Admitted: 03/23/2009
Rejected:
Withdrawn:
Stricken:

Nuclear Regulatory Commission
Exhibit # - NRC000059-MA-BD01
Docket # - 05200011
Identified: 03/23/2009

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Vogtle ESP Mandatory Hearing

March 23-25, 2009

NRC Staff Presentation Topic #1

Water Use Impacts

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Protecting People and the Environment

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Pacific Northwest National Laboratory

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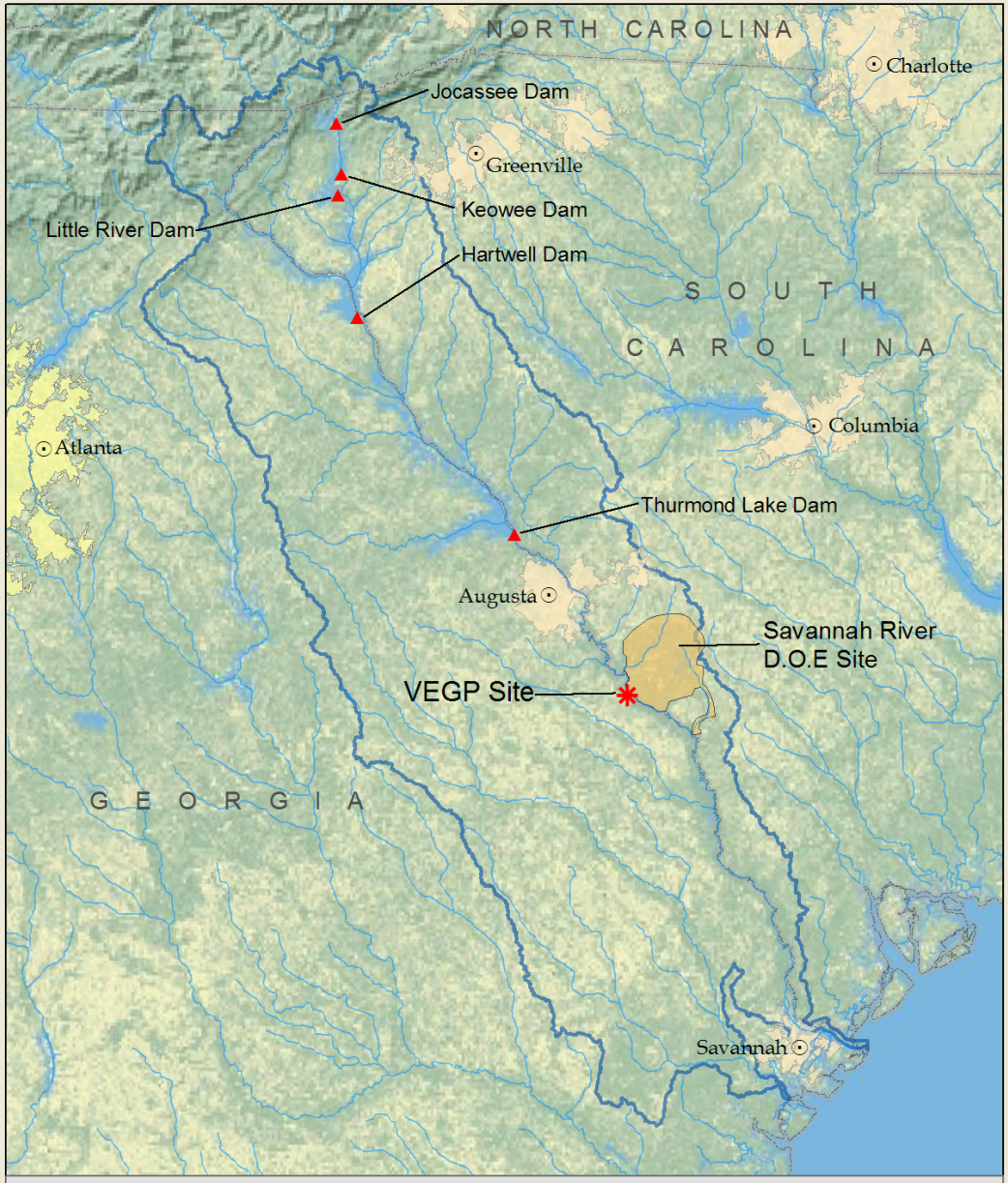
Hydrologic Engineering Branch
Nuclear Regulatory Commission

Cumulative Surface Water Impacts

- Hydrological environment
- Water users
- Water management
- Drought management
- Conclusion


