquired their land after the completion of the Addicks and Barker Dams, also does not bar relief, *see id.*, 138 Fed. Cl. at 669, and is more appropriately addressed as a consideration in regard to plaintiffs' reasonable investment-backed expectations. Lastly, defendants argue that "Section 702c of Flood Control Act of 1928 . . . supports the conclusion that landowners in the vicinity of a federal project constructed and operated to reduce flood risk lack a right to compensation for damages caused by floodwaters not fully controlled by the Project." Def.'s Br. at 97. This argument is unpersuasive. The Flood Control Act of 1928 does not supersede or bar this court's jurisdiction over takings claims for flooding. *See In re Upstream Addicks & Barker*, 138 Fed. Cl. at 668; *accord California v. United States*, 271 F.3d 1377, 1383 (Fed. Cir. 2001) ("Our review of the Flood Control Act of 1928 leaves us with the firm conviction that Congress did not partially impliedly repeal the Tucker Act.") (addressing immunity in Tucker Act contract claims); *see also Scranton v. Wheeler*, 179 U.S. 141, 153 (1900) ("Congress may not override the provision that just compensation must be made when private property is taken for public use."). The court finds defendant's arguments unconvincing; therefore, plaintiffs have met their burden of establishing a valid property interest.

2. Takings factors.

a. Nature and magnitude of the government action.

i. Time & duration of the taking.

The time and duration of the government invasion is an important consideration in many takings cases. *See, e.g.*, *Arkansas Game & Fish*, 568 U.S. at 38-39 (citing *Loretto v. Teleprompter Manhattan CATV Corp.*, 458 U.S. at 435 n.12; *Tahoe-Sierra*, 535 U.S. at 342; *National Bd. of YMCA v. United States*, 395 U.S. 85, 93 (1969)). Particularly, the time and duration of the government action may be a highly relevant inquiry when determining whether the action constitutes a tort or a taking in the context of temporary takings. *See Caquelin*, 140 Fed. Cl. at 579 (collecting cases applying the time factor in a temporary takings analysis). But when the taking is one of a permanent nature, as it is here, the time and duration of the invasion is essentially undisputed and manifestly supports the finding of a taking. The government, through its construction, maintenance, and operation of the Addicks and Barker Dams in the past, present, and future, has taken a permanent flowage easement on plaintiffs' properties.[19] Defendant argues that its actions had only temporary consequences, because flood waters from Harvey were only on the properties for a matter of days. *See* Def.'s Br. at 108-09. This

[19]The parties in their briefing for the motion to dismiss disputed whether plaintiffs' claims related only to government inaction, as opposed to affirmative government actions, and thus would not state viable takings claims. *See* Def.'s Motion to Dismiss at 4; Pls.' Opp'n to Motion to Dismiss at 17, ECF No. 99. For the reasons set forth in the court's opinion deferring ruling on the motion to dismiss, *see In re Upstream Addicks & Barker*, 138 Fed. Cl. at 666-67, the court concludes that plaintiffs' claims are properly based on government action, not inaction.

argument, however, fails to account for the fact that the government's actions have subjected plaintiffs' private properties to the possibility, rather probability, of government-induced flooding ever since the construction of these dams, throughout subsequent changes to the dams and reservoirs, and for at least the foreseeable future. The time and duration of the government's actions at issue here is *not* measured by "the length of time the water inundates the properties," as the government would have it, *id.* at 109; rather, it is measured by a permanent right to inundate the property with impounded flood waters. Thus, this factor weighs in favor of plaintiffs.

ii. Severity.

Another factor that warrants consideration in the determination of liability under *Arkansas Game & Fish* is the "[s]everity of the interference." 568 U.S. at 39. The severity factor aids in differentiating a taking from a tort. *See Ridge Line*, 346 F.3d at 1355 (noting that "[t]he tort-taking inquiry . . . requires consideration of whether . . . the government's actions were sufficiently substantial to justify a takings remedy"). In effect, it requires the court to assess whether the government's interference with plaintiffs' property rights "was substantial and frequent enough to rise to the level of a taking." *Id.* at 1357 (citation omitted). As the Supreme Court stated in *Portsmouth Harbor Land & Hotel Co. v. United States*, where the Court held that repeated firing of military guns over a beach resort could constitute a taking if frequent enough, "[w]hile a single act may not be enough, a continuance of them in sufficient number and for a sufficient time may prove [a taking]. Every successive trespass adds to the force of the evidence." 260 U.S. 327, 329-30 (1922); *see also Causby*, 328 U.S. at 258, 265 (holding that repeated overflights of governmental aircraft above a farm constituted a taking). In the flooding context, "property may be taken by the invasion of water where subjected to intermittent, but inevitably recurring, inundation due to authorized [g]overnment action." *Barnes v. United States*, 538 F.2d 865, 870 (Ct. Cl. 1976) (holding the government liable for taking a flowage easement) (citing numerous cases). Thus, intermittent inundation of land, as contrasted to continuous overflow, can give rise to a viable permanent taking claim. *See Cress*, 243 U.S. at 328. Moreover, even a single flooding event may give rise to a taking where the defendant uses a permanent structure to "purposely flood[] a property once and expressly reserves the right to do so in the future." *Quebedeaux v. United States*, 112 Fed. Cl. 317, 323 (2013). In that event, the "defendant's actions may be viewed not as an 'isolated invasion,' but rather as reserving a flowage easement over the affected property." *Id.* (internal citations omitted); *see also Nollan*, 483 U.S. at 832 (holding that a permanent physical taking occurred, "even though no particular individual [was] permitted to station himself permanently upon the premises," when the government reserved a "continuous right [of individuals] to pass to and fro").

Here, plaintiffs contend that "the [g]overnment's actions resulted in an invasion by flooding that preempted [their] right to use and enjoy the protectable real and personal property interests they owned in the manner expected" and were therefore "sufficiently severe to constitute a taking." Pls.' Br. at 52. To support this assertion, plaintiffs note that the government-induced flooding caused "[t]he disruption of their lives, the devaluation of their properties, the destruction of their real and personal property, and their displacement from their homes and businesses for an extended period." *Id.* at 59. They emphasize that the flooding "restricted access to and from their property, causing their eviction from their properties for a period long after the water receded due to necessary repairs [and] significantly limited use of that property." *Id.* On the other hand, the government asserts that the severity factor "favors a finding of no liability because repairable damage resulting from temporary flooding during a

single flood event is not the type of severe impact that can support a claim for compensation under the Fifth Amendment." Def.'s Br. at 101. Stressing that each property was repaired or capable of repair by the time of trial, the government asserts that such "repairable" damage or "temporary harm" is "manifestly different from the type of injury that can support a Fifth Amendment claim." *Id.* Additionally, the government maintains that some plaintiffs recovered "significant flood insurance" and received federal benefits that mitigated actual out-of-pocket expenses, and that the damage attributable to the government action was "relatively minor" for many of the properties. *Id.* at 102.

The flooding at issue here went well beyond a tort and was sufficiently severe to rise to the level of a compensable taking. The government's suggestion that this flooding is not a compensable taking because it was temporary and confined to a single flood event carries no water. Even if a single event of this nature were insufficient to rise to a taking, the sheer frequency of significant storms in the region both before and since construction of the dams—the Hearne storm, the Taylor storm, the 1929 and 1935 storms, Tropical Storm Claudette in 1979, the 1992 series of storms, Tropical Storm Allison in 2001, and the Tax Day Storm—suggests that this was more than an isolated event, and that it is likely to recur. *See also* Tr. 1199:13 to 1200:7 (Kappel) (noting that Harvey's maximum rainfall was not unprecedented in the region when Harvey occurred). Indeed, this was not the first time that water had exceeded government-owned land, and the Corps itself had fully anticipated a storm the likes of Harvey. The future recurrence of a similarly large storm, producing comparable rainfall, remains likely to occur again. *See* Tr. 1198:4-8 (Kappel) (stating that "[t]here is a probability that [a rain event similar to Harvey] could happen again in the future [over the Addicks and Barker watersheds]"); Tr. 1494:3-11 (Long) (noting the "inevitably recurring" continuation of storms "that are of large magnitudes that could have impacts similar to those of Harvey"). Nor is there any reason to expect that the government would, or that it ought to, operate the dams to release more water downstream any differently in a future storm than it did during Harvey. As noted previously, the Corps operated the dams as prescribed by the Water Control Manual. Hence, in the nearly inevitable event of a future storm of significant magnitude, it can be expected that the government would similarly impound water on plaintiffs' properties to prevent what would be catastrophic flooding downstream. As a result, the likelihood of recurrent flooding is high, weighing strongly in favor of the finding of a compensable taking.[20]

The significant harm caused to plaintiffs' properties, almost entirely preventing their normal use and enjoyment, is also relevant to the severity analysis. Water measuring as much as several feet in some cases inundated plaintiffs' homes—for as long as a week in multiple instances—destroying substantial personal property, causing structural damage, and rendering properties uninhabitable or unusable until repairs could be completed months or years later. And even in the case of the Popovici residence, where water came within inches but did not actually

[20]The government also avers that plaintiffs suffered "no lasting infringement on their property rights" differing from those of "thousands of other Texans in nearby areas whose homes flooded." Def.'s Br. at 102. But contrary to the government's contention, the flooding on plaintiffs' property did differ from that experienced by others because it was directly caused not by the storm itself but by the impoundment of water behind the dams, and that infringement is lasting because the government reserves the right to repeat the impoundment in the future.

enter the home, seepage around the foundation caused structural damage. *See* Tr. 1242:13 to 1243:6 (Popovici). Some homeowners expressed concern about the substances and materials absorbed into the soil from the composition of the water itself, which became putrid, smelling of "fecal material and dead animal material and chemicals." Tr. 66:5-12 (Site Visit) (Popovici). Given that the water at the test properties was classified as Category 3 "black water," *i.e.*, water with "a greater potential to harbor pathogens, including sewage, chemicals, fertilizer, [and] organic material," these fears are not unfounded. Tr. 2892:14-24 (Hooper).

Furthermore, while water was present it prevented basic ingress and egress at all the properties, with some accessible only by watercraft. *See, e.g.*, Tr. 1299:1-12 (Micu). Notably, the amount of water that actually entered the structures is not reflective of, and actually much less, than the severity of the water level outside the structures in the lawn and streets. *See* Tr. 1952:24 to 1953:21 (Bedient). The streets in these areas were designed to serve as a drainage system that channeled water, and to that effect the elevation of street levels is lower than the elevation of structures by at least 18 inches, meaning that the water would be much deeper in the streets and lawns than in the structures themselves. *See id.*

Also relevant to the severity analysis is the substantial decline in property value caused by the flood event and the likelihood of similar events in the future. The court takes judicial notice of a recently enacted Texas law that requires a seller of residential real property to disclose to potential purchasers whether the property is located wholly or partially in a reservoir subject to controlled inundation by the Corps and whether the property has previously flooded. *See* Tex. Prop. Code Ann. § 5.008 (West, Westlaw through the end of the 2019 Reg. Sess. of the 86th Leg.). All the properties at issue here fall within these disclosure requirements and the adverse impact of the government-induced flooding on their market value is evident. Additionally, Dr. Bell testified at trial that flooding events of this kind generally cause a decline in property value of at least 20 to 30 percent, although he did not specifically opine on the properties involved here. Tr. 1353:13 to 1354:2 (Bell). While the government seeks to discredit his testimony as "decidedly qualitative, not quantitative," Def.'s Br. at 104, the severity factor is by nature a qualitative inquiry, lacking any definite quantitative thresholds. Nor is the dollar amount of damages in issue at this juncture. Therefore, although Dr. Bell's testimony did not provide quantitative analyses for the specific properties, there is little room to question his broad conclusions about the severe impact of this kind of flooding at these kinds of properties on market value. Simply put, the absence of specific quantitative calculations does not serve to discredit those conclusions. Likewise, Mr. Deal's expert opinion concluded that plaintiffs' properties "suffer[ed] permanent damage, damage that wouldn't be healed by itself" and "would require [a] significant amount of investment and risk of capital in order to get them all the way back to [being] habitable." Tr. 2210:6-10 (Deal). After inspecting the residential properties involved here, Mr. Deal identified nearby comparable sales and compared the two. *See generally* PX2205. He concluded "[t]hat the inundated properties suffered a significant diminution in price levels." Tr. 2210:25 to 2211:22 (Deal).

The government maintains that the testimony of Dr. Bell and Mr. Deal simply "show[s] that the flood-related impacts to the [t]rial [p]roperties were temporary and repairable," suggesting that such impacts do not rise to the level of a taking. Def.'s Br. at 105. But contrary to the government's assertion, the fact that property has been or could be, with sufficient outlays, restored to its pre-flood condition is not a relevant consideration in the severity analysis. *See Arkansas Game & Fish*, 568 U.S. at 26-34 (finding a compensable taking even though the

damaged terrain could be repaired by "costly reclamation measures"); *see also Dickinson*, 331 U.S. at 751 (holding that "no use to which [plaintiff] could subsequently put the property by his reclamation efforts changed the fact that the land was taken when it was taken and an obligation to pay for it then arose"). Under the government's theory, seemingly any takings claim based on government-caused damage to property could not be sustained if the damage were susceptible to repair. Even catastrophic damage can often be mended by enough time and expense, but the mere capacity for repair in no way mitigates the severity of the harm itself. Furthermore, the government's argument that the ability to repair damages caused by flooding weighs against imposing liability on the Corps is also heedless of the recurrent nature of the flooding involved here. Plaintiffs may have—in many, if not most, instances—been able to repair their real property, if not their personal property, but the taking here involves more than the damage already incurred; it encompasses a loss of the property owners' right to exclude future floodwater incursions onto their land and into their homes. Thus, that most of the bellwether plaintiffs were able to repair their property is likewise irrelevant to their inability to prevent future government-induced flooding on that property. It is not defensible to propose that an action which destroys property, all the while reserving the right to do so again, is not a taking simply because the property owner can, at great inconvenience and expense, repair the property after the fact. Moreover, the government fails to consider that some plaintiffs could not even afford to conduct the necessary repairs to render their homes habitable. Plaintiff Scott Holland, for example, could not afford to fix his property, was forced to move away, and continued living in a trailer at the time of trial. Tr. 1844:15 to 1845:11 (Holland).

Likewise, that some affected property owners recovered insurance money is not apposite to whether the government deprived plaintiffs of their right to use and enjoy their property. Insurance proceeds that mitigate the amount of out-of-pocket expenses incurred to repair damages in no way lessens the degree of harm caused by the initial infliction of that damage. The same is true of other government benefits plaintiffs may have received, such as FEMA grants. Independent awards of aid might have lessened the *ex post facto* cost of recovery for some plaintiffs and be relevant to damages, but that has little bearing on whether the government effected a taking initially.

Given the extensive damage caused to plaintiffs' real and personal property, their inability to exercise the right to exclude floodwaters, the interference with their right to use and enjoy their property, the high likelihood of recurring floods, and the significant diminution of property values, the court finds that the severity calculus weighs in favor of finding a taking.

iii. Benefit to the government.

Another consideration in the takings analysis is whether the invasion "appropriate[s] a benefit to the government at the expense of the property owner," *Ridge Line*, 346 F.3d at 1356, as opposed to inflicting a mere "consequential" injury, *id.*; *Armstrong*, 364 U.S. at 48. The line between which destructions of property by government action are compensable takings and which are simply consequential, and therefore subject to a tort analysis or not compensable, is not always easy to distinguish. But when the direct result of the government's actions is the destruction of property for its own, and thus the public's, benefit, the affected property owners are entitled to just compensation for a taking. *See Armstrong*, 364 U.S. at 48-49. In the case of Addicks and Barker, the government received a notable benefit at the expense of the upstream private property owners. That the dams protected downstream Houston is not the point. It

suffices to say that, consistent with the purpose for the construction of the Addicks and Barker flood-control projects, the government protected downstream properties from an estimated $7 billion in losses during Harvey, *see* Tr. 164:24 to 165:8 (Thomas), while concurrently causing upstream properties to suffer from severe flooding.

The government argues that "the direct . . . result of the government action is to reduce the risk of catastrophic downstream flooding" and "[t]hat such [upstream] flooding occurred in connection with Hurricane Harvey was merely a consequential result." Def.'s Br. at 82. But the precedents suggest otherwise. This is not a case where the damage to plaintiffs' land was a residual effect of government actions on other property. *Cf. Southern Pac. Co. v. United States*, 58 Ct. Cl. 428, 432 (1923) (finding that the injury to plaintiff's railroad from construction of a jetty nearby that may have altered ocean currents was not compensable as a taking because the injury was incidental and indirect to the government actions). Notably, here the same actions which benefitted the downstream properties are those which caused harm to plaintiffs. The damage to plaintiffs' properties was the direct result of the government's construction, modification, and operation of the Addicks and Barker Dams, reflecting the sheer fact that plaintiffs' properties are, by government design, within the dams' flood-pool reservoirs. The flooding suffered by plaintiffs and the associated "damages were not merely consequential. They were the product of a direct invasion of [the plaintiffs'] domain." *Causby*, 328 U.S. at 265; *see also Cress*, 243 U.S. at 327 ("[T]his is not a case of temporary flooding or of consequential injury, but a permanent condition, resulting from the erection of the lock and dam, by which the land is subject to frequent overflows of water from the river."). The invasion of the Addicks and Barker flood pools onto plaintiffs' properties from the construction and modification of the dams and their operation during Harvey, appropriated a benefit to the government at the direct expense of inflicting significant injury to plaintiff property owners. Therefore, this factor weighs in favor of plaintiffs.

b. Intentional or foreseeable.

Arkansas Game & Fish next requires the court to assess "the degree to which the invasion is intended or is the foreseeable result of authorized government action." 568 U.S. at 39. A taking occurs either where the government intended to invade the property or where the invasion is the "direct, natural, or probable result of an authorized activity and not the incidental or consequential injury inflicted by the action." *Ridge Line*, 346 F.3d at 1355 (quoting *Columbia Basin Orchard*, 132 F. Supp. at 709). The presence of the disjunctive "or" in the *Arkansas Game & Fish* factors, *see* 568 U.S. at 39 ("intended *or* is the foreseeable result") (emphasis added), makes evident that one of these circumstances must be present to support the finding of a taking. *See Barnes*, 538 F.2d at 871 ("[P]laintiffs need not allege or prove that defendant specifically intended to take property. There need be only a governmental act, the natural and probable consequences of which effect such an enduring invasion of plaintiffs' property as to satisfy all other elements of a compensable taking.") (internal citations omitted). Despite being separate inquiries, the two factors are interrelated—one cannot find intent without foreseeability; but what is an objectively foreseeable result may not have been the intended result. *See John Horstmann Co. v. United States*, 257 U.S. 138, 146 (1921) ("[I]t would border on the extreme to say that the government intended a taking by that which no human knowledge could even predict."); *Columbia Basin Orchard*, 132 F. Supp. at 711 ("Such [results were] not the direct, natural or probable consequence[s] of the Government's act, and for this reason no intent to take can be

implied."). Here, both intent and foreseeability were present. Because foreseeability bears on intent, foreseeability is addressed first.

i. Foreseeability and causation.

Whether the asserted invasion is the "direct, natural or probable result of an authorized activity" is a critical part of the takings analysis. *Columbia Basin Orchard*, 132 F. Supp. at 709. Put in other terms, the court should determine here "whether the [flooding] on the claimants[']property was the predictable result of the government action." *Ridge Line*, 346 F.3d at 1356 (citing *Sanguinetti v. United States*, 264 U.S. 146, 149-50 (1924)). If the most that can be said is that the government's actions are only "a contributing factor towards" the flooding, in contrast to the flooding being "the natural or probable consequence" of those actions, then "a tort action may lie in the proper forum for such an incidental or consequential injury," but not an action for taking. *Columbia Basin Orchard*, 132 F. Supp. at 709.

The invasion asserted here by plaintiffs is that of impounded floodwaters entering onto their properties resulting from the Corps' construction, modification, maintenance, and operation of the Addicks and Barker Dams. Plaintiffs contend that "the inundation of private properties from the reservoir pools behind each dam was the predictable result of the [g]overnment's actions." Pls.' Br. at 30. Plaintiffs support this assertion by arguing that the Corps always "knew there would be recurrent storms of such a magnitude [as Harvey]," *id.* at 30, and that the foreseeability of plaintiffs' properties flooding was obvious in light of the fact that the properties are located within the maximum pool size for the reservoirs, *see id.* at 38.

Defendant, in response, puts forth several postulates why the inundation was not foreseeable. Defendant first argues that the flooding of private properties in the reservoirs was not foreseeable because "Hurricane Harvey was an extraordinarily rare and large storm." Def.'s Br. at 58 (heading) (capitals omitted). Further, defendant argues that, "[t]he relevant government action . . . for purposes of this [foreseeability] analysis should be at the time the Corps constructed the dams in the 1940s." *Id.* at 79. The government avers that "[t]he agency's knowledge at th[at] time [was] that [this] particular result is [] *possible*" and that "does not mean it is a *direct, natural or probable* result." *Id.* at 80 (emphasis in original). Additionally, the government argues that the Corps did not foresee "the resulting damage when it constructed the Project in the 1940s" and that "[t]o find otherwise would hold the Corps responsible for unforeseen urbanization." *Id.* at 81.

Defendant's reliance on the contention that foreseeability in this scenario is most properly measured from the viewpoint of the government in the 1940s, at the time the Addicks and Barker Dams were constructed, is not appropriate because the foreseeability inquiry should not be so constrained. Most importantly, defendant misstates the underpinnings of the foreseeability analysis. Foreseeability—in contrast to intent, which more aptly accounts for subjective positions—is not simply measured from the viewpoint of the government; foreseeability is an objective inquiry. *See, e.g.*, *John Horstmann Co.*, 257 U.S. at 146 (considering whether the results of the government actions could have been objectively foreseen); *Sanguinetti*, 264 U.S. at 147-48 (explaining how the foreseeability inquiry depends on whether there was "any reason to expect that such result would follow."). That is, would an objective person reasonably foresee that the actual results which occurred would have been the direct, natural or probable results of the government's actions? Whether the Corps subjectively foresaw the results may bear on

objective foreseeability, but it is not the only consideration. Therefore, it is irrelevant in this case whether foreseeability is measured in the 1940s, 1970s, or even in the 2000s, because at all of these points defendant should have objectively foreseen that the pools could and would exceed government-owned land.

