RECLAMATION

Managing Water in the West

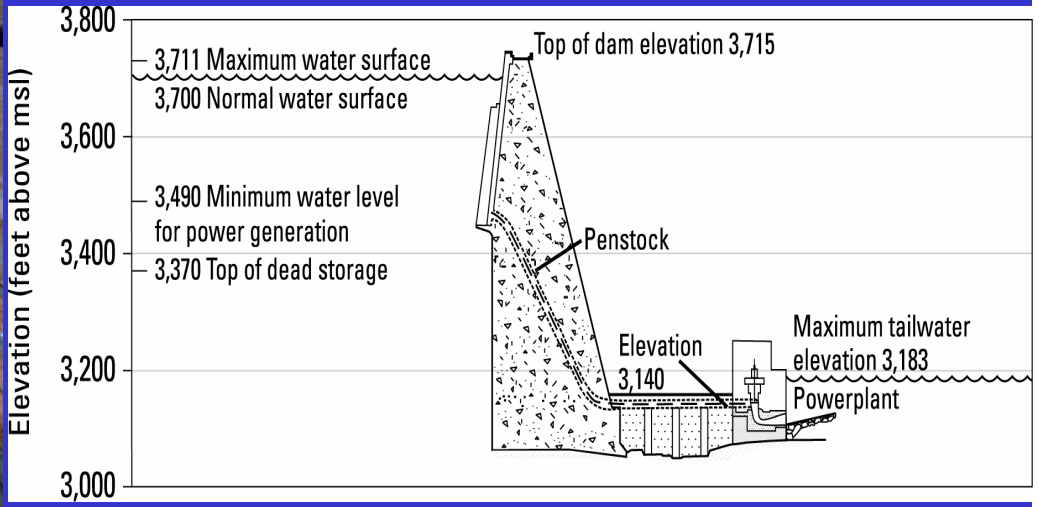
Selective Withdrawal on Glen Canyon Dam

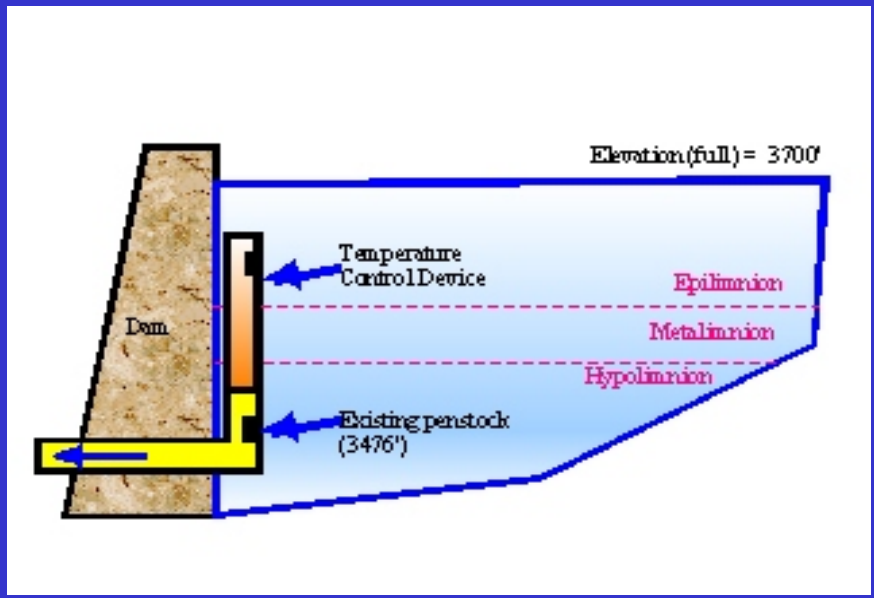
TWG Update Jan 26, 2006

Dennis Kubly
Upper Colorado Region
Salt Lake City, Utah

U.S. Department of the Interior
Bureau of Reclamation

Glen Canyon Dam and Powerplant





- Concrete Arch Dam
- 710 feet high
- 27 MAF Storage
- Eight Francis turbines
- 1,320 MW capacity

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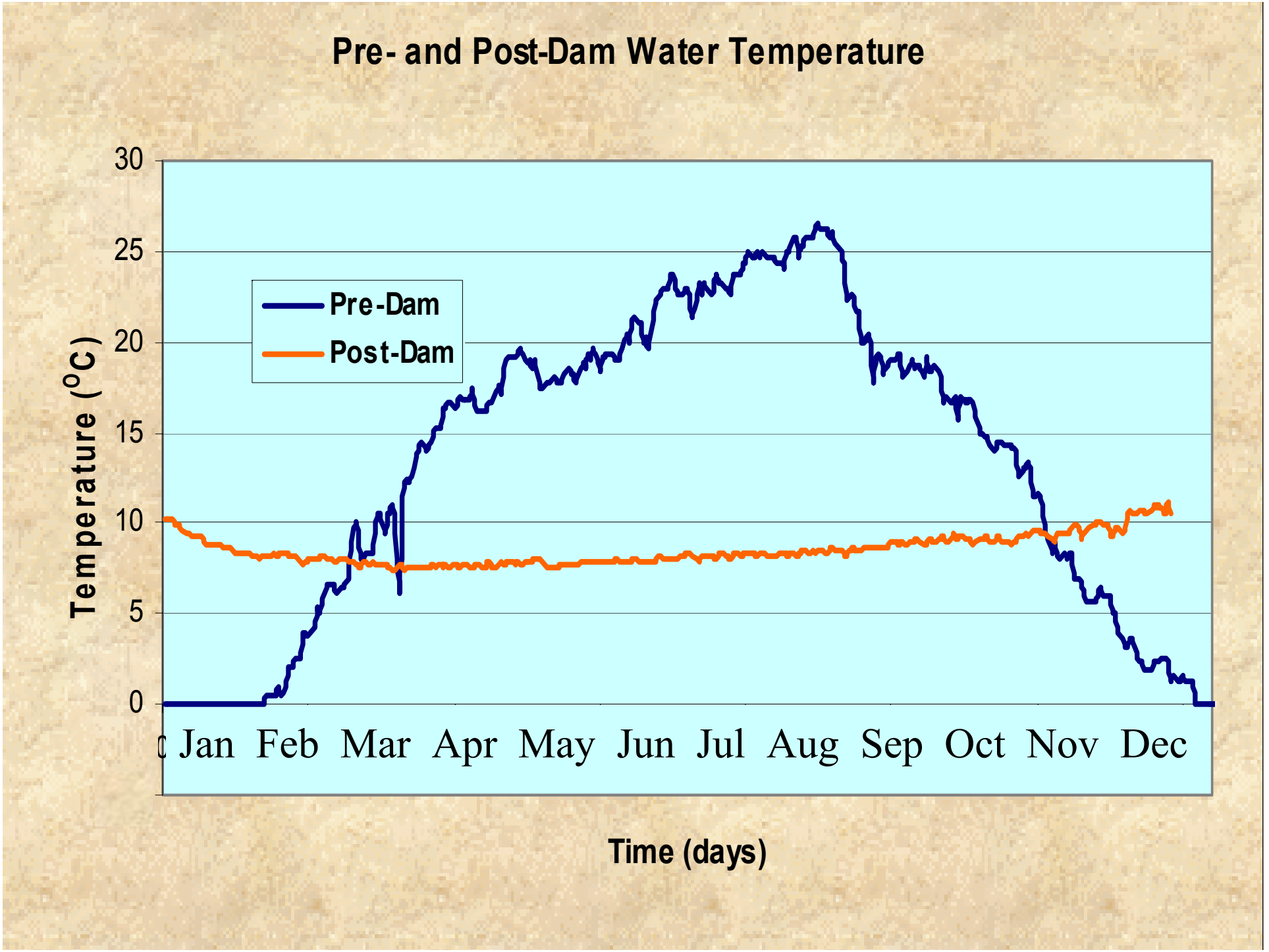
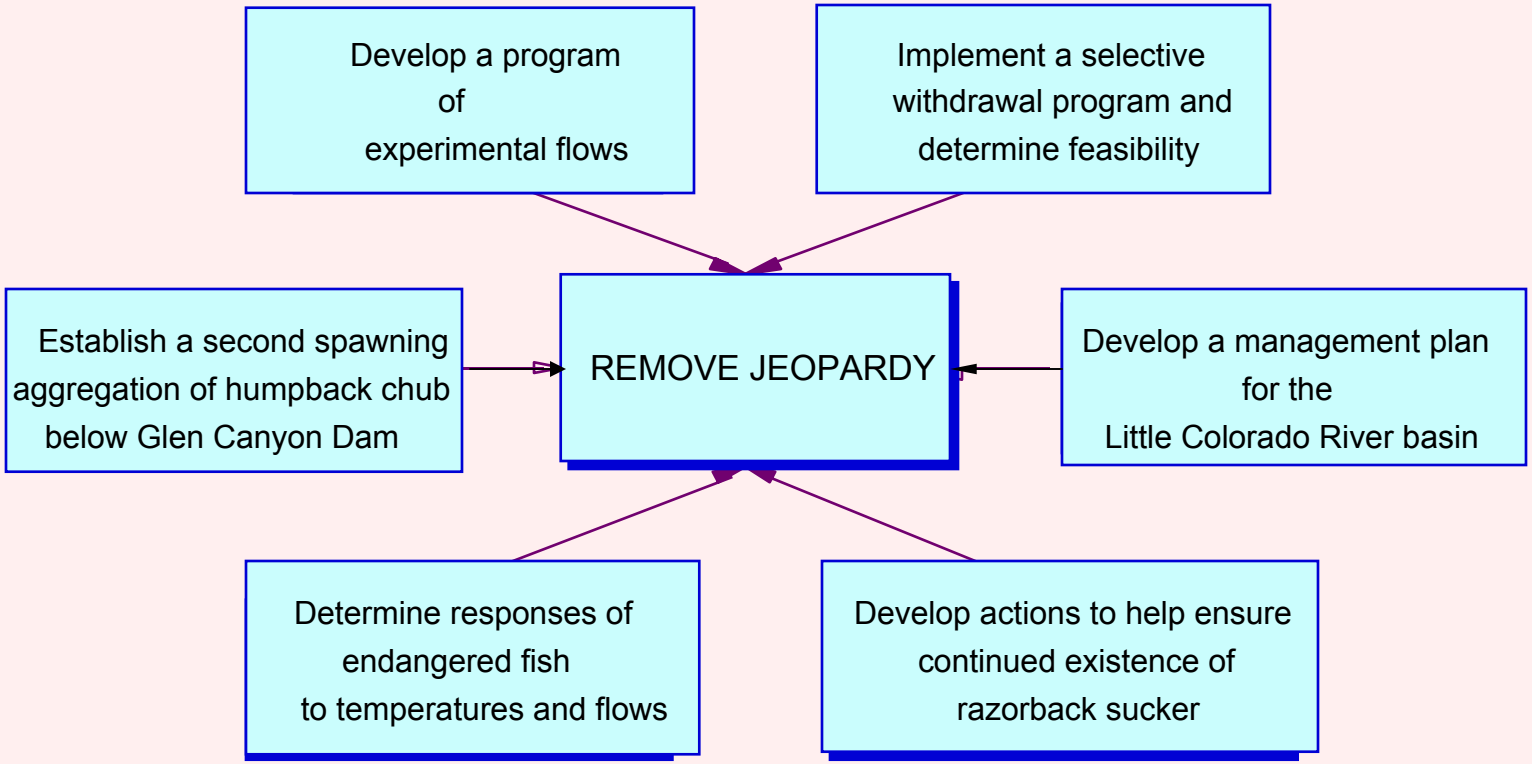