NORTH CAROLINA
Charlotte
Jocassee Dam
Greenville
Keowee Dam
Little River Dam
Hartwell Dam
SOUTH
CAROLINA
Columbia
Atlanta
Thurmond Lake Dam
Augusta
Savannah River
D.O.E Site
VEGP Site
GEORGIA
Savannah
Vogtle ESP
Savannah River Watershed
Source: National Hydrologic Dataset (USGS)
0 10 20 40 60
Miles
N

NORTH CAROLINA
Jocassee Dam
Greenville
Keowee Dam
Little River Dam
S O U T H
C A R O L I N A
Hartwell Dam
Savannah River D.O.E. Site
Thurmond Lake Dam
G E O R G I A
Augusta
Drainage areas below Thurmond Lake Dam and VEGP Site
VEGP Site
Savannah River Watershed
Vogtle ESP
Drainage Basins Above VEGP Site
Source: National Hydrologic Dataset (USGS)
0 5 10 20 30
Miles
N

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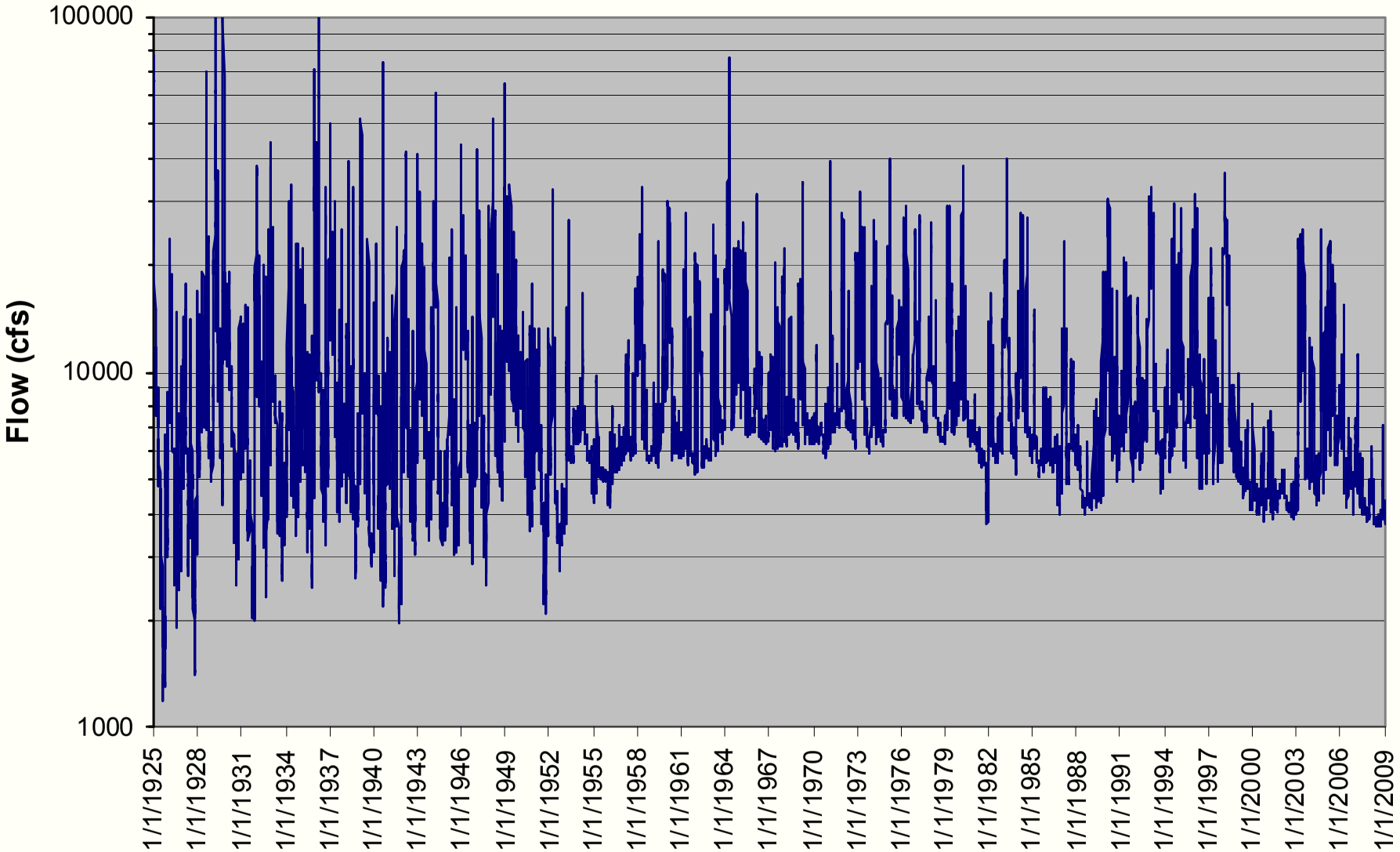
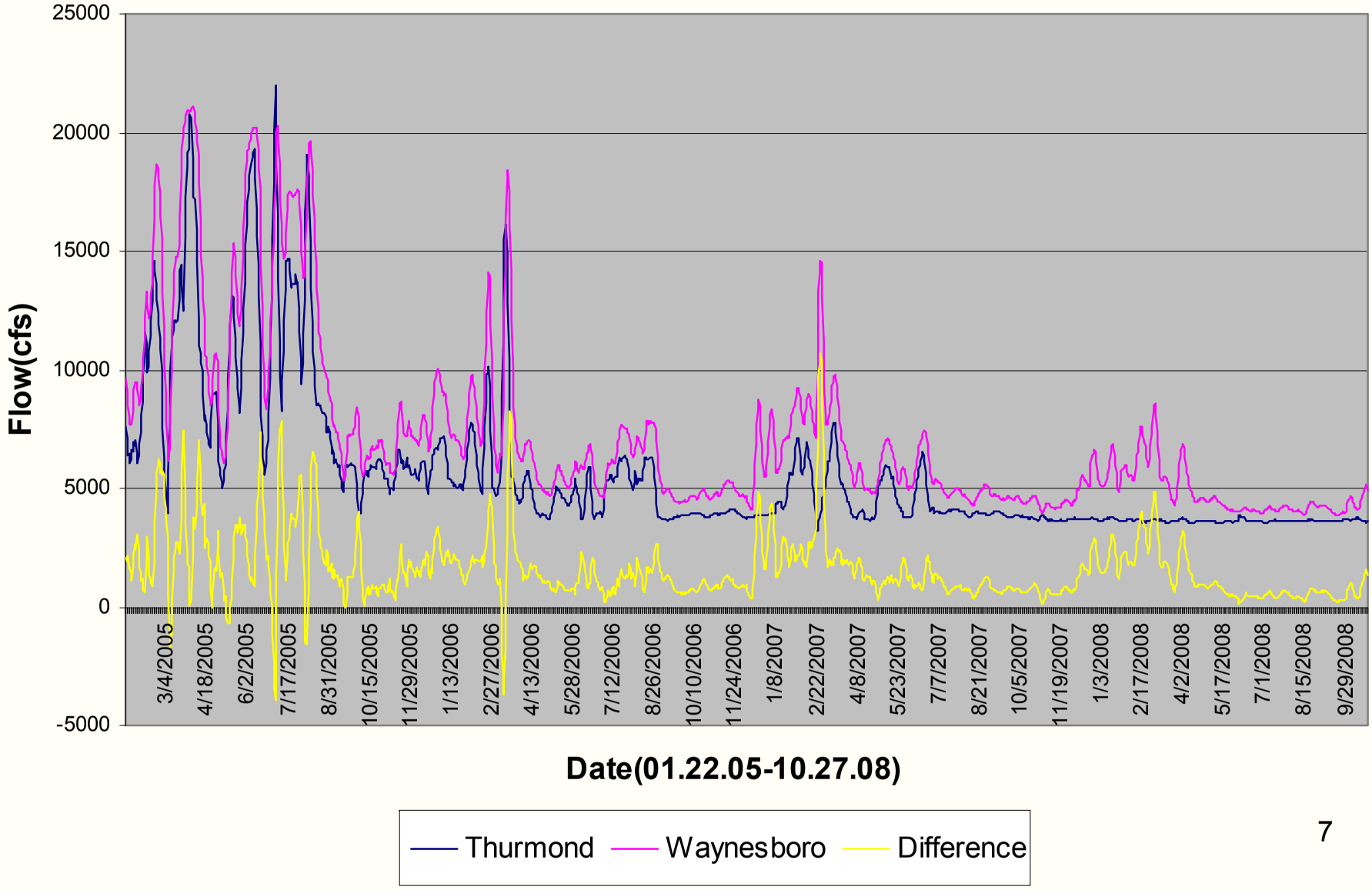
Historical Augusta Flows