Here, the evidence demonstrates the Corps was aware or should have been aware since the initial construction of the dams and at every point onward, that the flood pools in the Addicks and Barker Reservoirs would at some point (and thereafter) exceed the government-owned land, inundating private properties. As early as the 1940s, the Corps understood that storms of exceptionally large size were possible in the Houston metropolitan area. For example, the Corps noted in the 1940 Definite Project Report that the Buffalo Bayou watershed is situated "in an area subject to all of the circumstances making possible large storms" and that "only chance has prevented the occurrence of a storm over the basin much larger than the 1935 storm." *See* JX5 at 7. The Hearne storm of 1899, which served as a basis for the design of the maximum pool size in each reservoir, occurred only 90 miles northwest of Houston. *See id.* (explaining that the Hearne storm occurred under meteorological conditions that the Corps noted "could be approximated closely over the Buffalo Bayou watershed"). Notably, the Corps considered that pool sizes beyond the extent of government-owned land were foreseeable in the 1940s during the lifetime of the structures, when they conducted a cost-benefit analysis, *see generally* JX52, ultimately determining that "the expected damages of inundating pastures and rice fields" would be less than the cost of buying additional land, *see* Tr. 200:21-24 (Thomas). To an objectively reasonable person, it was not a question of whether the pools would reach the level they did—it was merely a question of when and how often. Just as in *Cotton Land Co. v. United States*, "The events which occurred, although they took some time, were only the natural consequences of the [government's actions]. If engineers had studied the question in advance[,] they would . . . have predicted what occurred." 75 F. Supp. 232, 233-34 (Ct. Cl. 1948). Accordingly, even measuring foreseeability in 1940, as defendant advocates, leads to a conclusion that pools of a size at or close to Harvey were objectively foreseeable.

But the taking at issue here does not begin and end with the construction of Addicks and Barker. The Corps' modification, operation, and maintenance of the dams was and is ongoing, continuing well into the years following the 1940s, and at each successive instance, the likelihood of occurrence of flood pools exceeding government-owned land grew. By the 1960s and 1970s, the Corps had a definite understanding that larger pool sizes were highly probable. A study by the Corps in the 1960s explained that the now-permanent gates on the reservoir conduits would lead to larger and more permanent pools. *See* JX15 at 44. In a 1973 memorandum, the Corps' Chief of the Engineering Division in the Galveston, Texas district noted that the Corps should "develop a history and rationale for our operating concept of imposing flooding on private lands without benefit of flowage easement or other legal right." *See* PX37 at 1. A 1974 Corps inspection report echoed similar thoughts. *See* PX38 at 5 (USACE233674) (1974 Buffalo Bayou Inspection Report) ("Development of the area will eventually place the [g]overnment in the position of having to flood the area within the reservoir with the accompanying damages in order to protect downstream improvements in the event of a severe future storm.").

Later events only magnified the risk of flooding beyond government-owned land, rendering it virtually inevitable. Around March of 1992, a series of storms resulted in then-record flood pools in both the Addicks and Barker Reservoirs. *See* Tr. 363:20 to 364:2

(Thomas). This result, known as the "ratcheting effect," demonstrated that one Harvey-sized storm was not necessary to create large flood pools—a series of consecutive moderate storms could have the same effect. *See* Tr. 363:20 to 364:11 (Thomas). The Corps in the 1990s and 2000s, aware of the increased risk, surveyed properties in the reservoirs located beyond government land to have a firmer idea as to the extent of the possible damage if flooded. *See* Tr. 100:5-16 (Thomas) (One such field study was conducted and completed in July 1994; another study was completed in 2003.). Not only is it evident that the Corps believed flooding beyond the extent of government-owned land was probable, it is unreasonable to contend otherwise.

It is true that Tropical Storm Harvey was a record-setting storm. But the evidence markedly shows that pools of this size and the attendant flooding of private property were, at a minimum, objectively foreseeable. Thus, Harvey's magnitude does not exculpate the government of liability for its actions. Even so, the government suggests that "the *claimed losses* were not the direct, natural or probable result" because the Corps could not have foreseen "such significant development upstream of the reservoirs." Def.'s Br. at 81 (emphasis added). Essentially, the government suggests that because the properties that flooded were more developed, *i.e.*, homes and businesses occupied the land as contrasted to the more rural fields of the 1940s, it should not be held responsible for the resulting damage. The government, however, misapplies the foreseeability inquiry. That the monetary amount of damages may be more significant than initially thought does not detract from the fact that it was foreseeable that the land would be invaded by floodwater. In short, just because the nature of the invaded land has changed from farm land to residential does not bear on the question of whether an invasion of such land should have been foreseen.

The parties also present opposing views on the causation analysis for the flooding at issue. Establishing causation is a vital component of the foreseeability inquiry. "In order to establish causation, a plaintiff must show that in the ordinary course of events, absent government action, plaintiffs would not have suffered the injury." *St. Bernard Par. Gov't v. United States*, 887 F.3d 1354, 1362 (Fed. Cir. 2018). Additionally, "the causation analysis must consider the impact of the entirety of government actions that address the relevant risk." *Id.* at 1364. Therefore, the relevant question here is whether the flooding on plaintiffs' properties would have occurred but for the government's actions regarding Addicks and Barker.

Causation for all thirteen properties was originally contested, *see* Pls.' Br. at 39-49; Def.'s Br. at 63-75, and expert testimony on the subject was presented from both Dr. Bedient for plaintiffs and Dr. Nairn for defendant. As for ten of the thirteen properties, defendant has essentially conceded that without the dams these properties would not have flooded. *See* Tr. 3258:8-12 (closing argument). Defendant's expert opined that only the "finished first floors on *three* of the thirteen upstream Test Properties would have experienced some flooding even in the absence of the federal project." DX608 at 166 (emphasis added). With respect to ten properties, plaintiffs' burden of causation thus has been met: (1) Banker; (2) Holland; (3) Lakes on Eldridge; (4) Popovici; (5) Sidhu; (6) Soares; (7) Stewart; (8) Turney; (9) West Houston Airport Corporation; and (10) Wind.

The remaining three properties require a more thorough analysis: (1) Burnham; (2) Giron; and (3) Micu.[21] The parties presented competing testimony about the causes of the flooding on these three properties. Plaintiffs argue that "Dr. Bedient's work establishe[d] that each of the Test Properties' [] flooding was in fact caused by the Addicks or Barker [D]am impoundment." Pls.' Br. at 43. In his report, Dr. Bedient concluded that "all of the test properties were flooded due to the impounding rainfall runoff waters by the [Corps] behind the Addicks and Barker Dams," PX526 at 46, and such flooding was not a result of the local drainage systems or due to riverine flooding, *see id*. at 47, 49, 54. Contrastingly, defendant argues that flooding was unavoidable upstream due to the magnitude of Harvey. Def.'s Br. at 72. That is, defendant asserts that the flooding on these three properties cannot be attributed to the pools created by the Addicks and Barker Dams. *See id.* at 68-69 (arguing that the flooding on the three properties was attributable to alternative sources such as diversion channels and riverine flooding).

Dr. Bedient reached his conclusions by studying and analyzing real-time data collected during the storm, whereas Dr. Nairn reached his conclusions through modeling and projections. While modeling can be a useful tool for planning and analyzing hypothetical outcomes and at times may be able to provide more sophisticated insights than even real-time data, in the case at hand, Dr. Bedient's analysis was more persuasive. Particularly, Dr. Nairn's testimony suffered from a major flaw—a failure to fully capture what *actually* occurred. For instance, Dr. Nairn's model concluded that flooding within the homes on the Giron and Micu properties due to riverine overbanking had already occurred as of August 27. *See* DX608 at 125-26. But live witness accounts and photographic evidence show that water did not enter either home until at least an entire day later. *See* Tr. 1999:14 to 2000:13 (Bedient). Additionally, Dr. Nairn's model failed to account for stormwater drainage systems and improperly accounted for channel diversions and drainage projects. *See, e.g.*, Tr. 2002:14-25 (Bedient). These oversights render the model scenario different from the real-life scenario, and likely caused an overstatement of Dr. Nairn's projections of riverine flooding. *See* Tr. 2004:19 to 2005:2 (Bedient); *see also* Tr. 1858:6-12 (Lesikar-Martin) (explaining that, in contrast to Dr. Nairn's assertions, Bear Creek was not overflowing beyond its banks during Harvey). A predictive modeling system which relies on incorrect inputs and outputs used to align the model's coefficients and factors, cannot provide reliable projections. Accordingly, Dr. Nairn's model, which relies on input data that do not match what in fact occurred, cannot be fully reliable. Lastly, Dr. Nairn's conclusions seem, in part, to agree with that of plaintiffs' expert, Dr. Bedient, even as to the three contested properties. Dr. Nairn concludes that "[*P*]*eak* flood elevations at all of the upstream Test Properties are attributed to backwater due to high pool elevations in Addicks or Barker Reservoirs." DX608 at iii (emphasis added). In other words, Dr. Nairn appears to agree that the water would not have been as high in each of the three contested homes but for the Addicks and Barker projects.

Defendant has alleged a number of errors in Dr. Bedient's calculations. For example, defendant contends that Dr. Bedient failed to account for cumulative effects, and simply looked at discrete six- and twelve-hour time periods when collecting certain data. Def.'s Br. at 73. But these allegations do not suffice to discredit Dr. Bedient's conclusions. Whether Dr. Bedient's model fully accounts for intervening hours does not detract from the fact that his conclusions are

[21]Given that the causation issues were the same for all three properties, the properties can be discussed collectively with regard to causation.

more reliable because they align with what was actually witnessed.[22] As such, plaintiffs have met their burden of showing that but for the Addicks and Barker project, flooding would not have occurred to the level it did on the three contested properties.

Defendant also puts forth in rebuttal one additional argument on causation. Defendant argues that because the government's actions that address the relevant risk must be considered in their entirety, plaintiffs' failure to account for the impact of the outgrants is fatal to their argument. *See* Def.'s Br. at 97-98 (citing *St. Bernard Par.*, 887 F.3d at 1364). Defendant argues that the outgrants that the "United States allowed to be built on the Project property were built to reduce flood risks to upstream properties," and because this is "'government action [that] mitigates the type of adverse impact that is alleged to be a taking, it must be considered in the causation analysis.'" *Id.* (citing *St. Bernard Par.*, 887 F.3d at 1367). It is defendant, however, who fails to fully account for *all* the impacts of the outgrants. Defendant asserts that the outgrants mitigated the flood risk upstream. To an extent, that allegation is correct. They effectively allowed water to be removed from the upstream neighborhoods more rapidly. But the outgrants also had the effect of causing "more frequent" and "larger" impoundments in the reservoirs and "increase[d] flood damages resulting from reservoir impoundments." JX52 at 16 (USACE01545). Thus, it cannot be said that the government's granting of easements for drainage systems consequently built by developers and local entities, as a whole, provided a greater benefit than harm. As to the "but for" analysis, it would be wrong to say that but for the granting of the outgrants, plaintiffs would have been worse off. Notably, the evidence actually suggests the opposite. Moreover, in the counterfactual scenario where the federal government refused to grant these easements, the evidence suggests that upstream developers would have been required to seek other feasible remedies for drainage. *See* Tr. 817:1-11 (Vogler).

Thus, considering the totality of the evidence, plaintiffs have met their burden of showing causation for all thirteen properties. Plaintiffs have sufficiently demonstrated that the inundation of floodwaters onto their private property was the "direct, natural, or probable result" of the government's activity. *Ridge Line*, 346 F.3d at 1355.

ii. Intent.

Intent does not concern whether the government meant to abridge a private property right but whether it intended to occupy the pertinent property without lawful authority or excuse. *See LaBruzzo v. United States*, 144 Fed. Cl. 456, 474 (2019). Thus, the intent element is present if the government intended its physical occupation even if it did not intend to effect a taking. *See id.* As noted by the Supreme Court of Texas, "build[ing] a flood-control dam knowing that certain properties will be flooded by the resulting reservoir" is a "*conscious decision* to subject particular properties to inundation so that other properties [will] be spared." *Harris Cty. Flood Control Dist.*, 499 S.W.3d at 807 (emphasis added). The requisite intent to invade is present in

[22]Similarly, defendant's assertions that Dr. Bedient's testimony relied upon flawed gauge data, *see* Def.'s Br. at 67, are unavailing. Defendant argues that "Dr. Bedient erroneously based his critique on uncorrected data for [the upper Buffalo Bayou gauge]." *Id*. But these gauges are regularly inspected, *see* Tr. 2173:10-15 (Test. of Jeffrey East), and are considered reliable, *id*. Even if the gauge was misreading, Dr. Bedient's report corrects any misreading by comparing and subsequently aligning the data with what was actually witnessed. *See* Tr. 3195:9-15.

such cases, and "of course the government must compensate the owners who lose their land to the reservoir." *Id.* *See also Tarrant Reg'l Water Dist. v. Gragg*, 151 S.W.3d 546, 555 (Tex. 2004) (citing *City of Dallas v. Jennings*, 142 S.W.3d 310, 314 (Tex. 2004) ("[T]he requisite intent is present when a governmental entity knows that a specific act is causing identifiable harm or knows that the harm is substantially certain to result.")). The government may not, however, intend an outcome which it did not subjectively foresee as a "direct, natural, or probable consequence" of its action. *See John Horstmann Co*., 257 U.S. at 146.

Here, the Corps knew from the outset that the land it purchased was inadequate to hold the amount of water that would be contained in the reservoirs should the embankment-design storm occur. *See* JX5 at 26. It knew then that if such a storm transpired, the water produced would exceed government-owned land and flood private property. *Id.* But it appears doubtful that the Corps *subjectively* foresaw the occurrence of a storm event large enough to create pools that exceeded government-owned land—although, as already noted, such a storm was *objectively* foreseeable at that time, *see supra*, at 35-36. It certainly knew that such a storm was *possible* over the Addicks and Barker watersheds, *see, e.g.*, Pls.' Mot. to Reopen the Trial R. Ex. A at USACE2019_0000013-14 (recording the Corps' observation that the occurrence of a storm like the Hearne storm was not "unreasonable"), but the Corps seems to have reckoned then that it was an *improbable* event, *see* JX5 at 9-10 (concluding that the occurrence of a storm as severe as the Hearne storm was "very remote"), or at least that it would not occur frequently. This conclusion is also inferable from the cost-benefit analysis the Corps conducted around this time. To perform such an analysis, the Corps needed to determine both how much it would cost the government to flood beyond government-owned land and how frequently that was likely to happen. Comparing the cost attributable to flooding rural land to what it would cost to purchase rights to the then-undeveloped land, the Corps determined that the cost of flooding was less. That the calculus reached the conclusion it did indicates that the Corps regarded such overflow as possible but that it was willing to take the ensuing risk. That calculus did not withstand the test of time. Nonetheless, the intent inquiry does not end there.

Intent is present here because, like foreseeability, intent is not measured at one singular point in time. Again, this is because the government action at issue is not simply the construction of the dams, but the totality of their construction, modification, maintenance, and operation over the project lifespan. The Corps subjectively knew by the 1940s, and particularly by the 1960s, that storms larger than the design storm were likely to occur over Addicks and Barker. *See supra*, at 17, 31, 36. From that time forward, it had subjective knowledge that pools exceeding government-owned land were probable at some point. Indeed, by 1973 the Corps expected the possibility of flooding off of government-owned land to become a public concern. *See* PX37 at 1. Thus, intent can be inferred here because the government knew flood waters would likely occupy plaintiffs' private properties at some point.

Equipped with the knowledge that storms of the design storm magnitude were probable, the Corps did not stray from its primary objective to prevent downstream flooding (indeed, it probably could not), even when it knew that could well mean impounding water on private property. For example, the 2012 Water Control Manual, which the Corps followed during Harvey, instructs the Corps to operate the dams in a manner consistent with their original purpose: to protect downstream property by impounding water in upstream reservoirs. It states that "the general plan for reservoir regulation will be to operate the reservoirs in a manner that will utilize to the maximum extent possible, the available storage to prevent the occurrence of

damaging stages on Buffalo Bayou." JX110 at 7-4 (USACE016338). Notably, the "available storage" that was to be "utilize[d] to the maximum extent possible" encompasses *all* land in the intended reservoir behind the embankments, including land the government has never owned. *See* Tr. 67:12 to 68:3 (Thomas). To accomplish its purpose of downstream protection, the Corps planned all along to impound water to the maximum extent of the available storage—a determination that never altered even when the Corps came to understand that rainfall events reaching the design storm magnitude were probable rather than merely possible. In short, the government had the requisite intent to invade plaintiffs' properties because the Corps had been well aware that storms capable of overflowing government-owned land were likely to occur, and despite that knowledge it still intended to occupy the property concerned without lawful authority or excuse. *See LaBruzzo*, 144 Fed. Cl. at 474.

c. Reasonable investment-backed expectations.

A property owner's "reasonable investment-backed expectations regarding the land's use" is also a factor relevant to the takings inquiry under *Arkansas Game & Fish*, 568 U.S. at 39 (citing *Palazzolo v. Rhode Island*, 533 U.S. 606, 618 (2001)). As a threshold matter, plaintiffs assert that this factor should not even be considered here because the concept applies only to regulatory, not physical, takings. *See* Pls.' Br. at 116-17 n.541. They correctly observe that "time and again, the Supreme Court has underscored the distinctness of [the physical and regulatory] lines of takings cases," *id*. at 117 n.541, and there is no question that the reasonable investment-backed expectations factor is ordinarily applied in the context of regulatory, and not physical, takings. *See, e.g.*, *Penn Cent.*, 438 U.S. 104. Noting this difference, the Federal Circuit stated in *Preseault v. United States* that "[t]he Government's attempt to read the concept of 'reasonable expectations' as used in regulatory takings law into the analysis of a physical occupation case would undermine, if not eviscerate, long-recognized understandings regarding protection of property rights; it is rejected categorically." 100 F.3d 1525, 1540 (Fed. Cir. 1996). *See also Palm Beach Isles Assocs. v. United States*, 231 F.3d 1354, 1364 (Fed. Cir. 2000) (explaining that "'reasonable investment-backed expectations' are not a proper part of the analysis" in physical takings cases); *Caquelin*, 140 Fed. Cl. at 582 (citing and quoting *Love Terminal Partners, L.P. v. United States*, 889 F.3d 1331, 1345 (Fed. Cir. 2018) ("The reasonable, investment-backed expectation analysis is designed to account for property owners' expectation that the *regulatory* regime in existence at the time of their acquisition will remain in place, and that new, more restrictive legislation or regulations will not be adopted.")) (emphasis added).

The precept plaintiffs reach from this line of precedents is that the inclusion of the investment-backed expectations factor in the *Arkansas Game & Fish* listing was not intended to translate that factor outside the regulatory takings context. They seek to diminish its enumeration as a relevant factor in *Arkansas Game & Fish* by noting the preamble to the list of factors, which states that the ensuing factors are relevant "[w]hen regulation or temporary physical invasion by government interferes with private property." 568 U.S. at 38.

Even so, flooding cases can pose an exception to the quotidian rule that physical takings do not involve consideration of "reasonable investment-backed expectations." Plaintiffs fail to take account of the context in which *Arkansas Game & Fish* arose. *Arkansas Game & Fish* plainly involved a physical, not regulatory taking, but the Court nonetheless included the factor as relevant for guiding the decision on remand. Although citing *Palazzolo*, a regulatory takings case, for inclusion of the factor, the Court applied it to the physical taking before it because it

had accepted the finding that the flooded area at issue had flooded previously. The prior flooding had occurred fairly often following Spring rains, but that flooding was transient and did not affect the growing season of the management area's forest. *See* 568 U.S. at 39. Extensive flooding that stretched over the growing season was quite a different matter. *Id*. Thus, the Court acknowledged the plaintiff's expectations that flooding at certain times and of limited duration was possible, but that the flooding involved in the taking claim was of a different kind than that which they could have anticipated or had previously encountered.

The context of the case at hand is strikingly similar. In this case, the properties are located in a geographical area that is generally susceptible to large storms and potential flooding, and the landowners were aware of that fact. But the flooding that caused the alleged taking before the court was different in kind from that which had occurred naturally and from what plaintiffs had reason to anticipate; it was more severe than any prior flooding and it was not the result of natural conditions but rather of deliberate government action. Reasonable investment-backed expectations are therefore as equally applicable here as they were in *Arkansas Game & Fish*.[23] Despite the evident tension of transposing this factor from the regulatory to the physical takings context, *Arkansas Game & Fish* clarifies that reasonable expectations are a relevant consideration in connection with physical takings cases of this particular nature.

Informing the application of the factor are two considerations. First, the landowner's expectations must be "reasonable," meaning that while this is a fact-intensive inquiry, "it is nonetheless an objective one." *Chancellor Manor v. United States*, 331 F.3d 891, 904 (Fed. Cir. 2003). Second, the matter at issue is a question of degree, that is "the extent to which the [government action] interferes" with those expectations. *Palazzolo*, 533 U.S. at 617. Significantly, it is not the case that a takings claim must fail simply because a property owner "acquired [] land while on notice that a taking was occurring or had the potential to occur." *In re Upstream Addicks & Barker*, 138 Fed. Cl. at 669 (citing *Dickinson*, 331 U.S. at 750); *see also Cooper v. United States*, 827 F.2d 762, 764 (Fed. Cir. 1987) (finding a taking where the plaintiff acquired property while on notice that the government-induced flooding was already occurring). The law offers the government no loophole whereby it may escape takings liability by putting landowners on notice of the risk that it could or would take their property. *See Palazzolo*, 533 U.S. at 626 (rejecting the "sweeping rule" that "a purchaser or a successive title holder . . . is deemed to have notice of an earlier-enacted restriction and is barred from claiming that it effects a taking."). In short, the government gains no immunity for an uncompensated taking by giving advance notice that it will take property. When the taking actually occurs, it still must provide compensation.

Even if notice had a bearing, plaintiffs would still prevail here because they neither knew, nor reasonably should have known, of the risk posed by the dams. The government nonetheless maintains that plaintiffs fail on this factor because "they lacked an objectively reasonable expectation that their properties would not flood in a Hurricane Harvey-like event." Def.'s Br. at

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[23]Perhaps the Supreme Court's inclusion of the words "investment-backed" invites too strong a reference to regulatory takings law. Simply referring to "reasonable expectations" would capture the context in which the Court used the factor in *Arkansas Game & Fish*.