Pre- and Post-Dam Water Temperature
30
25
20
15
10
5
0
Temperature (°C)
Pre-Dam
Post-Dam
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Time (days)

Elements of the Reasonable and Prudent Alternative



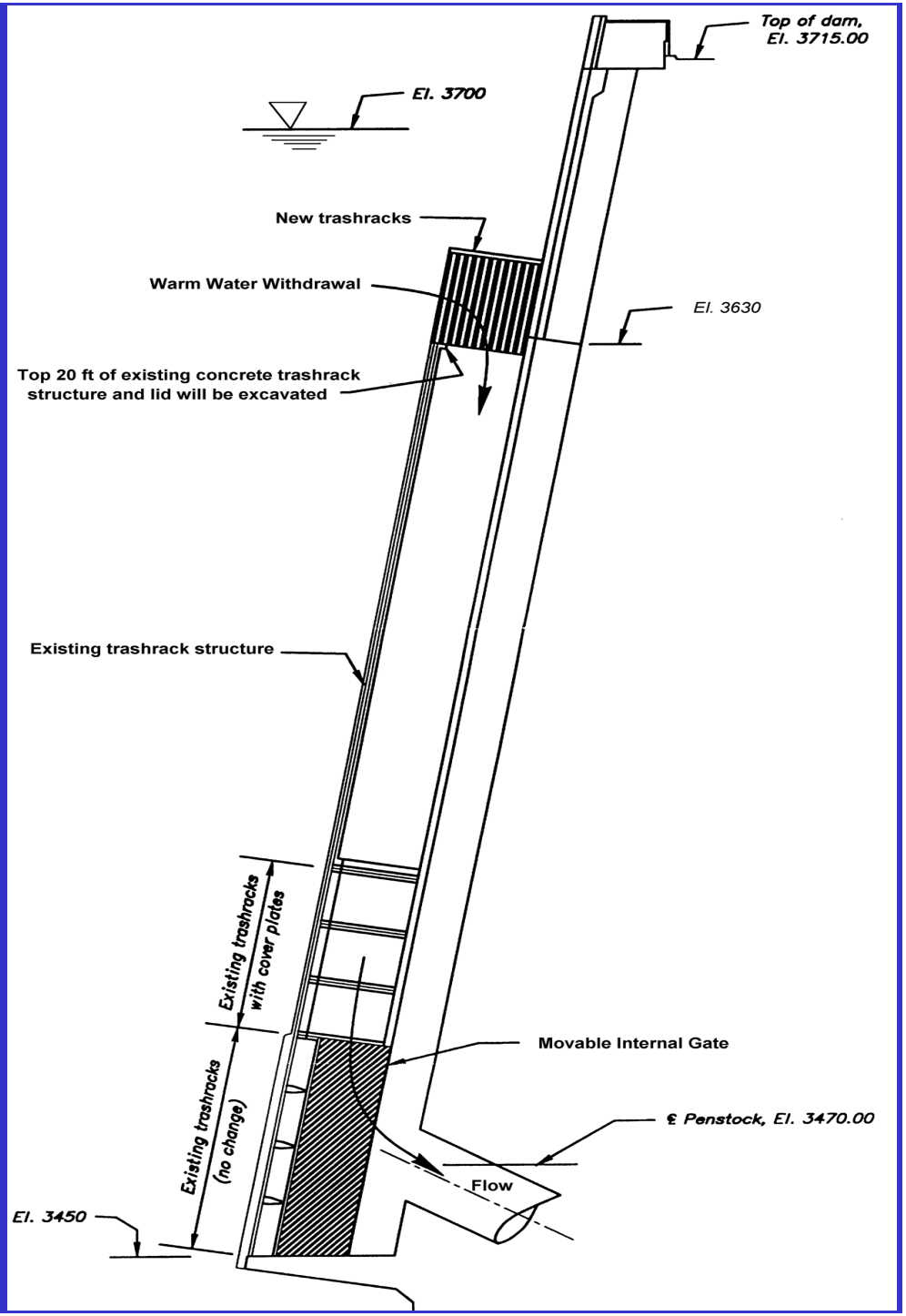
RECLAMATION

Uncontrolled Overdraw- Fixed Inlet

