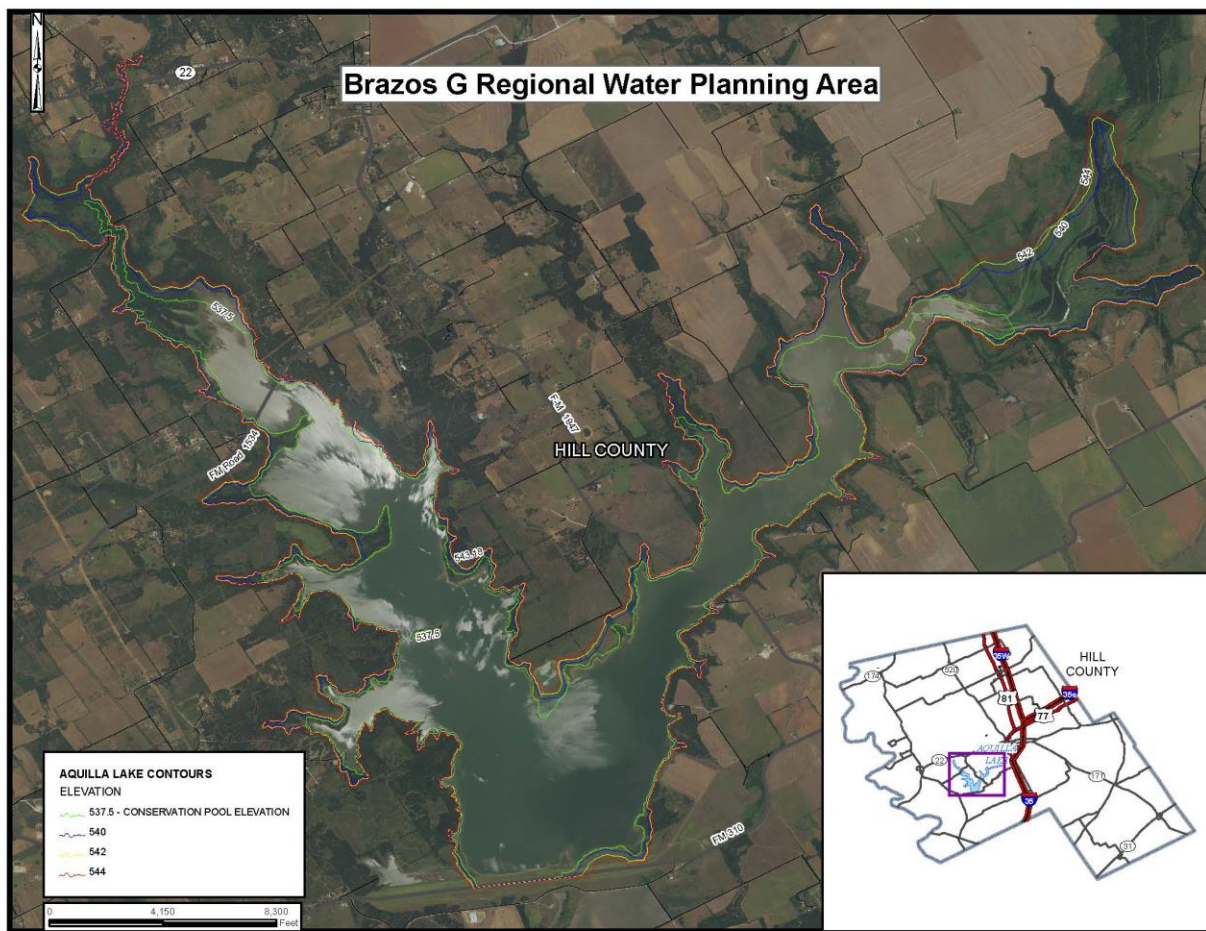


## 7.6 Lake Aquilla Storage Reallocation

### 7.6.1 Description of Option

Figure 7.6-1 is an aerial map of Lake Aquilla showing the water surface area at the four alternative pool elevations discussed in this section. According to a March 2008 volumetric survey, Aquilla Lake has 44,566 acre-feet of storage and a surface area of 3,066 acres at the current conservation elevation of 537.5 feet<sup>1</sup>. The flood storage in the reservoir extends up to elevation 556.0 feet (Table 7.6-1)

**Figure 7.6-1 Aerial Map of Lake Aquilla with Elevation Contours**



<sup>1</sup> Texas Water Development Board, Volumetric Survey of Aquilla Lake March 2008 Survey, April 2009.