106.[24] To support this contention, it emphasizes that plaintiffs had notice of the possibility of flooding, pointing out that "Harris and Fort Bend Counties have a long history of flooding during large storms." *Id.* It also cites publicly available information demonstrating the possibility of upstream flooding during large storms, notifications proliferated by local governments, and the frequency with which residents in the region purchased flood insurance. *See id.* Plaintiffs counter that not one of them had any knowledge that their property was situated in a reservoir, *see* Pls.' Br. at 117, and assert that there is no reason to think plaintiffs reasonably should have known about that particular risk, different from natural flooding. *See* Pls.' Reply at 24. *See also* Tr. 1729:10-17 (Banker); Tr. 1758:15 to 1760:3 (Burnham); Tr. 1651:8-23 (Giron); Tr. 1834:14-16 (Holland); Tr. 1413:15 to 1414:5 (Lakes on Eldridge); Tr. 1293:24 to 1294:15 (Micu); Tr. 1225:2-17 (Popovici); Tr. 1738:9-17 (Sidhu); Tr. 1076:22 to 1078:3 (Soares); Tr. 1607:19-22 (Stewart); Tr. 2151:16-20 (Turney); Tr. 1626:1 to 1627:10 (Wind); Tr. 2120:20 to 21221:5 (Lesikar).

It is undisputed that plaintiffs did not know their properties were located within the reservoirs and subject to attendant government-induced flooding. The point of contention here is whether plaintiffs objectively ought to have known about that risk based on notice.[25] First, the government points to "[p]ublic documents" that discuss the "possibility of upstream flooding during large storms." Def.'s Br. at 106. But the mere fact that information is available does not make it reasonable to assume that plaintiffs should have known about it or, if they did, that they would understand that it related to government-induced flooding. Even if plaintiffs are assumed to be aware of information in places such as Key Maps, FEMA Maps, or United States Geological Survey quadrangle maps—an assumption that is hardly a given—the import of data on these maps is far from obvious. For example, to infer the possibility of flooding from the Key Maps would require a baseline knowledge about property elevations, something the average homeowner does not generally know. It is highly tenuous to suggest that the average citizen should know how to read and understand the information in these maps or recognize that the map annotations refer to government-induced flooding rather than naturally occurring flooding.

Next, the government cites the subdivision plats, which indicate that land was subject to controlled inundation, as evidence that plaintiffs had notice of the risk when they purchased their property. *See, e.g.*, Def.'s Br. at 113-14. These subdivision plats are replete with miniscule

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[24]The court perceives the irony of the government's simultaneous contentions that the Corps could not have anticipated a storm of Harvey's magnitude but that plaintiffs ought to have foreseen the risk of their properties flooding in such an event.

[25]At trial, the government sought to introduce the testimony of Dr. Gerald Galloway, a retired Brigadier General in the Corps, as an expert witness. The government proposed that Dr. Galloway testify as to "indicators that are available to laypeople that they could consider when making a decision such as purchasing property." *See* Tr. 2544:10-12 (Test. of Gerald Galloway). The court declined to certify Dr. Galloway as an expert witness because the government did not satisfy its burden to show by a preponderance of the evidence that the testimony was based on scientifically valid principles rather than a subjective belief or unsupported speculation. *See* Tr. 2580:12 to 2581:17 (Galloway). Likewise, the proposed expert's opinions about the subjective views of the landowners were far less credible than the testimony offered by plaintiffs themselves of their own personal knowledge and belief.

details. *See, e.g.*, DX557. Even if one were to examine the plats, which it appears no purchaser actually did, *see, e.g.*, Tr. 1295:6-9 (Micu); Tr. 1660:14-16 (Giron), it would take an uncommonly attentive eye to notice and comprehend the import of such a "disclosure." Moreover, the government's own witness, the Fort Bend County Drainage District's Chief Engineer, testified that the plat language was not successful in informing the public of the risks involved. *See* Tr. 682:10-16 (Vogler). Additionally, the fact that the Corps discussed the possibility of upstream flooding with developers is not evidence that anyone who subsequently purchased that property also should have been apprised of the information. The government further cites the high rate of flood-insurance purchases compared to the national average, concluding that this demonstrates that "the possibility of upstream flooding has long been knowable in this region." Def.'s Br. at 106. This argument also fails because no one disputes that the Houston region is, and long has been, especially flood prone. Because that general flood risk was well known, and because some residents purchased flood insurance to account for it, is simply not evidence that plaintiffs should have been aware of the specific risk associated with the very different type of flooding at issue here, namely, government-induced flooding.

Perhaps the government's strongest argument on the issue of notice is the fact that both the Corps and local governments conducted public meetings, in which they disclosed information about the possibility of flooding, during the decades leading up to Harvey. Def.'s Br. at 106. But here, too, the government fails to show that plaintiffs should reasonably have known of the risk. The mere fact that meetings occurred does not mean they were effective at communicating the risk such that the public should have known about government-induced flooding; there is no evidence that these meetings were heavily attended or particularly well publicized in the community. And in rapidly developing suburbs of a large city like Houston, it is reasonable to expect a regular flow of people moving in and out of the area, further reducing the likelihood that new residents adapting to the area would know of the risk without an especially aggressive public campaign. That not one of the plaintiffs in this case was aware of the situation regarding government-induced flooding is also telling with respect to the effectiveness of these meetings, suggesting that it is quite reasonable to conclude that the average person in the community was likely unaware of the risk.

Having determined that plaintiffs' investment-backed expectations were reasonable, the court next addresses the extent to which the government's action interfered with those expectations. Plaintiffs purchased their property for the same varied reasons people generally buy real estate, *e.g.*, for a home to live in safely or as an investment. *See, e.g.*, Tr. 1704:12-19 (Banker) (noting that the property was purchased as home for retirement and was considered an investment that would appreciate). As already noted, the degree of interference with these expectations was acute—rendering properties uninhabitable for a significant time, requiring substantial outlays to perform repairs, and resulting in a significant diminution in the resale value of inundated properties. Subsequent developments prompted by the flooding, such as the recently enacted Texas statute mandating disclosure when property is situated in a reservoir, can further be expected to diminish property market value. Therefore, the court concludes that the government-induced flooding severely interfered with plaintiffs' reasonable investment-backed expectations.

Overall, each of the factors identified in *Arkansas Game & Fish* supports the finding of a taking of a flowage easement on all thirteen of the bellwether test properties.

B. Defenses to Liability

The court must determine whether any of the government's defenses would preclude the finding of liability. The government asserts two defenses. First, the government argues that its actions constituted an exercise of police powers, such that no viable taking claim exists. *See* Def.'s Br. at 87-91. Second, the government argues that "the doctrine of necessity [] 'absolv[es] the State of liability for the destruction of real and personal property.'" *See id.* at 91-92 (citing *TrinCo Inv. Co. v. United States*, 722 F.3d 1375, 1377 (Fed. Cir. 2013)) (internal citations omitted). These defenses, however, are inapplicable to the case at hand.

The government first argues that "[p]articularly in an emergency, where the government action is part of an effort to reduce or mitigate *unavoidable* harms to the public, no viable taking claim exists." Def.'s Br. at 88 (citing *Miller v. Schoene*, 276 U.S. 272, 279-80 (1928)) (emphasis added). But that argument cuts against the defense, because the flooding at issue here was not an *unavoidable* harm. Defendant asserts that in the situation at hand, the Corps had little to no choice on how to act when Harvey hit, and that in an effort to protect lives, the Corps operated the project in accordance with the 2012 Water Control Manual. *See* Def.'s Br. at 89-90. That is, the Corps could open the gates and risk more severe downstream flooding or keep the gates closed, as it did, flooding upstream properties. When Harvey struck, it was true that certainly "the actions available to the government for dealing with the relevant emergency were constrained by the design of the dams and impoundments, the Corps' 2012 Water Control Manual, and the Corps' normal operating procedures." *See In re Upstream Addicks & Barker*, 138 Fed. Cl. at 669. But these constraints only existed because the Corps' design of the dams contemplated flooding beyond government-owned land onto private properties. "Thus, it was not that the government had to respond to Tropical Storm Harvey as an emergency that necessitated the flooding of private land," but rather that the government had made a calculated decision to allow for flooding these lands years before Harvey, when it designed, modified, and maintained the dams in such a way that would flood private properties during severe storms. *Id.* Defendant cannot now claim that this harm was unavoidable when it planned for years to impound floodwaters onto plaintiffs' properties.

Similar reasoning applies to the government's necessity defense. That defense rests on the notion that "in times of imminent peril—such as when fire threatened a whole community—the sovereign could, with immunity, destroy the property of a few [such] that the property of the many and the lives of many more could be saved." Def.'s Br. at 91 (quoting *TrinCo*, 722 F.3d at 1377). Three requirements must be met for the necessity doctrine to apply: (1) "actual emergency;" (2) "imminent danger;" and (3) "actual necessity of the [g]overnment action." *TrinCo*, 722 F.3d at 1379. That this case involved a severe tropical storm, and a record-breaking one at that, is not enough to infer an actual emergency. *See id*. at 1378 (rejecting this court's "decision to extend the doctrine of necessity to automatically absolve the [g]overnment's action in any case involving fire control"). Where, as here, the government is responsible for creating the emergency, granting the government immunity from liability under the necessity doctrine would "stretch[] the doctrine too far." *Id.* Further, the term "emergency," according to both common usage and definition, refers to "a state of things *unexpectedly arising*." *Emergency, Oxford English Dictionary*, https://www.oed.com/view/Entry/61130?redirectedFrom=emergency#eid (last visited Dec. 17, 2019) (emphasis added). The invasion alleged here was by no means unexpected—the Corps knew that when a severe storm like Harvey came, flooding beyond the extent of government-

owned land upstream would result, in light of the design of the dams and the plans for their operation. Thus, the necessity defense cannot apply here, because it cannot be said that "necessity" existed in this case, when the flooding that occurred was the direct result of calculated planning.

CONCLUSION

For the reasons stated, the court finds that the government's actions relating to the Addicks and Barker Dams and the attendant flooding of plaintiffs' properties constituted a taking of a flowage easement under the Fifth Amendment. Thus, the court finds defendant liable.[26]

Because liability and damages were previously bifurcated, a plan for addressing damages must now be put in place. The court proposes to adjudicate damages for five out of the thirteen test properties. To that end, the parties shall each propose three properties for consideration as to damages, thus providing to the court with a total of six candidates. The court will then select five test properties from the six properties proposed. Each party is requested to file with the court a notice detailing its three proposed test properties for damages and its respective arguments for selection of those properties as bellwethers by January 21, 2020.

It is so **ORDERED**.

s/ Charles F. Lettow
Charles F. Lettow
Senior Judge

[26]The court had previously deferred resolution of the government's earlier motion to dismiss, *see In re Upstream Addicks & Barker*, 138 Fed. Cl. at 672 (acting pursuant to RCFC 12(i), taking into account the fact-intensive inquiry involved). In light of the detailed post-trial findings of fact and conclusions of law in this decision, that motion to dismiss is DENIED.

Further, pursuant to the court's previously stated reasons, *see supra*, at 8 n.9, Pls.' Mot. to Reopen the Trial R., ECF No. 245, is GRANTED, subject to the inclusion of the sworn statement included in Def.'s Opp'n to Mot. to Reopen the Trial R., ECF No. 254. Also pending before the court is Def.'s Mot. to Correct [the Trial] Transcript, ECF No. 241. This motion is GRANTED as to those requests not opposed by plaintiffs, *see* Pls.' Opp'n to Def.'s Mot. to Correct [the Trial] Transcript, ECF No. 243, but the requests for correction opposed by plaintiffs are DENIED.

Corrected

In the United States Court of Federal Claims

Sub-Master Docket No. 17-9001L

(Filed: October 28, 2022)

**********	)	Taking via government-induced flooding of private property; post-trial decision on just compensation for six bellwether plaintiffs; text of flowage easement to be filed in pertinent title records of affected properties
IN RE UPSTREAM ADDICKS AND BARKER (TEXAS) FLOOD-CONTROL RESERVOIRS	)	
**********	)	
THIS DOCUMENT APPLIES TO:	)	
ALL UPSTREAM CASES	)	
**********	)	

Daniel H. Charest and E. Lawrence Vincent, Burns Charest LLP, Dallas, Texas, Charles Irvine, Irvine & Conner PLLC, Houston, Texas, and Edwin Armistead Easterby, Williams Hart Boundas Easterby, P.C., Houston, Texas, Co-Lead Counsel for Upstream Plaintiffs. With them at trial were Vuk. S. Vujasinovic, VB Attorneys, PLLC, Houston Texas, Lawrence G. Dunbar, Dunbar Barder, PLLC, Houston, Texas, and Amanda Klevorn, Burns Charest LLP, Dallas, Texas.

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OPINION AND ORDER

LETTOW, Senior Judge.

At issue are the financial consequences of flooding of private property located "upstream of the federally designed, built, and maintained Addicks and Barker Dams" and "within the Addicks and Barker Reservoirs;" that occurred when Tropical Storm Harvey ("Harvey") "doused Houston with an average of 33.7 inches of rain over a four-day period" in August 2017. *In re Upstream Addicks & Barker (Texas) Flood-Control Reservoirs*, 146 Fed. Cl. 219, 227 (2019). After Harvey, "hundreds of owners of 'upstream' properties," including the bellwether plaintiffs here, brought suit against the United States, claiming that its operation of the Addicks and Barker Dams resulted in "the government-controlled inundation of their properties" by Harvey

floodwater and constituted an uncompensated taking. *Id.* at 227-28. The Harvey flooding cases were initially consolidated into a single Master Docket for plaintiffs both upstream and downstream of the Addicks and Barker Dams. The Master Docket was subsequently divided into separate sub-master dockets for upstream and downstream properties. *Id.* at 228. The upstream cases were further bifurcated into liability and damages phases, and discovery on liability proceeded with a focus on thirteen bellwether plaintiffs. *Id*. Following disposition of motions, the case proceeded to a 10-day trial in May 2019 in Houston on the issue of liability. *Id.*

Thereafter, "the court found the United States liable to thirteen bellwether property owners under the Fifth Amendment of the United States Constitution for the taking of a non-categorical, permanent flowage easement on their properties as a result of government-induced flooding during Tropical Storm Harvey, produced by the government's construction, maintenance, and operation of the Addicks and Barker Dams." *In re Upstream Addicks & Barker*, 148 Fed. Cl. 274, 275 (2020) (citing *In re Upstream Addicks & Barker*, 146 Fed. Cl. 219).

With that decision in hand, the cases moved to discovery on just compensation. Of the thirteen test property plaintiffs at issue in the liability trial, the properties of six test plaintiffs were chosen for the just compensation phase. *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 275. The covid pandemic delayed trial preparations, but the necessary work was nonetheless completed and trial was held in Houston, Texas from May 31 to June 10, 2022. Post-trial briefing was undertaken, and a closing hearing was held on September 29, 2022. This decision follows.

FACTS[1]

A. Tropical Storm Harvey, Flooding, and the Liability Trial

Factual circumstances were critical to the court's liability determination. First, in response to a series of serious storms in the first half of the twentieth century, the United States Army Corps of Engineers ("the Corps") designed and built the Addicks and Barker Dams. The dams' purpose is to impound rainwater upstream to prevent flooding to downstream property in and around downtown Houston. *See In re Upstream Addicks & Barker*, 146 Fed. Cl. at 228-33. In constructing the dams, the Corps acquired land upstream of the dams to create reservoirs to hold impounded water but chose not to purchase enough property to accommodate the storage capacity of the dams' design. *Id.* The reservoirs are ordinarily dry but impound water during and after rain events. After the Corps constructed the dams, it decided to install gates at the dams in the 1940s and 1960s to control the release of impounded water from the reservoirs. *Id.* at 233-34; *see also* Tr. 1297:1-11 (Vail). Then, in the late 1970s the privately-held grazing pastures and rice fields on land upstream were replaced with housing developments. *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 234. Subsequently, the Corps conducted a study of

[1] This recitation of facts constitutes the court's principal findings of fact in accord with Rule 52(a) of the Rules of the Court of Federal Claims ("RCFC"). Other findings of fact and rulings on questions of mixed fact and law are set out in the analysis.

the Addicks and Barker dams and reservoirs, which disclosed "a dramatic increase to the maximum design spillway . . . and . . . a higher probable maximum precipitation value." *Id.* at 234-35. The Corps responded by strengthening and modifying the dams to reduce seepage and enhance stability, but it did not expand the government-owned reservoirs. *Id.* at 235-36. The Corps continued to conduct studies into the twenty-first century, recognizing "[t]he possibility of flooding lands in the reservoirs beyond the government-owned land," *id.* at 234, but "the Corps decided to take no action" to mitigate that upstream risk. *Id.* at 236-37.

When Hurricane Harvey arrived on August 25, 2017, and "stalled over the Houston metropolitan area for four more days," the Corps operated the Addicks and Barker Dams according to the design criteria, impounding water in the upstream reservoirs. *See In re Upstream Addicks & Barker*, 146 Fed. Cl. at 240-41. The Corps' official operating procedures for the dams provided that the dam gates be operated in a controlled manner to prevent flooding downstream, even when such operation would flood upstream private property beyond the government-owned land. *Id.* Accordingly, during Hurricane Harvey, "[t]he flood pools in the reservoirs crested at a record pool elevation of 101.6 feet in Barker and 109.1 feet in Addicks on August 30, 2017," flooding private property. *Id.* at 241.

This flooding damaged the houses and property of bellwether test plaintiffs Todd and Cristina Banker, Elizabeth Burnham, Scott Holland, Christina Micu, Catherine Popovici, and Kulwant Sidhu. The Bankers' home—located at 4614 Kelliwood Manor Lane, Katy, Texas—experienced 1.1 feet of flooding that remained in the home for four days. *See In re Upstream Addicks & Barker*, 146 Fed. Cl. at 241. Ms. Burnham's home—located at 15626 Four Season Drive, Houston, Texas—experienced approximately four to five feet of flooding, which persisted at least seven days. *Id.* at 241-42. Mr. Holland's home—located at 1923 Wingleaf Drive, Houston, Texas—experienced 1.5 feet of flooding that lasted three and a half days. *Id.* at 242. Ms. Micu's home—located at 6411 Canyon Park Drive, Katy, Texas—had approximately two feet of flooding, which "was present in the home for about ten days." *Id.* Ms. Popovici's home—located at 19927 Parsons Green Court, Katy, Texas—experienced no flooding inside the residence, but water came "within a couple inches of entering" the home, damaged the garage, Tr. 799:17-23 (Popovici), and was on the property "between four and six days." *See In re Upstream Addicks & Barker*, 146 Fed. Cl. at 243.[2] Mr. Sidhu had two test properties at issue in the liability and just compensation trials, both condominiums located at 16111 Aspenglenn Drive, Houston, Texas. *Id.* One unit was located on the ground level and experienced 2.4 feet of flooding for around four and one-half days, while an upstairs unit did not suffer any flooding. *Id.*

Following the court's liability opinion, the parties asked the court to clarify the date and physical scope of the government's taking, which the court did on April 30, 2020. *See In re Upstream Addicks & Barker*, 148 Fed. Cl. at 275-78. That opinion specified that until Harvey, impounded water at the Addicks and Barker Reservoirs had only slightly exceeded government-owned land and minimally flooded private property, so the government's "physical invasion of plaintiffs' properties began on August 28, 2017[,] and 'crested at a record pool

[2] Citations to the trial transcript are cited as "Tr. _____ (Witness)." Citations to joint exhibits are shown as "JX___," plaintiff's exhibits are identified as "PX-JC___," or "PX-JC___(name)" specific test property exhibits include plaintiff's name and are marked as "name-JC," and defendant's exhibits are denoted as "DX___."

elevation of 101.6 feet in Barker and 109.1 feet in Addicks on August 30, 2017.'" *Id.* at 276-77 (quoting *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 241). The court therefore determined that the government's taking occurred on August 30, 2017. *Id.* at 277. It further concluded that because "no taking occurs until water enters the property," the extent of the government's easement corresponded to the peak flooding on August 30, 2017, not the dams' highest design pool level. *Id.* at 278.

B. The Just Compensation Trial

After the court resolved a series of discovery and procedural disputes, *see, e.g.*, *In re Upstream Addicks & Barker*, 152 Fed. Cl. 114 (2021) (addressing a discovery dispute), and 157 Fed. Cl. 189 (2021) (denying class certification), the just-compensation trial took place in Houston, Texas, from May 31 through June 10, 2022. At issue were the flowage easement's scope based on Corps policies and meteorological circumstances, the test properties' values, plaintiffs' personal property losses, an appropriate interest award, and whether the just compensation award should be reduced to reflect federal benefits plaintiffs received.

1. Scope of the easement.

The purpose and design of the Addicks and Barker Dams make the court-ordered easement necessary. Colonel Timothy Vail, the commander and district engineer for the Corps' Galveston district, testified that the dams' purpose is to impound water upstream before it flows downstream and floods downtown Houston. Tr. 1311:13-22 (Vail). Because the dams' storage capacity exceeds government-owned land, operating the dams as planned under certain meteorological conditions entails a risk to upstream private property, human health and safety, and public infrastructure. Tr. 1317:16 to 1318:8 (Vail). As the dams currently exist, the government can account for this risk to upstream properties from peak reservoir pool elevations only by acquiring an interest in the properties. *See* PX-JC773 at 8.

(a) Corps' policies regarding easements.

At trial, Paula Johnson-Muic and Timothy Nelson testified about the Corps' policies regarding easements, both in general and as applied to the court-ordered easement in this case. Ms. Johnson-Muic, the Corps' highest civilian authority on real estate issues across the United States, focused on the Corps' Real Estate Handbook and policies. *See* Tr. 136:10-13, (Johnson-Muic); JX1007. The Real Estate Handbook, published in 1985 and periodically updated thereafter, is a reference manual the agency uses when making real estate decisions, such as managing flowage easements. *See* Tr. 139:8-13 (Johnson-Muic). Mr. Nelson, the chief of the Corps' Real Estate Division within the Galveston District, related means of enforcing government property rights to land, including the land subject to the court-ordered permanent flowage easement in this case. Tr. 310:9-18, 364:12-16 (Nelson).

Under Corps' policy, as confirmed by Ms. Johnson-Muic's testimony, "[w]henever a plaintiff successfully prosecutes litigation which establishes that an interest in real property has been taken, the interest so taken should be confirmed in the form of a grant, wherever possible," and such "instrument should be recorded in the public land records and permanently retained in the real estate files as evidence of the interest taken." JX1007 at 5-71, ¶ 5-22; Tr. 143:8-24,

145:19-24, 147:24 to 148:6 (Johnson-Muic). By recording the instrument, the Corps notifies the public of the property interest acquired. Tr. 153:10-13 (Johnson-Muic). Nonetheless, she testified that the Corps sometimes does not record an instrument to memorialize such conveyances. Tr. 149:2-18, 157:3-13 (Johnson-Muic); *but see* Tr. 264:12-14 (Johnson-Muic) ("Q: The Corps policy calls for the recordation, correct? A: Yes."); JX1007 at 5-74, ¶ 5-24(e) (outlining the Corps' policy to record the judgment conveying a property interest in event that court does not issue a deed confirming the conveyance). The Corps retains the discretion to enforce its property rights. *See* Tr. 227:2-5, 232:13 to 233:1 (Johnson-Muic); *but see* PX-JC352 at 3, ¶ 6 (Corps Memorandum of May 10, 2019) ("Encroachments and trespasses of government real property shall be identified and resolved in a timely manner.").[3]

The easement here permits the Corps to store water during occasional flooding by the operation of the Addicks and Baker Dams and allows plaintiffs to continue lawful use of the property subject to the risk of occasional flooding. *See In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. Accordingly, the Corps understands the flowage easement here to be a non-standard or atypical easement because the fee owners of the burdened properties "retain the right to lawful use of their property" according to state and local laws, which includes human habitation and maintaining existing structures on the properties. Tr. 204:13-25, 296:7 to 297:9 (Johnson-Muic).