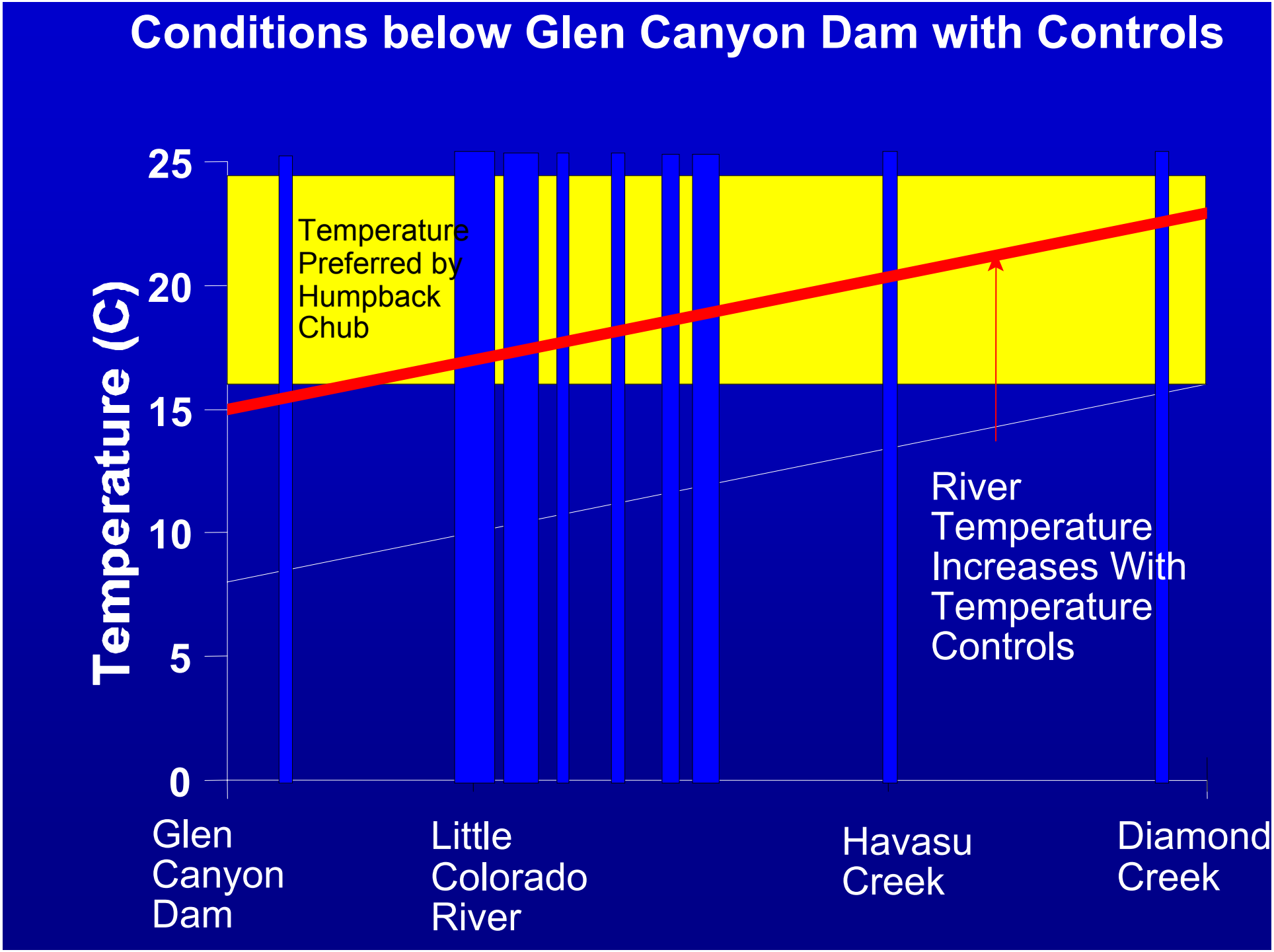
Overview

Operating Range/Minimum Reservoir Elevation: 30’/3670’

Field Cost Estimate $13.5M

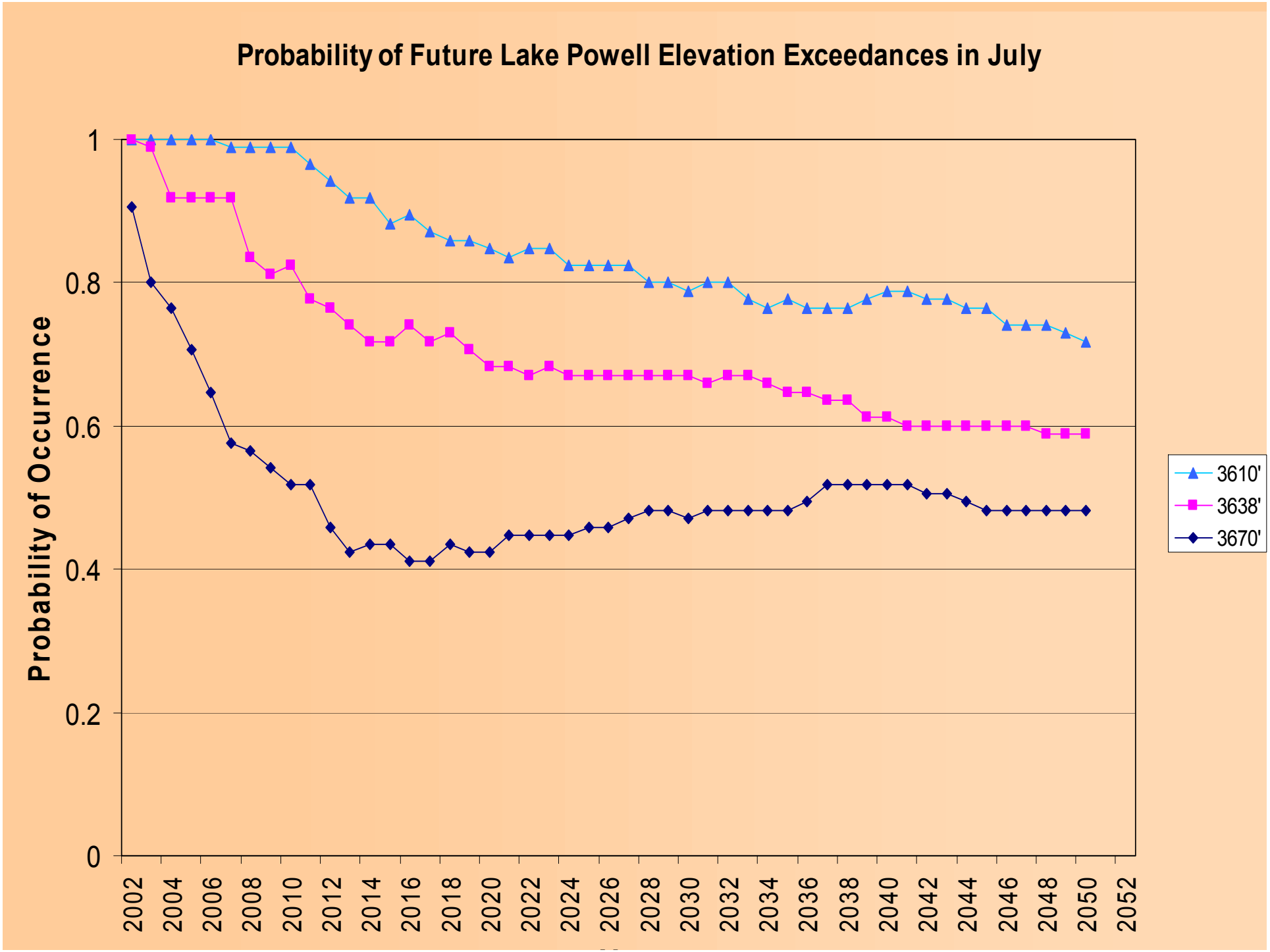


Conditions below Glen Canyon Dam with Controls



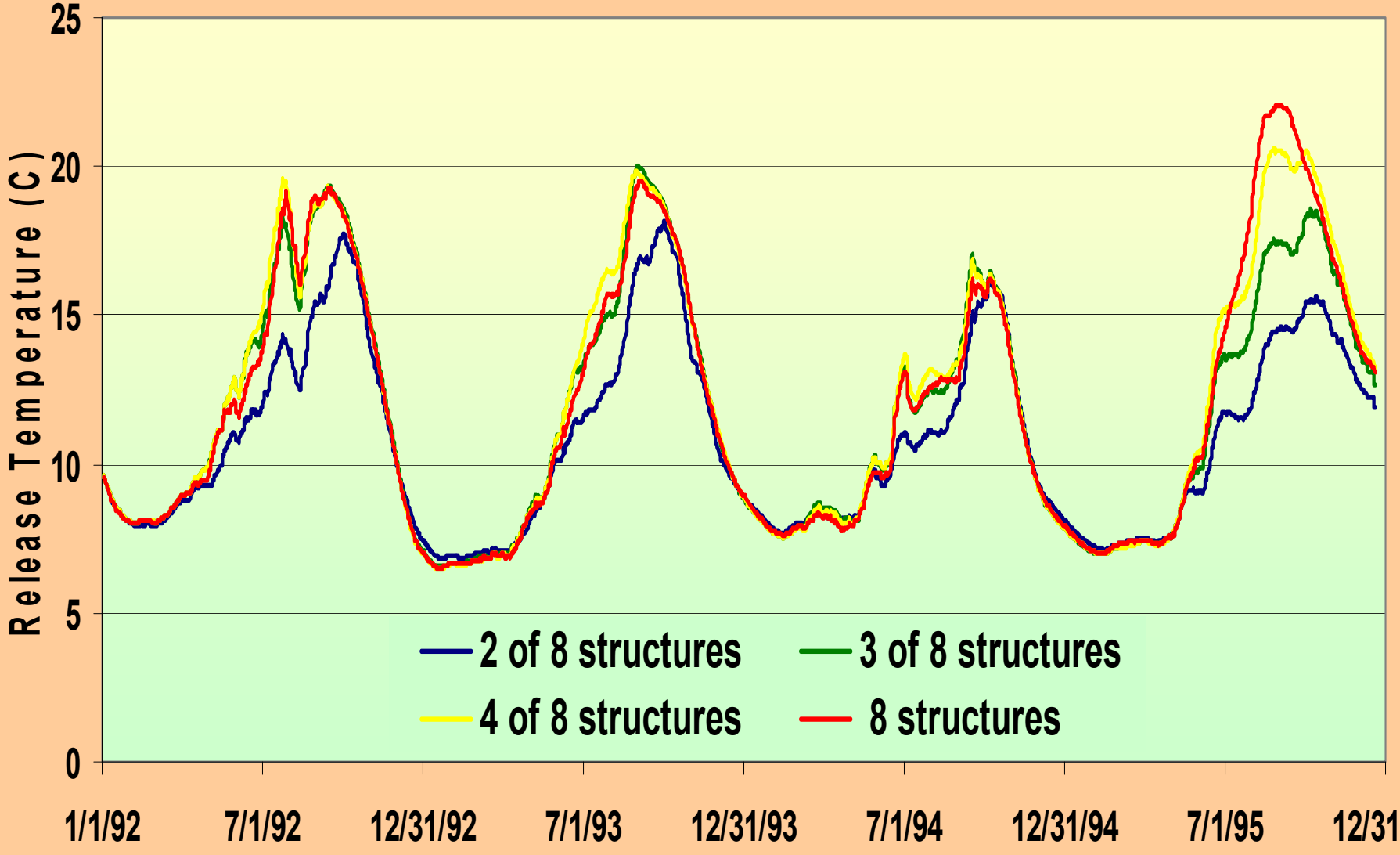
What Could go Wrong?