**Table 7.6-1 Lake Aquilla Characteristics<sup>2</sup>**

Owner	U.S. Army Corps of Engineers
Water Supply Contract	
Owner	Brazos River Authority
Storage amount	52,400 acft
Texas Water Right	
Number	CA 12-5158
Owner	Brazos River Authority
Diversion	13,896 acft/yr
Storage	52,400 acft at elevation 537.5 ft-msl
Priority date	October 25, 1976
Flood Pool	
Top elevation	556 ft
Storage <sup>3</sup>	93,634 acft
Conservation Pool <sup>1</sup>	
Top elevation	537.5 ft
Surface area	3,066 ac
Storage	44,566ac-ft
Sediment Pool <sup>1</sup>	
Top elevation	503 ft
Storage	106 ac-ft

## 7.6.2 Available Yield

As part of this plan, the TCEQ Brazos WAM was used to calculate yields for Lake Aquilla under the following four scenarios:

- Existing – Current conservation storage elevation of 537.5 ft-msl
- Scenario 1 – Raise conservation elevation to 540.0 feet, an increase of 2.5 ft-msl
- Scenario 2 – Raise conservation elevation to 542.0 feet, an increase of 4.5 ft-msl
- Scenario 3 – Raise conservation elevation to 544.0 feet, an increase of 6.5 ft-msl

<sup>2</sup> Certificate of Adjudication 12-5158

<sup>3</sup> Based on original volumetric survey, October 1983

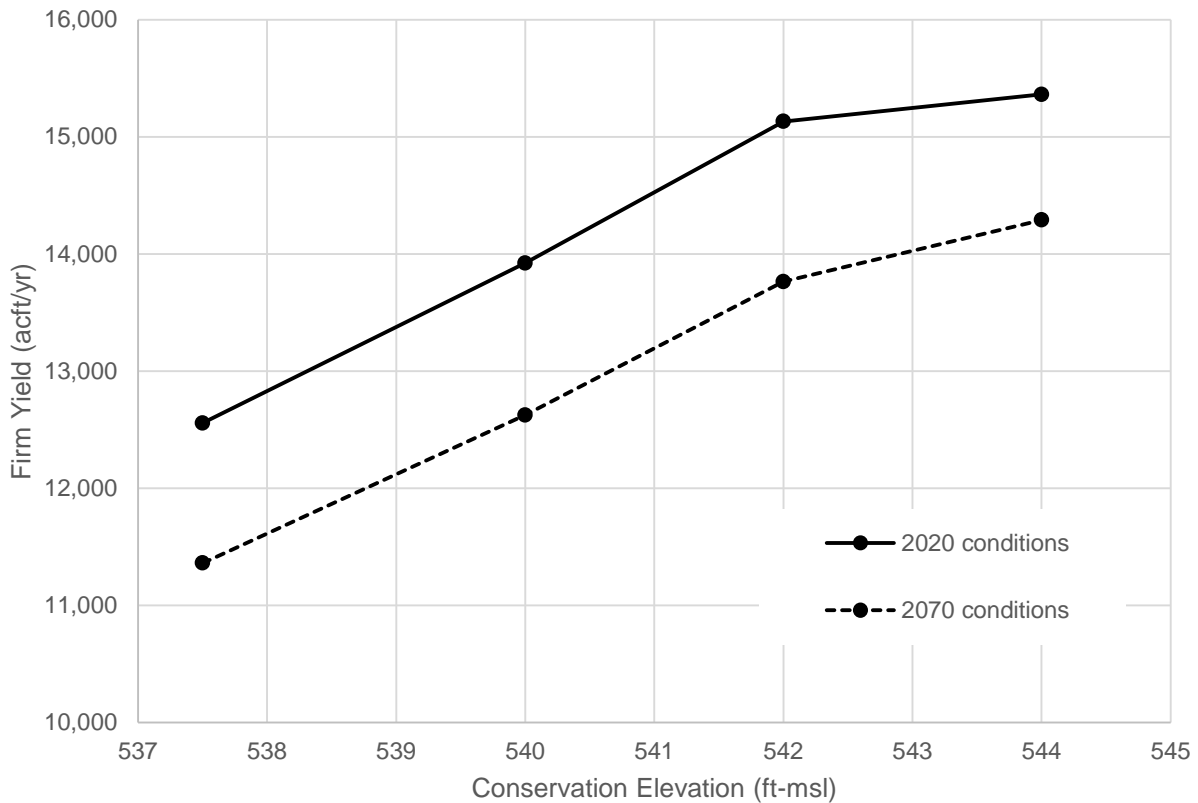


Figure 7.6-1 shows the elevation contours for the four proposed conservation storage elevations. Table 7.6-2 is a summary of the yield studies. Figure 7.6-2 shows the relationship of yield to conservation storage elevation.