The Corps' understanding of "occasional flooding" as used to describe the easement here encompasses anything less than permanently inundating the burdened property. Tr. 166:18 to 167:7, 169:17-21 (Johnson-Muic). On this understanding, the court-ordered easement permits the Corps to flood burdened properties whenever operation of the Addicks and Barker Dams so requires, *i.e.*, when meteorological events threaten downstream properties and cause impounded waters to exceed the capacity of the government-owned property making up much of the reservoir. Tr. 174:9 to 175:2, 175:22 to 176:11, 184:11-25, 188:20 to 189:25 (Johnson-Muic).

The Corps may enforce its easement against any residual fee owner of burdened property who interferes with the government's rights as the dominant estate holder. Tr. 164:23 to 165:3 (Johnson-Muic). Specifically, Mr. Nelson testified that efforts to exclude floodwaters from upstream properties subject to the permanent flowage easement would be contrary to the Buffalo Bayou and Tributaries project's purpose and would encroach on the government's easement. *See* Tr. 361:14-25, 367:6 to 368:8 (Nelson). For example, the Corps could and would prevent a burdened property's owner from using fill or building a berm to reduce the risk of flooding. *See* Tr. 176:12-24 (assuming a standard easement), 194:18-21, 197:4-11, 200:24 to 201:7, 201:21 to 202:13 (Johnson-Muic) (indicating attempts to circumvent the easements' restrictions "may"

[3] Specifically, the Corps may protect its rights through litigation. Tr. 233:22 to 234:1, (Johnson-Muic); *see also* Tr. 305:11 to 306:25 (Johnson-Muic) (stating that litigation about the relationship between the Corps and the fee owner under an easement is "a real possibility"). The exercise of that discretion would turn on the Corps' technical and legal analysis of the potential encroachment and whether it would "substantially interfere" with the government's property rights under the easement. Tr. 279:14 to 280:8, 284:4-22, 290:2-17 (Johnson-Muic); *see also* Tr. 396:18 to 397:12 (Nelson) (describing Corps procedures governing engineering assessments of whether a potential encroachment impairs the project); JX1010 at 4, ¶ 1.6.3 (defining encroachment for Corps policy purposes).

constitute encroachment); JX1010 at 3, ¶ 1.5 ("It is the intention of the Corps to protect project authorized purposes . . . by preventing new encroachments."); JX1007 at 8-12, ¶ 8-24(b) (explaining that using landfill to alter an easement's contours "would be considered an encroachment") (citing *United States v. Fisher-Otis Co., Inc.*, 496 F.2d 1146 (10th Cir. 1974)); *but see* Tr. 212:13-25, 213:23 to 214:1, 215:6-17 (Johnson-Muic) (explaining that JX1007 at 8-12, ¶ 8-24(b) predates the atypical easement in this case and could be interpreted to apply only to standard easements).

(b) Meteorological factors.

The plaintiffs' primary expert on meteorological developments and the likelihood of flooding was Dr. Philip Bedient, an engineering professor at Rice University who researches hydrology, disaster management, and flood modeling and prediction systems. *See* PX-JC873 at 4. Dr. Bedient estimated "the frequency or chance of occurrence of flood stages within Addicks and Barker Reservoirs between . . . [g]overnment-[o]wned [l]and . . . and the maximum pool level reached during the Harvey 2017 storm event, and then used that information to provide estimates of the frequency and duration of various pool levels at each of the . . . [t]est [p]roperties." *Id.* at 2. Using stage level data provided by the Corps, Dr. Bedient estimated that the maximum flood pool stage observed during Harvey "approximates between a 35-year and a 100-year recurrence event, while the . . . pool stage [on government-owned land] approximates a 10-20 year recurrence event." PX-JC873 at 2-3; *see also* Tr. 1241:10-21, 1247:17 to 1248:1 (Bedient).

Mario Beddingfield, a hydraulic engineer for the Corps, testified that flooding beyond government-owned land would occur more frequently than the government had previously thought. Tr. 903:1-7 (Beddingfield). Mr. Beddingfield spoke to stage frequency analyses, the preparation of which he oversaw when the Corps created a provisional 2019 Water Control Manual. Tr. 905:22 to 906:3 (Beddingfield). The pool elevation levels in the prior version of the Manual from 2012 were based on an approximately 30-year period of record back to the early 1980s, a period in which the highest precipitation event was a 1992 storm that peaked at a level of 93.6 inches of water behind the Addicks and Barker Reservoirs. Tr. 908:2-6, 933:5 to 934:20 (Beddingfield). Since that time, Mr. Beddingfield testified that changed conditions—*i.e.*, a boom in urbanization and increasingly frequent and severe storms—have caused more water to accumulate at times in the Addicks and Barker Reservoirs. Tr. 942:6 to 951:20 (Beddingfield); *see also* Tr. 1303:10-18 (Colonel Timothy Vail) (confirming that the Corps has received information from the National Oceanic and Atmospheric Administration indicating increased "frequency and intensity of rainfall events"). The 2019 Manual does not account for these changed conditions. Tr. 952:3-19 (Beddingfield). According to Mr. Beddingfield, accounting for these developments leads to higher storm and runoff levels and an overall higher frequency curve than those presented in the 2019 Manual. Tr. 969:1 to 980:25 (Beddingfield); *see also* JX1021A and JX1021B (demonstrative exhibits representing a higher frequency curve that includes the top ten storms, including Harvey). Mr. Beddingfield testified that this adjusted curve would "approximately" place the Harvey event between a 20- and 50-year event. Tr. 987:5-11 (Beddingfield). Mr. Beddingfield also testified that each test property is within the 20- to 50-year flood event frequency, except for Ms. Micu's home which is within a 10-20-year flood event frequency. Tr. 990:2 to 992:21 (Beddingfield).

The government called Dr. John England, a lead civil engineer in the Corps' Risk Management Center and expert in flood hydrology, to rebut Dr. Bedient's analysis. *See* Tr. 2490:3 to 2491:1 (England). Dr. England's rebuttal consisted of two main criticisms. First, Dr. England opined that Dr. Bedient's report did not follow industry best practices. Tr. 2531:18 to 2534:16 (England). Second, Dr. England opined that Dr. Bedient used a small data set to produce an estimate of flood frequency. Tr. 2528:3 to 2532:24 (England). Dr. England also testified that Dr. Bedient's report looked only at elevation data but ignored storage capacity data specific to the Addicks and Barker Reservoirs. Tr. 2518:18 to 2519:21 (England). In Dr. England's opinion, these errors caused Dr. Bedient to reach a flood frequency estimate five times more frequent than his own estimate. Tr. 2529:16-19, 2533:25 to 2534:2 (England).

Dr. Barry Keim, a professor at Louisiana State University specializing in precipitation frequency analysis, challenged Dr. Bedient's conclusions concerning rainfall frequency. Tr. 2577:13 to 2580:1 (Keim). Dr. Keim criticized Dr. Bedient's data set and methods, opining that Dr. Bedient's estimated frequency of a Harvey-like flood event over the Addicks and Barker reservoirs was too frequent to be the result of proper analysis. *See* Tr. 2610:9-19 (Keim). For example, Dr. Bedient's analysis considered the total rainfall from several storm events, rather than only the rainfall from each of those storms that fell specifically on the reservoirs. Tr. 2596:17 to 2601:18 (Keim). Moreover Dr. Bedient's data set did not include storms before the 1970s. Tr. 2606:18 to 2607:5 (Keim). A longer period of record, according to Dr. Keim, would produce more accurate results that are closer to the government estimates of the frequency of Harvey-like flood events. Tr. 2607:8-19; 2612:5-15 (Keim).

Mark Glaudemans, branch chief over the Water Resources Services Branch of the National Weather Service, likewise defended the government's current precipitation frequency estimates. Tr. 2029:12 to 2031:9 (Glaudemans). Specifically, he testified that the National Oceanic and Atmospheric Administration ("NOAA") estimates that the frequency of a 33-inch rainfall over the Addicks and Barker Reservoirs is 1-in-1000 years. Tr. 2045:3-10 (Glaudemans).[4] NOAA's estimate includes Harvey data as well as data from sources that, in some instances, date back 150 years and correlate records gathered from hundreds of recording stations over 120 years. Tr. 2031:6-9, 2035:22 to 2037:24 (Glaudemans); DX1339 at 15. Nonetheless, the data NOAA used were not adjusted to reflect the upward trend in rainfall observed over the last two decades as distinct from the broader 150-year period. Tr. 2048:25 to 2051:3 (Glaudemans). Mr. Glaudemans also acknowledged that at least two storm events within two years of each other have exceeded NOAA's estimate for 1,000-year events, *i.e.*, both Hurricane Harvey in 2017 and Tropical Storm Imelda in 2019 produced over 40 inches of rainfall. Tr. 2060:11 to 2064:17 (Glaudemans).

[4] These estimates are contained in NOAA Atlas 14, which estimates the precipitation frequencies of various locations. Tr. 2035:6-21 (Glaudemans).

2. Appraisal of test properties.

Real estate appraisers determine a subject property's value by determining its best use and analyzing its characteristics and aspects of the relevant market. *See* PX-JC156 (Interagency Land Acquisition Conference, *Uniform Appraisal Standards for Federal Land Acquisitions* ("Yellow Book") at 8, § 1.1 (2016). The Yellow Book outlines the standards for developing "an opinion of market value that can be used to determine just compensation under federal law." *Id.* at 3, § 0.1. Here both parties have adopted appraisal approaches outlined in the Yellow Book.

The Yellow Book requires appraisers to apply the before and after rule to determine just compensation. This approach measures the difference between the parcel's before-taking value and its after-taking value. Yellow Book at 17, § 1.2.7.3.4. The Yellow Book identifies three approaches to valuing land: (1) the sales comparison approach, (2) the cost approach, and (3) the income approach. *Id.* at 26-35, §§ 1.5.2-1.5.4.

The sales comparison approach is "normally the preferred method of valuation." Yellow Book at 26, § 1.5.2. Appraisers applying this approach identify "sales of properties with the same highest and best use as the subject property that are as close in proximity" and as close to the time of the taking as possible. *Id.* Each sale is then adjusted to account for differences between the comparable and subject properties. *Id.* Next, the resulting "sales data is [*sic*] reconciled to a final opinion of market value." *Id.* The sales comparison approach requires that comparable sales be between "willing and reasonably knowledgeable buyers and sellers." *Id.* at 95, § 4.2.1.3 (emphasis omitted). To qualify, buyers and sellers need not be "all-knowing." *Id.*

Under the cost approach, the land's market value, separate from the value of any improvements and typically determined according to the sales comparison approach, is added to the depreciated cost of reproducing or replacing improvements on the property. Yellow Book at 33, § 1.5.3. Replacement costs are estimated based on current, local market labor and material costs. *Id.* It is reduced to account for "depreciation from all causes." *Id.* at 34, § 1.5.3.1.2.

Finally, the income approach applies to income-generating properties. Yellow Book at 35, § 1.5.4. For rental properties, the income approach calculates the market rent by analyzing comparable leases and deducting operating expenses to determine the net operating income. *Id.* at 35-36 §§ 1.5.4.1-1.5.4.3.

Here, the parties disagree on both the before and after valuations. Regarding the before-taking values, the parties' primary disagreement concerns the selection of comparable properties and whether to make quantitative or qualitative adjustments to account for any differences from the subject properties. *See* Def.'s Post-Trial Mem. at 17-19, ECF No. 570. Their disagreements on the after-takings valuation are more fundamental. The parties debate whether the market is aware of the flowage easement, and, as a result, whether a direct sales comparison methodology can be applied at all. They also disagree on how to account for subsequent repairs and renovations and whether just compensation should be limited to the flooding actually caused by the Addicks and Barker Dams, as distinct from flooding that would have occurred if the dams were never built. *See* Pls.' Post-Trial Resp. at 72-73, ECF No. 571.

(a) Plaintiffs' valuations.

Two experts estimated the before-taking and after-taking values of the test properties for the plaintiffs, and a third estimated the diminution percentage.

Timothy Archibald and Matthew Deal estimated the test properties' before-taking values using the sales comparison approach. Both determined that the Sidhu properties were best used as condominium projects and that the other properties were best used as single-family residences. *See generally* PX-JC877, 878, 880-884 (Archibald appraisals); PX-JC886-891 (Deal appraisals). For the Sidhu condominium units, Mr. Archibald and Mr. Deal each provided estimates under the income approach as well. *See* PX-JC883 at 25-28, PX-JC884 at 24-27 (Archibald); PX-JC890 at 42-43, PX-JC891 at 42-43 (Deal).

The plaintiffs contend that the market is unaware of the flowage easement and, accordingly, that no direct comparison of sales can be used to determine the bellwether properties' after-taking value. *See* Pls.' Pre-Trial Mem. at 16, ECF No. 466. Plaintiffs stress the distinction between market awareness of a flood risk and market awareness of a flowage easement because an easement grants dominant estate rights, including the right to prevent mitigation efforts and the right to store water inside structures. *See* PX-JC1025 at 7 (identifying eleven significant differences between flowage easements and flood risks); *see also* Pls.' Post-Trial Br. at 14, n.49, ECF No. 568 (arguing that the easement "prohibit[s] the property owner from interfering with the government's use of the easement").

As evidence that the market is unaware of the flowage easement, plaintiffs rely on the lack of activity in the title insurance industry, the dearth of public-facing Flood Insurance Rate Maps ("FIRMs") demarcating the Harvey flood pool, and property sellers' general failure to disclose the existence of an unrecorded easement in state-required disclosure forms.

Mr. Robert Philo, a real estate attorney who has worked in the title insurance industry for more than 40 years, Tr. 434:23 to 435:9 (Philo), testified that the title insurance industry is unaware of the court-ordered easement. Tr. 462:3-19 (Philo). He averred that if the industry were aware, there would be several observable responses. For instance, some buyers would opt out of sales after learning of the easement, Tr. 469:3-7 (Philo), and title insurance companies would likely take exception to the easement—meaning they would not cover financial losses the easement inflicts, Tr. 470:23-471:5—causing lenders to stop issuing mortgages, increase interest rates, Tr. 481:22-482:19, or demand a higher down payment for encumbered properties. Tr. 487:20 to 488:6. Mr. Philo testified that none of these downstream effects has occurred, so the title industry is unaware of the easement. *See* Tr. 462:15 to 463:4 (Philo).

Moreover, FEMA (Federal Emergency Management Agency) and Harris County officials, who collaborate on FIRMs that demarcate flood pools, *see* Tr. 740:18 to 742:10 (Wanhanen), averred that the FIRM maps showing the Harvey flood pool had not been made public. *See* Tr. 726:6 to 727:11 (Wanhanen); Tr. 530:16-21 (Hahn). Corps employees indicated that "multiple sources" had asked the Corps to include reservoir inundation limits on public-facing FIRMs. JX1078; *see also* Tr. 560:6-15 (T. Ward). These sources also reminded the Corps that FIRMs are "the main source residents use for flood risk information for their property." PX-JC371. But FEMA's public-facing maps nonetheless do not show the Harvey flood pool. Tr. 530:16-21 (Hahn).

Additionally, one of plaintiffs' appraisal experts, Dr. Randall Bell, testified that an unrecorded easement was disclosed on only three of 1,288 seller's disclosure forms for properties sold within the Harvey flood area between September 1, 2019 and October 31, 2021. *See* PX-JC1025 at 22-23; Tr. 2790:22 to 2793:13 (Bell). Nine sellers related the property was in a flood way, 68 that the property was in a reservoir, and 71 that the property was in a flood pool. *See* PX-JC1025 at 22-23; Tr. 2793:15 to 2796:14 (Bell). According to Dr. Bell, these seller's disclosures are a place to go to determine market awareness "[i]f you had an authentic interest in understanding the level of market knowledge," and these low reporting numbers indicate the market is largely unaware of the easement. Tr. 2797:1 to 2799:2 (Bell).

Plaintiffs' after-market appraisals also accounted for repair costs. Matison Construction Estimating and DeFacto Consulting Group provided estimates for plaintiffs. DeFacto estimated repair costs for the Banker, Burnham, Micu, and Sidhu unit 603 test properties. *See generally* PX-JC1113 (Banker); PX-JC1114 (Burnham); PX-JC1115 (Micu); and PX-JC1116 (Sidhu 603). DeFacto's estimate relied on the government experts' scope of work, dimensional information, and quantity of materials. Tr. 1782:2 to 1783:16 (Lozos); *but see* Tr. 2444:9-16 (McReynolds) (indicating these scopes of work were general, and plaintiffs' experts had to fill in the details). These figures were accepted during the liability phase.[5] DeFacto then used the "published cost data for the area immediately after . . . Harvey" to determine material costs. Tr. 1782:2-9; *see also* Tr. 1786:3-16 (Lozos) (describing the Xactimate tool that gathers and publishes costs by zip code on a monthly basis). Matison followed a similar approach but arrived at somewhat different estimates.[6]

Aside from specific cost estimates for restoring the test properties, the Internal Revenue Service (IRS) published Revenue Procedure 2018-09 to help individuals calculate the financial loss Hurricane Harvey inflicted upon personal-use residential property. Rev. Proc. 2018-09, 2018-02 IRB 290. When one's property is damaged, a taxpayer can reduce his or her taxable income by the amount of damages. *See* 26 U.S.C. §§ 165(a), (h). IRS procedure 2018-09 provides tables taxpayers can use to calculate a safe harbor number by which they can reduce their taxable income. Rev. Proc. 2018-09, 2018-02 IRB 293. These tables allow a taxpayer to calculate their deduction without obtaining appraisals or contractor estimates of the property damage they suffered. Tr. 886:18 to 887:8 (Ward).[7]

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[5] Plaintiffs called Mr. Timothy Lozos as an expert to testify regarding the cost of repairing the plaintiffs' flooded real property structures. He calculated the costs of remediating the Banker structures to be $166,740.29, PX-JC1113 at 40, the Burnham structures to be $106,777.59, PX-JC1114 at 21, the Micu structures to be $121,908.83, PX-JC1115 at 32, and Sidhu unit 603 to be $49,101.09, PX-JC1116 at 19.

[6] The plaintiffs' did not call a witness to testify to the truth of the Matison expert reports, so they were excluded. Tr. 1708:21 to 1710:13. The court did, however, permit Mr. Deal to rely upon those estimates. Tr. 1710:8-13 (court).

[7] Donald Ward, a lead appraiser with the IRS, was called by plaintiffs to testify regarding the development of the Cost Index Per Square Foot tables published in Revenue Procedure 2018-09 and, more specifically, the data used to develop the values in the "Texas" columns in that procedure and a Memorandum captioned Hurricane Harvey & Irma Disaster Area—Casualty

Mr. Sidhu provided evidence of the actual costs associated with repairing the condominium units following Harvey. *See* JX1172; Sidhu-JC83 at 964-967. Repairs and lost income amounted to $29,504.11 for the downstairs unit and $1,194.99 for the upstairs unit. JX1172.

In the after-taking analysis, both Mr. Archibald and Mr. Deal concluded that the best use of the Banker, Burnham, Micu, and Popovici properties, and the Sidhu upstairs condominium, was residential. Tr. 1533:17 to 1534:5 (Deal); Tr. 1992:16 to 1993:15 (Archibald). Mr. Archibald also deemed the best use of the Sidhu downstairs condominium to be residential, Tr. 1992:16 to 1993:15 (Archibald), while Mr. Deal deemed its best use to be speculative because the estimated repair costs exceeded his appraisal of its before-taking value, Tr. 1534:6-24 (Deal).

As a result of positing that the market remains unaware of the easement, plaintiffs' after-taking appraisals were not based on a direct sales comparison. *See, e.g.*, PX-JC877 at 30 (Archibald) (indicating no comparable sales could be located because "the market has no notice of the government's right to 'occasionally' inundate the properties"); PX-JC886 at 23 (Deal) ("We performed an exhaustive search and were unable to confirm transactions of comparable single-family residential properties similarly encumbered."); PX-JC897 at 105 (Bell) ("[T]here is a lack of general awareness regarding the flowage easement.").

Mr. Archibald instead referenced data and studies on how flooding and flowage easements affect property value. *See, e.g.*, PX-JC881 at 33. Mr. Archibald consulted a chart devised by Donald Sherwood to determine the diminution in value attributable to the flowage easement itself. *Id.* at 33-34. He then considered the repair cost estimates submitted by DeFacto and Matison to assess the total diminution to property value in the after-taking, uncured condition. *Id.* at 35-36. He concluded that the government's taking caused a diminution in the fair market value between 85-95% in the single-family home properties that experienced structural flooding—the Banker, Burnham, and Micu residences. *Id.*; *see also* Pls.' Pre-Trial Mem. at 24. He concluded that the Sidhu downstairs unit's entire value had been taken and applied a 99% diminution factor. PX-JC883 at 33. Even though the upstairs unit was not flooded, he applied a 51% diminution factor because the flowage easement burdened common areas of the condominium complex. PX-JC884 at 36. Because there was no structural flooding on Ms. Popovici's property and only 55.9% of her property was subject to the flowage easement, Mr. Archibald applied a diminution factor of 51%. Pls.' Pre-Trial Mem. at 24, PX-JC882 at 28-34.

For the Sidhu condominiums, Mr. Archibald also applied this diminution factor to his before-taking figures under the income approach. PX-JC884 at 36.

Loss Determination and a spreadsheet titled Hurricane Safe Harbor Calculations 09/2017.xlsx. *See* DX1990 at 2. Safe Harbor provisions allow taxpayers to calculate tax deductions using a standardized formula. Tr. 887:2-8 (Ward). This cost index table helps individuals calculate the Harvey-related losses that the taxpayer can deduct from his or her taxable income.

Mr. Archibald calculated Mr. Holland's leasehold interest to be $3,300 by multiplying Mr. Holland's leasehold advantage[8] by six—the number of months remaining on his lease. Pls.' Pre-Trial Mem. at 25.