- Entrainment of non-native fish from Lake Powell
- Modification/degradation of food base
- Increase in parasites and diseases
- Increase in non-native fish competitors and predators

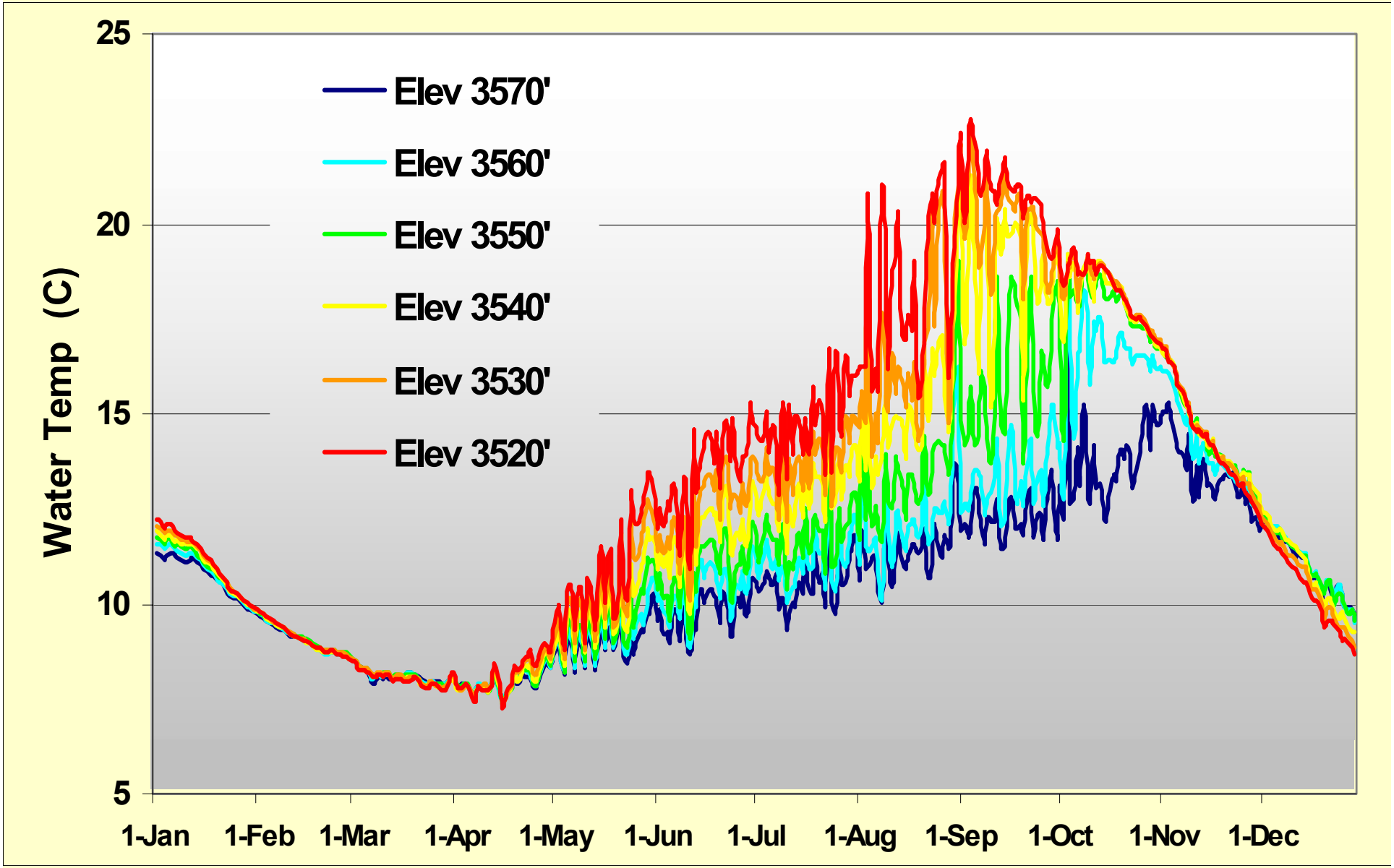

Probability of Future Lake Powell Elevation Exceedances in July
Probability of Occurrence
1
0.8
0.6
0.4
0.2
0
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
2052
3610'
3638'
3670'