http://waterdata.usgs.gov/nwis/uv?02197000

Savannah River Flow at Thurmond Dam and at Waynesboro Gauge



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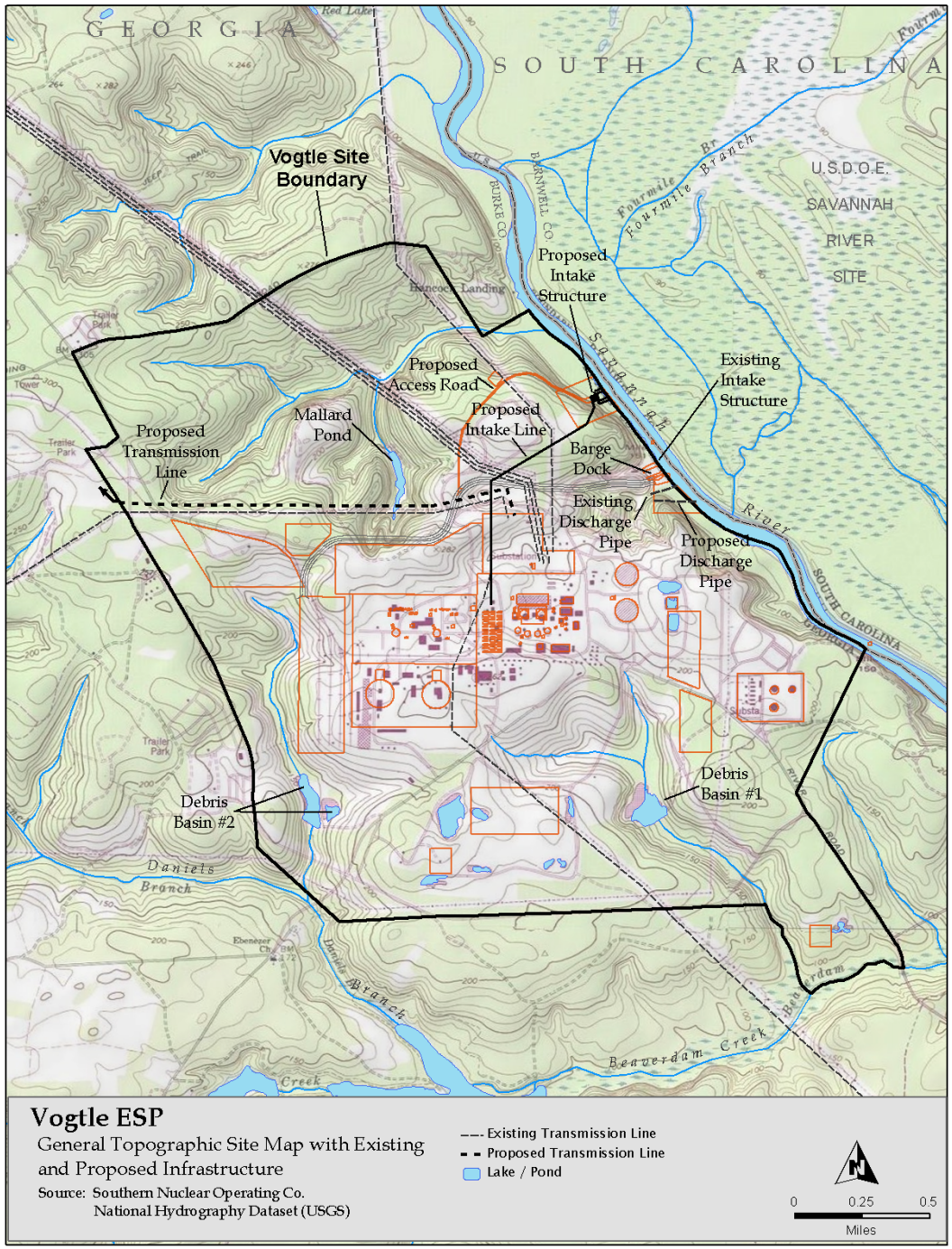
Other Water Use Summary

	Reported Withdrawal	Staff Consumptive Use Estimate
D-Area Powerhouse (FEIS pg. 2-33)	68.4 cfs	16 cfs (Savannah River Operations Office)
Urquhart Station (FEIS pg. 2-33)	127.5 cfs	20 cfs (650 MW wet tower equivalent)
SRS (FEIS pg. 2-33)	4.5 cfs	4.5 cfs (100% consumptive)
Augusta-Richmond County (ER pg. 2.3.2-11; monthly average for withdrawal from Savannah River)	23.2 cfs	4 cfs (15% consumptive; municipal)
Georgia (ER pg. 2.3.2-11; monthly average for facilities withdrawing from Savannah River)	146.8 cfs	15 cfs (10% consumptive; industrial)
South Carolina (ER pg. 2.3.2-13; for Edgefield, Aiken, and Barnwell Counties)	19.2 cfs	19.2 cfs (100% consumptive)
Total	389.6 cfs	**78.7 cfs**

Cumulative Consumptive Surface Water Use

Savannah River Streamflow	Units 1-4 (129 cfs) (Table 7-2 of FEIS)	Units 1-4 and Other Users (207.7 cfs)
8830 cfs	1.5%	2.4%
3800 cfs	3.4%	5.5%
3000 cfs	4.3%	6.9%
2000 cfs	6.5%	10.4%

The consumptive water use of Units 1-4 is expected to exceed the consumptive use of other users between Thurmond Dam and the VEGP site. However, these other consumptive water users are expected to be more than offset by surface water runoff and groundwater inflows between Thurmond Dam and the VEGP site.