Mr. Deal also did not base his after-taking appraisals on a direct sales comparison. Instead, he first determined the maximum value remaining after the taking based on various market studies, a literature review, and research in reservoir databases. *See, e.g.*, PX-JC888 at 17; PX-JC889 at 17-18; PX-JC890 at 15-16. He then determined the immediate compensable damage to improvements on the test properties under a modified sales-comparison approach and a cost-comparison approach. Under the modified sales-comparison approach, Mr. Deal analyzed diminution in value suffered by comparable properties that were sold in an un-remediated state. *See, e.g.*, PX-JC886 at 83-84 (Banker); PX-JC887 at 84-86 (Burnham); PX-JC888 at 79-82 (Micu); PX-JC889 at 77-79 (Popovici); PX-JC890 at 79-81 (Sidhu 603); PX-JC891 at 80-82 (Sidhu 604). In the cost-comparison approach Mr. Deal considered the construction cost estimates submitted by Matison Construction Estimating and DeFacto Consulting Group, and, as a third alternative, generated safe harbor numbers using Revenue Procedure 2018-09. *See, e.g.* PX-JC886 at 85-86 (Banker); PX-JC887 at 86-88 (Burnham); PX-JC888 at 83-85 (Micu); PX-JC889 at 79 (Popovici);[9] PX-JC890 at 81-83 (Sidhu 603).[10]

Mr. Deal then selected a figure within the cost range established by these measures and subtracted it from the maximum market value remaining after the taking to determine the diminution value. *See, e.g.*, PX-JC886 at 86-87 (Banker); PX-JC887 at 87-88 (Burnham); PX-JC888 at 84-85 (Micu); PX-JC889 at 79-80 (Popovici); PX-890 at 83 (Sidhu 603); PX-891 at 82 (Sidhu 604). Mr. Deal testified that the Banker home diminished by 66%, PX-JC886 at 87, the Burnham property by 91%, PX-JC887 at 88, and the Micu home by 77%, PX-JC888 at 85. *See also* Pls.' Pre-Trial Mem. at 23. Mr. Deal's market research led him to conclude that the Corps' easement diminished the Popovici property's value by 17%. PX-JC889 at 80. Mr. Deal found diminutions in value of 94% and 17% for Sidhu units 603 and 604, respectively. PX-JC890 at 83; PX-JC891 at 83.

Dr. Randall Bell, a licensed real estate appraiser, computed a diminution percentage. Tr. 1821:15 to 1822:18. Dr. Bell determined that "market resistance" to purchasing a property with

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[8] Mr. Archibald used Mr. Holland's leasehold advantage, $550, because he determined that Mr. Holland's monthly rental payment, $1,200, was under-market, which Mr. Archibald determined to be $1,750. Tr. 1948:6 to 1949:14 (Archibald).

[9] For the Popovici structures Mr. Deal considered only the estimate submitted by Matison.

[10] Because the cost estimate for repairs to the Sidhu downstairs unit "far exceed[ed] the Maximum Remaining Market Value of the property," Mr. Deal found the taking resulted in a complete economic loss of the improvements and determined the after-taking value by applying Mr. Sidhu's and his sister-in-law's 0.9% undivided interest appurtenant in 603 to the land's value after the taking. *See* PX-JC890 at 81-83.

a flowage easement caused between 85% to 100% diminution in value. Tr. 1847:6-11 (Bell).[11] To reach this value, he conducted a literature review, market surveys, and a case study analysis, reviewed the Corps' valuation of the flowage easement, and consulted a chart prepared by the International Right of Way Association that determines an easement's effect on property value. PX-JC897 at 8-9; Pls.' Pre-Trial Mem. at 20-21; Tr. 1833:12 to 1834:9 (Bell). Dr. Bell testified that this rate applied equally to the Sidhu condominiums and regardless of whether the property was partially or fully flooded. PX-JC897 at 140. Plaintiffs then applied this diminution to Deal and Archibald's before values. Pls.' Pre-Trial Mem. at 21.[12]

Below is a table summarizing plaintiffs' valuations. Because Dr. Bell did not provide an after-taking estimate, the upper end of the ranges for Bell were determined by applying his diminution to the higher of Mr. Archibald and Mr. Deal's before-taking estimates.

Banker			
	Before	Diminution	After
Archibald	$560,000	85-95%	$28,000-84,000
Deal	$530,000	66%	$181,000
Bell	NA	85-100%	$0-84,000
Burnham			
	Before	Diminution	After
Archibald	$180,000	85-95%	$9,000-27,000
Deal	$180,000	91%	$17,000
Bell	NA	85-100%	$0-27,000
Micu			
	Before	Diminution	After

[11] Dr. Bell used a range because at the time of his report "the specific language of the flowage easement [wa]s unknown." PX-JC897 at 9.

[12] Colonel Timothy Vail testified about statements he made during public presentations regarding the Corps' studies of the Addicks and Barker dams and proposed solutions to eliminate the threat of flooding upstream properties. Tr. 1330:21 to 1331:4 (Vail). Slides displayed during one of these public presentations on October 15, 2020 depicted the probable maximum flood area upstream from the Addicks and Barker dams and the extent to which that area went beyond land owned by the government. *See* PX-JC773. Ms. Popovici testified that during the October 15, 2020 presentation "a gentleman in uniform" stated that the "impact of a flowage easement on the value of your property . . . [is] about 90 percent of the local land cost." Tr. 810:20 to 811:14 (Popovici). Colonel Vail testified that he spoke during this presentation, Tr. 1390:6-9 (Vail), but did not recall whether he averred that the value of a flowage easement was equal to 90 percent of the property value. Tr. 1391:14-22 (Vail).

Archibald	$270,000	85-95%	$13,500-40,500
Deal	$290,000	77%	$68,000
Bell	NA	85-100%	$0-43,500
Popovici			
	Before	Diminution	After
Archibald	$655,000	51%	$321,000
Deal	$625,000	15%	$516,250
Bell	NA	85-100%	$0-344,000[13]
Sidhu 603 Downstairs			
	Before	Diminution	After
Archibald	$53,000-54,000	99%	$530-540
Deal	$50,500	94%	$3,156
Bell	NA	85-100%	$0-8,100
Sidhu 604 Upstairs			
	Before	Diminution	After
Archibald	$53,000-54,000	51%	$26,000-26,500
Deal	$50,500	17%	$41,900
Bell	NA	85-100%	$0-8,100

(b) The government's valuation.

The primary difference between plaintiffs' and defendant's valuations arises from defendant's decision to conduct a direct sales comparison to determine after-taking property values based on its view that the market's awareness of the flood risk is sufficient notice of the flowage easement to render post-Harvey sales comparable. DX1001 at 11775-76, ¶¶ 39-40.

In evaluating the test properties' before-taking values, Mr. Frank Lucco compared each to comparable single-family properties in the same or relevantly similar subdivisions or neighborhoods with a similar area of above-grade, finished living space and a similar lot size that sold between August 31, 2016 and August 30, 2017. *See* DX1002 at 11215-16 (Banker), DX1003 at 11321-22 (Burnham), DX1004 at 0011443-44 (Micu), and DX1005 at 11552-53 (Popovici). For the Sidhu condominiums, Mr. Lucco searched for sales between August 31, 2014 and August 30, 2017 and included two comparable sales from before this period "[d]ue to the limited number of condominium sales in the subject[s'] market" and other similarities with

[13] Plainitffs reached this figure by applying Mr. Bell's diminution (85%) only to the portion of the Popovici property burdened by the flowage easement (55.9%), *i.e.*, after value = before value – (before value x 0.85 x 0.559). *See* Pls.' Post-Trial Br. at 35, n.135. While plaintiffs only apply the revised version of Mr. Bell's formula to the before values from Mr. Deal, the court believes this is in error and applies it to Mr. Archibald's before value to obtain the range in the table.

the Sidhu properties. DX1006 at 11623-37 (Sidhu Unit 603); DX1007 at 11708-22 (Sidhu Unit 604).

To ensure the comparisons were precise, Mr. Lucco then adjusted his valuation where appropriate to reflect differences in the comparable sales he selected or, alternatively, explained why no adjustment was necessary. *See, e.g.*, DX1005 at 11555-57 (Popovici) (considering, for example, adjustments reflecting differences in the room count, area of above-grade, finished living space that was air-conditioned, car storage, exterior amenities, and construction quality).

Defendant contends that the market is aware of "the conditions of the easement" because it knew of the flooding caused by Harvey and "the easement is based on the extent of actual flooding behind the dams during the Harvey event." *See* Def.'s Pre-Trial Mem. at 4-5, ECF No. 507. The government relies on publicly available maps of the Harvey flood pool, seller's disclosures, and social and news media coverage of the flooding. *See id.* at 19.

Mr. Lucco concluded the market was aware of the easement's conditions after surveying various sources "such as media reports, USACE reports and meetings, public meetings, litigation outreach, online resources, flood-related closures, professional knowledge, [p]laintiffs' [u]pstream takings claims, flood insurance, Multiple Listing Service (MLS) listings, and seller's disclosures." DX1001 at 11790-91, ¶ 66.

While plaintiffs focused on whether sellers checked the box on the disclosure form indicating the existence of an unrecorded easement, the government focused on whether sellers disclosed prior structural or property flooding, flooding caused by the failure or breach of a reservoir, or flooding caused by natural events elsewhere on the form. *See* Tr. 2820:10 to 2821:10 (Bell); *see generally* JX1127 (cataloguing local MLS listings). Indeed, many sellers of properties subject to the court's easement did indicate the property had flooded during Harvey without disclosing an unrecorded easement. *See, e.g.*, DX1676 at 49000; PX-JC1201 at 2-3 (disclosing previous structural and property flooding and that the unit flooded completely "from Addicks Reservoir overflow during Hurricane Harvey"); PX-JC1189 at 2-3 (disclosing flooding "due to hurricane Harvey aftermath" and "release [*sic*] of water from Barker Dam"). Defendant also produced MLS real estate listings containing information about flood history and risk. *See, e.g.*, DX1021 at 12800 (*E.g.*, "[t]his house was flooded during Hurricane Harvey."); *id.* at 12804 ("[H]ome did flood in Harvey due to reservoir and owner has mold remediation certificate.").

Moreover, public-facing maps of the Harvey flood pool were available on the Harris County Flood Control District website during and after Harvey. Tr. 556:22 to 557:14 (T. Ward). The maps illustrated which areas would be flooded depending on the water elevation in the Addicks and Barker Reservoirs. DX1356; DX1357; Tr. 632:11-24 (T. Ward). Maps depicting the flood pool were also published in the Texas Tribune less than two months after Harvey. *See* DX1080 at row 1500; Neena Satija and Kiah Collier, *Houston officials let developers build homes inside reservoirs. But no one warned buyers.*, The Texas Tribune (Oct. 12, 2017), https://apps.texastribune.org/harvey-reservoirs/.

Defendant also accounted for repair costs necessary to restore the test properties. Mr. John McReynolds estimated the repair costs under the government's estimated level of flooding that would have occurred even without the Addicks and Barker dams. He generated two sets of

figures, one that accounted for upgrades and depreciation and one that did not. *See* DX1097 at 12156-58.

In formulating his opinions, Mr. McReynolds first determined each property's condition "immediately prior to the loss" and the reasonable repairs necessary to restore the property to that condition. Tr. 2415:13-22 (McReynolds). Mr. McReynolds entered this scope of work into Xactimate to estimate the price of materials at the time the work would be performed. Tr. 2416:16-25 (McReynolds). Finally, before writing his report, Mr. McReynolds applied his professional judgment to adjust the resulting estimate to match unique features of the properties in question and account for economies of scale impacting the work to be performed. Tr. 2418:3-18 (McReynolds).

Defendant's after-taking valuation was also based on the direct sales comparison approach. Mr. Lucco provided an after-taking valuation for each property in its damaged condition. For the properties that suffered structural flooding—Banker, Burnham, Micu, and Sidhu—Mr. Lucco also estimated the after-taking value according to their repaired condition.[14] He used the same search parameters to select comparable properties but focused on sales occurring after August 30, 2017. *See* DX1002 at 11215, 11250 (Banker), DX1003 at 11321, 11375 (Burnham), DX1004 at 11443, 11487 (Micu), and DX1006 at 11623, 11649 (Sidhu 603).[15]

Except for the downstairs Sidhu unit discussed *infra*, Mr. Lucco determined the after-taking value for the properties in their damaged state by searching for comparable properties that had suffered similar flooding. *See* DX1002 at 11231 (Banker); DX1003 at 11345 (Burnham); DX1004 at 11462 (Micu); DX1005 at 11571 (Popovici);[16] DX1007 at 11734 (Sidhu 604). Each

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[14] Mr. Lucco did not calculate the after-taking repaired values of the Popovici and Sidhu upstairs properties because "there was no interior structural flooding of these properties requiring repairs." Def.'s Pre-Trial Mem. at 22. The government contends that the after-taking value should be assessed based on the properties in their damaged condition if structural repairs are deemed non-consequential and should be assessed based on the repaired condition if repairs are deemed consequential damages, which it urges must not be included in a just compensation award. Def.'s Post-Trial Mem. at 26, n.40.

[15] For both Sidhu units, Mr. Lucco also conducted an income approach analysis to assess the after-taking value of the properties as renovated. DX1006 at 11664 (Sidhu 603), DX1007 at 11749 (Sidhu 604). For the downstairs unit, the income approach yielded a range of $52,706-58,667, DX1006 at 11665, and for the upstairs unit, $48,094-53,533. DX1007 at 11750. While Mr. Lucco took the income approach estimates into consideration, he gave most weight "to the [s]ales [c]omparison [a]pproach as it best represents the actions of buyers and sellers in the marketplace." DX1006 at 11666, DX1007 at 11751.

[16] Because the Popovici property suffered site but not structural flooding except for the garage, Mr. Lucco looked for comparable sales for property that had "site flooding . . . as opposed to structure flooding." Tr. 2287:20 to 2288:3 (Lucco). Mr. Lucco testified, however, that he based this information on GIS mapping and aerial imagery and not on information from the listing agents for those comparable property sales. Tr. 2308:5 to 2310:8 (Lucco).

of these comparable properties for the Banker, Burnham, and Micu properties had also suffered structural flooding, and Mr. Lucco applied a seven dollar per square foot downward adjustment to the first floor living spaces to reflect the fact that comparable "sales of damaged properties reflect[ed] some work completed after flood waters receded, *e.g.*, removal of wet materials, such as sheet rock, insulation, flooring." *See, e.g.*, DX1002 at 11235 (Banker); DX1003 at 11351 (Burnham), and DX1004 at 11467 (Micu). For the Sidhu upstairs unit, Mr. Lucco made a deduction to account for a special assessment that condominium owners had to pay to cover damage to the common areas. Tr. 2290:16-23 (Lucco).[17] In appraising the Popovici property, Mr. Lucco considered "a small amount of repairs associated with the garage." Tr. 2285:15 to 2287:5 (Lucco).

Regarding the Sidhu downstairs unit's after-taking damaged value, in his view there were insufficient sales of comparable condominium units. DX1006 at 11669 (Sidhu 603). Accordingly, Mr. Lucco appraised the unit's value by deducting the estimated renovation costs from the after-taking renovated value. *Id.* at 11670. He estimated the property's renovation costs to be $40,000 by multiplying the costs Mr. Sidhu submitted by a factor between 1.5 and 2 times the repair costs to reflect the risk an investor would associate with a renovation project. *Id.*; *see also* Tr. 2292:21 to 2294:10 (Lucco) (describing how he calculated the after-renovated value).

The below table summarizes Mr. Lucco's appraisal conclusions:

	Before Value	**Diminution From After-Damage Scenario**	**After-Taking Damaged Value**	**Diminution From After-Repaired Scenario**	**After-Taking Repaired Value**
Banker	$510,000	48%	$265,000	13%	$445,000
Burnham	$175,000	60%	$70,000	none	$185,000
Micu	$260,000	40%	$155,000	6%	$245,000
Popovici	$605,000	1%	$600,000	n/a	n/a

[17] Plaintiffs also claim a $1,079.98 assessment for the special assessment the homeowners association (HOA) charged Mr. Sidhu for the downstairs unit, JX1172, but Mr. Sidhu testified that he received a $1,200 reimbursement from the HOA that was related to the special assessment. Sidhu-JC62; Tr. 1736:1-5 (Sidhu).

Sidhu Upstairs	$50,000	2%	$48,900	n/a	n/a
Sidhu Downstairs	$50,000	52%	$23,900	none	$63,900

3. Personal property and fixtures valuation.

Plaintiffs also request compensation for personal property damaged when the government took the permanent flowage easement. In general, plaintiffs calculate this amount by multiplying each item's replacement cost by a depreciation rate that accounts for how age affects the item's value over time. *See* PX-JC867 at 3. Plaintiffs each catalogued their personal property,[18] and their expert, Mr. Lozos, calculated and applied a depreciation rate. *See id.* at 2-4; Tr. 1773:20 to 1774:2 (Lozos). Mr. Lozos arrived at the depreciation value by referring to four different depreciation guides, including as his primary reference the Joint Military Industry Depreciation Guide. PX-JC867 at 4-7; 1774:11-19 (Lozos). He determined the actual cash value of the Banker personal property to be $90,592.34, Burnham to be $21,088.63, Micu to be $43,984.85, Popovici to be $7,193.41, and Holland to be $79,087.52.[19] PX-JC867 at 6; *see generally id.* App. II (itemizing personal property values and applying depreciation to determine award amount). Mr. Sidhu provides receipts for replacement appliances in the downstairs unit totaling $1,900.40. Sidhu-JC52; Sidhu-JC89.

Aside from arguing that plaintiffs' personal property losses are non-compensable consequential damages, the government contests plaintiffs' personal property valuation on various grounds. In general, the government argues that plaintiffs have failed to meet their burden of establishing losses and corresponding values for all the personal property claimed. Def.'s Post-Trial Mem. at 79. In particular, the government challenges plaintiffs' inclusion of various costs as personal property costs; plaintiffs' assertion that certain property was damaged by Harvey; and plaintiffs' valuation of expensive items. After adjusting for these costs, defendant contends the Bankers suffered $16,527.41 in personal property losses; Holland, $37,957.52; Micu, $42,184.85; and Popovici and Sidhu no compensable losses. *See id.* at 90. The government offers no adjustment to Ms. Burnham's total claimed personal property loss of $21,088.63. *See id.*

The parties contest whether landscaping constitutes personal property separate from real property. The Bankers claim $8,500 in yard landscaping and sod. PX-JC867 App. II at Banker

[18] Tr. 91:17-18 (Burnham) ("All of these items right here were owned by me."); Tr. 115:14-20 (Micu) (indicating all the personal property lost was shared with her husband).

[19] Elsewhere plaintiffs claim Mr. Holland suffered $91,837.52 in personal property loss, adding $12,750 for damage to his vehicles, Ms. Popovici $8,283.69, and Mr. Sidhu $4,195.31. *See* Pls.' Post-Trial Br. at 40.

1.[20] Ms. Popovici likewise provides two invoices, bearing 2020 dates, for landscaping services totaling $11,559.74. JX1170; JX1171.

The parties further disagree on whether the plaintiffs have proven that personal items were damaged by the taking, including above-flood-level property and the Popovicis' car, and whether Ms. Micu had an obligation to redeem rather than dispose of up to $1,800 in mutilated currency. Specifically, the Bankers claim $162.50 for a microwave located above the flood level, as well as a refrigerator valued at $285 that the Bankers did not have before Harvey. PX-JC867 App. II at Banker 1-2; Tr. 775:15 to 776:14 (Banker).

Ms. Popovici submits evidence that repairs to her garage door frame cost $806.11, JX1165, and repairs to the garage door's torque, part of the mechanism that opens the garage door, for $595.38, JX1167; Popovici Resp. to Req. for Admis. No. 14, ECF No. 534-36 Tab 40 at 5. Ms. Popovici further claims $2,390.97 for cleaning services performed on her home's heating, ventilation, and air conditioning system in November 2018. JX1168; *see also* 2019 Liability Trial Tr. 822:2-23 (Popovici) (testifying that the units themselves were not damaged by flooding).[21] In addition, Ms. Popovici seeks to recover $1,239.11 in repair costs associated with flushing brake fluid and replacing the starter in her Toyota Sequoia. JX1169; Tr. 824:25 to 825:18 (Popovici) (excluding from her claim $25.50 incurred for a state inspection). She testified that these repairs were made necessary because her husband drove the car off the property through flooded streets during Harvey. Tr. 824:13-24 (Popovici).

Ms. Micu's claims for damaged currency involve $1,000 in cash and a piggybank containing an unknown amount of additional money, which Mr. Lozos depreciated to $800. *See* PX-JC867 App. II at Micu 7, 9. In addition to lost cash, Ms. Micu also claims losses for "piles" of personal property that Ms. Micu disposed of without confirming whether the items were damaged during Harvey or salvageable. Tr. 112:17 to 113:12 (Micu).

The parties also contest whether plaintiffs have established the depreciated value of certain high-value items, namely antiques, heirlooms, and specialty items claimed by Mr. Holland and cars owned by the Bankers. Mr. Lozos testified that antiques "need more documentation than just what's claimed" but did not receive any supporting documentation for plaintiffs' antique claims. Tr. 1798:5-18 (Lozos). As a result, Mr. Lozos was unable to form an opinion on the antique status or depreciation applicable to plaintiffs' antiques. Tr. 1799:9-21 (Lozos); PX-JC867 at 5 ("[T]he determination of what is or isn't 'antique' is beyond the scope of this assignment.").

Mr. Holland claims damage to antiques, such as a dining hutch that he valued at $3,000, a dining room table and chairs valued at $5,000, a sterling silver set valued at $500, and a sewing machine valued at $1,500. PX-JC867 App. II at Holland 4, 6-7, 11. He also claims to have lost various specialty items including a Kiss Guitar signed by Paul Stanley valued at $1,000, a World Wrestling Entertainment championship belt valued at $450, and an original 1970's Star Wars

[20] The page numbering in PX-JC867 Appendix II starts over for each plaintiff. "Banker 1" refers to the first page in the section of Appendix II devoted to the Bankers' personal property claims.

[21] "2019 Tr." refers to the transcript of the 2019 liability trial in this case.

collection valued at $15,000. *Id.* He further claims $1,430 in items described as "Hobby" and "Art, Hobbies & Collectibles," and "Collections." Holland-JC28 at 155-56.