**Table 7.6-2 Comparison of Firm Yield of Lake Aquilla with Flood Storage Reallocation using Brazos G WAM for 2020 and 2070 Conditions**

Scenario	Top of Conservation Elevation (feet)	2020 Conditions			2070 Conditions		
		Storage (acft)	Firm Yield (acft/yr)	Yield Increase (acft/yr)	Storage (acft)	Firm Yield (acft/yr)	Yield Increase (acft/yr)
Existing	537.50	43,174	12,556		37,374	11,361	
Scenario 1	540.00	51,267	13,922	1,366	45,467	12,624	1,263
Scenario 2	542.00	58,258	15,131	2,575	52,458	13,764	2,403
Scenario 3	544.00	66,748	15,362	2,806	60,948	14,290	2,929

**Figure 7.6-2 2020 and 2070 Yield vs. Storage Elevation for Lake Aquilla**

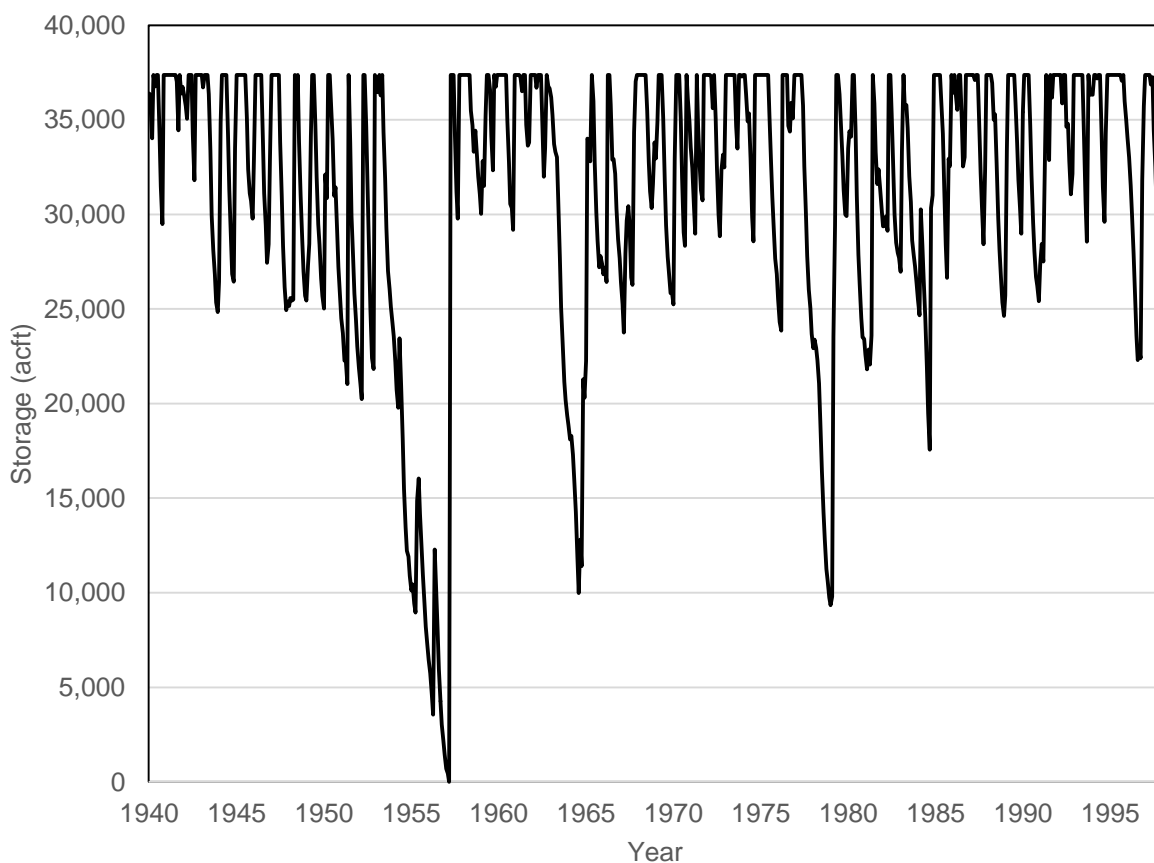


Currently the USACE has the authority to reallocate at its own discretion up to 50,000 acre-feet or 15 percent of the total flood storage, whichever is less. The yield increase of the reservoir with the discretionary authority is about 2,400 acft/yr declining only slightly by 2070. Additional reallocation of flood storage to conservation storage requires the