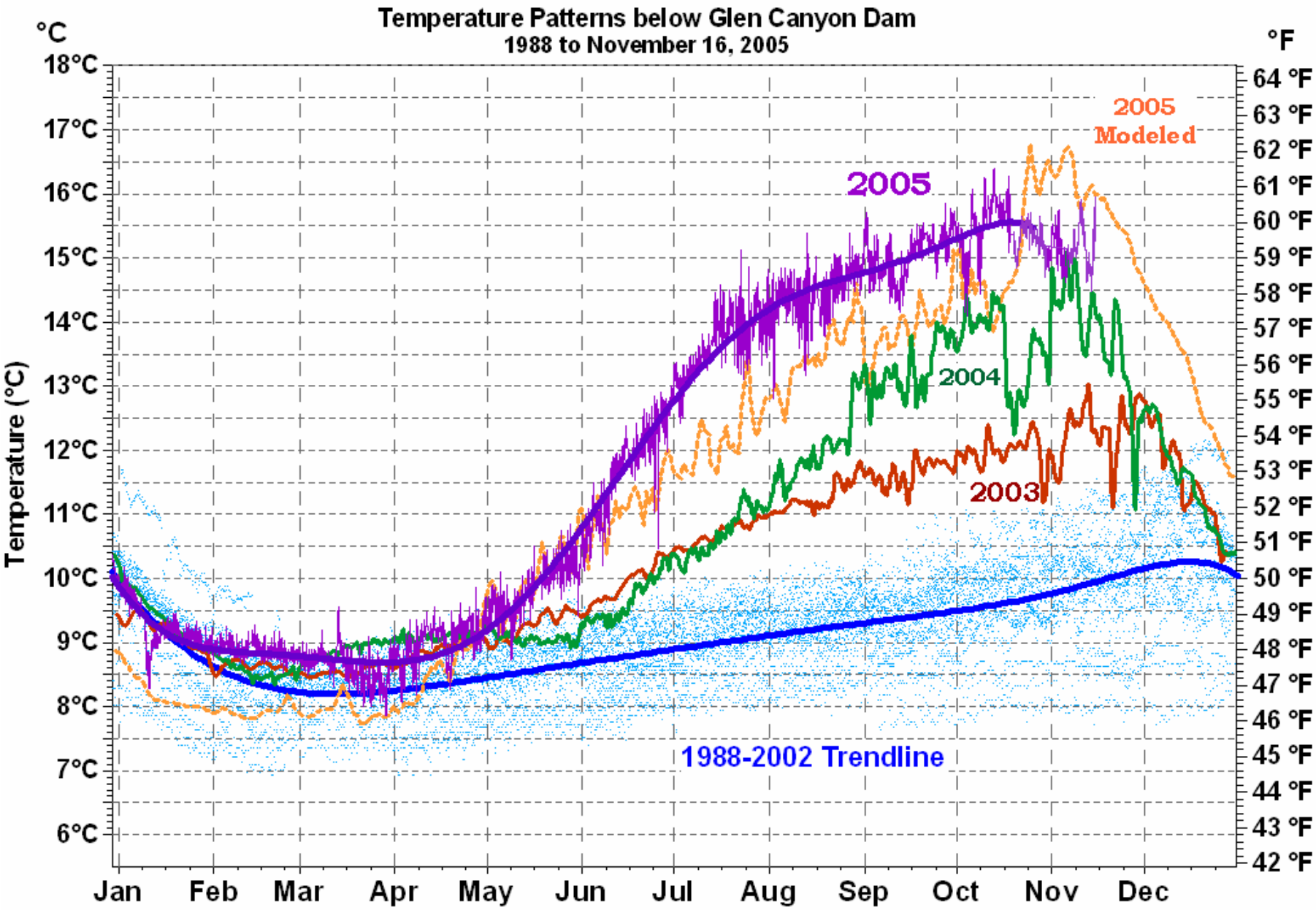
Alternative 4: Release Temperature

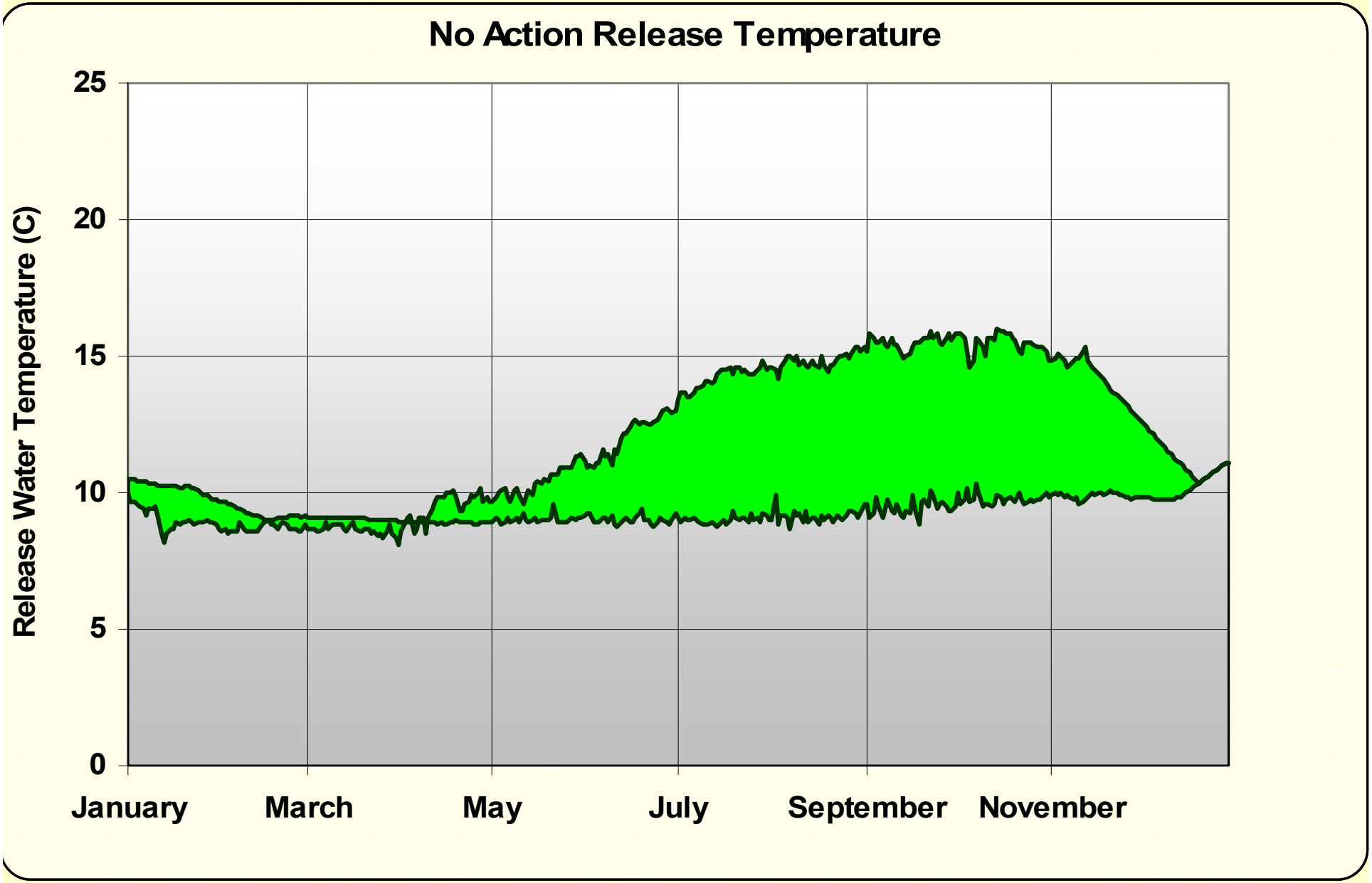
Modify Intakes



Modeled Glen Canyon Dam Release Temperatures




Temperature Patterns below Glen Canyon Dam
1988 to November 16, 2005
°C
°F
Temperature (°C)
18°C
17°C
16°C
15°C
14°C
13°C
12°C
11°C
10°C
9°C
8°C
7°C
6°C
64 °F
63 °F
62 °F
61 °F
60 °F
59 °F
58 °F
57 °F
56 °F
55 °F
54 °F
53 °F
52 °F
51 °F
50 °F
49 °F
48 °F
47 °F
46 °F
45 °F
44 °F
43 °F
42 °F
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2005
Modeled
2005
2004
2003
1988-2002 Trendline

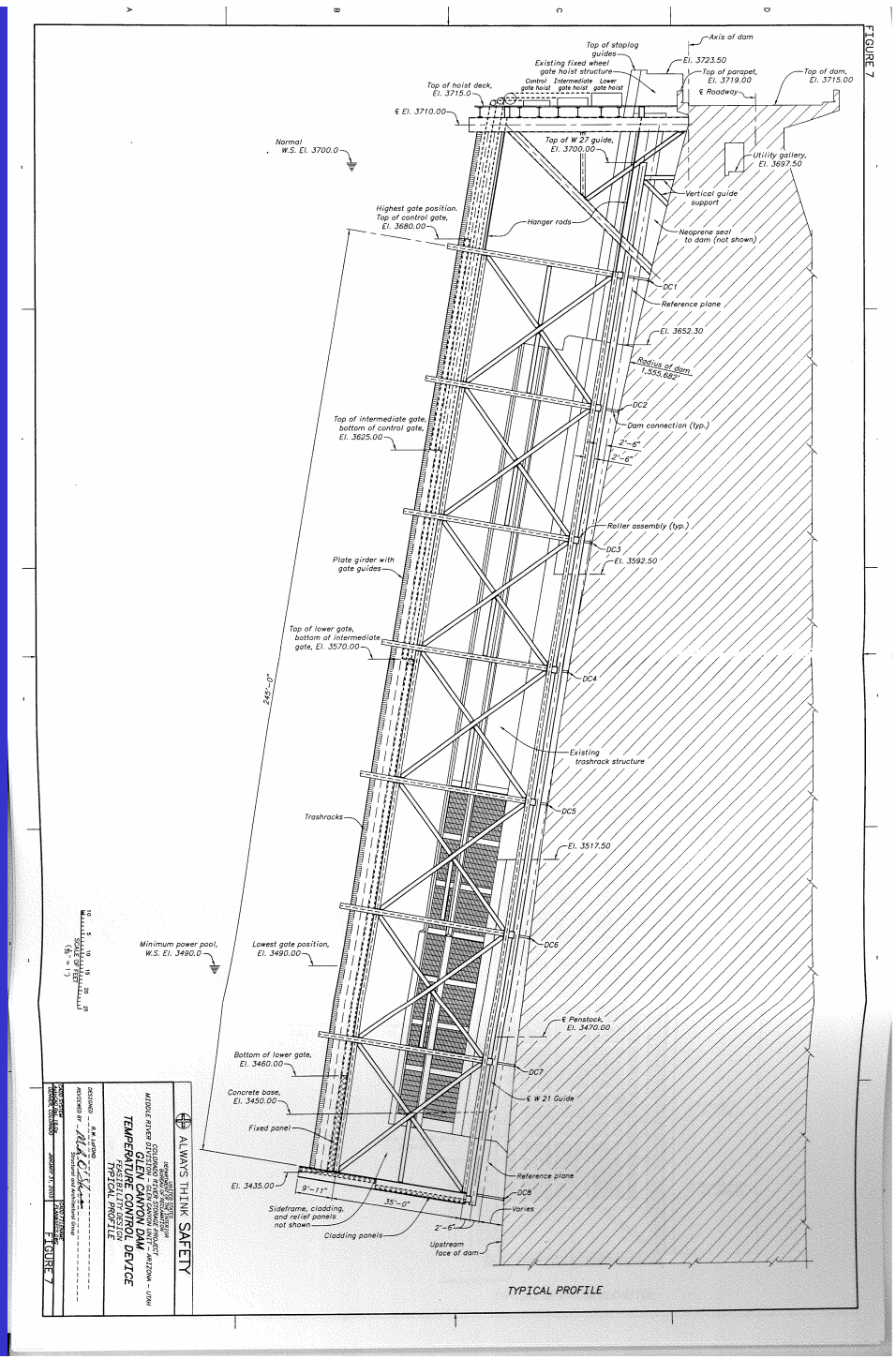

No Action Release Temperature
Release Water Temperature (C)
25
20
15
10
5
0
January
March
May
July
September
November