GEORGIA
SOUTH CAROLINA
Vogtle Site Boundary
Proposed Intake Structure
Existing Intake Structure
Proposed Access Road
Proposed Intake Line
Mallard Pond
Proposed Transmission Line
Barge Dock
Existing Discharge Pipe
Proposed Discharge Pipe
U.S.D.O.E. SAVANNAH RIVER SITE
Debris Basin #1
Debris Basin #2
Savannah River
Fourmile Branch
Daniels Branch
Beaverdam Creek
Vogtle ESP
General Topographic Site Map with Existing and Proposed Infrastructure
Source: Southern Nuclear Operating Co.
National Hydrography Dataset (USGS)
Existing Transmission Line
Proposed Transmission Line
Lake / Pond
0 0.25 0.5
Miles

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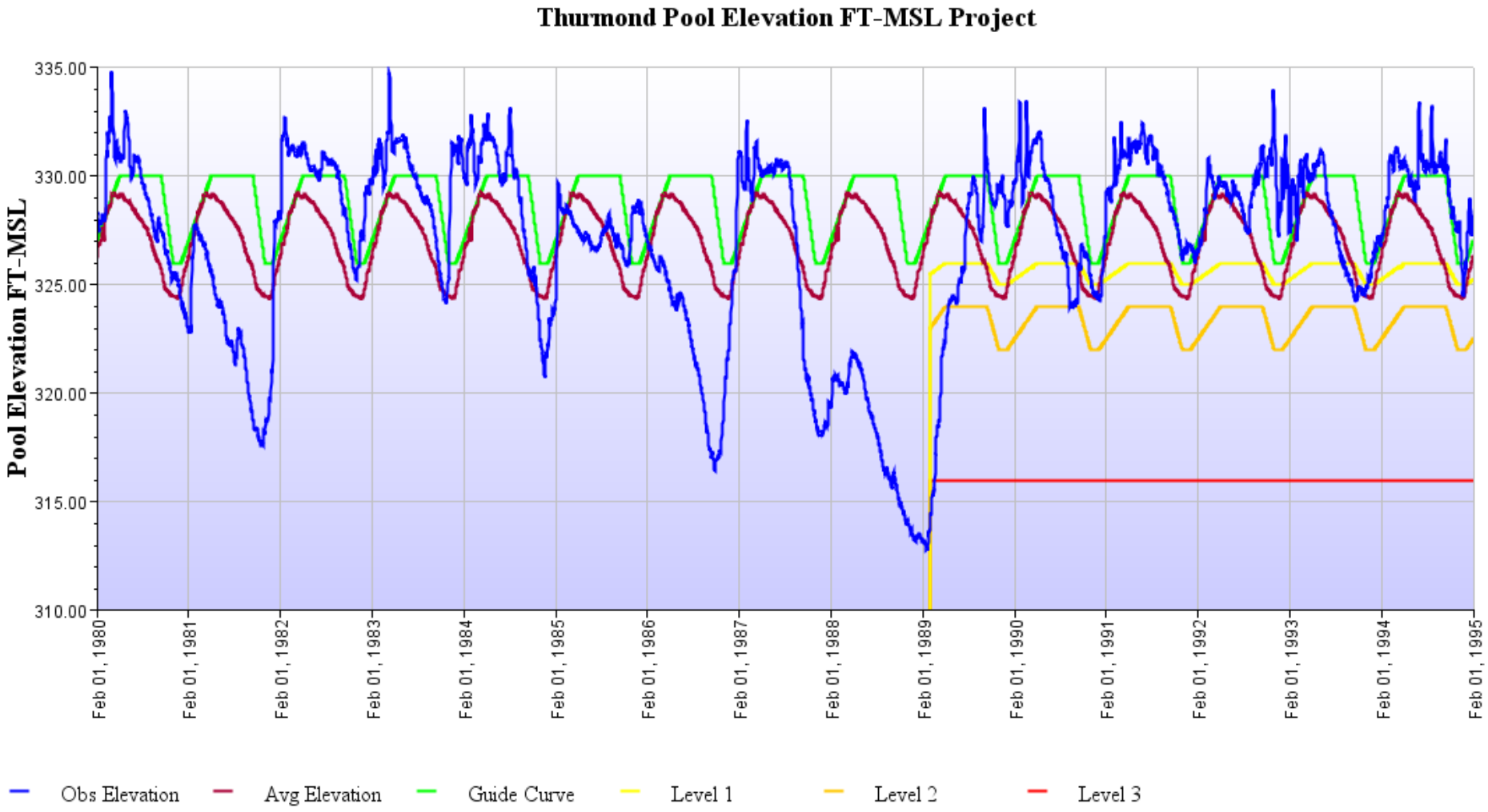
Reservoir Management