approval of the U.S. Congress. Scenario 1 is within the discretionary authority of the USCOE. Since raising the conservation pool 4.5 feet to 542 ft-msl (i.e., Scenario 2) will reallocate 15,073 acft, this amount corresponds to the discretionary authority, and therefore would not require congressional approval<sup>4</sup>. Scenario 3 is well above the discretionary authority and would require the approval of Congress.

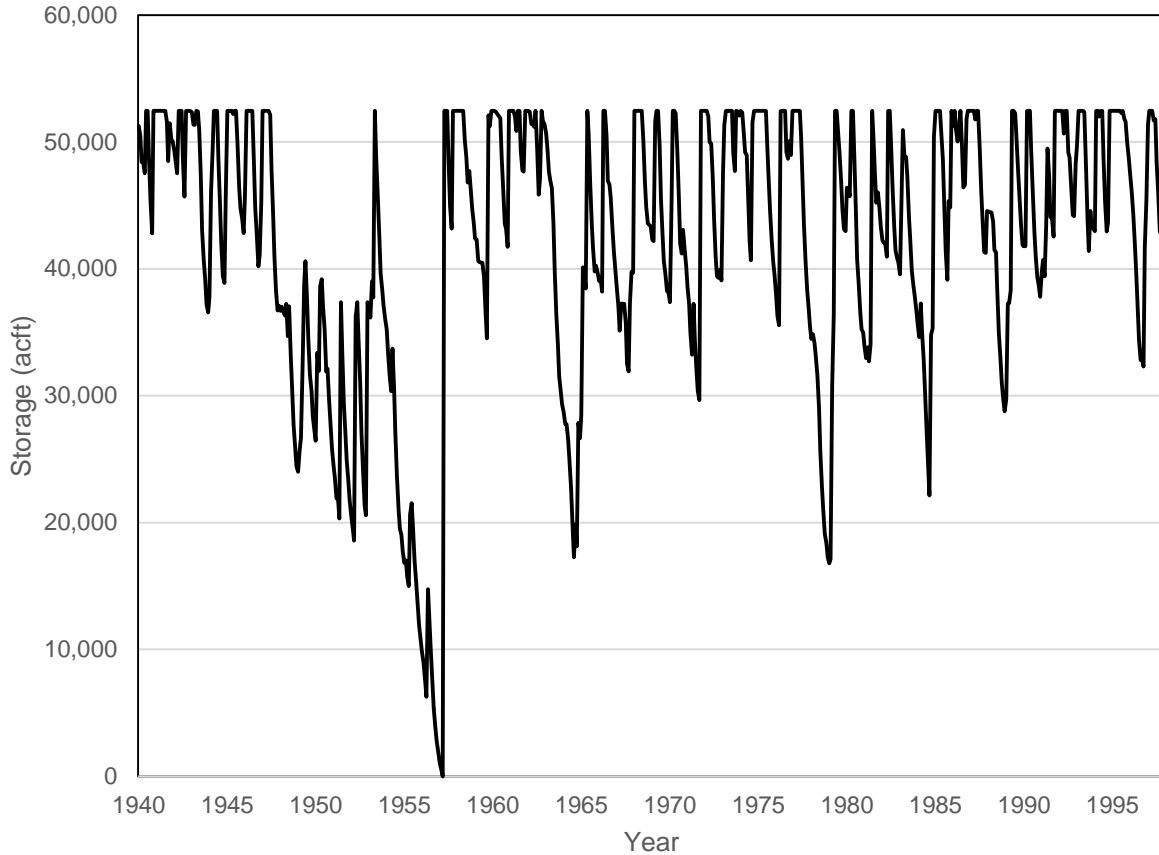
By 2070 the estimated storage of Lake Aquilla decreases to 37,374 acre-feet. The calculated firm yield in 2070 from the Brazos G WAM at the current conservation storage of elevation of 537.5 feet is 11,361 acre-feet. In Scenario 2 (elevation 542.0 feet) the yield of Lake Aquilla is 13,764, resulting in 2,403 acre-feet of additional yield in 2070. This is a 21% increase over the existing scenario yield. Figure 7.6-3 and Figure 7.6-4 show the storage trace in the year 2070 for Lake Aquilla under existing conditions and with Scenario 2, respectively. This strategy could potential be provided supply under the BRA System Operation permit (See Section 7.12), currently pending at the Texas Commission on Environmental Quality. If an entity other than the BRA were to sponsor and pursue this strategy, then an agreement with the BRA would be required to address concerns related to the potential subordination of the System Operation strategy.