Mr. Holland seeks another $11,950 for a 2016 Kia Soul and $800 in repairs to his 1999 Ford F-150. Holland-JC28 Resp. to Written Dep. 59. These figures reflects the cars' ages and mileage. *Id.* Mr. Archibald determined the Kia Soul's retrospective value by speaking with an automobile broker, who in turn gathered price information from a dealership. Tr. 2003:12 to 2004:10 (Archibald). For his truck, Mr. Holland claims $300 for necessary supplies and $500 for ten hours of his own labor. Holland-JC28 Resp. to Written Dep. 59.

Mr. Lozos likewise did not apply a depreciation adjustment to the amounts the Bankers' claimed for each of their two cars, which were the cars' purchase prices. PX-JC867, App. II at Banker 1. The Bankers seek $38,117.43 for a Cadillac acquired in 2012 and $27,000.00 for a Murano acquired in 2010. *Id.*

4. Displacement costs.

The government's taking of a permanent flowage easement also displaced plaintiffs Banker, Burnham, Micu, and Holland from their homes. These plaintiffs lost the ability to occupy their homes and incurred costs associated with securing alternate housing. As part of their real property appraisals, Mr. Deal and Mr. Archibald estimated the test properties' monthly rental value. Both experts determined the test properties' monthly rental rate by comparing each to comparable rental transactions. Plaintiffs Burnham and Micu also provided lease agreements to establish the alternative housing costs they incurred.

After flooding caused the Bankers to evacuate their home, they lived with Mr. Banker's parents until they could safely return in the "last week of April or first of May." Tr. 763:2-10 (T. Banker). Mr. Deal estimated the monthly rental value of the Bankers' home to be $3,000, and Mr. Archibald estimated it to be $3,300. Pls.' Post-Trial Br. at 38.

Ms. Burnham evacuated her home on August 25, 2017 and never lived there again. Tr. 46:25 to 47:6 (Burnham). Ms. Burnham stayed with her now mother-in-law and in a hotel paid for by FEMA until she leased a new apartment on October 28, 2017. Burnham-JC38 at 133. She paid $161.29 to rent the unit for the remaining days in October, then $1,266.50[22] per month thereafter. *Id.* at 140. Ms. Burnham determined that she did not have the money to repair her home, so she sold it for $80,000 on February 5, 2018. *See* Burnham-JC94; Tr. 59:19-23 (Burnham). She moved out of the apartment she was renting and into her new home on April 14, 2018. *See* Tr. 58:25 to 59:2, 63:4-12 (Burnham). Mr. Deal estimated the monthly rental value of Ms. Burnham's property subject to the easement to be $1,500, and Mr. Archibald estimated it to be $1,700. Pls.' Post-Trial Br. at 38.

During Harvey, Ms. Micu sought refuge in a hotel in Dallas. Tr. 102:16-20 (Micu). When she returned to her home one to two weeks after Harvey, she realized she and her family could not move back in until the property was repaired. Tr. 102:21 to 103:15 (Micu). Ms. Micu relocated to a rental apartment from September 6, 2017 to August 31, 2018, when she and her

[22] This figure represents $1,250 per month in rent plus $15.00 in pet rent and a $1.50 monthly pest fee.

family returned to their home. Tr. 106:16 to 107:6, 123:5-8 (Micu). She paid $2,332.50 for the remainder of September 2017 and $2,799 for each month thereafter. Micu-JC19 at 4950. Mr. Deal estimated the monthly rental value of Ms. Micu's home to be $1,875 and Mr. Archibald estimated it to be $1,900. Pls.' Post-Trial Br. at 38.

Mr. Sidhu seeks to recover costs associated with re-leasing the condominium units and lost rent after Harvey displaced his tenants. For the upstairs unit, 604, Mr. Sidhu claims $127 in lost rent because Harvey displaced the tenant for a few days. JX1172.

Mr. Sidhu's claims for the downstairs unit, 603, are higher. Due to flooding caused by Harvey and subsequent renovations, the downstairs unit was unoccupied between September 1, 2017 and July 27, 2018. *See* Sidhu-JC62. He accordingly accounted for $7,183 (eleven months at $653 per month) in lost rent when calculating his damages. From this lost rent, Mr. Sidhu subtracts an HOA reimbursement of $1,200 and $129 for an "other adjustment." *Id.* To this ultimate net rental loss of $5,854, Mr. Sidhu adds $313.43 he paid in electric utilities that accrued while the unit was vacant, JX1172; Tr. 1738:11-21 (Sidhu), and $200 in fees he paid an agent to show the apartment to obtain a new tenant, Tr. 1739:3-7 (Sidhu). Finally, Mr. Sidhu claims $3,001.53 in travel, hotel, and food costs, $1,774.30 of which he incurred in traveling from his home in California to testify at the liability trial and the remaining $1,227.23 in traveling to Houston to oversee repairs to the unit. Tr. 1739:19 to 1740:22 (Sidhu).

5. Plaintiffs' FEMA benefits.

The federal government administers relief programs that help those affected by federally declared disasters. FEMA pays hotels to house individuals who are displaced, *see* Tr. 2694:12-21 (Glasschroeder), and issues direct payments to individuals for home repairs, critical needs (*i.e.*, life-sustaining items including food, first aid, and hygiene items),[23] and personal property assistance for repairs or replacement. *See, e.g.*, DX1288; DX1977. FEMA assistance is available when the President declares that a major disaster has occurred and federal assistance is needed to supplement efforts by state and local governments. *See* 42 U.S.C. § 5122. Individuals within the disaster zone are eligible if they are a U.S. citizen, noncitizen national, or a qualified alien, they register within the application period, and FEMA verifies their request for disaster-related damages. Tr. 2704:12 to 2705:19 (Glasschroeder). FEMA requires those within a special flood hazard area, as designated by FEMA, to obtain and maintain flood insurance on their property. *See* Tr. 2693:18 to 2694:7 (Glasschroeder). FEMA pays for the first three years of flood insurance. *Id.*

President Trump issued a disaster declaration (No. 4332) for the State of Texas on August 25, 2017. Plaintiffs Burnham, Micu, Banker, and Holland each received FEMA benefits. Ms. Burnham and her then fiancé received $27,957.65 in direct payments comprised of $4,618 in rental assistance, $19,060.06 for home repairs, and $4,279.59 for personal property repair and replacement. DX1288. FEMA also paid $7,897.50 directly to a hotel to provide Ms. Burnham transitional shelter. *Id.* Ms. Micu and her husband received $30,656.46 in direct payments: $500 for critical needs, $12,366 in rental assistance, $17,540.47 for home repairs, and $249.99 for a dehumidifier. DX1980. FEMA also directly paid a hotel $155.60 to shelter Ms. Micu. *Id.* The

[23] FEMA, *Individual Assistance Program and Policy Guide* 148 (January 19, 2019).

Bankers received $23,992.89 in direct FEMA payments: $21,256.89 for home repairs and $2,666 for two months of rental assistance. DX1287. Mr. Holland received $9,959.67 in direct payments: $500 for critical needs, $3,546 in rental assistance, and $5,913.67 to repair or replace personal property. DX1977. FEMA also paid $4,887.09 directly to a hotel to house Mr. Holland. *Id.*

Dan Leistra-Jones, the government's expert in economic and financial analysis, testified regarding "whether the plaintiffs received payments or benefits from the United States that relate directly to the losses they are claiming in this matter." Tr. 2718:25 to 2719:5 (Leistra-Jones). Mr. Leistra-Jones classified home repair assistance and miscellaneous assistance awards as offsets to plaintiffs' home repair costs; personal property assistance and critical needs assistance awards as offsets to plaintiffs' personal property losses; and rental assistance payments as offsets to their claimed displacement expenses. Tr. 2728:11-21 (Leistra-Jones).

C. Post-trial Procedures

At the conclusion of the just compensation trial, the court established a schedule for post-trial briefing and closing arguments, and the parties filed their post-trial briefs accordingly. The parties presented closing arguments on September 29, 2022 in Washington, D.C.

STANDARDS FOR DECISION

The Takings Clause of the Fifth Amendment provides that "private property [shall not] be taken for public use, without just compensation." U.S. Const. amend. V. A just compensation award must be "'just' both to an owner whose property is taken and to the public that must pay the bill[.]" *United States v. Commodities Trading Corp.*, 339 U.S. 121, 123 (1950). The proper measure of just compensation enforces this balance: the property owner "is entitled to be put in as good a position pecuniarily as if his property had not been taken. He must be made whole but is not entitled to more." *Olson v. United States*, 292 U.S. 246, 255 (1934). This measure "derives as much content from the basic equitable principles of fairness as it does from technical concepts of property law." *United States v. Fuller*, 409 U.S. 488, 490 (1973) (citations omitted). Just compensation is an "objective standard that disregards subjective values" ascribed by the owner. *United States v. 50 Acres of Land*, 469 U.S. 24, 35 (1984). The just compensation award includes interest that accrues from the date of the government's acquisition until the date of compensation. *See Tech. Coll. of the Low Country v. United States*, 147 Fed. Cl. 364, 367 (2020).

Just compensation is determined according to a before-and-after approach that gauges "the difference in the market value of the property taken before and after the taking." *Potts v. United States*, 130 Ct. Cl. 88, 91 (1954). In cases involving a partial taking, just compensation "may [also] include the diminished value to the remaining portion of land." *Ideker Farms, Inc. v. United States*, 151 Fed. Cl. 560, 607 (2020). The plaintiff must show the quantum of damages claimed "to a reasonable approximation." *Arkansas Game & Fish Comm'n v. United States*, 736 F.3d 1364, 1379 (Fed. Cir. 2013). Put differently, although damages must be shown "to a reasonable certainty," the plaintiff "need not prove the precise amount of damages." *Id.* Additionally, plaintiffs' damage calculation can be approximate if the defendant's "wrong… preclude[s] exact ascertainment of the amount of damages," but this approximation still must be

more than speculative. *Kestenbaum v. Falstaff Brewing Corp.*, 514 F.2d 690, 698 (5th Cir., 1975). A court "'confronted with conflicting evidence and relatively extreme valuations' from the plaintiff and the Government" may form a just compensation award independent from the parties' formulations. *Gadsden Indus. Park, LLC v. United States*, 956 F.3d 1362, 1372 (Fed. Cir. 2020), *cert. denied*, 141 S. Ct. 2795 (2021) (quoting *Otay Mesa Prop., L.P. v. United States*, 779 F.3d 1315, 1326 (Fed. Cir. 2015)).

"[N]ot all losses suffered by the [property] owner are compensable under the Fifth Amendment." *United States ex rel. Tennessee Valley Auth. v. Powelson*, 319 U.S. 266, 281 (1943). Specifically, no compensation is due for damage or destruction that is the "unintended incident of the taking of land." *Mitchell v. United States*, 267 U.S. 341, 345 (1925). Whether the loss is compensable turns on whether the loss is an "incidental or indirect consequence[] of a taking of other property" or a "direct product[] of the actual invasion or taking of the property involved." *R.J. Widen Co. v. United States*, 174 Ct. Cl. 1020, 1028 (1966). Accordingly, so long as the owner is deprived of a piece of property's use "not by a negligent act, but as the natural consequence of the deliberate, intended exercise of an asserted power," it makes "no difference" whether the property is personal or real property. *Causby v. United States*, 109 Ct. Cl. 768, 772 (1948). So too if a business or its assets are taken as a natural consequence of government action. *See Kimball Laundry Co. v. United States*, 338 U.S. 1, 14-15 (1949) (holding just compensation includes a business's "demonstrable loss of going-concern value," the value contributed by non-physical assets like management or client development skills); *Todd v. United States*, 155 Ct. Cl. 87, 98 (1961) (awarding plaintiffs the depreciated value of fishing equipment used in a fishing business conducted on property taken by the government).

Notably, a plaintiff injured by a taking is not entitled to double recovery. *See Innovair Aviation, Ltd. v. United States*, 83 Fed. Cl. 498, 502 (2008) (adopting one approach to valuing an asset because the other would "give Plaintiff a double award"); *Adams v. United States*, 230 Ct. Cl. 628, 631-32 (1982) (considering compensation the state government paid for easements on the same land that the federal government took "to avoid double recovery by plaintiffs"). "As the finding of any such offset results in the reduction of a just compensation award, the government bears the burden of proving the applicability of any alleged offsetting benefit and its amount." *In re Upstream Addicks & Barker*, 159 Fed. Cl. 512, 526 (2022). The government fails to carry this burden, for instance, if it provides only "a listing of the public benefits that flow from nearly all flood control projects." *See City of Van Buren v. United States*, 697 F.2d 1058, 1062 (Fed. Cir. 1983). The government must establish that the benefit arose "directly and proximately to the remaining land as a result of the public work on the part taken, due to the particular relation of the land in question to the public work." *Hendler v. United States*, 175 F.3d 1374, 1380 (Fed. Cir. 1999).

ANALYSIS

The court has held that the government's taking encompassed both "a permanent flowage easement" and "plaintiffs' personal property, fixtures, and improvements damaged or destroyed by [flooding attributable to Harvey]." *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. Accordingly, the court's just compensation award accounts for three categories of loss caused by the government's easement: (1) diminution in real property value including damage to attendant structures, (2) damage or destruction of personal property, and (3) dislocation costs. The first

two categories constitute just compensation for the taking itself, the last for dislocation that was the direct and natural result of the government's physical taking.

In the foregoing analysis, the court first determines the extent to which the government's easement diminished the value of plaintiffs' real property. This valuation is a factor of the easement's scope, the likelihood of future flooding under the easement, and the cost of repairing damage to structures taken by the government. Next, the court calculates the just compensation award for the government's taking of plaintiffs' personal property. The court identifies and applies deductions reflecting plaintiffs' failure to prove certain items' value and that items were taken. Then, the court concludes that housing and dislocation costs that plaintiffs incurred while the properties were uninhabitable are compensable because they were the direct and natural result of the government's takings. To prevent duplicative recovery, the court then reduces the above awards to account for compensation plaintiffs have already received from FEMA to repair their homes, replace personal property, and obtain substitute housing until their homes were repaired. Finally, the court determines the interest necessary to make plaintiffs whole for the delay between payment and the government's taking.

A. Just Compensation

1. Real property.

The government has a "categorical duty to compensate the former owner" for property it physically takes. *Tahoe-Sierra Pres. Council, Inc. v. Tahoe Reg'l Planning Agency*, 535 U.S. 302, 322 (2002) (citing *United States v. Pewee Coal Co.*, 341 U.S. 114, 115 (1951)). The flowage easement taken here constitutes a physical, permanent partial taking. *See United States v. Cress*, 243 U.S. 316, 328-29 (1917). Accordingly, the government must pay just compensation for the property interest it has taken and the "depreciation which results to the remainder in its use and value." *United States v. Grizzard*, 219 U.S. 180, 185 (1911). While the Yellow Book binds only the government's appraiser,[24] the parties agree that the Yellow Book's before and after approach to valuation is proper. Under the before and after approach, the just compensation award is the difference between the property's market value without the easement and the property's market value with the easement plus any diminution to the remainder property's value. Yellow Book at 37, § 1.7.1.

Market value is the amount for which the property would have sold on the effective date from a "willing and reasonably knowledgeable seller to a willing and reasonably knowledgeable buyer." Yellow Book at 95, § 4.2.1 (emphasis omitted). A reasonably knowledgeable buyer or seller is not "all-knowing," but rather has the knowledge possessed by the "typical" willing buyer or seller. *Fla. Rock Indus., Inc. v. United States*, 18 F.3d 1560, 1566 (Fed. Cir. 1994). Regarding easements specifically, market participants can be reasonably informed for the purposes of a direct sales comparison appraisal even if the easement's exact language has not been recorded. *See Vaizburd v. United States*, 384 F.3d 1278, 1283-85 & n.5 (Fed. Cir. 2004)

[24] "The Yellow Book applies only to appraisers hired by the federal government for condemnation purposes; it is not mandatory with respect to appraisers not hired by the government." *Hardy v. United States*, 141 Fed. Cl. 1, 32 (2018).

(upholding an appraisal notwithstanding the absence of easement language due to the court finding an easement and determining just compensation simultaneously).

While the parties agree that the before and after approach is proper, they disagree on how to resolve two issues that arise when applying the approach to determine the test properties' after-taking value. First, the parties debate the scope of their rights under the easement, which bears on how extensively the easement diminishes property value. Second, they contest whether the market is aware that the easement exists, which determines whether a direct comparison of actual post-Harvey sales in the flood pool accurately captures the properties' after-taking value. These disagreements explain the parties' divergent after-taking valuations.

Concerning the easement's scope, the court's prior rulings specify that the easement "leave[s] plaintiffs a fee simple interest in their properties which allows them to continue their lawful use subject to the risk of occasional flooding caused by the operation of the Addicks and Barker Dams." *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. This leaves at issue only the parties' rights and obligations "in the event of potential future floods." *See id.*

Plaintiffs' primary contention is that the government and property owners' rights are uncertain because the easement has not been "reduced to express language and recorded." Pls.' Pre-Trial Mem. at 7. Plaintiffs argue that Texas law will determine the parties' rights under the easement, and that under Texas law the government has an "unrestricted right" to use the easement and "prohibit[] the property owner from interfering with the government's use of the easement." *Id.* at 4-5. Plaintiffs further contend that the Corps will enforce its policies to the maximum extent permissible, and that the Corps' promises to the contrary are inapposite. *Id.* at 7; Closing Arg. Tr. 123:8 to 124:3. In plaintiffs' view, the government must compensate plaintiffs for the expansive rights it obtained via this partial taking. Pls.' Pre-Trial Mem. at 5.

The government responds that the easement's scope will be determined by the court's orders, not Texas law. Def.'s Post-Trial Mem. at 43-45. Based on the court's previous rulings, the government argues there is no uncertainty in the easement's scope. Plaintiffs and their successors "retain all development rights and can continue to make all lawful use of these properties," and plaintiffs have not identified state laws that would restrict plaintiffs' use of their properties. *Id.* at 45. The government maintains that just compensation for the easement should therefore reflect these allowances for the property owners and not the expansive view of the government's rights that plaintiffs advance. *Id* at 43-45.[25]

Next, regarding market awareness of the easement, plaintiffs claim that "without a written, recorded, final easement, no comparable [after-taking] sales exist or could be found," so post-Harvey sales in the flood pool do not provide reliable evidence of the test properties' after-taking value. Pls.' Pre-Trial Mem. at 16. As evidence of the lack of market awareness the

[25] To resolve and define the easement, the court asked the parties to brief the text of the easement, and the parties have done so. *See*, *e.g.*, Upstream Pls.' Br. on Easement Language, ECF No. 577; Def's Submission of Proposed Easement Language, ECF No. 578; Upstream Pls.' Resp., ECF No. 579; Def.'s Reply, ECF No. 580. The court has taken the parties' proposals into account, along with the trial testimony in the case, in crafting the text of the comment, which text is set out in the Appendix, *infra*.

plaintiffs point to the absence of public-facing FEMA flood insurance rate maps, *see* Tr. 726:6 to 727:11 (Wanhanen), the lack of any response from the title insurance industry, *see* Tr. 462:15 to 463:4 (Philo), and recent sellers' general failure to disclose the existence of an unrecorded easement, *see* PX-JC1025 at 22-23. Therefore, in plaintiffs' view, literature reviews, case studies, sales data for properties outside the flood pool, and other indirect information provide the only reliable basis for calculating the properties' after-taking value. *See* Pls.' Pre-Trial Mem. at 18-19. Plaintiffs also claim the government's after-taking comparable sales analysis is invalid because the market was ignorant of the easement, so none of those sales transferred the same property interest as the subject properties: fee simple ownership subject to the court-ordered flowage easement. *Id*. at 15-17.

The government counters that the market is aware of the flood risk, and this awareness supports its direct sales-comparison analysis. Def.'s Post-Trial Mem. at 33-40. According to the government, "market participants' awareness of the conditions that the [c]ourt found to constitute a taking was enough to use actual sales to determine market value even though there is no recorded easement." *Id.* at 31-32. Put differently, to know the extent of Harvey flooding is to know of the easement. The market's awareness of the flood risk comes from individuals' "personal, direct experience" with upstream flooding during Harvey, local and national news and social media coverage, public meetings and outreach, and school and road closures. *Id.* at 33, 36.

The government criticizes plaintiffs for defining market awareness too narrowly and ignoring relevant evidence of market awareness. Specifically, it argues that plaintiffs put form over substance by distinguishing knowledge of the easement from knowledge of the flood risk. *See* Def.'s Post-Trial Mem. at 42. Additionally, the government claims that plaintiffs' focus on the lack of a recorded easement and sellers' general failure to check the disclosure form box for unrecorded easements is too narrow. It contends that, in addition to the aforementioned sources beyond disclosure forms, other fields on the disclosure forms where sellers disclosed flooding due to Harvey and the Addicks and Barker Reservoirs, adequately informed the market of the easement's conditions. *Id*. at 34-37, 60-61.

The court's just compensation award for plaintiffs' real property is informed by the atypical nature of the easement and the fact that the market knows of the flood risk even if the precise terms of the easement have not been identified until now. *See* Appendix, *infra*. The court's past rulings are explicit that this flowage easement is an atypical one. Unlike standard flowage easements that generally prohibit human habitation and structures, *see* JX1007 at 8-12 to 8-14, plaintiffs are allowed "to continue their lawful use subject to the risk of occasional flooding caused by the operation of the Addicks and Barker Dams." *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. Importantly, because this taking involves "a permanent right to inundate the property with impounded flood waters," it has a greater impact on property value than a temporary taking would. *See In re Addicks & Barker*, 146 Fed. Cl. at 250. This permanence also means that plaintiffs cannot recover from the government for any damage caused by future flooding up to the elevation of the government's easement. *See id.* at 253.

Plaintiffs' expansive conception of an easement's scope overlooks the fact that the government's rights under this atypical flowage easement are narrower and more qualified than they would be under a standard flowage easement. Plaintiffs identify rights that a standard flowage easement imparts to the dominant estate. But the extent to which the easement

diminishes plaintiffs' property value largely turns on the atypical scope of the government's rights and how frequently these rights are likely to be invoked, namely how frequently meteorological conditions would cause flooding above government-owned land under the Corps' operating procedures.

In short, this easement's effect on property value is tied to the frequency and extent of flooding, *i.e.*, how frequently the government will resort to the easement. *See In re Upstream Addicks & Barker*, 159 Fed. Cl. at 522. Plaintiffs contend that the easement has a greater impact on property value than flooding because it gives the government the right to flood homes at any time for any reason,[26] and the pool behind the dams is deliberately engineered to flood and could cause flooding that is not limited to natural disasters. PX-JC1025 at 7. The court-ordered easement, however, does not confer the right to flood homes "at any time for any reason," *id.*, but only the right to flood "by the operation of the Addicks and Barker Dams," *i.e.*, when meteorological conditions and the Corps' purpose for the dams so require. *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. Admittedly, the Corps' operating procedures do little to limit the frequency of flooding because "the 2012 Water Control Manual, which the Corps followed during Harvey, instructs the Corps to operate the dams in a manner consistent with their original purpose: to protect downstream property by impounding water in upstream reservoirs." *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 259. The probability that the meteorological conditions necessary for the reservoir pools to exceed government-owned land will occur, however, provides a more meaningful limitation on how frequently the government will use its easement.