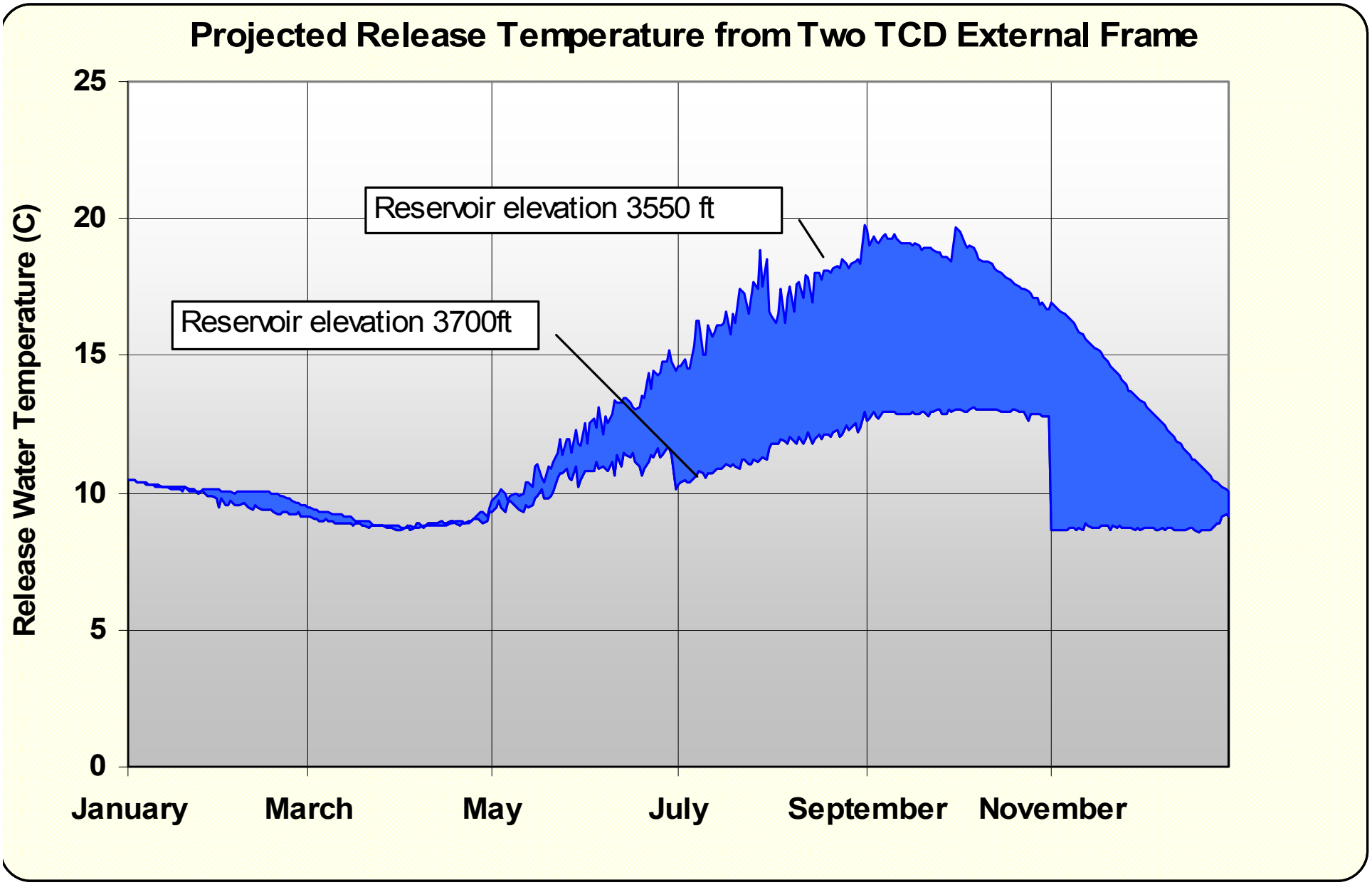
External Frame

Overview

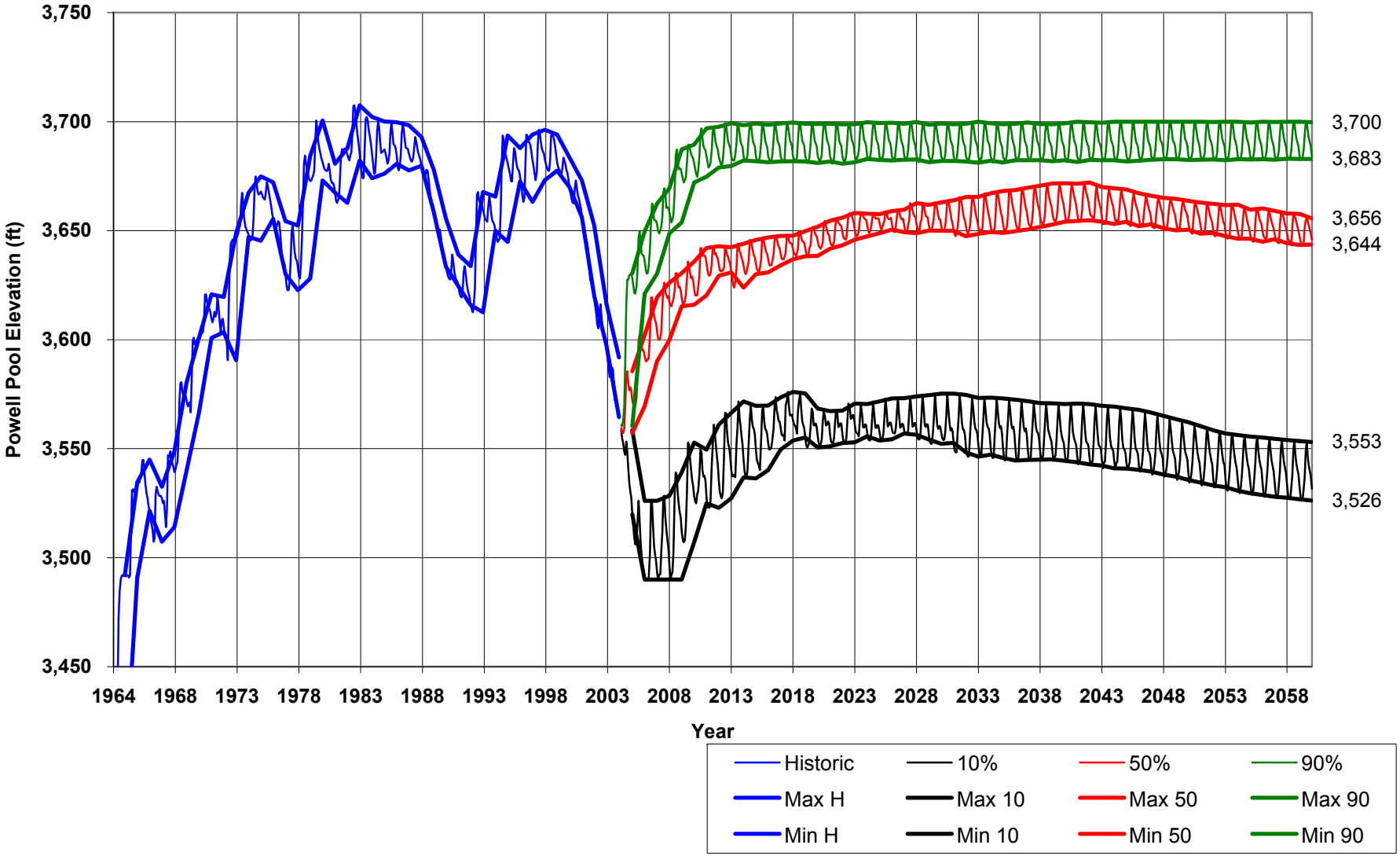
Operating Range/
Minimum Reservoir
Elevation: 190’/3510’