- Operation of reservoirs to balance multiple conflicting objectives
- USACE Guide Curve
  - If the reservoir stage is above the Guide Curve, then increase dam releases to protect against flooding
  - If the reservoir stage is below the Guide Curve, then decrease dam releases to increase likelihood of refill
  - If the reservoir stage is significantly below the Guide Curve, then progressively decrease dam releases to protect the conservation pool

Reservoir Management

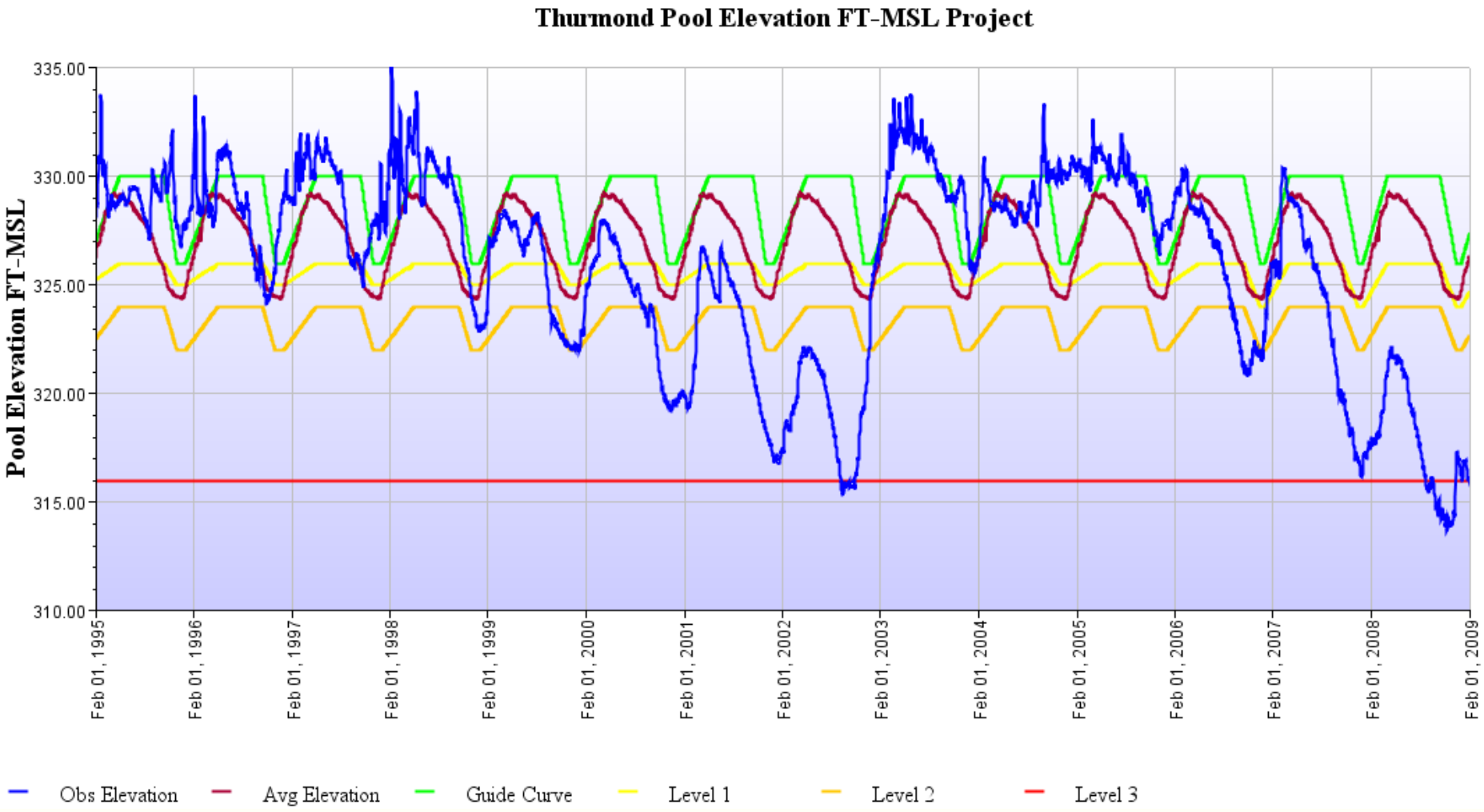


Level refers to the Savannah River Drought Level.

Avg Elevation refers to the average pool elevation for each day of the year (1954-present).