Neither the parties nor the court can predict for certain how frequently the government will use its easement, but the evidence suggests that the frequency of a Harvey-level flooding event will be somewhere between the parties' estimates. Plaintiffs' experts testified that flooding above government land is between a 10- and 20-year recurrence event and flooding to the Harvey pool level is between a 35- and 100-year recurrence event. PX-JC873 at 2-3; *see also* Tr. 987:5-11 (Beddingfield) (agreeing Harvey is approximately a 20- to 50-year recurrence event). But these estimates fail to account for storage capacity information about the reservoirs, Tr. 2518:18 to 2519:21 (England), and posit recurrence of rain that fell on the reservoirs during the observed storms, Tr. 2596:17 to 2597:20 (Keim). In comparison, defendant's expert characterizes Harvey as a 1000-year recurrence event. *See* Tr. 2045:3-10 (Glaudemans). But recent trends suggest that storms and hurricanes on par with Harvey are becoming increasingly frequent, and the government fails adequately to account for this increase. *See* Tr. 2062:16-19 (Glaudemans) (testifying that two greater-than-thousand-year events occurred within two years); JX1013 at II01926565 (stating the need to reduce flood risks within the Buffalo Bayou and surrounding areas is driven in part by the "increased frequency of large-scale flooding events"). In short, the government understates the frequency of a Harvey-level storm. Similarly large storms will likely occur in the future, but it remains uncertain when or how frequently. Notwithstanding this uncertainty, the evidence does show that the government will use its easement only in the event of a natural disaster. That the President actually declared Harvey and Imelda to be major disasters supports this conclusion.

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[26] Plaintiffs list separately the right to store water inside a house, *see* PX-JC1025 at 7, but this right is encompassed by the right to flood homes at any time circumstances warrant.

Plaintiffs further contend that the easement grants the Corps the rights to prevent new construction and to control the plaintiffs' flood mitigation efforts. PX-JC1025 at 7. But these rights are more qualified and narrower than plaintiffs suggest. For one, the court-ordered easement preserves the property owners' rights to continue all lawful uses. *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. The Corps understands this to mean property owners can inhabit and maintain existing structures on the property. *See* Tr. 296:7 to 297:9 (Johnson-Muic). Moreover, apart from storms, the Corps officials testified that the easement would only be enforced if the owners' actions reduced the storage capacity of the land in question. *See* Tr. 164:23 to 165:3 (Johnson-Muic); JX1010 at 3, ¶ 1.5; JX1007 at 8-12, ¶ 8-24. The Corps further suggested that the easement's atypical nature might require it to tolerate even some property modifications that would reduce the reservoirs' storage capacity. *See* Tr. 211:22 to 214:10 (Johnson-Muic).

Plaintiffs also include certain dominant estate rights that they have not shown the Corps will exercise. These rights include the Corps' freedom to post signs and enter plaintiffs' property. PX-JC1025 at 7. Plaintiffs presented no evidence that the Corps would post signs or that, if the Corps did, posting signs would impact property value. *See* Tr. 2840:21 to 2841:13 (Bell). Plaintiffs also have not presented evidence on the likelihood that, absent storms, the Corps would access properties, how frequently, or how this access would affect property values. *See* Tr. 2839:23 to 2840:18 (Bell). Accordingly, the easement's scope is narrower than plaintiffs contend, and narrower than the scope plaintiffs' experts used in appraising the test properties' after-taking value. The after-taking value must reflect only those rights that the government actually acquired and only to the extent those rights affect the value of plaintiffs' property.

Turning to market awareness, the typical buyer and seller in the market are reasonably aware of the flood risk but not the easement. Knowledge of a flood risk is not the same as knowledge of an easement. While an easement can impress its full effect on property's value without being recorded, a market participant who is reasonably knowledgeable of a flood risk will likely behave differently than one who is reasonably knowledgeable of an easement. Indeed, the title industry treats easements and flood risks differently. For instance, a title insurance company would likely except from its policy any financial loss attributable to an easement, which in turn would cause the loan provider either to increase either the mortgage rate, the down payment or both, or deny the loan altogether. Tr. 482:1-19, 487:20 to 488:6 (Philo). This would price some buyers out of the market unless the owner lowered the sale price. *See* Tr. 469:3-7 (Philo). Because title insurance companies will issue policies to properties within 100- and 500-year floodplains and lenders will issue mortgages for such properties, an easement's existence negatively affects value independent from and in addition to the property's flood risk. *See* Tr. 501:12-22 (Philo).

The market is unaware of the easement but has begun to experience some of the effects on property value that will occur once the market learns of the easement. To date, no easement has been recorded, title insurers have continued to issue policies for properties sold in the Harvey flood pool, *see* Tr. 462:15 to 463:4 (Philo), and less than one-half percent of people who sold homes within the Harvey flood pool after Harvey disclosed the existence of an unrecorded easement. PX-JC1025 at 22-23. Although the court has previously indicated that its own prior rulings "are sufficient to inform the scope of the easement" even absent the recording of "exact easement language," *In re Upstream Addicks & Barker*, 159 Fed. Cl. at 524, there is evidence

that price trends for flood-pool properties did not specifically change after the court's liability ruling, *see* DX1001 at 11896-11900.[27] Taken together this evidence shows the market remains unaware of the easement's terms.

Nevertheless, the market's knowledge of the test properties' flood risk indicates that post-Harvey sales data informs to some extent the test-properties' after-taking value. Social and news media covered and continues to cover Harvey-related flooding and more general flood risks in the Houston area. *See generally* DX1001 at 11790-11878 (cataloguing the effect recent weather events and Harvey specifically had on the market's awareness of flood risk). Moreover, although property owners often use FIRMs to gauge flood risk and none shows the Harvey flood pool, other sources have provided public-facing maps of the Harvey flood pool, including the Harris County Flood Control District's website and the Texas Tribune. *See* Tr. 556:22 to 557:14 (T. Ward); DX 1080 at row 1500; Neena Satija and Kiah Collier, *Houston officials let developers build homes inside reservoirs. But no one warned buyers.*, The Texas Tribune (Oct. 12, 2017), https://apps.texastribune.org/harvey-reservoirs/. Market participants could also access even more site-specific information. Beside the box for disclosing an unrecorded easement, sellers used various fields on disclosure forms to notify buyers of the flood risk associated with particular properties. For instance, sellers disclosed previous structural and site flooding and even specifically mentioned Harvey and the Addicks and Barker Reservoirs. *See* DX1676 at 49000; PX-JC1201 at 2-3; PX-JC1189 at 2-3. Similar information was displayed on MLS real estate listings. *See, e.g.*, DX1021 at 12800, 12804.

The court's real property just compensation award reflects the properties' value in their damaged state, subject to the easement. *See In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. The court's award takes into consideration the facts that the government's easement is atypical and "a similarly large storm, producing comparable rainfall, remains likely to occur again." *See In re Upstream Addicks & Barker*, 146 Fed. Cl. at 251-52. The court rejects the government's valuation for the properties in their after-taking repaired state because just compensation is measured "at time of the taking." *United States v. 564.54 Acres of Land*, 441 U.S. 506, 511 (1979). Accordingly, the government cannot credit repairs that plaintiffs made after the government damaged their property by impounding Category 3 black water on plaintiffs' land and in their homes. *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 252 (2019). The awards account for repairs only to the Banker, Burnham, Micu and Sidhu 603 homes and the Popovici's garage, and for only those costs the plaintiffs incurred to restore their property to their pre-taking state. The numbers exclude costs associated with upgrades, remodeling, or other improvements going beyond the repairs that the government's taking necessitated.[28]

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[27] The government contends this is evidence that knowledge of the easement "had no negative effect on prices." Def.'s Post-Trial Mem. at 28. But this lack of a market response could just as well indicate the court's liability ruling did not alert the market of the easement.

[28] The award for the government's taking of plaintiffs' real property and improvements is reduced by 50% for plaintiffs Burnham, Micu, Popovici, and Sidhu to reflect these plaintiffs' proportional ownership interest. Tr. 41:12-18 (Burnham); Tr. 101:18 to 102:7 (Micu); Tr. 789:11-20 (Popovici); Tr. 1713:11-22 (Sidhu).

The award for structurally flooded properties reflects both the fact that the easement grants the government the permanent right to impound water within the homes on the properties, and the structural damage the government caused by taking the easement. The government flooded Ms. Burnham's home with four to five feet of water for at least seven days. *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 242. The damage was so extensive that Ms. Burnham had to sell a home that she described as her forever home which she had renovated and decorated with her own original artwork. *See* Tr. 43:12-44:19 (Burnham). The Bankers' property was flooded with roughly one foot of water for four days. *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 241. The flooding distributed mucky sludge throughout the first floor of their home, requiring a eight-month-long restoration. Tr. 762:14 to 763:25 (Banker); Pls.' Post-Trial Br. at 38. Ms. Micu's property was flooded with approximately two feet of water for ten days. *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 242-43. The home had to be mucked out and remediated to eliminate mold growth and portions of the home's walls and foundation had to be restored, a process that took roughly one year. Tr. 121:10-11 (Micu).

Damage to Mr. Sidhu's downstairs unit was even more extensive. The flooding required Mr. Sidhu to gut and renovate his property over the course of nearly one year. *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 243. Plaintiffs' experts opined that the cost of repairing the unit far exceeded its market value, PX-JC890 at 83, and that "all value of the unit ha[d] been taken," PX-JC883 at 33. The government's expert estimated the flooding and necessary repairs diminished the property's value by $40,000. DX1006 at 11670.

The government did not flood homes on the Popovici and Sidhu 604 properties and the Popovici's garage suffered only limited damage, so the just compensation award for them is lower. Tr. 1730:7-9 (Sidhu) (testifying that the upstairs unit did not need repairs because it was not flooded); Tr. 791:19-21, 799:17-23 (Popovici) (describing damage to the wooden garage door).

Mr. Holland's real property interest generates different issues from the fee simple plaintiffs. The government argues that his favorable leasehold is a non-compensable consequential loss because Mr. Holland's interest is a contract right, and the government has not appropriated his contract right. Def.'s Post-Trial Mem. at 77. This argument fails. Leaseholds are compensable property interests under the Fifth Amendment. *United States v. Petty Motor Co.*, 327 U.S. 372, 378 (1946). The government executes a taking by interfering with a contract right in a way that affects an underlying property right. *See Palmyra Pac. Seafoods, L.L.C. v. United States*, 561 F.3d 1361, 1369 (Fed. Cir. 2009). For this reason, although residential leases involve contractual rights, "[i]t has long been established that the holder of an unexpired leasehold interest in land is entitled, under the Fifth Amendment, to just compensation for the value of that interest." *Alamo Land & Cattle Co. v. Arizona*, 424 U.S. 295, 303 (1976).

Just compensation for a leasehold interest is the value of the government's use and occupancy for the remainder of the lease as determined either by the amount specified in the lease or the fair rental value plus the value of the tenant's renewal right. *Alamo Land & Cattle Co.*, 424 U.S. at 304. Mr. Holland had a leasehold interest in the property that would have extended for six months after Harvey. But Mr. Holland's landlord indicated he did not intend to restore the property, and because Mr. Holland could not afford to both restore the property and pay his rent, the landlord terminated the lease. *See* Holland-JC28 Resp. to Written Dep. 48-50.

By flooding the property such that Mr. Holland could not safely return, the government effectively terminated Mr. Holland's leasehold. Because he paid for no repairs to his leased property, he is entitled to compensation only for his leasehold advantage. *Id*.

Based on these considerations, plaintiffs are entitled to just compensation for their real property in the following amounts:

Plaintiff(s)	**Gross Just Compensation Award**[29]
Mr. and Ms. Banker	$200,279.34
Ms. Burnham	$57,237.81
Mr. Holland	$3,300
Ms. Micu	$64,988.90
Ms. Popovici	$1,401.49
Mr. Sidhu, for unit 603	$25,000
Mr. Sidhu, for unit 604	$534.00

2. Personal property.

Plaintiffs are entitled to compensation for "personal property, fixtures, and improvements damaged or destroyed by the flood" that attended the government's taking of the flowage easement. *In re Upstream Addicks & Barker*, 148 Fed. Cl. at 278. This prior ruling comports with precedent that establishes plaintiffs whose personal property the government appropriates are entitled to just compensation. *Horne v. Dep't of Agric.*, 576 U.S. 350, 359-361 (2015). The plaintiffs nonetheless must take reasonable steps to mitigate damages. *See Heydt v. United States*, 38 Fed. Cl. 286, 310 (1997).

The government argues that plaintiffs' personal property losses are non-compensable results of the taking, that such losses overlap with their real property claims, and that plaintiffs have failed to establish the value of their personal property and that Harvey caused loss or damage to various items. *See* Def.'s Post-Trial Mem. at 77-90. The government first argues that "[p]laintiffs' claims relating to personal property are consequential damages, which are not compensable under the Fifth Amendment." *Id.* at 78. More specifically, it asserts that these losses are non-compensable because in taking the flowage easement the government neither "appropriate[d] [p]laintiffs' personal property for public use . . . nor . . . intend[ed] to damage any personal property." *Id.* This argument ignores the court's ruling that plaintiffs' personal property was not merely damaged by the government's taking of plaintiffs' real property. Rather, the personal property itself was taken by the government. Just as when it takes real

[29] These amounts for award do not account for offsets discussed *infra*, section B.

property, the government must pay just compensation when it takes personal property. *Horne*, 576 U.S. at 359-61.

The government's argument also falters because, even had the court held the government only took real property, the personal property losses would nonetheless be compensable because they were directly and naturally caused by the government's real property taking. To be specific, whether a loss caused by a taking is compensable hinges not on whether it is a consequence of the government's taking but on whether it is an "incidental or indirect consequence[] of a taking." *R.J. Widen Co.*, 174 Ct. Cl. at 1028. Accordingly, a loss that is the "direct product[] of the actual invasion or taking of the property involved" is compensable. *Id.* This distinction, further defined by cases surveyed below, also explains that the plaintiffs' personal property losses are compensable even if the government did not intend to cause such damage and did not acquire the personal property for public use.

A loss is incidental and non-compensable when its connection to the taking is too attenuated. For example, an injury that results from the government's taking of another's property is not compensable under the Fifth Amendment. *Air Pegasus of DC, Inc. v. United States*, 424 F.3d 1206 (Fed. Cir. 2005); *United States ex rel. Tennessee Valley Authority v. Powelson*, 319 U.S. 266 (1943). In *Air Pegasus*, a plaintiff heliport business sought to recover its leasehold interest for a building when the government prohibited the operation of helicopters in the area where the heliport was located. 424 F.3d at 1209-10. The Federal Circuit noted that "Air Pegasus does not actually own or operate any helicopters," and that the injury was non-compensable because it resulted not from the government taking Air Pegasus's property but was "the more attenuated result of the government's purported taking of other people's property." *Id.* at 1215. Similarly, the plaintiff in *Tennessee Valley Authority* argued the value of land the government had taken should reflect the land's potential future use for a hydroelectric project. 319 U.S. at 274. But the plaintiff had not yet built the project and could not do so without combining the land in question with other tracts it had not yet acquired through eminent domain. *Id.* at 284. The Court held the plaintiff was not entitled to "compensation for the loss of a business opportunity based on the unexercised privilege to use the power of eminent domain," *id.*, because the opportunity was "too remote and speculative." *Id.* at 275-76 (quoting *McGovern v. New York*, 229 U.S. 363, 372 (1913)).

Similarly, the government need not compensate a party for a reduction in profit caused by factors outside the governments' control. *Yuba Nat. Res., Inc. v. United States*, 904 F.2d 1577 (Fed. Cir. 1990). The government temporarily took land that Yuba had agreed to lease to a third party in exchange for rent and a percentage of mineral royalties. *Id.* at 1578-81. The trial court awarded Yuba its minimum rent and royalty payments but declined, however, to award royalty losses that occurred because gold had a lower value after the temporary taking. *Id.* The Federal Circuit affirmed because "any attempt to determine how much gold would have been extracted during the taking period, and what its net sales price would have been, would involve the very kind of conjectural and speculative analysis the courts consistently reject as a basis for determining just compensation under the Fifth Amendment." *Id.* at 1582-83.

Property losses, including personal property losses, are compensable when they are directly caused by the government's taking. In *Causby v. United States*, the court held the government had taken an easement over plaintiffs' property by flying airplanes 83 feet above the

land. 109 Ct. Cl. at 769-70. At the time of the taking the *Causby* plaintiffs had used the land to raise chickens. 104 Ct. Cl. 342, 349 (1945), *rev'd*, 328 U.S. 256 (1946).[30] By using its easement, the government caused "as many as 6 to 10 chickens a day [to be] killed by flying into the walls from fright caused by the planes." *Id.* The Claims Court ultimately awarded plaintiffs just compensation for the lost personal property. 109 Ct. Cl. at 772. It reasoned that there was "no difference in the destruction of personal property and real property" if the owner is deprived of its use "not by a negligent act, but as the natural consequence of the deliberate, intended exercise of an asserted power." *Id.* Similarly in *Todd v. United States*, the court ordered the government to compensate plaintiffs for both real and personal property losses. 155 Ct. Cl. 87. In *Todd* the government took plaintiffs' fishing rights under their state fishing licenses. *Id.* at 91. In addition to the value of the fishing licenses, the court held that plaintiffs were entitled to compensation for nets and poles rendered useless by the taking. *Id.* at 91, 98.

Here, unlike in *Yuba Natural Resources*, the personal property damage plaintiffs claim they suffered is neither speculative nor conjectural. This case does not include the sale of a commodity subject to rapid fluctuations in value. Instead, plaintiffs' loss was directly caused by factors within the government's control, namely the operation of the Addicks and Barker Dams. *See In re Upstream Addicks & Barker*, 146 Fed. Cl. at 254 ("The damage to plaintiffs' properties was the direct result of the government's construction, modification, and operation of the Addicks and Barker Dams."). Plaintiffs' claims are also not attenuated as those were in *Powelson* and *Air Pegasus* because at the time of the taking plaintiffs actually owned the personal property for which they seek compensation. Moreover, the damage to this personal property was a direct result of the government's taking the easement, like the losses suffered by plaintiffs in *Todd* and *Causby*. The flowage easement gives the government the right to impound water on plaintiffs' property, and the personal property was damaged when the government did just that. The Corps was "well aware that storms capable of overflowing government-owned land were likely to occur." *In re Upstream Addicks & Barker*, 146 Fed. Cl. at 260. It also knew that the at-risk land contained residences. *See id.* at 256 (describing Corps surveys of properties "in the reservoirs located beyond government land"). Accordingly, plaintiffs are entitled to the personal property lost when the government flooded their properties on August 30, 2017.

Also at issue is whether plaintiffs' have met their burden of proof in establishing the value of personal property and that it was damaged or destroyed as a direct result of the taking. The government specifically contests the value plaintiffs ascribe to particular items and whether certain personal property damage was caused by Harvey. Def.'s Post-Trial Mem. at 78-80, 82-90.

The property owner "must show actual damages 'with reasonable certainty,' which requires 'more than a guess, but less than absolute exactness.'" *Otay Mesa Prop., L.P.,* 779 F.3d at 1323 (quoting *Precision Pine & Timber Inc. v. United States,* 596 F.3d 817, 833 (Fed. Cir. 2010)). And, "all costs claimed must have supporting documentation." *Chevron U.S.A., Inc. v. United States*, 116 Fed. Cl. 202, 227 (2014); *Tyger Const. Co. v. United States*, 31 Fed. Cl. 177,

[30] Upon appeal, the Supreme Court affirmed the Claims Court's holding that there had been a taking and remanded for the Claims Court to determine the "precise nature of the easement taken." *Causby*, 109 Ct. Cl. at 769. The description of the property damage is included in the Claims Court's first opinion: *Causby*, 104 Ct. Cl. 342

260 (1994) ("Because [plaintiff] presented no documentary evidence, proof of damages is insufficient with respect to this claim."). Absent documentary support, even a claim for damages that is supported by testimony from a plaintiff's expert may fail for lack of proof. *See Transtechnology Corp., Space Ordnance Sys. Div. v. United States*, 22 Cl. Ct. 349, 384 (1990). Similarly, a plaintiff fails to carry its burden if its damages claims are so vague that the court "cannot ascertain whether they are viable." *Bowman Constr. Co. v. United States*, 154 Fed. Cl. 127, 142 (2021).

Mr. Holland claims substantial dollar values for antiques and specialty items but provides no documentation to establish the items' status or value as antiques or collectables. Instead, Mr. Holland provides only general descriptions such as "Dining hutch – antique" and "Dining room table and chairs – antique" to support his claimed losses. *See* PX-JC867 App. II at Holland 7. His valuation of collectors' items also rests on sparse evidence. For instance, he requests compensation for "an [o]riginal 1970's Star Wars Collection" and a "WWE championship belt." *Id.* at 7, 11. Still other listed entries provide categorical descriptions without describing what particular items comprise the loss, namely his claim for $1,430 in lost "Art Hobbies & Collectibles." Holland-JC28 at 155-56. These descriptions are too vague for the court to determine their accuracy. Additionally, plaintiffs' expert on personal property valuations admitted that he did not verify Mr. Holland's claims for antiques and collectibles even though such items typically must have their value confirmed with supporting documentation. PX-JC867 at 5. In short, Mr. Holland has provided inadequate evidence of the value of the antique dining hutch, sterling silver set, and table and chairs as well as his signed Kiss Guitar, WWE championship belt, Star Wars action figures, and general losses to art hobbies and collectibles. Mr. Holland's valuation of these items exceeds the value of non-antique or non-collectible items of the same kind to the point that the items' value requires independent documentation. His just compensation award is reduced by $13,940 to reflect this inadequacy. Aside from the above items, Mr. Holland has provided sufficient proof to support the loss of $63,957.52 in personal property. Thus, Mr. Holland is awarded $77,897.52 for his loss of personal property.