Field Cost Estimate $59M




Projected Release Temperature from Two TCD External Frame
Release Water Temperature (C)
25
20
15
10
5
0
January
March
May
July
September
November
Reservoir elevation 3550 ft
Reservoir elevation 3700ft

Statistical Percentiles Following Historic Record
Powell Pool Elevation

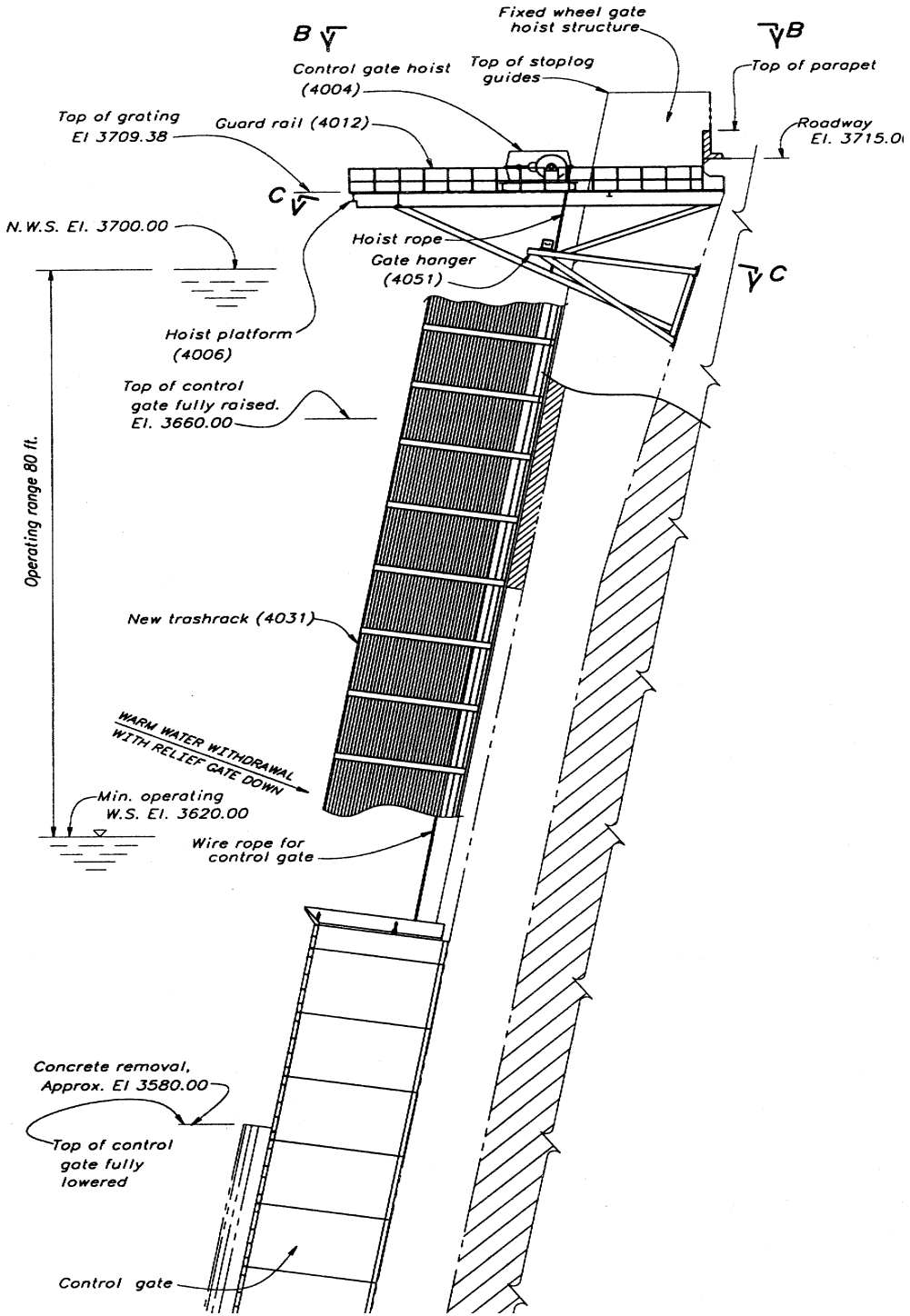


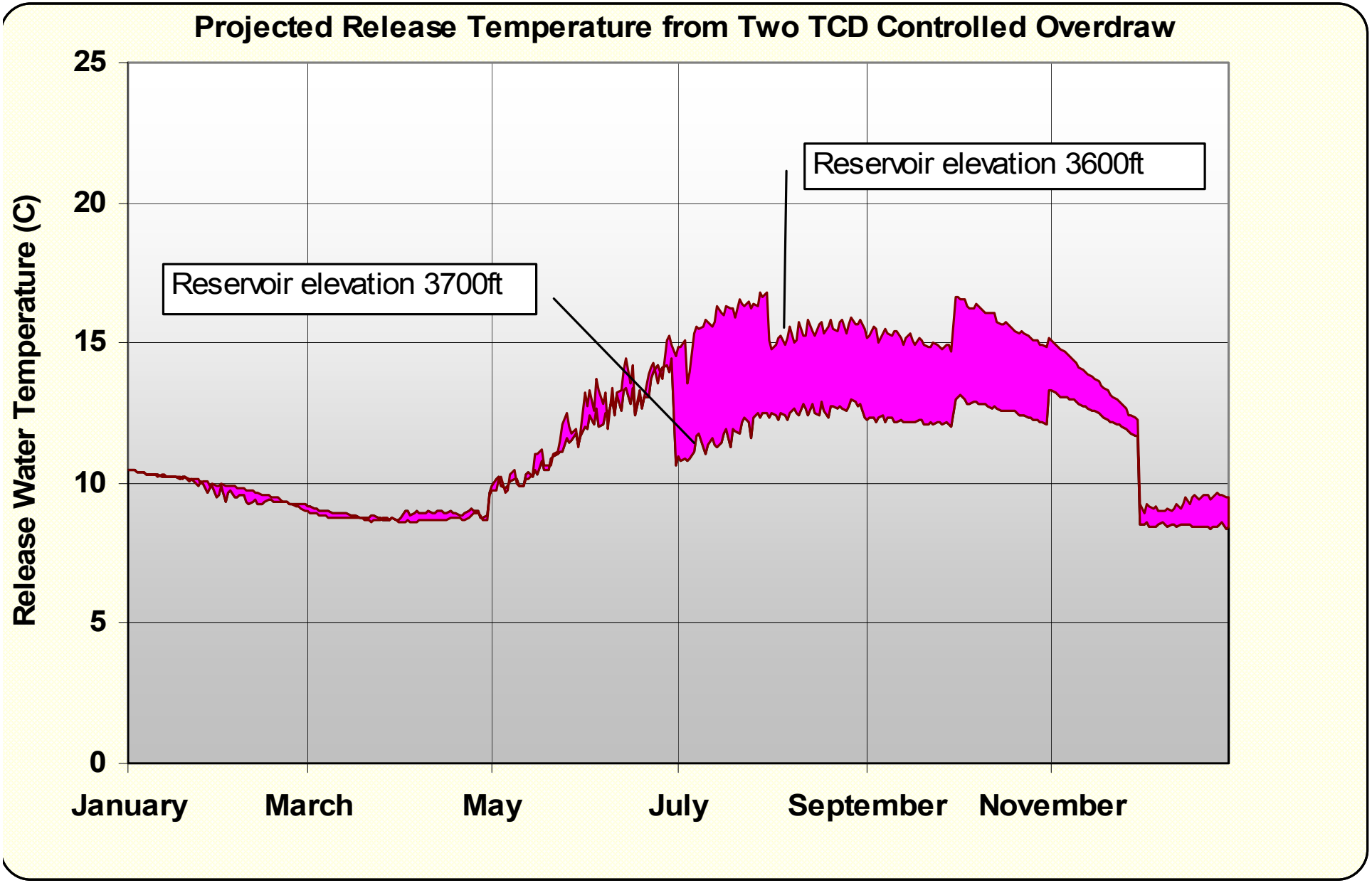
Controlled Overdraw Or Stacked Frame

Overview

Operating Range/Minimum Reservoir Elevation: 70’/3600’