Source: http://water.sas.usace.army.mil/cf/KavaPlot/KPlot.cfm?project=Thurmond

Reservoir Management



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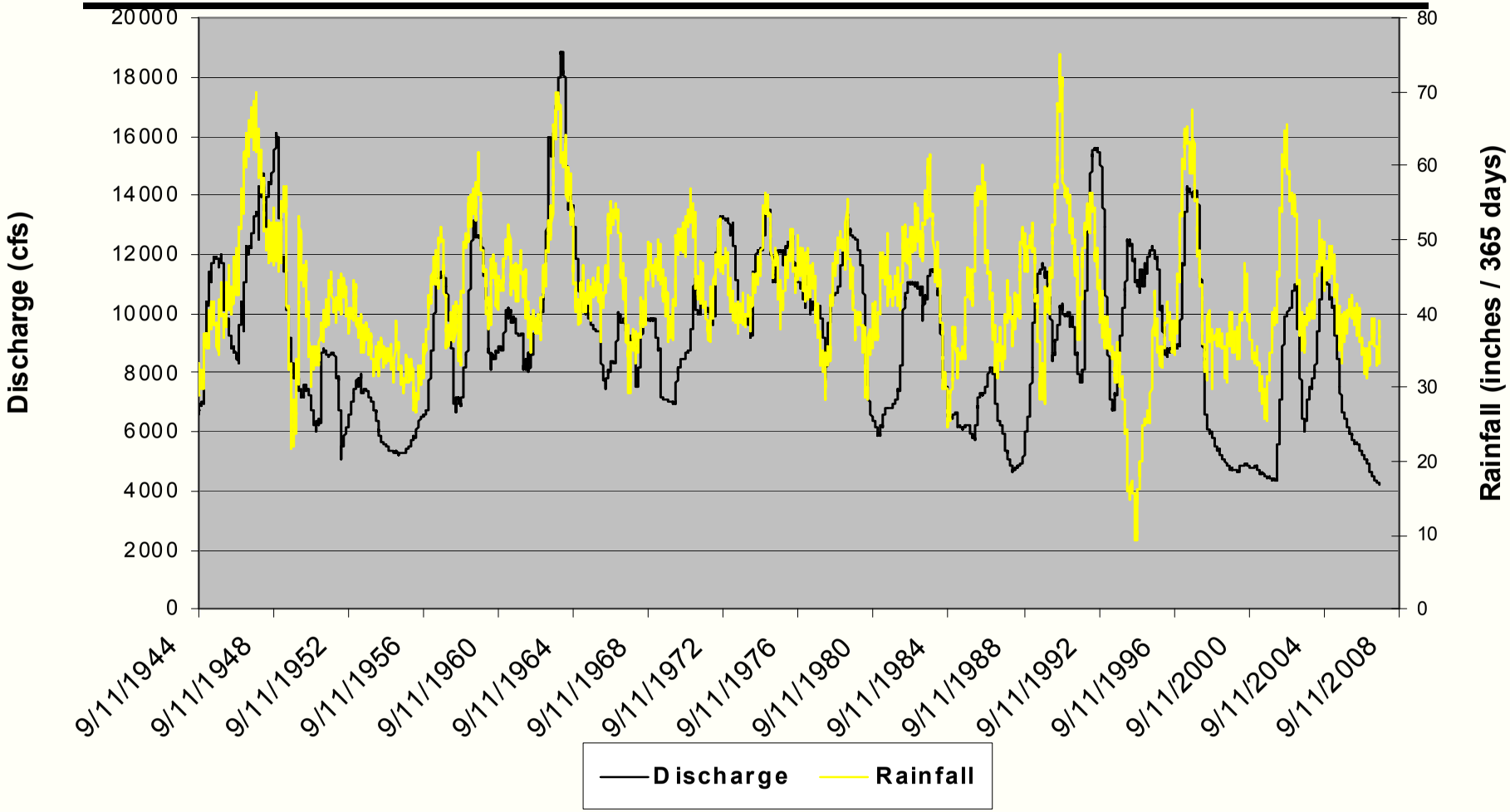
Source: http://water.sas.usace.army.mil/cf/KavaPlot/KPlot.cfm?project=Thurmond

Drought Management

- Thurmond Release
  - Historic Management – 3600 cfs
  - Drought Management Plan – 3800 cfs
  - Temporary Deviation Drought Plan – 3100 cfs
  - Recent Revisions – 3600 cfs
- Drought Level 4

Savannah River Hydrograph and Precipitation Record



* Flow Data from USGS gage 02197000 at Augusta, GA. (http://waterdata.usgs.gov/nwis/nwisman/?site_no=02197000&agency_cd=USGS)
* Precipitation Data from NOAA COOP Precipitation Gage (COOPID 90495) at Augusta Bush Field Airport at Augusta, GA. from NOAA (http://cdo.ncdc.noaa.gov/CDO/cdo)
* The plot is from a 365-day moving average of the daily values (data from 4/1/1944 to 8/31/2008).