The Bankers similarly provide insufficient evidence of their cars' value at the time of the taking and that certain personalty and fixtures were damaged by Harvey. The Bankers identified the amount they initially paid for the cars but did not provide evidence—such as vehicle repair histories, their mileage, or the extent to which they were damaged—to establish the value of the cars at the time of the taking. *See* Tr. 772:11-14 (Banker). The Bankers claim will also be reduced by $285 attributable to a beverage refrigerator that they acquired after Harvey and $162.50 for a microwave that they admitted "was probably not damaged" because it was above the flood line. PX-JC867 App. II at Banker 1-2; Tr. 775:173 to 776:4 (Banker). The Bankers also mischaracterize the cost of yard landscaping, sod, and refinishing their front door as personal property losses. PX-JC867 App. II at Banker 1. Plaintiffs have failed to establish that these costs are distinct from the amounts they claim for repairs to their real property. Compensation for these losses is addressed by the court's award for repairs to the Bankers' real property. Accordingly, the Bankers' award is reduced by $74,064.93 to account for their failure of proof with respect to damage to their two vehicles, microwave, refrigerator, and landscaping and door repair costs. The Bankers have submitted sufficient evidence to support their claim for $16,527.41 in personal property losses. *See generally* Banker-JC6 (invoice listing appliances); PX-JC867 App. II at Banker 1-2 (personal property inventory); PX-JX1128; Tr. 771:5 to 773:11 (Banker) (describing personal property losses).

Ms. Popovici likewise claimed amounts for landscaping services and personalty and fixtures that allegedly were damaged by the government's taking. JX1170-71. Ms. Popovici failed to prove that landscape-related damages were proximately caused by the government's taking. The landscaping invoices are dated September 29 and October 2, 2020, more than two years after the government's taking. *Id.* Similar deficiencies undermine Ms. Popovici's claim for service and repair costs associated with her car and home HVAC system. The HVAC system was cleaned over a year after the government's taking once Ms. Popovici noticed "vents in the ceiling that were dirty." Tr. 796:24 to 797:12 (Popovici). The flood water did not enter the Popovici residence, Tr. 814:4-8 (Popovici), and the HVAC units themselves were not damaged by flooding, 2019 Tr. 1252:2-7 (Popovici). Ms. Popovici fails to show that these repairs were necessitated by the government's taking rather than routine servicing. Next, Ms. Popovici testified that her vehicle was damaged not when the government flooded her property, but when her husband drove the car off the flooded property. Tr. 824:13-24 (Popovici). Accordingly, Ms. Popovici has failed to establish that she suffered any personal property damage because of the government's easement. The $1,401.49 Ms. Popovici claims in repairs to her garage is included in her just compensation award for real property. JX1165; JX1167.

Ms. Micu's claims for mutilated currency and the depreciated value of a piggy bank containing damaged currency falter as well. Ms. Micu was obligated to mitigate her damages. The Bureau of Engraving and Printing allows people to redeem mutilated currency for up to its face value. 31 C.F.R. § 100.5(a). Because Ms. Micu provides no evidence that she sought to mitigate these losses, her personal property award is reduced by $1,800. Ms. Micu is entitled to recover $42,184.85 for the government's taking of her personal property. *See generally* Micu-JC246 (personal property inventory); Micu-JC55 (photographs of damaged personal property); Micu-JC143 (photographs); Micu-JC192 (photographs).

Ms. Burnham carried her burden of proof for establishing her personal property damages claim for $21,088.63. Ms. Burnham submitted numerous images depicting damage to personal property that supports the losses she claimed in her personal property inventory. *See generally* Burnham-JC92 (photographs); Burnham-JC96 (inventory).

Mr. Sidhu also seeks compensation for personal property, namely a range, range hood, refrigerator, and dishwasher to replace damaged appliances in the downstairs unit. Sidhu-JC52; Sidhu-JC89. These costs are not included in the court's just compensation award for damage to Mr. Sidhu's downstairs unit, so Mr. Sidhu is entitled to $1,900.40 for these losses.

3. Displacement.

Plaintiffs also claim damages for their temporary displacement from their properties. Plaintiffs base their claim for dislocation on their properties' fair rental value. *See* Pls.' Post-Trial Br. at 37-38. The government argues that the plaintiffs are not entitled to any just compensation for the temporary displacement caused by the government's taking. *See* Def.'s Post-Trial Br. at 91. It contends that the just compensation for the taking of real property includes just compensation for temporary displacement because the after-taking valuation measures the value of the properties in their "unrepaired, flood damaged condition," and a reasonable buyer and seller would factor into the purchase price the time it takes to restore the property to a livable condition. *Id.*

The court agrees that using the monthly rental value of the properties would duplicate the court's real property just compensation award. *See* Yellow Book at 172, § 4.6.5.2. That award compensates plaintiffs for the cost of restoring the home to a livable condition including the cost of materials. The plaintiffs are nonetheless entitled to just compensation for the dislocation costs they incurred as a direct result of the government's taking.

A just compensation award may take into consideration displacement costs imposed on the plaintiff as a direct and natural result of the taking. *Cf. United States v. Gen. Motors Corp.*, 323 U.S. 373, 383 (1945); *see also Nat'l Lab'y & Supply Co. v. United States*, 275 F. 218, 220-21 (E.D. Pa. 1921) (indicating just compensation can include either the cost and expense of equipping the location taken by the government or the cost and expense of equipping the plaintiff's substitute location but not both and awarding the plaintiff the latter). For instance, in *General Motors* the Supreme Court explained that a plaintiff may be entitled to just compensation for "the reasonable cost of moving out the property stored and preparing the space for occupancy," including the cost of storing goods or returning them to the leased premises. 323 U.S. at 383. In that case the Court stated such costs could be considered along with the market rental value of the temporary occupancy taken but "not as independent items of damage." *Id.*

Accordingly, the court takes into consideration dislocation costs including the costs of securing substitute housing actually and necessarily incurred by plaintiffs here in determining the just compensation award. These displacements extended from the time the homes were rendered uninhabitable until the homes were repaired and safe to occupy once again. Ms. Burnham and Ms. Micu both established the length of time they were displaced from their homes and had to secure alternative housing. Ms. Burnham paid $7,043 in rent for alternative housing,[31] and Ms. Micu paid $33,122.[32] *See* Burnham-JC38 at 140; Micu-JC19 at 4950. These awards are reduced by half to reflect each plaintiff's co-tenancy.

Mr. Sidhu also suffered costs when the government used its easement and displaced his tenants. Specifically, Mr. Sidhu claims $5,854 in lost income and $313.43 in utility payments he made while unit 603 was vacant. *See* JX1172. He further claims $127 in lost rent for Unit 604 to reflect the discount he provided the tenant because they were displaced during Harvey. *Id.*; Tr. 1737:15-24 (Sidhu). Structural flooding caused by the government's easement rendered Unit 603 uninhabitable between September 1, 2017 and July 27, 2018. Sidhu-JC62. The government contends these losses are non-compensable as "normal business expenses incurred anytime a unit is vacant." Def.'s Post-Trial Br. at 75. But this argument ignores that Unit 603 was vacant because the government used its flowage easement and flooded the property. Lost profit and damage caused to business assets are compensable if they are the direct and natural consequence of the government's taking. *See Kimball Laundry Co.*, 338 U.S. at 16-19 (holding the government "must pay compensation" for a laundry business's trade routes and suggesting "the record of its past earnings" and expenditures building up the routes provide evidence of their value); *see also Causby*, 109 Ct. Cl. at 772 (awarding just compensation for destroyed business

[31] This reflects $161.29 for the month of October, $6,332.5 for November-March, and $548.82 prorated for April 1-13, 2018.

[32] This reflects $2,332.50 for September 2017, and $2,799 per month from October 2017-August 2018.

assets). These figures are reduced by half to reflect Mr. Sidhu's proportional ownership of the property.

Mr. Sidhu also claimed $3,001.53 for costs, prorated for unit 603, incurred in traveling from his home in California to Texas to oversee the repair of his properties and testify during the liability trial. Tr. 1739:19 to 1740:22 (Sidhu). These expenses are incidental and therefore non-compensable. In *Georgia-Pacific Corp. v. United States*, the plaintiff also requested additional management costs, including travel costs, made necessary by the taking. 226 Ct. Cl. 95, 151-53 (1980). Unlike business assets that are taken, such costs represent how the taking may frustrate business operations, and "business frustrations and readjustments have been held noncompensable." *Id.* at 153. Impounding floodwaters directly displaced Mr. Sidhu's tenants, but travel costs he incurred because he lives in a different state and elected to travel to oversee the unit's renovation have too attenuated a connection with the government's taking.

B. Offsets

The government seeks to offset just compensation awards by the amount of money plaintiffs have already received in the form of direct payments from FEMA.[33] The rule against awarding a plaintiff duplicate recovery is attributable to just compensation's guiding principle that the property owner "must be made whole but is not entitled to more." *Olson*, 292 U.S. at 255; *Recovery*, *Black's Law Dictionary* (11th ed. 2019); *see also Innovair Aviation, Ltd.*, 83 Fed. Cl. at 502; *Pettro v. United States*, 47 Fed. Cl. 136, 151 (2000) (refusing to grant plaintiff lost profits for an asset that plaintiff retained, to prevent double recovery); *Adams v. United States*, 230 Ct. Cl. 628, 631-32 (1982) (considering compensation the state of Utah paid for easements on the same land that the federal government took to "avoid double recovery by plaintiffs").

Plaintiffs contend that FEMA payments must not be offset. They rely on cases applying the relative-benefits doctrine. *See Ideker Farms Inc. v. United States*, 146 Fed. Cl. 413, 415 (2020). Under this doctrine, the court may offset only "direct and special benefits "which arise directly due to the particular relation of the land in question to the public work and proximately to the remaining land as a result of the public work on the part taken." *Hendler*, 175 F.3d at 1380. Plaintiffs contend that FEMA payments do not qualify because they do not arise directly and proximately from the taking. Pls.' Post-Trial Resp. at 31. Instead, the FEMA payments apply to "anyone who suffered from a declared disaster regardless of any connection to any taking or benefit . . . to the remainder property." *Id.* at 33 (emphasis omitted).

The facts of this case do not fall neatly within the relative-benefit doctrine. Where that doctrine applies, the taking itself causes some benefit to the remainder property.[34] The relative-

[33] FEMA cannot claw back the funds it has disbursed because it can only do so within three years of awarding the funds, and each plaintiff who was granted FEMA relief was awarded relief more than three years ago. Tr. 2701:5-10 (Glasschroeder).

[34] *See, e.g.*, *Hendler*, 175 F.3d at 1383 (affirming the lower court's holding that the government's taking of an easement to sink wells for the purpose of monitoring water migration conferred special benefits in the form of groundwater testing and remediation associated with installing the wells); *Laughlin v. United States*, 22 Cl. Ct. 85, 114 (1990) (applying the relative–benefits doctrine in holding that any increase in groundwater levels was offset by the special

benefit doctrine is a specific application of the general principle guiding the proper measure of just compensation: the person whose property is taken "must be made whole but is not entitled to more." *Olson*, 292 U.S. at 255. Failing to deduct FEMA payments would constitute duplicate recovery. The government reimbursed for some losses of property once by issuing FEMA relief and should not be compelled to pay again for the damage to the property by the same flood pursuant to the court's just compensation award. That the government made funds available to some others whose homes were flooded during Harvey but not because of a government taking is inapposite. *Cf. United States v. River Rouge Improvement Co.*, 269 U.S. 411, 415-16 (1926) (discussing authority establishing that a benefit can be special even if adjacent lands are "similarly benefited" by the government action). The government issued payments through FEMA to compensate plaintiffs for the very same property losses and damages that they seek to recover here. In sum, the government has established that the cash payments from FEMA were related to the same flood damage that the plaintiffs seek to recover. Def.'s Pre-Trial Mem. at 37. FEMA relief was provided as a direct result of the government's taking an easement on plaintiffs' land. Indeed, the plaintiffs were only eligible because FEMA verified their claims for Harvey-related damages. *See* Tr. 2705:10-19 (Glasschroeder).

Offsets also are relevant to plaintiffs' costs for displacement, property loss, and repairs to structures flooded by Harvey. Plaintiffs Burnham, Micu, Banker, and Holland each received direct payments from FEMA, and if these amounts are not offset from the just compensation award these plaintiffs would receive an award greater than the loss they sustained. The Bankers received $21,256.89 in home repair assistance and $2,666 in direct rental assistance payments. DX1287. Ms. Burnham received $4,618 in direct rental assistance payments, $19,060.06 in home repair assistance, and $4,279.59 in personal property assistance. DX1288. Mr. Holland received $6,413.67 in critical needs assistance and personal property assistance and $3,546 in direct rental assistance payments. DX1977. Ms. Micu and her husband received $17,540.47 in home repair assistance, $12,366 in direct rental assistance payments, and $500 in critical needs assistance. DX1980. Accordingly, the Bankers' total award will be reduced by $21,256.89, Ms. Burnham's by $16,118.62,[35] Ms. Micu's by $15,203.24,[36] and Mr. Holland's by $6,413.67. These offset amounts exclude money paid directly to hotels that housed the plaintiffs.

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benefit the government's flood control system provided by making the property in question suitable for farming).

[35] Ms. Burnham's offset is reduced by $2,309, 50% of the total direct payments for rental assistance, because her fiancé is a co-applicant for FEMA relief and co-signed the lease agreement for the property she moved into after selling her home. DX1288; Burnham-JC38. It is further reduced by $9,530.03, 50% of the total direct payments for real property repairs, because Ms. Burnham had only a 50% interest in the property and any increase in the sale value attributable to these repairs would be split with her mother. JX121. No reduction for personal property is made because Ms. Burnham indicates all the personal property in the home was hers. Tr. 91:17-18 (Burnham).

[36] Ms. Micu's offset is reduced by 50% because Ms. Micu's husband was listed as a co-applicant on the FEMA award. DX1980. Direct assistance in the form of a dehumidifier, valued at $249.99, is also not deducted because it does not offset a loss Ms. Micu claimed.

	Banker	Burnham	Holland	Micu	Popovici	Sidhu
Gross just compensation award	$216,806.75	$81,847.94	$81,197.52	$102,642.33	$1,401.49	$29,631.42
FEMA offsets	$21,256.89	$16,118.62	$6,413.67	$15,203.24	$0	$0
Net just compensation	$195,549.86	$65,729.32	$74,783.85	$87,439.09	$1,401.49	$29,631.42

C. Interest

To make the landowner whole, the government may be required to pay interest for the delay between the date of the taking and the date of compensation. *Tech. Coll. of the Low Country*, 147 Fed. Cl. at 367. The court has held the taking occurred on August 30, 2017, and the parties disagree only on the appropriate rate and how frequently that interest should be compounded. Plaintiffs request an interest award of 3.62%, compounded quarterly, based on Moody's Aaa Corporate Bond Index. Pls.' Post-Trial Br. at 39-40. Defendants argue the rate awarded should be that set by the Declarations of Takings Act, compounded annually. Def.'s Post-Trial Mem. at 100.

Under the Prudent Investor Rule, the appropriate interest rate is based on "how 'a reasonably prudent person' would have invested the funds to 'produce a reasonable return while maintaining safety of principal.'" *Tulare Lake Basin Water Storage Dist. v. United States*, 61 Fed. Cl. 624, 627 (2004) (quoting *United States v. 429.59 Acres of Land*, 612 F.2d 459, 464-65 (9th Cir.1980)). The Moody's Aaa Corporate Bond Index rate has been held to satisfy the prudent investor rule without over-compensating the plaintiff. *Jackson v. United States*, 155 Fed. Cl. 689, 720 (2021), *appeal dismissed*, No. 2022-1276, 2022 WL 2163785 (Fed. Cir. Jan. 25, 2022); *Tech. Coll. of the Low Country*, 147 Fed. Cl. at 368-70; *Hardy v. United States*, 138 Fed. Cl. 344, 356 (2018); *Sears v. United States*, 124 Fed. Cl. 730, 733-37 (2016). It adequately protects plaintiffs' principle against loss and provides a reasonable return for the liquidity risk borne by plaintiffs without over-compensating them. PX-JC872 at 8-9. The prudent investor rule also requires interest to be compounded. *Tech. Coll. of the Low Country*, 147 Fed. Cl. at 370.

Because it is the rate a reasonably prudent investor would seek, the court concludes that an interest rate of 3.62%, reflecting the Moody's Aaa Corporate Bond Index, compounded semi-annually, comports with the prudent-investor rule in this case.

CONCLUSION

For the reasons stated, the plaintiffs are entitled to just compensation for the permanent flowage easement the government took through its construction, maintenance, and operation of the Addicks and Barker Dams. This award compensates plaintiffs for the taking of plaintiffs' real property as well as the taking of their personal property, fixtures, and improvements as a result of the flowage easement. Thus, the government is liable to plaintiffs in the following

amounts, plus interest at the rate of 3.62% compounded semi-annually from August 30, 2017 until the date of payment:

To Mr. and Ms. Banker $195,549.86

To Ms. Burnham $65,729.32

To Mr. Holland $74,783.85

To Ms. Micu $87,439.09

To Ms. Popovici $1,401.49

To Mr. Sidhu $29,631.42

Pursuant to Rule 54(b), there being no just reason for delay, the Clerk is directed to enter final judgment for the test plaintiffs as specified.

Costs are deferred.

Additionally, the court delineates and defines the flowage easement taken by the government as set out in the Addendum to this opinion. The government is directed to file the flowage easement in the title records of the private properties affected by the flooding that occurred at the end of August 2017.

It is so **ORDERED**.

s/ Charles F. Lettow
Charles F. Lettow
Senior Judge

ADDENDUM

In the United States Court of Federal Claims

Sub-Master Docket No. 17-9001L

(Dated: October 28, 2022)

**********	)
IN RE UPSTREAM ADDICKS AND BARKER (TEXAS) FLOOD-CONTROL RESERVOIRS	)
	)
**********	)
THIS DOCUMENT APPLIES TO:	)
	)
ALL UPSTREAM CASES	)
	)
**********	)

Flowage Easement

Pursuant to the court's opinions and orders in the above-captioned case, which are incorporated by reference, IT IS ORDERED that the United States, through its construction, maintenance, and operation of the Addicks and Barker Dams, has taken a permanent flowage easement on the properties identified in Exhibit A.[37] This taking occurred on August 30, 2017.

This flowage easement grants the government the right to flood the properties identified in Exhibit A if meteorological conditions and the authorized operation and maintenance of the Addicks and Barker Dams so require. The easement's geographic limits are derived from the Harvey flood pool elevations as of August 30, 2017: 101.6 feet (NAVD 1988, 2001 adjustment) behind Barker Reservoir and 109.1 feet (NAVD 1988, 2001 adjustment) behind Addicks Reservoir. Future flooding is not expected to occur regularly or frequently but is instead subject to particular meteorological conditions under which the operation of the dams may result in temporary flood pools that extend beyond government-owned land.

The owners of the properties subject to this flowage easement retain a fee simple interest in their properties. The fee simple owners and their successors in interest (the "owners") retain (1) the right to continue their lawful residential uses of the properties; (2) all development rights, including the rights to build new, and maintain existing, structures, fixtures, and improvements; and (3) the right to make any other lawful use of their properties. Provided, however, that absent prior approval from any authority governing the operation or maintenance of the dams, the owners may not exercise these rights in a way that interferes with the government's easement by

[37] The relevant prior opinions and orders are *In re Upstream Addicks & Barker (Texas) Flood-Control Reservoirs*, 146 Fed. Cl. 219, 250 (2019); *In re Upstream Addicks & Barker (Texas) Flood-Control Reservoirs*, 148 Fed. Cl. 274, 278 (2020); Order of June 11, 2021, ECF No. 381.

reducing the water storage capacity of the property, or portion of the property, that is subject to the easement.

This order does not alter any otherwise applicable local, state, or federal laws that may affect or restrict the present or future use of the properties.

Following the entry of a final, non-appealable judgment requiring the payment of just compensation for this flowage easement, this order shall be recorded by the United States in the Fort Bend County and Harris County land records for the properties identified in Exhibit A.

EXHIBIT A
Properties Subject to Permanent Flowage Easement

Fort Bend County, Texas

Street Address	Fort Bend County Parcel Identification Number	Legal Description	Plat/Slide
4614 Kelliwood Manor Lane, Katy, Texas	R356720	Lot 36, Block 1, Kelliwood Park	Plat No.: 20060157
6411 Canyon Park Drive, Katy, Texas	R241191	Lot One (1), Block Two (2) of Canyon Gate Cinco Ranch, Section Seven (7)	Slide No.: 1953/A and 1953/B

Harris County, Texas

Street Address	Harris County Appraisal District Parcel Identification Number	Legal Description	Volume: Page
15626 Four Season Drive, Houston, Texas	1137260000060	Lot TR 60, Minus the Easterly Eleven (11) feet thereof, Block 31 in Bear Creek Village, Section 12	273:146
19927 Parsons Green Court, Katy, Texas	1168400040021	Lot 21 & West ½ of Lot 22 (Tract 22A), Block 4, of the Kelliwood Estates, Section 5	340:93
16111 Aspenglenn Drive, Unit 603, Houston, Texas	1150100060013	Unit 603, Building F, 0.90 Int Common Land & Ele, Aspen Club Condo Ph 2	117:125 Am in 123:48 Supp in 136:103
16111 Aspenglenn Drive, Unit 604, Houston, Texas	1150100060014	Unit 604, Building F, 0.89 Int Common Land & Ele, Aspen Club Condo Ph 2	117:125 Am in 123:48 Supp in 136:103

In the United States Court of Federal Claims

Sub-Master Docket No. 17-9001 L
Filed: October 28, 2022

IN RE UPSTREAM ADDICKS AND BARKER (TEXAS) FLOOD-CONTROL RESERVOIRS
****
THIS DOCUMENT APPLIES TO: ALL UPSTREAM CASES

RULE 54(b) JUDGMENT

Pursuant to the court's Opinion and Order, filed October 28, 2022, finding that the plaintiffs are entitled to just compensation for the permanent flowage easement the government took through its construction, maintenance, and operation of the Addicks and Barker Dams, and directing the entry of judgment pursuant to Rule 54(b), there being no just reason for delay,

IT IS ORDERED AND ADJUDGED this date, pursuant to Rule 58, the following test plaintiffs recover of and from the United States, the following amounts, plus interest at the rate of 3.62% compounded semi-annually from August 30, 2017 until the date of payment:

- Mr. and Mrs. Todd and Cristina Banker $195,549.86
- Ms. Elizabeth Burnham $65,729.32
- Mr. Scott Holland $74,783.85
- Ms. Christina Micu $87,439.09
- Ms. Catherine Popovici $1,401.49
- Mr. Kulwant Sidhu $29,631.42.

Costs are deferred.

Lisa L. Reyes
Clerk of Court

By: s/ Debra L. Samler

Deputy Clerk

NOTE: As to appeal, 60 days from this date, see RCFC 58.1, re number of copies and listing of all plaintiffs. Filing fee is $505.00.