**Figure 7.6-3 2070 Lake Aquilla Storage Trace, Current Conservation Elevation (537.5 ft-msl)**



<sup>4</sup> United States Army Corps of Engineers, Middle Brazos Systems Assessment, Phase II Aquilla, Water Supply Reallocation Report and Environmental Assessment, DRAFT version, December 2014.

**Figure 7.6-4 2070 Lake Aquilla Storage Trace, Alternative 2 (Conservation Elevation at 542 ft-msl)**



### 7.6.3 Environmental Issues

The greatest impact on the environment from the reallocation of storage in Lake Aquilla is the loss of terrestrial habitat due to higher lake levels. Table 7.6-3 compares the water surface area at conservation under current conditions to the three storage alternatives described above. In Alternative 3, the maximum reallocation scenario considered for this strategy, the reservoir will inundate an additional 947 acres at conservation. All of the land up to the flood pool elevation around Lake Aquilla is owned by the USACE. The USACE manages the area around the lake as a wildlife management area.

**Table 7.6-3 Comparison of Water Surface Areas with Reallocation**

Scenario	Elevation (feet)	Surface Area (ac)	Change in Surface Area (ac)
Existing	537.5	3,066	-
Alternative 1	540.0	3,388	322
Alternative 2	542.0	3,613	547
Alternative 3	544.0	4,013	947

Wetlands and bottomland hardwoods located in the upper reaches of the lake will be impacted by raising the conservation elevation. Endangered and threatened species reported in Hill County include the whooping crane, black-capped vireo, and golden-cheeked warbler. Species which are candidates for listing are the small-eye shiner and sharpnose shiner. The USCOE did not encounter any habitats that appeared suitable for the black-capped vireo or golden-cheeked warbler in the affected area. It is possible that whooping cranes may temporarily use the affected habitat during their annual migration but an encounter would be rare. The USCOE did not find evidence of either the small-eye shiner or sharpnose shiner within the study area.

#### 7.6.4 Engineering and Costing

Scenario 2 approximately restores original reservoir capacity and is selected for evaluation. The cost of minor improvements to Lake Aquilla dam is included in the cost estimate. Studies on the slope stability, seepage, and geotechnical aspects of the project have already been conducted and so are not included in the estimate. The total project costs for the reallocation of storage to an elevation of 542 ft-msl is \$21.9 million. Detailed costs are shown in Table 7.6-4.

Very few recreational facilities are located at Lake Aquilla, so the reallocation of flood storage will have a low impact on recreation. Other infrastructure that may be affected and needing relocation are utility lines, petroleum pipelines and roads. Another cost is the mitigation of the loss of terrestrial habitat, which is potentially high for this project.