Cumulative Surface Water Impacts

- The proposed wet cooling towers would reduce the flow in the Savannah River downstream of the VEGP site.
- Since the consumptive use of water by the plants is nearly constant, the fractional reduction in the flow will increase as the upstream flow decreases.
- Generally, the other consumptive water uses between Thurmond Dam and the VEGP site are more than offset by surface water runoff and groundwater inflow.
- The Staff determined that 3800 cfs is an appropriate basis at the VEGP site to evaluate cumulative impacts during low flow conditions in a NEPA analysis.
- The current ongoing drought has not altered the Staff's conclusion that the cumulative impacts of the VEGP ESP would be SMALL.

Cumulative Groundwater Impacts

- Groundwater Resource Use
- Tritium in the Water Table Aquifer
- Savannah River Site Groundwater Plumes
- Saltwater Intrusion
- Conclusion

Groundwater Resource Use

- Projected 2% cumulative groundwater resource use; 1% increase from proposed new Vogtle units
  - Normal operation of four units: 2.13 MGD (3.30 cfs)
  - Deep aquifer base flow: low estimate 119 MGD (184 cfs) (Aucott et al. 1987)
- Drawdown impacts acceptable
  - 120 m (400 ft) confining head - Cretaceous aquifer
  - Projected drawdown at boundary, 4 m; at nearest neighboring well, 3 m
  - Possible flow reversal from Tertiary to Cretaceous aquifers, local to onsite pumped wells
- Conclusion: Production of groundwater will not impact substantially the groundwater resource or adjacent users; therefore, impact is SMALL.

Tritium in the Water Table Aquifer

- First discovered in 1988
- Studies conducted by the Georgia Geological Survey and the US Geological Survey
- All lines of reasoning lead to the conclusion that the tritium source was atmospheric releases at the Savannah River Site
- VEGP Units 1&2, and proposed Units 3&4, do not withdraw groundwater from the Water Table aquifer, or make releases to it.
- Conclusion: There is no reason to believe the proposed project will contribute to the issue of tritium in the Water Table aquifer; therefore, impact is SMALL.

SRS Groundwater Plumes

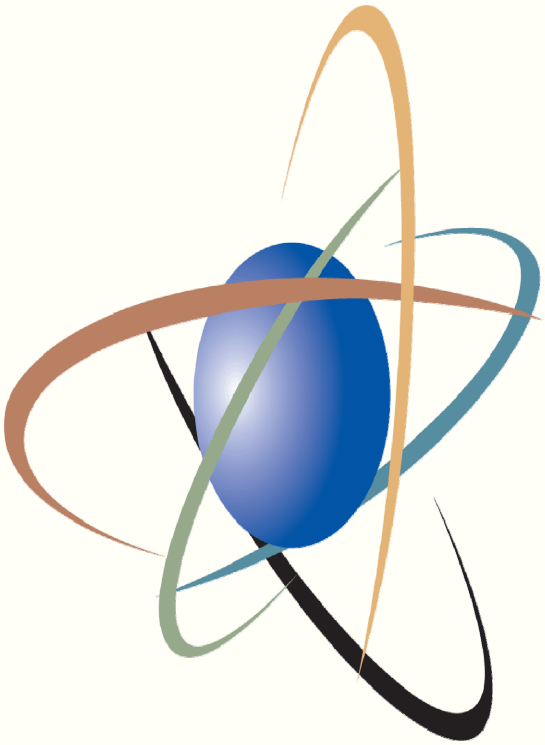
- Any contamination of the aquifers underlying the SRS would be intercepted by the Savannah River
- Basis:
  - Savannah River incises and intercepts the Water Table and Tertiary aquifers
  - Simulations were run using the regional groundwater model developed by the USGS (Cherry & Clarke 2007)
- Conclusion: Existing and proposed production of groundwater at VEGP does not appear to contribute to the broader migration of SRS contamination; therefore, impact is SMALL.

Saltwater Intrusion

- The State of Georgia (GDNR 2006) identified Burke County as one of 19 counties not contributing substantially to development or extent of saltwater intrusion in coastal areas.
- The quality of water withdrawn from wells in Burke County is not impacted by salt water intrusion.
- Conclusion: The production of groundwater for the proposed project will not contribute substantially to the saltwater intrusion occurring in coastal regions of Georgia and South Carolina, or be impacted by salt water intrusion; therefore, impact is SMALL.

Cumulative Groundwater Impacts

- Based on evaluations of
  - Groundwater Resource Use
  - Tritium in the Water Table Aquifer
  - Savannah River Site Groundwater Plumes
  - Saltwater Intrusion
- The Staff determined cumulative impacts to groundwater would be SMALL.



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