Field Cost Estimate $21-36M

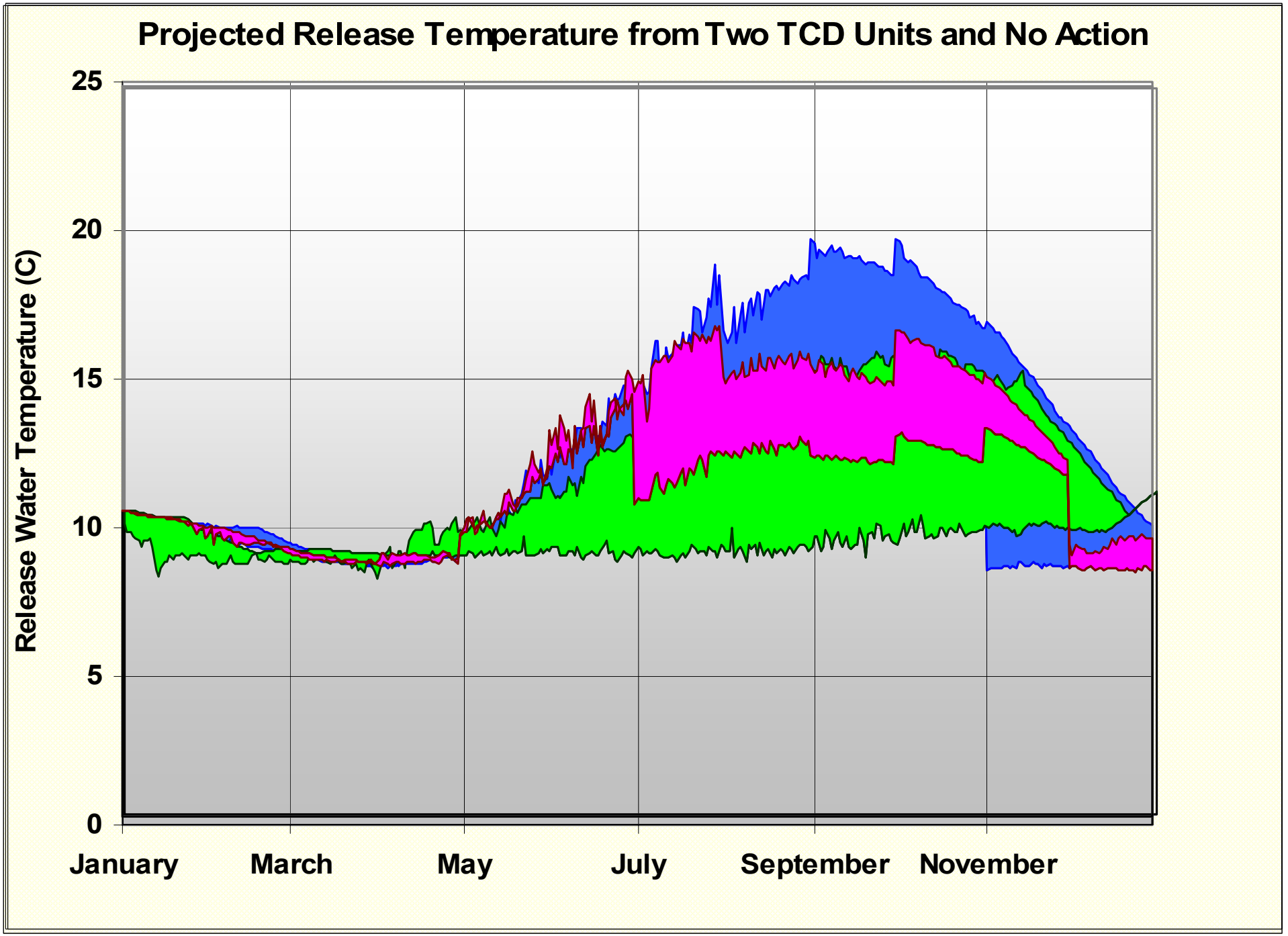


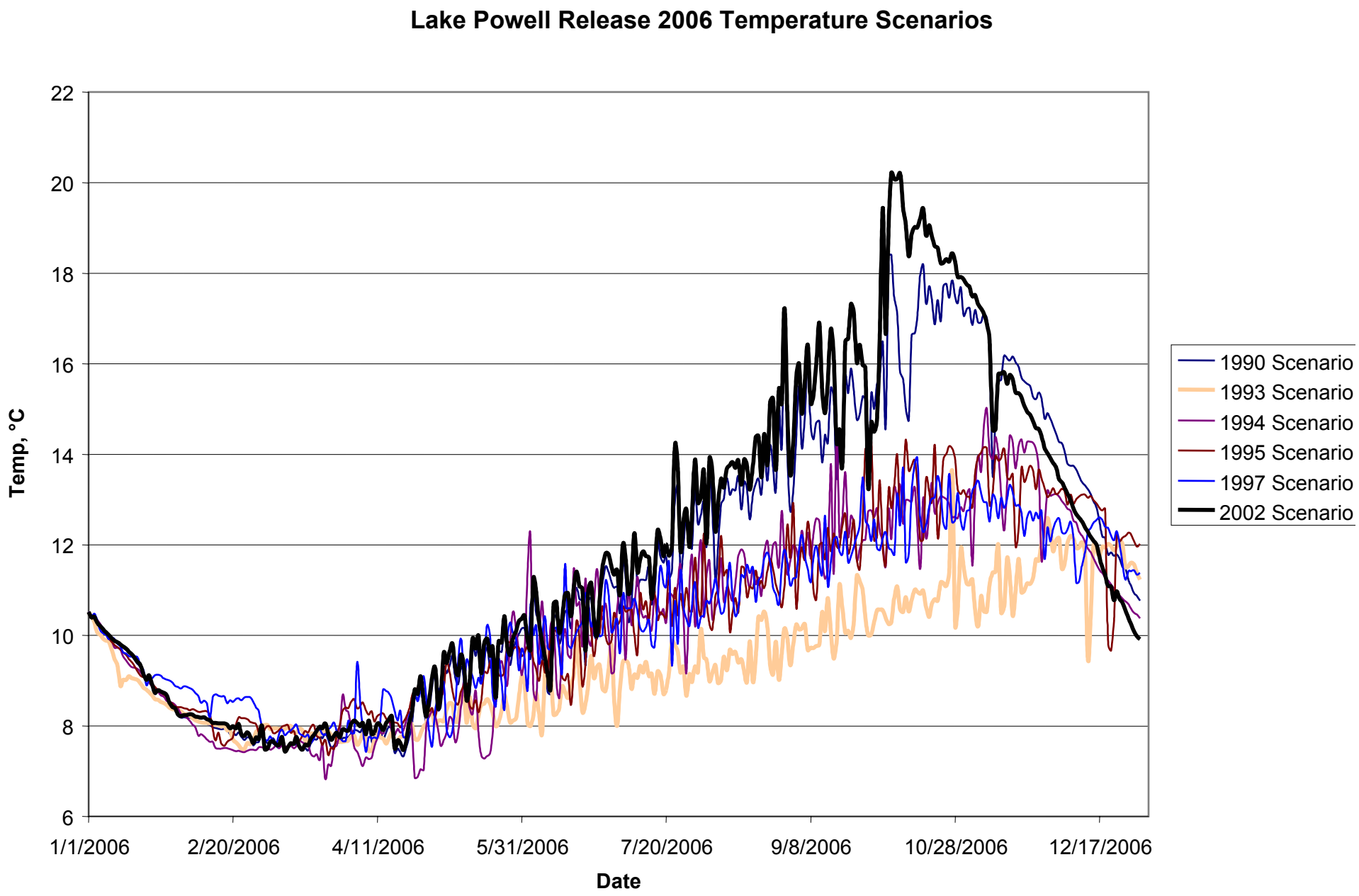

Projected Release Temperature from Two TCD Controlled Overdraw
Release Water Temperature (C)
25
20
15
10
5
0
January
March
May
July
September
November
Reservoir elevation 3600ft
Reservoir elevation 3700ft

Probability of Operation

Operational Range-Reservoir Water Surface Elevations	Percent of Time that TCD Could be Operated Over the 10 Year Test Period*
El. 3700 to El. 3510	99%
El. 3700 to El. 3575	90%
El. 3700 to El. 3600	75%
El. 3670 to El. 3590	50%
El. 3670 to El. 3600	45%

*During months of May through October. Based on Riverware model.


Projected Release Temperature from Two TCD Units and No Action
Release Water Temperature (C)
25
20
15
10
5
0
January
March
May
July
September
November


Lake Powell Release 2006 Temperature Scenarios
Temp, °C
22
20
18
16
14
12
10
8
6
1/1/2006
2/20/2006
4/11/2006
5/31/2006
7/20/2006
9/8/2006
10/28/2006
12/17/2006
Date
1990 Scenario
1993 Scenario
1994 Scenario
1995 Scenario
1997 Scenario
2002 Scenario