**Table 7.6-4 Cost Estimate Summary for Lake Aquilla Pool Reallocation**

Item	Estimated Costs for Facilities
Improvements to Dam	\$1,901,000
Relocation	\$1,773,000
<b>TOTAL COST OF FACILITIES</b>	<b>\$3,674,000</b>
Engineering, Legal Costs and Contingencies	\$1,286,000
Environmental & Archaeology Studies and Mitigation	\$898,000
Real Estate	\$0
Storage Allocation	\$14,180,000
Slope Stability, Seepage and Geotechnical Studies	\$0
Water Rights Permit from TCEQ	\$1,000,000
Administrative Cost for USACE Storage Reallocation Process	\$588,000
Interest During Construction (12 months)	\$261,000
<b>TOTAL COST OF PROJECT</b>	<b>\$21,887,000</b>
<b>ANNUAL COSTS</b>	
Debt Service (5.5 percent, 20 years)	\$1,831,000
Operation and Maintenance	\$244,000
<b>TOTAL ANNUAL COST</b>	<b>\$2,075,000</b>
<b>Available Project Yield (acft/yr)</b>	<b>2,400</b>
<b>Annual Cost of Water (\$ per acft)</b>	<b>\$865</b>
<b>Annual Cost of Water (\$ per 1,000 gallons)</b>	<b>\$2.65</b>

### 7.6.5 Implementation Issues

This water supply option has been compared to the plan development criteria, as shown in Table 7.6-5, and the option meets each criterion. Seepage related concerns have been expressed about Lake Aquilla dam in the past. A dam safety evaluation completed in August 2013 found that embankment stability has not been much of an issue and that seepage appears well controlled by measures implemented as part of the USACE's Risk Management Plan and is currently being monitored with a system of piezometers, relief wells and collection weirs. The habitat lost to inundation will have to be mitigated. Mitigation property has not yet been identified. If Alternative 3 is chosen, Congressional authorization for the project will be required. A summary of the implementation steps for the project is presented below.

### Potential Regulatory Requirements

- Texas Commission on Environmental Quality (TCEQ) Water Right and Storage permits; potentially dependent on the granting of the BRA System Operations permit
- U.S. Army Corps of Engineers (USACE) Permits will be required for discharges of dredge or fill into wetlands and waters of the U.S. for dam construction, and other activities (Section 404 of the Clean Water Act)
- USACE Section 404 permits for pipeline stream crossings, discharges of fill into wetlands and waters of the U.S. for construction, and other activities
- TCEQ administered Texas Pollutant Discharge Elimination System Storm Water Pollution Prevention Plan
- Texas General Land Office Easement if State-owned land or water is involved
- Texas Parks and Wildlife Department Sand, Shell, Gravel and Marl permit if a state-owned streambed is involved

State and Federal Permits may require the following studies and plans:

- Environmental impact or assessment studies
- Wildlife habitat mitigation plan that may require acquisition and management of additional land
- Flow releases downstream to maintain aquatic ecosystems
- Assessment of impacts on Federal- and State-listed endangered and threatened species
- Cultural resources studies to determine resources impacts and appropriate mitigation plan that may include cultural resources recovery and cataloging, which would require coordination with the Texas Historical Commission

### Land Acquisition Issues

- Land acquired for reservoir and/or mitigation plans could include market transactions or other local landowner agreements
- Additional acquisition of rights-of-way and/or easements may be required
- Possible relocations or removal of residences, utilities, roads, or other structures





**Table 7.6-5 Comparison of Reallocation of Storage in Lake Aquilla Option to Plan Development Criteria**

Impact Category	Comment(s)
A. Water Supply	
1. Quantity	1. Sufficient to meet needs
2. Reliability	2. High reliability
3. Cost	3. Reasonable
B. Environmental factors	
1. Environmental Water Needs	1. Low impact
2. Habitat	2. Low (540 ft) to moderate (544 ft) impacts on bottomland hardwood and fish and wildlife resources. Lake sedimentation may create significant amounts of shallow wetlands that might benefit migratory water fowl.
3. Cultural Resources	3. Low impact
4. Bays and Estuaries	4. Low impact due to distance from coast
5. Threatened and Endangered Species	5. Low impact
6. Wetlands	6. Low (540 ft) to moderate (544 ft) impacts on wetlands
C. Impact on Other State Water Resources	<ul style="list-style-type: none"> <li>• No apparent negative impacts on state water resources; no effect on navigation</li> </ul>
D. Threats to Agriculture and Natural Resources	<ul style="list-style-type: none"> <li>• None</li> </ul>
E. Equitable Comparison of Strategies Deemed Feasible	<ul style="list-style-type: none"> <li>• Option is considered to meet municipal shortages</li> </ul>
F. Requirements for Interbasin Transfers	<ul style="list-style-type: none"> <li>• Not applicable</li> </ul>
G. Third Party Social and Economic Impacts from Voluntary Redistribution	<ul style="list-style-type: none"> <li>• None</li> </ul>

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